Using Mental Imagery in Stroke Rehabilitation in Saudi Arabia

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ABSTRACT

Background

Rehabilitation is vital for promoting post-stroke recovery across the world and fast becoming an essential service in recent years in Saudi Arabia.

One potentially cost-effective rehabilitation method is the use of mental imagery (MI) alongside other more conventional methods such as task-oriented training in the field of stroke rehabilitation, which includes repetitive based training to specific tasks. MI is defined as the experience of generating images of movements in the mind using different senses, such as visualising oneself exercising or feeling oneself performing an exercise.

Findings from randomised clinical trials (RCTs) suggest that the practice of MI improves functional stroke recovery. MI can be practised at home without any supervision, requiring less time and costs. However, its impact on outcomes, remains unclear due to scarcity of research and explicit best practice guidelines.

Methods and Findings

A series of three studies were conducted sequentially. The first was a systematic review with a meta-analysis to determine whether MI, combined with task-oriented training, improves performance in activities of daily living (ADL), mobility and recovery after stroke, and which MI practice designs were the most effective for stroke.

The review, which included 12 RCTs, found that combining MI training with conventional physiotherapy and/or occupational therapy sessions for four weeks or more could improve ADL and mobility performance after stroke by increased gait and balance

normality levels. However, the trials included highlighted the lack of best practice guidelines for both MI use and its implementation in stroke rehabilitation, which was evident through the heterogeneity of intervention protocols used across all studies. Further investigation was therefore warranted to identify factors enabling MI use in clinical practice in Saudi Arabia.

The second study, a qualitative study, with an inductive approach that included 23 therapists (physiotherapists and occupational therapists) in four focus group discussions that were necessary for data saturation. Additionally, 12 individual interviews with stroke survivors were conducted and were sufficient to reach data saturation for the thematic analysis employed. Results from therapist discussions revealed factors essential for enabling MI use in stroke rehabilitation, highlighting what might help therapists better understand MI and its implementation in practice such as training courses, workshops and other resources that would help facilitate MI training with stroke survivors. Also, the findings from interviews with stroke patients supported therapists' opinions and suggest its potential use for promoting post stroke recovery in improving safe and unsupervised practice away from the clinic. The interviews with stoke patients indicated a consensus between stroke survivors and therapists regarding the advantages of unsupervised home-based training.

The third study was a Delphi survey conducted with 18 experts in MI use and training in stroke rehabilitation, to agree on a list of statements that were compiled as a result of reviewing existing research on developing therapists' knowledge and supporting the delivery of MI intervention in stroke rehabilitation. The aim of this survey was to develop consensus on the specific training therapists need to effectively implement MI and the required attributes of stroke survivors to enable their engagement in MI in stroke rehabilitation. A Delphi technique has been suggested as helpful in health research when there is a paucity of experts in clinical and academic intervention use. Findings from the Delphi suggested that the therapists' knowledge, experience and skills in MI training and management are essential in order to train stroke survivors to use MI in clinical practice. In addition to the required attributes of stroke survivors to enable their engagement in MI in stroke rehabilitation and assessment tools necessary for MI use and training. Furthermore, such knowledge and skills could be extended by improving the undergraduate training of professionals, integrating evidence-based and clinician-informed training courses at post-graduate level, and providing MI workshops and training courses for therapists and professionals across the world and in particular in Saudi Arabia. Similarly, stroke survivor engagement in MI intervention could be improved by recognizing patient cognitive impairment levels and motivation, and monitoring treatment progress. Preparing and incorporating MI content within training plans tailored to personal, achievable goals could make a difference to levels of patient recovery.

Synthesizing the findings from the different studies involved following a thread method that addresses the issues identified in these studies, such as the need to train therapists, the methods in which therapists acquire their MI experience and skills, and possible areas for improvement in MI training. In addition, it considers the benefits of treatment engagement to stroke survivors eligible for MI training, the assessment tools necessary to identify their levels of imaging or task performance, and the clinical guidelines and protocols required for best practice in MI therapy. In addition to issues related to MI practices, there were also other areas that remained unclear and required further examination, such as which variables involved in the delivery of MI require enhancement and the relevance of environmental and social settings. These issues were not clarified within either the qualitative study or the systemic review. They are discussed in greater depth later in this thesis with reference to their re-inspection within the quantitative study for further answers.

Conclusion

Current evidence suggests that the clinical use of MI improves post-stroke physical functionality. However, poorly defined intervention content can limit the effectiveness of clinical implementation and evidence-based stroke rehabilitation. MI is seen as a novel intervention and is not routinely used by Saudi-Arabian therapists due to the lack of Evidence-Based Practice (EBP). Interviews offered insight into therapist and stroke survivor experiences and perceptions of MI use, suggesting the need for best practice recommendations for training both stroke survivors and therapists in how to deliver MI effectively as part of stroke rehabilitation.

The studies in this thesis identified that MI, as with any other interventions, lacks clinical implementation informed by EBP, an issue which needs to be resolved. The consensus-based recommendations for best practice MI use in stroke rehabilitation herein proposed, are underpinned by expert clinical and academic opinions, absent in previous literature. This highlights the importance of providing resources that include training therapists, workshops, and developing strategies into gaining further knowledge and proficiency in how to implement MI in clinical practice as an intervention.

DEDICATION

I dedicate my work to my beloved husband, without whose great love, limitless support and constant encouragement, this thesis would have been impossible to complete. You have always respected my hard work, supported my decisions and kept my dreams alive all the way through, you never let me down and always saw the best in me at all times throughout our life together. Thank you and I love you forever.

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I will challenge my limits and win success. I will embrace knowledge and make a difference one day. I don't need wings to help me fly, miracles happen once in a while; my dreams will come in light, only when I believe.

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List of Abbreviations

ACPIN	Association of Chartered Physiotherapists in Neurology
ADL	Activities of Daily Living
AE	Adverse Event
AFT	Arm Function Test
ARAT	Action Research Arm Test
BBT	Berg Balance Test
BCW	Behaviour Change Wheel
BI	Barthel Index
OQP	Online Questionnaire Platform (Online Survey)
CCT	Clinical Control Trial
CG	Control Group
CI	Chief Investigator
CI	Confidence Interval
CIMT	Constraint Induced Movement Therapy
CME	Continuous Medical Education
COM-B	Capability, Opportunity and Motivation Behaviour Model
CPD	Continuous Profession Development
CRF	Case Report Form
EBP	Evidence-Based Practice
EG	Experimental Group
EQ-5D	European Quality of Life Assessment
ESDT	Early Supported Discharge Team
EVI	External Visual Imagery
FAI	Frenchay Activities Index
FAS	Fatigue Assessment Scale
FES-I	Fall Efficacy Scale International
FIM	Functional Independence Measure

FMA	Fugel-Meyer Assessment
fMRI	Functional Magnetic Resonance Imaging
ICF	International Classifications of Functioning Health & Disability
IQR	Median Inter Quartile Range
IRB	Institute Review Board
IVI	Internal Visual Imagery
KFH-UD	King Fahd Hospital University of Dammam Educational
KFUH	King Fahd University Hospital
KSA	Kingdom of Saudi Arabia
KVIQ	Kinaesthetic and Visual Imagery Questionnaire
MAL	Motor Activity Log
MD	Mean Difference
MI	Mental Imagery
MIQ-RS	Movement Imagery Questionnaire-Revised Version
MMSE	Mini-Mental State Examination
MODA	Ministry of Defence and Aviation
MOH	Ministry of Health
MT	Mirror Therapy
NDT	Neurodevelopmental Therapy
NHS	National Health Service
NVIVO QSR	Qualitative Science Research Software
OT	Occupational Therapist
PAT	Stroke Patient Participant
PEDro	Physiotherapy Evidence Based Scale Tool
PETTLEP	Physical, Environment, Task, Timing, Learning, Emotion & Perspective
PIS	Participant Information Sheet
PNF	Proprioceptive neuromuscular facilitation
PROSPERO	International Prospective Register of Systematic Reviews
PT	Physiotherapist
QoL	Quality of Life
RAND	Research And Development Cooperation

RCT	Randomised Controlled Trials
REC	Research Ethics Committee
SMD	Standard Mean Difference
SONY IC-RECORDER	Digital Voice Recorder (SONY)
SPSS	Statistical Package for the Social Sciences
SS-QoL	Stroke Specific Quality of Life Assessment
SSNP	Specialist Section in Neurological Practice
TDF	Theoretical Domains Framework
TH	Therapist Participant in the Focus Group Discussion
TIDeiR	Template for Intervention Description & Replication Checklist
TMS	Transcranial Magnetic Stimulation
TUG	Time Up and Go Test
UE	Upper Extremities
UK	United Kingdom
UL	Upper Limb
UON	University of Nottingham
VR	Virtual Reality
WHO	World Health Organisation
WMFT	Wolf Motor Function Test (WMFT)

GLOSSARY

Several technical terms are used throughout this thesis; thus, a brief definition is provided below.

Active treatment: It is a form of an exercise or an activity that requires the patient's effort into completing the task given to him. The patient can practice the exercises or the activities with or without the supervision of the physiotherapist.

Mental imagery: Refers to the mental process of creating and experiencing mental images in mind by visualising one-self performing a movement or imaging the feel of the movement.

Mental practice: Refers to the cognitive process of rehearsing an image repeatedly of a specific exercise or a task without executing any explicit physical movement.

Passive treatment: is an approach of any therapy or exercise that involves some activities or different strategies performed by the physiotherapist on the patient, without the patient having to execute any effort.

Physical practice: It is defined as any gross motor movement or task that exhorts muscle contraction in the body.

Publications and Presentations at Conferences

- Alhashil N. Kontou E., Radford K. The Use of Mental Imagery for Stroke Rehabilitation: A Delphi Study. 15th UK World Physio Congress 2021 online 9th -11 April 2021 online.

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- Alhashil N., Kontou E., Fletcher-Smith J., Radford K. Using Mental Imagery in Stroke Rehabilitation in Saudi Arabia. World Confederation of Physical Therapy Congress, 2019 Meeting, 10-13 May 2019, Geneva, Switzerland. The Physical Therapy Congress, 2019 Journal. [Presented as a Poster].

- Alhashil N., Kontou E., Fletcher-Smith J., Radford K. Using Mental Imagery in Stroke Rehabilitation in Saudi Arabia. The 15th Congress of the European Forum for Research in Rehabilitation (EFRR) Together with the 28th Reha-Wissenschaftliches Kolloquium, Germany in Reha Congress for Rehabilitation Research, 2019. Meeting, 15-17 April 2019, Berlin, Germany. The German Medical Science website. 15(28), p. 555. doi: 10.3205/19efrr106, urn:nbn:de:0183-19efrr1068. [Presented as a Poster].

- Alhashil N., Alotaibi M., Kontou E., Fletcher-Smith J., Radford K. Mental Imagery Practice with Task-oriented Training Enhanced Rehabilitation to Improve ADL Recovery, Quality of Life and Participation After Stroke: A Systematic Review. The International Journal of Stroke Forum book 2018, Vol. 13(3S), pp. 10–65.

- Alhashil N., Alotaibi M., Kontou E., Fletcher-Smith J., Radford K. Mental imagery practice with task oriented-training enhanced rehabilitation to improve ADL recovery, quality of life and participation after stroke: A Systematic Review Protocol. PROSPERO 2016: CRD 42016051995 Available from: http://www.crd.york.ac.uk/PROSPERO/displayrecord.php?ID=CRD42016051995

- Alhashil N., Alotaibi M., Fletcher-Smith J., Kontou, E. and Radford K. Mental Imagery Practice with Task-oriented Training Enhanced Rehabilitation to Improve ADL Recovery, Quality of Life and Participation After Stroke: A Systematic Review (work in progress). The 14th Congress of the European Forum for Research in Rehabilitation (EFRR) and The Society of Research in Rehabilitation (SSR) Conference Meeting in Glasgow, 2016. P. 52. [Presented as a Poster] Meeting, 24-27 May 2017, Glasgow Scotland.

- Alhashil N., Alotaibi M., Kontou E., Fletcher-Smith J., Radford K. Mental Imagery Practice with Task-oriented Training Enhanced Rehabilitation to Improve ADL Recovery, Quality of Life and Participation After Stroke: A Systematic Review. International Journal of Stroke Forum book 2018, Vol. 13(3S), p. 25. Available at https://journals.sagepub.com/doi/abs/10.1177/1747493018801108

- Alhashil N., Kontou E., and Radford K. The Use of Mental Imagery in Stroke Rehabilitation: A Delphi Survey (Work in progress). The Society of Research in Rehabilitation (SSR) Conference Meeting held in Nottingham, 2019. [Presented as a Poster] at the 5th of February 2019, Nottingham, UK.

- Alhashil N., Kontou E., Fletcher-Smith J., Radford K. Using Mental Imagery in Stroke Rehabilitation in Saudi Arabia. The 15th Congress of the European Forum for Research in Rehabilitation (EFRR) Together with the 28th Reha-Wissenschaftliches Kolloquium, Germany in Reha Congress for Rehabilitation Research, 2019. 15(28), p. 555. doi: 10.3205/19efrr106, urn:nbn:de:0183-19efrr1068.

- Alhashil N., Kontou E., Fletcher-Smith J., Radford K. Using Mental Imagery in Stroke Rehabilitation in Saudi Arabia. World Confederation of Physical Therapy Congress, 2019. [Accepted Abstract number A-0990-0000-03094, Presented as a Poster] Meeting, 10-13 May 2019, Geneva, Switzerland.

DECLARATION

I, Najla Alhashil, declare that the research in this PhD thesis, including the ideas, studies, analysis, results, and conclusions, were all genuinely developed by my own self, based at the University of Nottingham, and the thesis has not been submitted for a qualification at any other University.

Chapter One:

Background

1.1 Introduction

Rehabilitation following a stroke is a long process and can cause much distress to stroke survivors as they struggle to reclaim their lives. This study explores one specific intervention, mental imagery (MI), that may improve the condition of stroke survivors and maximise successful rehabilitation process. Whilst there are a number of conventional and traditional therapeutic approaches and task-oriented methods, little attention has been paid to MI, which is considered a more unconventional approach. However, it is worth investigating the effectiveness of this intervention given the current contextual constraints in Kingdom of Saudi Arabia (KSA) and explore to what extent it is commonly used alongside other existing therapies and approaches. This chapter provides an overview of stroke, definitions, types and associated risk factors, its impact and rehabilitation programmes both in context and globally, associated with its aftercare pathways.
The rationale for focusing on MI and its implementation in stroke rehabilitation alongside other therapeutic treatments in rehabilitation is then briefly discussed. Next, a critical evaluation of the theoretical framework for informing MI implementation in this research is presented, aligned to the research questions focused specifically on factors in MI use not yet adequately explored. There then follows an overview of the Saudi setting for

this study, a brief description of implementation science in healthcare and methods currently incorporating MI in stroke patients' rehabilitation, including factors enabling its use, clinical guidelines, and a framework for MI use in practice. Finally, the significance of this thesis, related research aims, and methodological framework are outlined.

1.2 Stroke

1.2.1 Definitions and types

Stroke is a clinical term used to describe a disruption to the blood flow within a vascular artery of the brain that lasts for more than 24 hours or results in death (Winstein et al., 2016). Such an interruption may cause the brain cells to die due to a lack of oxygen. Similarly, according to Hatano's (1976, p. 541) findings reported in the World Health Organisation (WHO) preliminary report, a more clinical definition of stroke is "clinical signs of focal (or global) disturbances of cerebral function, with symptoms lasting 24 hours or longer, or leading to death, with no apparent cause other than vascular distortion". A stroke can be classified pathologically by background as either 'ischaemic' (caused by a blood clot that blocks blood flow) or 'haemorrhagic' (caused by a burst blood vessel bleeding within the brain) (Kwakkel et al., 2004). The former, known as thrombotic cerebral infarction, results from a block to a large cervical artery, and other cerebral arteries or blockage of distal cerebral arteries.

The latter can be intra-cerebral and the result of arteriolar hypertensive disease, or other causes such as coagulation disorders and diet imbalance (low blood cholesterol, high blood pressure), or subarachnoid haemorrhage due to rupture of aneurysms in the brain where the large arteries divide (Winstein et al., 2016). Research suggests that this type of stroke does not cause direct damage to the brain and should be excluded from the classification (Edlow, Malek & Ogilvy, 2008). However, this has been shown to develop into a mature stroke and therefore should be regarded as such (Sun et al., 2019). Stroke may result in many adverse outcomes related to the area of the brain affected, the vascular artery damaged, type of stroke and onset (Polychronopoulos et al., 2002).

1.2.2 Risk factors, incidence and prevalence of stroke

Stroke incidence is associated with risk factors such as age, gender, family history and ethnicity (Ayala at al., 2002), as well as a history of hypertension, high cholesterol, diabetes mellitus, atherosclerosis, cardiac disease, obesity, smoking, excessive alcohol consumption, and physical inactivity (Porter, 2013). Notably, stroke remains the leading cause of nearly 10% of all deaths worldwide (WHO, 2001) affecting around 17 million people (Clarke & Forster, 2015). It is the second greatest cause of disability for around 5 million people (Mukherjee & Patil, 2011), leaving almost one third of survivors with long-term impairments (Truelsen, Begg & Mathers, 2006). Such impact can take the form of significant physical and psychological impairments and limitations (Feigin et al., 2008). In this respect, 33% of all stroke survivors are functionally dependent after one year; moreover, stroke can result in psychological and social problems (Robinson, 1997). In the United Kingdom (UK), stroke is the fourth most prevalent cause of mortality, with an estimated 1.2 million survivors, 42% of whom will require assistance and be dependent on others when performing everyday activities. Furthermore, 22% will have mild disability, 12% will be severely affected and almost 11% will need to live in care homes (Stroke Association, 2018; Adamson et al., 2004). After a stroke, approximately 80% of survivors suffer general movement loss and functional limitations (Hajek et al., 1997). In comparison, stroke prevalence and incidence in Saudi Arabia is reported to be lower than elsewhere, which may be due, as in Western countries, to scarcity of reliable information around stroke rates and available research conducted in this field (Ayoola et al., 2003). Alahmari and Paul's (2016) survey estimating stroke prevalence in a community in the Eastern region of Saudi Arabia, identified 178 stroke cases per 100,000 population. However, Khealani et al. (2008) reported that death rates after stroke are predicted to double by 2030 in Arab countries. According to a study by Robert and Zammzami (2014), 22% of annual deaths after stroke in Saudi Arabia are caused by cardiovascular disease; however, the specific prevalence of stroke is unknown (Alahmari & Paul, 2016). A paucity of research and lack of clarity of available statistical data regarding incidence, prevalence and stroke socio-demographics in the Middle East, particularly in Saudi Arabia, is concerning (Al-Rajeh et al., 1998; Ayoola et al., 2003). A single-centre study conducted in Saudi Arabia by Al Khathaami et al. (2014) found stroke prevalence to be high, relative to morbidity and death rates in the population. Furthermore, a recent critical review by Bindawas and Vennu (2016) acknowledged the increasing rise in stroke rates alongside mortality and functional impairment of individuals living in Saudi Arabia. Recently, the annual prevalence of stroke was recorded as 57 per 100,000 people in the south-west region of Saudi Arabia in 2018 (Alhazzani et al., 2018). In the absence of other detailed studies, there is a clear need to provide enhanced prevention programmes and improved rehabilitation services. Moreover, these programmes and services should aim to include effective interventions to reduce the risks of stroke morbidity and mortality and, furthermore, facilitate post-stroke recovery.

1.2.3 Health risk implications after stroke

In stroke survivors, manifestations and neurological dysfunctions may present as acute symptoms or later as chronic disability outcomes (Geyh et al., 2004). Impairments can clinically manifest in loss of speech, weakness or paralysis (usually on one side of the body). Specifically, motor impairments such as limitation or loss of leg or arm functions on one side of the body may include paresis of the upper limb (UL) (77% of survivors), paresis of the lower limb (72%), while sensory impairment may affect sensation on both touch and proprioception levels, resulting in pain and inability to feel objects (Bowden, 2012). Other post-stroke consequences include cognitive impairment (44%) such as memory loss, concentration lapses, orientation and attention problems (Diamond et al., 1996), as well as difficulties with thought-processing, language and communication (Kase et al., 1998). These can all lead to mood disturbances, such as irritability, and an imbalance in or disturbed feelings of distress (Lawrence et al., 2001), anxiety, anger, sadness and post stroke depression (Robinson 1997; Whyte & Mulsant 2002; Intercollegiate Stroke Working Party, 2012).

Besides mood disturbance, stroke may further lead to dysfunctions, limitations and difficulties in performing everyday tasks, known as activities of daily living (ADL), such as personal grooming and housework (Jorgensen et al., 1995). Furthermore, a stroke may lead to decreased muscle strength, reduced motor control and postural imbalance, resulting from hemiparesis, which may in turn impact on gait normality, walking abilities and general mobility activities such as the ability to transfer weight and move or roll over in bed, the ability to stand from sitting and walk from one point to another (Canning, Ada & O'Dwyer, 1999). These types of impairment are seen as health-risk implications resulting from stroke, for instance, inability to walk post stroke is an indicator of increased rates of frailty. Other impairments such as mobility problems and co-morbidity, lead to other secondary complications common to stroke such as heart disease, bone disease and mortality. Consequently, both diminished levels of ADL and mobility can impact on the survivor's Quality of Life (QoL) and may debilitate their social participation and return to work (Kluding & Gajewski, 2009; Lord et al., 2004; Lai et al., 2002).

1.2.4 Impact of stroke

After stroke, an individual's life and family may be affected financially, physically, emotionally or socially. Given the consistent need to undergo rehabilitation and seek assistance to overcome this sudden traumatic event, a financial burden may be placed on the stroke survivor or other family members. A study by Sprigg et al. (2013) investigated the relationship of stroke characteristics of 2569 patients after stroke and impact on QoL. Analysing data gathered from trials using the EuroQol questionnaire (EQ-5D; Rabin & Charro, 2001), findings showed that stroke patients who were left primarily with mobility problems and ADL dysfunction, or who were mostly dependent on a carer, had low health-related QoL. Moreover, several studies examining the impact of stroke on life participation and return to work found that decreased ADL, mobility and cognitive impairments were the main determinants of negative impact (Alexanderson & Hensing, 2004; Hindfelt & Nilsson, 1977; Hofgren et al., 2007).

The focus of this study is to examine improving ADL independency in stroke rehabilitation, rather than focusing simply on improving isolated abilities or upper limb functions. This is similar to the concept outlined by Kingston et al. (2012) which addresses a combination of both basic personal ADLs, such as bathing, feeding and toileting, and instrumental ADLs, such as the ability to administer self-care within the household through shopping, cooking and cleaning. According to the International Classification of Functioning Health and Disability

(ICF, 2011) and WHO (2013), intervention studies should address what can support better rehabilitative programmes that could help improve functional impairments, bodily limitation levels and independency capacity within the treatment plans aimed within recovery stages.

Furthermore, any intervention study should aim to reduce ADL limitations resulting from a problem in body function or structure that may prevent normal task execution, rather than improve any anatomical structure deficiency caused to the limb resulting in dysfunction (WHO, 2001). Improving levels of ADL independency may enhance a return to routine activities, given that the productivity of both the stroke survivor and their family caregivers may also be affected negatively (Saka et al., 2009). Around 69% of UK survivors are reportedly unable to return to work, while 65% describe a decrease in family income leading to an increase of up to 85% in everyday expenses, including contributions to healthcare services (Stroke Association, 2018). Patel et al. (2020) estimated the annual financial impact of stroke at around £8.6 billion in healthcare costs, and £9 billion associated with loss of productivity and the need for informal care in the UK. Following a stroke, the chronic stage (>3 months after stroke) is the costliest due to the requirement for long-term assistance and the patient's lack of independence (Intercollegiate Stroke Working Party, 2016). To date, data on the economic impact, family expenses and costs after stroke are lacking in Saudi Arabia (Almekhlafi, 2016). Significant disabilities and impairments resulting from stroke require on-going medical follow-up, medication, family care or the need for stroke survivors to be admitted to a nursing home (private centres for the elderly and infirm), in addition to the use of assistive devices and other healthcare services. Most families in Saudi Arabia take care of their own elderly and sick family members in their own homes.

Recent studies identified that economic and emotional burdens are placed upon carers and families (Abu Kamel et al., 2010). Salama (2012) indicated that family members were likely fearful over their partner's future health. Furthermore, carers and families may experience anxiety regarding continued treatment or, as supported by Anderson et al. (1994), may worry about the chances of their partner suffering another stroke. These impacts highlight the importance of providing effective rehabilitation programmes to facilitate or maintain levels of function and participation in life (Al-Jadid 2013; Af'el-Hazmi, 1997).

1.3. Rehabilitation theory from a global perspective

Stroke impact can affect a survivor's life multifariously with impairments extending beyond physical (anatomical or body structure), psychological and emotional levels, to environmental and social aspects (WHO, 2013). Specifically, environmental factors can be social and attitudinal in that an individual may maintain execution of tasks and activities, but the impact might affect their participation in society and limit involvement in everyday activities (Gill & Kurland, 2003; Loisel et al., 2002).

After a stroke, functional motor recovery may be enhanced by well-planned rehabilitative programmes that include different clinical therapy strategies, such as physiotherapy or occupational therapy (Pollock et al., 2014). The period of rehabilitation could begin instantaneously from hospitalisation and continue at home after discharge (Pollock et al., 2007). Members of the survivor's support system, such as family, carers or gym instructors, can contribute by encouraging them to adhere to the rehabilitation programme (Coupar, 2012).

Therefore, a rehabilitation programme is needed which addresses and meets all individual recovery needs including different levels of biological, environmental, and social factors (ICF, 2011; NICE, 2013).

1.3.1 Rehabilitation programmes theories

Findings from randomised trials and systematic reviews support stroke rehabilitation achievement, as guided by several main theories (Hoenig et al., 2002; Nudo, 2003). Healthcare services providing rehabilitation programmes can work to ensure stroke survivors have access to appropriate guidance and services as to the best rehabilitation plans tailored to their own needs and goals (McKevitt et al., 2011). By considering individual needs and setting goals within a personalised rehabilitative plan, attention could be placed on informing patients of the best options based on rehabilitation theories (Dijkers, Hart, Tsaousides, et al., 2014). This can be conceptualised under two theories: the treatment theory (Keith, 1997) that can help inform therapists in selecting the appropriate intervention to meet stroke survivors' needs in their recovery, and enablement theory (Dijkers et al., 2014) which informs surrounding contextual factors specifically impacting intervention success and any recovery scheme.

For example, Ellis et al. (2010) in a meta-analysis of trials including stroke rehabilitation interventions, reported significant reductions in disability and death levels in stroke survivors with mild to moderate disability when associated with factors such as social support and stroke survivor's education with their carers provided by the healthcare providers (Saka et al., 2009; Anderson et al., 1994). This included 16 RCTs with a total of 4759 participants exploring the impact of connecting stroke survivors with other services to help support their recovery plan, compared to other groups with only standard care services. Reported findings supported the need to identify potentially beneficial services among those proposed by health care workers in addition to the standard available care, to minimise death rates and disability levels, and improve primary outcomes of ADL, carer strain, and patients' health status (Langhorne et al., 2011; Dombovy et al., 1986). Rehabilitative programmes can be based on theories constituting treatment and rehabilitation goals to tackle their different inadequacies resulting from stroke (Locke & Latham, 2002).

The ICF (WHO, 2013) is one global theory underpinning rehabilitative programmes, provided to support recovery stages. This theory addresses performance and capacity levels in functioning and disability within an individual. According to an evaluation of ICF theory by WHO (2013) regarding health and disability at both an individual and population level, it provides a communal basis by defining three component levels of information. These components are related to individual's health condition, functioning and disability: body level such as anatomical or structural impairments, activities level such as limitations in task completion. Finally, contextual level including environmental and personal factors (WHO, 2001).

Theory regarding biopsychological factors, critical to rehabilitation treatment planning underlines an individual's needs after stroke and can help maximize rehabilitation plans for such needs (Kamper et al., 2015; Marin et al., 2017). This multidisciplinary model of health and illness suggests that one or more levels including biological, psychological and social, can interact and influence one another.

Importantly, using such rehabilitation theories can help in planning and implementing interventions in clinical practice. The treatment and enablement theories both help in selecting the appropriate patient treatment and identification of clinical treatment intervention relevant to any specific patient needs (Wade, 2020). For example, choosing cognitive related interventions with stroke survivors who might have cognitive impairments may not be appropriate. It has been suggested that rehabilitation programmes for any patient in clinical practice can encounter many challenges in selecting further highly complex clinical interventions that may enhance patient recovery. Therefore, developing an understanding of scientific knowledge regarding a patient's health and rehabilitation and applying this in clinical settings is crucial for promoting successful practice (Alsufyani, 2020).

It can be noted that practical application of theories is lacking in most developing countries, potentially due to several contextual factors including availability of rehabilitation professionals, lack of resources and poor quality of professional educational bodies. However, scope within a patient's context such as social, psychological, cultural, and environmental factors need to be highlighted in any assessments to enhance intervention processes and healthcare services quality (George et al., 2014). Although there may be disparity in rehabilitation and intervention plans when it comes to using any theory-guided research, this may be due to the many different and appropriate sets of concepts available for selection within the wide range of potential domains that are under inspection in rehabilitation.

1.3.2 Structure of rehabilitation plan

The structure of any rehabilitation care plan should comprise several factors. First, the assigned care services provider should deliver a comprehensive stroke pathway care system. This system begins with stroke prevention, extends to acute care, early phase rehabilitation, then later to community rehabilitation and access to long-term support plans. Other factors include provision of services that should be based on the best available evidence, either locally or nationally, tailored to population needs. Further, care services providers should have the required knowledge and skills and access to professional training schemes to fulfil safe care of stroke survivors. Moreover, discharged stroke survivors should be assured sufficient information on how to access special services at all pathway care stages.

Currently there is an urgent need for researchers, healthcare providers and organisations to develop the best and most cost-effective interventions to minimise stroke disabilities and related personal and societal burden. The combination of different balanced measures and rehabilitation services could include medical, social, vocational programmes, training individuals to improve and optimise functional ability through proposed goals (WHO, 2001).

Recently evidenc-based practice (EBP) interventions have been employed within rehabilitation services to maximize care services for stroke patients (Davies et al., 2007). These comprise a range of interventions implemented within key guidelines for different stroke cases that incorporates different impairments, within different settings and according to different goals serving a recovery process required for each condition.

Components of a successful care pathway include an interaction process between an appropriate care plan structure and an optimal care processing system led by professions, which, in turn, impacts on the final outcomes. While health care districts and independent hospitals generally administer care schemes based on type and availability of accessible resources, alongside care strategy, this is indeed processed through planning rehabilitation treatment intensity, the outlined prevention and preparation plans to discharge the patient from hospitals and wards (Intercollegiate Stroke Working Party, 2012).

1.3.3 Context of rehabilitation

Rehabilitation care is recognised as an important step after stroke, including starting as early as possible, that can reduce levels of impairment and optimise the prognosis (Indredavik et al., 1999). Different stages of rehabilitation care include emergency care, intensive or acute care, in-patient or recovery care, and early discharge settings, as well as home-based services, return to work and long-term support services. Once a stroke patient is medically stabilised and there are no signs of any other clinical contradictions or complications, the rehabilitation plan can then be moved into the acute stage, otherwise the services can continue up until the time the patient is discharged or relocated to other rehabilitation settings (Duncan et al., 2005).

Goals and contexts specific to patient needs, alongside family support in stroke rehabilitation programmes, impact on successful outcomes in a care pathway. A study by Bernhardt et. al. (2004) aimed to determine how well stroke survivors manage within acute stroke units in relation to identifying their physical activity patterns. A total of 64 stroke survivors were recruited from five stroke units, and were observed within 14 days of their stroke, from 8 am to 5 pm, for two days at10-minute intervals. The therapists recorded the therapy undertaken by the stroke patients which included general physical activities to improve their mobility levels. Their findings showed stroke survivors spent over 50% of their time on bedrest, 60% of their time alone, and only 13% of their time engaged in physical activity that aimed to help them improve mobility levels and minimise complications. This highlights the importance of rehabilitation care during the different recovery phases post-stroke.

A critical phase in stroke recovery is persistence in a sustained in-patient care setting, in which experienced, trained, interdisciplinary staff provide optimal assessment and care for stroke recovery outcomes. Furthermore, a complimentary outpatient care phase is essential in factoring rehabilitation structure to promote stroke recovery and sustaining improved functional level. Evidence suggests that outpatient rehabilitation is key to improving outcomes, yet it is overlooked in services offered by many well-developed healthcare systems (Hansen et al., 2013).

In-patient care phase is a complex system of care in rehabilitation provided for patients after stroke (Saposnik et al., 2009; Kwakkel et al., 2004). Evidence obtained from randomised studies and systematic reviews addressing assessment of rehabilitation in specific systems for complex interventions found that in-patient services are organised in a multidisciplinary stroke unit that promotes recovery from stroke and is aimed at improving level of functional independence and returning to home. Although stroke survivors vary in age, stroke severity and symptoms, most can benefit from this type of care to facilitate earlier discharge/return to home phase (Mayo et al., 2000).

Outpatient care in rehabilitation programmes can involve a range of services such as home-based, community rehabilitation services or post discharge rehabilitation services in outpatient clinics (Outpatient Service Trialist, 2004).

During the long-term rehabilitation phase, stroke survivors benefit from rehabilitations plans. Forster et al. (2009) found no evidence of significant clinical benefit for mild to moderate disabled patients or carers from a structured reassessment system at six months post-stroke. Promoting physical activities, community integration and participation alongside practical and emotional support among stroke survivors via care home rehabilitation is important, alongside family carers or informal carers. Although few trials have been conducted in this area, evidence from those completed shows improvements in walking and function in patients who received such interventions after six months (Duncan et al., 2011).

Long-term management follows an initial recovery phase when discharged from inpatient care, most commonly occurring within the first six months after stroke. At this stage, many situations can be incorporated, such as continuous improvement in the case of young stroke survivors, or as for most cases continued progress in dependency and avoidance of further deterioration due to any relapse, other complications and aging. It is highlighted by Dobkin (2004) and Duncan et al. (2005) that a continued period of rehabilitation is essential to monitor disabilities and long-term support within any rehabilitation plan, carried out through outpatient clinics, home carers and carer support.

1.3.4 Intervention therapies in rehabilitation

Rehabilitation care can include different intervention types, with varying periods of therapy duration from minutes to hours and can differs from situations of primary or community care that can last from weeks up to months of care. The designing and implementing of care pathways mainly depend on the nature of the particular case in the rehabilitation plan, approach and significant flexibility of the different interventions and therapeutic techniques needed for a well organised plan. Each phase of care needs to be individualised to a case specific within the rehabilitation plan instead of being a general plan for all (Langhorne et al., 2011). Effective interventions in stroke rehabilitation programmes are associated with trained tasks and related volume of intensity given (Kwakkel, Wagenaar & Koelman, 1997; Page, 2003).

Benefits of multidisciplinary rehabilitation programmes with different intensity levels were investigated by Clarke and Forster (2015) in a review comprising 21 randomised controlled trials (RCT) involving 3,994 acute stroke survivors. Their review aimed to identify which rehabilitation programme was more effective, to improve functional independence recovery alongside reducing early mortality rates. The authors compared a medical ward unit to the stroke unit, undergoing acute medical treatment and early intensive rehabilitation care. Findings showed significant improvements in functional ability to live independently at home following discharge from the stroke unit, as well as reduced early mortality rates. The study concluded that the stroke unit helped to improve recovery more than the medical ward, due to the availability of specific services, including intensive rehabilitation programmes, delivered by specialist rehabilitation staff. Moreover, on the stroke unit, patients were consistently encouraged to participate more actively in skills learning rehabilitation sessions. Having rehabilitation programmes with intensive and applicable interventions that specifically meet stroke survivors' needs and relate to the patient's recovery phase, are essential to promoting recovery (Miller et al., 2010).

Bernhardt et al. (2007) conducted a study that included therapist reports and individual patient observation records, in addition to senior staff completing a survey of stroke unit resources. The authors acknowledged that stroke patients spent nearly 13% of their first 14 days of stroke exercising in acute stroke units, and undertaking standing and walking tasks, to help improve mobility levels and prevent secondary complications. Further, it was reported that patients were with their therapists for only 5.2% of their time (Bernhardt et al., 2007). A total of 148 treatment therapies were delivered by therapists over two days, and 98% of time treatment was delivered at the patient's bedside. Therapy was provided by both physiotherapists (PT) and occupational therapists (OT) to help improve upper limb functions. Treatment intensity ranged from 09.00 h and 12.30 h and average session duration for PT is 24 minutes. Access to this information has helped to reflect on how therapies and interventions are implemented by therapists (PT and OT) in an in-patient care unit and their impact on recovery of the stroke survivor’s outcomes (Bernhardt et al., 2007). The findings from this study show the importance of the presence of physiotherapists during treatment to help patients engage in their activity tasks for up to 24 minutes. Evidence-based research suggests a range of 45 minutes is a reasonable amount of time to spend in intense active treatment sessions, to help improve outcomes supervised by a therapist or an individual therapy (Kwakkel et al., 2004; Langhorne et al., 2011; Smith et al., 2009).

Interventions and rehabilitation plans are designed according to the patient’s needs, goals, available evidence-based research guidelines provided and perceived risks and benefits. Further, these programmes can help reduce impairments, after stroke and improve independency levels.

1.3.5 MI use in rehabilitation

Rehabilitation programmes include a variety of strategies and interventions designed to improve functional impairments and minimise disability. These interventions can be represented in strengthening exercises that can help improve gait patterns and mobility recovery (Brazzelli et al., 2011; Saunders et al., 2009). In terms of arm function retraining evidence obtained from RCTs, interventions include exercises such as repetitive and task-specific approaches (French et al., 2007; Langhorne et al., 2009; Page et al., 2008); Constraint Induced Movement Therapy

(CIMT) to help improve physical outcomes after stroke (Wolf et al., 2008); gait training and training on the use of walking aids to help improve mobility, as well as use of other orthoses. Further interventions in rehabilitation programmes improve balance and reducing the risk of falls due to impairments in motor control and impaired sensations leading to reduced upright posture and misperceiving body representation. Further, application of acupuncture, robotics, repetitive task training, and mental practice are interventions utilised to improve functional recovery after stroke (Langhorne et al., 1997). MI is defined as practicing movement tasks in the mind only to help improve performance (Barclay-Goddard et al., 2011; Page et al 2009; Zimmermann-Schlatter et al 2008). The National Clinical Guidelines for Stroke (2016) have recommended MI use in acute, subacute and chronic rehabilitation phases to improve upper limb and gait impairments. However, it is not clear what the best protocol, intensity, is and time to start the treatment, as research evidence to-date is only supported by small trials. Braun et al.'s (2008) framework suggests MI use with stroke survivors at any recovery stage as long as they are able and have the capacity to create images. The therapist should establish enough assessment regarding their patient's situation before training them on MI and decide whether or not they have sufficient mental capacity to endure the training, including good working memory, attention, and orientation.

To date, the literature is lacking strong evidence supporting the impact of MI in stroke. For example, in a systematic review assessing the effects of MI after stroke including four RCTs and one Clinical Control trial (CCT), Braun et al. (2006) showed a clear difference in the studies, in patient characteristics, MI protocol, and recovery outcomes. Four intervention designs were used, most of which focused on arm tasks, with intervention periods varying from two to six weeks, and sessions from three to multiple times per week. Although their review provided evidence supporting MI use combined with conventional therapy which has a positive effect on arm function recovery after stroke, however the studies included in their review were limited in their sample sizes. Moreover, the study offered no clear definition of the content of MI use, outcomes, patient characteristics and protocol training to allow for future adoption in clinical practice and conclusions were open for further research investigation.

A study by Jackson et al. (2001) discussed using MI as an approach to enhance recovery in neurological conditions. This provided extensive evidence from brain imaging studies and neurophysiological and psychology fields explaining the mechanisms of MI and how it operates. Participants were randomised to either MI group or usual therapy, with outcomes such as goal-attainment, ADL and mobility levels evaluated for improvement. Therapists received training on implementing MI for 2 hours. The MI group were then trained 3 times per week, using a 15-20-minute video. Findings suggested that improvements were present on the goal attainment scale outcome after training on MI use compared to the control group. However, results were limited due to noncompliance of both patients and therapists with the training programme; either the therapist was on vacation or the patients had low cognitive levels, which were measured using an intervention compliance questionnaire completed by the therapists at the end of the intervention. Furthermore, although the therapists in the study received a short, rapid training session prior to implementing MI in rehabilitation, neither the basis for the training context nor the training method involved were clear enough. This therefore made it difficult to understand how knowledgeable therapists were in instructing the patient, or what specific technique(s) were identified for training therapists in MI use in clinical practice. Thus, their report suggests that greater understanding of the barriers and facilitators in implementing MI in practice and what support is needed, are essential.

Other studies (Liu et al., 2004; Liu, 2009) showed improvement in ADL when using MI with tasks such as cooking food and cleaning the house, after stroke with on MI group (n=17) compared to the control group (n=17). Treatment duration was four weeks and was regularly monitored by the trained therapist conducting the MI use. In their studies the therapists demonstrated MI involving the task for the patient and then used a video clip to instruct MI use with the stroke survivor. Their findings showed improvements in tasks independency in the MI group higher than the control group. These examples suggest that factors such as adherence, trained therapists through adequate and quality level of training, progress monitoring instruments and therapists' role are highly important for MI to successfully work in clinical practice. Other factors that could be associated to patient's ability in imaging relative to cognitive impairments that can include poor memory, sustained focus when following instructions. Further studies are therefore needed to help address these factors and highlight key recommendations that may further enhance successful MI implementation in stroke rehabilitation.

1.3.2 Rehabilitation context in Saudi Arabia

In Saudi Arabia, the healthcare pathway for stroke is inadequate compared to other developed countries. Recovery after stroke is crucial, and early rehabilitation programme services are essential to help minimise the risk of disabilities and improve survival levels. After a stroke, patients are admitted to either internal medicine wards, neurosurgical wards, general medicine wards, or stroke units, via emergency triage departments. There are two stroke units in Saudi Arabia: one in King Fahd Medical centre, Riyadh; the other in King Abdul-Aziz Hospital, Jeddah. Stroke survivors are treated mainly by neurologists and then referred to physiotherapists or specialised stroke therapists. They mainly receive their rehabilitation in in-patient wards or referred on after being discharged to the hospital’s physiotherapy department as an outpatient for follow-up treatment. Rehabilitation centres and other community rehabilitation services are also available to stroke survivors (Memon et al., 2019). Regarding treatment and healthcare services, these are provided free in Saudi Arabia and managed through the Saudi Ministry of Health. The Ministry operates through the government sector and is the most accountable agency with primary responsibility for Saudi Arabia’s standard healthcare. The Ministry offers many healthcare services, including preventive, curative and rehabilitative services. Further, healthcare services are operated through other government agencies including university teaching hospitals, Ministry of Defence and Aviation and Saudi Arabian National Guard. These all offer healthcare services to both their employees and the general population. Private agencies also deliver substantial healthcare services to the general public. All general healthcare services are covered by a full range of networks, including clinics, hospitals, dispensaries and chemists (Al Yousuf et al., 2002).

Although significant healthcare services are provided in Saudi Arabia, there is paucity of knowledge around the variety of techniques that can be implemented in rehabilitation programmes, highlighting the need for further and deeper understanding around different intervention types within stroke rehabilitation programmes.

Moreover, such programmes within healthcare services, which might include for example physiotherapy-based interventions, could also include effective strategies, or a variety of treatments to help improve post-stroke recovery, as discussed in the next section.

1.3.3 Physiotherapy in stroke rehabilitation

Physiotherapy forms an important part of post-stroke recovery, helping to improve functional abilities and enhance independence. Physiotherapy interventions can take many different forms, depending on the services in which they are embedded, the nature of the therapy, and its theoretical and clinical basis and use (Woldag & Hummerlsheim, 2002). It is believed that physiotherapy is essential in helping to regain functional and motor recovery in stroke rehabilitation (Jette et al., 2005). However, outcome success also depends on the patient's motivational level, and the physiotherapist's acquired specialised knowledge in addition to the preferred therapeutic techniques.

A randomised trial by Langhamme and Stanghelle (2000) compared two different physiotherapy interventions on 61 stroke patients: the Bobath concept group and a group receiving the same intervention with additional task-orientated training. Bobath concept known also as Neurodevelopmental Therapy (NDT; Bobath, 1990) is a scientific concept based on principles of re-learning of the normal movement patterns, and normalising muscle tone, based on the ability of the brain to recover and recognise movement patterns by adapting to changes after neurological damage. Their findings suggested that the latter group had a shorter length of hospital stay and greater improvement in ADL levels. Another study by Kwakkel et al. (2004) identified supporting evidence on physiotherapy interventions for improving recovery outcomes and functional independence after stroke. Their review included 123 RCT. The findings revealed that a physiotherapy programme including task-oriented training, when applied after stroke with high intensity and at an early stage, can improve stroke recovery in terms of gait and balance pattern. This suggests the need for more well-designed physiotherapy interventions in stroke rehabilitation and that physiotherapy is essential in rehabilitation to help improve functional recovery after stroke.

Physiotherapy is one of the therapies provided in stroke rehabilitation programmes (Dobkin, 2004) and includes approaches such as Bobath or NDT (Bobath, 1990), Brunnstrom technique (Perry, 1967), proprioceptive neuromuscular facilitation (PNF) (Voss et al., 1985), as well as methods of motor re-learning and muscular functional strengthening approaches (Brazzelli et al., 2011). Other interventions include electrical simulation (ES) (Meilink et al., 2008), and thermal stimulation (Chen et al., 2011). These are mainly adopted in clinical settings, to improve stroke recovery and restore motor function as a standard approach based on practical and theoretical evidence of positive effects (Dobkin & Dorsch, 2013).

Advanced novel intervention therapies have also been developed in recent decades to help maximise post-stroke functional recovery (Jeannerod & Jacob, 2005). These strategies are mainly based on empirical evidence gained from neuro-rehabilitation research. For instance, one of the main concepts used in this strategy is neuroplasticity and mechanisms of neurogenesis (development of new neuron cells) (Koratamaddi, 2012) that the brain undergoes after stroke, which can enhance function recovery. This has been evident through many studies of neuro-technologies, such as functional brain MRI (Saposnik et al., 2010; Clément, 2019). This group of therapies include the use of brain-computer-interface based action observation and robotic orthotic devices (Lum et al., 2012), virtual reality (VR) (Eng et al., 2007; Levin & Therapy, 2011; Zimmermann-Schlatter et al., 2008), intermittent compression (Feys et al., 1998), CIMT (Wolf et al., 2008), thermal stimulation and mirror therapy (Pandian et al., 2014), action observation (Sale & Franceschini, 2012), and task oriented training (Van Peppen, 2007; Carr 1987). Moreover, there has been some exploration into the potential use of mental imagery with patients to improve motor function during rehabilitation (Sitaram et al., 2012; Jeannerod & Jacob, 2005), as discussed in detail in the next section.

1.4 Mental imagery

1.4.1 Definitions and origins

One possible therapeutic approach that may be used as part of stroke rehabilitation is Mental Imagery (MI) practice. MI has various definitions in the literature. Weinberg (2008) defined MI as rehearsing physical skills performance in the mind without actually executing them in reality, while Parnabas et al. (2015) suggest it involves all appropriate senses. Furthermore, Cox et al. (2011) point out that imagery could be visualising or kinaesthetically feeling the movement. Likewise, Morris, Spittle and Watt (2005) define MI as the process of creating images in the mind that relate to movement represented in a visual (seeing) or sensory (feeling) manner, as a method of re-learning functional skills. Adopted originally from sports psychology, MI techniques may be used to help athletes improve their training skills, or as a performance strategy by visualising the winning move, thus, increasing feelings of positivity and enhancing motivation and confidence (Murphy & Martin, 2002).

1.4.2 Importance of implementation MI in stroke rehabilitation

MI use has been proposed as an alternative approach to physical exercise therapy, involving less energy generation and being more cost-effective with the least adverse risk in clinical practice. Additionally, MI is potentially effective in helping to improve motor performance and enhance skills of re-learning without the need to change location or adding any physical output, whilst combined with optimal physical practice. MI is advantageous in stroke rehabilitation when re-learning motor skills with physical exercise is included in treatment plans (Jackson et al., 2004; Malouin et al., 2004) to help reduce anxiety, improve attention and confidence, and subsequently improve recovery. Although MI has both psychological and physiological clinical advantages with minimum adverse effects and low costs, larger trials to investigate this approach have not been employed in this field with EBP research. Additionally, where studies have focused on how MI improves arm-hand function, little research has been conducted to assess possible effects on locomotor tasks (Malouin & Richards, 2009). With this paucity of evidence supporting the potential of diverse types of MI interventions, different studies for example (Bovend'eerd et al., 2010; Braun et al., 2012; Dunsky & Dickstein, 2018) have presented the use of different protocols in MI clinical practice interventions. Established protocols from these studies were designed to fulfil the research purpose and according to the sample of stroke under investigation, for example, Dunsky and Dickstein (2018) established a protocol for MI training to help improve gait patterns in people with stroke. This protocol was developed based on the concept of PETTLEP. This framework aimed at helping to train athletes in using MI by integrating different levels of components (i.e., physical, environmental, task, timing, learning, emotion, and perspective) (Holmes & Collins, 2001). The six-week protocol included tasks for training in balance and walking exercises for stroke patients. Results showed improvement in walking and balance levels after MI use (Dunsky & Dickstein, 2018).

Research has explored MI use and the relationship and similarity between actual and imagined physical movement, and interrelation of neuroscience and psychological and physiological aspects (Decety & Jeannerod, 1996). Based on this evidence, researchers believe that MI use in physical rehabilitation may improve levels of motor recovery after stroke for survivors with a damaged central nervous system (Decety, 1993; Yue & Cole, 1992; Warner & McNeill; 1998). However, it is clear from a review of the literature that few MI designs have been applied in rehabilitation settings in clinical practice. This may be due to the lack of evidence-based practice implementation and small trial sizes employed. Experimental evidence of theoretical approaches in interventions, currently lacking, can help promote practical guidelines to support future professions in implementing MI in physical rehabilitation. Moreover, MI as with any other intervention requires outcome measures to be available and acknowledged clearly as the field of sports psychology for athletes has shown, and this is still lacking for stroke patients in clinical practice (Jackson et al., 2001).

1.4.3 Types and use of mental imagery

Imagery comprises two common modalities as described by White and Hardy (1995): 'visual imagery', defined as the use of visual sources of information to help construct mental images. This includes two perspectives: internal visual imagery (IVI) when a person imagines himself from a first-person perspective as though seeing himself through his own eyes, and as an external visual imagery (EVI) which involves a third person perspective such as seeing oneself performing the action (a bird's eye view) (Callow et al., 2013). The other modality is 'kinaesthetic imagery', which relates to sensory sources of information and is associated with the sense of images. MI in this case can also involve movements, forces and efforts (Callow & Waters, 2005) and can be referred to as movement imagery in some practices. Visual imagery feeds from the visual sense and obtains visual experiences from the seeing process; an example of visual imagery is seeing oneself reaching for a cup in front of you and grabbing it. However, the feeling of the cup grasped in the hand and the muscles gripping the cup is the kinaesthetic imagery of the feeling process (Morris et al., 2005). In sports psychology, Guillot et al. (2009) stated that these different modalities and perspectives are used with athletes for different task characteristics specified for motor performance. For instance, internal imagery can be used with open skills tasks which involve perceptions, such as developing strategies, for example, performing golf putting skills (Hardy & Callow, 1999). Internal imagery can be referred to as motor imagery in practice (Jeannerod, 1994). Furthermore, external imagery is mainly used with a more formed task skill that enables the individual to see the precise position and movement of the successful performance of the task (Hall et al., 1998). External visual imagery is effective for enhancing the skill learning process, movement ability and new skills (White & Hardy, 1995). However, kinaesthetic imagery is used more with tasks that match the feeling and timing of the movement of the task, such as feeling the muscles in the thigh and leg stretch forward and extend to kick the approaching football (Jeannerod, 1994). Furthermore, complex movements can be enhanced by kinaesthetic imagery (Yu et al., 2015). According to Paivio (1985) imagery may be effective for executing some tasks more than others, and MI can be used in different ways, depending on the nature of the action (Hardy & Callow, 1999).

In rehabilitation, MI has been taught using either or both modalities, such as experiencing the kinaesthetic sensation by performing a kinaesthetic movement related to the task. Kumar et al. (2016) trained 20 patients to visualise themselves in a warm, relaxing place and feel their knee bend and their muscles tighten. In comparison, the control group practiced only gait training and showed improvements in gait patterns after three weeks of training for MI and task-oriented training combined. Another study by Vikasini et al. (2016) trained 30 stroke survivors to mentally visualise functional exercises of hand movements and to feel muscles contract in the limb while performing the task following an audiotape instruction over four weeks. The control group had task-oriented training. The findings from this randomised trial support the importance of combining MI with a more traditional therapy such as task-oriented training, which improves functional upper limb recovery after stroke in rehabilitation, by improving levels of walking and ADL.

In the field of neurorehabilitation, MI has been used to treat many different neurological conditions to improve levels of functional and motor recovery (De Vries & Mulder, 2007), and been found to be effective in both neuroscience and neurorehabilitation (Nilsen at al., 2012). A systematic review by Zimmermann-Schlatter et al. (2008) evaluated motor MI combined with any conventional therapy (physio or occupational) compared to standard therapy alone. They included four RCTs conducted in Asia and North America only, with a total of 86 patients in the acute post stroke phase. These trials reported using motor imagery combined with standard therapy to instruct stroke survivors on MI through the use of audiotapes for 10-60 minutes per day, 3 to 5 sessions per week, for 3 to 6 weeks. Findings suggest this course of MI provides ultimate benefits for functional upper limb recovery outcomes. Three studies demonstrated positive effects from the Fugl-Meyer Stroke Assessment outcome for the upper extremity and two studies reported positive effect on the Action Research Arm Test (grasp, grip, pinch and gross movement) outcome. However, a limitation of the review was the small sample size of stroke survivors as well as low quality of the included trials in the review. These issues together with geographical limitations make it challenging to judge the effectiveness of MI use with stroke and transferability of the findings. In contrast, a trial conducted by Verma et al. (2011) with 30 post stroke survivors, aimed to evaluate the effectiveness of MI combined with task-oriented training to improve gait patterns after stroke. This involved a MI group intervention (15 minutes) combined with task-oriented training sessions (25 minutes) for seven days a week, two weeks after stroke. The control group underwent only task-oriented training sessions for 25 minutes. Findings from this trial showed enhanced independent ambulation levels and minimised gait abnormalities with the intervention group in comparison with the control group. Although improvements were observed in the intervention group, it is difficult to judge the true effectiveness due to the small sample size of only 30 stroke survivors from one country (India). Moreover, the training provided for both the stroke survivors and the therapist instructing the patient was unclear and lacked sufficient details for future replication.

MI benefits extend beyond body function recovery to managing pain (Moseley, 2004), reducing anxiety and stress (Arora et al., 2011), enhancing muscle flexibility (Lebon, Collet & Guillot, 2010), improving muscle strength (Williams, Odley & Callaghan, 2004), and ensuring better control of movement and skill relearning (Weinberg, 2008), all of which have been demonstrated in many single-centre, randomised controlled trials. However, it is noted that these have mainly been conducted on small samples, thus these findings may have limited generalisability.

MI has been performed in the field of sport psychology with healthy populations and been proven effective and during the last decade, potential studies have been conducted on MI and its impact on physical functional outcomes with neurological conditions. To date, none have investigated whether cognitive impairments might impact MI training outcomes. Furthermore, no study has investigated the extent to which working memory impacts patient's engagement in MI training and progress, given that the MI process comprises tasks whereby the patient repeats an imagined movement several times to help improve motor performance. The created mental image is in a dynamic state representing an exact action that is mentally reactivated within the working memory with no explicit motor production. Thus, the ability to sustain visual and kinaesthetic information in the working memory is essential for successful outcomes in MI training (Murphy et al., 2011). Further, the ability to engage in successful MI training requires proper levels of working memory to produce better MI outcomes. For instance, results from Malouin et al. (2004-b) who investigated MI use after stroke and the relationship between working memory and motor improvement with three individuals, showed that working memory domains included visual-spatial, kinaesthetic, and verbal working memory domains and that some impairment was present in the working memory at differing mild to moderate levels across the three patients. The results also showed that during MI training, patients had to retrieve kinaesthetic sensations as well as verbal information from the part of their working memory associated with motor strategy performance during MI, and those patients with a better level of memory achieved greater success than those with poor cognitive functions (Malouin et al., 2004-b). The study suggested no specific benefit from MI training and therefore more studies are needed to identify ways of determining who might benefit from this technique.

1.4.4 Mental imagery frameworks

MI originated from the field of sports psychology. Specifically, this comprises a two-by-two framework of imagery functions relative to its use in enhancing cognitive and motivation levels, which are specific to performing actions and re-learning skills (Guillot et al., 2009). According to Paivio (1985), the framework includes a cognitive specific imagery use function, for improving skills in sport, and a cognitive general function, to improve strategies and sports planning. Other MI use functions include a motivation-specific function, which helps to improve performance and achieve goals and the motivational general use function, elaborated by Hall et al. (1998) which includes both functions of imagery, motivational general arousal and mastery cognition, aimed at regulating moods and enhancing confidence (Cumming, 2002; Martin, Moritz & Hall, 1999).

Another conceptual framework that has been used in sports psychology by Munroe et al. (2000) is based on the original applied model of MI involving the 4-Ws (Where, When, What & Why) questions of MI use. This framework is based on the where and when athletes can use imagery, in addition to the why and for what purpose athletes use it. Whilst this model has been proposed for the use of MI during and outside practice of competitions in athletic settings, this may be applied generally in stroke rehabilitation since it has been shown to result in successful outcomes within three contexts, namely, rehabilitation, competition, and training situations for athletes. In Munroe et al.'s (2000) study, use of the 4-W Questions was identified and described to 14 athletes from a range of different sports through a qualitative interview approach. In-depth interview questions were aimed at facilitating understanding of how athletes used MI in training for sports events. Findings showed that athletes used MI for several functions: (Why) such as motivationally for maintaining confidence, focusing on skills, reducing stress and relaxation and for cognitive functions such as skills learning and execution of imaging strategies for playing; the content of MI (What), which relates to frequency and duration, such as for how long they imagine and the surroundings as in the gym or in the field of play which, can also include either a positive or a negative image of performing the skills; the time athletes imagine (When) such as using imagery before or during competition, and finally the places (Where) they use this technique such as on the playing field or in the gym. The findings of Munroe's study formed a framework to guide athletes in effective use of MI based on various reasons such as improving focus, motivation, toughness and remaining confident and positive in completion, as well being a useful framework for successfully guiding them in training athletes in enhancing mental images and achieving all round improvement. Furthermore, the framework can be used as a tool for any athlete-practitioner to develop a more tailored or a personalized case and implement MI as an intervention. A better understanding of how athletes create images and develop their representation may therefore help in developing interventions with effective imagery use in other fields such as healthcare services and with therapists in stroke rehabilitation.

This model has been developed further and implemented in rehabilitation by Schuster et al. (2012), explored with stroke survivors. A qualitative study using semi-structured interviews of 11 chronic post stroke patients, ranging in age from 31-85, this randomised trial investigated two MI training approaches to help improve participants' balance using MI training in six physiotherapy sessions over a two-week period. Interviews were conducted before and after intervention with patients divided into three: Experimental Group (EG); MI integrated; EG2 MI embedded and Control Group (CG) only during physiotherapy. Researchers explored the stroke survivor's experience and knowledge of MI use, alongside their description of MI content during training and evaluation on the practical use of MI. Findings suggested that stroke survivors had some MI experience; however, evaluating stroke survivors prior to engaging in MI training and during the session was found essential to ensuring progress in training. Participants described imagining themselves being healthy and disability-free, practising MI at home or in clinics (Where), during physiotherapy or before (When), perceiving both negative and positive images (What). Further, they described that MI helped them perform tasks such as standing from sitting or helped increase their confidence levels and remain relaxed (Why); finally, they described (How) to use MI involving a form of visualising actions and surroundings.

This framework is unique as it was the first to be developed involving stroke survivors. Importantly, the authors established an overall understanding of MI use and of the stroke survivors' capacity in MI training. The authors adapted the 4-W Questions framework originally established by Munroe et al. (2000) in sport psychology, establishing their 5-W Questions (Where, When, What, Why, and How), for use with stroke survivors, which appeared to be effective relative to the small stroke sample. It seems therefore that in stroke rehabilitation, MI was not specifically used to support recovery of motor function, rather, in certain cases, MI appeared to encourage enhancement of practicing movements that were not possible at the time or encouraged them by giving them confidence to attempt difficult movements. Furthermore, it suggested that MI interventions should start with a training plan comprising simple motor tasks and fewer MI repetitions, gradually becoming more complex with increased MI repetitions and more complex imagined motor tasks. This proposed framework, however, lacks two essential elements: how to train patients in MI use and how to evaluate their capacity in engaging in MI. Implementing MI in clinical practice requires identification of strategies for its effective delivery. Furthermore, a comprehensive understanding of how to implement interventions in practice should be fully explored alongside identification of factors enabling MI delivery.

1.4.5 MI and brain neuroplasticity in stroke rehabilitation

Current research indicates that stroke outcomes can be improved through the application of research-informed designed interventions and capacity-enhancing techniques. Such techniques and approaches can vary from simple strategies such as task-oriented training to more complex ones such as brain-computer-interference-based action observation training, all with the aim of helping stroke survivors to obtain optimum independency after stroke (Clarke & Forster, 2015; Langhorne et al., 2011).

Brain neuroplasticity theory is among the many theories that could support the notion of MI therapeutic use to enhance and influence stroke motor recovery (Sharma et al., 2006). During MI practice, the brain develops the ability to activate adjacent areas responsible for motor-generating information, including prompting enhancement of the motor cortex region's excitability. This process refers to the brain's plastic mechanisms as a valuable tool in the neurological recovery phase and appears to be an essential core of the nervous system, which is engaged throughout the lifecycle of all neural activity, including mental practice (Johnson et al., 2002; Facchini et al., 2002). Neuroplasticity is defined as neuro-biological occurrences in the brain when stroke-damaged brain cells start to restore, reorganise and alter themselves to adopt other neural pathways (Takeuchi & Izumi, 2013). Furthermore, Sharma et al. (2006) defined neuroplasticity for motor cortex excitability and suggested that stroke survivors, unable to produce motor movements, attempt to push their brains to generate movement by practising MI. Ming and Song (2005) further noted that the process involves cells and biological changes, including neurogenesis mechanism (development of new neuron cells). During rehabilitation, stroke survivors learn how to adapt and re-learn how to perform forgotten movements and tasks under the advice and instruction of specialists within the rehabilitation team. It may be that the use of therapy techniques enhances the brain to undergo positive cortical changes within the brain's neural networking (Kho et al., 2014).

A trial by Alessandro et al. (2014) investigated the efficacy of MI use and Botulinum toxin drug as a treatment for spasticity after stroke. Three scans of fMRI records of brain activity were examined before and during the use of MI training using the finger tap task with seven stroke survivors compared to a control group of ten healthy patients. Treatment duration was eight weeks, with the two groups scanned in the week of administration, week four and week eight. Results showed that during MI training, the motor areas in the brain were highly activated. Furthermore, changes and alternation were seen in the cortical secondary motor areas in the brain. These findings support the efficacy of MI use in enhancing functional recovery after stroke. Moreover, their study supports its therapeutic use in rehabilitation application. Similarly, another trial by Nyberg et al. (2006) investigated excitability in motor brain regions and neuroplasticity changes, explored during MI training, aimed at identifying the relationship between a finger tapping task and neural activities in the brain. Sixteen healthy, young, righthanded participants were divided into two groups and tested: one group visualising the task, the other physically tapping their fingers. Participants were asked to train four times daily, which required them to tap for 90 seconds, rest for 60 seconds and then tap again with the MI group only visualising the finger-tapping exercise. Participants were scanned twice, once before the task and then again after one week of treatment; the training took two weeks in total. Results showed that both groups improved in their skill learning activity. Findings from imaging techniques such as fMRI suggest that there existed distinct neuroplastic changes as well as cortical alternation in the brain after MI training. Such processes may therefore help with training in gaining skills and motor performance improvement. It is however noted that this study is limited to only healthy, young participants and may have resulted in different findings had the sample involved stroke survivors (Liu, Song & Zhang, 2014).

Another more traditional therapy that enhances neuroplasticity is task-oriented training when combined with MI use. Verma et al. (2011) identified that repetitive and intensive training such as task-oriented training might help facilitate motor and functional recovery after a stroke. To date, only a limited number of trials have tested the importance of using MI in clinical practice, and those conducted have featured small samples. Kumar et al. (2016) investigated the effect of MI combined with task-oriented training to improve gait abnormality patterns after stroke. Their RCT included one group practicing MI task-oriented training and another group practicing only task-oriented. Each group had 20 patients with sessions lasting 45-60 minutes and delivered 4 days per week for three weeks. Results showed significant improvement in gait outcomes, including gait speed and muscle strength in lower limbs. These suggest that adding MI to task-oriented training can help improve gait performance in stroke rehabilitation. However, their study is limited by the small sample size, making it hard to generalise these findings.

Task-oriented training can deliver real-world actual motor task practice, with the aim of improving muscle weakness and functional limitations. This approach focuses on certain defined tasks, which need to be improved following a stroke (McDermott et al., 2014). The effectiveness of this approach used either alone or combined with others in stroke rehabilitation has been demonstrated in ≥ 40 RCTs. An improvement in upper limb motor function and reduction in ADL limitations in 21 stroke survivors was shown after MI and task-specific training for 20–30 minutes, three days a week, for 10 weeks. The improvement was still evident three months after the trial ended (Page et al., 2011). More trials including larger samples are necessary to explore MI practice in more depth, including pragmatic trials that measure the impact of changes following MI interventions in stroke rehabilitation. Such evidence is required to successfully implement MI in clinical practice.

1.5 Implementing evidence in healthcare services

Challenges in accomplishing clinical practice changes and intervention skills development is underpinned by many factors including some barriers in learning skills and implementing new knowledge, as well as time limits for practitioners to adopt new practices and difficulty in unlearning old-fashioned ones. Thus, many conceptual frameworks supporting changing behaviour in practice have been proposed in the literature, such as the Theoretical Domains Framework (TDF) developed from 128 constructs and 33 different theories of behaviour change frameworks. Given that most models of behaviour change are mainly focused on overcoming barriers to enable learning and implementation of new knowledge (Gupta et al., 2017), there is tension between implementing the intervention and applying it in a precise context. Moreover, another burden that can impact the intention to translate new research into existing practices is the issue of limited availability of researched interventions for EBP and subsequent need to unlearn skills as a consequence, at both an individual and organisational level (Teasell et al., 2009).

Previous research has addressed clinical and health services failings in translating research knowledge into practice and policy due to healthcare system complexity and diversity, alongside availability of the required resources and time (McGlynn et al., 2003). Additionally, patients may fail to benefit from optimal available health services, which can impact on their QoL and social and personal productivity, as examined in a review by Grol (2001). More than 70 evidence-based guidelines for intervention programmes were examined, with comprehensive procedures available through a variety of strategies covering Netherland’s family medicine from within a 10-year period. The review aimed to determine whether well-designed guidelines should be implemented in care services. It reported that guidelines were distributed effectively through two approaches, either a scientific journal through written support materials, or an individual approach such as via local consensus discussions, colleagues' connections and peer visits. However, it found that these guidelines were implemented in only 67% of clinical decisions within the available programme procedures. There was a lack in implementing guidelines due to shortfalls in better understanding how to implement guidelines in clinical practice that would help improve care levels. Evidently, planning programmes and interventions with well-designed and well-prepared guidelines are needed to successfully implement interventions in care pathways and services.

Over the past 15 years, research has investigated the reduction in EBP gap in clinical practice within healthcare systems. This includes its overall impact on the quality of improvement of knowledge translation processes, knowledge practice, and knowledge exchange procedures, as well as innovation diffusion, implementation research, and evidence-informed health systems (Mckibbon et al., 2010). Furthermore, Tetroe et al. (2002) acknowledged several barriers impacting EBP, including the sheer volume of research evidence produced, access to research, time to read evidence-based inquiries, and skills in appraising and understanding research. Although research has been conducted to help overcome these barriers by providing vast evidence-practice guidelines and systematic reviews to reduce time in retrieving evidence and maximising the volume of research in one source, barriers remain at different levels in health care systems operating beyond the control of individual practitioners. The different levels of barriers within the healthcare system can include barriers within the organisation and system structure that involves finance-distinctive and professions skills and facility equipment. Further, professional-patient interaction barriers are represented in the communication and information process. The other main barrier can be the profession's knowledge, skills and experience.

A review by Davies, Powell and Rushmer (2007) identified that although availability of resources and time are critical in improving EBP levels at an individual professional level, this may still not be enough if organisational level barriers are present, as these may impact on professionals gaining the desired knowledge to improve their skills in clinical practice. How to integrate MI into clinical practice and encourage therapists to use the technique are on-going issues that need investigation. Moreover, therapists' experience of introducing MI or any other intervention in rehabilitation and facilitating patients' engagement therein are crucial to the successful intervention implementation (Morris et al., 2019). Several studies have highlighted the importance of integrating evidence in clinical practice. Al-Shehri et al. (2017) investigated the concept of integrating EBP in the health profession to improve therapists' knowledge in implementing therapies. An online survey was conducted with 376 clinical and academic physiotherapists in Saudi Arabia to explore their behaviour, attitudes, awareness, and knowledge about EBP, along with barriers that curb its implementation. Results revealed that physiotherapists received no EBP training at university, in addition to their poor experience of teaching on the use and implementation of evidence and therefore overall lack of research knowledge and skills. Although the findings highlighted a positive attitude towards the use of research in practice, it appears that physiotherapists were unfamiliar with the terms and implementation of EBP. This issue is a major research gap that may hinder understanding in applying the concept of EBP among physiotherapists in Saudi Arabia.

Similarly, Fairburn and Cooper (2011) identified that training strategies for professionals may need to better develop their ability to apply knowledge in practice, seen as essential in promoting the implementation of interventions and improving healthcare service outcomes. They acknowledged the development of new strategies for professional training, replacing old, common and costly methods requiring more time, availability and other resources. It is essential, however, to train therapists and to evaluate their knowledge levels, and ability to integrate this acquired knowledge into clinical practice.

It is therefore crucial to develop further understanding of MI as a neuro-rehabilitation technique, delivered by therapists with experience in stroke rehabilitation, to successfully implement it in clinical practice. Moreover, there is the need to integrate concepts related to EBP into developing strategies and to encourage implementation of research in clinical practice, enabling physiotherapists to gain further knowledge and skills in EBP. This can help improve therapists’ level of understanding of the nature of the mechanism of MI use and ensure they receive the required training for its successful implementation in clinical practice. Therefore, acquiring experience in MI use with stroke survivors, and improving skills in instructing stroke survivors in how to use MI, through theoretical understanding and practical application in clinical practice are critical requirements in training for any therapist (Williams & Webb, 1994-b; Ericsson, 1996). Moreover, a comprehensive understanding of MI use in stroke rehabilitation is necessary before introducing the technique in clinical practice (Schuster et al., 2012).

1.6 Evidence-based physiotherapy interventions in Saudi Arabia

Thirty years ago, physiotherapy was first introduced in the King Saud University as a bachelor's programme. To date, it has been taught in more than 12 universities across Saudi Arabia. Examination success must be obtained from the Saudi Health Commission before staff are allowed to practice physiotherapy, to certify the quality of care provided (Al-Maghraby & Alshami, 2013). At bachelor's degree level, the programme is five-to-six years in length and can include introductory and qualification courses, followed by a year-long clinical practice internship to train in theoretical knowledge and gain further skills in the fields of rehabilitation of neurology, orthopaedics, geriatrics, paediatrics, and cardiopulmonary disease. Training must include skills in patient examination, diagnosis evaluation and treatment of different types of interventions. As of January 2020, there were no postgraduate programmes, including doctoral-level, in Saudi Arabia, when master's and doctoral degrees were established in the university of Imam Abdurrahman Bin Faisal. Academic candidates lecturing in Saudi universities were sponsored for scholarships to travel abroad and obtain master's and doctoral degrees from other countries such as USA, UK and Australia (Bindawas, Vennu & Azer, 2013).

The Saudi Physiotherapy Association (SPTA) is currently chartered and formally named as the Saudi Physical Therapy Group. It works under the direction and support of the Scientific Assembly for Higher Studies at King Saud University to offer registration to all physical therapists practicing in Saudi. Their aim is to include developing professional requirements, providing workshops and conferences to update the professional's level and improve acquired clinical skills in patient care and healthcare services in addition to providing training courses and supporting their continued medical education. SPTA offers credits for on-going professional development training, which is a mandatory requirement for continued membership in the SPTA. However, few courses are available and concerned with training undergraduate on the use of EBP, or the uptake and use of research evidence, such as providing knowledge on critical appraisal or research methods. The Saudi Health Commission, as another governing body, also ensures high-quality patient care and healthcare services, conducting theoretical and practical exams and offering training courses for professionals (SCFHS, 2009). These small organisations are created recently to help support developing professional education and promote clinical practice.

EBP is defined as deciding individual's care by applying reliable and sensible method supported by existing evidence. The EBP decision requires three measures to be valid. Accessibility of best, current, and significant evidence, the involvement of the individuals who will uptake the services, and the skills and experience of the service provider. The Saudi government supports continued youth education through providing a substantial budget to cover expenses of educational organisations and private management groups mainly to help sponsor research. For example, a chair known as the Rehabilitation Research Chair has been formed to support research in physiotherapy topics. However, there is still no strong professional association that can help develop professional education and promote clinical practice to ensure both society and patients are provided with high quality health care interventions (Al-Eisa et al., 2016).

To meet healthcare needs in Saudi, and promote more EBP interventions, investigation into the scope of practice is needed by empowering educational bodies to further translate research into practice, the primary focus of Saudi Arabia's vision by 2030 (Alghadir, Zafar & Iqbal, 2015). Saudi healthcare government desires to bridge the gap in research in physiotherapy, by improving the system in training at undergraduate physiotherapy education. Additionally, developing professional requirements, to help improve acquired clinical skills in healthcare services in addition and supporting continued medical education for therapist. These approaches are significant to put in place implementation of EBP interventions in healthcare services.

1.7 TIDieR checklist for describing rehabilitation interventions

Evidence-based research into complex therapy interventions in stroke rehabilitation mainly follows a systematic method in either interventions design or reporting of descriptions in clinical practice. The comprehensive description of piloted trials and process of evaluating their effectiveness within the included realms of comparison can provide reliable implementation approaches to therapies; thus, enabling replication research in future designs (Hoffmann et al., 2014). Trialists have reported insufficient detail on therapy interventions delivered in trials making it difficult to replicate and improve on implementation (Hoffmann et al., 2014). Thus, The Template for Intervention Description and Replication (TIDieR) was created to guide researchers in the reporting of interventions, given its importance for future publications and replication.

TIDieR was developed through consensus from a world-wide panel of experts, by including literature review evidence to extend both the Consolidated Standards of Reporting Trials (CONSORT;Schulz, Altman & Moher, 2010) and the Standard Protocol Items (SPIRIT; Chan, 2013). While item five of the CONSORT checklist expresses the need to report enough details from interventions such as reasons and time of conducting the intervention to facilitate later replication, similarly, item 11 from SPIRIT suggests describing interventions in enough details to allow future implementation reflecting the need for more comprehensive guidance in interventions description. Alongside extending these two original checklists, TIDieR was also developed as a means of addressing the challenge of reporting essential information from the intervention in a primary report that requires publication, rather than in a separate article (Donaldson, Tallis & Pomeroy, 2009; Hunter et al., 2006). This approach is crucial for complex therapy interventions tailored to after-stroke care, as such therapies can include detailed procedures, tailored to different situations, stroke patients and settings.

The TIDieR checklist comprises 12 items (see Appendix 1.1). The first item addresses the name of the intervention and a brief description. The second addresses why the intervention is being conducted, and the third, what materials are used in the intervention. The procedure followed is covered in the fourth item, while the intervention provider, their background or specialism, any relative training and expertise is captured in item five. Item six concerns mode(s) of delivery and whether delivered individually or by group. Where (location or place) the intervention is conducted, is the seventh item. Other items include when and how much, as regards intensity, frequency, and duration of sessions. The eleventh item concerns tailoring the intervention to each case, and any modifications made. Finally, how the intervention is delivered as planned (described as adherence or fidelity assessment), and how well it is delivered is captured in item twelve.

The TIDieR checklist is aimed at improving reporting levels and describing interventions, which, in turn, helps in structuring the interventions by the authors, while reviewers and publishing editors of journals can easily assess the level of intervention from the description provided. Readers may then later use information, such as checklists in systematic reviews, to evaluate, replicate and implement the intervention more easily in clinical practice.

1.8 Knowledge gaps

There is a lack of research investigating MI use within stroke rehabilitation relative to the training content of its implementation in clinical practice both within Saudi Arabia and the wider global health community. Studies have concluded that this gap needs to be investigated and addressed (Bovend'Eerdt et al., 2012 & 2010; Schuster et al., 2012). This is particularly important, as the use of MI helps in improving both cognitive and physiological aspects after stroke.

Timmermans et al. (2013) investigated the effectiveness of task-oriented MI added to conventional therapy for hand and arm recovery after stroke. In the experimental group, 18 stroke survivors watched video instructions of movements in addition to receiving their usual care, while 14 patients in the control group underwent the usual care (functional tasks on ADL related to upper limb movements, e.g. drinking from a cup) and neurodevelopmental-based exercise therapy. Duration of sessions for both groups lasted 6 weeks, at least 3 times per day. Results showed improvements in arm and hand functions for both groups; however, the MI group, maintained improvement for at least 12 months at follow-up. The study highlighted the importance of client-centered MI training, and tailoring MI content according to the patient's plans and goals to optimize effective MI use. The findings further suggest that MI can help maintain improvements in long term goals; however, on the spectrum of short-term recovery, it is unclear if there was any difference found with the additional MI therapy compared to only conventional care, as the control group had neurodevelopmental-based exercise therapy, which might have had similar effects to MI. It therefore remains unclear what are the appropriate strategies of potential guidance for MI use in stroke, such as factors supporting training to enhance attention, adherence and barriers, or the use of technologic systems. These factors can have an impact on implementing therapeutic interventions in rehabilitation.

There is evidence to suggest that MI use can help enhance recovery of upper limb movements, for example, Letswaart et al. (2011) investigated stroke survivors in an RCT to look at improvements in upper limb, over four weeks, with a duration of 45 minutes, three times a week. The MI group with 39 patients using MI training, was compared to two control groups, one with 31 receiving the usual care (e.g., drinking from a cup) only, while the other group of 33 received attention placebo intervention in visualising static subjects only. The results showed no difference between groups and no statistical evidence to support benefits of MI training. Although their findings supported that imagery-training effects are underlined by the mechanism therapy of brain plasticity, the results were mainly based on intensive and closely supervised MI training in isolation of physical practice. The combination of MI and physical practice found by other similar studies, such as Dijkerman et al. (2010) has proven otherwise in favour of MI intervention groups. Additionally, the content of imagery in the experimental group (Letswaart et al., 2011) was insufficiently described, which limits further implementation intervention.

Further studies are therefore needed to investigate the effectiveness of imagery in neurorehabilitation by improving its design in interventions for use in training. Compliance and continued practice are essential elements in implementing MI, which have been poor in previous interventions, based on reports retrieved from therapists' instructions in clinics and patients' practice in training time. Clinicians and therapists who encourage imagery use with stroke survivors need more training in this area and instruction on delivering in a way which matches patients' needs and their training on MI use. Furthermore, there has been no research to date investigating both barriers to and facilitators of implementation of imagery in clinical practice. Factors affecting imagery use need to be identified and more effective strategies for training patients in MI use should be developed (Bovend'Eerdt et al., 2012). Additional studies are also warranted to identify interventions types and designs, amount of training and optimal benefits for patients from this type of intervention (Carrasco & Cantalapiedra, 2016). Moreover, there should be further exploration of the specificity of imagery training effects in terms of tailored task types involving

ADL, such as the task of preparing a cup of tea (Craje et al., 2010).

Although some authors have applied knowledge of current best practice for MI, there are still key details missing from descriptions of the technique deployed in the training elements of neurorehabilitation, and further research is needed to gain more insight into MI interventions used in clinical practice. Other details also lacking include imagery content, modality of imagery delivery, patient variables, training intensities and potential guidance. Although the literature has highlighted imagery elements, such as modality and perspectives, it does not address it in a clear manner in intervention designs (Schuster et al., 2012; Zimmermann-Schlatter et al., 2008). Thus, further research is needed to investigate combining MI with physical task-oriented training, to clarify the therapeutic benefits for stroke survivors. There is good evidence to suggest (Verma et al., 2011) that use of this combination enhances recovery; however, what remains unclear and needs further research, is the specific design, intensity, volume, modality of delivery and content, as well as influence of predictive indicators of outcome, and barriers to and facilitators of its uptake and use in clinical practice.

Exploring the insights and opinions of MI use in stroke rehabilitation, from the perspective of the therapist may also help develop a better understanding around how to deliver MI effectively in clinical practice. This is in addition to exploring the insights from stroke survivors and their expectations towards this technique.

1.8.1 Thesis aims

The aim of this research is to identify factors affecting the use of MI in stroke rehabilitation.

This thesis will focus on meeting the following research objectives as outlined in Figure 1.1 below:

1. To investigate whether MI practice combined with task-oriented training enhances rehabilitation to improve ADL, mobility, QoL and participation after stroke.
2. To explore factors affecting the implementation of MI with therapists and stroke survivors.
3. To identify barriers to, and enablers of, the use of MI practice in stroke rehabilitation.
4. To develop best practice consensus recommendations for MI use in stroke rehabilitation for clinical practice.

Accordingly, the corresponding research questions are:

1. To what extent does mental imagery, practiced alongside task-oriented training, enhance rehabilitation to improve movement performance of ADL tasks, mobility, QoL and participation after stroke?
2. To what extent do therapists currently use mental imagery in stroke rehabilitation in Saudi Arabia?

3. What are the barriers to and enablers of the effective use by therapists and clinicians of mental imagery in stroke rehabilitation?
4. What are best practice consensus recommendations for MI use in stroke rehabilitation?

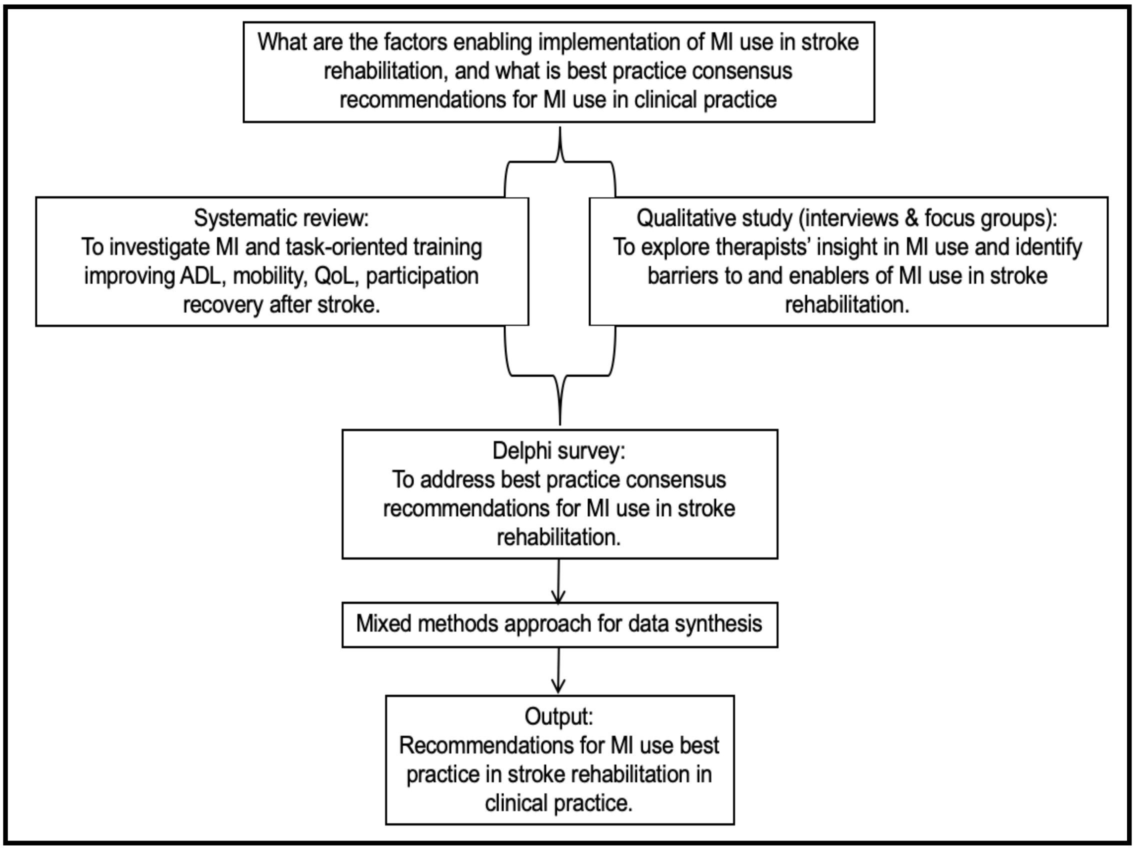

Figure 1.1 Research design and methodology to investigate the use of MI within stroke rehabilitation.

1.8.2 Thesis structure

There is a paucity of evidence from high-quality trials to support the use of MI in stroke rehabilitation. Although evidence from supporting trials has shown implementing MI use in stroke rehabilitation, their procedure in its application was heterogeneous in clinical practice. Given this clear research gap in MI's optimum application and best clinical practice, this PhD research aimed to bridge the gap by undertaking a systematic review of existing studies. Findings from this review informed the second stage of the research, a mixed-method, two-phase exploratory study: a qualitative study exploring clinicians', therapists' and stroke survivors' experience of MI use, and a quantitative study to develop consensus on best practice recommendations for MI use in stroke rehabilitation clinical practice. Each study set out to build on the findings of the previous one, to develop a comprehensive understanding in response to the research questions and thus meet the objectives of this thesis.

The thesis is structured as follows:

Chapter One offers a comprehensive background to stroke and the use of MI in stroke rehabilitation programmes alongside a brief description of the evidence gap and factors affecting the use of evidence-based interventions in the Saudi-Arabian context of healthcare services.

Chapter Two is a systematic review of relevant literature underlining the effectiveness of MI use in stroke rehabilitation to improve ADL, mobility, QoL and participation. It provides a detailed and in-depth analysis of the identified areas. Systematic reviews can help summarise findings from multiple studies, synthesising information with the aim of establishing whether interventions can work and identifying knowledge gaps from previous research to guide future implications. In line with the objectives of this study, available evidence was selected, synthesised and critiqued, and the quality of the selected studies and their results critically appraised. Findings will help to inform clinicians and researchers on which currently available MI interventions enhance ADL, mobility, QoL and participation outcomes following stroke. Chapter two also provides a detailed description of MI use in clinics reflected from the trials included in the systematic review.

Chapter Three explores the methodology and philosophical approach guiding the research design to answer the research questions. It presents the researcher's adopted philosophical approach to data collection and interpreting the findings, and a critical evaluation of the methodologies chosen. Specifically, this research adopts a pragmatic philosophical approach, and mixed-method design, that incorporates both qualitative and quantitative methods.

Chapters Four and Five describe a mixed-method, two-phase exploratory study exploring clinicians', therapists' and stroke survivors' experiences of MI. The first phase comprised qualitative data collection using individual interviews and focus groups. Drawing on the themes from the qualitative data, the second phase, a Delphi technique, involved a survey of MI experts to establish consensus on how to implement the evidence on MI use in stroke rehabilitation. Mixed-method approach incorporating both quantitative and qualitative data provides a robust methodology for conducting research about collecting, evaluating, and analysing to inform and answer the research questions (Creswell, 2014). The rationale for this approach is that it offers healthcare researchers a clearer understanding of a research problem than either approach can offer in isolation thus increasing validity (Bryman, 2006) and reducing the likelihood of any pre-existing study biases or assumptions (Doyle, 2007).

Chapter Five, a Delphi survey, aimed to develop best practice recommendations for the use of MI in stroke rehabilitation clinical practice including recommendations for the minimum standards required for training therapists to effectively facilitate MI and encourage stroke survivors’ engagement in this therapy. Thus, this responds to the fourth research question: What are best practice consensus recommendations for MI use in stroke rehabilitation in clinical practice?

Chapter Six is a synthesis chapter that helps integrate data obtained from both the qualitative and the quantitative studies, and the systematic review. This helps inform and answer the overarching research question (state what this is), by: 1) providing a deeper explanation into understanding the experiences of therapists and stroke survivors’ use of MI and the barriers to its use, in stroke rehabilitation clinical practice. 2) Assisting in interpreting the findings of the Delphi consensus.

The final chapter provides a general discussion, highlights the limitations of this research and draws final conclusions, exploring and critically discussing the extent to which each chapter has met the objectives of this thesis. Additionally, the chapter addresses the clinical implications and outlines the need for further research in MI in order to develop the therapists' knowledge and skills and support the implementation of MI intervention in stroke rehabilitation in clinical practice based on findings and recommendations from the included studies.

Chapter Two: A Systematic Review and Meta-analysis of Mental Imagery with Task Oriented-Training enhanced Rehabilitation to Improve ADL Recovery, Quality of Life and Participation After Stroke

2.1 Introduction

Following a stroke, individuals experience impairment, reflected in motor weakness and paralysis, leading to limitations in ADL, mobility, participation, and poor quality of life (QoL) (WHO, 2001; Stucki, 2005). Other effects include the loss of speech or cognitive impairment, such as memory loss (Cengić et al., 2011). To enhance recovery after stroke, various therapeutic approaches are used in rehabilitation programmes. Rehabilitation interventions can improve functional outcomes after stroke, including enhanced ADL, participation (Hartman-Maeir et al., 2007) and QoL, as demonstrated in a critical review of 44 studies investigating the relationship between rehabilitation interventions and the functional outcomes of patients (Cifu & Stewart, 1999). Their findings show that the type of rehabilitation programmes provided in multidisciplinary settings in early rehabilitation admission services seem to have an impact on improving their functional outcomes after stroke.

Stroke rehabilitation programmes have been shown to maximise recovery after stroke through a multidisciplinary approach that includes physiotherapy, occupational therapy, psychology, and speech and language therapy. A RCT by Indredavik et al. (1991), involving 110 acute stroke survivors, compared one group participating in a stroke rehabilitation programme in which a motor relearning approach and functional training techniques were applied by nurses trained under the supervision and guidance of expert physiotherapists, to another group enrolled in a general ward programme only. Findings show a significant improvement in the mortality rate with functional ability recorded for the stroke rehabilitation group, leading to ADL and QoL enhancement as identified in the 10-year follow up (Indredavik et al., 1991; Indredavik et al., 1999). These studies suggest that effective rehabilitation programmes should include a focused rehabilitation programme with educated staff, appropriately trained to deliver a specific physiotherapy programme with interventions intended for stroke recovery using motor relearning and functional techniques.

Recently, neurorehabilitation theories with a focus on brain plasticity and the reaction of neural pathways have more frequently informed stroke rehabilitation, given that the reaction of neural pathways mirrors the mechanism and process of motor learning. Further, relatively new techniques such as computer-brain interface (Hochberg, Serruva & Friehs, 2006), virtual reality (Eng et al., 2007) and robotic training (Rodgers et al., 2019) are currently available. However, their clinical application with stroke rehabilitation is limited and there are relatively few studies with very small sample sizes exploring these techniques to support their use in clinical practice (Laver et al., 2017; Takeuchi & Izumi, 2013).

MI and task-oriented training is another technique that focuses on neuro-plasticity training in rehabilitation with stroke, yet evidence for this is lacking. MI is a technique described as a cognitive process of repeatedly creating and rehearsing images of visual motor movement and tasks, without involving physical movement (Butler & Page, 2006). While task-oriented training is defined in this review as an approach that focuses on performing a certain task a certain number of times to meet certain goals and attain a certain level of function. The technique of task-oriented training in therapy can be referred to as task-specific, goal-directed, and functional-task-practice, all of which relate to task-oriented training approach. Furthermore, MI and self-guided task-oriented training is a low-cost, accessible approach that can be integrated in rehabilitation programmes with effects, as observed in reported stroke trials (Braun et al., 2010).

Previous systematic reviews including a large number of studies have investigated the effect of MI on improving upper limb function and related ADL independency and functional recovery after stroke (Barclay-Goddard et al., 2011, {updated in 2020}; Santos-Couto-Paz et al., 2013; Holbrook & Skilbeck, 1998). One review aimed to identify the effectiveness of MI use on levels of MI training on ADL function and cognition when compared to relaxation therapy or a usual rehabilitation control group, in a population of people with neurological conditions including stroke survivors (Braun et al., 2013). This included 16 RCTs involving 421 stroke survivors and 70 patients with Parkinson's disease, and a meta-analysis with seven studies including a total of five stroke survivors' cases out of 39 neurological cases. The results showed a small effect of MI on Action Research Arm Test (ARAT) outcomes for arm and hand function. Although this suggested that MI improves ADL, the sample was too small to reflect real-world populations making it difficult to judge the true effect of the intervention from the seven studies included therein. Thus, making conclusions about the effectiveness of MI in stroke rehabilitation is challenging and highlights a gap requiring further investigation.

MI is increasingly used with stroke survivors in clinical practice. Improvements in mobility performance, walking ability and balance were seen in a six-week treatment evaluating the effect of gait performance with 17 stroke survivors in a nonrandomised control trial (Dunsky et al., 2008). Further benefits were seen for upper limb improvements and QoL enhanced in an RCT involving 26 stroke survivors receiving MI treatment combined with physiotherapy and task-oriented training. Unfortunately, these trials lacked any clear description of how they trained the participants to use MI. For example, whilst the importance of imagery elements, such as inclusion of MI mode (visual or kinaesthetic) and perspective (internal visual or external visual) is acknowledged in some trials (Schuster et al., 2012; Zimmermann-Schlatter et al., 2008), it is unclear or lacking in current literature what is appropriate with stroke survivors that may impact recovery. Further research with clear details of strategies for training stroke patients in using MI in practice is critical (Uttam, Midha & Arumugam, 2015).

Previously, the effectiveness of using MI combined with physical practice interventions (practicing ADL, such as reaching for and grasping a cup) to improve upper limb function was assessed in a systematic review of three RCTs involving 73 stroke survivors by Svetlana and Dizon (2009). Greater improvements were identified in the group using MI compared to those receiving relaxation and physical practice. However, there was heterogeneity in the MI training protocols across the studies and in the MI intervention designs used, therefore it remains unclear which interventions are best suited to particular stroke characteristics or attributes of stroke survivors (Svetlana & Dizon, 2009).

Although these studies explored MI effectiveness on improving varied outcomes, and while they have identified potential benefits of MI training after stroke, they lacked clear descriptions of the MI interventions delivered, how participants were trained in its use, adherence level or indeed whether this was affected by particular attributes of the stroke participants and or how these were measured. The literature is also lacking in how MI use impacts global ADL and what measurement tools are needed. This point requires further exploration and more clarification; thus, specific research gaps are outlined below.

Firstly, the specific design, intensity, duration, mode of delivery and content of MI alongside the influence of predictive indicators of outcome, barriers to and facilitators of its uptake and use in clinical practice in relation to stroke. Additionally, the reported heterogeneity in MI training protocols across studies and in MI intervention designs used, such as combining MI with any other physical practice interventions to improve functional outcomes and recovery. It remains unclear which interventions are best suited to particular stroke characteristics. This limitation highlights the need to explore the variability of MI intervention designs and protocols developed for different stroke survivors and should be addressed to a greater extent in the description and reporting of these intervention designs. This leads to questioning what are best practice guidelines for MI use in stroke rehabilitation.

Moreover, the best measurement tools employed to address stroke attributes (functioning level, lesion site, stroke type, onset of stroke and the ability to generate images) have yet to be determined. The limitations in the availability of these measurement tools, highlight the need to explore what can be used and developed to assess stroke survivors with different needs and attributes prior to training on MI use. To date, these issues have not been clearly addressed in previous systematic reviews. Therefore, the question that needs to be assessed is what are the best appropriate assessment tools for stroke survivors?

In summary, MI is increasingly used in clinical practice to enhance functional recovery after stroke. However, paucity of evidence in how to train stroke survivors in its use, makes it very challenging to implement in stroke rehabilitation. Further research is needed to narrow these gaps and optimise knowledge in its effective use in practice, specifically, how MI use combined with task-oriented training could improve global ADL, mobility, QoL, and participation performance and recovery after stroke.

2.1.1 Aim

The aim of this review was to investigate whether MI practice combined with other enhanced techniques such as task-oriented training could improve functional levels of ADL, mobility, QoL. Further, participation after stroke remains unexplored.

2.1.2 Objectives

1. To determine the effectiveness of MI practice combined with task-oriented training in improving ADL performance and recovery after stroke (primary outcome).
2. To determine whether MI practice combined with task-oriented training improves mobility, QoL, participation

performance and recovery after stroke (secondary outcomes).

3. To identify which MI practice treatment designs are the most effective for stroke.

2.2 Methods

2.2.1 Protocol and registration

This systematic review was prepared as a protocol and registered on PROSPERO database on 23rd of November 2016 (CRD42016051995) (Alhashil et al., 2016). This systematic followed PRISMA reporting guidelines to ensure clear and comprehensive reporting of evidence (see Appendix 2.1) (Moher et al., 2009).

2.2.2 Electronic searches and information sources

PubMed (1985-2017), Medline (1996-2017), CINAHL (1996-2017), PsycINFO (1996-2017), EMBASE (1996-2017, Cochrane Library (2000-2017), and PEDro (1996-2017) were electronically searched by (NA) in July 2017. Authors of on-going studies were contacted to obtain further information on as yet unpublished results (e.g. from conference proceedings).

Keywords, such as “mental imagery”, “motor imagery”, “mental practice”, “visual imagery practice”, “task oriented”, “task specific”, “functional task”, “stroke”, “hemiparesis”, “hemiplegic stroke”, “ischaemic stroke”, “post stroke”, “acute stroke” and “chronic stoke” were used. Boolean “AND” and “OR”, as well as truncation and wildcard operators, were applied throughout the process. Comprehensibility and clarity were ensured by applying broad MI-related terms such as “mind and body exercise” and “cognitive rehearsal”. The search was limited to journals published in English. See Appendix 2.2 for details of search strategies across all included databases.

2.2.3 Inclusion criteria

Completed, quantitative study designs with RCTs and CCTs, published between January 1996 and July 2017, in English only, were included in the study, with a focus on existing investigative studies in which MI was conducted in conjunction with task-oriented training for the purpose of enhancing rehabilitation and improving recovery in a stroke population. Articles reporting MI intervention effects on functional ADL limitations, mobility, QoL and participation were included.

The selected study designs included RCTs with non- or single-blinded therapists. Single-blinded therapists can be independent assessors or research assistants, who were not part of the research team that were only assessing the patient’s outcomes. Prospective cohort studies were also included. Exclusion criteria for articles were therefore a) neither RCT nor CCT such as retrospective cohort studies, case reports, and case studies; b) did not include an MI intervention; c) had a study population which did not meet inclusion criteria; d) had a measured outcome which did not meet the inclusion criteria, or e) had a combination of all the above.

2.2.4 Intervention

The focus was on any type of MI intervention, used either alone or in combination with standard therapy, in a rehabilitation programme compared to a control group that received standard therapy alone. Examples included MI practice with task-oriented training alone versus placebo, “sham” groups (e.g. listening to a recording on stroke information) and standard therapy control (i.e. progressive muscle strength training, repetitive task-oriented training or relaxation therapy).

2.2.5 Participants

The study participants were stroke survivors with a primary diagnosis of stroke, either ischaemic or haemorrhagic, aged ≥ 18 years, with stroke onset at any stage, i.e. acute (1–7 days up to 3 months), sub-acute (3 ≤ 6 months), or chronic stage (≥ 6 months). Patients aged ≤ 18 years, with unknown diagnosis or cognitive impairment based on a standardised cognitive screening test (e.g. a score of ≤ 20 on the Modified Mini-Mental State test) or with any significant mental state measurement for cognitive problems were excluded from the study.

2.2.6 Outcomes

Primary outcomes

Primary outcomes included improving ADL performance (e.g. measured by the Barthel Index (BI), and Functional

Independence Measure (FIM) (Beninato et al. 2006). Limitation in completing or performing ADL and daily life tasks has been defined based WHO's (2001) classification of disability and health. This limitation can be due to impairment in any structural or anatomical components of the body on a physiological functional level, resulting in impairment of an individual's functioning level in general.

Secondary outcomes

Secondary outcomes included mobility, for example, as measured by the Berg Balance Test (BBT) and/or Time Up and Go Test (TUG); Quality of life, as measured by health-related or stroke-specific quality of life measures such as the European Quality of Life Scale and the Stroke Specific Quality of Life (SS-QoL), and finally, participation, as measured by the Impact on Participation and Autonomy for participation.

Quality of life was defined according to WHO (2001) as an individual's level of awareness within their own cultural position and their existing contextual values, in relation to their standards of values, their living purposes and surrounding life prospects (Barcaccia et al., 2013). It is an extensive ranging concept affecting person's health status, psychological state, level of independence, social relationship, non-public beliefs and their relationship to significant features of their environment (WHO, 1997).

Participation refers to involvement in life situations that are of value to the person. This can extend to fulfilling one's social role, or attaining personal goals, e.g. work, religion, prayers, interpersonal interaction and relations. One measure adopted by Timmermans et al. (2013) was to use the Frenchay Activities Index (Wade, Legh-Smith & Hewer, 1985) to measure levels of independence and social participation. However, this tool is concerned with measuring ADL levels and may not in fact be a measure of this outcome. It does, however, reflect on a broad range of ADL in this review.

2.2.7 Data extraction and quality assessment

The PROSPERO protocol registered was followed for study selection and data extraction.

Data extraction

Data of potential relevance to the study were extracted using a screening form (PICO-S) developed by the researcher (NA), and a co-researcher (MA) also helped in data extraction (see Appendix 2.3). Extracted data included information on the authors, year of publication, study design, setting, population, patients' demographic and baseline characteristics, recruitment and study completion, study variables, intervention details, control groups, methodology, outcomes, results, risk of bias information assessment tools, and study limitations. The TIDieR checklist was also used to guide in data extraction and to help in describing MI interventions (Hoffmann et al., 2014).

Methodological quality assessment

Methodological quality of included studies was evaluated by two independent reviewers (NA) and (MA) using the Physiotherapy Evidence Database PEDro scale (Maher et al*.,* 2003). PEDro was chosen as it is considered reliable when measuring the internal validity of RCTs and statistical reports (Tooth et al*.,* 2005).

An advantage of using this scale is that it helps readers quickly judge whether the trial results can be trusted and meaningfully interpreted and ordered according to 11 criteria (Kamper et al., 2015). In addition, Elkins et al. (2013) reported that one feature of using the PEDro scale, is that these RCTs will be more readily identified in the web search by the highest valid estimation given for their effect in intervention.

PEDro has also undergone psychometric validation through its use in systematic reviews to rate the quality of their included trials in regard to specific physiotherapy interventions (Moseley et al., 2009). Moreover, its potential in evaluating both external and internal validity of the included trails optimises rigor (Moher et al., 1996). The scale comprises a checklist of 11 items with each item scored as 1 or 0 (yes=1 or no=0), where the highest mark (11) is indicative of maximum quality (see Appendix 2.4). Ten items measure internal validity. These criteria include randomisation, baseline characteristics, blinding of assessors, missing data, between-group comparisons, concealed allocation, blinding of patients and blinding of therapists. In addition, one extra item measures and assesses external validity for the included patients.

Any disagreement was resolved by consulting a third reviewer, if the third reviewer's assessment agreed with one of the existing assessments (e.g. NA as the 1st rater), the consensus score was adopted as the final assessment. In cases where three reviewers had entirely different ratings, further discussion was held until consensus was reached.

Methods for synthesising results

Findings regarding MI intervention were reported narratively using the TIDieR checklist (Hoffmann et al., 2014) to synthesise description of the MI content, type of MI, details of the task-oriented intervention, content, intensity, session duration, frequency, stroke characteristics and outcomes. It is believed in this research that the TIDieR checklist is necessary and needed to be used in the systematic review to help evaluate and describe MI use for the included randomised trials. The checklist might help provide a better description of MI intervention from the obtained studies in stroke rehabilitation. Furthermore, the intervention effect was reported according to the standardised mean change difference observed.

Quantitative synthesis was undertaken when there was adequate scope in relation to the data to perform a meta-analysis, taking into consideration the number of patients, interventions used, and outcome measures used to generate statistically significant effects between groups. Two methods were used to analyse the effect of interventions. In studies using the same outcome measure, the difference in means between the groups was used. When different studies assessed the same outcomes using different measures, alternatively, the standardised mean difference was used in the meta-analysis; otherwise, the individual effect of the outcome was reported in studies that were not included in the meta-analysis.

The RevMan software programme Version 5.3 (Review Manager, 2020) was used to help conduct and perform the meta-analysis and prepare the included study data and finalise the results with graphs.

Summary of measures

Intervention effect was reported using the standardised mean difference change observed. Quantitative synthesis was undertaken when there was adequate scope in relation to the data to perform a meta-analysis after taking into consideration number of patients, the comparison of the interventions and the different range of outcome measures to help generate statistically powered effect between groups. Two methods were used to analyse the effect of interventions, using the difference in mean between the groups when the same outcomes measure is used in all studies. However, when different studies assessed the same outcomes but used different outcome measures the standardised mean difference was used to report that outcome effect.

2.3 Results

2.3.1 Study selection

One thousand one hundred and forty-two articles were identified: PubMed (n = 214), PsycINFO (n = 87), PEDro (n = 55), Medline (n = 230), Cochrane Library (n = 132), CINAHL (n = 121) and EMBASE (n = 303). Four hundred and sixty-six titles and abstracts remained after duplicates or non-eligible papers were removed. A further four hundred and forty-four records were excluded according to titles and abstracts. The remaining 22 papers were retrieved for full text. Finally, 15 papers were included in this review (see Figure 2.1).

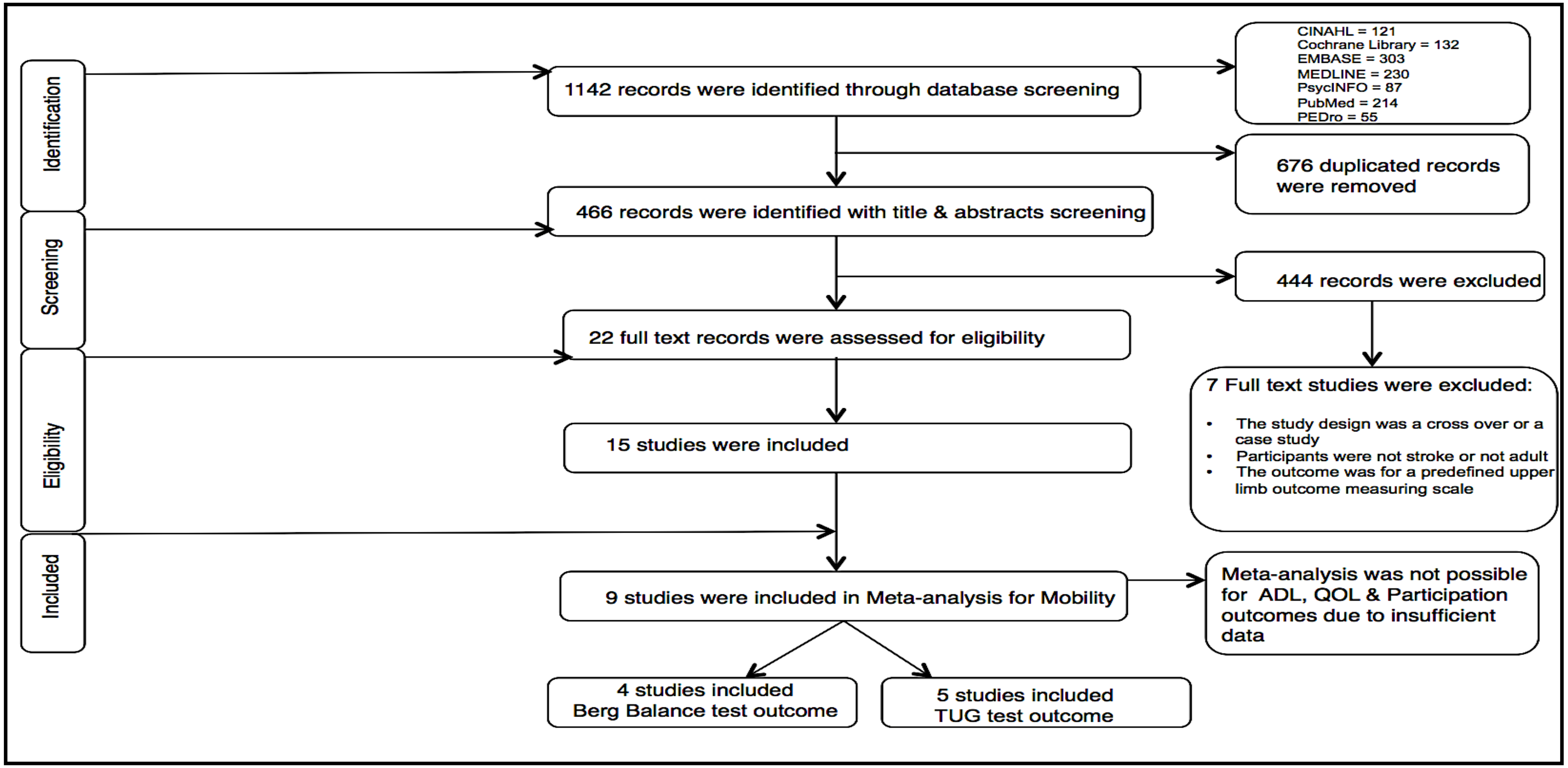

Figure 2.1 Included studies in PRISMA chart (Moher et al., 2009).

2.3.2 Study characteristics for included studies

Characteristics of the included studies are presented in Table 2.1.

Table 2.1 Characteristics of the included studies.

Characteristics of the included studies							
Study ID	**Study Design**	**Sample size (Male/Female)**	**Type of stroke (I/H)**	**Stroke severity**	**Age (Mean) years**	**Comparison**	**Mode/type of MI**
Braun et al., 2012	RCT	36 (14/22)	Not mentioned	Sub-acute	77.8	MI + TOT vs. TOT	All modes of MI
Cho et al., 2013	RCT	28 (17/11)	23/5	Chronic	53.89	MI + GT vs. GT	Visual; Kinaesthetic
Hong et al., 2012	RCT	14 (9/5)	8/6	Chronic	52.36	MI + EMG-TES vs. FES	Not mentioned
Hosseini et al., 2012	RCT	30 (16/14)	Not mentioned	Chronic	48.1	MI + OT vs. OT	Visual
Hwang et al., 2010	CCT	26 (18/6)	22/2	Chronic	47.24	MI + Standard PT vs. Standard PT	Visual; movement
Kim et al., 2015	RCT	26 (14/12)	23/3	Not mentioned	<= 65	MI + TOT vs. TOT	Kinaesthetic
Kumar et al., 2016	RCT	40 (30/10)	13/27	Chronic	52	MI + TOT vs. TOT	Visual; Kinaesthetic; movement
Lee et al., 2011	RCT	24 (10/14)	Not mentioned	Chronic	61.3	MI + Treadmill GT vs. Treadmill GT	Visual; movement
Lee et al., 2015	RCT	36 (20/16)	30/6	Chronic	Not mentioned	MI + vs. Proprioception	Visual
Liu et al., 2004	RCT	49 (22/24)	49/0	Acute	71.85	MI + vs. FT	Visual
Liu, 2009	RCT	35 (20/13)	Not mentioned	Acute	70.25	MI + Standard training vs. Standard training	Not mentioned
Phung-Phrarattanatrai et al., 2015	CCT	14 (10/4)	14/0	Sub-acute	60	MI + PT program vs. PT program	Not mentioned
Polli et al., 2017	CCT	28 (21/7)	24/4	Chronic	56.6	MI + TOT vs. TOT	Other (GMI)
Timmermans 2013	RCT	42 (26/16)	Not mentioned	Sub-acute	59.2	MI vs., NDT	Visual
Verma et al., 2011	RCT	30 (22/8)	23/7	Sub-acute	54.16	MI + TOCCT vs. Standard therapy	Motor

Note: RCT: Randomised Control Trail; CCT: Clinical Controlled Trials; MI: Mental Imagery; OT: Occupational Therapy; PT: Physical Therapy; TOT: Task-Orient Training; TOCCT: Task-Oriented Circuit Class Training; EMG: Electricalmyography; TES: Trigger Electrical Stimulation; FES: Functional Electrical Stimulation; GT: Gait Training; FT: Functional Training; GMI: Graded Motor Imagery; NDT: Neuro-Developmental Therapy. * The study has not mentioned any information on how they dealt with dropouts.

Participants

Fifteen studies were included involving 458 stroke survivors (283 men and 175 women). The mean age of participants ranged from 47 to 78 years. Time since stroke onset and trial participation ranged from 12.25 to 1350 days. Most studies (n=8) included stroke survivors in the chronic stage of recovery (≥ 6 months) n= 226 patients within 8 studies (Hwang et al., 2010; Lee et al., 2011; Cho et al., 2013; Hong et al., 2012; Hosseini et al., 2012; Lee et al., 2015; Kumar et al., 2016; Polli et al., 2015). While the sub-acute stage included n= 122 (Verma et al., 2011; Braun et al., 2012; Timmermans et al., 2013; Pheung-Phrarattanatrai et al., 2015). Only two studies by the same author included participants in the acute stage (0–3 months) (n= 84) (Liu et al., 2004; Liu, 2009). One study by Kim et al. (2015) did not specify any stage.

Country

Twelve of the fifteen included studies were trials conducted in Asian countries. Specifically, six studies were conducted in Korea (Hwang et al., 2010; Lee et al., 2011; Cho et al., 2013; Hong et al., 2012; Kim et al., 2015; Lee et al., 2015), two in China (Liu et al., 2004; Liu, 2009), two in India (Verma et al., 2011; Kumar et al., 2016), one in Iran (Hosseini et al., 2012) and one in Thailand (Pheung-Phrarattanatrai et al., 2015). The remaining three were conducted in Europe, including two studies in the

Netherlands (Braunn et al., 2012; Timmermans et al., 2013) and one in Italy (Polli et al., 2015). Stroke survivors were recruited via health care centres including hospital, rehabilitation centres and nursing homes. Sample size ranged from 14 to 49 stroke survivors.

Study type

Twelve studies were RCT and three were CCTs design (non-randomised) (Hwang et al., 2010; Pheung-Phrarattanatrai et al., 2015; Polli et al., 2017).

Intervention

Included studies compared MI use with task-oriented training, standard therapy in conventional rehabilitation or standard care. The type or mode of MI used in the included studies comprised visual (seeing oneself performing the action), kinaesthetic (feeling oneself performing the action) or both modes. Furthermore, movement imagery and motor imagery (as defined in chapter one, section 1.4) were used with the visual mode. Graded motor imagery type was used in one study only (Polli et al., 2017). Visual imagery modality was used in five studies (Liu et al., 2004; Hosseini et al., 2012; Timmermans et al., 2013; Lee et al., 2015; Lee et al., 2011), while kinaesthetic imagery modality was employed by Kim et al. (2015). A combination of both imagery modalities was employed in four studies (Cho et al., 2013; Hwang et al., 2010; Braun et al., 2012; Kumar et al., 2016). Motor imagery was employed only by Verma et al. (2011). Three studies did not mention the type of imagery used (Hong et al., 2012; Liu, 2009; Pheung-Phrarattanatrai et al., 2015).

2.3.3 Quality assessment for included studies

The average methodological quality score of the included studies was 6.5 out of 11 points on the PEDro scale, which is considered fair. Randomisation was in 12 out of 15 studies (Braun et al., 2012; Cho et al., 2013; Hong et al., 2012; Hosseini et al., 2012; Kim et al., 2015; Kumar et al., 2016; Liu et al., 2004; Liu, 2009; Lee et al., 2011; Lee et al., 2015; Timmermmans et al., 2013; Verma et al., 2011).

Concealment and allocation were absent for most studies (Liu, 2009; Hwang et al., 2010; Timmermans et al., 2013; Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015; Polli et al., 2017; Lee et al., 2015; Pheung-Phrarattanatrai et al.; 2015). Patient and therapist blinding was not possible for most studies, only four studies blinded the therapists (Braun et al., 2012; Cho et al., 2013; Hong et al., 2012; Liu et al., 2004).

One study had less than 85% missing data (Liu, 2009). Almost all studies included participants' eligibility criteria except for one (Kim et al., 2015). Baseline characteristics were collected was achieved in all except for one study (Hong et al., 2012). All studies conducted between group statistical comparisons, meeting this criterion. Three studies did not establish mean and variability statistics for group outcomes (Cho eat al., 2013, Liu, 2009; Pheung-Phrarattanatrai et al.; 2015). The provided level for methodological quality within the evidence obtained is somewhat worthy in supporting MI use in clinical practice (see Table 2.2 for quality assessment of included studies).

Table 2.2 Quality of included studies.

Quality of included studies												
Study	**Eligibility patient criteria**	**Randomis ation**	**Concealed allocation**	**Group similar at baseline**	**Blinding patients**	**Therapist blinding**	**Assessor blinding**	**Follow-up > 85%**	**Outcomes analysed**	**Group comparison**	**Point measures & variability**	**Total score**
Braun et al., 2012	1	1	1	1	0	1	1	1	1	1	1	9
Cho et al., 2013	1	1	1	1	1	1	1	1	1	1	0	9
Hong et al., 2012	1	1	1	0	0	1	1	1	1	1	1	8
Hosseini et al., 2012	1	1	0	1	0	0	1	1	1	1	1	7
Hwang et al., 2010	1	0	0	1	0	0	0	1	0	1	1	4
Kim et al., 2015	0	1	0	1	0	0	0	1	0	1	1	5
Kumar et al., 2016	1	1	1	1	0	0	1	1	1	1	1	8
Lee et al., 2011	1	1	0	1	0	0	0	1	1	1	1	6
Lee et al., 2015	1	1	0	1	0	0	0	1	0	1	1	5
Liu et al., 2004	1	1	1	1	0	1	1	1	0	1	1	8
Liu, 2009	1	1	0	1	0	0	1	0	0	1	0	4
Phung-Phrarattanatrai et al., 2015	1	0	0	1	0	0	0	1	0	1	0	3
Polli et al., 2017	1	0	0	1	0	0	1	1	1	1	1	6
Timmermans et al.,2013	1	1	0	1	0	0	0	1	1	1	1	6
Verma et al., 2011	1	1	1	1	1	0	1	1	1	1	1	9
Total	14 (93.3%)	12 (80%)	6 (40%)	14 (93.3%)	2 (13.3%)	4 (26.7%)	9 (60%)	14 (93.3%)	9 (60%)	15 (100%)	12 (80%)	_

2.3.4 Effectiveness of intervention

Narrative synthesis was used to summarise the key findings of the included interventions (see Tables 2.3 below illustrating MI intervention components using the TIDieR checklist). Meta-analysis was undertaken where possible when sufficient data was available for the included studies (see Table 2.4 below for meta-analysis outcomes reported). Table 2.5, illustrates all outcomes reported in the included studies shown by estimated range effect of the value of 95% CI in MI use, in addition to Table 2.6 which illustrates all outcomes reported in the included studies with skewed data.

Table 2.3 TIDieR checklist for MI intervention.

TIDieR checklist					
	Braun et al., 2012	**Cho et al., 2013**	**Hong et al., 2012**	**Hosseini et al., 2012**	**Hwang et al., 2010**
1. Brief name	Guided MI with TOT*	MI training	MI training	MI therapy	MI training
2. Why	Investigating whether using MI enhances movement's quality & speed in recovery stage after stroke.	Investigating effects of MI training on balance & gait abilities after stroke.	Investigating whether MI training combined with electromyogram-triggered electric stimulation improved motor function of upper-extremity after stroke.	Investigating effect of MI on postural balance among stroke survivors.	Evaluating whether locomotor imagery training leads to clinical improvements in gait after stroke.
3. What (materials)	Audiotape equipment	Videotape equipment	Not stated	Not stated	Videotape equipment
4. What (procedures)	A four-step treatment plan that included, explaining MI use, developing imagery techniques, applying MI by performing the movements and generating sensory information. Finally, consolidating MI use by therapist recording steps & following feedback with patient files.	Treatment included; participants imagined normal gait movement using visual & kinematic imagery separately. They visually imagined normal movement on their non-paretic side & that their paralytic side moves like their non-paretic side. Then they kinaesthetically imagined, their non-paretic side when they move normally, followed by the non-paretic side.	Three stages of treatment included vigorous waving of the entire arm during occupational therapy sessions, then applying MI training (maximum12 seconds) with electronical mayography stimulation & last stage relaxation (12 seconds).	The participant imagined themselves how to stand up & go. while seated on an adaptable armchair. Then they visualized themselves in a first perspective, standing up & approaching a wall 3 meters far away, then turning in without stop and coming back to the armchair & siting on it. Speed & care was integrated in the following times.	Two different videotapes were used for MI training. One videotape, showing a normal person from anterior, posterior & side views while walking on a 10-m walkway (6 min & 23 sec). The other videotape showing a person from same views walking slowly & comfortably speed (4 minutes & 44 sec). 1st week of MI included familiarising participants with normal gait sequences. While the last 3 weeks, they performed MI according to a five-stage protocol (progressive relaxation, external imagery (analysis of task sequences), problem identification, internal imagery and mental rehearsal).

	Braun et al., 2012	Cho et al., 2013	Hong et al., 2012	Hosseini et al., 2012	Hwang et al., 2010
5. Who provided	PT/OT/ researcher instructor.	PT/OT/ researcher instructor, Researcher assistance.	PT/OT/ researcher instructor.	PT/OT/ researcher instructor.	Using an instructive videotape.
6. How	Face to face/Listening in a quiet room.	Face to face/Individually & watching visual images.	Not stated.	Face to face.	Watching visual images.
7. Where	Home/Rehabilitation centre.	Rehabilitation centre.	Not stated	Clinic	Not stated
8. When & how much	During PT/OT sessions, 6 w, at least 10 sessions a week.	Not stated	During PT/OT sessions, 4 w, 40 minutes, 5 times a week.	During PT/OT sessions, 5w, 15 minutes, 3 times a week.	Before PT/OT sessions, 4 w, 25-30 minutes, 5 times a week.
9. Tailoring	Benefit of the intervention is having a framework in which the PT or OT can tailor the MI content to the patient's abilities & preferences.	Not stated.	Not stated.	Not stated.	Not stated.
10. Modification	Not stated.	Not stated.	Not stated.	Not stated.	Not stated
11. How well (planned)	Participants were asked to report unguided therapy in logs, & they received the intervention according to protocol.	Not stated.	Not stated.	Not stated.	A protocol for this study was developed based on the 'active relaxation, imagery & mental rehearsal' strategy, based on previous studies of MI in sports.
12. How well (actual)	One participant in each group failed to receive the intervention according to protocol, & both were excluded from the analyses.	Not stated.	Not stated	Not stated.	Two dropped out from control group.

(*): The study did not report the relevant information for dropouts. MI: Mental/Motor imagery training; TOT: Task-Oriented Training; PT: Physical therapist OT: Occupational therapist.

Table 2.3 TIDieR checklist for MI interventions (continued)

TIDeiR checklist					
	Kim et al., 2015	**Kumar et al., 2016**	**Lee et al. 2011**	**Lee et al. 2015**	**Liu et al., 2004**
1. Brief name	MI training.	MI with TOT*	MI training using imagination of normal gait movement.	MI training.	MI training.
2. Why	Comparing effects of ankle strengthening exercises combined with MI training verses ankle strengthening exercises alone in stroke survivors.	Evaluating the effects of combining motor imagery with physical practice in paretic lower extremity muscles strength & gait performance after stroke.	Investigating effects of motor imagery training on improvement of gait ability of patients with chronic stroke.	Examining & comparing effects of proprioceptive training accompanied by MI training & general proprioceptive training after stroke.	Investigating efficacy of MI at promoting relearning for people after a stroke.
3. What (materials)	Not stated	Videotape equipment	Audiotape & videotape equipment	Not stated	Videotape & computer equipment
4. What (procedures)	Participants were seated in a chair for 15 min, while performing MI to improve concentration on the task, they imagined feeling the sensation of the ankle joint, knee joint, hip joint, & their surrounding muscles moving & maintaining balance during this movement.	Participants were instructed to train on task specific to improve their performance & endurance their functional tasks. They visually and kinaesthetically imagined tasks if siting-to-stand, reaching in sitting & standing, marching, walking, turning & transferring.	Participants sat on a chair to maintain relaxation. They visually imagined affected leg movement as if it were the unaffected leg after imagining the normal movement of the unaffected side from an external point of view. Then they kinaesthetically imagined body moving on the affected side as if it were the unaffected side after imagining the sensory information felt during the movement of the unaffected side.	Pparticipants visually (internal) & kinaesthetically imagined tasks of balance after they have conducted the proprioception training. 30 min training and 10 sec breaks between tasks, with 5 trials including 5 sets in each. 8 weeks treatment plan with initial 4 weeks of training was conducted on a balance pad then from 5 weeks to 8 weeks, the training was conducted on a balance board. Therapists instructed them	Participants used visually imagined tasks of standing in each week of the treatment plan. 1st week, focusing on task sequences to using computer-generated pictures & movies. 2nd week, identifying problems in tasks performed for rectification through the use of MI. 3rd week, practicing the rectified task performance using MI and actual practice. Pictures, with verbal explanations of the physical & mental demands of that particular step was used. Alongside visual aids. Additionally, video playback was used to confirm the problems that they identified. Participants were guided to develop strategies to overcome the problems.
5. Who provided	PT/OT/ researcher instructor.	PT/OT/researcher instructor.	PT/OT/ researcher instructor. MI training was performed by a researcher who had sufficient experience of MI	PT/OT/researcher instructor.	PT/OT /researcher instructor.

	Kim et al., 2015	Kumar et al., 2016	Lee et al. 2011	Lee et al. 2015	Liu et al., 2004
			training & was carried out using the same protocol by the same researcher from start to finish.		
6. How	Individually trained.	Face to face.	Listening in a quiet room; Watching visual images.	Group training.	Face to face; Individually; Watching visual images.
7. Where	Clinic (ward).	Rehabilitation centre.	Rehabilitation centre.	In the cognitive rehabilitation room in order to enhance concentration on the motor imagery training.	Clinic.
8. When & how much	During PT/OT sessions, 4 w, 15 minutes.	Before and during PT/OT sessions, 3 w, 30 minutes, 4 times a week.	Not stated, 6 w, 30 minutes, 3 times a week.	During PT/OT sessions, 8 w, 30 minutes, 5 times a week	During PT/OT sessions, 3 w, 60 minutes, 5 times a week
9. Tailoring	Not stated	Not stated	Not stated	Not stated	Not stated
10. Modification	Not stated	Not stated	Not stated	Not stated	Task standing & walking modification and demonstration was provided throughout the program to maximize the functional patients regain.
11. How well (planned)	Not stated	Not stated	Not stated	Performance of motor imagery, cognitive functions & imagery of the movements were tested through the Mini Mental State Examination-Korea version and the Vividness of Movement Imagery Questions.	Standardising the protocol through a computerogram to guide patients to relearn the steps and performing each of the 15 tasks.
12. How well (actual)	Not stated	Not stated	Not stated	Not stated	3 patients dropped out during the 1st week of the program: 1 from MI group, 2 from functional training group.
(*): The study did not report the relevant information for dropouts. MI: Mental/Motor imagery training; TOT: Task-Oriented Training; PT: Physical therapist OT: Occupational therapist.					

Table 2.3. TIDieR checklist for MI interventions (continued).

	Liu, 2009	Pheung-Phrarattanatrai et al., 2015	Polli et al., 2017	Timmermans et al., 2013	Verma et al. 2011
1. Brief name	MI with TOT*.	MI training.	Graded MI.	MI with TOT*.	MI with TOT*.
2. Why	Investigating efficacy of MI for promoting generalization of the task skills training environment to trained & untrained tasks carried out in a novel environment.	Investigating effect of gait training with motor imagery on gait symmetry & self-efficacy of falling in stroke patients.	Investigating feasibility & clinical effect of GMI in motor recovery after stroke.	Evaluating effectiveness of a task-oriented mental practice approach as an addition to regular arm hand therapy in patients with subacute stroke.	Investigating task-oriented circuit class training with MI training to improve walking abilities.
3. What (materials)	Videotape equipment.	Not stated	Videotape & computer equipment.	Videotape equipment.	Visual materials.
4. What (procedures)	Participants underwent several stages that included truncating the task (chunking), self-reflecting on their abilities & deficits in performing it (self-regulation), feedback (using video playback), mentally rehearsing as if performing it (rehearsal), & then actually carrying the task out. The tasks included 15 daily living tasks (e.g. cocking food, going to the park…etc.) across the 3 weeks.	Participants contracted & relaxed their muscles and limbs for 5 min followed by 10 min practice focusing on steps during walking using visual and kinaesthetic MI. Starting with the non-paretic side followed by the paretic side & both sides by self-pace, individually. Followed by practicing both steps following the rhythmed metronome. Lastly, relaxation period for 5 min.	The IMI training used the Left/Right Hand Judgment Task included the random presentation of 60 images of right (N=30) or left (N=30) hands oriented in various positions and degrees of rotation. Images were projected on a 15” screen. All modes of MI were used.	Participants visually imagined (internally), moving the hand. Using DVD guiding the patient in 3 steps. 1st step, five repetitions of correct performance are shown on the screen combined with a verbal explanation. 2nd step, five repetitions of task performance were shown without verbal explanation, where the patients were asked to mentally practice the movement. 3rd step, no guidance during task performance was given except visual & verbal cues indicating the end of the task performance.	Participants were trained on task related to real life situation to imagine walking abilities. Tasks included: balance control, Stair walking, Turning. Transfer, Speed walking, improve meaningful tasks related to walking competency.
5. Who provided	PT/OT/ researcher instructor.	PT/OT/ researcher instructor.	PT/OT/researcher instructor.	PTs doe the measurements OTs conducted the study.	Visual instructor.
6. How	Face to face.	Individually trained.	Individually trained; watching visual images.	Face to face; Individually trained.	Group training
7. Where	Rehabilitation centre.	Not stated.	Not stated.	Home/ Rehabilitation centre.	Clinic.

	Liu, 2009	Pheung-Phrarattanatrai et al., 2015	Polli et al., 2017	Timmermans et al., 2013	Verma et al. 2011
8. When & how much	Before PT/OT sessions, 3 w, 60 minutes, 5 times a week.	During PT/OT sessions, 4 w, 20 minutes.	During PT/OT sessions, 4 w, 60 minutes, 5 times a week.	Before PT/OT sessions, 6 w, 10 minutes, 3 times a day.	During PT/OT sessions, 2 w, 15 minutes, 7 times a week
9. Tailoring	Not stated.	Not stated.	Not stated	Not stated.	Not stated.
10. Modification	Not stated.	Not stated.	Not stated	Not stated.	Not stated.
11. How well (planned)	Using a scoring sheet of 7 rating items, 7. Complete independence.	Not stated.	Not stated	Not stated.	The participants were given a diary to their MI practice to measure the rehearsal frequency after treatment sessions.
12. How well (actual)	Not stated.	Not stated.	Not stated	Not stated.	Not stated.
(*): The study did not report the relevant information for dropouts. MI: Mental/Motor imagery training; TOT: Task-Oriented Training; PT: Physical therapist OT: Occupational therapist.					

Table 2.4 Outcome results included in the in the Meta-analysis of the included studies.

Outcomes	Studies (n)	Participants (n)	Effect Estimate [95% CI]	I^2
Berg Balance Test/Scale (BBT/BBS) *(high=well)*	4 studies	124	4.29 [-3.16, 11.74]	96%
MT used during PT/OT sessions	Braun et al., 2012; Hosseini et al., 2012; Lee et al., 2015.	100	2.33 [-0.97, 5.63]	53%
MT used before PT/OT sessions	Hwang 2010	24	13.96 [12.31, 15.61]	0%
Timed up and go test (second)	5 studies	144	-3.92 [-6.77, -1.07]	76%
MT used during PT/OT sessions	Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015.	92	-1.78 [-3.31, -0.25]	0%
MT used before PT/OT sessions	Hwang et al., 2010; Cho et al., 2013;	52	-6.85 [-8.81, -4.90]	0%
10-m walk test (second)	(Braun et al., 2012 and Cho et al., 2013	53	-0.21 [-3.51, 3.09]	34%
Cadence (step/min)	Lee et al. (2011) and Verma et al. (2011)	54	13.12 [6.98, 19.26]	0%
Double limb support (%) – unaffected side	Lee, 2011	24	-2.69 [-10.76, 5.38]	0%
Gait speed (m/s)	4 studies	118	0.08 [0.00, 0.15]	51%
Patients with chronic stroke	Hwang et al., 2010; Lee et al., 2011; Kumar et al., 2016	88	0.03 [-0.01, 0.08]	0%
Patients with subacute stroke	Verma et al., 2011;	30	0.17 [0.07, 0.27]	0%

Table 2.5 Outcome results from the included studies.

Outcomes and measures	Author	Patients (n)	**Statistics** Mean Difference (MD)	Effect estimate [95%CI]
1. Activities of daily living				
1.1. Barthel Index	Braun et al. 2012	34	MD	0.06 [-3.34, 3.46]
1.2. Barthel Index modified	Verma et al.,2011	30	MD	16.00 [7.59, 24.41]
1.3. Functional Independence Measure	Polli et al. 2017	28	MD	20.40 [1.91, 38.89]
2. Mobility				
2.1. Paretic muscle strength (Newton)	Kumar et al. 2016			
2.2. Hip flexors		40	MD	9.80 [1.54, 18.06]
2.3. Hip extensors		40	MD	8.68 [-3.31, 20.67]
2.4. Knee flexors		40	MD	-0.74 [-11.68, 10.20]
2.5 Knee extensors		40	MD	15.51 [-3.61, 34.63]
2.6. Ankle dorsiflexors		40	MD	6.22 [-0.16, 12.60]
2.7. Ankle plantar flexors		40	MD	-8.01 [-19.03, 3.01]
3. Other mobility outcomes				
3.1. Six-meter walk test (m)	Verma et al. 2011	30	MD	75.10 [44.73, 105.47]
3.2. Ascending and descending five stairs (second)	Hwang et al. 2010	24	MD	-4.70 [-8.65, -0.75]
3.3. Cadence (step/min)	Lee et al. 2011			
3.4. Double limb support (%) – affected side		24	MD	-2.40 [-10.26, 5.46]
3.5. Double limb support (%) – unaffected side		24	MD	-2.69 [-10.76, 5.38]
3.6. Maximal walking speed (m/s)	Verma et al. 2011	30	MD	0.18 [0.06, 0.30]
3.7. Single limb support (%) – affected side	Lee et al. 2011	24	MD	0.43 [-4.66, 5.52]
3.8. Single limb support (%) – unaffected side	Lee et al. 2011	24	MD	2.09 [-2.90, 7.08]

Outcomes and measures	Author	Patients (n)	**Statistics** Mean Difference (MD)	Effect estimate [95%CI]
3.9. Traversing a standardized obstacle course (second)	Hwang et al. 2010	24	MD	-5.83 [-9.36, -2.30]
3.10. Step length (m) – affected side	Lee et al. 2011	24	MD	-0.01 [-0.08, 0.06]
3.11. Step length (m) – unaffected side	Lee et al. 2011	24	MD	-0.01 [-0.08, 0.06]
3.12. Step length (m) – unaffected side	Lee et al. 2011	24	MD	-0.03 [-0.09, 0.02]
3.13. Stride length (m) – affected side	Hwang et al. 2010	24	MD	0.16 [-0.00, 0.32]
	Lee et al. 2011	24	MD	-0.04 [-0.14, 0.06]
3.14. Stride length (m) – unaffected side	Hwang et al. 2010	24	MD	0.15 [-0.01, 0.31]
	Lee et al. 2011	24	MD	-0.04 [-0.15, 0.06]
3.15. Weight bearing ratio – affected side	Kim et al. 2015	26	MD	1.39 [-3.71, 6.49]
3.16. Weight bearing ratio – unaffected side	Kim et al. 2015	26	MD	-2.97 [-5.42, -0.52]

Table 2.6 Outcome results from the included studies, reporting other data (skew).

Outcomes and measures	Author	Patients (n)	**Statistics** Mean Difference (MD)
Other data (skew)			
1. Activities of daily life			
1.1. Modified Barthel Index (change data)	**Hong et al. 2012**	14	Median (IQR)
	MI group	7	2 (0-5)
	Control group	7	0 (0-3)
1.2. Modified Ashworth Scale (change data)	**Hong et al. 2012**	14	Median (IQR)
	MI group	7	1 (0-1)
	Control group	7	0 (0-1)
Other skewed data			
2. Mobility			
2.1. Functional Ambulation Classification (FAC)	**Verma et al. 2011**	30	Median (IQR)
	MI group	15	4 (4-5)
	Control group	15	3 (3-4)
2.2. Motor Activity Log (MAL) – Amount of Use (change data)	**Hong et al. 2012**	14	Median (IQR)
	MI group	7	2 (0-8)
	Control group	7	1 (0-3)
2.3. Motor Activity Log (MAL) – Quality of Movement (change data)	**Hong et al. 2012**	14	Median (IQR)
	MI group	7	0 (0-8)
	Control group	7	1 (0-1)
2.4. Step length (cm) – asymmetry	**Verma et al. 2011**	30	Mean (SD)
	MI group	15	0.043 (0.044)
	Control group	15	0.136 (0.115)
2.5. Stride length (cm) – asymmetry	**Verma et al. 2011**	30	Mean (SD)
	MI group	15	0.003 (0.47)
	Control group	15	0.123 (0.115)

Outcomes and measures	**Author**	**Patients (n)**	**Statistics** Mean Difference (MD)
2.6. Weight bearing ratio – affected side	**Lee et al. 2015**	36	Mean (SD)
	MI group	18	9.48 (5.8)
	Control group	18	11.74 (2.02)
2.7. Weight bearing ratio – affected side front/rear	**Lee et al. 2015**	36	Mean (SD)
	MI group	18	5.34 (2.02)
	Control group	18	8.11 (5.35)
2.8. Weight bearing ratio – unaffected side front/rear	**Lee et al. 2015**	36	Mean (SD)
	MI group	18	5.71 (2.35)
	Control group	18	8.10 (5.79)

2.3.4.1 Mental imagery intervention details

The included studies compared intervention of MI combined with task-oriented training to standard rehabilitation. In terms of the specified tasks included in MI, most comprised ADL such as frying vegetables, folding clothes, or preparing a cup of tea. Other functional tasks included mobility activities and balance training such as standing, walking, or gait training. Two studies described tasks with a focus on quality of life or participation (Timmermans et al., 2013; Pheung-Phrarattanatrai et al., 2015).

Type of mental imagery and equipment used (WHAT)

Regarding the type of imagery used, MI was instructed and delivered through one or more methods, such as using videos combined with physiotherapist (PT)/Occupational Therapist (OT) instructions to help facilitate detailed images of the movement with patients in eight studies (Hong et al., 2012; Hosseini et al., 2012; Hwang et al., 2010; Kim et al., 2015; Lee et al., 2015; Pheung-Phrarattanatrai et al., 2015; Verma et al., 2011; Timmermans et al., 2013); a combination of more than one method such as combining audios with computer and instructions of the PT/OT or researcher, for example, audiotape, videotape, computer, or PT/OT/researcher instructor, was used by seven studies (Liu et al., 2004; Liu, 2009; Lee et al., 2011; Braun et al., 2012; Cho et al., 2013; Kumar et al., 2016; Polli et al., 2017).

Four studies included use of only one type of imagery, specifically, the visual mode (Liu et al., 2004; Hosseini 2012; Timmermans et al., 2013; Lee 2015). One study by Kim et al. (2015) used kinaesthetic imagery. Verma et al. (2011) used only motor imagery, while another four studies applied at least two modes of MI in their training (including visual, kinaesthetic; movement). Two studies (Braun et al., 2012; Polli et al., 2017) did not report how they gave instructions on which perspective of visual imagery to use (for example, internal or external visual imagery), rather they stated simply that they used sensory information, for which it was assumed that the training involved more than one type. The remaining three studies (Liu, 2009; Hong et al., 2012; Pheung-Phrarattanatrai et al., 2015) did not report any relevant information.

Place of mental imagery practice (WHERE)

In terms of carrying out the intervention, seven studies (Liu, 2009; Lee et al., 2011; Braunn et al., 2012; Cho et al., 2013; Timmermans et al., 2013; Lee et al., 2015; Kumar et al., 2016) reported that they had carried out the interventions mainly in rehabilitation centres, while a further five studies were carried out in clinics (Liu et al., 2004; Verma et al., 2011; Hosseini et al., 2012; Kim et al., 2015; Pheung-Phrarattanatrai et al., 2015). The remaining three studies (Hwang et al., 2010; Hong et al., 2012; Polli et al., 2017) did not describe where the rehabilitation took place.

MI application in stroke rehabilitation (WHO and HOW MI is delivered)

Regarding training stroke patients, MI training was delivered by physiotherapists (PTs), occupational therapists (OTs), or researchers with PT or OT backgrounds, in all the included studies. Face to face instruction was provided in seven studies (Liu et al., 2004; Liu, 2009; Braun et al., 2012; Hosseini et al., 2012; Cho et al., 2013; Timmermans et al., 2013; Kumar et al., 2016). In regard to how MI was delivered, two studies provided group instruction (Verma et al., 2011; Lee et al., 2015) and six studies delivered the training individually (Liu et al., 2004; Cho et al., 2013; Timmermans et al., 2013; Kim et al., 2015; Pheung-Phrarattanatrai et al., 2015; Polli et al., 2017). In two studies, the delivery method was listening to an audiotape in a quiet room (Lee et al., 2011; Braun et al., 2012), and in five studies watching visual images (Liu et al., 2004; Hwang et al., 2010; Lee et al., 2011; Cho et al., 2013; Polli et al., 2017). In contrast, three studies used more than one style in training patients in the use of the MI intervention (Lee et al., 2011; Liu et al., 2004; Cho et al., 2013). Hong et al. (2012) did not report any relevant information as regards how MI was instructed to patients.

When to use mental imagery (WHEN)

Regarding when MI was used in relation to the standard therapy, five studies (Liu et al., 2004; Liu, 2009; Hwang et al., 2010; Cho et al., 2013; Timmermanns et al., 2013) used it before PT/OT sessions, while seven studies performed it during PT/OT sessions (Verma et al., 2011; Braun et al., 2012; Hong et al., 2012;

Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015; Polli et al., 2017). Kumar et al. (2016) reported using MI training before and during PT/OT sessions. Lee et al. (2015) and Pheung-Phrarattanatrai et al. (2015) reported MI use after PT/OT sessions while Lee et al. (2011) did not state the time of application for MI training.

How mental imagery was used and its content (HOW)

The duration of MI sessions ranged from 2 to 8 weeks. Ten studies applied MI for less than 6 weeks (Liu et al., 2004; Liu, 2009; Hwang et al., 2010; Verma et al., 2011; Hong et al., 2012; Hosseini et al., 2012; Kim et al., 2015; Kumar et al., 2016; Pheung-Phrarattanatrai et al., 2015; Polli et al., 2017), while the remaining studies applied MI for more than six weeks. The intensity of training MI varied across all included studies from 10 to 60 minutes per session. The frequency of application also varied across all included studies, from three to seven times a week for most studies. Table 2.3. above provides a full overview of all MI components used in the included studies.

2.3.4.2 Outcomes

Primary outcomes
Activities of daily living

Two studies (Verma et al., 2011; Braun et al., 2012) reported MI use combined with standard therapy involving Bobath neurodevelopmental technique. Verma et al. (2011) used standard care (including training on homework tasks involving ADLs). In Braun et al.'s (2012) study multi-professional rehabilitation was used (e.g. physiotherapy, occupational therapy and speech therapy). Both studies measured ADL using the Barthel Index (BI) at two points during the 6 weeks with varying results over time. The standard mean difference (SMD) was calculated by the researcher (NA), instead of the mean difference (MD) due to the different ADL scales using Revman software Version 5.3 (Higgins, 2008). Timmermanns et al. (2013) used BI to evaluate ADL, however, the data obtained were considered skewed and therefore, inappropriate for statistical testing.

While the first study by Verma et al. (2011) used the original scoring system of BI (0-100) and found BI scores higher in the MI group (n=30; SDM 1.33, 95% CI 0.52 to 2.13), the other study (Braun et al. 2012) with n=34 used the modified BI (0-20) and found no significant difference between the two groups (n= 0; SDM 0.01, 95% CI 0.66 to 0.69). Meta-analysis was not possible due to the different outcome measure used (see Figure 2.2).

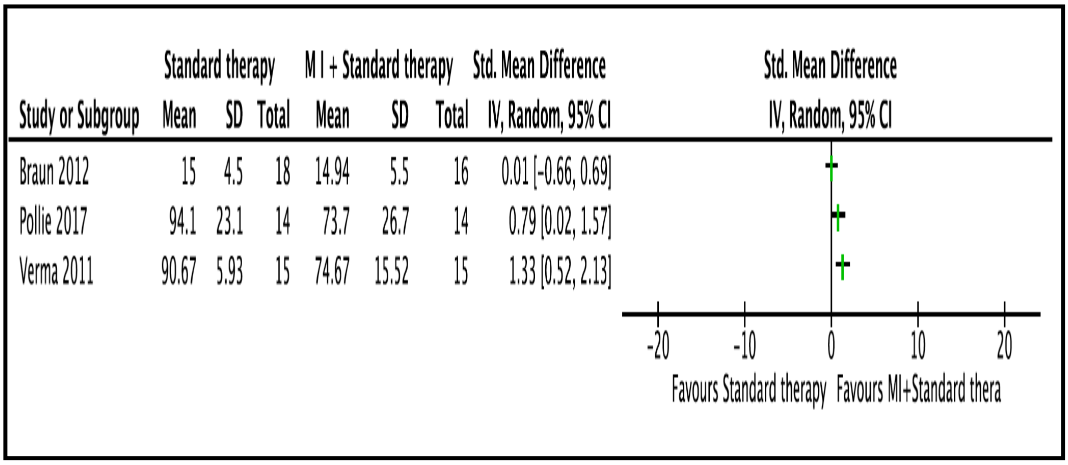

Figure 2.2 Forest plot for MI combined with standard therapy compared to standard therapy (ADL- BI, Modified BI & FIM) outcome.

Functional Independence Measure outcomes for ADL measures:

Polli et al. (2017) included 28 stroke survivors and measured ADL using the Functional Independence Measure (FIM), when comparing MI to a standard therapy of active physical exercises. They found no significant difference between the two groups (n=28; MD 20.4, 95% CI 1.91 to 38.89) after four weeks. Efforts were made to convert the FIM score into a BI score so that it could be entered in the meta-analysis since according to Nyein et al. (1999) and Prodinger et al. (2017) conceptual equivalence exists between FIM and BI. However, the Rasch interval metric equivalent between the two measures was lacking, therefore, it was not possible to establish a formula with which to conduct the conversion.

Hong et al. (2012), investigated the effect of MI use to improve upper limb motor functions after stroke. The study reported median change scores on the Barthel Index and modified Ashworth scale with n=14. MI training was compared against the control group, which included only standard therapy involving general functional electrical stimulation therapy. The treatment programme comprised 20 minutes, five days per week, for four weeks. Their findings showed no significant difference between the two groups.

Two studies compared MI use with other standard therapy such as functional training (Liu et al., 2004; Liu, 2009) and reported Likert-type scale scores for the trained and untrained task performance measure after three weeks of treatment with n=46. The findings revealed higher scores for the MI group than the standard care group.

Timmermans et al. (2013) used the BI and Frenchay Activities Index (FAI) to measure ADL in a sample of 32 stroke survivors that underwent MI training with tailored functional tasks of upper limb while the control group were provided with standard treatment using NDT with functional tasks for six weeks and a follow-up at six and twelve months. Data was reported using Median Inter Quartile Range (IQR), thus the study was excluded from the previous statistical analysis of ADL due to skewed data. There was no clear acknowledgement of any significant differences between the MI and control group.

In summary the overall findings for ADL measures were that MI use may potentially improve levels of daily activities of life.

Secondary outcomes
Mobility

Similar to the primary outcomes, when reporting MI use combined with other standard therapy versus standard therapy alone, mobility was reported and findings were addressed using different scales or tests of mobility including the Berg Balance Test (BBT), Time Up and Go (TUG) test, 10-metre-walk test and gait speed. Meta-analyses were conducted for the BBT (Hwang, 2010; Braun et al., 2012; Hosseini et al., 2012; Lee et al., 2015), TUG (Hwang et al., 2010; Cho et al., 2013; Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015) and 10-meter-walk test (Braun et al., 2012; Cho et al., 2013).

Berg Balance Test

Four studies (Hwang 2010; Braun et al., 2012; Hosseini et al., 2012; Lee et al., 2015) reported mobility outcomes using the

BBT. Meta-analyses were initially performed with all four studies and the pooled estimate showed a high level of heterogeneity (n=124; MD 4.3, 95% CI -3.2 to 11.7; I^2 = 96%). Subsequently, the characteristics of these studies were re-inspected for potential clinical factors causing heterogeneity. One possible cause for the heterogeneity source was suspected to be found in MI treatment courses lasting four, five, six and eight weeks, respectively (see Figure 2.3). The different time duration of MI training may have produced differential effects. Furthermore, there were other sources that might have caused this observed heterogeneity; for example, Braun et al. (2012) included only sub-acute stroke, while the rest included chronic cases. Another issue is the use of different modality of MI and perspective such as visual and kinaesthetic; Braun et al. did not specify the type while the other studies instructed the patients to use visual internal prospective combined with kinaesthetic modality.

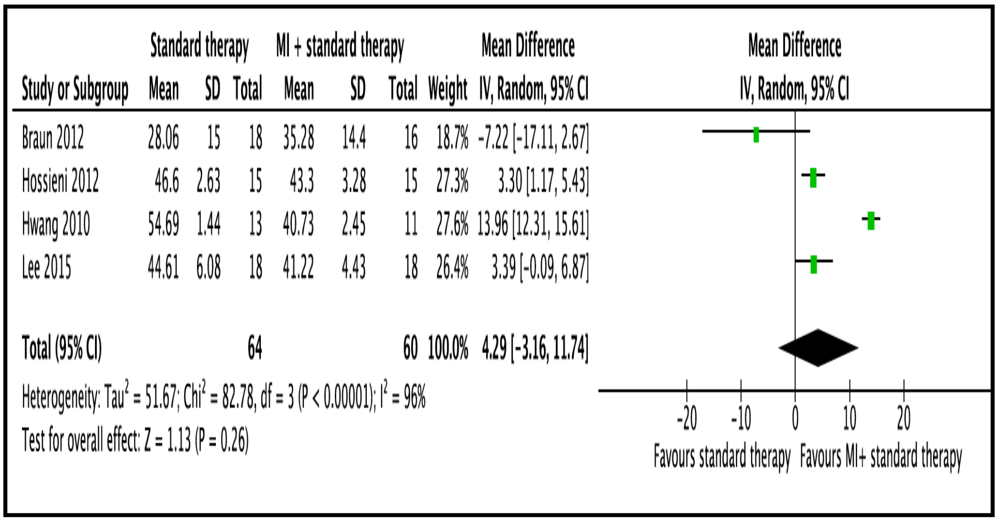

Figure 2.3 Forest plot for MI combined with standard therapy compared to standard therapy (BBT) outcome.

Timed Up and Go test

Five studies (Hwang et al., 2010; Cho et al., 2013; Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015) reported mobility outcomes measured by the TUG test. Meta-analyses were performed with all five studies and the pooled estimate showed a high level of heterogeneity (n=144; MD -3.92, 95% CI -6.77 to -1.07; I^2=76%). Duration time of MI application ranged from four up to eight weeks, specifically, four (Kim et al., 2015; Hwang et al., 2010); five (Hosseini et al., 2012); six (Cho et al., 2013) and eight (Lee et al., 2015), weeks of MI course application. As with the BBT outcomes, findings for the TUG test for walking suggest that mobility outcomes were better the longer the duration of MI training (see Figure 2.4).

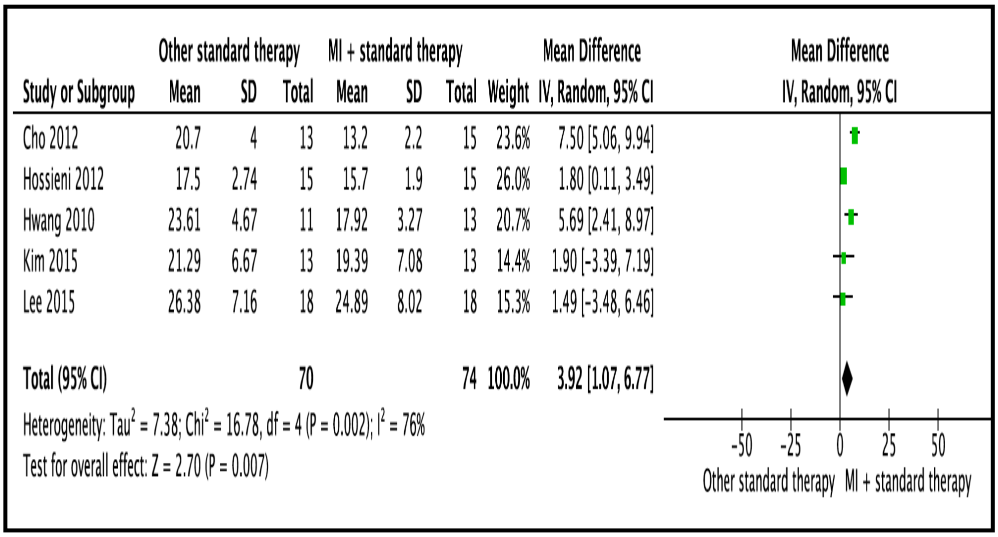

Figure 2.4 Forest plot for MI combined with standard therapy compared to standard therapy (mobility-Timed up and go test) outcome.

Re-inspection of the characteristics of these studies was performed by the researcher (NA) for potential clinical heterogeneity. Different duration of MI training is one plausible explanation for this. Others may be in stroke onset varying from acute to chronic, different age range and different types of MI use across all studies. However, other factors included wide variation in MI intervention protocols, making it difficult to determine what works for whom and therefore what should be implemented clinically and how.

Gait speed

Four studies (Hwang et al., 2010; Lee et al., 2011; Verma et al., 2011; Kumar et al., 2016) reported mobility measured by gait speed in meters per seconds (m/s). Meta-analyses were initially performed with all four studies and the pooled estimate showed a high level of heterogeneity (n=118; MD 0.08, 95% CI 0.00 to 0.15; I^2=51%). The findings showed no clear difference between the MI group compared to control groups. In this case, the source of heterogeneity was investigated and identified onset of stroke as the source. Subsequently, Verma et al. (2011) was removed from the analysis due to onset of stroke (acute stroke = six weeks). The remaining three studies conducted with stroke survivors in the chronic stage (Kumar et al., 2016; Lee et al., 2011; Hwang et al., 2010) (≥ six months) showed no clear difference in outcome, using gait measured in speed per metre (n=88; MD 0.03, 95% CI -0.01 to 0.08; I^2=0%). However, the study by Verma et al. (2011), which included sub-acute (0-3 m) stage stroke survivors, showed that gait speed increased in the MI group in a study of 30 sub-acute stroke survivors (MD 0.17, 95% CI 0.07 to 0.27) (see Figure 2.5), suggesting that onset of stroke and different stages of recovery could differentially affect outcomes following MI use.

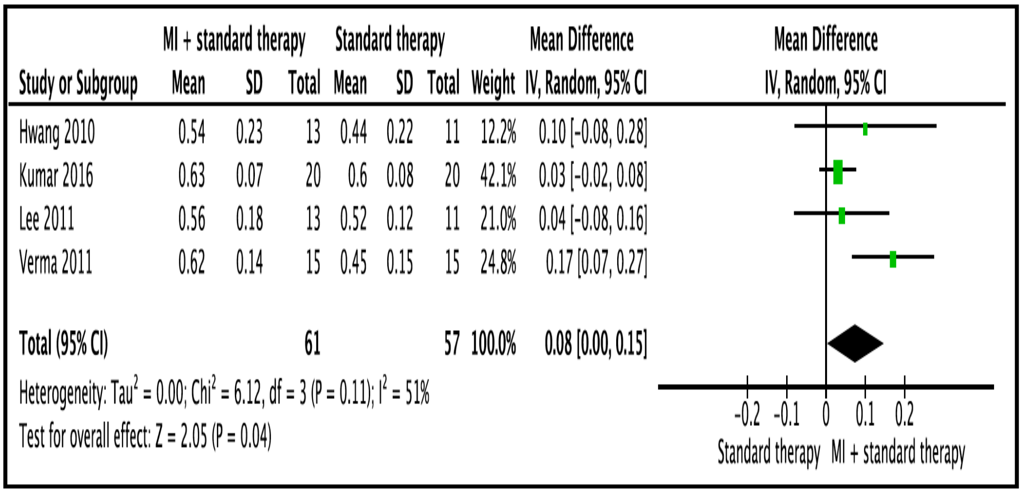

Figure 2.5 Forest plot for MI combined with standard therapy compared to standard therapy (mobility-speed gait) outcome.

10-meter walk test

*The pooled estimate of the e*ffect for the results of two studies (Braun et al., 2012; Cho et al., 2013) measuring mobility using the 10-meter walk test showed that MI use could potentially have an effect on walking n = 53; MD -0.21, 95% CI-3.51 to 3.09; I^2=34%) (See Figure 2.6).

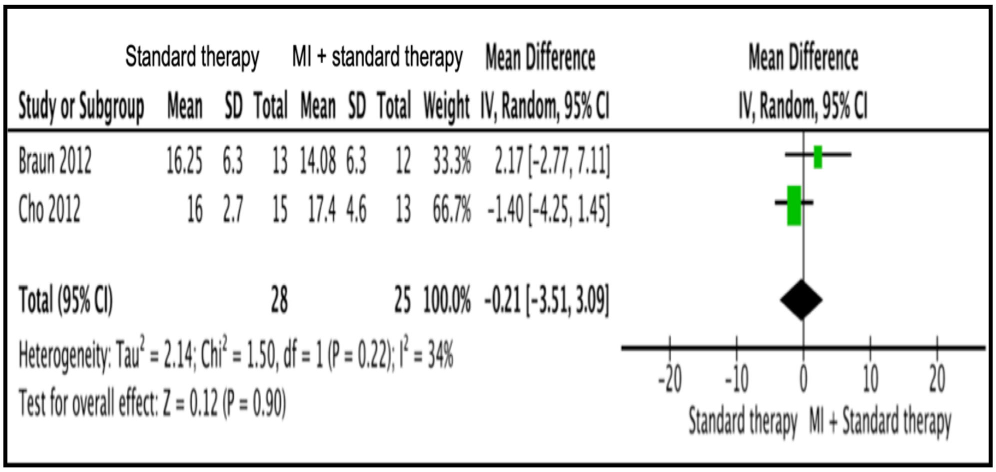

Figure 2.6 Forest plot for MI combined with standard therapy compared to standard therapy (mobility–10-meter-walk test) outcome.

Cadence and other mobility-related measures

Another pooled estimate effects for the results of studies by Lee et al. (2011) and Verma et al. (2011) measuring mobility using the cadence outcome showed an increase in the number of steps per minute in the MI group compared to controls (n=54; MD -13.12, 95% CI -6.98 to -19.26; I^2=0%).

The remaining measures used to assess mobility were reported by a single study by Hwang et al. (2010), which showed that MI may improve patients' performance on the 5-metre-walking test (hard surface and carpet) and the Modified Emory Functional Ambulation Profile resulted in significant improvement in walking task. See Tables (2.4., 2.5 and 2.6) illustrating the results for the included studies above).

Other secondary outcomes

Quality of life

Among all studies included in this review, only one study by Pheung-Phrarattanatrai et al. (2015) reported an outcome measure for quality of life using the Fall Efficacy Scale-International (FES-I) for testing self-efficacy of falling. Although the FES-I is a tool used to measure and evaluate levels of fear regarding falls during physical activities and participation in life, improved levels of FES-I can impact physical functioning and QoL (Yardley et al., 2005). Due to insufficient data, no clear conclusion could be drawn from the findings as regards MI and its effect in helping to decrease fear of falling after stroke;

additional information could not be obtained from the author of this study.

Participation

Likewise, participation was only reported by Timmermans et al. (2013) using the Frenchay Activities Index (FAI). The FAI is an instrument commonly used for measuring ADL across a broad range of actual activities patients have undertaken in the recent past. Focusing on basic levels of functioning in activities reflecting a higher level of independence and social participation rather than considering issues related to general self-care and mobility (Holbrook & Skilbeck, 1998; Wade et al., 1985). However, in Timmermans et al.'s (2013) study, the FAI was used as a measure of participation after stroke, as also recognised by Tse et al. (2013). In this study the use of MI combined with standard therapy (includes exercise for functional and motor movements) was compared with a control group given neurodevelopmental therapy plus standard therapy. The findings showed no clear difference between the two groups. Similar to Pheung-Phrarattanatrai (2015), the data was unavailable, and further information could not be obtained from the author, therefore only the median interquartile (IQR) was reported.

2.4 Discussion

2.4.1 Summary of the main findings

This review aimed to investigate MI use with task-oriented training and to evaluate its effectiveness on post-stroke on ADL, mobility, QoL and participation. Further, it sets out to describe the MI intervention delivered in the trials included. In contrast with previous reviews for example (Braun et al., 2006; Barclay-

Goddard et al., 2011; Nilsen et al., 2010), it examined the effectiveness of MI combined with task-oriented training on global ADL outcomes rather than upper limb function alone.

Fifteen clinical trials were included of which 12 were considered good quality RCTs as rated on the PEDro scale including 458 stroke survivors in total, (male n = 275), and (chronic stroke stage n= 247). Data was pooled from a total of nine studies (268 strokes) allowing meta-analysis on the mobility secondary outcome for balance as measured by the BBT and walking abilities as measured by TUG test. The sample size of studies included in the meta-analysis ranged from 22 to 36 participants. Of the nine studies conducted involving MI use with task-oriented training, eight were conducted in Asia (largely in China and Korea). Participants were adult stroke survivors aged between 47 and 78 years, most of whom were men (78%). The meta-analysis favored MI intervention combined with task-oriented training in addition to standard PT/OT compared with PT/OT therapy alone.

The findings from this review show that the effectiveness of MI training on global measures of ADL as a primary outcome was less clear, due to the limited number of studies including ADL outcomes which met the criteria for inclusion in this review. A reason may be that few studies investigated ADL improvement, and it was also noted that ADL was not adequately and consistently defined across all the included studies.

Few studies were identified that examined the impact of MI on quality of life and participation secondary outcomes. The use of MI in combination with physiotherapy or occupational therapy was found to improve performance on balance and mobility outcomes using a variety of MI protocols across the included studies. Moreover, MI training delivered to stroke survivors varied widely across the studies.

This review included a meta-analysis for two important outcomes for mobility; balance using the BBT and walking abilities using the TUG test, and observed improvements in walking speed were found with the addition of MI. Although, this point credits the review in demonstrating MI can improve mobility after stroke in relation to aspects of balance and walking. However, MI intervention protocols varied, this inadequacy in describing the instructions given to participants for MI use makes it too challenging train its use with stroke rehabilitation in clinical practice.

2.4.2 Quality assessment for the included studies

The quality of evidence in the studies in this review is considered to be fair and it included mostly RCTs to help produce the highest quality of evidence in MI use with stroke. To date there is no other systematic review that has investigated MI use with task-oriented training and evaluated its effectiveness on global ADL, mobility, QoL and participation after stroke.

Despite the inclusion criteria for this review in selecting RCTs and interventions considerable in MI use, it remains unclear whether any selection biases could have occurred due to missing out any unpublished studies at the time of this review. It is suggested that a future update of the review is conducted by re-running the search and including more recent studies.

Regarding missing data for some of the included studies, authors were approached to seek further data (means, standard deviations) to clarify the results from their studies to help include them in the meta-analysis where possible. However, non-response from the authors (Pheung-Phrarattanatrai, 2015; Polli et al. 2017) led to the decision to analyse the data quantitatively for example the QoL outcome had inadequate data to help explore MI effect. Therefore, it was more appropriate to a narrative synthesis of the findings.

In support of the included studies and their good quality level, and having some studies lacking in reporting sufficient information, this may have led to unclear intervention effects. Further methods of allocations and blinding in MI intervention need to be considered, as they can be difficult to attempt in interventions such as MI use. Notably, treatment allocation and blinding process may not be possible as both the stroke survivors and therapists have actively participated in the intervention; in addition to having rehabilitation programmes intervening in the process, it is not possible to conceal the treatment allocation from participants (Berger, 2015). This explains why the quality of these studies could have in some way influenced the results.

2.4.3 Clinical interpretation

The findings show two main limitations in implementing MI use in clinical practice with stroke survivors. Firstly, the MI training protocols were different in each study and inconsistent in the outcome measure used for measuring ADL levels (primary outcome) within the included studies. These two limitations make it difficult to draw clear conclusions on the effectiveness of MI training on ADL and limit future implementation of MI training with stroke survivors in clinical practice. Although the meta-analysis for the mobility outcome (secondary outcome) demonstrated effectiveness of MI use, this could not be demonstrated with ADL outcome.

Although individual studies suggest MI may potentially improve ADL ability, estimating the effect size was not possible for a number of reasons: 1) discrepancies between the studies in the definition of ADL; 2) different tools used to measure ADL in the included studies. Some studies used only part of a tool or focussed only on upper limb function rather than seeing it as a global construct as defined by the ICF (WHO, 2001).

The possible reason for this could be related to the global definition of ADL and distinctions in using different scales to assess ADL ability relative to the overall measure not only measuring the upper limb function. Most included studies investigated the improvement of some aspects of ADL. For example, five out of eight studies considered improving hand/arm movement to as ADL. Similarly, Timmermans et al.'s (2013) study examined the effect of MI on improving ADL exclusively to the upper extremity, using measuring scales such as the Fugl-Meyer test-UE (FMA-UE) section only, whereas ADL measuring was considered as an assessment tool for general ability and independence. Furthermore, measuring participation as an outcome was only reported in the study by Timmermans et al. (2013). However, the outcome measure attributed to 'participation', FAI, is arguably a measure of ADL.

The findings from this review do provide some evidence to support the efficacy of MI on global ADL. Verma et al. (2011) used the BI and found improved levels of ADL ability. However, Braun et al. (2012) used the modified version of BI (10 items) and found no difference from the intervention group using MI. This suggests the need to advance and unify a global outcome measure for ADL to help serve in MI use in rehabilitation with stroke rather than having multiple and different measures. Having a well-defined outcome measure for ADL in MI use can help sense improvement clearly in stroke rehabilitation. The study by Polli et al. (2017) measured ADL using the FIM. Further, Liu et al. (2004), and Liu (2009) examined the effect of MI on improving ADL ability and improving a full range of independence in ADL, using a 7-point Likert-type-scale to show the effectiveness of MI use on trained and untrained ADL tasks, which included putting clothes on hangers, washing the dishes and preparing fruit and food. In both trials, a broad ADL scale was used for measuring ADL ability and independence in executing ADL tasks. These two studies by Liu et al. (2004; 2009) in addition to the study by Polli et al. (2017), which used the FIM and Verma et al. (2011) using the Barthel Index and Braun et al. (2012) using a modified version of BI (10 items), provide a better indication of the effectiveness and contribute to a potential understanding of the effect of MI on stroke recovery, alongside other previous reviews that have demonstrated the effect of ADL on upper limb function only.

Several systematic reviews have been conducted, some of which included meta-analyses, (including two that were published since this review was completed). Barclay-Goddard et al. (2020) published an update to their 2011 review investigating the effect of MI training on improving impairments of the upper extremity in stroke. In contrast to the initial review, this update found more data and included more studies relevant to this comparison. Their updated review included a total of 25 RCTs and cross-over trials, with a total of 676 stroke survivors with impairments in upper extremity and structural dysfunction. The trials included MI use interventions to improve upper extremity movements or tasks stand-alone interventions or adjunct to any other therapeutic interventions. Moreover, their meta-analysis included 15 studies for the upper extremity activity outcome and upper extremity functional limitation outcomes such as Action Research Arm Test (ARAT), Wolf Motor Function Test (WMFT), and Arm Function Test (AFT), which favoured MI use extremity activity outcome and upper extremity functional limitation outcomes such as ARAT, WMFT, and AFT, which favoured MI use. The ADL outcome measured using BI and modified BI, included only four studies with 157 stroke survivors with low certainty of evidence on the GRADE. The results showed mental practice improves upper extremity outcomes related to ADL independence after stroke, although, the outcomes focused mainly on activity limitations of the upper limb, including arm and hand functions such as grasping a cup or folding a towel. However, their findings are similar to those reported in this review, in providing no clear evidence of the effectiveness of MI in improving recovery of global ADL. Additionally, they found limited evidence on the ideal dosage of MI for use in clinical practice, as was found in this review. Similar to this review, their findings suggest the need for more research of good methodological quality and better-described interventions in this field of study.

Much like Barclay-Goddard et al.'s (2020) review, Harris and Hebert (2015) aimed to evaluate the effects of MI compared with other methods on upper limb motor restoration after stroke. Inclusion and exclusion criteria for their review included RCTs of stroke exploring the impact of MI practice with an intervention group including stroke survivors treated with imagery combined with other treatments and a control group including stroke survivors treated by any other type of exercise method. The included trials had to focus on the use of MI of the upper limb as a primary intervention. This is different to this review which included trials focusing on the impact of MI use on global ADL outcomes. Further, they excluded trials focusing only on MI use impacting upper limb functions as a minor part of the intervention, or if MI was implicit only (such as laterality recognition or mirror therapy). As with this review, trials focusing only on MI used with brain-computer interface technology were excluded.

Their review included 48 articles with a total of 854 individuals, where a total of 38 articles involved 678 stroke survivors, five articles involved individuals with complex regional pain syndrome, and five articles for other conditions. The PETTLEP model was used to extract details of MI intervention content and use. Their findings reported MI elements that were most commonly described in the trials; physical, environment, task, and perspective content. Content such as timing, learning and emotional aspects were described less. Although their review, is similar to this one in that it illustrates MI content across the included trails, their findings were restricted by the low-quality RCTs which limited detection of any clinical effects of MI as a rehabilitation method for upper extremity function in stroke survivors.

Their findings reported motor imagery elements that were most commonly described based on the PETTLEP model, yet, their review was limited by low-quality RCTs that did not adequately address and clarify the clinical effects of MI as a rehabilitation method for upper extremity function in stroke patients. Further their findings from their review limit clear MI implementation in practice.

These published systematic reviews led to distinctive conclusions to the current review, with the heterogeneity in study designs, different use of MI descriptive models and concluded that MI is a significant addition to treatment intervention after stroke to improve upper extremity recovery only. However, gaps are apparent in the included low-quality of evidence; suggesting that mental training, in combination with other treatment, may not be beneficial in improving ADL. The findings do not indicate the ideal amount of MI for use in clinical practice as it has been reported within these systematic reviews.

The findings from the systematic review by Booth et al. (2014) reported eight RCTs, evaluating the effect of virtual reality interventions, to improve impaired balance in adults. Their evidence was limited due to the inconsistency of outcome measures used in the included studies, which was a result of evaluating balance by using incidence and frequency of falls, and balance levels. Their findings are similar to this review in that the outcome was evaluated using different measures, which impacted on the results and made it hard to judge the impact of the intervention used. Their evidence was presented neither in favour of nor rejecting the virtual reality intervention, as with this review, in the use of MI and its impact in stroke rehabilitation. This suggests that clinical impact for an intervention can be acquired through the usability of proper outcome measures that ensure meeting the measures for stroke survivors' needs within the intervention. It suggests that to help achieve successful outcomes from an intervention, emphasis should be placed mostly around the theoretical understanding, programme components and delivery monitoring of the intervention. MI interventions reported in the trials are lacking in the detail needed to replicate them across different settings. Guideline tools such as TIDieR and CONSORT reporting systems are needed to help increase the consistency of trial details and intervention applicability. Additionally, RCTs are needed to support the use of MI with improved designs using the TIDier checklist tool for designing, describing, and reporting these interventions. Once these interventions are replicated across different settings, it could help deliver a better standard of intervention model tailored within the healthcare services (Durlak & Dupre, 2008).

Another important point from this review is that there was wide variation in MI intervention protocols used between the included studies making comparison of the interventions across studies challenging. Sources of heterogeneity within protocols included the duration of MI training sessions (for example, five weeks and above). Other factors that varied contributing to this heterogeneity, were the average of stroke survivors and how they were trained in MI use. For example, whether they were instructed to visualise (visual imagery) or whether kinaesthetic methods, videotapes or audiotapes were used to guide or compliment training for stroke participants. The lack of clear clinical guidelines for MI use in practice may explain some of this variation, along with variation in stroke rehabilitation programmes across services and between countries. Arguably, the variation in research protocols also makes it challenging to determine how to implement MI in clinical practice, or to determine what works best, for whom, how it works, and when and where it works best. The findings are in accordance with other reviews, for example Carrasco and Cantalapiedra (2016) who investigated the effectiveness of MI training on functional recovery of ADL skills after stroke across 23 clinical trials and 120 strokes participants at different recovery stages (acute, sub-acute and chronic). Their findings support that MI combined with physiotherapy can improve recovery of upper, lower limb and ADL abilities. Similar to this review, Carrasco and Cantalapiedra's (2016) review found heterogeneity in protocols on MI use including treatment designs, MI content and patient characteristics (e.g., cognitive impairment, general health condition and inability to image). Additionally, different outcomes to measure ADL and mobility were used across the included studies. Although their review supports MI use it does not define the specific outcome measure, which could have contributed to optimal effect for this therapy. Furthermore, the lack of clear descriptions of the interventions hinders successful delivery in clinical practice.

Clinics can deliver more effective MI interventions once enabled by specific best practice guidelines and clear intervention descriptions. The National Institute for Clinical Excellence (NICE, 2013) has emphasised the importance of the quality of reporting guidelines of interventions in trials. This issue is not MI-use specific. However, it is generally evident in more than 50% of interventions (Samaan et al., 2013). This suggests the need for consensus-based guidelines for interventions such as MI use in stroke rehabilitation alongside making available assessment tools and measurement outcome.

These findings highlight the need for developing evidence-based protocols to guide clinicians in MI delivery and training in the use of MI.

2.4.4 Strengths and Limitations

As with other reviews reporting limitations, this was focused on a new topic in stroke rehabilitation, thus ongoing trials and newer publications of MI studies might have been missed during the searches. Although comprehensive search strategies were used, it is possible that some studies were missed, especially in languages other than English. To help overcome this issue a search test was run initially, to ensure that all key studies identified during the development of the strategy were identified, before finalising the actual search. Moreover, while the focus was on studies that included task-oriented training alongside MI, the lack of a definition for task-oriented training, resulted in screening a lot of non-relevant titles.

The difficulty in establishing statistically significant effect between groups may be compounded by differences in outcomes measured which most likely decreased the likelihood of finding an effect. Although most studies included in the review were RCT designs, the MI interventions differ between studies. Furthermore, the search did specify ADL as the primary outcome, however, studies that had secondary outcomes for mobility, QoL and participation were included, to theoretically show the most significant effect of the intervention, thus, not many studies had a global ADL outcome measure but still were included as their secondary outcomes met the review objectives.

These two strategies could either minimise any possible relative bias through internal validity (criteria 2-11 on PEDro scale), including blinding of stroke survivors, which was not possible and analysing outcome measures, or it can maximise generalizability through external validity (criterion 1), including baseline measures to assess stroke survivor's characteristics. Although most included studies in the review were RCTs, and randomisation was covered. Yet, these RCTs lacked to the sound understanding of design strategies relative to implementing MI use, as well as the definition of the components of the intervention (Campbell et al., 2000). Randomisation is found to be a suitable method that helps limit bias and provide treatment effect that can be estimated and reliable (Chalmers 1994; Sackett & Oxman, 2003).

The included studies have incurred gender and regional variation, where most patients were men and the trials predominantly conducted in Asia, which could limit generalisation. The review included 283 male and 175 female stroke survivors. This gender bias is in line with research evidence demonstrated worldwide, that there is a gender differential in mortality and morbidity examining interventions, some of which are related to neurological conditions (Carolan M, & Hodnett, 2007). Moreover, stroke is more prevalent in men than women (Goldstein et al., 2006). Finally, previous research by Brodie et al. (2009) acknowledged that in some countries, women could be socially disadvantaged in their need for health treatments, due to their lower levels of knowledge regarding their health issues in society, compared to men, has been addressed by Habibis and Walter, (2009). The region where the trials were conducted was also noted as varying across studies and included Asian countries, such as Korea, Thailand, India, and Iran, while other trials were conducted in European countries, such as the Netherlands and Italy. However, it could be that a specific population could affect the application of the evidence internationally, relative to the nature of the intervention, and include influencing factors such as health care providers and different cultural settings. These gender and regional variations in the review could impact the results of MI use in stroke and might limit generalisation to the representative sample of studies.

Poor descriptions of MI in the included studies make it challenging to implement in clinical practice. For future intervention designs, the findings need to be described, designed and reported using the TIDieR guidelines for reporting interventions in trials (Hoffmann et al., 2014). Nevertheless, it is acknowledged that more research is needed to future examine the content of MI and explore how MI interventions fit alongside other standard rehabilitation interventions offered to stroke survivors. In this review, the use of MI combined with other standard therapy was included, however, it may be more relevant to explore its use as a stand-alone therapy. Additionally, the benefit of MI training and delivery with survivors of stroke is that it can be given with only basic instructions. Further research might explore the feasibility of implementing it as a therapy on its own with stroke survivors at home without the need for therapists' guidance (unguided MI use), as an independent and self-practicing therapy. Very few studies appeared to measure the impact/effect of MI on participation and QoL. Future studies need to examine the effect of using MI on improving levels of participation and QoL after stroke.

This review found the design of RCTs of MI practice lacking in the core outcome, which should be emphasised in future studies. The contradiction in results across the different studies implies no definite conclusion about the efficacy thus far, nor offers any clear or specific description of MI use or training in stroke in clinical practice. Clinicians can therefore deliver more effective MI interventions in clinical practice, once specific best practice guidelines and clear intervention descriptions are available.

Publication bias was not appropriate to conduct in this review, due to having less than 10 studies included in the meta-analysis (Dalton, Bolen & Mascha, 2016).

In summary, some limitations were present in the review, and the findings reported a lack of description of both the MI intervention and the standard rehabilitation comparator trials. The review has identified a potential for MI use in stroke rehabilitation in clinical practice when combined with physiotherapy or occupational therapy. RCTs are needed to determine the effect of MI practice alone to support its effectiveness in clinical practice.

This current review intended to examine whether MI could improve ADL abilities more generally, instead of improving isolated upper-limb abilities or functions. ADL is a fundamental skill required to independently care for oneself such as eating, bathing, and mobility. Limitations in general functional status of stroke survivors and inability to perform ADLs or accomplish essential activities results in their dependence on other individuals or assistive devices.

While ADLs could be combined into both basic personal ADLs, such as hygiene, grooming, dressing, toileting, transferring or ambulating, and eating which requires physical skills to manage an individual’s basic needs (Kingston et al., 2012; Katz et al., 1963). Instrumental ADLs are more complex activities that require more complex skills to help patients live independently in the community, and include the ability to self-care, complete household tasks, such as shopping, cooking and sweeping. Further, managing finances, housekeeping, and laundry (Lawton & Brody, 1969) are also activities that require functional independence.

This review investigated the effect of MI training with tasks that are mostly related to ADLs and mobility outcomes. Studies where ADL was measured as an outcome, but which focussed only on activities pertaining to the upper limb were not included. This is because MI training for upper limb functions has been the focus of many previous reviews such as those by Song et al., (2019) and Harris et al., (2015), alongside Barclay-Goddard et al.'s (2011) review, who have only included the global ADL in their updated version in 2020.

Another limitation in this review was in defining the term ADL outcome before conducting the search, and assuming the term could be distinguished from any other upper extremity assessment tools. This may have led to poor identification of the existing evidence within the resources. Thus, some evidence could have been missed during data screening and impacted retrieved results and eligibility criteria. In this review only studies which focused on specific ADL general assessments were included, otherwise any other body structural and functional movements such as upper extremity was excluded. When reading the full text of the obtained papers, they appeared to indicate that assessing ADL outcome was obtained through measurements of only upper limb function evaluation tools (i.e., Page et al., 2011; Page et al., 2009; Page et al., 2007). It would be helpful if future trials included well-defined and sensitive outcome measures for detecting improvement in ADL ability and independence.

Timmermans et al. (2013) used the BI to evaluate ADL, but the data obtained were considered skewed and inappropriate for statistical testing. Although the overall findings for ADL measures were that MI use could potentially improve global activities of daily life, the inconsistency in tools used to measure ADL across the included studies suggests the data should be interpreted with caution to prevent over-estimating the effect. Other studies included in this review with skewed data reporting only median and interquartile ranges were not included in the effect size comparison. Instead, they were reported qualitatively (i.e., Liu et al., 2004; Liu, 2009). This process may have underestimated the effect of ADL interventions.

This review may have synthesised fewer data from the literature compared to Barclay-Goddard et al.'s (2020) review which focused mainly on determining the effect of mental practice training on improving upper extremity impairments after stroke, in particular, enhancing functional activities for the upper extremity related to general activities of daily living and health-related quality of life. They focused on outcomes related to activity limitation of the upper extremity, including the ability of the arm and hand to perform functional tasks such as grasping a cup or folding a towel. Some examples of upper extremity activity outcome measures included the Box and Block test, ARAT, WMFT, MAL, and the Fugl-Meyer Test of Sensorimotor Ability.

Sensitive and specific search criteria were developed to include studies that had MI use and measured global ADL as an outcome, rather than those limited to measurement of impaired movement or upper limb function. It was often not possible to identify studies with a global measure of ADL at the abstract screening stage. It would therefore be helpful in future research to only include trials that have conducted MI use with tasks being measured with any global ADL specific measuring tool. This was usually only possible from the detailed study description in the full paper and primarily due to inconsistency in the use of subject headings or keywords defining ADL. In turn, this may have impacted on obtained results from the literature on available studies that have included ADL as an essential outcome and not for upper extremity functions.

2.4.6 Clinical implications

The review provides potential evidence for the clinical use of MI in improving physical function after stroke. Combining MI training with task- oriented training delivered in physical/occupational therapy sessions for four weeks or more may improve ADL and mobility performance levels after stroke. Furthermore, the findings of this review suggest the need for sensitive tools for measuring the effect of MI that are specific to or customised for stroke.

To date little is known about MI use in stroke rehabilitation, and specifically the impact of intervention in the long term; guided and unsupervised MI training can be integrated and combined with any explicit physical exercise or movement, using both sensory information of a kinaesthetic and visual nature to deliver more effective intervention.

Regular physiotherapy and/or occupational therapy in rehabilitation can sometimes involve passive engagement of stroke survivors, while MI use involves active participation in the intervention and processing, thus, MI use through unsupervised self-practice for stroke survivors needs to be encouraged at home and after discharge as suggested by the review's findings.

While the findings suggest that most trials have used clinical judgement to help candidates and include stroke intervention, there remains a need to develop assessment tools specific to stroke. Further, training should be given on motor images relevant to real life stroke (Dickstein et al., 2013) and monitoring process MI training including easiness and vividness throughout the training with feedback to help maintain effective MI use. This suggests evaluating and tailoring stroke survivor's needs and setting goals specific to the stroke survivor, using appropriate assessment tools, an issue lacking in previous literature.

At present, the findings of this review suggest that therapists need adequate training in MI use; this can ensure delivering MI effectively in stroke rehabilitation. Further, therapists should encourage patients to practice MI at home without supervision and train them in MI as a supplementary method that would help increase the training time in rehabilitation.

Future studies need to employ high quality RCTs that include larger samples of stroke survivors with pre-defined outcome measures (for example, ADL outcome measure using the BI). Additionally, the dosage and session length should be gradually increased, to help optimise rehabilitation recovery.

Despite the limitations in this review, future clinical application and research for MI is needed, to investigate how therapists can pre-scan stroke survivors for their eligibility, to identify those that their MI ability and cognitive level would allow them to benefit from this type of training. A further step might include progression monitoring, developing assessment tools specific to stroke, which can enable future trials to help improve clinical judgment and progress of MI use. This was lacking in the included trials.

2.5 Conclusion

The purpose of this review was to investigate MI use enhanced task-oriented training effect on ADL, mobility and QOL.

The review found that differences in ADL outcome measures used in the included trials, as well as discrepancies in the designs and protocols used in training MI, making it difficult to determine the effect of MI training on stroke rehabilitation ADL outcomes. However, there was some evidence from previous trials combining MI with standard physiotherapy and/or occupational therapy in stroke rehabilitation to suggest its potential for improved mobility outcomes. While the included randomised trial studies indicated that MI could be used as a self-practice intervention and was feasible to use at home without supervision, the poorly defined interventions limit future research replication and clinical implementation. Therefore, further research is needed to determine MI use in clinical practice.

Therapists may consider utilising MI in addition to their current treatment to improve ADL and mobility function after stroke during rehabilitation programmes. However, consideration should be given to stroke survivors’ ability to use mental imagery for necessary movement. There is no clear evidence regarding the ideal dosage or amount of MI for training or the best method of delivering MI or of training stroke survivors in its use or how this could be achieved alongside their conventional treatment. Moreover, it remains unclear which patient’ attributes are important for therapists and clinicians to consider before/during training or what is the ideal content of MI training, such as the type of task imagined, how best to evoke imagery, and how to combine it with physical practice for best results. These are intervention elements that are poorly and inconsistently reported in the literature and need further exploration. Finally, there is a need to identify more accurate and better-standardised outcome measures tailored to stroke survivors’ needs which are useful both for monitoring progress and measuring outcomes.

Chapter Three: Methodology

3.1 Introduction

Findings from the systematic review highlighted the effectiveness of MI in stroke rehabilitation and suggest it could be used as a self-practice intervention, feasible for use at home without supervision. However, the descriptions of MI in the included trials were limited and the programmes and protocols used in training and delivery were unclear, making it difficult to replicate research and limiting clinical implementation. Thus, further research is needed to identify the details of MI for use in clinical practice and factors, which may support implementation.

Given the Saudi Arabian context for this study, consideration for in depth exploration of the Saudi Arabian therapists' perceptions and beliefs regarding the current use of MI in clinical practice was undertaken during the planning stages for this research. Together with the aim to identify enablers and barriers to MI use from the perspective of stroke survivors undergoing stroke rehabilitation. This is essential to inform the design of protocols, guidelines and recommendations for MI use to enhance clinical implementation of MI interventions in stroke rehabilitation. The previous literature highlighted that therapists needed greater knowledge and skills for delivering MI, together with issues involving stroke survivors training on MI use and its delivery in clinical practice.

The purpose of this chapter is to present and critically evaluate all aspects of the methodological approach and related rationale adopted in this research to answer the research questions. A pragmatic philosophical approach and mixed methods design are adopted, which incorporates both qualitative and quantitative methods (Clarke, 1999). There follows a brief discussion on the philosophical assumptions underpinning the study's research approach and the rationale for adopting a philosophical quantitative and qualitative phenomenological approach to fieldwork data collection alongside a discussion of the epistemological challenges and researcher's view in data interpretation. Consideration is made of the different paradigms and their influence on qualitative and quantitative methodologies. Likewise, the quantitative part and rationale for choosing a consensus Delphi approach, is explained in detail. The data collection method and process for both qualitative and quantitative studies are presented. Finally, confidentiality and data protection issues are addressed in the ethical considerations of this research.

3.2 Philosophical research paradigms

In recent years, greater emphasis has been placed on how research is conducted in terms of philosophical paradigms and assumptions (Creswell & Clark 2007; Phellas, Bloch & Seale, 2011; Quinn, 2002). Research methodology is basically influenced by research paradigms and philosophy, which are crucial to help in the appropriate choice of research design and data collection methods (Thorne, 2000).

A paradigm is a standpoint structured around a set of beliefs, values and assumptions, also referred to as the research theoretical framework, which knowledge is investigated, interpreted and concluded (Mackenzie & Knipe, 2006). The paradigm is influenced by assumptions of the research which underwrite the orientational approach that rationalises the mean in which people function in a specific situation (Kunz & Oxman, 1998; Ryan, 2018).

This view of reality and the belief in what is real and truthful, lies in naturally existing settings, representing two lenses through which the researcher views the data: ontological and epistemological (Patton, 2002; Denzin & Lincoln, 2000).

Ontologically is where one external reality exists, which could be uncovered using deductive reasoning through hypothesis and experiment (Patton, 2002). However, epistemologically is a completely different entity and world, separate from the world of the researcher (Krauss, 2005).

The main key research paradigms adopted in general research areas are critical theory approach, pragmatism, positivism, interpretivism, and post-structuralism (Rocco et al., 2003).

Pragmatism considers the research problem under investigation to be more critical than the underpinning philosophical assumption itself, allows researchers to utilise more than one approach in exploring the problem (Cherryholmes, 1992; Rorty, 1982). This study is guided by this philosophical approach, as pragmatic research is advantaged by analysing the findings based on realistic values, common principles and any related human conditions (Giacobbi, Poczwardowski & Hager, 2005). Thus, the pragmatic philosophical approach was seen as appropriate for answering the research questions in this study, as it can provide better outcomes when collecting data through both qualitative and quantitative methods (Creswell & Clark, 2007). The pragmatic approach shares communal features from both. While positivism indicates that reality is established through independent views and personal meanings (Gorski, 2013), the interpretivist approach asserts that reality can be a personal interpretation to fully understand the phenomenon (Lin, 1998).

The positivism paradigm relates to quantitative research and is an extension of empiricism and rationalism paradigms (Mackenzie & Knipe, 2006), both of which hold that knowledge should be objective, free from bias and supported by the researcher's values and beliefs. Positivism is the true knowledge-based experience of the senses and can be examined through observation and experiment (Comte, 1998). It is believed that people in a society could be investigated through empirical observation.

Positivism refers to what can be directly observed that reflects the world as it really is (Comte, 1998). An interpretivism paradigm, aims to fully understand the phenomenon from a personal interpretation view. While any researcher believes there is no correct route or method to knowledge, whereby the researcher accesses the information set through people's subjective experiences of the external world (Williams, 2000). This paradigm is supported by observation and interpretation and judgments (Deetz, 1996). Subjective experiences can be accessed through the use of a particular instrument, such as an interview where a qualitative method is adopted, the researcher can interpret where the reality lies within the interview data, which helps in understanding the true meaning of the event (Lin, 1998). This approach is therefore useful for phenomenological exploration of factors impacting the nature of a service development or a therapy experience (Reid, Flowers & Larkin, 2005; Seamark et al., 2004).

This approach was deemed to contribute to the current qualitative study of the thesis (Chapter four), which seeks to inductively understand the many factors and perspectives that impact on the nature and experience of MI rehabilitation and its implementation in practice (Gordon, 2019). Although there are no strict rules in research as to which one is best, an inductive approach and interpretivism paradigm is generally associated with qualitative data collection, while the deductive approach relates more to quantitative methods with a positivist paradigm (Fereday & Muir-Cochrane, 2006).

In contrast, critical theory or postmodernism is where the researcher believes that social reality is a historical form, produced and reproduced by individuals alone (Kilgore, 2001; Kellner, 1993; Cheek, 1999), and applies their thoughts on concepts by self-consciousness and a mixture of different artistic styles and media. This approach tends to have a general distrust of theories (Grbich, 2004). Further, the researcher appreciates altered subjectivity, in a society in which both personal insights and knowledge in any given settings, is impacted by many factors such as media, culture, personal qualities and characters, are all influential (Howell 2016; Kemmis, 2006). However, the critical theory approach is questionable as it may be difficult to apply where the researcher is isolated from a particular culture, gender or race (Wilder., 2014).

3.3 Mixed method approach

The pragmatic approach adopted in this research incorporated mixed methods of data collection, in order to compensate for weaknesses in either approach. According to Creswell and Zhang (2009), using a mixed-method technique within the philosophical pragmatic approach provides a robust methodological design for conducting research that is about collecting, evaluating, and analysing the acquired data around the investigated subject (Moran-Ellis, 2007). This type of methodology contributes to data triangulation to enhance trustworthiness of the research (Carter, 2014).

A mixed-method exploratory sequential approach and synthesis using the 'following a thread' method was adopted in this research. See Figure 1.1, in Chapter One for a mixed-method design approach.

The aim of this design was to combine, guide and synthesise knowledge from two different research methods to help improve understanding of the topic (Tashakkori, Teddlie, & Teddlie, 1998). One advantage of this approach is that combing two approaches together in the same study can help overcome each paradigm's limitations to produce more robust data and synthesise data to guide following stages if the research and future implementations (Palinkas, 2015).

By contrast, multiple method designs can either include one paradigm (either qualitative or quantitative) or both (qualitative and quantitative) (Morse, 2015), and typically include studies with different purposes in answering the research question. In addition, the multi-method approach might adopt two theoretical frameworks that underpin the research data collection and the data analysis process.

When selecting an appropriate approach, consideration should be given to the research purpose and the methods required. It is crucial to have a clear vision of which method should be applied for the observed subject at an early stage in the research (Gale et al., 2013). The approaches needs to underpin scientific methods when aiming to examine reality, and gathering of data through reflection on observations, this can help build on the existing data to reform a concept, that enables future research testing (Fereday & Muir-Cochrane, 2006) Exploring MI use in clinical practice is not assumed to result in one single explanation (reality), as this would be considered to potentially narrow consideration of the researcher. In this study, the researcher was required to adopt a broader position on all potential views of the reality to help in conceptualising a wider and fully comprehensive picture of the experience and the surroundings. This notion would have been impossible if just one method had been employed in the investigation of this research.

The current research investigates an intervention that can be applied by therapists and undertaken by stroke survivors and can include personal, social, and cultural contexts. Therefore, pragmatism was deemed an appropriate paradigm to address the research questions. Moreover, this paradigm allowed the use of many different methods to data collection (Moran-Ellis, 2007).

The qualitative study was interested in exploring MI use in stroke rehabilitation in clinical practice, with a specific interest in how therapists use MI and train stroke survivors to use it, as well as how MI is perceived by stroke survivors and to what extent they are encouraged to use it. Although MI has been used worldwide, it is yet not known how therapists use it, or indeed, if they use it at all in the Saudi context. It will be interesting to understand the reasons for their lack of knowledge in applying it and what knowledge and skills might help them in the future to use it more confidently and effectively. Furthermore, it is important to have an overall understanding of the contextual factors that might have hindered their awareness and how this has impacted on stroke survivors receiving different interventions including MI.

It is apparent from the systematic review that although MI use is acknowledged worldwide, there are no guidelines or developed recommendations to support therapist training for MI use in practice with stroke survivors. Therefore, it was essential that these issues were explored and used to guide the structure of this thesis and to help inform the design and chosen methodology.

In this study, it was acknowledged that MI is an effective therapy used in stroke rehabilitation to help improve recovery, however, how it is used, how therapists are trained to deliver it, and how stroke survivors are trained by therapists to use it, remains unclear. The following sections provide a critical evaluation for the research methods chosen for both the qualitative and the quantitative approach, in light of other available methods, discussing their advantages and limitations in research.

3.4 Paradigms and methodologies selection

Research methods applied to help understand training stroke survivors in the use of MI in clinical practice can be take in various forms such as research reasoning and constructing proposed assumptions from the basis and grounds of resembled patterns in the findings using either an inductive method (generating a hypothesis) or deductively (testing a hypothesis) (Gale et al., 2013). An indicative reasoning approach aims to explore new phenomena whereas the deductive approach emphasises rather the causes and effects of an examination or an observation.

Due to the nature of this study, a qualitative approach was deemed most appropriate to explore the views of therapists and stroke survivors on MI use in rehabilitation and identify factors that facilitate its effective use. Qualitative research identifies issues by analysing thoughts, opinions and ideas that can help to explain the phenomena under inspection (Boyatzis, 1998; Thomas, 2003). Unlike the quantitative approach, that only deals with numerical data to its nature of analysing, qualitative methods enhance an open environment between the researcher and participant, making data collection more flexible and provide more visible insight into the problem under investigation and inductively enhances the developing of assumptions (Phellas, Bloch & Seale, 2011).

Given the purpose of the research and chosen data collection methods, an inductive approach was adopted. This enabled the researcher to draw flexible conclusions based on the data collection process and allowed interpretation of the participants' experience of MI within their social context (Hyde, 2000; Bryman, 2006; Rocco et al., 2003).

3.4.1 Qualitative methodology

The main reason for conducting a qualitative study (Chapter four) was to provide empirical evidence to gain further knowledge about the phenomenon being studied. Regarding MI use in stroke rehabilitation and its application in clinical practice, there is a paucity of qualitative research. Semi-structured interviews conducted with 11 stroke participants investigated two types of MI training and its application model to improve balance in a physiotherapy session for rehabilitation. This study by Schuster et al. (2012), was a qualitative study embedded in a RCT, and the participants were randomised either in the MI embedded in PT sessions group or MI added to PT sessions group. The study explored stroke survivors’ experience of MI use, as well as observing how they describe their MI training. The findings suggested that patients had some experience in MI, however evaluating their ability to imagine, prior to engaging in MI training and during the sessions was found to be essential in ensuring progress in training. Schuster et al. (2012) managed to capture an overall understanding of MI use in stroke survivors and established the 5-W Questions Model (Where, When, What, Why, and How), which proved to be effective despite the study’s small sample size. Their understanding of how stroke survivors used MI in sessions was brief and concise. Through interviews they presented information around how stroke survivors use MI not specifically from the perspective of supporting their recovery of motor function, rather, in certain cases, it appeared that MI encouraged the enhancement of practicing movements that were not possible at the time or that MI gave them confidence in making difficult movements. Although the study proposed a practical framework, it lacked several essential elements, for example how to train stroke survivors in MI use and how to evaluate their capacity for MI engagement.

Implementing MI in clinical practice therefore requires further investigation to help identify strategies for its effective delivery. In addition, a comprehensive understanding of how to implement interventions in practice needs to be fully explored alongside the need to identify factors enabling MI delivery in stroke rehabilitation.

Qualitative studies are used extensively in the field of nursing practice and health care services to help analyse services and critically contribute knowledge to deliver or develop interventions and services (Deniz & Lincoln, 2005). In qualitative research, there is a connection between the researcher's background, insights and experience and the phenomena under investigation. The findings obtained from the study reflect its blended context for the data collection, in this case MI training in stroke rehabilitation by therapists (Guba & Lincoln, 1994). During data collection, participant's views, beliefs, and attitudes are expressed in their own words through a textual format to help devolve ideas and concepts explaining the phenomena under investigation. In interpreting the data, it is important to reflect on personal beliefs and social context, to help in understanding the participants' behaviours in this context.

3.4.2 Data collection methods in qualitative designs

In this study, qualitative focus group discussions and face-to-face individual interviews were used. Qualitative data collection includes a variety of methods such as document analysis process, observational methods, surveys and questionnaires, as well as focus group discussions, and in-depth interviews. Observational methods aim to access certain information by studying participants for a period of time in a certain place under specific circumstances. Observation methods can be conducted with participants, and could be employed in several ways, such as asking questions in the field under examination, monitoring social media or even just reading through written materials. One advantage of this method is that data is collected at the time and behaviours are observed directly without asking the participants about anything or asking others to report back about someone's behaviour. In this situation the phenomena are observed in its own natural context. However, this method has limitations such as small sample sizes, making it difficult to quantify the obtained data as there is no control over external factors that may impact data collection and consequently interpretation of findings (Crabtree & Miller, 1999). Focus groups and in-depth interviews are discussed below in more detail as the main methods employed in the qualitative study for this research.

3.4.2.1 Focus groups (Therapists)

The purpose of conducting focus groups was to gather as many professionals/therapists with the same background as possible in one place to discuss their experiences (Wong, 2008). In this study this involved exploring the use of MI in stroke rehabilitation. A further objective was to produce resources and data as a basis for structuring a survey with MI experts at a later stage of the study, as highlighted by McNamara (1999). Participants' experiences relating to encouraging MI use were explored in detail from two perspectives: that of therapists who encouraged the approach and of stroke survivors who had experience of using MI or planned to use it in the future.

One of the advantages of a focus group is that the moderator can help group members participate in a discussion of the issues around the topic. Participants are given the freedom to agree and disagree with each other, to reflect their insights and perceptions more accurately, specifically MI techniques (Webb & Kevern, 2001). Although an appropriate method for this type of research, it may be somewhat limited by participants holding back their true and sincere views due to shyness and/or the fear of going against others' opinions in the group (Creswell, 2014;

Guest et al., 2006). Group dynamics such as participants that differ or are alike in age, gender, and rank or professional position, can help in facilitating interaction with people sharing the same and or hold relative experience on the topic that enables them to discuss issues and share emerging points of view. This sort of dynamic can help in assuring relevant and in-depth data collection for the topic under research and motivates individuals to speak and interacts with each other (Webb & Kevern, 2001). Groups are also valuable in research where professionals experience time constraints which don't favour the researcher.

3.4.2.2 Individual interviews (stroke survivors)

To explore stroke survivors' perspectives, semi-structured face-to-face individual interviews were conducted. This method was considered appropriate to facilitate in-depth investigation of the insights of stroke survivors concerning MI. Their knowledge, experience, and opinions of being encouraged by a therapist to use MI were all of interest (Kvale, 1996).

Semi-structured interviews allow greater flexibility, enabling the researcher to explore the area of interest in more depth and uncover richer data, permitting a greater understanding of the phenomenon (Smith, 2011). In addition, interviews enable the researcher to focus on the participant's emotions, and behaviour, which help gain greater insight into the topic (Baker et al., 2012). However, semi-structured interviews also have limitations, for example, the interview situation may not be fully controlled by the researcher and facilitating and analysing the dataset may take more time than anticipated (Williams & Vogt, 2011).

Other factors can limit the number of interviews conducted, such as the end date of the Institute Review Board (IRB) ethical permit; all included approvals are valid for up to one year from the received date. There are also some challenges related to finding participants and maintaining contact with them (Adler & Adler, 1987). Finally, there is the risk that the interview process may be limited by the amount of time allocated to the project (Phellas et al., 2011). However, interviewing relies heavily on the researcher's ability to influence the interview direction, their interview skills and experience. The purpose of these interviews was to seek opinions and impressions concerning MI, as well as to understand the deeper meaning of the stroke survivors' statements about MI therefore this method was considered the best option for this sample type (Kvale, 1996).

3.4.2.3 Qualitative phenomenological approach to data analysis

MI use was considered a less known phenomenon that needed further exploring to help provide further details and description, to identify future directions to its implementations in practice (Marshall & Rossman, 2006). One data collection and analysis approach employed in qualitative research is the phenomenological approach, which was seen the best method for this research, and chosen after an extensive exploration of several approaches.

Other commonly used approaches to qualitative inquiry include grounded theory, case studies, discourse conversational analysis, and narrative analysis (Finlay, 2011; Moran-Elis, 2007).

Phenomenology focuses on how individuals make sense of the world without any pre-conceptions of that world (Deniz & Lincoln, 2005). The researcher provides an interpretation of others interpreting their own experience therefore, the researcher is not in fact obtaining any interpretation, but rather is accepting what the participant says. The phenomenology approach is defined as the lived experience of a conception or a notion, that could be described in a shared meaning by several people (Creswell & Clark, 2007; Creswell, 2014). The purpose of this approach is to establish a common principle describing its nature and with minimum personal involvement in the experience itself (Van Manen, 2007), and most importantly, what and how it was experienced is what really matters (Moustakas, 1994).

Finlay (2011) argued that in the field of rehabilitation, a patient's health has optimised its needs in understanding the lived experience of being unwell or undergoing treatments for specific disorders, and only through the phenomenological approach is it possible to understand patient's making sense of their own experience.

Phenomenology is a way of thinking that allows for a comprehensive understanding across a small group of people broadly engaged in the exploration of the nature of their relationships (Gearing, 2004). This is an authentic process that reflects the phenomenon in context from which it has emerged (Giorgi & Giorgi, 2008). It seeks to uncover hidden information through a process of enquiry into opinions and insights conducted inductively through methods such as interviews, discussions and observations (Groenewald & Bhana, 2016). While phenomenology describes what is projected in relation to the phenomena, the researcher in this approach, from an epistemological perspective, situates them self around a paradigm of subjectivity and personal knowledge together with their own views and interpretations. This can conflict with the real-world knowledge, which is instead supported by an objective approach (Finlay, 2011).

Grounded theory, however, aims to collect and analyse data by employing a coding system to help identify patterns and arrange the data in a comparative category log that can explain the studied phenomena or topic (Goulding, 2005). A theory is constructed afterwards that fits the meaning within the codes obtained. Although grounded theory is flexible in application, it is structured in the data (Glaser & Strauss, 1967). In a grounded theory approach, the researcher needs to be highly skilled in the method, and data production is often enormous, which makes it difficult to administrate. Other approaches include the use of a case study approach, that involves detailed and intensive qualitative analysis of a single case (Bryman, 2006). However, researchers can relate to the value of the case study in explaining, exploring or describing phenomena (Connolly, 2005). A case study is mainly used to help gain further understanding around a complex issue such as medical conditions and social issues (Eckstein, 2000). Although case studies are relatively cost-effective and less time-consuming, they are subject to bias in data collection and results interpretation more than other approaches. In addition, generalisability of findings to the whole population is limited.

Discourse analysis explores interpretive language and communication, and the social contexts implicit within it to process meaning (Patterson, 1997). It can help to uncover deeply held attitudes and perceptions that are highly important for an organisation's image and communication practices, but it does take a large amount of time and effort. Further, while it focuses on how language is used in the context of real life, it rarely tells the whole story, and therefore needs other supportive methods such as observation or focus group discussion (Gillen & Petersen, 2005). The study of MI use, in this case, was not concerned with investigating its meaning nor how participants defined or understood it, thus discourse analysis was not considered appropriate for this research.

3.4.3 Quantitative methodology

The quantitative approach, a Delphi survey included in this research (Chapter Five) follows on from the findings of the qualitative study, which informed the development and structure of the Delphi survey statements. The choice of quantitative method was a strategic choice, based on a consensus technique that involved a panel of experts ranking and validating items considered essential to MI training and its implementation in stroke rehabilitation.

This study tried to measure the extent and rationale for aspects of MI use in clinical practice based on findings retrieved using qualitative methods.

This approach allows interpretation of the participants' experience of MI use within their social context (Hardman & Hosp, 2007).

This approach helps in providing more clarification for the given evidence retrieved from the findings related to the phenomena examined and are interpreted jointly with secondary data from the literature search. This allows a process of data collection which is driven from a quantitative estimation process through the qualitative data informatic approach, permitting further interpretation to the evidence that might be essential for implementing MI in clinical practice, which were subsequently verified by a panel of experts. Therefore, the quantitative research method is highly appropriate for this study.

3.4.3.1 Data collection methods in quantitative designs

The quantitative method employed in this study was a consensus development technique using a Delphi survey, which is not purely quantitative in its approach, rather combines both qualitative and quantitative methods, using a consensus technique to determine to what extent a panel of experts reach agreement on a given issue.

There are three commonly used types of consensus methods; 1) Delphi process, 2) conference developmental group, and 3) nominal group technique. The conference developmental group is a combination of experts and lay people gathered together in one location or in a specific event to consider a set of presented evidence by other experts, aiming to reach consensus. One advantage of this method is that the group of people making the decision are un-biased participants combined in one single party, from different professional backgrounds, sharing their opinions with other lay people. However, this method can be a challenge to conduct in many cases, as it requires resources that were beyond the scope of this PhD, such as organising interaction with participants, funding and managing the event and the location.

The nominal group technique is a face-to-face structured individual meeting with experts. Initial generated ideas from the individual meetings, are then structured into statements by the lead moderator, to be presented, discussed, and ranked with the group as a whole. Although this method is good for collecting data from individuals, and reaching consensus on the presented and discussed issues, which can help minimise group dynamics issues, it is, however, limited by time restriction to prepare for the individual meetings (Krueger, 2014).

A Delphi process was used as it was seen as the most appropriate and had advantages over the other methods. This technique can be conducted in several ways depending on the aim of the research (Goodman, 1986). For example, the Decision Delphi technique, which is based on making decisions on certain given issues rather than reaching consensus (Jenkins & Smith, 1994). The other type is Policy consensus, used for developing future policies on a given topic (Fink AJMR, 1984). The real-time Delphi process is where experts are seated in the same room and asked to reach relative consensus on a topic, in real time rather than via post (Keeney et al., 2011).

Some Delphi processes are conducted via email or online (online Delphi), where experts are asked to complete an online web survey; the other type is the technological Delphi, where experts complete a hand-held survey operated via a key-pad device allowing them to respond to the questions immediately. The desegregated Delphi process is about structuring preference decisions over a set of a global holistic judgments, where these decisions are already known but need to be reconstructed and re-ranked in a model-like survey (Matsatsinis, Grigoroudis & Samaras, 2005). The most common Delphi processes used in health research are the Classic Delphi technique and Modified Delphi. Both are similar in terms of having three to five rounds, are conducted by email or by post and are sent to a group of experts to give opinions on certain issues to reach consensus. However, in the modified type the first round is replaced by a focus group instead (see Chapter Five: Delphi survey study chapter) (Hasson, Keeney & McKenna, 2000).

The results obtained from the Delphi survey are based on a structure of consensus from the expert panel of experts' agreements (Synowiez & Synowiez, 1990; Starkweather, Gelwicks & Newcomer, 1975). Consequently, it can be said that the outcomes are established through the group construct, rather than through the process of answering a set of enquiries constructed after proposed methods and studies. In the Delphi process, participants carefully include each other's opinions, critiquing the information sensibly and objectively before making their decisions. The researcher follows up with their response, data analysis and overall study evaluation (Linstone & Turoff, 1975).

In this Delphi study, survey rounds were continued until consensus was reached for 70% of the included items (three-five) rounds. Any item upon which consensus was not initially reached, was added to the levelled round for further judgment (Keeney et al., 2011; Fink et al., 1984). It has been recognised that consensus might mostly occur between the first and fifth rounds, however, the best results will be apparent in the third round. Thereafter, any additional rounds between the Delphi group may not be needed (Green et al., 1999). More details on the rounds and data analysis of the Delphi study are described in Chapter Five.

3.5 Aims of the qualitative and quantitative studies

Aim of the qualitative study:

To explore to what extent therapists and clinicians currently use MI in stroke rehabilitation. Additionally, to identify factors that determine whether clinicians and practitioners use MI effectively in stroke rehabilitation.

Objectives:

- To explore to what extent therapists and clinicians currently, use MI in stroke rehabilitation.
- To explore to what extent stroke survivors experience MI use in stroke rehabilitation.
- To identify barriers to and enablers of MI use in stroke rehabilitation, and the necessary factors in enabling MI use, and equipment required to facilitate the use of MI within post-stroke rehabilitation in clinical practice.

Aim of the quantitative study

To establish best practice consensus and recommendations for MI training and implementation in clinical practice. Additionally, to identify the necessary factors in enabling MI use, and equipment required to facilitate the use of MI within post-stroke rehabilitation in clinical practice.

Objectives:

- To identify the necessary factors (skills and training required for the therapists) and required equipment (e.g.

video, audio, paper-based scripts) required to facilitate the use of MI within post-stroke rehabilitation from expert's opinion.

- To determine necessary attributes stroke survivors', possess to successfully engage in MI training.
- To establish best practice r consensus and recommendations for MI training and implementation in clinical practice.

3.6 Implementing interventions in clinical practice

Findings retrieved from recent literature regarding MI use suggest limited practical value in research, which may be due to the lack of a theoretical basis for the development of this intervention in stroke rehabilitation. However, establishing success in any intervention implementation can be guided through a range of applied behavioural theories and models. These behavioural theories can help in the process of guiding intervention implementation by determining the intervention components and identifying key factors that needs changing and improving, whilst linking them to the key constructs of the theory or model. This process can lead to successful implementation of interventions in healthcare by optimising their practical value (Palinkas et al., 2015; Hovmand & Gillespie, 2010).

Poorly described research interventions in research and heterogeneity in protocols for implementing MI in clinical practice by therapists have made it difficult to conclude which design is more effective for stroke (French et al., 2012; Grol, 2001), And the lack of access to practical guidelines for its application limit any advancements in use. Thus, it is assumed that there are some factors that can help determine MI use in clinical practice. Yet to date, these enablers are elusive, and could be related to strategies of translating research knowledge in terms of how to implement MI use effectively in clinical application. Such factors might persist in the individuals' lack of awareness in implementing interventions, skills, and experience. Further, other factors that might affect its use are the impact of motivational, environmental and personal behaviours (Glanz & Bishop, 2010; Michie et al., 2011).

The objective of the qualitative study was to identify factors, enablers, and barriers of MI use in stroke rehabilitation in clinical practice. Following identification of these factors, it can be determined how these are linked to theoretical and evidence-based behaviour change concepts (i.e. COM-B framework) (Jackson et al., 2014). This will inform the development of recommendations for guidelines in MI use based on evidence and theory and make suggestions for implementing MI in clinical practice. Thus, the following section will discuss the different types of behaviour change theories employed in health care that can inform implementation of interventions in clinical practice.

3.6.1 Behaviour change theories

Many different theoretical frameworks and models based on behaviour change theories have been proposed to support implementing interventions, for example, the COM-B framework (Jackson et al., 2014), that incorporates both the Behaviour Change Wheel framework (BCW) (Morris et al., 2019; Campbell et al., 2000) and the Theoretical Domains Framework (TDF) (Cane, O'Connor & Michie, 2012). Interventions may be improved by outlining factors of enablement through the theories of human behaviour. There are many theoretical behaviour models used in the health research field involving EBP (Jett et al., 2005; Green & Britten, 1998), to improve implementation, such as the Health Belief Model and the Theory of Planned Behaviour (Manstead & Parker, 1995),

However, these models are limited to behavioural understanding and helping to predict and explain health behaviour in relation to action to change it (Champion & Skinner, 2008; Manstead & Parker, 1995; Rosenstock, Strecher & Becker, 1988).

There are other theories in social sciences, such as the diffusion of innovation theory (Rogers, 2003), which proposed that over time people adopt new ideas/ behaviours as part of a social system and that idea can be diffused through specific people. Furthermore, the social cognitive theory (Bandura, 1991) considers in a unique way how an individual acquires and maintains behaviour while considering the social environment in which they perform the behaviour. Finally, the transtheoretical model focuses on an individual's decision making and intentional change. Changing behaviour goes through a cyclical process (Prochaska, Redding & Evers, 2008). Similar to the previous ones, these theories are somehow limited by a way of not taking into account the individual's beliefs and attitudes that can impact their health behaviour, nor do they consider the social and cultural context that can implicate personal performance behaviour. Further they assume that changes in the environment will lead to changes in a person, and while this can't be the case in most behaviours, they suggest individuals make logical plans as part of their decision-making process, when this is not always true.

Although most of these theories depend on human behaviour changes, for the implementation of EBP there is a major overlap in the significant number of theories. In social and behavioural sciences many theories have been developed that aim to explain behaviour change using theoretical constructs. Selecting the most suitable theory from the collection of theories, can be based on their critical value and complete application of constructs towards the implementation (Morris et al., 2019). Thus, researchers need to comprehend established theoretical explanations of behaviour change and note exclusively how relevant these are to the research in question (Glasgow & Linnan, 2008).

The COM-B framework was chosen for this research, as it proposes a systematic method to help enhance the development of complex interventions and their successful implementation in health care services (Jackson et al., 2014; Michie et al., 2011). The COM-B framework was seen as best fit for data interpretation and used in the data analysis phase to help validate the data. Further, this framework aims to change therapists' behaviour in delivering rehabilitation to patients by identifying factors within different levels surrounding the environment in a healthcare setting. Motivating patient's level of recovery through raising awareness and supporting their needs and goals is another aspect that COM-B helps to identify.

Based on evidence from literature, MI training in stroke rehabilitation clinical practice has not been used in Saudi Arabia, thus developing best practice guidelines for MI use may help its implementation in practice. Further, identifying factors relevant to its training to enable therapists to deliver it, attributes that need to be assessed in stroke survivors, specific to MI training, in addition to identifying social and environmental enablement. This thesis aims to bridge these gaps. The COM-B framework is discussed in more detail in the section below.

3.6.2 COM-B Model

The COM-B model helps researchers implement interventions into clinical practice through behavioural analysis of problems related to intervention designs, and identification of factors based on evidence that would impact the development of the intervention once changed and modified (Grol, 2001). This is done through focusing on components of the behaviour change model: 'Capability', 'Opportunity' and 'Motivation' related to COM-B framework (Jackson et al., 2014). Each component influences the other and creates a mutual link to each other. This helps provide a comprehensive relationship between the three components and behaviour that constructs the core system needed while planning interventions, in addition to using a wide range of intervention strategies or key functions to help change behaviour and enhance intervention delivery in optimising effective implementation. This model incorporates the use of the BCW framework that supports the change implementing behaviour within interventions and helps identify strategies that might improve the effectiveness of interventions (Michie et al, 2011). Additionally, the model is guided through the Theoretical Domain Framework (TDF) to help investigate implementation behaviour problems. To further guide the theory of behavioural change in enhancing professional behaviour and effective implementation of interventions in clinical practice, specifically in MI use, the COM-B model and incorporated frameworks can be used to assess implementation through changing behaviour that would theoretically help inform interventions in clinical practice (Cane, O'Connor & Michie, 2012) (see Figure 3.1).

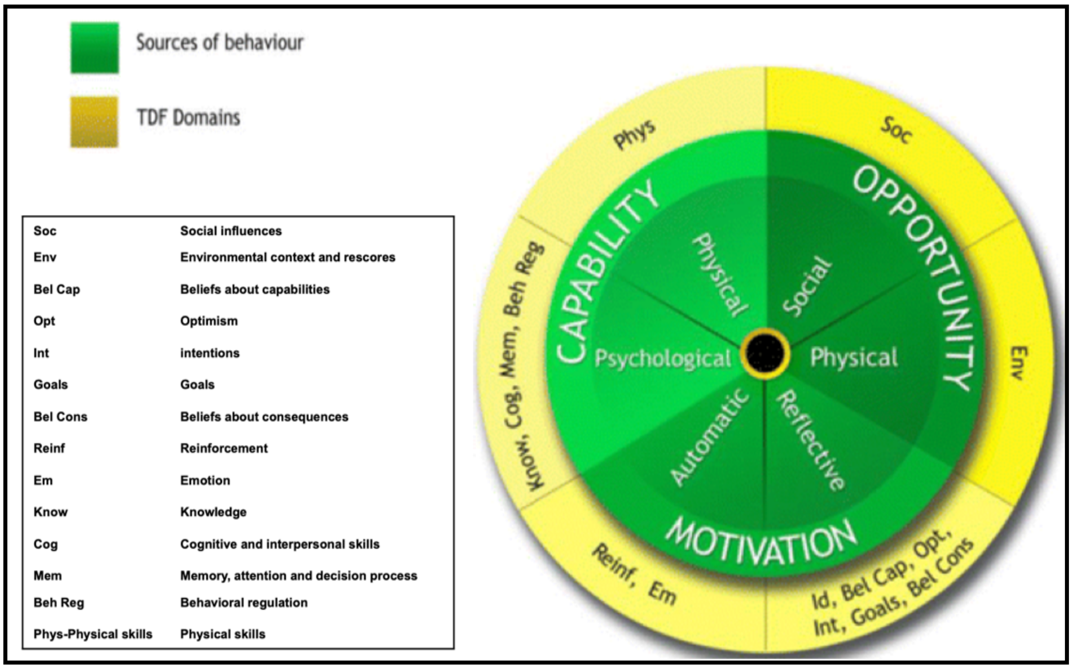

Figure 3.1 The COM-B concept includes the Behaviour Change Wheel & Theoretical Domains Framework (Jackson et al., 2014).

The TDF includes 14 domains: knowledge, skills, social influence, memory, attention and decision process, behavioural regulation, professional/social role or identity, beliefs of capability, beliefs about consequences, optimism, intentions, goal, emotion, environmental context and resources, reinforcement (French, 2012). This framework offers a comprehensive coverage of factors influencing behaviour, making links between the theory and techniques in changing behaviour, that can help solve implementation issues within any intervention. This framework can be used with qualitative data or surveys. Finally, the intervention function can be employed to help understand what intervention implementation is needed for successful delivery. The components of the behaviour change model COM-B alongside the TDF fit well together within the BCW framework to help in the effective design and implementation of interventions by identifying techniques that are likely important in helping change behaviour, and successfully impact intervention implementation (Michie, Stralen & West, 2011).

Although MI has been used in sports psychology, and, despite the number of RCT interventions conducted in stroke rehabilitation, there has never been an in-depth exploration of MI use before conducting the trials. In this case, implementing MI use in the Saudi Arabian context could be seen as a complex intervention, even though the training in itself may still be seen as feasible. Thus, the process of understanding, analysing and identifying target behaviour through the process of triangulating data and mapping down the obtained themes from the qualitative study to the COM-B framework, to help provide a robust data analysis method and underpin intervention components to a behaviour change theory, can help deliver MI successfully in stroke rehabilitation.

3.6.3 COM-B and phenomenology approach

While the aim of the qualitative study was to explore therapists' MI use in stroke rehabilitation and what factors could enable its use, as a result identifying the factors that could lead to behaviour changes may help implement MI more successfully in clinical practice. The incorporation of individual, social and environmental circumstances impact on delivering an intervention when looking at the meanings and interpretation of that specific phenomenon, as well as the social process in which it occurs, in relation to its current behavioural factors. Additionally, phenomenology fits into a situation where the individuals' attitudes and behaviours tend to vary from one another that can consequently relate to their emotional or physical experience (Cassidy et al., 2011).

Furthermore, phenomenology analysis produces interpretation for the data, that can help expand knowledge on how MI is used in stroke. Identifying what factors help influence its implementation and any facilitators that can help structure guidelines for its future use, can be produced from mapping the findings within available behavioural frameworks later on. The process of mapping the themes onto the BCW and TDF frameworks can help bring together the data in a more robust way and enhances meaningful rationality in the data synthesis process (Palinkas et al., 2015; Hovmand & Gillespie, 2010). Hence, identifying factors of implementation or developing guidelines and informing recommendations for MI use in practice should be based on evidence and theory linked to the reflected knowledge gained around the explored phenomena to optimise its successful implementation in practice.

Developing recommendations for MI use in practice needs to be based on evidence and theory linked to the reflected knowledge gained around the explored phenomena to optimise its successful implementation in practice.

3.7 Trustworthiness and rigour in the data

Qualitative research studies have to demonstrate that the findings obtained through the approach are valid and reliable

(Lincoln & Guba, 1986; Shaw, Connelly & Zecevic, 2010). As a result, it was important for the researcher to assess the qualitative elements in the study by ensuring the study design met all the criteria for trustworthiness, namely: credibility, transferability, dependability and confirmability.

Credibility (internal validity)

Studies are judged to be credible if they measure what they set out to measure, and this is therefore a question of internal validity (Boyatzis, 1998; Thomas, 2003). Triangulation minimises researcher bias, and the likelihood that the study will prove ungeneralisable. It can provide credibility and was therefore used at various levels and throughout every stage of data gathering (Silverman, 1998 Guba & Lincoln, 1994).

Triangulation can be implemented in a number of ways, for example by using a range of sources, varying data collection methods, including multiple researchers and relying on more than a single theory (Denzin, 1978). This study used triangulation during data analysis, by involving members and an anonymous researcher in checking the codes. In addition, the COM-B model was used to interpret data and then map it to the BCW components and TDF domains, to explain both behaviour changes and successful implementation. Additionally, several methods of data collection were used, including focus groups and therapists, as well as interviews with stroke survivors.

Transferability (external validity)

Transferability denotes the degree to which a study's findings can be applied to other environments (Connelly, 2016). This study's transferability process was based on describing and assessing the experiences of the participants' deliberate interactions which was not easy, given the fact many therapists are unaware that MI can be used in clinical practice. In addition, the participants varied in their patterns of experience, and it was challenging to describe and explain the use of MI (Starks & Trinidad, 2007). To make this method more reliable in its application, other factors had to be considered. The research activities need to be planned in advance, and the outline of the study should be recorded in detail, to improve applicability. In addition, other researchers and the participants can be asked for their views, and be integrated into the researcher's plans, and determine the optimum timeframe for the data collection and analysis stages of the study.

Reflexivity

A reflective diary was used to provide credibility and reliability during the data gathering stage, to record impulsive feelings and transparent thoughts, and to contribute during the analysis stage. Kvale (1996) states that reflection has a positive effect on study design and findings and enhances reliability and coherence. Bryman (2006) favours using a diary during interviews, since it enables the researcher to note down responses which could be overlooked by audio recordings. The dataset stage and data interpretation process both benefit from the diary. In addition, a record of reflections and half-formed ideas prior to, during and after the interview, can mirror the interview setting and the thought processes of interviewees

(Smith, 2011). Polit and Beck (2008) concur that study credibility is enhanced by using a reflective journal.

Dependability and conformability (reliability)

Lincoln and Guba (1982) define conformability as minimising the risk of bias, whether this comes from the researcher's beliefs, or inbuilt suppositions, and highlighting any weak areas in the study design which could affect its outcomes. This study applied conformability by combining themes in the data analysis process, and connecting them back to the literature, to demonstrate that the findings emerged from the research (Tuckett, 2005).

A wide-ranging explanation was supplied for the results obtained from the exploration of MI use, which was a key factor in building a credible argument (Starks & Trinidad, 2007).In addition, the literature was integrated into the findings, which supported the creation (Aronson, 1994), and explanation of the story, and ensured this qualitative study was rigorous in its methods (Kvale, 1996). Parker and Roffey (1997) stated that reliability depends on setting out the meaning of each theme and noting any suppositions or inferences which could affect the themes. Connelly (2016) pointed out that trustworthiness is dependent on evaluating the research findings and providing a detailed description of a study's methodology.

3.8 Ethical considerations for the research studies

Ethical principles are the backbone of every research study and include, ensuring anonymity and confidentiality, gaining participants' informed consent, avoiding risks and harm and safeguarding the autonomy of those who take part. In certain settings, meeting these standards can be difficult, and the findings are also covered by the Data Protection Act (2018). The following sections will look at ethical considerations relating to each study in greater detail.

Participants' anonymity was guaranteed in this study by treating all data as confidential throughout the research and publication process (Beaucamp et al., 1982). Since the interviews and focus groups were recorded for later analysis, the participants' anonymity was a priority when it came to data storage. In addition, every panel expert was provided with a personal code which was connected to the results they obtained from the Delphi round questionnaire. All data was stored on a password-protected PC which only the researcher could access.

Each participant was provided with a Participant Information Sheet (PIS) which set out the aims of the study in two languages. All participants were informed that they could withdraw at any time without having to provide a reason, since the right to self-determination and autonomy is a key ethical standard (Streubert & Carpenter, 1995).

The PIS also provided contact details, so participants could ask questions. In regard to the Delphi study, potential participants were also given the PIS, which specified what was involved, how the Delphi study worked and what they would be asked to do. In addition, the PIS specified the kind of information which each expert would be asked to supply. A two-week deadline was set, allowing the experts' time to decide whether or not to take part, and to ask further questions.

The researcher's role is two-fold: to make sure the study is conducted in a way which safeguards the participants, and to ensure that their answers and thus the study's outcomes are not influenced by external forces. No participant was permitted to join a focus group or be interviewed until they had signed the PIS, confirming they were giving informed consent. This step is essential for confidentiality and applies to data collection, as well as the findings and how they are used in the future. Experts participating in the Delphi study also had to sign and return a consent form before taking part, to ensure that their participation was confidential.

The researcher strove to inform every participant clearly and comprehensively about the aims of the research and what they would be asked to do if they agreed to take part (Judd et al., 1991). It is, for example, possible that stroke survivors who are being interviewed could find the personal probing questions, necessary to give the researcher a multi-dimensional and full picture of their experiences, quite distressing. Harmful emotional damage is something researchers must not inflict, and therefore they need to consider this possibility, and either know how to defuse the situation and comfort the patient or recognise that the interview must end.

The Data Protection Act (2018) was passed to ensure individuals' privacy would be protected. All the data gathered in the study will only be accessible to the researchers, study staff and the relevant regulatory authorities. Password-protection ensures data stored on computers, which includes the study database, cannot be accessed by unauthorised individuals. The data collected for the study is stored on a secure webserver, and access is restricted by setting up user identifiers and creating passwords (the latter are encrypted through a one-way encryption system). All electronic data was also backed up daily, to local as well as remote media, using an encrypted format.

Overview

This chapter has offered an extensive explanation for the philosophical approaches and methodologies employed in this thesis. In addition, it presented the data analysis approaches used to describe and analyse the qualitative data (Chapter Four) exploring therapists' insight on MI use and identifying factors enabling MI use in clinical practice and the quantitative study (Chapter Five) establishing consensus on best practice recommendations for MI training and implementation in clinical practice.

Chapter Four:

A Qualitative Study;

The Use of Mental Imagery in Stroke Rehabilitation in Saudi Arabia

4.1 Introduction

This chapter describes a qualitative study as part of a mixed method design, involving focus group discussions with therapists and individual semi-structured interviews with stroke survivors. The study aims to explore therapists' current use of MI in stroke rehabilitation and training in Saudi Arabia.

The chapter provides a detailed overview of how the focus group discussions and interviews were conducted including sampling criteria for participants, the location and time the study took place. Thereafter, it describes how the resultant findings were analysed in detail using an inductive qualitative phenomenology analysis method. Three themes emerged from the focus group dataset: therapists' awareness and knowledge; social and environment factors, and motivation and support factors. Further, three themes were identified from the stroke interview dataset: patients' awareness and knowledge of MI, social influence or social norms, and professional's role in training stroke survivors to use MI. Finally, the findings were discussed in relation to other similar findings from the literature in terms of MI intervention use, how it can be delivered effectively in clinical practice and what factors enable future successful use in stroke rehabilitation programmes.

4.2 Procedure

Reporting the interviews and focus groups procedure followed the Consolidated Criteria for reporting Qualitative Studies (COREQ) guidelines checklist that includes 32 items (see Appendix 4.1).

4.2.1 Ethical approvals

Ethical approval for the study was obtained from The Nottingham Research Ethics Committee (IRB reference number 44-1704, see Appendix 4.2 copy of the IRB Nottingham Research Ethics Committee letter). Furthermore, local ethical approval was obtained from the following centres in Saudi Arabia: the Dammam Research Ethics Committee (IRB-PGS-2017-11-096, see Appendix 4.3 copy of IRB-Dammam University Research Ethics Committee letter), Prince Sultan Rehabilitation Complex (Efa'a Society) Research Ethics Committee (IRB reference number 442, see Appendix 4.4 copy of The IRB Prince Sultan Rehabilitation Complex Research Ethics Committee letter) and King Fahd Specialist Hospital Research Ethics Committee (IRB–EXT0338, see Appendix 4.5 copy of the IRB King Fahd Specialist Hospital Research Ethics Committee letter.

4.2.2 Eligibility criteria and consent for therapists

Potential participants were identified by department heads from three centres (King Fahd Educational Hospital of Dammam University, Prince Sultan Rehabilitation Complex and the King Fahd Specialist Hospital) in the Eastern Province of the KSA. All three centres provide rehabilitation programmes for stroke survivors. Interested participants were provided with a PIS (see Appendix 4.6), then invited to the study by the researcher and screened for eligibility before agreeing a time for the meeting. Therapists were considered eligible for inclusion if they were physiotherapists or occupational therapists working at one of the participating hospitals and were qualified to degree level in rehabilitation exercise science or had a professional background physiotherapy or occupational therapy. The professionals were required to have at least two years' experience of working with stroke survivors to ensure that they had developed transferable skills and a wider understanding in managing stroke rehabilitation programmes. The information sheet included information about MI use, and purpose of the study, which was to explore participants' experience of using MI with stroke survivors undergoing rehabilitation. Potential participants were assured that confidentiality would be maintained and were asked to sign a consent form prior to joining the focus group; discussion took place once written informed consent had been received (see Appendix 4.7).

4.2.3 Eligibility criteria and consent for stroke survivors

The same procedure was followed to recruit participants for the one-to-one semi-structured interviews, including being invited by the department heads in the relevant hospitals, and being recruited from the same centres as the therapists. Participants underwent screening for eligibility before being invited to participate. Individuals were eligible if they were at least 18 years of age, were admitted because of having a stroke, and had been diagnosed by a physician, as confirmed in the patient's records. In addition, participants had received physical or occupational therapy interventions or were currently in a rehabilitation programme. Stroke survivors were excluded if they were unable to communicate or it was not feasible to establish that they understood the study or if their condition was unstable.

Potential participants who expressed interest in the study, were provided with an information sheet on MI use, and the purpose of the study, which was to explore participants' experience of using MI (see Appendix 4.8). Potential participants were assured that confidentiality would be maintained and were asked to sign a consent form prior to the interview (see Appendix 4.9).

4.2.4 Sampling

Convenience sampling was employed for the therapist focus group discussions and purposive sampling method used to identify stroke survivor individual interviewees. Judgments on sample size were influenced by the extent of data needed to help answer the research questions, taking into consideration the available resources and study approach (Crabtree & Miller, 1999).

In terms of the focus group sampling, previous research within the inductive approach acknowledged that five focus groups are needed to reach saturation (Coenen et al. 2012). Guest et al. (2017) concluded that with only two or three focus groups more than 80% of themes may be discovered from the data set during data analysis. In the current study, an inductive approach was adopted, as participant sampling was guided by the need to develop new understanding around encouraging MI use. Consequently, a sample of three to four focus groups with six to eight members in each group was considered adequate to produce the required themes for this qualitative study. Although arguably the therapists in this study are a homogenous group by nature of their interventions with stroke survivors. Consideration was given to the different experience and seniority levels of the therapists included in the study sample and the different backgrounds of the rehabilitation professionals, to help ensure representation from across a range of rehabilitative professions. The aim was to gain an understanding of each opinion from the perspective of different professions (Crabtree & Miller, 1999).

Regarding stroke survivors interview sampling while conducting this qualitative research, emphasis was placed on two sampling issues, namely, the use of purposive sampling and determining how many interviews should be carried out. A purposive convenience sample was considered appropriate as it has been used widely for locating and selecting relevant cases that may relate to a phenomenon under investigation and may provide rich data for an understanding of the experience (Palinkas et al., 2015).

Since this was an exploratory study, the number of interviews required to obtain a representative dataset was not known. One approach that a researcher can use to address this issue is to observe whether the evidence from the data is repeated, at which point it may be said that data saturation has been reached and a decision can be made to discontinue the interviews. Baker et al. (2012) state that when data saturation is reached, the researcher can decide whether to stop or to continue with the interviewing stage. Whether having more interviews may help to achieve the desired outcome is less important than the quality of the analysed data, given the time and care required for the analysis. Hence, this study aimed for a relatively small sample size of 12 participants, which enhanced the planning (Smith et al., 2009), structuring and conduct of the interviews, as well as the transcription of the stroke survivor interviews (Baker et al., 2012). Moreover, there is evidence to suggest that a qualitative study featuring interviews with a sample size of 12 participants may be sufficient to reach the point of data saturation in a homogenous sample, when thematic analysis is used (Latham et al., 2013).

4.2.5 Topic guides

Both the focus group and interview topic guides followed a semi-structured format with open-ended questions. These were developed from a review of the literature (Patton, 2002) and based on the findings of other studies involving interviews with stroke survivors receiving MI therapy (Braun et al., 2008; Schuster et al., 2012) and studies on MI use in athletes (Driediger et al., 2006; Sordoni et al., 2000). The topic guide ensured that issues warranting exploration were addressed and questions allowed for these issues to be discussed.

The topic guide developed for the focus group discussions in English only (see Appendix 4.10.), set out to explore and understand the therapists' experiences of encouraging stroke survivors to use MI during rehabilitation, and to elucidate barriers that might prevent them from adopting this MI approach in post-stroke rehabilitation or act as facilitators to its use in clinical practice. It introduced the topic directly, with no opening questions, unlike the stroke survivors' topic guide, which introduced details related to rehabilitation programmes and the nature of their design or delivery. Flexibility was allowed in the order of questions to facilitate a more natural flow in the conversation (Lincoln & Guba, 1986). Probing questions were used when needed to enrich the depth of data or to facilitate responses (Patton, 2002). It was expected that MI is a novel topic in Saudi Arabia, thus, questions targeted therapists who used MI as well as those who had not used it in stroke rehabilitation. It was further anticipated that interviewing therapists with no experience in MI use may help develop an understanding around why MI has not been implemented in clinical practice and identify reasons behind its poor delivery and implementation in stroke rehabilitation

The guide contained three sections exploring a) Therapist knowledge and experience of using MI with stroke survivors in rehabilitation, b) Likelihood of using MI, including enablers and barriers to MI content, and c) Stroke survivors satisfaction in terms of acceptability and usefulness of MI. See Appendix 4.10 for more details on the topic guide, for examples of questions were included in the discussion guide. The guide included other aspects of the therapists' use of imagery, such as whether they would encourage its' use in the future with stroke survivors, even if this could not be fully explored at present. The guide followed a sequential order exploring the therapists' experience of encouraging MI use. Following this order helped tackle any issues that might arise, such as what to do if participants had never heard of the concept, what their thoughts were about its future use, and what might prevent their use of this intervention.

The topic guide for the stroke survivor interviews was produced specifically for this study in the same way as that for the focus group, drawing on an in-depth review of qualitative literature (Patton, 2002). It was developed to explore MI use and identify factors that enable the successful use of MI as an intervention in clinical practice (see Appendix 4.11 topic guide English version; Appendix 4.12 topic guide Arabic version). It included open-ended questions that followed a specific order for exploring stroke survivors’ experience of MI, so that any participant who had never heard of MI could be introduced to the concept first before exploring their views about its potential for use with stroke survivors. Participants were asked their thoughts on using MI in stroke rehabilitation and their expectations about the outcomes following MI use. The topic guide ensured that all participants were asked the same questions, in the same order and with the same wording. Similar to the focus group, both flexibility and probing were used when needed to enrich the data or to facilitate responses (Patton, 2002).

See Appendices 4.10/4.11/4.12, topic guide in two languages for more detailed questions that included three sections aimed at exploring stroke patients’ views on whether they had been encouraged to use MI or could be encouraged to use it in the future. The interview questions targeted the following topics, a) Stroke survivor’s experience of being encouraged to use MI by a therapist in rehabilitation, b) The prospect of using MI, including enablers and barriers related to MI content, and c) Stroke survivor’s satisfaction in terms of acceptability of MI and whether they found it helpful.

4.2.6 Piloting topic guides

Prior to data collection in Saudi Arabia a pilot focus group was held in the UK on 16th June 2017 with two participants, a physiotherapist and an occupational therapist, both of whom had more than 2 years’ experience in stroke rehabilitation. Both read the information sheet and signed consent forms. Questions were established and developed to ensure they captured the required information and addressed the research questions. Amendments were made following the focus group discussion with the help of comments and feedback from the participants and the research team. Some questions were refined because they were identified as repetitive, leading, unclear or not relevant to the research questions (Majid et al., 2017). The use of a reflective diary also helped in altering, rewording or removing unclear questions.

Regarding the stroke survivor's interview topic guide, it was piloted once before the main study, on 12th July 2017 with a 52-year-old male stroke survivor who volunteered for the interview. The interviewee's stroke had occurred six months earlier, and he had made an excellent recovery. His rehabilitation programme was therefore less intense than that of other stroke survivors. Once he had read the information sheet, he signed a consent form. The interview was timed and recorded, and notes were taken throughout. During the interview, the researcher noted whether the questions asked followed a linear process and avoided causing distress for the participants. The questions were examined to ensure that they captured the information they were intended to explore and addressed the research question. Piloting helped to test the interview topic guide and to practise interviewing skills prior to launching the project. The participant provided comments and feedback on some questions that he perceived as repetitive or closed-ended, or unclear questions while some leading questions were refined.

Amendments were made to the topic guide following the pilot interview. Questions that were repetitive, leading, unclear or not relevant to the research questions were altered or removed. For example, the topic guide was focused on the rehabilitation programme that was given to the stroke survivor following their stroke and the queries were not relevant to MI use. Therefore, it was altered to include more relevant questions related to MI. Other questions were relevant to stroke survivors' dysfunctions and types of exercises provided to help improve or enhance their recovery, these were removed later to make the exploration of MI use more succinct (see Appendix 4.11/4.12 topic guide in two languages).

4.2.7 Data collection

The interviews and focus groups were conducted between August year 2017 and October 2017. Data were recorded using a digital audio recorder. Recordings were then transferred as an MP3 file to a secure password protected computer and stored on the University of Nottingham secure web server, to which access is permitted only to the researcher through a specific user identifier and password.

The therapist focus groups were all conducted in English, although the participants' first language was Arabic, English was a more common language in medical health centres and facilities in Saudi Arabia. Group discussion times ranged from 29 minutes and 47 seconds to 55 minutes and 56 seconds (mean time was 40 minutes and 9 seconds). The researcher acted as a moderator, by introducing the topic to the participants, probing for further discussion and assisting in guiding the flow of conversation. The topic guide helped to structure the conversation, clarify the gaps and define the objectives of the research.

All interviews with stroke survivors were conducted in Arabic, except for one interview that was in English, generally Arabic is the native language for patients, but in some cases, patients speak English and engage in conversations in both languages. Interview times ranged from 11 minutes and 17 seconds to 36 minutes and 29 seconds (mean time 19 minutes and 6 seconds). The researcher conducted the interviews in private rooms and helped to introduce the topic to the participants and probed during the subsequent stages of the interview to help guide the flow of the interview. Again, the use of a topic guide ensured consistency across all interviews while investigating research dimensions from different aspects. As with the focus groups, a reflective diary was kept at all times to ensure credibility and trustworthiness; this was used during the data collection stage to assist in capturing spontaneous feelings and readily perceived thoughts and then used later to help with reflection in the analysis stage (Nowell et al., 2017).

4.3 Data analysis

The audio-recordings notes were transcribed by NA from the recorded discussions within the focus groups as well as the written notes recorded in the diary that complemented the transcription (Berger, 2015; Krueger, 2014). Same was followed for the stroke survivor's interviews. Phenomenological interpretive analysis was conducted on the data obtained through the transcripts. This procedure of data analysis is explained in the following section.

4.3.1 Data analysis procedure of phenomenology approach

In this study, an exploratory, phenomenology approach analysis was considered the best approach to explore the insights and points of view of the therapists and the stroke survivors concerning the use of MI. A framework of data analysis established by Smith (2011) was followed. Following preparation of the data, by transcribing in verbatim, a practical colour coded analysis approach was initially used before the NVivo QSR software package (Version 11, NVivo QSR; Qualitative Science Research Software) was also employed. Categories were then applied for the common themes.

Miles and Huberman (1994), acknowledge the importance of presenting an adequate viewing process for the data set that allows ideas emerging in the same sense and thoroughly organised in the flow direction to answer the research question underling credible and trustworthy analysis process. Further on understanding the lived experience of an individual involved in any study research in much details as possible and with deep insight of the deep knowledge how this has impacted their reality is a crucial in research success (Smith, 2011). More, systematised phenomenological traditional method of analysis, needs to behold elements of the lived experience by including supported disputes from the data set, in a shape of long paragraph by telling the readers what the participants in the research have experienced and also how they experienced these phenomena in its original context that have been expressed by participants of the research. In this study the data analysis process started since initial data had been available, thus continues key questions and ideas remained to expand when needed. Thoughts were formulated and discussed during supervisory sessions. Moreover, a diary is invested to help apprehend notes of minutes, reactions and ideas during the interviews. Using a diary in a qualitative research can help support thoughts and unclear responses and infer data. The data analysis followed general phenomenology approach analysis, using a developed framework supported by (Giorgi & Giorgi, 2008; Giorgi, 2006). In this study both data from the audio recordings from the two samples the focus group discussions and the stroke interviews. The audio recordings from the focus group discussions and the same was done with the individual interviews from stroke survivors (see Appendix 4.13 and 4.14: codebook) are transcribed and prepared for analyses by the author (NA). Audios were transformed to written text and transcribed using the F-5 Transcription software. The software is a basic free program that helps in assisting and turning the conversation of human speech voice into a text transcript.

Table 4.1 Stage involved in transcribing and preparing transcripts from the audio recording from therapist's focus groups and stroke interviews.

Stage of analyzing the transcripts	
Transcription	All interviews were audio-recorded and transcribed verbatim.
Familiarisation	This stage involved reading the transcripts to familiarise myself with the data and take notes about key messages reported in the interviews.
Coding	The transcripts were coded using a codebook with pre-defined codes from the COM-B, theoretical domains framework. Additional codes were generated from themes that emerged from the interviews through an iterative process.
Developing a framework	Once the transcripts were coded, an independent researcher reviewed the findings to identify areas of congruence or discrepancy in the coding. After agreement with the researcher, the codes were categorised, and I developed the framework for analysis.
Applying a framework	I systematically applied the framework to all focus groups and interviews transcripts and identified quotes to report the key themes identified.

4.3.2 Mapping of themes and sub-themes to the COM-B

Transcripts from each focus group discussion and stroke interviews transcripts from each participant were themed inductively and phenomenologically analysed using a framework and a codebook was developed, containing all the codes and their definitions. Certain categories were then proposed to help organise the codes into similar units, themes and sub-themes.

The themes were then mapped to the components of the COM-B (Michie et al., 2011), which was used as a theoretical framework to help describe factors elucidated from the interviews affecting MI implementation as explained in Chapter Three. Triangulation theory is applied by involving the BCW and TDF theories known as (COM-B) the 'Capability', 'Opportunity' and 'Motivation' components (Jackson et al., 2014). In this study these theories helped interpret data and map them out into the domains and components to help explain efficacy of behaviour changes and success in implementation. While subthemes were drawn under the TDF (14 domains) including knowledge, skills, social influence, memory, attention and decision process, behavioural regulation, professional/social role or identity, beliefs of capability, beliefs about consequences, optimism, intentions, goal. See Chapter Three for more details on (COM-B) model and the TDF.

4.4 Results from therapists' focus group

4.4.1 Therapist characteristics

A total of 24 participants were recruited, however, one dropped out due to illness, thus data was analysed and presented from a total of 23 participants. Participants were physiotherapists and occupational therapists working in health services, in hospitals or rehabilitation settings (see Section 4.2.1), they represented therapists who deliver and design rehabilitation programmes for stroke survivors in Saudi Arabia. The current sample represents a mixed range of therapists, including 13 men and 10 women, with different levels of experience and specialisms. The therapists in this study had been in practice between four years and 20 plus years (mean of experience of was 9.9 years). The demographics are provided in Table 4.2.

Table 4.2 Demographics of participants involved in the focus groups

Demographics of participants in the focus group discussion.			
	Category	**Count**	**Percentage**
Gender	Male	14	58%
	Female	10	42%
Profession	PT	18	75%
	OT	6	25%
Specialism	Neurology	11	46%
	General	9	38%
	Orthopaedics*	2	8%
	Paediatrics*	2	8%
Years post-qualification experience	(2-4) Years	6	25%
	(5-9) Years	1	4%
	(10-14) Years	9	71%
	(15-19) Years	3	13%
	20 years and plus	5	21%
Years' experience of stroke rehabilitation	(1-4) Years	8	33%
	(5-9) Years	4	17%
	(10-14) Years	7	30%
	(15-19) Years	1	4%
	20 years and plus	4	17%
Total		**24**	**100%**

Note: * Have worked in the past with stroke survivors before specialising in their own field

4.4.2 Key themes from the therapist focus groups

Thematic analyses resulted in three key themes, each an overarching theme for two to three subthemes. The three themes emerged from the data analysis which, have been mapped to the COM-B. The first emerging theme related mainly to the therapists' views on their knowledge and awareness of MI use and training in stroke rehabilitation (Capability); the second theme involved social influence, including patients' education level beliefs and environmental factors, such as modifying settings to help provisional instruction of MI training (Opportunity); and finally, motivational factors were identified (Motivation), including the professional's role in encouraging MI use and family support, alongside the patient's belief in therapy and its effect, as well as setting personal goals to enhance a positive attitude and confidence in the patient. Figure 4.1 illustrates the relationship between the themes and subthemes. The results indicated that these aspects highlighted by the therapists must be considered when training on the use of MI and designing future interventions that include the use of MI in stroke rehabilitation. A detailed discussion is provided below for each theme. For the definition of the themes see Table 4.3. All themes have been supported by direct verbatim quotes from the participants. Furthermore, these three key themes summarise most of the topics discussed among the therapists, regarding the use of MI in clinical practice within stroke rehabilitation in Saudi Arabia.

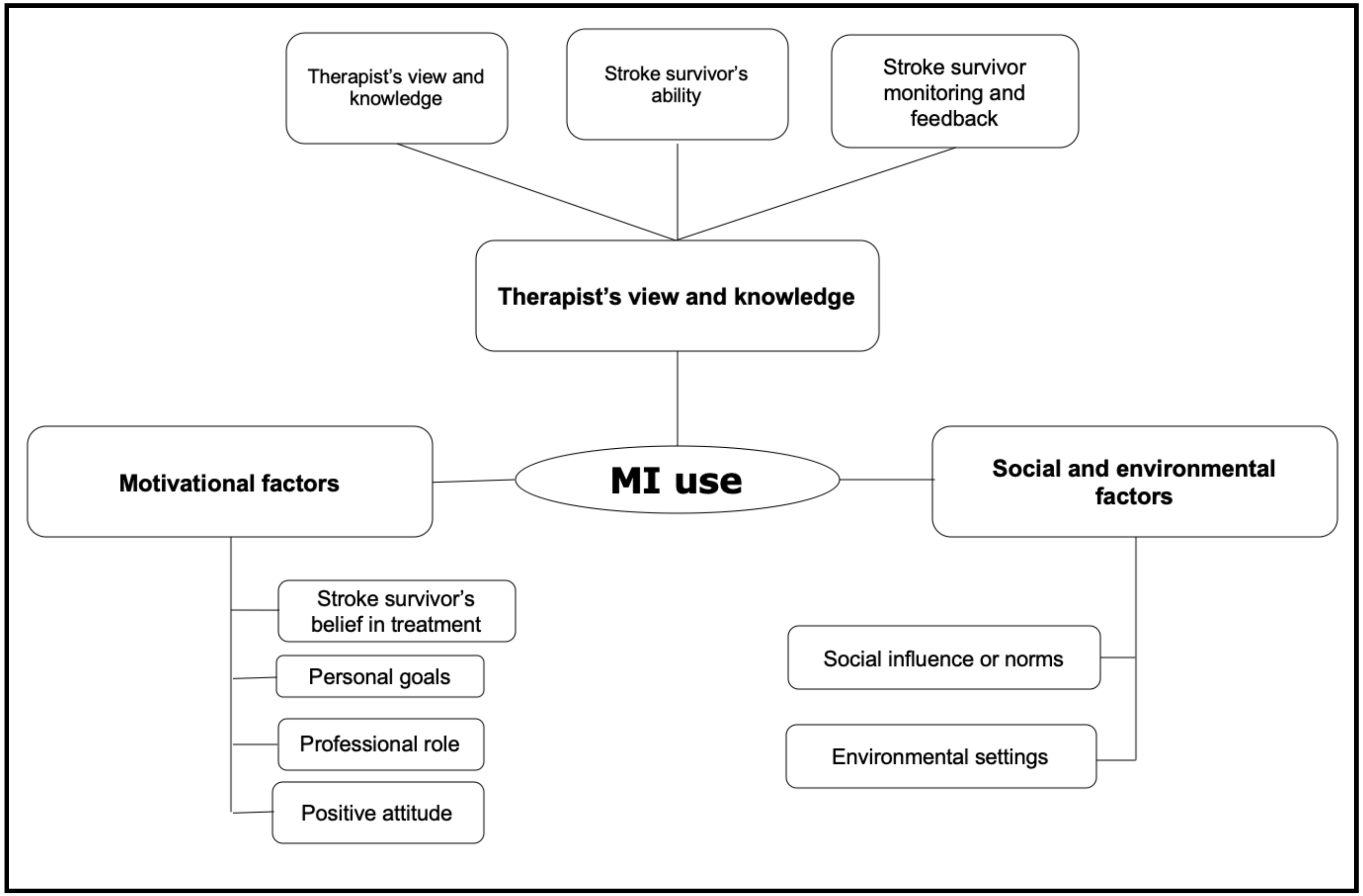

Figure 4.1 Key themes and subthemes from focus groups discussion.

Table 4.3 Definition of themes from focus group discussion.

Definition of themes	
Themes	**Definition**
Therapist’s view and knowledge (Capability)	This theme included the therapist’s view about their knowledge and awareness of MI use, as well as it being an important factor in enabling the use of MI in stroke. This theme fits within the COM-B framework concept of Capability for using MI and included how the therapist anticipated their level of knowledge and experience in delivering MI use with patients and the importance of having therapists skilled in MI use.
Social influence and environment factors (Opportunity)	This theme referred to the enabling or hindering factors within the stroke survivor’s situation (personal circumstances) or environmental factors that may impact on the engagement process. This theme fits within the COM-B model Opportunity.
Support and motivation factor (Motivation)	The support and motivation factor fitted with the COM-B concept of Motivation and is influenced mainly by the role of the therapist in encouraging the use and instructing of MI within guidelines. This is in addition to the stroke survivor’s belief in the treatment and its effects, the setting of personal goals for recovery and reinforcing the stroke survivor’s feelings. It refers to the emotional and reflective behaviour that can help set up a positive approach, which can indicate a beneficial environment for recovery.

The COM-B conceptual model inducted findings that helped address factors regarding behaviours of Capability, Opportunity and Motivation; this resulted in consideration of several intervention functions (Michie et al., 2011) including therapists' views and their source of knowledge, the therapist's skills and the ability of the patients to engage in the intervention and be monitored. Additionally, social influence and the physical environment were identified as factors that can facilitate MI use and the stroke survivors' successful engagement. Finally, the importance of the therapist's role in encouraging MI, the patient's belief in therapy and its consequences, the positive reinforced outcomes that help enhance recovery such as being confident, alongside personal goal attainment, can all help change behaviour.

Theme one: Therapists' views and knowledge (Capability)

This theme highlights the importance of the therapists' views concerning MI use, including them being aware of its clinical use, their source of knowledge, MI training and its benefits. Further improving their level of experience in its use and their insights around methods of improving this skill, such as the impact of availability of workshops, and training courses. Accessible protocols and guidelines to help them train the patient in using it are also important.

Three subthemes were identified under this theme that fitted within the COM-B framework concept of Capability and behavioural enablement in facilitating MI use: 1) the therapist's skills and experience in using MI, and what they know about its benefits to them, originating from evidence-based practice sources (knowledge); 2) the stroke survivor's ability to practise MI effectively and their attributes; and 3) Monitoring and feedback (belief and behaviour regulation) (see Figure 4.1). Together, these three subthemes, with an overall understanding and assessment, can help facilitate the stroke survivor's effective engagement in MI use in clinical practice.

Therapists using MI with stroke patients need to have adequate experience of using MI and the skills to train stroke survivors, and to have access to available evidence resources (e.g., clinical trial findings and guidelines) but, as can be seen from the following, the participants' knowledge was not sufficient. Some therapists resorted to finding information from popular online sources, such as books or medical journals. Others had heard of MI from experienced peers but were not fully aware of its benefits in clinical practice, especially as there is little information emerging from evidence-based practice resources and experimental clinics.

This indicates that more knowledge and EBP resources about MI and its benefits are required before it can be formally used and so that the stroke survivors with whom it is used can make informed choices about potential therapies, including MI, rather than choosing limited passive therapies. Within this theme, two other important factors were identified; the stroke survivor's ability to use MI is thought to be a key factor in the effectiveness of the intervention, which can be hindered by both stroke survivor responsiveness, including the stroke survivor's attributes (such as cognitive, language, severity and inability to image) and enabled by the factor of continuous improvement monitoring for MI use.

Subtheme one: Therapist's skills and experience

The concept of MI use in stroke has limited evidence-based practice knowledge around its use in stroke rehabilitation. The absence of this might have influenced therapists' choices to select other treatment options with more supporting evidence. Any knowledge therapists had seemed to be neither reasoned nor supported by evidence. Additionally, implementing MI in clinics based on clinical guidelines and evidence-based sources had a positive impact more than just clinical reasoning. Similarly, if it were assumed that they obtained adequate knowledge about MI through journals and sources on how to use it, it would still need to be supported by further practice and experience. Skills needed to be improved on how to deliver it in stroke rehabilitation, but there was no indication that there was availability of resources regarding the theory underpinning MI opportunities held in education institutes and training centres. This notion is supported by many therapists, for example:

> *"Maybe if it's (effective), you need to introduce the idea. What is the idea? We need to know about it first. Okay. After this, we can implement."* (TH.16 pp. 67-68)

> *"So, they (therapists) will accept ok, some kind of theoretical help. "(*TH.16 p. 338)

> *"If just a small knowledge about it just read it in the Internet or whatever, but no practising, I think I will not give too much to that patient and of course he will not be happy with the result."* (TH.24 pp. 607-9)

It appeared that the amount of knowledge that therapists had gained about MI was mainly theoretical, from published articles or books, and was limited. For academic scholars and therapy professionals in Saudi Arabia, MI is not included in the undergraduate curriculum or taught as a basic professional skill. Clearly the lack of knowledge regarding the use of MI has affected the implementation of MI in clinical practice as proposed by the therapists. Most participants argued that the reason they had not used MI before, or heard of it, was because it was not introduced in their curriculum or taught at undergraduate level.

Factors that could help inform or enhance the structure of intervention knowledge and awareness were identified, such as what could be provided by Higher Education institutes, health care professionals or bodies of educational programmes. The resources or knowledge could be skills, attitudes and values that are gained in professional training or as part of continuous professional development (CPD). The participants viewed this training as essential to improving the body of knowledge regarding MI use and supported its practical delivery on stroke rehabilitation.

Alongside the theoretical awareness of MI use, practical experience was considered important. The importance of being experienced in MI training and how that impacted on the patient's engagement and their response to therapy was an important factor in MI use. MI is seen as a new therapy in rehabilitation. In this study in Saudi Arabia, some therapists said that it was the first time they had heard about it, and that they had no knowledge of how to use it or experience in delivering it, nor they had any experience of its use in stroke specific rehabilitation. Some therapists had heard of MI, but it had never occurred to them that this method could be used in stroke rehabilitation. Therapists in the focus group have supported this, for example:

> *"So, skill is very important uh experience with this one because if this is the first patient that you are using this technique with him, I think again with the next patient this will become different." (*TH.08 pp. 711-15)

> *"But when you become more experienced, uh, exposed to many patients now you'll have like the potential to answer some questions that arise from the patient himself. Okay, so it's very important to explain"* (TH.08 pp. 717-24)

> *"Really, we don't have any experience with this technique*." (TH.06 p. 673)

> *"Lately we heard about this mental imagery as part of a certain technique. But we didn't know. We didn't use it, from our experience."* (TH.14 pp. 458-460)

> *"For me, it's my first time to hear about it. So, I don't have any experience regarding the mental imagery thing about rehabilitating stroke patients*." (TH.06 p. 9)

It was believed that workshops introducing MI, and training courses that could help and train on its use would help more in improving skills for using MI and gaining full experience in its training. TH.06 and TH.11 suggested one main method that could be through the availability of training courses to help develop and improve therapists' MI use in clinical practice. Accordingly, short training courses and workshops can help them understand more about how to deliver MI and enhance their professional skills. Another method suggested is that workshops could provide therapists with more insight into actual guidelines and the best strategies for instructing patients in MI use. Further, these workshops could help professions underline the importance of focusing on covering the main points of inclusion criteria regarding stroke survivors being involved in MI training.

According to therapists, protocols would help inform them more about MI. It seemed that therapists lacked knowledge of MI use, however they were very keen use it in rehabilitation if it were evidence-based. The available information needs to be supported by research evidence and expert advice. Notably, there is a need for guidelines and protocols to be developed. MI is seen as any other new intervention or technique applied in professional health care and can be delivered effectively in clinical practice by improving the practical skills and applications of its conceptual framework as supported by TH.16 "So they (therapists) will accept ok, some kind of theoretical help."

> *"I think first we have to know about this itself like workshops or class, showing how to introduce this, protocol, guidelines, skills, progression of this, how this is the first things to do with the patient."* (TH.06 p. 658)

> *"If I will be, um, given the chance to have a workshop I would be more comfortable*." (TH.11 pp. 225-227)

> "*Given the chance to have a workshop I would be more comfortable."* (TH.11 pp. 225-227).

In general, it is observed that therapists demonstrated any practical experience of MI or any skills in delivering it poorly. An explanation for this could be the lack of experience on the part of the therapists, including the lack of MI intervention knowledge and lack of foundations regarding this technique, but primarily based on the source of intervention knowledge. Relatively, this could be provided or sought within the continuous professional development of the therapists' and professionals' physical and environmental settings and rescores available to help implement interventions and conduct treatment in clinical practice.

Further, most participants stated that mastering this skill could help provide an extensive progression route, goal model and framework, regulated and adapted to the stroke survivor's pace and needs. The ability to train people having suffered from stroke about the use of MI requires specific skills and techniques that are delivered in health facilities. This is by utilising the chosen evidence-based approaches of MI types. The aim is to help them improve both in terms of their psychological and physiological levels.

Subtheme two: Stroke survivor's ability

Stroke survivor's ability is a subtheme and one factor of the therapists' views and knowledge theme, where is successfully engaging in MI training was deemed crucial to successful and effective implementation by the COM-B framework. Participants explained, there are currently no guidelines that include which attributes stroke survivors need to be able to use MI or to help determine whether they could be trained in MI use, and further, there is a lack of assessment tools specific to the use of MI in clinical stroke rehabilitation. Participants in this study discussed this as an important facilitator or barrier to changing behaviours towards MI.

Some therapists believed that criteria such as cognition, age and education could both enable the therapist to teach and the stroke survivor to learn MI skills and may act as facilitators to successful engagement. Furthermore, stroke survivors need to possess the ability to imagine and follow instructions. Findings from therapists recognised that a younger age group would benefit more from this intervention being more open to new ideas than the older generations would have in treatments and also their higher levels of education would help facilitate their engagement. These two criteria were said to be essential qualities that a person might possess and would help in selecting the patients for MI use. Instructing MI can be hard with patients who have suffered a stroke and they need screening for certain criteria to help facilitate their engagement.

> *"As Occupational Therapist, we did use it with a certain person, with certain criteria, cognition, age, education, knowledge of their own body. They can imagine, they can have imagination or, I mean of their own body, position in the space and stuff like this."* (TH.23 pp. 121-26)

"But for the young patients they understand, and you know the education level also it is effective." (TH.17 pp. 209-10)

Furthermore, certain stroke survivors may experience cognitive impairments, which can impact a stroke survivor's ability to engage in rehabilitation or learn new skills such as MI. Additional factors that may affect the use of MI in stroke survivors include the location of stroke. If the stroke lesions due to stroke occur in a particular site in the brain, they could cause impairments such as aphasia, impairing the ability to understand or produce speech, and could lead to other complications, such as clinical depression that is resulting from cognitive impairment or an emotional response as therapists in the group have explained. TH.23 suggested attributes that might hinder MI use, such as severity of stroke. Also, the participants explained that stroke severity could negatively affect the patient's cognition and communication.

"The severity of the stroke or, what do you call that, the cognition level and communication." (TH.23 pp. 79-80)

*"If you have, for example, patients with low-level of cognitive communication." (*TH.07 p. 456)

"Yes, I think one of the issues as mentioned before, the severity of a stroke, you know, and the location." (TH.07 p. 436)

Some participants acknowledged that it may be more helpful if there was a checklist for required attributes within the stroke survivor prior to planning for MI use in rehabilitation

> *"I think, if we should plan to introduce this technique here, maybe we should before set a criteria list for such and such patient, I mean checklist to introduce for set of certain category of patients*." (TH.23 pp. 74-76)

Further, a few therapists proposed that screening for eligibility, whilst still adopting a monitoring process. This may ensure that patients could continue with MI as they would feel supported and helped to overcome any difficulties, they may encounter in implementing the intervention. While training on the use of MI, it is therefore important, prior to the process, to assess the stroke survivor's level of function, whilst considering relative post-stroke shortfalls that may hinder their engagement in MI, including cognitive impairments. The participants have suggested that there is a need for an assessment tool that screens patients for specific attributes, using the therapist's experience and following guidelines for MI use.

Importantly, it was proposed by the therapists that acknowledging the stroke survivor's limitations and focusing on their strengths could be advantageous to recovery during rehabilitation.

Subtheme three: Monitoring and feedback

It was reported by therapists that stroke survivor's progress and outcomes needed to be measured during MI use and clear feedback given on the results once stroke survivors had engaged in MI training or following its use in clinical practice, as this may help facilitate further success.

This was considered particularly important for monitoring the stroke survivors' ability to imagine or when determining the impact of certain attributes such as cognitive impairment on the stroke survivor's abilities. Progress monitoring and follow-up feedback were identified as much needed valuable tools in MI use. Not only would this ensure the ability to imagine, but it would also encourage stroke survivors to identify a need for support.

One therapist suggested the use of a progress chart for stroke survivor's self-monitoring. This might serve as a record of the frequency of treatment but also challenges faced while receiving the treatment. This would enable therapists to follow the stroke survivor's progress and understand any improvements or shortcomings during rehabilitation, particularly if they were non-supervised and practicing MI at-home. The therapists in the discussion group highlighted that such follow-up instruments could reflect the stroke survivor's progress and improvements, for example:

> *"Maybe we can provide also a feedback-chart for patients and so he can inform us how many times he did it and yeah, reflect on it, and also the outcome measurement. How can we measure the outcomes? How they measure it at home how much they do and for how long that's needed."* (TH.17 pp. 436-7)

Furthermore, TH.11 saw compliance as important in successful MI training, as compliance can be considered mutual behaviour between therapist and stroke survivor that can help inform how well the patient was getting on with his set goals and training.

> *"It depends on the compliance of the patient because sometimes our problems are compliance."* (TH.11 pp. 254-255)

It has been seen that as with other treatments used in stroke rehabilitation, an outcome monitoring system or progress chart can help therapists review and understand progress in a given technique to show if it is aiding the achievement of desired outcomes. Consequently, improvements can be recorded, and shortfalls noted and rectified with other treatment plans. It was also noted that ongoing monitoring and evaluation of treatment progress during the process is a main influencer that impacts effectiveness of treatment. This factor is highly important during training in MI by the therapist, as it influences the engagement of patients and contributes to enhancing positive outputs.

Importantly, it was thought that MI could be successfully implemented in rehabilitation following improved therapist skills and experience developed through delivering MI, while visualising the stroke survivor's ability in training and monitoring any improvement.

Theme two: Social influence and environmental factors (Opportunity)

This theme includes potential factors, which could support stroke survivors in being trained in the use of MI by the therapist. Opportunity behaviour involved two important domains from the theoretical domains framework intervention functions within the COM-B model that may help change behaviour and enhance the use of MI. The two components of opportunity behaviour are; the social and cultural influence factors. Once these are recognised in the intervention the interaction structure can be successful.

Two key factors lie within the individual's ability and within their surroundings, which could facilitate the effective delivery of MI. These factors fit within the COM-B concept of Opportunity and related TDF domains: 1) social influence or norms (e.g., common knowledge among society with elimination of externalities such as an individual's belief in a taboo or a tradition) which could influence the stroke survivor's ability to accept the use of MI or receive the training; these could be personal qualities (factors) of the patient, such as education level or age, or social and attitudinal factors, such as the social norms of the patient and support and relationships (having someone with them in life (carer); and 2) physical and environmental settings which include the availability of appropriate audio tapes, having quiet and private rooms and MI being used as a time-effective method (see Figure 4.1, above).

Therapists described different types of barriers and facilitators within this theme, related to the surroundings of the stroke survivor and including both the social influence and social norms that can impact on the patients' lives and decisions. The physical environment or settings and the availability of resources were found to impact on whether patients are willing to be trained to use MI. Personal qualities that a stroke survivor can possess (e.g. being educated or being self-dependent) were suggested to help enhance their use of equipment or resources that can, in turn, help in attaining the training.

According to the therapists, stroke survivors were more likely to be impacted by their social influence and norms, including good personal qualities such as high education level. Other social influences impact can take the shape of being an independent person after stroke and not relying on a carer or a family member, which were considered more likely to enable the more frequent use of MI. In addition, participants considered training would be easier to follow if there were more instructive videos and audiotapes available in a quiet room.

Subtheme one: Social influence

Social influence and norms are recognised as either facilitators or enablers that may affect individual behavioural change. They may help influence the use of MI when existing within the stroke survivor's context, as therapists could make use of them and encourage MI use. These factors were identified as influencing stroke survivor's opportunities and included their personal qualities, social norms and beliefs in the intervention. This was important, as it was believed to influence the delivery of MI. Several of the social influence factors could impact the effectiveness of MI use with stroke survivors in clinical practice. It is believed by participants that sometimes stroke survivors would not be able to understand the concept of using MI, especially those who had a lower level of education, to understand what was required of them. This could be because of their social background and their beliefs, as suggested by the participants.

For stroke survivors who had already been encouraged on engaging in active treatments, provided to them by the therapist, starting to introduce MI in rehabilitation could lead them to think that it was not a valid treatment and reject it as evidence suggests from the focus groups. Furthermore, it is thought that it was a difficult issue and could result instead in an adverse outcome such as negative experience in MI use. It was highlighted that a lack of support from family or community, or the stroke survivor might be living alone could be an issue for those struggling with daily life and who are dependent on themselves. Support from family and surrounding community was important to ensure stroke recovery and, if not available, it could be a sign of shortfall in supporting delivery of interventions and continued treatment and rehabilitation. These factors were raised by the therapists, who clearly explained the social factors that might either help or prevent delivery of successful MI. These may have an impact on the patient's attitude and behaviour towards the treatment, and any rehabilitation programme conducted in Saudi Arabia could still be influenced by these factors.

> *"Especially this culture you know, they imagine (think) that we are giving them something not true*." (TH.17 pp. 206-207)

"For the patient I think, maybe, he cannot understand what I want to reach, as I said before they're socially affected. But for me, I think if it's difficult, patient didn't believe in what he is doing, I think this, I mean negative thing." (TH.24 pp. 467-71)

"Okay, socially maybe, I can put in those criteria because, we don't know if he is alone, because most of stroke survivors are elderly so, most of them are not ignored but live alone?" (TH.24 pp. 101-103)

Another factor which was highly important within 'opportunity behaviour' was survivors' personal qualities, such as the level of education and age, which could facilitate the use of MI in clinical practice.

"Some of the patients are educated and some of them highly educated, some of them not educated. They come from different places really and this is, I think this is not easy." (TH.04 pp. 191-4)

"The culture or education, it depends on the person." (TH.23 p. 666)

"As Occupational Therapists, we did use it with certain people with certain criteria, cognition, age, education..." (TH.23 p. 23-26)

"I, as I know, I mean, the severity of the stroke, what do you call that, the cognition and, communication, education, age, sex, associated condition and, associated affection." (TH.23 pp. 95-98)

"But for the young patient they understand, and you know the education level also it is effective." (TH.17 pp. 209-10)

"We also have to consider the people around them. The caregivers, because in my experience, with stroke survivors. Most can do it but because of the caregivers they always offer help. So, I think that, even if the patient can do it because of the caregivers are always offering help taking the motivation away…Mostly they treat the patient like they cannot do it." (TH.11 pp. 430-64)

Education was a positive element that the therapist could work around as a critical criterion sought in a stroke survivor. Education might in some way effect someone's ability to imagine or might impact how a person conceives imagining in being an activity that could be part of a treatment. An educated stroke survivor was said to be more aware of scientific treatments that included mental practice therapy. TH.17 shared similar thoughts to her colleague and added another quality, which was that younger and educated stroke survivors might benefit more in using MI, as younger educated stroke survivors are more likely to be keen to overcome their impairments and would try all options of therapy available.

Although in some cases there may be available support, social influences still impacted on an individual's decision. These may involve perceptions of religion, cultural factors and personal background, which can generate negative pressure on an individual's decision-making in accepting any treatments. These social influences could challenge any intervention process, however the support of an experienced and skilled therapist, could help to overcome these challenges and create a more positive environment for intervention. Therapists identified that social awareness and marketing in healthcare sectors and promoting evidence-based studies could help maximise acceptance levels and engagement for stroke. Beliefs, attitudes and behaviours could be primed to change through distribution of proper information (evidence-based) and through proper channels through appropriate sectors.

Subtheme two: Physical environment settings

Equipment such as videotapes/audiotapes and anatomical aids and images to supplement the MI training, or even the availability of a quiet room, are other factors suggested by the participants that may facilitate the use of MI. These factors could help overcome some of the difficulties that may occur in any intervention, specifically while following instructions and training. It was believed that the availability of such resources could help therapists use MI more effectively. This was verified by the opinions of some therapists, who clearly viewed the physical settings as an asset for improving their practice of MI. For example, this therapist (TH.23) would have liked to have some tools such as anatomical aids and images that could reinforce the training:

> *"This is what we use. Sometimes we do two hours because (Sometimes, you know people live, believe in what they see). Sometimes, we give tools to help grasp just to make the things more realistic."* (TH.23 pp. 302-312)

> *"I should give him the adaptive equipment"* (TH.04 pp. 561)

It was recognised that in some cases hospitals and facilities were not well equipped for MI use. However, if there were different settings in the hospital, MI could work more effectively. Providing the reason that the stroke survivors always came in for more physical or passive exercises, the setting of the facility was not appropriate for MI training. This was in accordance with TH.22's suggestion that they needed quiet rooms with protective privacy, and further tools and equipment. Therapists highlighted the importance of having the facility fully equipped with tools and equipment that would help deliver MI easily, including private rooms set aside in the rehabilitation centre or service clinics. Some of the participants had concerns about delivering MI in a clinic that was not fully designed for this purpose.

> *"Okay, I think maybe in different settings if because always, the idea or for the patient if they came, just we came for exercises*." (TH.04 p. 160)

> *"I should give him the adaptive equipment to make them be independent*." (TH.04 p. 561)

> *"The gym. Sometimes it is not a quiet place or sometime we don't have privacy. Maybe that helps also."* (TH.22 pp. 216-217)

> *"Or sometimes you can use recording. Recording and patient can listen to the recording."* (TH.17 pp. 186-7)

Findings highlighted the importance of environmental factors, such as having a provisional instructive device like an audiotape with pre-recorded instructions that the stroke survivors could listen to and follow steps of MI training, could facilitate the successful use of MI. It was suggested that changing and modifying the physical and environment settings, for example providing a quiet room for training, could enhance the stroke survivor's effective engagement in MI training. Additionally, that video or audiotapes could reinforce the training and improve the instructing of MI training. Therapists wanted to support their training to the stroke survivor's MI use in having more provisional stimulation products such as audios, which better reflected how some people could learn and follow instructions, and their range of auditory learning styles.

> *"Yes, but if you, sometimes you have a lot of, like with the stroke survivor, you have a lot of things that you would work on like, balance and muscle power, range of motion, so there is a lot of technique requiring practice but most of*

these techniques doesn't take time, so like to exercise MI, it doesn't take time.” (TH.21 pp. 415-8)

“So, you really don’t need a lot of time with the patient.” (TH.21 p. 412)

Another important point from therapists is that MI could be used as a cost-convenient intervention, meaning that it would not cost anything for the patients to train. Other available therapies could take more effort and time for training however, MI was found to be less costly in time application. This was seen as an enabler within the environmental and resources context, and as a facilitator for opportunity behaviour especially for those patients who would benefit from the free services. Using MI in rehabilitation could be seen as a helpful and time saving technique compared to other therapies that demand more time. Having MI in a facility with a high demand for seeing stroke survivors and attaining treatments and one, which also lacked a physical setting, could be resolved by the use of MI after training stage and followed up by self-practice from the patient that can save time.

It was believed by the participants that these factors support the possibility of stroke survivors being able to be trained in the use of MI. It is likely that these two domains from the TDF intervention functions within the COM-B model are linked to Opportunity behaviour and can help change behaviour and enhance the use of MI.

Theme three: Support and motivation factors (Motivation)

This theme covers many factors, which were considered important, and would help in incorporating the use of MI in rehabilitation plans. The factors were found to be necessary to facilitate the behaviour change required for using MI, an important component of the COM-B model to help change behaviour.

This theme deals with enablers of using MI with stroke survivors with different levels of motivational capacity: for example: 1) the therapist's role, and 2) the stroke survivor's belief in treatment and consequences of using MI or its effectiveness, 3) intentions for using MI and reinforcements of its use and finally and 4) goals of the intervention.

Data obtained from this study showed that therapists appreciated their role and believed that it may impact hugely on the stroke survivor's training in MI and was an important factor in instructing MI use (see Figure 4.1). It was seen that for changing or priming motivational behaviour, personal and achievable goals should be considered to help recovery and prompt the stroke survivor's optimistic outlook. Appreciating these factors could help further in establishing a more positive approach to enhance different stroke recovery outcomes within the rehabilitation.

Nevertheless, it was believed that the setting of goals and improving feelings and reinforcing them might help improve other functional outcomes. Importantly, it was thought that MI could be successfully implemented in rehabilitation, taking into account the importance of the therapist's role and the stroke survivor's confidence in the treatment, while still visualising the patient's goals in recovering and reinforcing through positive feelings.

Subtheme one: Therapist's role

The therapist's role (professional) during MI use and training was also seen to influence the stroke survivor's belief in the use of MI and its effectiveness, where the therapist could help encourage the stroke survivor and support his or her progress with continuous monitoring. This thought about MI influenced most of the participants' opinions concerning the delivery of MI in clinical practice in relation to the stroke survivor's beliefs or their engagement in the intervention (see Figure 4.4 above, theme and its included four subthemes). It was suggested that encouraging the stroke survivor or supporting them while using MI was vital. Therapists discussed the importance of their role in encouraging the use of MI in clinical practice, which could help in influencing the acceptability of the patient to the treatment.

Therapists highlighted the importance of taking the role of encouraging, supporting and guiding the stroke survivors in using MI more effectively and acknowledged that if they had the experience, they would have offered the use of this technique. A professional role was deemed an important enabler to help facilitate and guide MI training in stroke rehabilitation. TH.07

noted that trying to encourage them into using MI could motivate them more as stroke survivors needed to be provided with advice or guidance about MI. Instructing the stroke survivor to engage in training in MI use could motivate them to recover.

> *"So, you try to encourage them. So, you know, you should, just do some exercises, imagine that you do these exercises"* (TH.07 p. 357)

TH.23 added also how he encouraged the stroke survivors to use MI constructively and step by step and reflected how this helped to motivate them into thinking real progress towards improvement.

> *"I ask the patient to open the hand to encourage him or to make him to think real, in front of him, do it with your sound hand and see what will happen now… this imagery is what we use"* (TH.23 pp. 32-35)

Nevertheless, other interventions delivered in rehabilitation must, at some point in time, have similar doubts before application and delivery as suggested by the therapists. TH.16 remarked that with the skills of the therapist and a good level of experience he would be able to play his role effectively, by explaining theories and concepts to the stroke survivor, illustrating the effectiveness of MI training scientifically. TH.18 also agreed to TH.16's remarks and was in addition to discussing the improvement of recovery outcomes.

> *"So, they will accept, ok, such kind of theoretical, but as I said, you know, it's sometimes depends on the therapist who handles the patient but he has to prove to those patients that this work…"* (TH.16 pp. 338-341)

> *"We would explain to the patient, that this technique is used before with a lot of patient and there is a good outcome from this, so we will explain to the patient*." (TH.18 pp. 357-59)

As suggested by the therapists, the importance of this factor relies mainly on the therapist's knowledge in MI and their skills. To achieve the stroke survivors' engagement in therapy and their acceptance of an intervention, improving skills was a key factor that needed to be met, highlighting the importance of developing best practice guidelines for MI use and making available workshops and training courses. As noted, most participants stressed the importance of this; that in order to achieve the stroke survivor's acceptance and engagement, skills and practical experience first needed to be acquired.

Subtheme two: Stroke survivor's belief in therapy

MI use and training was also seen to be influenced by the stroke survivor's belief in the therapy they underwent. Engaging in training, receiving positive feedback and monitoring or seeing their results could help further enhance determination towards the level of recovery. For example, when a stroke survivor believed that MI use would help improve their recovery, for instance, their hand movement, the patient would feel more confident in performing functional exercises. From the view of the therapists, the belief in treatment and its effectiveness was considered a motivating factor, as it helped direct the plan of recovery positively and reinforced a more positive approach.

In this subtheme, it was understood that the stroke survivor's belief and agreement towards different types of treatments available within the rehabilitation programmes, could in some cases influence how he/she accepted the treatment plans. The thought of having MI, as an alternative treatment other than physical treatment, could hinder MI use with the stroke survivor in some cases. Some of the participants argued that this factor could hinder MI delivery in rehabilitation. For example, TH.23 noted that stroke survivors believed in results, and when they saw positive results, they would believe that the therapy was effective, such as when using machines such as transcutaneous electrical nerve stimulations and interferential therapy. The participant also stated that most people believed in what they could see, so stroke survivors would likely believe in what the therapy offered them. He also added that stroke survivors mainly did not reject any treatment plans, because they believed in the therapist's opinions. In order for them to recover, they were willing to go with anything offered.

> "*Patient believes in result, if there is no result, patient will believe in machine technology*." (TH.23 pp. 594-6)

> *"Sometimes, you know people live, believe in what they see."* (TH.23 pp. 311-312)

> *"They don't reject because you know they believe in what we are providing, it's one of the technique, and I try, you know, for the patient they use whatever you give them. They want to recover."* (TH.23 pp. 358-60)

> *"He would not be convinced. So the best way is to show him the results, and from my experience, I get the results, within the first sessions."* (TH.07 pp. 228-2)

However, to help ensure acceptance of treatment, efforts could be made to address what results could be gained from using MI, or by illustrating its effectiveness by acknowledging rational and evidence-based experience to help the uptake of the therapy.

In contrast, the stroke survivors might not believe that a specific intervention or training would be of any benefit, or the intervention was generally not necessary, and that might mean a loss of confidence and negative attitude towards the intervention. Belief could be in some cases a barrier and might impact on the stroke survivor's acceptance of MI training. TH.11 supported this thought by arguing that stroke survivors already had established beliefs on therapies that were more passive (hands-on), and stroke survivors would not easily warm to the idea of MI.

> *"But I think the problem because some patients, I'm working more in, women, so it's something that's hard to explain to them and worry, I'm using this and mostly they want, something like you apply to them, they don't want something imaginary. Hands-on. If you would just tell them that, "Think of this", they will not like it..." (TH.11* pp. 258-67)

Additionally, TH.23 and TH.07 shared similar views and agreed on the stroke survivor's acceptability, from a negative point of view in assuming about the stroke survivors' beliefs, not accepting MI.

> *"For me as I said, the resources, background, education, if patient see a technology in our outpatient, believe in electricity, stimulation, all things and rather when you use something, just talking words with patient."* (TH.23 pp. 458-62)

> *"One of the barriers that we, face, actually, is the patient's belief."* (TH.07 p. 336-7)

> *"Because the patient came just to image or for imagination on mental exercises, they came for physical exercise for motor exercise."* (TH.04 pp. 395-6)

> *"Because always the idea for the patient if they came is just we came for exercise."* (TH.04 pp. 160-1)

> *"Some of the patient's he just needs electro-therapy you have to put some electro therapy." (*TH.16 pp. 264-5)

Stroke survivors formed opinions around their trust in the nature of a treatment plan. Some therapists reflected that in some cases stroke survivors perceived therapy in rehabilitation programmes as being an active exercise-based intervention, which could be integrated with other modalities of treatment. Therapists found that this form of programme was more acceptable for stroke survivors than passive or cognitive-based treatment. During exercises in rehabilitation stroke survivors could either actively be engaged in the practice of exercises such as feeling the movements and following instructions or just basically be involved in only passive therapy such as the application of machines and or therapist applying PNF therapy.

Therefore, the significance of this factor in enhancing MI delivery was established once a bridge of confidence was built between therapist and patient within the therapeutic relationship. This role ensured the stroke survivor was involved in the therapy and is aware of the consequences or constructive success resulting from the therapeutic relationship and session. This underlines how each factor in each theme is reliant on the other. Likewise, it has been suggested by the therapists that during treatment, the stroke survivors would benefit more by sitting with the therapists and discussing the nature, options and consequences for each treatment giving the stroke survivors the opportunity to discuss and raise concerns. Building trust and mutual ideas between therapists and stroke survivors could help enhance acceptability of the treatment.

Subtheme three: Reinforcements for positive feelings

Positive feelings (e.g., emotions, feelings and mood) were suggested as motivating the stroke survivor towards recovery. In addition, there were suggestions from other participants that MI could be used as a therapy for making stroke survivors feel more comfortable and relaxed or could be used to reinforce their psychological abilities and boost their self-esteem. Nevertheless, it was stated that the setting of goals and improving feelings and reinforcing them could mainly help improve other functional outcomes. For example, one therapist (TH.23) explained that a stroke survivor needed to feel comfortable before initiating the treatment; once the patient was comfortable then they may be able to try anything, unlike uncomfortable patients who maybe in a tense state. However, TH.13 explained that once the stroke survivor gained self-esteem and then became confident, they could process imagery well and perceive their part effectively.

> *"They have to feel comfortable first…after preparation of the patient, relaxed and in good position etc." (*TH.23 pp. 302-304)

> *"But as he, gains self-esteem and then he gains the self-confidence with him-self, now he perceives his affected body as already a normal part…with the help of the exercises, he gains more confidence." (*TH.13 pp. 336-37)

Moreover, imagery was said to be used to help supress negative feelings and replace them with positive images to help the stroke survivor feel more relaxed. Using imagery with stroke patients might potentially help supress spasticity levels and approximate movement effects, for example, it might make stroke survivors think about the movement and imagine movement process in simple and gradual steps before executing it. Some of the advantages of MI identified by the therapists were that enhanced mood and increased confidence, impacting on psychological as well as physiological outcomes, such as ADL, mobility, QoL and participation.

> *"Just imagine or try to suppress by imagining you know that his hand is, you know, relaxed or he can't control his movements or his hand instead of you know the hand is controlling him. So this is one of the techniques that I'm using with my patients. Okay, to suppress sometimes spasticity and it showed some benefits with them."* (TH.07 pp. 598-604)

> *"To the patient and we use this as a tool and also we do imagination… I ask the patient to open the hand to encourage him or to make him to think real, in front of him, do it with your sound hand and see what will happen now… this imagery is what we use."* (TH.23 pp. 30-35)

> *"So, we have to like transfer to a psychosocial aspect, maybe we can give patients some things that he can do it like in social things. Like, for example, what you would*

*think if you are sitting with your family now." (*TH.06 pp. 615-617)

As a result, MI could be used as a motivating factor to help improve cognitive issues such as self-esteem and confidence and for reinforcing positive feelings towards treatment and recovery. The consequences being that this could lead to improved functional outcomes as TH.13 suggested previously. Similarly, it was proposed that having an approach that improved different outcomes after stroke could benefit the stroke survivor during rehabilitation. Building trust and mutual ideas between therapist and patient could help enhance acceptability of the treatment.

Subtheme four: Goal setting

After stroke, both functional and psychological impairments exist, and many outcomes were taken into consideration for recovery. However, a therapist would need to create a mutual plan with the stroke survivor to help in achieving a set of realistic and achievable goals. This sub-theme addresses the opinions of the therapists based on their understanding of why they would want to prescribe MI for the rehabilitation of patients after stroke.

It was noted that MI was considered helpful in improving mobility and functional levels in stroke recovery. Other recovery that could be impacted included improvements in psychological wellbeing, QoL, participation, and independence. During rehabilitation it was noted that a stroke survivor's main goal was to recover and be able to transfer; it was crucial for an individual to regain his abilities on being able to move from his bed and into his chair, moreover to be able to go to the toilet on his own. Although some goals can be achieved over a longer term, this may be a slow process, but setting realistic and achievable goals can help a stroke survivor envisage their recovery and be optimistic about achieving their goal, of being independent in ADL. Additionally, setting goals with the patient is a key factor in motivation for the use of MI. As goal setting is a general aim for stroke survivors attending the clinics for making improvements. Therapists preferred to use MI for improving functional outcomes, as the stroke survivor came to the clinic to improve his level of functional activity. Furthermore, the therapist would perceive this factor to be essential in helping inspire stroke survivors to use MI as a therapy and help motivate them to improve other functional outcomes and progress. Most rehabilitation plans for stroke survivors are for recovery as most patients come to the services and expect to achieve recovery outcomes.

> *"The main goal for the patient is just to transfer to go from bed to chair or from chair to the toilet." (TH.04 pp. 558-60)*

> *"Since I'm working here, mostly the goals are for functional, so, I would like, to use it, for the patient to be more functional because that's what they want to improve*." (TH.11 pp. 230-2)

> *"So, I would like, to use it, for the patient to be more functional because that's what they want to improve."* (TH.11 pp. 231-2)

This sub-theme underpins the importance of setting goals within the plans delivered to the stroke survivors and how setting a goal may help motivate the patient in recovery, if the delivered therapy is effective. Setting clear personal and achievable goals, related to attaining stroke recovery outcomes, or prompting a positive attitude, assist in promoting active and positive behaviour to help engage successfully. It indicates that having a set of achievable goals can help to enhance motivation for recovery for the stroke survivor. Accordingly, MI could be used as a motivating factor to help enhance goal settings or help achieve planned goals in rehabilitation programmes that could include both physical and psychological goals. Adopting this method could help underpin the importance of planning rehabilitation, and milestones could be established to advance progress leading to improved functional outcomes.

Likewise, it was acknowledged that goal setting in rehabilitation programmes is useful; for example, using MI could help motivate the stroke survivor to achieve goals or to improve outcomes after stroke and could enhance acceptability of the treatment and outcomes.

4.4.3 Summary of the results from therapists

Therapists acknowledged that MI as an intervention could be delivered, with a shortlist of barriers; however, among these barriers, they also identified a range of factors that could encourage stroke survivor's engagement in MI. They reported concerns about certain stroke survivor attributes e.g. cognition and social influences, such as education levels and private healthcare. The delivery of MI training as a technique in rehabilitation plans could be enhanced by the therapist's professional skills and practical experience in MI as explained by therapists.

Nevertheless, one could foresee other enabling factors such as motivational factors that included the stroke survivor's beliefs in therapy and consequences, and the therapist's role in prompting positive feelings and confidence.

From the data, it was found that capability behavior was influenced by several factors: the therapist's views and knowledge sources; the therapist's skills; the ability of the stroke survivor to engage and the procedure of monitoring. These examples of enablement indicated these were methods to help promote desired behaviour. Regarding Opportunity, surrounding settings helped enhance behaviour and included social influence and norms and physical environment, which could help promote the desired behaviour. Finally, many factors that influenced behaviour fell under the construct of Motivation: the professional or therapist's role, the stroke survivor's belief in the treatment;

personal goal setting; reinforcing positive feelings, all of which were techniques for facilitating the uptake and use of MI.

It was observed from the findings of this study, that few therapists were aware of MI use or its potential value in stroke rehabilitation. They described a lack of training and experience in delivering it in clinics with stroke patients. They suggested a need for workshops and training to address this necessity. Moreover, they recognised the role of the therapist in encouraging and guiding the use of MI. Other factors, such as the patient's attributes and assessing and monitoring the progress of the intervention, could help improve the patient's capability level in receiving and accepting any intervention in rehabilitation, and specifically with using MI.

Two factors were identified from the data, with regards to the opportunity for using MI in rehabilitation. These involved the social influence factor and the physical environmental settings and context, for stroke survivors to be able to understand the perceptions of stroke survivors towards MI. This could help them plan treatment strategies within the patient's responsiveness.

The findings suggest that therapists need to recognise the influence of personal attributes, social influences and attitudes that could affect the stroke survivor's adherence. Optimising the rehabilitation environment by providing a quiet room and resources such as audio and video tapes to assist training could facilitate the use of MI and encourage intervention acceptability and effectiveness.

Identifying motivational factors could help therapists in enabling the use of MI through their own professional role, which would help establish rapport between the therapist and the patient and enhance the patient's engagement in MI. Identifying the stroke survivor's social influences and attitudes towards their capabilities and their views about the intervention, could promote engagement and deal with negative experiences.

In addition, recognising the stroke survivor's goals and intentions for the intervention, and having a clear understanding of their emotional capacity, could help highlight strategies for implementation.

4.5 Results from stroke survivors' interviews

This section of the chapter describes the results obtained from the face-to-face semi-structured interviews with stroke survivors. There is a brief description of the study participants, followed by analysis of their responses from the interview data. Three themes emerged as key findings from the data and these were mapped onto the COM-B model.

4.5.1 Participant characteristics

The sample involved 12 stroke survivors undergoing rehabilitation. They included people undergoing either physiotherapy or occupational therapy or both, with a range of time post-stroke, both males and females of varying ages and differing functional and independence levels. There were eight men and four women and were aged between 30 and 60 years (mean age of 49.20 years). The majority (58%) were in the chronic stage (more than six months since stroke) of recovery. Most of the participants (75%) experienced mild limitations in ADL and mobility acquired from their history of description to their state of condition, while approximately a quarter experienced moderate limitation in ADL and mobility. Just over half of the stroke survivors (58%) were recruited from the Outpatients Department (OPD) of the Educational Hospital Clinic.

During the interviews stroke survivors were asked about their current rehabilitation programmes and to describe their persisting level of limitations to give a general overview of their rehabilitation programmes and what types of exercises they had undertaken. The demographics are provided in Table 4.4.

Table 4.4. Demographics of stroke survivors sample.

Demographic characteristics of the stroke survivor participants					
Age	**N**	**Minimum**	**Maximum**	**Mean**	**SD**
	12	31.00	62.00	49.20	±10.71

Variables	**Categories**	**Count**	**Percentage**
Gender	Male	8	67%
	Female	4	33%
Age (years)	30-39	2	17%
	40-49	2	17%
	50-59	4	33%
	60 and more	4	33%
Department	Out-patient	10	83%
	In-patient	2	17%
Centre	Educational Hospital Clinic	7	58%
	Rehabilitation Centre	2	17%
	Specialist Hospital (Specialist Clinic)	3	25%
Stroke onset	Acute (0-3 months)	2	17%
	Sub-acute (≤ 6 months)	3	25%
	Chronic (≥ 6 months and more)	7	58%
Stroke Type	Left side/ischemic	4	33%
	Left side/haemorrhagic	4	33%
	Right side/ischemic	2	17%
	Right side/haemorrhagic	2	17%
Functional level *	Mild limitation in ADL and mobility	9	75%
	Moderate limitation in ADL and Mobility	3	25%
Note: * Functional levels were determined based on the Nottingham Extended ADL scale.			

4.5.2 Key themes

Three themes that emerged from the data collected during the individual interviews. The first emerging theme related to the stroke survivor's awareness and knowledge of MI and its benefits, and the importance of having therapists skilled and experienced in mental imagery (Capability). The second theme involved social influence or social norms, such as the stroke survivor's educational level or beliefs, and environmental enablement to use MI for instance, the provision of video and audio tapes (Opportunity). The third theme related to the professional's role in training stroke survivors to use MI, alongside the stroke survivor's beliefs in the treatment and its potential benefits, the setting of personal goals and feedback, and stroke survivor optimism, as a positive approach indicates a beneficial environment for recovery (Motivation), (see figure 4.5). Each theme is discussed sequentially below. For definitions of the themes, (see Table 4.5 and Appendix 4.15 codebook of stroke survivor themes).

Table 4.5. Definition of key themes for the stroke survivors semi-structured interviews.

Definition of key themes	
Themes	**Definition**
stroke survivor's awareness & knowledge (Capability)	This theme included stroke survivor's view about their level of knowledge and awareness of MI use in regard to its benefits and the importance of having therapists skilled in MI use. This theme fits within the COM-B framework concept of Capability for using MI and included how stroke survivor had a level of capability towards understanding the use of MI in rehabilitation.
Social and environmental factors (Opportunity)	This theme referred to the enabling or hindering factors within the individual's situation or environment that may impact on the engagement process: it could be social or physical elements. This theme fits within the COM-B model Opportunity.
Support and motivation factors (Motivation)	Support and motivation factors to use MI fit with the COM-B concept of Motivation and have been influenced by the stroke survivor's belief in the treatment and its effects, the setting of personal goals for recovery and the stroke survivor's optimism. It referred to the emotional and reflective behaviours that can help to establish a positive approach, which may indicate a beneficial environment for recovery. This is in addition to the professional role of the therapist in encouraging the use and instruction of MI within guidelines.
	These themes illustrated the importance of stroke survivors fully understanding the potential benefits of MI and how it can be applied to them as individuals. Once they have this knowledge, their motivation levels can be raised to provide an optimum environment for its implementation successfully. Further changes to behaviour can then be established for effective successful intervention.

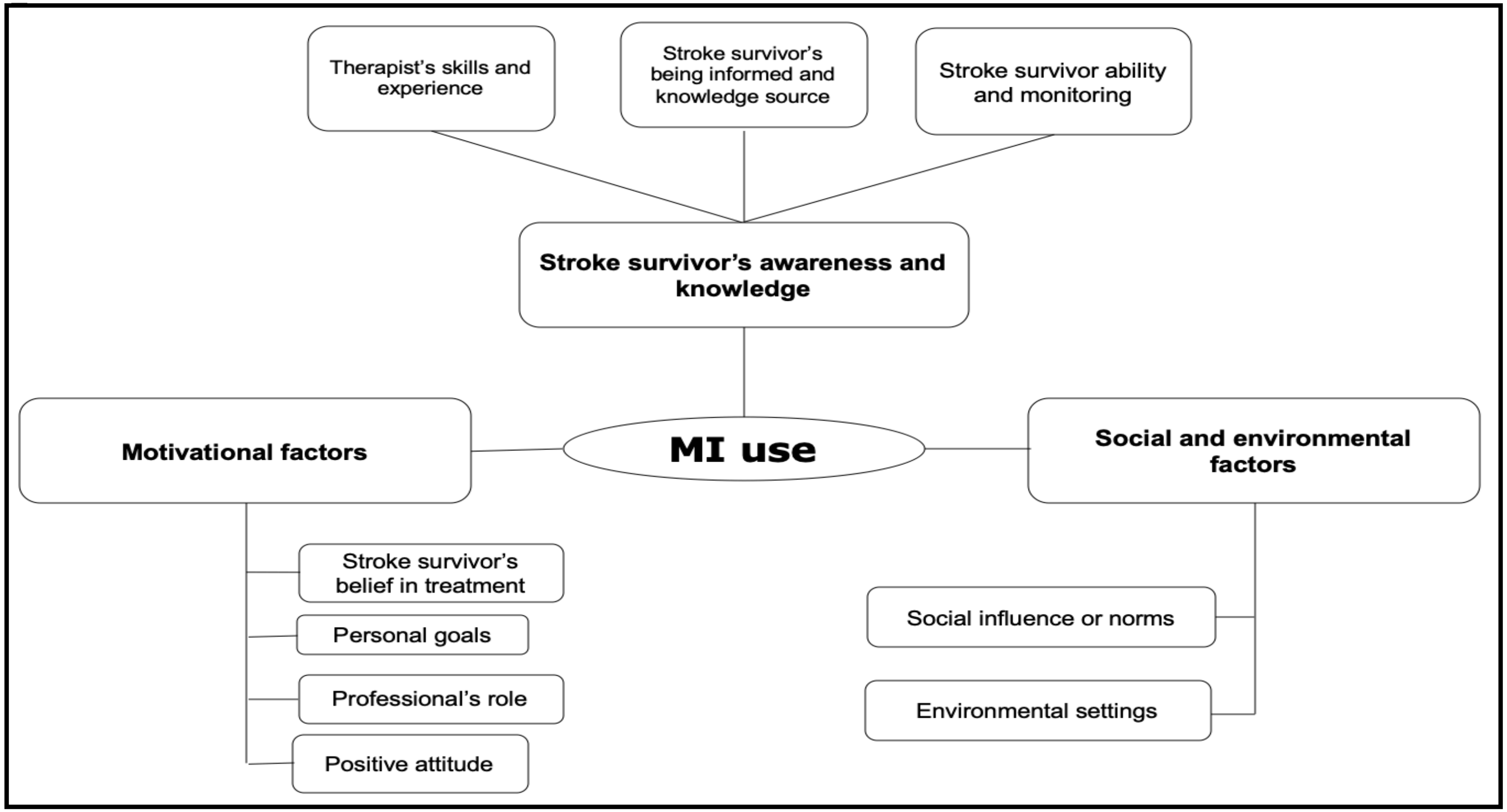

Figure 4.2 Themes and subthemes from the stroke survivors' interviews.

Theme one: Stroke survivors' awareness and knowledge (Capability)

This theme highlighted the importance of stroke survivors being fully informed about MI use and its' benefits. Furthermore, it underlined the impact of skilled therapists being able to follow guidelines while training patients on how to use MI. Three subthemes were identified under this theme that fit within the COM-B framework concept of Capability and related to TDF that could help assess and address behavioural enablement and therefore enhance stroke survivor's effective engagement in facilitating MI use in clinical practice. These enablement factors are: 1) Stroke survivor's being aware of MI use and knowledge relating to its benefits to them emanating from evidence-based sources (knowledge). 2) The skills of the therapist delivering MI and their experience (skills). 3) The stroke survivor's ability to practice MI effectively under supervision and with progress monitoring (belief and behaviour regulation) (see Figure 4.5).

Subtheme one: Stroke survivor's fully informed

Stroke survivors need to be fully informed of MI use and the evidence available to support its use but, as can be seen from the following participants, their knowledge was incomplete. Indeed, some had resorted to gathering information from on-line videos, books or family sources. Alternatively, they may have heard of MI but were not fully aware of how it could help them, especially as there was little information emerging from evidence-based resources. This was a strong indication that more knowledge and evidence-based information about MI and its benefits are required before patients can make informed choices about using MI.

> *"Yes, I know about it, and I've read about it in books, six years ago or more and from books my husband has learnt about it a lot, a lot about positive energy and imagination."* (PAT.11 pp. 12-17)

> *"I read, yes, I have watched YouTube videos."* (PAT.08 pp. 218-122)

PAT.11 had read about MI in books but that was six years ago, and much had changed in that time, therefore their knowledge may have been out-of-date. The participant mentioned positive energy but did not relate this to themselves or to any benefits that may be pertinent to them. Similarly, PAT.08 gained her knowledge from reading and also from watching videos, but there was no indication that experts were providing this information. These may simply be the experiences of other stroke survivors whose condition may not be aligned with PAT.08's situation. Additionally, within this theme two other important factors were identified that may have enabled the individual to use MI successfully. These factors related to the ability of the stroke survivors to engage in specific tasks or activities, and the therapist's ability to encourage stroke survivors to engage in such tasks.

Subtheme two: Therapist's skill and experience in MI use

The therapist's ability to encourage stroke survivor in the use of MI was deemed crucial to successful and effective implementation. However, therapists often lacked skills, knowledge and experience and were unable to guide their stroke survivors. There are currently no guidelines for training therapists' use of MI and there is also a lack of skilled and experienced MI therapists in stroke rehabilitation. Participants in this study discussed how the therapist might be both a facilitator and a barrier to enabling the stroke survivor to learn how to use MI and introduce it more widely in clinical practice.

According to the stroke survivors, they would feel more confident during rehabilitation if the therapist training them on the use of MI was experienced and followed guidelines for its use. It was suggested that there was a need to have someone who was trained and experienced in MI delivering the intervention and encouraging the use of MI, for its' effective uptake and use in stroke rehabilitation clinics.

> *"Yes, when she (Therapist) has experience, it's an excellent way of treating me, she can make me believe in myself and have confidence in her, there's a connection between me and her to achieve progress."* (PAT.11 pp. 98-100).
>
> *"I feel that if (therapist) encouraged me on imagining movements, it would help me more."* (PAT.02 p. 99).
>
> *"Months ago, she (Therapist) said, "You should try this. It's really good. It works, and you know, I've seen it, you know, with a lot of doctors before or therapists. They said, "You have to. It's all right. Try it."* (PAT.10 pp. 297-301).

> *"Yes, the therapist should be qualified to do this or I would not do it, and I should have training before doing* that." (*PAT.02 pp. 130-134).*

It can be seen from PAT.11's comments that they had confidence in their therapist and that they believed that the intervention was right and suitable because the therapist was knowledgeable and experienced. The participant was willing to try new therapies. PAT.11 believed they were working together as a team to achieve progress. However, PAT.02 did not have the same support from their therapist, even though they had a positive attitude towards MI; they felt that the therapist needs to be trained and so does the stroke survivor. PAT.02 would not have confidence in an unqualified therapist, however, PAT.10's quote illustrates how evidence of successful MI intervention and the therapist's encouragement can motivate patients to use it.

Subtheme three: Stroke survivor's engagement in MI use and monitoring

The ability of the stroke survivor to engage in MI training, due to cognitive impairment or difficulties with MI, was also raised as a concern, as it was felt this could hinder them in developing the required skills. This indicated the need for the monitoring of progress and follow-up feedback. Not only would this confirm the ability to image but would also to encourage stroke survivor to know support was available. The following participants commented on their limitations.

> *"For me it's numbers, I don't remember my date of birth, all my children's dates of birth, I have to ask about my mobile password I cannot remember it, and my medicine*

time, if nobody is sitting beside me I can take my medicine every 15 minutes, and I don't remember; especially old people, they always forget." (PAT.08 pp. 457-462).

"They should explain it to me with clear instruction so I can understand." (PAT.07 pp. 73-78).

PAT.08 reported that, her memory was not very good, and they needed help with remembering dates of birth, passwords and even the time to take her medicine. The participant commented that this was common in older people, but that it could also be a factor in stroke survivors of any age. PAT.08 mentioned that they needed to have someone around to help her/him and it was clear from their perspective that they might have had difficulty in using MI without support. Furthermore, PAT.07 needed to have everything explained in very simple terms so they could understand. It was likely that they too needed ongoing support to enable them to benefit from MI as described by PAT.07.

By adopting a follow-up and feedback iteration scheme, this meant that it is more likely that stroke survivors will continue with MI as they will feel supported and helped to overcome any difficulties, they may have in implementing the intervention.

Theme two: Social and environmental factors (Opportunity)

This theme featured two important factors related to the individual's ability and their surroundings, which could facilitate the effective delivery of MI. These factors fit with the COM-B concept of Opportunity and are related to the TDF framework which addresses behavioural enablement in facilitating MI use:

1) Social influence or norms e.g., common knowledge among society with elimination for externalities such as individual's belief in a taboo or a value. Further, may relate to stroke survivors' educational level, age or having someone with them in life (carer) in addition to taking into account the stroke survivor's transportation facility to and from appointments. 2) Physical and environment settings which included the availability of appropriate videos and facilities (e.g. a quiet room) and MI being used as a time-effective method e.g., requires less time in therapy or training (see Figure 4.6). These factors supported the possibility of stroke survivors being able to be trained in the use of MI. It is likely that these two domains from the TDF intervention functions within the COM-B model that are linked to Opportunity can help assess and enhance the use of MI.

Participants described different types of barriers and facilitators within this theme, related to social influence or social norms that may impact on their lives and decisions, for example, they would be less likely to accept MI training as a therapy with the belief or common knowledge that therapy must be passive and involves machines. Another stroke survivor may be more likely to use MI once supported and well informed by their carer or a family member or social community. Furthermore, there was an impact of the physical environment or settings and the availability of resources as to whether stroke survivors were willing to be trained to use MI. Personal qualities that a stroke survivor might possess (e.g., being educated or being self-dependant) that might enhance their use of MI, equipment or resources that may help in acquiring MI skills.

Stroke participants explained that when their education levels were poor or people were more dependent on their carers, especially those with older demographic features, there was less likelihood of accepting the concept of MI, especially where patients might never have heard of it or had the chance to experience MI. This suggests that some stroke survivors may not readily accept such new treatment strategies, compared to the more familiar passive treatments provided for example therapeutic strengthening exercises in the gym or therapeutic functional electronic stimulation. To overcome this barrier, the therapist's role was deemed important in explaining to the stroke survivor what MI use is and how they benefit from its training.

> *"According to their level…depending on their education and social community, we have to proceed one by one to let them understand."* (PAT.11 pp. 184-186)

> *"I see people, I see in the market and street, and in cinema and parking, no one is helping them, they only help themselves, depend on themselves."* (PAT.07 pp. 120-121)

From the participant's comments, PAT.11 explained that stroke survivors with lower levels of education, could find it difficult to understand what is required of them. This requires individual attention as stroke survivors are not sharing the same difficulties post-stroke and, accordingly, some may need more support than others in accessing MI. Furthermore, PAT.07 highlighted the lack of support for people, who may be struggling with daily life activities, and noted they may be left to depend on themselves with the absence of any carer support around them. They explained that the society and the community often failed to offer support to their healthcare services and illness needs.

Either negative or positive pressure from social norms including a person's beliefs, cultural and personal's values, may challenge any intervention process or an individual's decision making and acceptance of any new treatment that they undergo. However, well-informed research evidence and their demonstrations could power the acceptance and engagement for stroke survivors.

Participants explained that it would be useful to have equipment to demonstrate the techniques, such as videotapes and audiotapes to supplement the MI training. These could help stroke survivors visualise the effects of MI for themselves. Most participants agreed that the availability of such resources could help them use MI more frequently and more effectively. This factor was verified by the opinions of some participants, who clearly viewed this factor as an asset for improving their practice of MI. It was explained that the practical experience of using MI in clinical practice through relevant training for the therapists, as well as changing and modifying the physical and environment settings within treatment areas and centres that can help deliver MI training more effectively in rehabilitation. This participant would have liked to have videotapes to reinforce the training in MI use:

> *"According to the personality, visual, sensory or kinetic, I like to see and listen, visual and oral, yes, the video will speak, right? Yes, this is both visual and oral, and she will illustrate." (*PAT.08 pp. 304-314)

> *"If there is a video I can see."* (PAT.03 p. 129)

There was clearly a need for some sort of provisional instructor instruments such as visual stimulation or audio stimulation to encourage and reinforce training in MI intervention. This reflected the way in which people learn as it covered learning styles. PAT.11 wanted reassurance that the instructions would include sound and PAT.03 was particularly interested in the visual aspect. However, the environmental context and resources were dependent on the facility and organisation offering the health care services; this may hinder the acceptance of MI in the case of the stroke survivor's rehabilitation programme.

Theme three: Support and motivation factors (Motivation)

This theme captured factors necessary to change intervention behaviour required for using MI and was an important component of the COM-B model in terms of facilitating change behaviour. In this theme, the stroke survivor's belief in the treatment and its benefits was considered important; this was also one of the TDF domains linked to Motivation behaviour.

There was a focus on setting personal goals for recovery and the patient's optimistic outlook. Furthermore, the therapist's role was believed to be an important factor in instructing MI use (see Figure 4.5). These factors could help create a positive approach to indicate a beneficial environment for recovery. Furthermore, it was believed likely to enhance a stroke survivor's motivation in using MI more frequently.

Subtheme one: Positive attitude and confidence

Firstly, positive emotions (e.g., positive attitude) and confidence may motivate the stroke survivor to strive towards greater recovery. Stroke survivors revealed the importance of establishing, achievable goals to enhance recovery. In addition, there were suggestions from participants that their belief in their abilities and the benefits that they could obtain from rehabilitation could affect their recovery. Moreover, the belief that MI could affect feelings of happiness, alongside improving confidence and motivation, was expressed frequently. Although compounded by age, confidence needed to be addressed and as PAT.08 noted, MI could assist with this. The participant gave an example by linking the confidence loss to an older person falling, unlike a child who bounces back. The participant was also excited, as it was a new intervention that gave her hope.

> *"When you're old, and you fall on the ground it is different from a child falling, but if there is confidence everything will change."* (PAT.08 pp. 567-568)

> *"I think first it improves confidence."* (PAT.08 p. 559)

> *"I am so happy because it's new and she (Therapist) will do something new. Yes, I'm so excited."* (PAT.08 pp. 218-122)

Other participants were optimistic about MI and clearly saw it as having the potential to increase motivation and positivity:

> *"Motivation is the most important thing, it makes you believe and trust in imagination, what is the motive if it's all positive it will change your mood, and it will make you optimistic."* (PAT.11 pp. 346-348)

> *"I feel optimistic to do some imagery, it could be effective, with God's will, I, will improve, for sure*." (PAT.02 pp. 170-80)

As seen above, PAT.08 was excited about the potential of MI and both PAT.08 and PAT.02 showed a very positive attitude towards imagery. This could indicate that there was already motivation involved and these stroke survivors believed that using MI would help them improve.

Subtheme two: Therapist's and family's role

Stroke survivors expressed the importance of having a therapist to encourage, support and guide them in using MI more effectively. They also acknowledged that very few therapists had offered the use of this technique. A professional was deemed an important 'enabler' to facilitate and guide MI training. These participants had not had any advice or guidance about MI

> *"At hospital nobody asked me to do this to improve my movement. "(*PAT.01 pp. 50-54).

> *"No therapists have told me about MI, and I have not been encouraged by them to do it."* (PAT.09 pp. 32-33).

Neither PAT.01 nor PAT.09 had received any advice or support from the therapists or hospital about the potential benefits of MI. Yet other participants had received support and encouragement from family members:

> *"I and my husband read a lot, he does the mental imagery training, I always imagined positive things, and he's always optimistic... I gain my strength from him…I can now stand on my legs, I didn't think negatively, I was always in bed but thinking positively in my mind started to*

> *help me with this positivity, and thank God I now can walk and can move better than before*." (PAT.11 pp. 274-82)

PAT.11 had benefited from the support of her/his husband, who had put himself in the position of a therapist, reading about MI and learnt the technique. The participant commented that they had always had a positive attitude and her/his husband had been optimistic about their recovery. The participant believed that MI had helped them regain their mobility and they attributed this to positive thinking. However, without the support of someone else, their husband in this case, it may not have had the same positive outcome.

Subtheme three: Stroke survivors' belief

In addition to having the support of family members or rehabilitation professionals, MI use and training was also seen to be influenced by the stroke survivors' belief in the therapy they underwent. Engaging in training, having positive feedback and seeing the results could help enhance recovery. For example, in stroke survivors who had used this technique, there was a belief that practising MI had been useful, that it wasn't too difficult to do and that practice improved confidence. In contrast, believing that a specific intervention or training was of no benefit, or unnecessary, may result in a loss of confidence and negative attitude towards the intervention. The following participant had a firm belief that MI had helped them and would not have improved without this intervention. Psychologically, they felt hopeful that they would return to their pre-stroke job.

> *"Some people lost faith in the training when she came more than twice, and there is no improvement, in coming*

here for 2 years, I'm telling them that I'm better now, and if I didn't come here, I was not going to improve. I want to go back to my old life, want to go back to my work, it stopped me from teaching, they transferred me to administration work, but I want to go back to my students, I don't like sitting at a desk." (PAT.08 pp. 541-551)

Subtheme four: Personal goals settings

Having a stroke can be life changing but PAT.08 discussed her determination and positive attitude, which meant that they could see signs of improvement. These may have taken a long time to happen, as this is a slow process, but they remained optimistic and still had sight of her/his goal, to return to the job they had before her stroke. Having strong personal and achievable goals, related to attaining stroke recovery outcomes or prompting a positive attitude, promoted active and positive behaviour to engage successfully in rehabilitation. This suggested that setting personal and achievable goals may help enhance motivation for MI use and stroke recovery.

> *"Did find it actually effective. Yes, I like, about it that I actually saw the improvement. So, I like it somehow."* (PAT.10 pp. 587-594)

> *"When I imagine it helps me to make my mood better." (PAT.07 pp. 148-155).*

> *"When I imagine that I could move my hands, this would make me relaxed and happy."* (PAT.09 pp. 186-191).

As PAT.10 noted, seeing improvement could make a difference to continuation of the intervention. Not only did it help them physically, but also psychologically, as they commented that it improved his/her mood. These findings illustrated how MI had the potential to work at a psychological as well as a physical level following stroke. For instance, PAT.09 spoke of how it made them happy and relaxed just to imagine they could move their hands. It provided hope and had an impact on their mental wellbeing.

4.5.3 Summary of results

For the factors enabling the Capability, Opportunity and Motivation concepts of behaviour within the COM-B model to work, several intervention functions need to be present. It was found that MI intervention use could, include education (being fully informed), persuasion (raising positive feelings), coercion (creating a time-effective therapy that could be applied outside clinics), training (workshops), environmental restricting (modifying settings), modelling (monitoring) and enablement (encouraging).

In this data, 'Capability' behavior was influenced by several factors, such as stroke survivor's awareness and knowledge sources; therapist skills, and the ability and attributes of the patient. Enhancing education, training and patient monitoring of these functions could help implement MI in stroke rehabilitation. These examples of enablement suggest potential routes and mechanisms for promoting the use of MI in clinical stroke rehabilitation.

Regarding 'Opportunity', it was suggested that the use of MI might be enhanced by environmental and contextual factors in the surrounding setting, including social influences and norms; and the physical environment which could help promote the desired behaviour change in people who survived strokes and therapists providing stroke rehabilitation. Modifying existing environmental settings and providing quite rooms equipped with visual and audio aids could help MI be used as a time-effective technique, and enhance its training, which could be key functions for MI intervention implementation.

Finally, 'Motivation' included several factors that might influence behaviour and facilitate the uptake of MI: the stroke survivor's belief in the treatment; personal goal setting; the therapist's role and family support. Optimism could be created by the therapist encouraging MI use and enhancing positive feelings, this will help improve intervention delivery.

In general, it was observed that participants were very optimistic and motivated to use MI to help them recover. They acknowledged the potential benefits of MI in their recovery but wanted the techniques to be taught by an experienced therapist who could encourage and guide them in its use. These findings highlight the importance of stroke survivors fully understanding the potential benefits of MI and the need for individually tailored training programmes with clear goals. Once stroke survivors understood the value of MI and its potential to aid their individual recovery, motivation levels could be raised providing the optimum environment for teaching and learning and clinical implementation (i.e., training them to use in clinical practice).

Understanding the potential for novel rehabilitation interventions such as MI to be introduced clinically from the stroke survivors' perspective could help to identify and address potential barriers to implementation and assist therapists in planning treatment. This could also encourage engagement and reinforce stroke survivor' beliefs in achieving their goals.

Although MI use was presented as novel, no barriers that couldn't be overcome were recognised. The factors that were perceived as barriers were no different to any other therapy type of physiotherapy or occupational therapy (e.g., access, instructions, education with support of a carer).

Results suggested that stroke survivors were opposed to therapist's views in using MI, taking in consideration that patients are more self-motivated, keen to recover and looking for solutions for their problems and so are their carers. Stroke survivors may be more prone to actively directed therapies and may looking for any information that helps to lead them to therapies and recovery solutions. MI was not an unfamiliar concept to stroke survivors, rather, one that they had already explored with family members independently or friends, with the hope for the potentials to introduce such a technique with patients.

4.6 General discussion

4.6.1 Interpreting the findings

The main aim of this study was to explore the points of view and insights of therapists as well as stroke survivors in Saudi Arabia regarding the use of MI in stroke rehabilitation. It aimed to identify the factors affecting its’ use in clinical practice. The therapists in this study had been in practice between four years and 20 plus years, and the stroke survivors interviewed were aged between 30 and 60 years. Most were at a chronic stage in their recovery and had been receiving rehabilitation for more than six months. The results of the study cover mostly the Eastern province out of the 13 provinces, for that the findings cannot be generalised across all of Saudi Arabia.

A key finding from this study was that the stroke survivors were more receptive to MI use than therapists realised. They were looking for solutions to recovery and willing to try anything, as well as willing to give things a go and try out new therapies to help them recover. Clearly there were more opportunities to utilise the benefits of MI in stroke rehabilitation and recovery than previously considered, and therapists should be trained to do so. Therapists sought to obtain more guidance on how to overcome barriers presented with MI use and stroke training.

Enablement factors for MI use were highlighted by many therapists as a new approach in rehabilitation in Saudi Arabia, however the value of its’ use, and the necessary strategies for its future implementation in stroke rehabilitation were still lacking and not explicitly clear. Therefore, updating relevant MI knowledge, skills acquisition, regarding MI use training, which is currently lacking in literature, could assist in using MI more effectively in stroke rehabilitation. Furthermore, recognising facilitators that might enable MI delivery in clinical practice that includes improving the practice environmental settings and acquiring up to date professionals’ training. This notion is reinforced by Walshe’s (2002) report, which highlighted the importance of identifying factors for successful implementation of interventions in the healthcare field such as improving skills of professionals, availability of space, provision of equipment and monitoring patients during treatment. Additionally, findings suggest that, during rehabilitation, stroke survivors would feel more confident if the therapist training them on the use of MI was experienced and followed guidelines for MI use. The findings suggest that it is essential to have someone who is trained and experienced in MI delivering the intervention and encouraging the use of MI, for its' effective uptake and use in stroke rehabilitation clinics. The COM-B proposes that the following interventions should be considered (Bartholomew et al., 2011) for training the therapist: CPD for updating skills, training courses, and the availability of workshops. Therapists should encourage and support MI training, and the lack of knowledge about the intervention and not enough expert therapists had disadvantaged stroke survivors from MI use in Saudi Arabia. Yet other participants had received support and encouragement from family members. Once these factors are in place, initiation is needed in regard to strategies and developing guidelines for clinical practice to help implement these interventions (Aljojo, 2017; Davis & Taylor-Vaisey, 1997).

The therapists involved in this study were generally positive about the benefits of MI and reported that it was potentially effective, especially for stroke survivors within the age range interviewed. However, most therapists were taught very little about MI as part of their clinical training, which meant they lacked the knowledge and skills in using it. Concerns related to their clinical reasoning, decision-making, and behaviours that guided their beliefs during their work with patients. It was noted that more education was needed for entry-level practitioners and continuous professional developmental programmes alongside the re-structuring of environmental settings to help enhance MI training and guidance into its use.

These findings are in line with several studies that have looked at this issue including both professional developmental skills, and environmental settings in relates to successful implementation of interventions (Iles & Davidson, 2006; Jette et al., 2005). Salbach et al. (2007) investigated to identify therapists' different levels of barriers that impacted on their judgments in physiotherapy implementation EBP for stroke survivors' rehabilitation. The authors in the study approached 270 physiotherapists providing health care services to stroke survivors, through a postal survey in Canada, their findings identified factors impacting physiotherapist-implementation of EBP in current practice this included both personal barriers (e.g., education, perceived role, and confidence) and organizational barriers (e.g., support and resources). The findings showed a lack of education, poor awareness in research relative to their physiotherapist role in EBP, as well as lack of confidence in applying EBP in practice.

Other barriers were related to organizational levels such as limited access to online resources, and inadequate expertise in the field or poor support of experts in the field. These barriers made it difficult to enhance research use by clinicians.

The findings from this study shows that for experienced therapists, some of the crucial factors that enable the effective implementation of MI use at clinical level includes professional training courses as well as workshops and consultations with experienced MI trainers and specialists in MI training, to offer the therapist enough exposure in specialist settings, knowledge in training and proficiency to practise MI confidently and effectively. Examining different challenges, considering the position and emerging opportunities within practice as well as broadening the role of therapists in research and public health, may help to progress skills in the profession. It may also be useful to promoting intervention plans such as training on the use of MI, which are essential for the therapist's confidence in delivering interventions in practice (Bright et al., 2015).

Additionally, once their knowledge and competence includes adequate clinical skills and training, then confidence in the professional use of MI can be established (Wijbenga et al., 2019).

Additionally, another important finding in this study was that therapists often pointed out that the stroke survivor’s attributes were a primary factor in pursuing active MI engagement. Stroke survivor’s attributes can include (e.g., their health conditions, stroke survivor’s ability to image and stroke’s severity). Therapists were unsure whether stroke survivors would be receptive to MI, especially those who were used to more passive rehabilitation techniques. This belief deterred the therapists from attempting MI therapy with their stroke survivors. According to Braun et al’s (2010) framework, which gives an overview on how MI may be integrated with physical exercise with stroke, successful engagement in therapy needs to undergo an essential screening process of the patient’s capacity prior to MI training using clinical judgment to determine whether the patient has adequate mental capacity to engage in MI. The authors suggest various attributes within stroke survivors that could deter MI training. These limitations included impaired divided attention, poor working memory and reduced motivation, which are essential for following the therapist's instruction directing the process of imagery training. They also explain, as with any other interventions that during therapy the stroke survivor should be active and able to participate in the rehabilitation activities for at least ten minutes. This is also based on findings from Malouin et al. (2004-b) which report a relationship between stroke survivors' memory and MI training and their effect on their motor improvement after training and follow up.

Malouin et al.'s (2004) findings support the view that controlled information in working memory helps sustain mental practice ability and therefore improves outcomes. The study also reported that therapists listed some attributes that may act as barriers to the patient completing their therapy, such as pain, depression, and cognitive impairments. However, Bright et al. (2015) and Lequerica et al. (2009) identified that the therapist plays an essential role in stroke survivor engagement by constructing the process around the stroke survivor's abilities and planned goals. The findings of this study also suggest that goal setting is an essential motivator during rehabilitation and MI training. Therapists highlighted the importance of setting goals within the plans delivered to the stroke survivors and how setting a goal can help motivate the stroke survivor in recovery, if the delivered therapy is effective. Both therapists and stroke survivors in my study believed that setting achievable personal goals pertaining to the stroke survivor's needs may help motivate further recovery and engagement during MI training.

Stroke survivors might differ in needs, in that some may have mild disability or undergo a short inpatient stay, which differs from the needs of a stroke survivor, for example, with an acute onset, severe permanent disability or those with chronic or progressive disability admitted from the community. This in return, may impact on the processes for goal setting and on outcome improvements. This in line with Playford et al.'s (2000) study exploring views of 16 staff from different settings (e.g., therapists, nurses and doctors) working in a variety of rehabilitation settings on the goal-setting process, through a goal-setting workshop venue. Their views revealed that goal setting was a very satisfactory process for the professional team but needs to acknowledge the patient's needs to achieve further success in outcomes. Parry (2004) identified physiotherapy goal setting in stroke rehabilitation settings, through the method of analytical conversation reading of video-recorded treatment sessions with 21 stroke survivors and ten physiotherapists. The findings suggest that goal-setting processes were infrequent in the rehabilitation programmes and failed to maximise patients' involvement within these. It is essential those patients get actively involved in goal setting, and that the goals need to be appropriate, realistic and measurable to help achieve progress and recovery in rehabilitation (Wade, 2009). Further, there is a need to encourage goal setting, as this may contribute to improving practice, guidelines and education. Goal-setting is a primary plan for action and one of the most important points in MI use that motivates the individual's performance to the desired movement, and helps simulate the pictured ideal approach of the intended effort of the task.

Another key finding from this study was that some stroke survivors underwent treatments to help them in recovery that were only available at that time, by way of usual clinical care in rehabilitation within the context of healthcare provided services. These available treatments could have included strategies of Bobath and PNF concepts, in addition to the application of electro therapy, thermal therapy and hydrotherapy mainly considered as therapies that require patient's passive engagement only (Higgins, 2008). Unlike other therapies that require a more active role from the patients such as strengthening therapeutic exercises and cognitive based strategies which include action observation and virtual reality therapy.

The findings from this study suggest that stroke survivors were in favour to more therapies including the therapist handling them where they are the passive recipient in the session such as undergoing a session of electro-therapy, hydrotherapy or thermal therapy.

However, there were a few stroke survivors who were driven more towards self-management, where they were keen to investigate other options for therapies besides the conventional ones. They explored their options through accessing online resources, which involved them being more active and independent such as training in MI. This is in line with a study by Elwyn et al. (2012) that reported that shared decision making can exist within three steps of their applied model, and this could help guide therapists and clinicians in addition to the healthcare providers or care centre into considering what matters the most for patients when making choices and preferences regarding supporting interventions. These steps included Choice talk;

informing the patient about the interventions options that are available and Option talk; a supportive atmosphere for treatment discussions. The last step covers Decision talk, which refers to supporting preference and deciding what is the best of the available interventions. The authors have reported what were meaningful and acceptable as treatment concepts from a patient's perspective. Patients are mostly familiar with having a passive role in care, rather than being involved in discussion that can involve the process of decision-making regarding types of treatments available to them. It is important to note that, according to this study and reported findings, decision-making plays a key role in patient's engagement and the success of the intervention to enhance better outcomes of recovery.

Therefore, the findings need to be communicated to therapists, hospitals, and with patients who are willing to use MI in the future, as well as to the training programmes instructors delivering professional education for therapists. The support of the hospital or care centre is also necessary for success. Beliefs, attitudes and behaviours (Epstein and Paters, 2009) can positively impact through proper diffused publicized information (evidence-based) and health promotion marketing for health awareness and advertising though channel into healthcare organisations and services.

In summary, therapists must feel confident in their MI training by expanding their knowledge, skill and gaining more experience in MI use. They need to understand the benefits of MI use, have the support of their workplace, and believe that the stroke survivor is receptive to treatment, in order to implement the treatment successfully. Both the stroke survivor and the therapist must perceive the set goal as achievable. It is suggested that the mind-set of therapists need to change if stroke survivors are to benefit from MI treatment.

4.6.6 Strength and limitation of the study

The study has several limitations including available time and ethical considerations. In terms of time, recruitment and data collection needed to be conducted within three months on site in Saudi Arabia due to practical issues such as student's visa retention status. This may have created a built-in bias as the nature was to recruits therapists who knew something about MI in general, rather than those experienced in its use. There were also few therapists available with any knowledge of this intervention.

Similar to the therapist issue, at the time the study was conducted, the participating facilities were running low on stroke admissions, specifically, the third facility from which only two stroke survivors were recruited. Most of the participants who agreed to take part had heard of MI but had not used it or experienced it in rehabilitation settings. It may be that a different sample may have included more participants with experience of MI in their rehabilitation, thus, rich data much better insight into MI may have been gained.

Time restriction in obtaining ethical approvals from Saudi facilities and their ethics committees was a limitation to up taking this research, resulting in delays. The studies were also carried out in two languages, English and Arabic, therefore allowing time for translation, and data analysis proved challenging.

These factors affected recruitment of a larger sample size in the study, limiting the amount of data and generalisation to a broader population, which may reflect actual experience (Rahman, 2017). This study mainly focused on the experience of MI use rather than the cultural context. However, culture influenced the data collection resulting in fewer representative responses in both samples. The research was conducted in the Eastern Province of Saudi Arabia, which is very diverse, both culturally and socially. Results may have differed if carried out in other more central regions of the country and different complex health care systems. Although, the data collected could have reflected response rates from cultural and social variations yet, the data has reproduced responses that are representative samples in ingenuous communal health care facilities that empowers a sample into being more reflective towards a higher reasonable rate than the ones produced from central regions with a more complex facility and a less diverse culture. This could help the research become more factual and consistent with what the cultural and society beholds and produces more balanced and variable views as possible.

Data triangulation was applied at several levels while conducting the study to warrant validity, in terms of involving another researcher's coding match up, and mapping of the findings to the COM-B framework. However, bias can occur during data synthesis or data collection stages. Validity was ensured in this study, in the data processing stage, by repeated data refining and coding, cross-referencing with another researcher's coding, checks in applying code mapping, and accuracy checks for underlining the reflective themes into an existing framework.

4.6.7 Clinical practice implications

The findings can be used to inform the development and improvement of MI protocols, frameworks, and guidelines for professional therapists and healthcare teams involved in stroke rehabilitative programmes. In order to help implement MI in stroke rehabilitation in Saudi Arabia, there is a need to establish training courses that offer instruction on how to deliver MI technique in clinical practice. The training needs to cover patient attributes that can help or hinder MI treatment (Krakow & Zadra, 2006). Assessment tools need to be available to evaluate patient level and capacity of MI training and progress, in addition to providing instructive visual and audio guides to help train MI and be able to make modifications to the training environment and context of delivering MI in healthcare services.

Social influences including education, age, community and the cultural context, may also play a role in stroke survivor's beliefs, as acknowledged by Horne (1999). Thus, the environmental settings and social factors need to be supported to help enhance the patient's engagement in MI use. Appreciating and understanding the potential benefits of MI in stroke recovery may motivate stroke survivors, since a positive attitude provides an optimum environment for learning and MI implementation. This could be rectified through social marketing and public health care awareness campaigns. Therapists must also have the support of their workplace and believe that the stroke survivor is receptive to treatment.

According to Griffiths et al. (2009), who discussed the integration of health and social promotion through the effective use of resources and the impact of intervention on health and recovery, great value may be provided in applied health practice through further health awareness marketing and publicity.

4.6.8 Research implications

Research should explore psychological improvement and benefits from MI training with stroke survivors, for example its impact on self-esteem, confidence, positive attitude and mood.

Future research should further explore the use of MI with therapists who have used MI in their clinical practice, such repeating this focus group study with more experienced therapists who have experienced the effective use of MI in stroke treatment. Consequently, this may enable researchers to construct a solid MI clinical training basis that comprehends an approach of conceptualised practical guidelines, rather than assumed theorised principles. Evaluating the most effective way of training therapists, studies that measure the effectiveness of implementation strategies e.g., clinical observations and clinical opinions among experts of therapists representing MI in the field of stroke rehabilitation could provide crucial clinical evidence and identify limitations and strengths that are vital to contribute to the success of MI training in practice.

Finally, the findings have informed the development of a Delphi survey, presented in Chapter Four, to develop best practice guidelines for healthcare professionals involved in delivering MI in stroke rehabilitation. This study could be used as a basis for promoting therapists’ knowledge and skills in using MI and training in its use. Additionally, stroke survivor' attributes and facilitators to successful delivery, including motivational and social and environment factors, can be further explored.

There is a need for therapists in clinical settings to promote their levels of awareness and knowledge of research relating to adapting evidence in their practice. Additionally, therapists need further training in evidence-based practice interventions. Moreover, the findings suggest that lack of intervention integration through EBP is mainly due to readiness of prevalent knowledge which is provided though many bodies to the professions, for example the Saudi healthcare educational body which continuously provides training courses and professional workshops, but in some cases the lack of availability and delivery to theses training topics, can be due to not having enough experts in the field to help deliver these prevalent innovations at the moment. As well as absence in developing skills of research in evaluating the given evidence concerning interventions such as MI use (Eraut, 2000).

This issue is critical and needs to be furthered explored, to help prime and develop a culture of research and a multi-disciplinary research environment and to cultivate this within the field of a healthcare educational body to improve knowledge in Saudi Arabia.

4.7 Conclusion

It is important to recognise views, attitudes and behaviours towards the use of MI since it helps therapists to better understand MI and its potential benefits to stroke patients. Appreciating the potential benefits of MI in stroke recovery may motivate stroke survivors in its use since a positive attitude provides an optimum environment for learning and implementing MI.

Despite the methodological limitations of the study, it is the first to provide valuable insight information into how therapists in Saudi Arabia perceive MI use. Furthermore, the study provides a starting point for researchers to examine barriers to clinical implementation of MI in stroke rehabilitation.

Chapter Five:

A Delphi Survey;

The Use of Mental Imagery in Stroke Rehabilitation

5.1 Introduction

This chapter presents the results of a Delphi survey; a consensus process to inform the development of best practice guidelines for MI use in stroke rehabilitation clinical practice in Saudi Arabia. It includes a brief description of the approach to the Delphi study, including a general definition of the Delphi survey, and the advantages of using this technique. The chapter then describes how the Delphi survey was conducted, the criteria for participant selection, the location and timescales. An overall summary of the findings is provided, alongside a discussion of the process and findings in relation to the existing literature.

5.2 Aims

This Delphi survey aimed to establish best practice recommendations for MI training and clinical implementation based on expert opinion. Additionally, it set out to identify, a) the skills and training therapists need for enabling MI use, b) the equipment required to facilitate the use of MI in stroke rehabilitation, c) the attributes stroke survivors need to engage successfully in MI, and d) the minimum standards required for training therapists in MI for use in stroke rehabilitation.

5.3 Methods

5.3.1 Technique type and aims

A modified Delphi technique was used to meet the study’s aims (Keeney, McKenna & Hasson, 2011; Williams & Webb, 1994-a-b). This differs from the classical Delphi technique in that it involves a focus group discussion in round one. In this study the first round of the Delphi was replaced by findings from the two earlier studies in this thesis; the first was the systematic review and the second, the qualitative study including four focus group discussions with therapists and 12 stroke survivor interviews both conducted in Saudi Arabia. The data from both studies helped inform the construction of the Delphi, to obtain the opinions of experts on the use of MI (Keeney et al., 2011; Walker & Selfe, 1996).

5.3.2 Formulation of Delphi Statements

Findings from the literature review (Chapter Two) and the qualitative study (Chapter Three) highlighted the importance of having best practice guidelines for implementing MI in clinical practice. This study aimed to establish key factors and a rationale for their use in implementing MI in clinical practice based on a synthesis of the findings from the two studies. The findings were used to formulate assumptions about items essential for training the therapists and implementing MI in clinical practice, which were subsequently verified by a panel of experts. See Appendix 5.1 for an example of the Delphi survey.

Synthesised data extracted from the TIDieR checklists for studies included the systematic review were examined and crossed referenced with existing literature/other published systematic reviews. The data included the ‘how’, ‘when’, ‘where’, ‘what’ and ‘why’ TIDieR items that are necessary for implementing MI in practice. These items were then grouped under a series of headings concerning MI use and implementation and drafted into a comprehensive list of statements. The themes from the therapists’ focus groups and the stroke survivor interviews were then cross referenced with the data from the systematic review and the statements were refined in discussion with the supervisory team to form the survey.

5.3.3 Ethics

Ethical approval was obtained from the University of Nottingham Medical School Ethics Committee (Ethics reference no. 102-1809). See Appendix 5.2 for a copy of the IRB-Nottingham University Research Ethics Letter.

5.3.4 Participants

Email invitations to participants in the survey were sent to local, national and international experts in the use of mental imagery in stroke rehabilitation clinical practice or research (sample of 20 participants). Invitations were also sent to professional specialist interest groups in the UK, namely the Royal College of Occupational Therapists Specialist Section in Neurological Practice (RCOT-SSNP) and the Association of Chartered Physiotherapists in Neurology (ACPIN).

The experts included researchers (authors of published MI trials) or healthcare professionals including therapists and clinicians (e.g. physiotherapists and occupational therapists), who had used or instructed others in the use of MI with stroke survivors. The panel of experts had to meet one of the following criteria:

- A health care professional of any nationality, with local or national expertise in the use of MI in clinical practice for the rehabilitation of stroke survivors.
- An academic of any nationality who had conducted research or published scientific papers on the use of MI stroke rehabilitation within the last 20 years.

The selection of participants who are experts in the research field is recommended by Goodman (1986) and Adler and Ziglio (1996).

If any members expressed interest, an email with information sheet (see Appendix 5.4) and consent form (see Appendix 5.3) was sent to the participant. Concerning the systematic review authors, the first author was invited to participate in an invitation email but, if they did not respond, the second or the following author in the paper was contacted, to help identify the address of the targeted author. Attempts were also made through different media channels such as Research Gate and LinkedIn to help identify and approach suitable authors.

5.3.5 Data collection

Data was collected using two methods. In round one, a Word document attachment and a link to an electronic survey on the Online Questionnaire Platform (OQP) were used. This ensured efficient and timely data collection from a national and international pool of participants. For rounds two and three, only the Word document was utilised to allow individualised responses from each participant. This approach was adopted as it made it possible to individualise the survey for each expert and enable the experts to see and compare their ratings.

5.3.6 Procedure

The Delphi study started in October 2018 was completed in March 2019. Three survey rounds in total were completed until consensus agreement was achieved. Upon completion of each survey and following data analysis, feedback on the results from the previous round was provided to the panel in each subsequent round and new comments were viewed. As a result of new items being either generated or reworded if necessary and added to the subsequent survey to reach consensus (Sinha, Smyth & Williamson, 2011).

The participants were asked to complete the survey in each round of the Delphi. Reminders were sent each week over a period of two to four weeks for each round. Each round closed data collection at a maximum of five weeks after dissemination. This allowed time to clean the data, ensure all statements were completed, and confirm that all participants had completed the survey before data analysis, as proposed by Dillman (1991). In cases where participants experienced unforeseen circumstances and required extra time to finish the survey, extension of deadlines were planned, timed and assigned to them again if needed.

5.3.7 Analysis

Consistent within previous Delphi studies, the level of consensus was determined using a cut-off score of ≥ 70%, (Phillips et al., 2013; Fisher et al., 2011; Akins et al., 2005).

The analysis involved summarising the demographic information on the experts' knowledge, such as intervention knowledge, understanding of MI settings, patient engagement in MI use, and location/time of using MI. This was in addition to the group of statements in the survey.

Once the responses from the participants were received, statements were validated using a percentage cut-off score. Statements reaching consensus were removed, while statements with below the consensus level were circulated in the subsequent rounds to achieve consensus.

Additionally, consensus was established by combining scores of 'very important' and 'important' and combining 'somewhat important' with 'not important'. To observe the level and extent of importance of individual items, a classical normal distribution or a frequency distribution of responses to describe the item was followed (Sullivan & Artino, 2013).

All comments obtained from participants in each round were reviewed and revised. If any of the experts' comments suggested an additional item for MI use, a new item was generated and added to the following round. Newly generated items were those believed to be important by the experts or, which they might have used in clinical practice but that were not previously included in the Delphi. Adding these newly generated items in the following rounds, helped direct future thinking beyond the current knowledge of MI. This helped to improve the reliability and validity of the study by producing new knowledge from the experts themselves.

In rounds two and three, written feedback was sent to each participant, summarising the findings of the previous round.

Any returned feedback from the participants regarding the report was reviewed and discussed with the supervisory team. This process is recommended by Fitch et al. (2001) to ensure validation of the data.

Participants received the feedback either with the following round or before commencement. For the final round, the survey was sent a month after the feedback report was written. The topics identified informed recommendations in the report. In addition, the reflections and comments were gathered from the expert panel at a later stage. To finalise the Delphi process, the panel members were asked to address their contribution with thoughts and comments regarding the process, which informed the final written report.

Completion of the survey was satisfied once consensus of 70% or more was reached, otherwise more rounds were conducted (see Table 5.1 for a summary of the data analysis). The results from the Delphi's rounds were not mapped to the COM-B model, as was done with the qualitative data obtained from the focus groups and stroke survivor interviews. Data analyses was conducted on University of Nottingham (UoN) computers and backed up on the UoN secure servers.

Round one survey

The use of pre-existing information in this modified Delphi technique was advantageous in reducing time during the survey rounds (Crisp et. al., 1997; Jenkins & Smith, 1994).

During round one, three themes were identified from the qualitative study. These were 'improving the therapist's knowledge and skills', 'patient engagement' and 'delivery of MI'. The survey was arranged in the following order: section one was a brief summary of the Delphi process; and section two included demographic information, such as professional degree, years of post-qualification experience, specialism and years working in stroke (this data was to aid the description of the participants and contextualise participants' responses). The final section included statements related to MI intervention knowledge and how to improve therapist's skills and experience in delivering MI in stroke rehabilitation. This was in addition to other statements about the necessary attributes of stroke patients to enable them to use MI.

Each statement involved several items that required rating on a 5-point Likert-scale, which was either numerical, such as '1, 2, 3, 4 and 5', or textual. The importance of using a 5-point Likert-scale in the Delphi technique is to help facilitate respondents to reach consensus (Hsu & Sandford, 2017).

For example, participants were required to select one response from the following (5) Very important – essential item to include in recommendations, (4) Important – necessary item to include in recommendations, (3) Neutral – potential consideration in the recommendation, (2) somewhat important – item to be re-viewed and re-evaluated, if it is to be included in recommendations, (1) Not important – discarded from recommendations. Items rated three or below were placed in the following round to reach consensus, items with low importance were not reported in the recommendation list.

Participants were asked to review and rate 116 items within 13 statements. Statements were related to the therapist's knowledge of MI and their experience of delivering it; the instructions and/or demonstration that might help patients use MI effectively; assessment tools, time for using MI; application (how to instruct MI) and delivery; MI frequency (how often MI used); MI intensity (repetition of MI) in the sessions and duration (how long MI takes); location of using MI; and MI modes and prospects. This was in addition to statements about patient' attributes (e.g. patient engagement in MI use, their health conditions, and patient's ability). Participants were instructed to rate the importance of each item on the Likert scale as follows: "*This section is designed to help us understand, for example, how therapists could be helped to develop their theoretical knowledge and practical experience in using MI. From your experience, what do you consider important for therapists to learn about MI?*".

Below each statement, participants were provided with free text comment boxes to obtain any feedback or suggestions from the experts. These helped provide further description of the rated items by asking for example, "*do you have any comments, or is there anything else you consider important for improving this statement or additional items?"* (See Appendix 5.5 copy for round one results and data analysis). See Table 5.1 for the process of the finding's analysis.

Before sending the survey to participants, it was pilot tested with three colleagues in the School of Medicine who were not involved in this Delphi. The purpose was to highlight issues prior to the launch (Teijlingen Van et al., 2001; Novakowsji & Wellar, 2009).

Word document and the online survey, the time spent completing the survey, as well as clarity of the statements. Amendments were made and issues resolved before the actual launch of the survey.

Participants were asked to review and rate 116 items within 13 statements. Statements were related to the therapist's knowledge in MI and their experience of delivering it, the instructions and/or demonstration that might help patients use MI effectively, assessment tools, time for using MI, application (how to instruct MI) and delivery, MI frequency (how often MI used), MI intensity (repetition of MI) in the sessions and duration (how long MI takes), location of using MI, and MI modes and prospects. This was in addition to statements about patient attributes (e.g. patient's engagement in MI use, their health conditions, patient's ability). Participants were instructed to rate the importance of each item on the Likert scale as follows: "*This section is designed to help us understand, for example, how therapists could be helped to develop their theoretical knowledge and practical experience in using MI. From your experience, what do you consider important for therapists to learn about MI?"*

Additionally, below each statement, participants were provided with free text comment boxes to obtain any feedback, or suggestions from the experts, these helped provide further description of the rated items by asking for example, *do you have any comments, or is there anything else you consider important for improving this statement or additional items?* (See Appendix 5.5 example for round one results and data analysis). See Table 5.1, for the process of the finding's analysis.

Table 5.1 Summary of data analysis.

Analysis of findings.		
Round	**Type of analysis**	**Description**
Round 1	Descriptive statistics	Descriptive analysis was used to assess consensus agreements within statements. Percentile proportional values were considered the main analysis with a pre-defined cut-off of ≥ 70%. Additionally, where the level and extent of agreement for each item differed, another pre-defined score was used to score values of ≥ 70% to prioritise the item in its level of importance, from essential to necessary.
Round 2 and 3	Descriptive statistics	The same method of data analysis was applied in round two and three, as well as reviewing comments from round one and round two. New items generated form this process and unclear items that were re-worded, were added to the following survey. This allowed richer data to emerge and a more knowledgeable exchange of consensus. Where an item had a polarised value (i.e. where experts had different opinions), the item was only described in the report and not given an importance level.

Participants were informed about the date for completing the round one survey. Reminder emails were sent out every two weeks. Extension periods of two weeks were offered or granted to those requesting more time to respond.

Round two survey

After receiving the data from respondents in round one, results were analysed using SPSS version 24 (Statistical Package for Social Scientists). A level of a priori agreement (cut-off score of 70%) previously determined whether statements went through to the next level as recommended by Sumsion (1998) and Crisp et al. (1997).

Items within statements which did not reach this level were iterated in round three and re-sent to the panel of experts, who were asked to read through the feedback reflecting the collated data and to give ratings to reach consensus for agreement between the participants. During round two, participants were given further opportunity to complete an open question that included their comments regarding wanting to add further items to the existing ones or just stating comments in general.

The items reported by the panel experts in the Delphi were compared with the items reported in both the systematic review and qualitative study (Phillips et al., 2013). This process helped to ensure that all information collated from previous studies was included to be reviewed and rated in the Delphi survey (Phillips et al., 2013). As within round one, participants were informed of the dates for completing the round two survey.

Round three survey

The procedure for round two was repeated in round three. Items, which reached 70% consensus, were included in the analysis. Items not reaching the pre-defined consensus were reviewed by the research team to decide whether to include them in or omit them from the report. The Delphi was re-sent to ensure that items that had not reached consensus in round two were confirmed by the participants.

5.3.8 Data management

Each participant was assigned a unique identification number, and this process helped in the reporting and collating of the results. Demographic information was summarised and displayed in a table (see Table 5.2).

Table 5.2. Sample Demographics

Sample Demographics.			
Gender	Male	2	11%
	Female	16	89%
Country	UK	12	67%
	EU	1	6%
	NA	1	6%
	ME	3	17%
	Australia	1	6%
Setting	Academic	6	33%
	Clinician	11	61%
	Academic and clinician	1	6%
Profession	OT	9	50%
	PT	7	39%
	Psychologist	2	11%
Degree	PhD	9	50%
	Master	2	11%
	Bachelor	7	39%
Published (Articles)	Yes	7	39%
	No	11	61%

Note: United Kingdom (UK); European Union (EU); North America (NA); Middle East (ME); Occupational therapist (OT); Physiotherapist (PT).

Participant anonymity was maintained throughout the study. Any disagreements in an item's rating or lack of clarity regarding data analysis were always reviewed and discussed with the rest of the research team.

5.4 Results

5.4.1 Response rate

More than 400 experts were invited (see Figure 5.1 for sampling and recruitment) and 27 expressed interest in the study, but only 22 out of the 27 agreed to take part. Out these 18 participants signed consent forms and completed the survey with 100% response (n=18) in round one. Reasons for non-completion (n= 5) were as follows: 1) time constraints (n=2); and 2) perceived themselves as not being expert enough in stroke, although expert in MI (n=3).

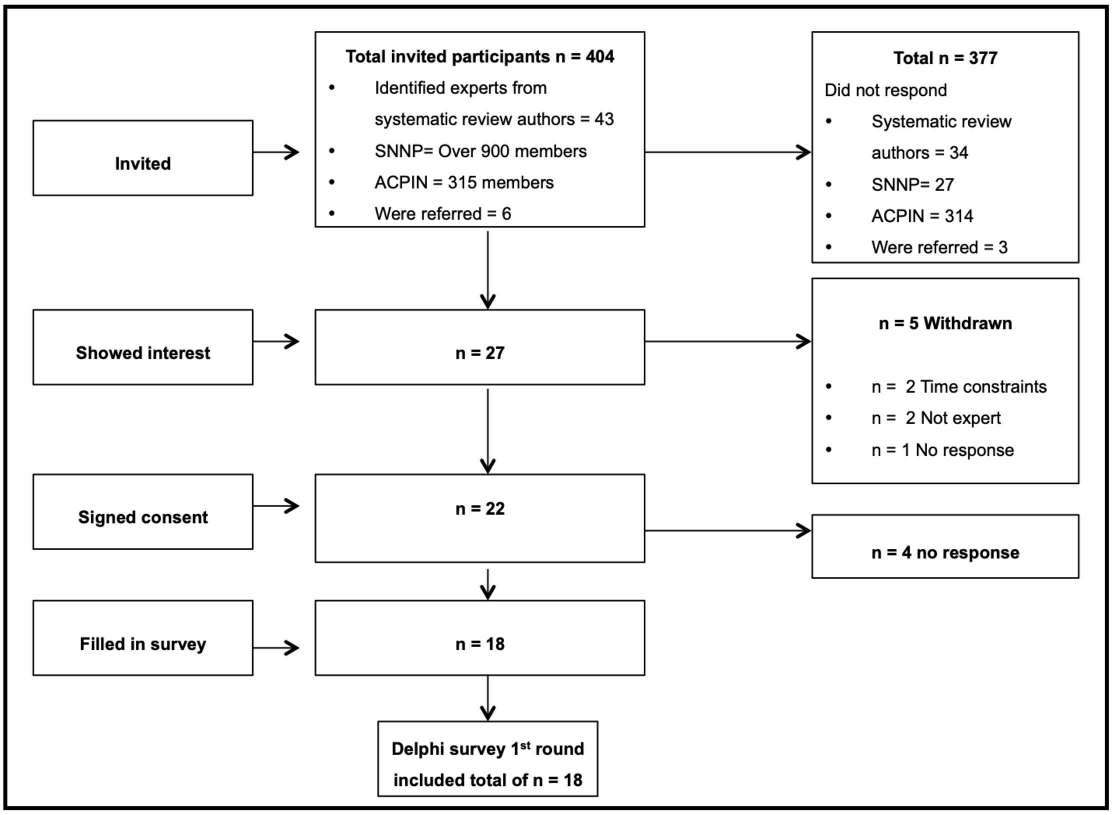

Figure 5.1 Sampling and recruitment stage.

5.4.2 Participants

The sample included a variety of experts experienced in the use and delivery of MI with stroke rehabilitation in clinical practice and/or research.

They included representation from different professional interest groups and settings, including clinicians and academics. See Figure 5.2 for sampling and recruitment.

In total, 18 people participated; the majority were women (89%). Most participants were from the UK (67%), other European counties (6%), North America (6%), the Middle East (17%) and Australia (6%). Most were clinicians (61%), academics (33%) or working as both (clinical and academic 6%).

The highest educational qualifications were PhD (50%), Masters degree (11%) and Bachelors degree (39%). Experts who had published articles on MI use totalled 39% (See Table 5.1).

The 18 experts who took part in the modified Delphi survey represented a range of expertise in MI use in stroke rehabilitation, including researchers and therapists (n=7 physiotherapists (PT), n=9 occupational therapists (OT) and n=2 psychologists.

The sample included lecturers, clinical neurological OT or PT specialists, acting Heads of Research, or clinical leads in stroke and neuro rehabilitation and stroke team leader. The experts worked in a range of clinical and academic roles.

5.4.3 Participants' proficiency in MI

Participants were asked to detail their proficiency in MI in the demographic section, to determine more about how they acquired their training.

Some participants stated that their expertise was basic, acquired through websites and workshops, in addition to reading up-to-date research and CPD training. A few acknowledged that their expertise was moderately proficient, and their experience was gained through observation of other practitioners with continuing practical application of the intervention. Others recognised their expertise to be within a reasonable range and that they were confident in applying it with stroke survivors. Some identified that they were already teaching other clinicians to use MI.

Others expressed that they had a solid foundation of knowledge for the use of MI for treating upper limb deficits and some participants acknowledged that MI was part of their Doctoral research with stroke survivors and that they were successfully using it in clinical practice. Some participants had learned about MI at conferences or events, or by taking part in research studies and regular clinical practice, by participating in these events they had managed to develop a protocol (based on evidence) for MI use and had applied that in a clinical setting to patients when appropriate. Similarly, a few physical therapists had used evidence-based practice in their research for investigating the role of MI in improving balance with patients. Some participants had run several studies using MI with stroke, as well as with dancers. Very few of them had not had any formal training in MI but had used it with clients with limited movement in their affected upper limb and were confident using it.

5.4.4 Participants' practical experience in MI use

Regarding the participants' practical experience some said this was developed through postgraduate study, such as an MSc research project. One had developed a protocol in the use of MI in Sit to Stand exercises. Since that time, they had regularly used MI as part of their on-going clinical practice in acute, sub-acute and later stage stroke rehabilitation. Others had adapted MI to individual patients' abilities and circumstances and through practical application of MI to other colleagues including medical students, physiotherapy and occupational therapy students and staff. Three participants had used MI in their research to investigate the role of MI in improving balance with patients.

Furthermore, another expert had conducted a small research study into the use of mental imagery/practice for people with upper limb movement problems after stroke. In a study, the research physiotherapist had used mental imagery in a clinical setting with a wide range of people with stroke and other neurological conditions, and their results showed significant improvement in balance outcomes. Another participant had used it in experimental trials as a method of understanding the mental representation of action. Furthermore, others had used it within an Early Supported Discharge Team (ESDT), with stroke survivors at home within the first few days/weeks and sometimes months post stroke. Emerging use, now considered standard treatment to be offered to patients in treatment plans, was delivered by physiotherapy and occupational therapy technicians with specialist stroke training, and this expert explained that they had used it personally and initiated it with approximately five patients.

One had used MI with mirror boxes as Mirror Therapy (MT) with stroke survivors many times over their professional years of stroke rehabilitation, and one participant acknowledged using it over once or twice. Seven participants explained how occasionally they used MI scripts, reading out loud to stroke survivors and also used pre-recorded scripts, obtaining these materials from YouTube. One participant explained they used MI scripts with patients as a preparation task before ADL practice. Another participant explained using MI with stroke in the acute stage inpatient wards to help promote use of the affected upper limb. They used it with any patient who met the criteria (e.g., able to communicate, follow instructions and image) and could do some tasks on their own. Three participants explained that they had used it as part of treatment sessions with family/friends. It was used in both acute and community settings. In studies with stroke, it had been used for walking improvement, and in studies with dancers for symmetry improvement.

5.4.5 Summary of the rounds

The results from round one, as an example can be found in Appendix 5.5.

5.4.5.1 Round one results

Round one took approximately five weeks to complete and was returned with 100% response rate. The round one survey comprised 13 category statements, including 116 items. During round one, the 18 experts agreed on 55 (47%) items, which reached consensus while 61 (53%) did not reach consensus. Fifty-five items achieving consensus and above were accepted and removed from subsequent rounds. Items that did not reach 70% were discussed with the supervisory team and revised where appropriate. In addition, 22 new items were generated, and 5 items were reworded from the feedback and comments from participants. Suggestions were made to examine unclear items, reword some of them based on the panel's feedback, and resend for consensus in round two. See Figure 5.2, for an example of a reworded item. Furthermore, all comments were examined carefully, and considered, and new items formulated from the observations. See Table 5.3, for a summary of all rounds and Table 5.4, for a summary of the accepted items.

Example of a reworded statement

Round one **statement 1:** *Intensity and frequency in MI use.*
Item 1: level of intensity of MI use and frequency; Training the patient up to 3 times per week.

- Very important (55.6%)
- Important (5.6%)
- Neutral (27.8%)
- Somewhat important (5.6%)
- Not important (5.6%)

While this item, did not reach consensus comments indicated there were some concerns over the statement therefore revised from: Training the patient up to 3 times per week.
In round 2, the **item** was **reworded and added** to the shortlist of the statement of intensity and frequency: *Encouraging self-practice up to 3 times per week.*

- Very important
- Important
- Neutral
- Somewhat important
- Not important

An example for generated items from the same existent items.
Round one **statement 9:** One item on the intensity and frequency on using MI.
Item 1: level of intensity of MI use and frequency: *Training the patient for 10 to 20 minutes per day.*

- Very important (5.6%)
- Important (27.8%)
- Neutral (16.7%)
- Somewhat important (23.9%)
- Not important (16.7%)

This item received a poor level of agreement. Comments indicated that it holds low importance during MI training, and for that, an alternative item was generated: *Encouraging self-practice for 10 to 20 minutes per day.*
An example for generated items from comments.
Round one **statement 6**: Instructing MI use.
Generated item: *Access to a quiet room*.

- Very important
- Important
- Neutral
- Somewhat important
- Not important Very important

This item was added to round two surveys.

Figure 5.2 Example of a reworded statement

Table 5.3 Summary of round

Summary of rounds			
	Round 1	**Round 2**	**Round 3**
Total number of statements	13	12	11
Total number of items within statements	116	85	51
The aim of round	Identifying items for best practice	Identify and clarify items for best practice	Clarify and confirm items for best practice
Reached consensus (≥ 70%) and accepted	55	34	17
Removed	0	0	0
Did not reach consensus and revised	61	51	34
New generated items	22	0	0
Revised and modified items	5	10	0

Table 5.4 Total items and statements achieving consensus in round one, two and three of Delphi survey.

Statement	Items	Consensus level (%)	Round
Therapist's knowledge	1. Shadowing with experts/ colleagues who have used MI in their clinical practice.	88.9%	Round 1***
	2. Gaining additional qualifications e.g. Modules on MI in taught courses at degree level.	88.9%	Round 1***
	3. Attending other training courses or workshops.	88.9%	Round 1***
	4. Reading about MI in scientific papers in peer reviewed journals.	100%	Round 1***
	5. Reviewing up-to-date clinical guidelines.	83.3%	Round 1***
	6. Watching videos explaining how to incorporate MI into practice.	83.3%	Round 1***
	7. Discussing research findings with colleagues/others (e.g., journal clubs, knowledge exchange meetings with academics).	83.3%	Round 1***
	6. Peer supervision and reflective practice (item was generated from round 1).	92.5 %	Round 2***
	7. Following a protocol (item was generated from round 1).	71.4 %	Round 2***
	8. Training therapists to practice MI with patients (item was generated from round 1).	78.6%	Round 2***
	9. Reading online and blogs/ publications.	74.1%	Round 2***
Therapist's engagement	1. Maintaining a good relationship between the therapist and patient during the intervention delivery.	100%	Round 1***
	2. Recognising levels of motivation for recovery within the patient.	94.5%	Round 1***
	3. Identifying the patient's belief about using MI to improve recovery.	94.5%	Round 1***
	4. Identifying the patient's level of awareness of MI and its advantages and disadvantages.	83.4%	Round 1***
	5. Follow-up with the patient to provide feedback and results.	83.4%	Round 1***
	6. Recalling and maintaining positive experience in MI use.	88.8%	Round 1***
Benefits of MI	1. Improve general ADL.	83.4%	Round 1***
	2. Improve posture, coordination and proprioception.	72.3%	Round 1***
	3. Improve upper limb function	100%	Round 1***
	4. Improve specific movement capabilities.	83.4%	Round 1***
	5. Improve re-learning movement patterns.	100%	Round 1***
	6. Improve sequence of movement.	88.9%	Round 1***
	7. Improve confidence.	88.9%	Round 1***
	8. Improve motivation (the ability to sustain positive attitude).	83.4%	Round 1***
	9 Improve focus/concentration.	88.9%	Round 1***
	10. Improve balance.	71.4 %	Round 2***
	11. Help reduce/control pain.	71.4 %	Round 2***
	12. Help reduce spasticity.	71.4 %	Round 2**
	13. Help make the patient feel calmer/more relaxed.	78.6%	Round 2**
	14. Help improve self-esteem.	71.4 %	Round 2**
	15. Improve positive attitude (mental and emotional wellbeing).	78.6%	Round 2**
	16. Improve adherence to rehabilitation programme.	78.6%	Round 2**
	17. Improve quality of life.	78.6%	Round 2**
MI instructions	1. Providing verbal instruction.	94.4%	Round 1**

Statement	Items	Consensus level (%)	Round
	2. Demonstrating the movement to the patient (e.g. pictures or posters).	83.3%	Round 1[**]
	3. Using audio imagery scripts to help patients imagine.	77.8%	Round 1[**]
	4. Therapist using some equipment/objects to help explain the movement (e.g. dumbbells).).	78.6%	Round 2[**]
	5. Using written imagery scripts to help the patient imagine.	71.4 %	Round 2[**]
	6. Using anatomical aids (e.g. skeleton or dummies).	78.6%	Round 2[**]
	7. Therapist following a protocol.	78.6%	Round 2[**]
	8. Ask patient to demonstrate ability to ensure instructions are clear/understood (item was generated from round 1).	100%	Round 2[**]
	9. Access to a quiet room (item was generated from round 1).	71.4 %	Round 2[**]
Assessment tolls	1. Levels of cognitive impairment (e.g. mild cognitive impairment i.e. score above 24 on the Mini-Mental State Examination (MMSE) test).	83.3%	Round 1[**]
	2. Ability levels to imagine task (e.g. good level of imagining is score above 60 on Kinaesthetic and Visual Imagery Questionnaire (KVIQ))	77.8%	Round 1[**]
	3. Levels of prominence of the image (e.g. good level of imagining the movement i.e. score above 56 on the Movement Imagery Questionnaire-Revised Version (MIQ-RS)).	74.1%	Round 2[**]
	4. Levels of tone of spasticity affected limbs (e.g. score below 2 on Modified Ashworth Scale).	74.1%	Round 2[**]
	5. Levels of pain on affected limbs (e.g. mild point i.e. 4 or less on Visual Analogue Scale, pointed: 0-10).	77%	Round 3[**]
	6. Levels of stroke fatigue (e.g. Fatigue Assessment Scale (FAS)).	77%	Round 3[**]
Time	1. During / as part of other treatment sessions.	88.9%	Round 1[**]
	2. Encouraging practice of MI outside treatment sessions (e.g. at home).	94.4%	Round 1[**]
	3. Before practicing the specific task or exercise.	94.4%	Round 1[**]
	4. While practicing the specific task or exercise.	88.4%	Round 1[**]
	5. Before other treatment sessions (e.g. physiotherapy or occupational therapy).	71.4 %	Round 2[**]
	6. Following other treatment sessions.	76.9 %	Round 3[**]
	7. After practicing the specific task or exercise increasing "reality" of meaningful activity and can directly be related to the tasks they are actually practicing (item was generated from round 1).	100 %	Round 3[**]
	8. When no physical therapy or treatment appointments are available.	77%	Round 3[**]
Application of MI use	1. Asking the patient to practice MI with the affected side when the patient is unable to perform the movement on that side.	83.3%	Round 1[**]
	2. Asking the patient to perform the movement on the sound side, then on the affected, when unable to perform on the affected.	77.8%	Round 1[**]
	3. Sitting aside the patient and verbally describing the movement then visually demonstrating to the patient to help enhance imaging when patient is unable to perform at all.	72.2%	Round 1[**]
	4. The patient should perform the movement within limits of their comfort range and not induce pain.	77.8%	Round 1[**]
	5. During the use of MI, ask the patient to practice MI and combine or integrate the imaging practice with the physical task together.	77.8%	Round 1[**]
	6. Using MI as a supplementary treatment.	94.4%	Round 1[**]

Statement	Items	Consensus level (%)	Round
	7. Asking the patient to perform the movement on both sides; the sound side, then the affected when unable to perform on the affected.	92.6%	Round 2**
	8. Asking the patient to describe the images, after the patient has practiced MI, to assure imaging process.	85.8%	Round 2**
	9. Using MI as a supplementary treatment.	94.5%	Round 1**
	10. Using MI as a graded technique training.	78.6%	Round 2**
Length and duration for MI use	1. Sessions should run from 2 to 6 weeks	77.8%	Round 1**
	2. Sessions should be up to 4 weeks only (not important).	100 %	Round 1**
	3. Sessions should be for a maximum of 2 weeks.	77.8%	Round 1**
Intensity and frequency	1. Training the patient up to 3 times per week.	78.6%	Round 2*
	2. Encouraging self-practice for 10 to 20 minutes per day (item was generated from round 1).	71.4%	Round 2*
	3. Encouraging self-practice up to 7 times per week (item was generated from round 1)	78.6%	Round 2*
	4. Training should be as frequently as can be tolerated by the patient (item was generated from round 1).	100%	Round 2*
	5. Training frequency should be individually tailored to the patient's needs and ability (item was generated from round 1).	92.8%	Round 2*
	6. Patients should be encouraged to self-practice as frequently as can be tolerated according to their individual needs and ability (item was generated from round 1).	100%	Round 2*
	7. Training the patient once a day.	76.9%	Round 3*
	8. Encouraging self-practice for up to 10 hours per week (item was generated from round 1).	77%	Round 3*
	9. Encouraging self-practice once a day (item was generated from round 1).	77%	Round 3*
	10. Training the patient once a day.	76.9%	Round 3*
MI mode	1. Instructing the patient to use visual imagery from any perspective (internal or external), as long as they are comfortable and able to imagine.	83.4%	Round 1*
	2. Instructing the patient to use both the visual and kinaesthetic modes.	72.2%	Round 1*
	3. Instructing the patient to use any type of imagery as long as it involves movement images.	77.8%	Round 1*
	4. Instructing the patients to use any type/mode of imagery as long as they are comfortable and able to imagine.	77.8% 76.9%	Round 1* Round 3*
	5. Instructing the patient to use visual imagery using only external visual imagery perspective.		
	6. Instructing the patient to use the kinaesthetic mode.	76.9%	Round 3*
Health condition	1. The patient should not suffer from any cardiology problems (coronary artery disease).	72.2%	Round 1**
	2. The patient should not suffer from any musculoskeletal problems (e.g. rheumatoid arthritis).	72.2%	Round 1**
	3. The patient should not suffer from any severe neurological problems (e.g., epilepsy or seizures).	85.7%	Round 2*
	4. The patient's general health condition should be good or normal (no hypertension or asthma).	85.7%	Round 2*
	5. The patient should not be taking medications that cause drowsiness.	76.9%	Round 3*
	6. The patient should not suffer from severe depression.	76.9%	Round 3*
Stroke ability	1. Patient needs to be able to imagine.	100%	Round 1*
	2. Patient needs to be able to identify objects (e.g., a pen or a bed).	83.3%	Round 1*
	3. Patient needs to be able to understand language (e.g., naming a pen or a bed).	83.3%	Round 1*

Statement	Items	Consensus level (%)	Round
	4. Patient needs to be able to communicate well (e.g., understand instructions and repeat).	83.3%	Round 1*
	5. The patient needs to be able to concentrate (item was generated from round).	85.7%	Round 2*
	6. The patient needs to be able to recall things.	77%	Round 3*
	7. The patient needs to be oriented.	84.6%	Round 3*
	8. The patient needs to be able to describe the imagining process.	76.6%	Round 3*
	9. Patient needs to have insight into their abilities (item was generated from round 1).	76.9%	Round 3*
Location	1. MI can be trained in rehabilitation centres or in clinics (e.g. specialised physiotherapy clinics).	94.4%	Round 1*
	2. MI can be trained in nursing homes.	88.9%	Round 1*
	3. MI can be encouraged and trained in their-own homes.	94.4%	Round 1*
	4 .MI can be trained in private settings (e.g. quiet rooms).	94.4%	Round 1*
Note: Importance level: ***Critical, **unimportant, *uncertain.			

5.4.5.2 Round two results

In round two the 14 experts agreed on 34 out of 85 items. The remaining items that did not reach consensus were reviewed and some items were reworded to enhance their clarity, then resent to the experts in round three. The second round survey was returned with a 78% response rate. Unfortunately, 4 participants dropped out due to heavy work commitments and time pressure, in addition to one participant who perceived himself as not being expert enough with stroke. Round two comprised 12 category statements, including 85 items. During round two, 34 (40%) items reached consensus and 51 (60%) items did not and were returned to the following rounds, in addition to a few items, reworded for clarity. In total, five items were reworded following feedback and comments from the participants.

5.4.5.3 Round three results

The third round survey was returned with a 93% response rate. Unfortunately, one participant dropped out. The participant never responded despite efforts to send reminder emails. The round three surveys comprised 11 category statements, including 51 items. During round three, only 17 (33%) items reached consensus, and 34 (67%) items did not reach consensus. See Table 5.3 above for round three items that reached consensus. The items that did not reach consensus are discussed in turn to explain the potential disagreement. See Table 5.5, below.

Table 5.5 Items that did not reach consensus.

Items that did not reach consensus		
Statement	**Total items**	**Consensus level (%)**
Statement 1: Therapist’s knowledge	Round 3(0)	Reached in round 2
Statement 2: Therapist’s engagement	Round 3(1)	
Identifying a supportive environment (e.g. family and peers).		61.5 %
Statement 3: Benefits of MI	Round 3(5)	
1. Improve gait pattern, gait speed and gait cadence.		46.1 %
2. Improve muscle strength.		53.9 %
3. Improve joint flexibility.		69.2 %*
4. Improves memory.		7.8 %
5. Improve participation.		69.2 %*
		69.2 %*
Statement 4: MI instructions	Round 3(1)	
1. Using video clips or DVDs of the movement to demonstrate the movement pattern.		61.5%
Statement 5: Assessment tools	Round 3(6)	
1. Levels of vividness of the image of the movement task on stroke capacity relative tasks Questionnaire-Revised Version (MIQ-RS)).	7.8 %	
2. Levels of ADL limitation.	23.2 %	
3. Mobility.	23.1 %	
4. Levels of QoL.	30.1 %	
5. Participation.	23.2 %	
6. Fear of falling.	7.8 %	

Items that did not reach consensus		
Statement	**Total items**	**Consensus level (%)**
Statement 6: Time	Round 3(2)	
1. Following discharge from the course of treatment sessions.		69.2 %
2. While waiting for scheduled appointments for the course of treatment sessions.		61.6 %
Statements 7: MI application and devilry	Round 3(2)	
1. Asking the patient to practice MI and then to complete a progress chart after sessions to assure progress.		53.8 %
2. Using MI as alternation treatment.		69.2 %*
Statement 8: Length and duration	Round 3(1)	
1. Sessions should continue for more than 6 weeks.		38.5%
Statement 9: Intensity and frequency	Round 3(10)	
1. Training the patient for 10 to 20 minutes per day.		69.2 %*
2. Training the patient for up to 1 hour per day.		69.2 %(NI)
3. Training the patient up to 5 times per week.		61.5%
4. Training the patient 7 times per week.		38.6%(N)
5. Training the patient twice a day.		53.8%(NI)
6. Training the patient up to 3 times a day.		69.2%(NI)
7. Encouraging self-practice up to 3 times per week.		38.5%
8. Encouraging self-practice up to 5 times per week.		69.2 %*
9. Encouraging self-practice twice a day.		61.5%
10. Encouraging self-practice up to 3 times a day.		51.8%
Statement 10: MI mode	Round 1(2)	
1. Instructing the patient to use visual imagery using only internal visual imagery perspective.		23.1%
2. Instructing the patient to use graded imagery.		30.8%

Items that did not reach consensus		
Statement	**Total items**	**Consensus level (%)**
Statement 11: Health condition	Round 1(3)	
1. The patient should not suffer from severe spasticity; muscle tone		7.8%
2. The patient should not suffer from any bone fractures or joint dislocations.		30.7%
3. The patient should not suffer from severe fatigue (item was generated from round 1).		53.9%
Statement 12: Stroke ability	Round 3(1)	
1. The patient needs to be able to select and divide attention (item was generated from round 1).		69.2%*
Statement 13: Location	Round 3(0)	Reached in round 1
Total items not reached consensus in round 3 = 34 Note: (*) is a marginal percentage approximating 70%. Not important item rating (NI). Neutral item rating (N).	Round 3(51)	34 (69%)

5.4.5.4 Items removed from rounds

In total, forty-two items were removed from the Delphi. Eight were removed during round one or two due to reaching consensus as *not* important in MI use. The remaining thirty-four were removed in round three, due to not achieving consensus (see Table. 5.5).

5.4.5.5 Items not reaching consensus

Thirty-four items within 11 statements were removed from the list of recommendations for MI use in stroke rehabilitation during the Delphi process, because they didn't reach consensus of 70% in the final round. One item was removed from the 'Therapist Engagement' statement: 'identifying a supportive environment (e.g. family and peers)'. Five were removed from the 'Benefits of MI use' statement. They included: 'improve gait pattern and improve gait speed and gait cadence', as well as 'improve muscle strength, joint flexibility, memory and participation'.

Furthermore, the item 'using video clips or DVDs of the movement to demonstrate the movement pattern' was removed from the MI instructions statement. 'Assessing levels of vividness of the image of the movement task on stroke capacity relative tasks Questionnaire-Revised Version (MIQ-RS), assessing levels of ADL limitation and mobility, assessing levels of QoL and participation, and fear of falling' items were removed from the 'Assessment tools' statement.

Regarding the ‘Time of application’ statement, two items were removed, including ‘Following discharge from the course of treatment sessions’ and ‘While waiting for scheduled appointments for the course of treatment sessions. In the MI application and delivery statement ‘Asking the patient to practice MI and then to complete a progress chart after sessions to assure progress’ and ‘Using MI as an alternative treatment’ items were removed.

The ‘Length and duration’ for using MI statement included ‘Sessions should continue for more than 6 weeks’ but was removed. Additionally, 10 items from the Intensity and frequency in using MI statement, including ‘Training the patient for 10 to 20 minutes per day’, ‘training the patient for up to 1 hour per day’, ‘training the patient up to 5 times, 7 times per week, twice a day, 3 times a day’, ‘encouraging self-practice up to 3 times per week’, ‘5 times a week’, ‘self-practice twice a day’, ‘self-practice up to 3 times a day’ were all removed.

The MI mode statement had the items ‘instructing the patient to use visual imagery using only internal visual imagery perspective’ and ‘instructing the patient to use graded imagery’ were removed. Furthermore, the ‘Health condition’ statement items ‘patient should not suffer from severe spasticity, muscle tone, patient should not suffer from any bone fractures or joint dislocations and patient should not suffer from severe fatigue’ were also removed. Finally, in the ‘Stroke survivor’s ability’ statement the item ‘Patient needs to be able to select and divide attention’ was removed (see Table 5.5).

5.5 Discussion

5.5.1 Summary of findings

Consensus was reached with of 18 experts (13 in final round) on a total of 103 items within thirteen statements that included the essentials of increasing the therapist's knowledge and engagement in MI and intervention experience (Therapist's knowledge and Therapist's engagement), as well as MI content in training, patient's attributes and assessment tools. Statements confirmed where to use MI, why to use MI (benefits of MI use), and how to use MI (instruct and demonstrate MI, application and delivery). Furthermore, the frequency of use, MI intensity (repetition of MI), and duration (how long MI takes). There was also agreement on MI modes including visual, kinaesthetic and perspective (internal and external imagery). Likewise, assessment tools for MI, when to use MI (optimum time for using MI), and where to use MI (the location of using MI) reached agreement level.

This was in addition to patients' attributes (e.g., patient's engagement in MI use, health conditions, and ability) important for use. This consensus helped to inform recommendations, for developing therapists' knowledge and experience in MI use and supporting their training so that patients have confidence in therapy and engage successfully in MI. Furthermore, identifying patient's attributes that may affect engagement in therapy, including impairments in cognitive in cognitive levels and general health condition and may hinder the delivery of MI in stroke rehabilitation in clinical practice.

5.5.2 Recommendations for MI use in stroke rehabilitation

It was apparent from the expert panel that MI use in stroke rehabilitation was largely based on clinical judgment or on self-developed protocols, rather than best practice guidelines. This was due to the intervention having insufficient MI evidence-based guidelines.

The consensus recommendations from the summary provided the first step in how to implement MI as an intervention in stroke rehabilitation clinical practice. These recommendations can inform clinicians on how to train stroke survivors in MI use (see Table 5.6).

5.5.2.1 Evidence to therapist's training needs

Comparable studies support the experts' consensus on improving therapists' knowledge and experience through training, suggesting that integrated training and evidence-based guidelines are essential for developing intervention-focussed training in healthcare services (Starkweather et al., 1975; Moore, 1987; Synowiez & Synowiez, 1990). Additionally, reading about MI in scientific papers and peer-reviewed journals, reviewing current clinical guidelines, having peer supervision and reflecting on experience can be included in any MI training programme to maximise the therapist's learning and experience (Fairburn & Cooper, 2011). This consensus process is supported by existing evidence regarding therapist training, showing that progressive career development and CPD should be typically supported by evidence-based guidelines to be effective in improving therapists' skills in clinical practice (Osborne & Brown, 2011). Results from this study showed that attending training courses or workshops, watching videos explaining how to incorporate MI into practice, and discussing research findings with colleagues/others (e.g., journal clubs, knowledge exchange meetings with academics) were the most acceptable and appropriate methods. The consensus is consistent with research from Ewers (2017), Gerber (2001), Osborne and Brown (2011) and Osborne (1998), which investigated the impact of skills training on psychological interventions in nursing practice. The authors investigated practical training approaches and strategies that maximized intervention-learning experiences in nursing practice. They found that guidelines, assessment and supervision by senior clinical nurses is crucial to successful intervention implementation.

However, despite of the supporting evidence, and according to Braun et al. (2012) and Dickstein Deutsch (2007), there remain a few existing MI protocols that include details on the use of MI in people with neurological conditions or with people with disabilities, as most are mainly designed for athletes. There is a shortage of experienced clinicians who could observe others delivering MI to build their confidence and skills in its application or offer expert shadowing to colleagues. This is consistent with Aryasomayajula et al.'s (2018) findings from interviews conducted with junior doctors who received poor teaching through medical school and postgraduate training, to assess their training programmes and whether they gained adequate learning of practical skills and experience. The study identified that shadowing colleagues working with stroke survivors, and observing other experts in the field, helps to support training, improving confidence and competence to practice by maximizing their learning experiences. This is in accordance with Williams and Webb (1994) who explored the critical role of supervisors and their educational activities in clinical settings with healthcare professionals and practitioners to support their training programmes.

The experts also agreed that it is essential to gain additional qualifications, e.g. modules on MI in taught courses at degree level if possible. This is in line with Ewers (2017), who suggested methods could include an interspersed curriculum or components of modules to be taught in under graduation levels. Furthermore, whilst the experts in this study, had exclusive experience in MI practice; however, it was apparent that most of their protocols for training MI in stroke, were developed from the sports psychology field. This highlight importance of availability of strategies to gain further knowledge on MI through training courses and workshops can help expand the intervention-learning experiences in MI. Recommendations for improving therapist's knowledge and experience in MI are found in Table 5.6, below.

5.5.2.2 Therapist's engagement and patient training

Improving patient engagement in MI training involves therapists' being able to instruct and clearly explain to the patient what MI is and how it might work for them. Importantly, successful engagement comprises a scale with the stroke survivors's criteria at one end, and the therapist's skills and experiences at the other. Essentially, assessing the stroke survivors's prior engagement in MI before commencing could help delineate treatment plans and provide a much clearer picture of the approach to adopt with a stroke survivor (Leguerice, Donnell & Tate, 2009).

Evidence to recommendation supporting therapist's engagement & stroke survivor's training

The consensus achieved in this study suggests that three aspects are essential in achieving stroke survivor and therapist engagement: maintaining a good therapist-patient relationship during intervention delivery; recalling and maintaining a positive experience in MI use to enhance engagement; following-up with the patient to provide feedback and results. Moreover, identifying stroke survivor's belief about using MI to improve recovery, identifying their level of MI awareness and its advantages and disadvantages, and recognising their motivation for recovery are also important factors.

Evidence from O'Leary (1985) proposed that the perceived self-efficacy of stroke survivors in a treatment course could prevent illness and induce recovery. This suggested treatment needs to be applied in ways that enhance patients' beliefs through two means: treatment effectiveness and their own ability to enhance positive changes in their health status. This could be in the form of source information stroke survivors rely on, and their personal communication distinguishing their personal capabilities, through health professionals and platforms providers. The latter can be achieved through the health professional themselves, as efficacy depends on the degree to which people believe what they are told about the value of the treatment (Horne, 1999).

Maximising therapists' engagement and stroke survivor's training via maintaining a good relationship achieved consensus in this study and is in line with Cott's (2004) qualitative study investigating physiotherapists-patient relationship and its impact on rehabilitation. The study included six focus groups of 33 stroke survivors who were 15 years post-stroke and who had recently undergone a rehabilitation which were interviewed by one focus of physiotherapists. Results identified the need for a further recognised approach in providing rehabilitation underpinned by the stroke survivor's needs rather than the professional's perspective of recovery. Hence a focus on encouraging active self-management in rehabilitation in partnership with professionals who respect their needs. The findings suggest that it is essential to empower the patient-focused-care function and enhance mutual collaboration between patient and professional which goes beyond goal setting and decision-making in any usual rehabilitation programme.

Another essential aspect is following-up with the patient and providing feedback on progress with their MI training. Kristjansdttoir et al. (2003) conducted a four-week trial using smartphone interventions with 140 in-patients with chronic pain undergoing rehabilitation. A three-day diary and written feedback were used alongside five and eleven-month follow-ups. These diaries elicited pain related thoughts, feelings and activities while the feedback given by therapists was based on cognitive behaviour principles. Outcomes of catastrophising, symptoms levels, daily functions, pain and distress, fatigue and pain acceptance were measured.

The results showed improvement in functioning and reduction in symptom levels compared to controls whose disease impact and emotional and fatigue distress increased. This evidence supports long-term follow-up after intervention, while using diaries to address reflections of experience around self-management activities (stretching, aerobic exercise and mild exercises). Furthermore, personalised written feedback between the patient and therapist positively reinforced and promoted self-management through enhancing awareness and mindfulness. These findings support that follow-up feedback and cognitive principles can help reduce levels of catastrophising and pain in the intervention (Kristjansdttoir et al., 2003).

Consensus from experts in this Delphi suggest that specific factors that hinder successful engagement; cognitive or perceptual impairments, fatigue, receptive language impairment, reduced motivation or low mood might work as a barrier and produce difficulty in understanding or fully engaging with MI. Identifying whether the stroke survivor can actually perform mental imagery was considered essential, as there are many stroke survivors who find it very difficult (Malouin et al., 2013).

Other factors recommended for inclusion in MI interventions are functional outcomes relative to MI and any functional limitations that might affect reliability, validity and sensitivity. These factors can include type of tasks, the stroke survivor's cognitive impairment level, adherence, and importantly therapists experience in MI use. These could all be resolved once the decision was made to use MI, by screening the stroke survivor for any impairment. Moreover, identifying tasks related to stroke survivors' personal needs, assessing patient's ability to image, monitoring MI training and most importantly training the stroke survivor and therapists in MI use were all highlighted.

Agreement in this study was not reached on methods for enhancing engagement through a supportive environment (e.g., family and peers), which differed from Szmelskyi and Szmelskyi's (2017) findings, which suggest that the support of both therapist and family are required for a successful intervention. This difference may be due to the experts' views not being based on up-to-date knowledge, alongside the absence of a strong evidence base in clinical practice. The study by Dorsey and Vaca's (1998) study, suggests that successful rehabilitation programmes are based on how well stroke recovery is fostered through several factors: First, through successful caregiving from the facility, alongside support of the caregiver's family and surrounding encouraging environment; second, the support received, and an appreciation of the emotional and physical challenges that stroke survivors perceive. Recommendations for therapist's engagement and patient training are addressed below in Table 5.6.

5.5.2.3 Content of MI use

5.5.2.3.1 Benefits of MI use (why)

The consensus suggested that benefits to be gained from using MI include outcomes, such as ADL levels, posture, coordination and proprioception, upper limb function, and specific movement capabilities. Furthermore, MI use can help in re-learning specific movement patterns and in improving the sequence of movement and balance.

Evidence of recommendations for MI benefits

These benefits are consistent with the findings of several trials conducted in MI use with stroke survivors, for example**,** those investigating MI use after stroke to improve levels of upper limb function, global ADL functions, and mobility by combining MI use with physical practice tasks in physiotherapy and occupational therapy treatment. Findings show improved recovery levels in these outcomes (Page, Levine & Lenorad, 2005; Liu, 2009; Timmermann et al., 2013; Kim et al., 2015).

In addition to the experts' consensus on MI use improving these different functional outcomes, agreement was reached on other MI benefits impacting positively on psychological aspects, such as improving confidence, focus/concentration, improving self-esteem and a positive attitude (mental and emotional wellbeing). Moreover, consensus was reached on improving motivation (the ability to sustain a positive attitude), which can help the patient feel calmer/more relaxed, reduce/control pain and reduce spasticity. This is broadly in line with Callow, Hardy and Hall's (2001) findings which suggest that training on MI use can improve self-efficacy and increase self-confidence.

Regarding controlling pain levels, Moseley (2006; 2004) reported that MI use has produced a substantial decrease in chronic pain levels and helped increase limb function. Aimed at evaluating new treatment for long-standing sufferers of Complex Regional Pain Syndrome Type (CRPSI). A 12 week programme was conducted with a crossover design study including 13 patients with CRPSI. MI group received physiotherapy and MI training, for two-week hand training (imagined laterality regeneration task therapy) while the control group had only physiotherapy treatment (active and passive mobilisation + limb exercises + hydrotherapy). Although results found no pre-treatment differences between groups, the findings support the hypothesis that MI for two weeks for 12 weeks reduces levels of pain.

Increase adherence to a rehabilitation programme was agreed as an essential benefit of MI use. Nilsen et al. (2012) found an improvement in adherence levels during MI training on 19 stroke survivors, especially after conducting manipulation checks post sessions, which included asking the stroke survivors to describe the imagery process (e.g., images they saw or felt), asking whether patients had understood instructions on MI training. Furthermore, adherence and its significant effect on MI training was addressed by Barclay-Goddard et al. (2011) in their meta-analysis of four studies which showed significant improvement in upper limb impairments with MI use compared to non-MI use with 102 stroke survivors.

While consensus was that MI did not improve QoL, this was contrary to Pheung-Phrarattanatrai et al.'s (2015) study, which found that MI use improved levels of QoL. In the Delphi study, the experts also reflected on the benefits of MI use in increasing a sense of control and encouraging self-management in rehabilitation, which allows some patients who are very limited in movement but who are very motivated, the opportunity to actively work on upper limb recovery and improve internal locus of control. A reason for this may be that once a stroke survivor is trained in MI use, they can choose which meaningful activity to improve and adjust the intervention level according to their abilities. Thus, it empowers the patient and increases their feeling of independence, an essential aspect to help adhere to treatment sessions (Braun et al., 2008).

Some items almost reached the cut off score of 70%, including improving levels of joint flexibility and memory (neutral score) and participation in life (important score). This marginal consensus could be due to several reasons based on the experts' experience in training MI use such as what works best for each individual stroke patient (case specific training). In regard to the flexibility, the experts did not reach consensus on whether MI could enhance muscle strength.

Further, consensus on flexibility was neutral, in accordance with some studies for example, Guillot, Tolleron, and Collet (2010) conducted a five-week MI programme with 21 synchronised swimmers and a control group, practicing active and passive stretching exercises. Findings suggest that joint flexibility can be enhanced after MI training, but this is yet to be translated into stroke rehabilitation in clinical practice.

Memory has also been acknowledged by Malouin et al. (2004) as an important process during MI training. In their trial, 12 stroke survivors matched with 14 healthy controls and received a single training session of MI practice involving loading the affected leg in a physical exercise of standing up and sitting down. The findings showed that the MI group improved in the loading exercise, which was dependent on maintaining and obtaining information within the working memory. There was a slight improvement in memory after training (straight after the session ended) and during follow-up after 24 hours. In terms of the improving participation, there was no evidence in the literature to support any change in participation after MI training. See Table 5.6, below for the list of recommendations for benefits of MI use.

5.4.2.3.2 Length and duration of MI use (how)

Evidence to recommendations to length for duration of MI use

Regarding length and duration of MI training, each treatment programme should run for around two to six weeks. However, there is little consensus on whether the programme should continue for more than six weeks. This differs from Braun et al. (2008) who recommended that the programmes be extended for weeks or months following success. This was further supported in a later study by Braun et al. (2012), which used a six-week programme and a follow-up period of six-months, finding that MI continued to produce a positive effect on maintaining improved functions with stroke survivors.

Additionally, findings from the Delphi study suggest that therapist support and guidance should reduce over time, as patients gain further self-generated treatments. After discharge, stroke survivors should be encouraged to use MI and resolve any issues by re-contacting therapists. This is in line with Malouin et al. (2013) who suggested that once the patient has been supervised and guided during MI practice and become independent, later sessions can be practiced alone without therapists.

Furthermore, findings based on the experts' consensus in this study show that MI support self-practice at home with no supervision once the patient is familiar with MI practice, with monitoring for adherence, progress, tracking and alterations in treatment plans or increases in intensity.

The experts in the survey acknowledged that MI programmes should not be less than six weeks. However, other timeframes of RCTs and most studies have provided MI for as little as two weeks and up to 10 weeks. Therefore, consensus on recommendations is somewhere in between, with a realistic and manageable timeframe, for example, MI training for four to six weeks, every day or five days a week. This is in accordance with Lee et al.'s (2011) study of 24 stroke survivors, Cho et al.'s (2013) study of 28, in which patients were trained in MI use for 30 minutes, three times a week for six weeks, and Hwang et al.'s (2010) study, in which stroke survivors were trained in MI use for one hour, five days a week over four weeks.

Given that stroke rehabilitation requires self-management in recovery, stroke survivors could continue MI use as much as needed. Additionally, stroke recovery may occur over many months or years, so there is no need for stroke survivors to stop MI if it is something that they find positive and helpful in their recovery. It was also seen as an adjunct to treatment for as long as it was useful (Malouin et al., 2013; Schuster et al., 2012; Braun et al., 2010). According to Braun et al.'s (2012) findings from a multi-centered trial on MI use with 36 stroke survivors, six weeks of intervention was found to have a significant effect on improving ADL function, and this effect was still evident after a six-month follow-up period, which suggests that MI could help maintain improvements even after discharge from sessions and rehabilitation therapy or clinics. See Table 5.6, below for the list of recommendations to length for duration of MI use.

5.5.2.3.3 Intensity of MI use (how)

The intensity (repetition of MI) and frequency (how frequent MI is used) of the sessions should be tailored to patients' needs. Training should be as intense and frequent as can be tolerated by the patient, and frequency should be individually tailored to the patient's needs and ability. As well as encouraging MI training during sessions, the therapist should encourage self-practice once a day for 10 to 20 minutes or up to one hour per day.

Evidence to recommendation for intensity of MI use

The consensus supports the recommendation that for best effect, MI should be used at least once a day and for up to three times per week. The findings are roughly in line with that of Dickstein & Deutsch's (2007) review, which suggests that the duration of MI practice is up to 20 minutes for healthy individuals while for stroke it is shorter at 12 to 15 minutes.

It is important to bear in mind that MI training will usually be in combination with another exercise, such as physical practice or relaxation, and that integrating MI time with other exercises can be in the patient's favour (Dunsky et al., 2008). Consensus on recommendations for MI intensity suggest that it may be more effective when encouraging self-practice for up to seven times per week, and stroke survivors should be encouraged to self-practice as frequently as can be tolerated, according to their individual needs and ability. Importantly, MI can be tailored to the patient's need and the stroke survivor should be given the opportunity to decide for themselves how and when their exercises take place.

Intensity has been found to be an important determinant of recovery in post stroke upper limb rehabilitation. A trial by Rodgers et al. (2019) compared the effect of Enhanced Upper Limb Therapy (EULT) in addition to usual post stroke care, and Robot Assisted Training (RAT), three times a week for 12 weeks, with usual NHS care alone (comprising 45 minutes physiotherapy and occupational therapy, five times per week to achieve rehabilitation goals). Findings showed an improvement in the impaired upper limb after undergoing RAT intervention compared to the group with usual care. Although no significant change to upper limb function or ADL was found after stroke, EULT reduced impairments and improved ADL and mobility compared to usual care alone suggesting that a higher intensity and duration of therapy may help to promote recovery after stroke.

Although there is limited evidence from controlled studies on the intensity of MI use, this technique depends on stroke survivor's tolerance and other factors relating to this and their situation as well as the effectiveness of self-practice/management. It therefore needs to be patient-specific, according to their needs and ability to participate in the session. This is supported by Malouin et al. (2013), whose review explored attempts to identify factors impacting MI training in rehabilitation. Their findings highlighted that some factors, such as adherence to MI training and patient self-managed (self-practiced) treatments, can help enhance successful MI training. Further, whilst the therapist can support them during clinical sessions, this need will gradually decrease and stroke survivor motivation levels in using MI independently and unsupervised will gradually increase.

A few items reached only marginal consensus (69%), for example those pertaining to the duration and frequency of training: training the patient for 10-20 minutes (important item), training the stroke survivor for one hour (non-important item), training the patient three times a day (non-important item) and encouraging self-practice up to five times a week (important item). This could be because experts presumed therapy efficacy and adherence in terms of its intensity and frequency of practice individualizing its content to each stroke case specifically. The experts might have believed that training for 10-20 minutes was important but that stroke patients may need more or less time depending on the stroke survivor's individual need and tolerance rather than individual intensity. In terms of encouraging self-practice up to five times a week, the experts in this Delphi also believed it is important to encourage self-practice with stroke survivors to help maintain progress in recovery. Yet, they felt that stroke survivors can be burdened in practicing exercises which are scheduled as part of a daily routine. Similarly, in Hong et al.'s (2012) trial investigating Electrical Stimulation (ES) for the upper limb with 14 stroke survivors, MI combined with ES was used for 20 minutes daily, for five days a week. Findings showed improved levels of upper limb functions compared to the usual care group. For recommendations for intensity of MI use, see Table 5.6, below.

5.5.2.3.4 Application of MI use and delivery (how to instruct MI use)

Regarding methods of instruction for therapists with stroke survivors, it was agreed that carrying out MI training using an audiotaped imagery instruction could help the stroke survivor follow the training step by step, breaking down and simplifying tasks.

Evidence recommendations for instructing MI use (how)

Using audio imagery scripts to help patients imagine and using appropriate equipment or objects to help explain the movement (e.g., dumbbells) or anatomical aids (e.g., skeleton or dummies), was also seen as beneficial for teaching MI use. Listening to instructions can help in task completion, as well as specific word use motivating and encouraging the patient to see or feel the movement and perform it effectively (Malouin, Jackson, & Richards, 2013; Nilsen et al., 2012).

Consensus was reached to support providing verbal instructions and demonstrating the movements to the stroke survivor (e.g., pictures, posters, or therapist's own limbs) as beneficial methods for teaching MI use. Additionally, there was consensus for technical support, for example using mirror therapy to support MI use with stroke survivors to help illustrate imagined tasks during training (Ietswaart et al., 2011). It was acknowledged that functional items (i.e., cup/glass) and having access to the correct equipment (e.g. having a mirror box and the correct table set up and access to a quiet room) allows stroke survivors to concentrate and is crucial. This is supported by Nilsen et al.'s (2012) study which used items in this way, for example in the training for MI use, to instruct participants on a task for drinking from a cup. They were asked to focus on movement of reaching to the cup, then lifting it from the table and bringing it closer to their mouth. Following that, taking several sips from the cup until they have finished the drink.

It's important when using MI to follow a protocol and ask the stroke survivor to demonstrate their ability to engage in MI to ensure instructions are understood. Patients should practice using MI themselves and have an understanding of the principles behind it (Braun et al., 2008). Consensus was reached regarding the use of a protocol to assist in follow-on training in MI. Access to a quiet room was also considered essential for instructing MI. This is generally in line with Braun et al. (2007) who acknowledged the importance of assessing a stroke patient's engagement and demonstrating the ability to understand the training. In their review, it was found that making a close specific link between what the stroke survivor experienced in their rehabilitation procedure and the imagery process technique was crucial, as this enhances practical training.

Furthermore, MI use is a dynamic approach that involves one-to-one guidance through close therapist/patient interaction during all stages of training. Thus, the therapist is required to introduce MI training, taking plenty of time, having adequate experience in MI themselves and supporting patient adaption to this treatment (Rushall & Lippman, 1997). Consensus was established regarding this point by the experts who agreed that familiarisation could be enhanced through producing examples and detailed explanations that include real-life experiences, as this was a more straightforward means of motivating patients to train effectively. Further, any unrealistic expectations of patients, which could be resolved by checking that the patient fully understands the imagery concept and recognises his set of goals should be avoided, as these are part of the rehabilitation process.

Experts acknowledged that it was essential that the therapist used a bespoke script for that stroke survivor, according to the task they were imagining, so they could incorporate specific details to ensure the experience was enhanced in terms of visual, sensory, and kinaesthetic feedback. This is in accordance with Malouin, Jackson and Richards (2013), who suggest that scripts are not designed to represent movements in real-life experiences. They therefore encourage tailoring scripts to the stroke survivor’s own movements, speed, and sequence, alongside tailoring training instructions to the individual needs and goals, focusing on stroke survivor’s abilities to enhance effective MI training. Table 5.6, below includes recommendations doe instructing MI use.

5.4.2.3.5 Time of MI use (when)

MI could be used during or as part of other treatment sessions, either before or while practising the specific task or exercise. Further, it can follow practicing specific tasks or exercises to increase "reality" of meaningful activity. It can be directly targeted at the tasks the stroke survivor is practicing. This can then encourage the practice of MI outside of treatment sessions (e.g. at home) or following other treatment sessions. This process is believed to help prime the effects of motor performance and skill learning, when the real movement is combined with MI (Lebon, Collet & Guillot, 2010).

Evidence to recommendation for time of MI use

Consensus was reached on when it is best to use MI. Experts felt it important that it be used during/or as part of other treatment sessions. This is supported by theory on MI practice when no physical therapy or treatment appointments are available. Braun et al.’s (2008) review suggests that patients need to be encouraged to use MI outside of therapy as soon as they can practice independently. As important as it is for patients to be supervised or guided by the therapist, unguided practice helps improve training intensity and empowers the stroke survivor (Malouin et al., 2010). Additionally, consensus was established by the experts in this study regarding that task training should be aimed at increasing "the reality" of meaningful activity. This follows Braun et al.’s (2008) review which highlighted that tasks should include examples and detailed explanation that include real-life experiences, as these are more likely to motivate patients to train effectively. Moreover, it is essential that MI is directly related to the tasks being practised and it is suggested that MI practice should be as close as possible to real performance (Guillot et al., 2010).

However, consensus was not reached in this study on whether to continue using MI after discharge from treatment, nor while waiting for scheduled appointments for a course of treatment. This finding is consistent with Braun et al.’s (2012) multi-centered trial on MI use with participants; where the sessions were for six weeks, with six months follow-up, which found significant improvements was maintained for ADL function. Although Braun et al.'s findings differ from the experts in this point, this could be because the experts had no external contact with their patients, unlike a trial that requires follow-up at different time points. Recommendations for time of MI use is listed in Table 5.6, below.

5.4.2.3.6 Modes of MI use (what)

Regarding mode of MI use and different perspectives, the results indicated that MI, when instructed in different modes and from different perspectives, could help enhance effective use. It is believed that a patient needs to be comfortable in using MI from any perspective (internal or external) or practice MI in any mode. This is supported by the experts' consensus, who agreed that stroke patients could use any type from any perspective of MI as long as they can imagine.

Evidence to recommendation for mode of MI use

Instructing stroke survivors to use visual imagery from an external visual imagery perspective and to use the kinaesthetic mode received the second highest consensus. The least favoured but still essential factor was instructing the stroke survivor to use both visual and kinaesthetic modes and to use any type of imagery as long as it involved movement of images.

This is similar to Schuster et al.'s (2011) review, which stated that motor-focused tasks were mainly explored with stroke survivors when using visual and kinaesthetic modes, achieving positive results. According to Crosbie et al. (2004) and Malouin et al. (2004-a; 2004-b; 2009), rephrasing imaging can help enhance accuracy and vividness in the imaging process and increase sensation levels.

However, consensus was not reached on whether MI should be instructed to the patient from only an internal visual imagery perspective, or whether the patient should be instructed to use graded imagery (external). This lack of consensus might be related to the lack of description in protocols used for MI in stroke research and the varying training intensities and exercise variability between studies. For example, Hosseini et al.'s (2012) trial with 30 stroke patients looked at improving functional mobility and postural balance. The intervention group (15 patients) received MI training in addition to occupational therapy for a total of 45 minutes per session for 4 weeks, compared to the control group (15 stroke survivors) who received only 45 minutes of occupational therapy. Both groups received task training related to walking abilities and balance. Their findings showed a significant impact of the intervention on functional mobility and balance levels (in the MI group).

Timmermann et al.'s (2013) trial with 32 stroke participants, 18 in an MI group to help improve upper limb ADL, instructed patients to use gradual MI (gradual complexity in task imaging), in comparison to the control group who received only the usual therapy and bimanual neurodevelopmental therapy. Results showed no difference between groups other than significant training-specific improvements found in the experimental group.

Furthermore, regarding the issue of which perspective to use, the study found it to be more effective tailoring MI according to the stroke survivors' preference and feedback and incorporating different perspectives in training. The results suggested that introducing different perspectives and making decisions based on patient feedback works more effectively.

Some experts stated that in their experience, the internal perspective was more popular, believing that using a combination of visual and kinesthetic approaches added more weight. This is consistent with Schuster's (2011) review, where studies incorporated both a visual (internal mode) and kinesthetic approach in MI implementation were more effective. Further, consensus showed the mode should be patient-specific, according to their needs and abilities. See Table 5.5 below for list of recommendations for mode of MI use.

5.5.2.3.7 Location for MI use (where)

As to where to train and deliver MI, agreement was reached in round one that MI can be practiced or trained anywhere, as long as the stroke survivor is able. Most agreed the location for training was in rehabilitation centres or clinics (e.g., specialised physiotherapy clinics) and in private settings (e.g., quiet rooms) and nursing homes (private accommodation providing health care for the elderly). It was further recommended for stroke survivors in their own homes.

Evidence to recommendations to location for MI use (where)

Practicing MI in homes is in line with Dunsky et al. (2008), who evaluated the feasibility and efficacy of imagery as part of a home-based approach in a non-randomised controlled trial. 17 stroke survivors were trained on MI use in their homes for 15 minutes on a task specific for gait training, three days a week for six weeks, supervised by visits from a physiotherapist. Findings supported that rehabilitation combined with home-based MI exercise programmes, can enhance walking levels after stroke. Meanwhile, Timmermann et al. (2013) trained stroke patients in rehabilitation centres or physiotherapy clinics in hospitals, as part of a multi-centre randomised control trial with 18 stroke survivors using MI and 14 using NDT, investigating the effectiveness of MI to improve ADL. Findings supported training-specific effects to the intervention group, and the use of a client-centred training approach, which is another appropriate location for MI use.

Experts in this study stated that MI can be used anywhere, for example, hospital wards, as long as a specific time and space is allocated with MI guidance. Further, it can be completed in any quiet space with minimal distractions as supported by evidence from the literature suggesting that MI can be carried out in quiet settings (Page et al., 2009, Nilsen et al., 2012). Table 5.6, below includes list of recommendations to location for MI use.

5.5.2.4 Stroke survivor's ability and attributes (who)

With respect to the stroke survivor's attributes for using MI, consensus was reached on several points and different co-morbidities that needs to be considered prior including in MI use and the ability of stroke survivors to train.

Evidence to recommendation to stroke survivor's ability and attributes (who)

Stroke survivors who are not suffering from cardiac problems, or major musculoskeletal problems (e.g., rheumatoid arthritis, orthopaedic surgeries, or musculoskeletal surgeries). This is in accordance with Kumar et al. (2016), who stated that any stroke survivor with coronary disease such as serious cardiac conditions should be excluded.

It could be argued that stroke survivor's attributes and criteria for inclusion in Kumar's (2016) study was not based on empirical evidence, that could have indicated that MI had a determination effect on people with these conditions; it is rather based on their informed and continued exploration from earlier studies. Further research is needed to explore and define the precise inclusion criteria for stroke survivors who will benefit from MI training.

The stroke survivor should not suffer from any severe neurological problems (e.g., epilepsy or seizures or hypertension or asthma). This is in line with Polli et al.'s (2017) study, which excluded any stroke survivors with a neurological disease (e.g., central nervous system, major head injury or neuro psychiatric diseases). The experts in the current study agreed that the stroke survivor should not be taking medications that cause drowsiness nor should not suffer from severe depression, dizziness or vertigo, in line with Liu's (2009) study, which excluded people who had depression.

However, consensus was not reached on other stroke survivor's health condition restrictions, such as whether the stroke survivor has severe spasticity, increased muscle tone, bone fractures, joint dislocations or severe fatigue. This differs from several studies that have included these features, for example Braun et al.'s (2006) review included 4 studies for MI use with stroke survivors and explored inclusion criteria for stroke regarding the trials conducted. There were restrictions on a couple of attributes, including cognitive and sensory abilities, and the capacity to understand and follow instructions; skills in terms of communicating with others; levels of spasticity and pain; symptoms related to the type and location of the lesion; the ability to imagine and generate images. These identified attributes were believed to be necessary requirements prior to admission to MI training and associated with beneficial MI use. However, comments relating to maintaining functions were identified by experts. They agreed on a set of stroke survivor health condition restrictions that did not reflect this role in MI use, including mental health, where some people can be distressed by the lack of movement on attempting MI, for example cognition was the most critical factor.

As for the stroke survivor’s ability, agreement was reached on patient's attributes. For instance, a patient needs to be able to imagine and describe the imagining process, as well as identify objects (e.g., a pen or a bed), and understand language (e.g., naming a pen or a bed) and be able to communicate well (e.g., understand instructions and repeat). Furthermore, the stroke survivor needs to be able to concentrate and be oriented. This is consistent with the findings of Braun et al. (2006), Liu (2009), and Liu, Song and Zhang (2014).

However, comments relating to the ability of stroke survivors to concentrate and have sustained and selective attention for a higher cognitive task were identified but fell short of reaching consensus at 69.2%. The agreed recommendation did not reflect the point related to the stroke survivor's ability. This differs from the findings of reviews conducted by Malouin et al. (2012; 2010; 2004b), highlighting the importance of screening for cognitive impairments prior to MI training, as impairments in concentration, attention and working memory can make MI training difficult for stroke survivors to follow. In addition, the ability to understand and follow instructions is considered a requirement for successful MI training. In Braun et al.’s (2008) critical review, it was concluded that it is crucial to assess the stroke survivor's mental capacity including attention, memory and ability to understand. See Table 5.6, below for list of recommendations to stroke survivor’s ability and attributes.

5.5.2.5 Assessment tools for MI use

Regarding the use of assessment tools to assess the stroke survivor prior to training, it is crucial to assess three main levels: levels of cognitive impairment (e.g., mild cognitive impairment, with a score above 24 on the Mini-Mental State Examination (MMSE) test); the ability to imagine tasks (e.g., right level of imagining is a score above 60 on the Kinaesthetic and Visual Imagery Questionnaire (KVIQ)) both seen as essential to engagement; levels of prominence of the image (e.g., right level of imagining the movement, with a score above 56 on the Movement Imagery Questionnaire-Revised Version (MIQ-RS)). These tools are highly supported by the experts.

Evidence to recommendations to assessment tools for MI use

The ability to image prior MI up taking, is in line with Malouin, Jackson and Richards (2013), who acknowledged that effective MI use necessitates the ability to create image, using several instruments to assess the ability to image, such as the KVIQ, which is a subjective measure of the stroke survivor’s ability to image simple movement vividly (Malouin et al., 2009, 2007).

Regarding the MIQ-RS, Dickstein & Deutsch (2007) acknowledged rating both upper and lower extremity movement to visual and kinaesthetic modes. Both these assessment tools are amenable to use in clinical settings and support the evaluation of the stroke survivor's ability to image prior to training. Using these assessment tools, the therapist can determine whether a patient is likely to engage in MI training and ensures successful engagement.

Other features of stroke survivors were also considered essential to assess, such as levels of tone or spasticity in affected limbs (e.g., score below 2 on Modified Ashworth Scale); levels of pain in affected limbs (e.g., mild -point 4 or less on Visual Analogue Scale of 0-10); levels of stroke fatigue (e.g., Fatigue Assessment Scale (FAS)). The only trials that have investigated MI use in stroke have included stroke survivors' levels of tone of spasticity affected limbs (e.g., scored below 2 on Modified Ashworth Scale). For example, Hong et al. (2012) excluded patients that scored below 2 on the Modified Ashworth Scale, as did Pheung-Phrarattanatrai (2015) and Polli et al. (2017).

Several points were highlighted by the experts as barriers that might cause conflict with MI use. Cognitive decline was identified as a barrier to MI if tailoring MI use and guiding stroke survivors based on their specific abilities, some stroke survivors with reduced attention capacity for the task have succeeded with MI. Other views were that following their own guidelines in treating stroke survivors in rehabilitation, they would trial MI for upper limb (UL) recovery with most stroke survivors, including those with language/communication impairments and mild cognitive impairments, to allow them to use an evidence-based UL therapy.

Malouin et al. (2004-b; 2010; 2012) explained the importance in screening for cognitive problems and MI ability. In addition to evaluating the working memory levels, which play an essential role in MI use, these issues must be documented as both impaired skills of working memory and sustained attention can make MI training and progress more difficult (Braun et al., 2010; 2012). Recommendations to assessment tools are listed in Table 5.6, below.

Table 5.6, Recommendations for MI use in stroke rehabilitation

Recommendations for MI use in stroke rehabilitation		
WHO (Provides it)?	Recommendations for improving therapist's knowledge & experience in MI.	1. Therapists can gain knowledge & improve their MI experience by accessing peer-reviewed journals, or by reviewing clinical guidelines if available. 2. Therapists should enrol on training programmes with peer expert supervision in MI use to help them reflect on their skills, maximise learning & increase their experience. Programmes offering evidence-based instructive guidelines are essential for developing intervention training in healthcare services. 3. Therapists should be observed in delivering MI by expert clinicians to build their confidence & skills in its application; & offered expert shadowing with supervisors or colleagues, who have used MI in clinical practice. This is essential to support training, ensuring maximum learning development, & improved confidence & competence to practice. 4. Therapists should seek CPD opportunities offering improvement via experience & clinical skills enhancement. Attending training courses or workshops, videos explaining how to incorporate MI into practice, & discussing research findings with colleagues/others (e.g., journal clubs, knowledge exchange meetings with academics) are the most useful & appropriate methods.
WHO (Provides it)?	Recommendations for therapist's engagement & patient training.	1. To ensure success in treatment engagement & MI training of stroke survivors, stroke survivor beliefs about their ability to enhance positive changes in their own health status must be acknowledged. This can be facilitated through health professionals & patient information platforms.

		2. The success of MI training relies on maintaining a good therapeutic relationship & encouraging active self-management in partnership with professionals who respect their needs. 3. Providing feedback on MI training progress is essential, alongside diaries to record reflections on experience. In addition to written personalised patient-therapist feedback, reflective feedback positively reinforces & promotes self-management with the overall aim of enhancing awareness & mindfulness. 4. Identifying whether stroke survivors can perform MI is essential; MI cannot be passively administered, rather stroke survivors need to be actively focused & engaged. 5. A supportive environment comprising successful care giving from the facility, alongside the support of the caregiver/family is required. Furthermore, appreciating the stroke survivors' emotional & physical challenges is essential to achieving a successful rehabilitation programme.
WHO (Receives it)?	Recommendation to stroke survivor's ability & attributes (who).	1. Stroke survivors should not be suffering from cardiac problems, major musculoskeletal problems (e.g., rheumatoid arthritis, orthopaedic surgeries or musculoskeletal surgeries); or any severe neurological problems (e.g., epilepsy or seizures or hypertension or asthma). 2. Stroke survivors should not be taking medication that causes drowsiness nor suffer from severe depression, dizziness, or vertigo. 3. MI should not be attempted with patients with severe mental health problems, or distress caused by lack of movement. 4. Cognitive impairments should be screened prior to MI training, as impairments that is related to cognitive & sensory abilities, attention & working memory, which can present stroke survivor difficulties in MI training. 5. Stroke survivors should be able to concentrate (sustained & selective attention for a higher cognitive task) & oriented. 6. Stroke survivors should be able to imagine & describe the imagining process, as well as identify objects (e.g., a pen or a bed), understand language (e.g., name a pen or a bed) & communicate well (e.g., understand instructions & repeat).
WHY (Benefits)?	Recommendations for the benefits of MI use.	1. MI use improves functional outcomes such as upper limb function, global ADL & mobility.

		2. MI use impacts on psychological recovery, such as improving confidence, concentration; improving self-esteem & positive attitude (mental & emotional wellbeing). 3. MI improves motivation (the ability to sustain a positive attitude) & can make the stroke survivor feel calmer/more relaxed, reduce/control pain & spasticity, improve self-efficacy & increase self-confidence. 4. MI helps in controlling levels of pain & produces a substantial decrease in chronic pain levels which, in turn, helps increase limb function. 5. Adherence to a rehabilitation programme is another essential benefit of MI use, showing stroke survivor understanding of MI training instructions. 6. MI use can improve QoL, specifically, levels of joint flexibility, memory, & participation in life. 7. There was no evidence in the literature to support an impact on participation following MI training.
WHAT (Tools)?	Recommendations for instructing MI use (how).	1. Audio imagery scripts can help stroke survivors imagine & train in MI. 2. Using equipment or objects to help explain the movement (e.g., dumbbells) or any anatomical aids (e.g., skeleton or dummies). 3. Listening to instructions can help in task completion. 4. Using words can motivate & encourage stroke survivors to see or feel the movement & perform it effectively. 5. Providing verbal instructions & demonstrating the movements to stroke patients can support teaching MI use (e.g., pictures, posters, or therapist's own limbs). 6. Technical support, for example using mirror therapy can be helpful to illustrate imagined tasks during training. 7. Functional items (i.e., cup/glass) & having access to the correct equipment (e.g., having a mirror box and the correct table set up and access to a quiet room) can allow patients to concentrate. 8. Following a protocol and asking stroke survivors to demonstrate their ability to engage in MI, will ensure instructions are understood accurately. 9. Accessing quiet rooms is essential for instructing MI use.

		10. One-to-one guidance through close therapist-patient interaction is required during all stages of training. The therapist should introduce MI training, allow sufficient time, have appropriate experience in MI themselves and support patient adaption to the therapy. 11. Familiarisation with MI use is required, examples & detailed explanations that include real-life experiences, is more straightforward to motivate patients to train effectively. Regularly checking stroke survivor's understanding of the imagery concept and recognising their own goals is important in avoiding unrealistic expectations. 12. Use of a bespoke script specific to the tasks the patient is imagining, can enhance visual, sensory, & kinaesthetic feedback. Adapting scripts to the stroke survivor's own movements, speed & sequence is encouraged. 13. Tailoring training instructions to the stroke survivor's own needs & set of goals is also recommended, focusing on the abilities of the stroke survivor to help enhance effective MI training.
HOW (Mode)?	Recommendation for mode of MI use.	1. Stroke survivors should be instructed to use visual imagery from an external visual imagery perspective. 2. Both visual & kinaesthetic modes can be combined, & any type of imagery is recommended, as long as it involves movement images. Motor-focused tasks explored with stroke survivors during visual and kinaesthetic modes result in positive outcomes. This type of imaging can enhance accuracy & vividness of the imaging process & further increase sensation levels. 3. Instructing stroke survivors to use graded imagery is recommended. 4. Perspective of use is more effective when tailoring MI according to stroke survivors' preference & feedback and incorporating different perspectives in training. 5. Combining visual and kinesthetic approaches can add more weight to the vision. 6. Imagery mode should be patient-specific, tailored according to their needs & abilities.
HOW (Length for duration)?	Recommendations to length for duration of MI use.	1. For length and duration, MI training should run for at least 2 & continue up to 6 weeks or more, to achieve a positive effect on improved function in stroke survivors. 2. Therapist support & guidance should be reduced over time, as stroke survivors develop self-generated treatments.

		3. After discharge from treatment, stroke survivors should be encouraged to use MI & re-contact the therapist if they are having difficulty or anything is unclear regarding their self-directed MI practice or progress. 4. Therapists must ensure that the stroke survivor is independent in MI use after being supervised & guided during MI training, & that they can practice independently in later sessions. 5. Self-practice of MI use at home, without supervision, should be encouraged by the therapist once the stroke survivor is familiar with the technique. Therapists should monitor adherence, & track progress, alternating treatment plans or increasing intensity if required. 6. MI practice should continue for 4-6 weeks, every day or five days a week, for 30 minutes up to one hour. 7. MI can be an adjunct to other treatment for as long as is useful & as much as it is needed for however long; MI could help maintain improvements even after discharge from sessions & rehabilitation therapy or clinics. Stroke patients can continue MI use as much as needed.
HOW (Intensity)?	Recommendations for intensity of MI use.	1. For best effect with MI use, stroke survivors should train at least once a day & up to three times per week, with a practice duration of up to 30 minutes up to one hour. 2. MI training can be used in combination with another exercise such as physical practice or relaxation and integrating the time for MI with other exercises can be in the stroke survivor 's favour. 3. Recommendations for MI intensity suggest encouraging self-practice for up to seven times per week or as much as it is needed for however long. 4. Stroke survivors should be encouraged to self-practice as frequently as can be tolerated, according to their individual needs & ability. Importantly, MI can be tailored to the patient's need & the patient is given the opportunity to decide for themselves how & when their exercises take place. 5. The experts recommended the frequency of MI for stroke survivors can be continued independently, unsupervised and followed easily, once initially administrated by the therapist & the concept understood by the stroke patient, who can practice daily to aid neural growth & recovery.

		6. MI needs to be patient-specific, according to their needs & ability to participate in the session. 7. Therapists can support stroke survivors during clinical sessions; this need will gradually decrease as stroke survivor motivation levels in using MI independently & unsupervised will gradually increase. 8. Training for 10-20 minutes is important, but stroke patients may need more or less time depending on their individual needs & tolerance. 9. The practice of MI may be incorporated alongside other interventions such as relaxation or task focused training, thus influencing factors such as intensity & duration. 10. The experts recommended encouraging self-practice up to five times a week, to help maintain progress in recovery. 11. The recommended frequency is from three to seven times a week and between 15-minutes up to an hour a day as tolerated; however, applicability of how much MI training is effective still remains imprecise requiring further exploration in future trials.
HOW (Tools)?	Recommendations to assessment tools for MI use.	1. Tools recommended for use in assessing the ability to ability to image simple movement vividly & determine whether a stroke survivor is likely to engage in MI training include the Kinaesthetic & Visual Imagery Questionnaire (KVIQ) & the Movement Imagery Questionnaire-Revised Version (MIQ-R). 2. Increased tone or spasticity, pain in affected limbs and fatigue should be assessed prior to training. For example, by using the Modified Ashworth Scale (score less than 2) for spasticity, score of 4 or less on Visual Analogue Scale of 0-10 for pain & the Fatigue Assessment Scale (FAS). 3. Assessment of cognitive difficulties e.g. reduced attentional capacity for specific abilities & tasks, language/communication impairments & mild cognitive impairments should be assessed prior to training. In addition to evaluating working memory levels, which play an essential role in MI use. 4. These issues should be documented as working memory & sustained attention deficits can make MI training more difficult.

WHERE (Place)?	Recommendations to location for MI use (where).	1. MI can be used anywhere (at home, in hospital & in outpatient rehabilitation settings), as long as specific time & space is allocated. 2. MI should be delivered in a quiet space with minimal distractions.
WHEN (Time)?	Recommendation for time of MI use.	1. MI is recommended either during/or as part of other treatment sessions & or when no physical therapy or treatment is available. 2. Encouraging independent practice outside of therapy as soon as stroke survivor can do so independently is important and beneficial. 3. Unguided practice, unsupervised by the therapist, can be encouraged to help improve the intensity of training & empower the patient. 4. Tasks need to be aimed at increasing personally meaningful activity. For example, detailed explanation that includes real-life experiences are more likely to motivate patients to train effectively. It is essential that MI is directly related to the tasks they are practising & should be as close as possible to real performance. 5. MI use can be continued after discharge from treatment, or while waiting for scheduled appointments for a course of treatment; thus, helping to maintain improvements in ADL function.

5.6.3 Strengths and limitations

In this study, using a cut-off score of 70% consensus helped achieve the desired effect of allowing the process to be completed, with only 7% - 22% (n=5) participant dropout over the three iterations: round one (n = 18), round two (n = 14) and round three (n = 13). From these findings, most items reached or exceeded the threshold of 70% by some degree, despite the fact that there are no available evidence-based guidelines in the field for MI use in stroke rehabilitation. This level of consensus can be regarded as strength for this study.

A second strength is the low dropout. In respect of iteration bias, the response in round two was 78% (round two ratio to round one), and 93% in round three (round three ratio to round two), which can be considered a small dropout rate in sample size within this small pool of responses, as addressed by Evans (1997). Another strength of this study is the reminder emails that helped maximise responses (Sandrey & Bulgur, 2008). This was in addition to offering an extension for some participants to complete the survey (Franklin & Hart, 2007). As well as planning the Delphi to be between two to three rounds, this helped reduce panel fatigue and each round was conducted over both general holidays and work times, with a quick turnaround time in data collection to enhance engagement and reduce drop-outs as much as possible (Linstone & Turoff, 1975).

A further strength comes from the snowball sampling technique which helped identify more experts to participate in the study. Participation was voluntary. Additionally, participants were working in a range of professional fields and settings, and included clinicians and academics, based in universities, hospitals and private settings. Some were employed as senior lecturers, therapist educators or were delivered clinical workshops on occupational topics. Others were associated with academic Rehabilitation Departments in their universities, and the sample also included clinical occupational therapists and physiotherapists in neurological specialisms. Including experts with different backgrounds helped reflect varied views on essential items of MI use and produce a valuable list of MI use and training. It could be argued that this latter group (neurological specialisms) had the greatest impact on the survey as they were directly involved with using MI with stroke survivors (Novakowski & Wellar, 2009). While the other participants, including researchers and educators' views, reflect their academic knowledge and proficiency in MI (Starkweather et al., 1975; Moore, 1987; Synowiez & Synowiez, 1990).

The focus of this study was on developing core recommendations for MI use in stroke rehabilitation in clinical practice. These covered both improving the patient's MI experience and influencing the behaviour of the therapists in training stroke survivors in MI use. This could only be informed by experts, and I believe that the views of the panel of experts are representative of experts in parts of the world where MI is currently practiced. Nevertheless, it is important to note that this does not mean that another sample with different dynamics, including time and geographical factors, could not give different views in the future. However, the body of experts who participated is seen as a strength of this study. One limitation to the study was that mixed views were received from both physiotherapists and occupational therapists (e.g. mainly around improving mobility). In addition, the mix of clinicians and academics in the sample could have produced different views. However, the aim of this study was to integrate views from those who have used MI with stroke and have an adequate level of experience in MI use, regardless of their professional background. Consequently, the work could have been influenced by the views of experts who have researched MI use but not generally applied it. However, the mixed proportional backgrounds helped to reduce the risk of experience bias. Another point that surfaced was that views from occupational therapists were entirely different from a physiotherapist's view in terms of a specific outcome, such as how effective MI was in relation to a specific mobility outcome (Lemmer, 1998). The Delphi method has been used extensively in the field of health care. However, there has never been one perfect method for attaining consensus. Several different methodologies (e.g. nominal group process or development panel for consensus) could have been used and may have produced a different set of recommendations (Rowe et al., 1991). However, the findings of a Delphi are mainly specific to the experts included in that sample (Sandrey & Bulger, 2008) and responses do not need to be repeatable as they may include members with the same qualifications but with different backgrounds (Clayton, 1997). However, as the use of MI in stroke rehabilitation is a novel technique, and there is no specific set of recommendations for practice due to a lack of available evidence-based guidelines in the field, Delphi was seen to be the best method proposed at the time. One limitation to the study was that the mix of clinicians and academics in the sample produced different views. However, the aim of this study was to integrate views from those who have used MI with stroke and have an adequate level of experience in MI use, regardless of their professional background. Consequently, the work could have been influenced by the views of experts who have researched MI but not applied it clinically. However, the mixed backgrounds helped to reduce the risk of experience bias. Another point that surfaced was that views from occupational therapists were entirely different from a physiotherapist's view in terms of how effective MI was in relation to a specific mobility outcome (Clayton, 1997; Lemmer, 1998). The Delphi method has been used extensively in the field of health care. However, there has never been one perfect method for attaining consensus. Several different methodologies (e.g. nominal group process or development panel for consensus) could have been used and may have produced a different set of recommendations (Rowe et al., 1991). However, the findings of a Delphi are specific to the experts included in that sample (Sandrey & Bulger, 2008), and responses do not need to be repeatable as they may include members with the same qualifications but with different backgrounds (Clayton, 1997). However, as the use of MI in stroke rehabilitation is a novel technique, and there are no specific recommendations for practice due to a lack of available evidence-based guidelines in the field, Delphi was seen to be the best available method at the time. It was most appropriate for this study to use the modified Delphi technique, rather than the classical Delphi technique. No focus group discussion was included in the first round, as the study was informed by results from a previous qualitative study that included focus groups with clinicians and one-to-one interviews with stroke survivors. In addition to findings from a previous systematic review, both the qualitative study and the systematic review helped inform the modified Delphi technique development (Hasson et al., 2000; Keeney et al., 2011; Williams & Webb, 1994-a-b). This type of Delphi might have introduced potential bias by two means: either by using the data from the previous studies or by the experts when rating the structured statements in round one (Goodman 1986; Walker & Selfe 1996), although the researcher provided a free text comment box for the experts to freely express any issues regarding the item or statement. Experts mainly completed the structured rating statements and might have rated the predefined statements spontaneously. It may have been a different if they had been given the opportunity to make their own statements (Sumsion 1998). The experts were invited to the Delphi due to their experience level in MI use, ranging from moderate to proficient level, and recognition of their expertise being within a reasonable knowledge range: they were confident in MI use and delivery with stroke survivors, in addition, some of them had identified that they were already teaching clinicians to use MI. However, a few experts stated that their expertise was somewhat basic and acquired through available knowledge and channels such as websites and workshops, in addition to reading up-to-date research for their CPD. Nevertheless, some felt incompetent in MI use with stroke in particular and chose to withdraw, explaining that their level was not reflective enough for the survey (Sumsion, 1998). The first round permitted participants to proceed, regardless of the number of years of experience in MI use. It could be argued that the length of experience was associated with the expert’s view and was reflected differently in the survey. However, the less experienced participants, who were small in number, are less likely to have influenced the set taken forward to consensus level. In addition, MI experience can vary between individuals, as it is very novel, and only years of practice can be considered rather than a qualification or self-perceived measure.

5.7 Research implication

With the ambiguity in the literature to provide evidence considering MI effectiveness and process of delivery in clinical practice with stroke. Some items of MI use were expected not to reach consensus, particularly regarding what should be delivered, for whom and how to enable this in practice with stroke. This can be very challenging, given the current evidence and remains an area for further research.

5.8 Conclusion

This chapter explained the Delphi process used to produce this consensus, which will inform clinical protocols for MI training in stroke rehabilitation. The findings suggest there is a need to train therapists in MI and that certain patient attributes may determine the success of MI in stroke rehabilitation. These attributes may include cognitive function levels, e.g. memory, attention and other co-morbidities, which may be contra indicative or negatively impact on MI use and/or outcomes. However, evidence to underpin these attributes is lacking (they tended to be based on the exclusion criteria from previous research only). Further research is needed to determine who can benefit from MI training. There was no consensus on the best tool or measure for assessing stroke patients' capacity to use MI. Further research is needed in this area. These consensus statements and recommendations are based on clinical and academic expert opinions, which has previously been lacking in the literature. They now need to be turned into a set of best practice recommendations for MI use in stroke rehabilitation in clinical practice, which can be used in different contexts and countries. Further future clinical implementation studies are warranted to test the effectiveness of training based on these recommendations in terms of their uptake and use in clinical practice. The knowledge and skills of the therapists and their confidence needs to be improved and optimised.

Chapter Six:

Mixed-Methods Design Synthesis

6.1 Overview

In this chapter, the method used to synthesise the research findings will be outlined. The reason for selecting this method of synthesis will be justified. Then the findings from each chapter will be synthesised and discussed in relation to each other. Finally, the synthesised findings will be reflected against existing research gaps, and areas, which lacks clarity or requires further investigation in the use of MI in clinical practice.

6.2 Introduction

O'Cathain, Murphy and Nicholl (2010) reported three main methods for synthesising data from different components of their own studies using a mixed-methods designs. These methods included a triangulation protocol, mixed methods matrix, and the following a thread method. The latter is a cyclical approach which involves analysing data by following a thread. O'Cathain et al. 2010 acknowledged that an advantage of this method for synthesising findings integrating qualitative and quantitative components is that it gives credibility to the findings that helps expand knowledge.

Adamson et al. (2009) reflected on one example which explored the effect of patients' views on using healthcare services. The findings were based on two studies: a survey conducted across patients registered at a general practice, and semi-structured interviews with patients. In Adamson et al.'s study, they synthesised the findings using the following a thread method by integrating both data sets at the analysis stage, having analysed each study individually and then interpreted the findings in relation to each other. Thus, they identified several critical themes and questions which were highlighted for further investigation. Each theme or question was examined closely and traced back to either the qualitative or quantitative study, in a back-and-forth re-inspection method.

Adamson et al.'s (2009) study identified no specific steps or frameworks for following this technique. This may be because such methods were novel and yet to be replicated by researchers or reported as frameworks in the literature. Thus, there are no right or wrong steps in its application; the method relies on the researcher's skills in working between the available data sets, and their ability to produce a simple model of their own research design and synthesis method (see Figure 6.1). This approach allows the researcher to determine the strengths and weaknesses of the investigated topic through employing research designs that allow integration of data from qualitative and quantitative approaches. However, there is often lack of integration between these methods or an iterative synthesis strategy that highlights the need for future exploration (O'Cathain et al., 2010).

Like Adamson's study, this research project used a sequential mixed-method approach, including an initial qualitative study involving focus groups with therapists and stroke survivor interviews, followed by quantitative Delphi survey to help identify factors that could facilitate MI use in practice.

The findings from the qualitative study generated themes and questions that needed to be tested and explored in the Delphi survey. For example, a key finding obtained from the focus group concerned therapists' need for training in MI use, which, was an essential factor for implementing MI use with stroke rehabilitation. Training was also poorly reported by studies in the systematic review, thus, by following this data thread, findings from the systematic review and qualitative study informed the Delphi survey and were later used to interpret its findings in more depth. This is what O'Cathain et al. (2010) described as an iterative or a cyclical approach to data analysis using the following a thread method. Taking this example of synthesis, for the therapists to improve their skills and experience in MI use and implement it in practice they need to follow the recommendations identified by the experts. However, some questions raised by the data and the consensus statements did not reach a definite conclusion because their hypothesis was not supported by the quantitative analysis, and the survey respondents did not reach consensus.

The purpose of conducting synthesis is to combine the results from multiple primary research studies (both qualitative and quantitative in nature) in order to generate more profound insights. Additionally, findings from existing studies are used to create a new higher order for data interpretation. In this thesis, the findings from the systematic review and the qualitative and quantitative studies were used to identify potential challenges and assumptions regarding the use of MI. The synthesis process was initiated by interpreting the preliminary findings from the systematic review with those of the focus groups and interviews and followed by creating a few questions and hypothesis that needed further testing in the Delphi survey. The Delphi findings were then reflected against the previous studies to produce a shortlist of recommendations for using MI in clinical practice.

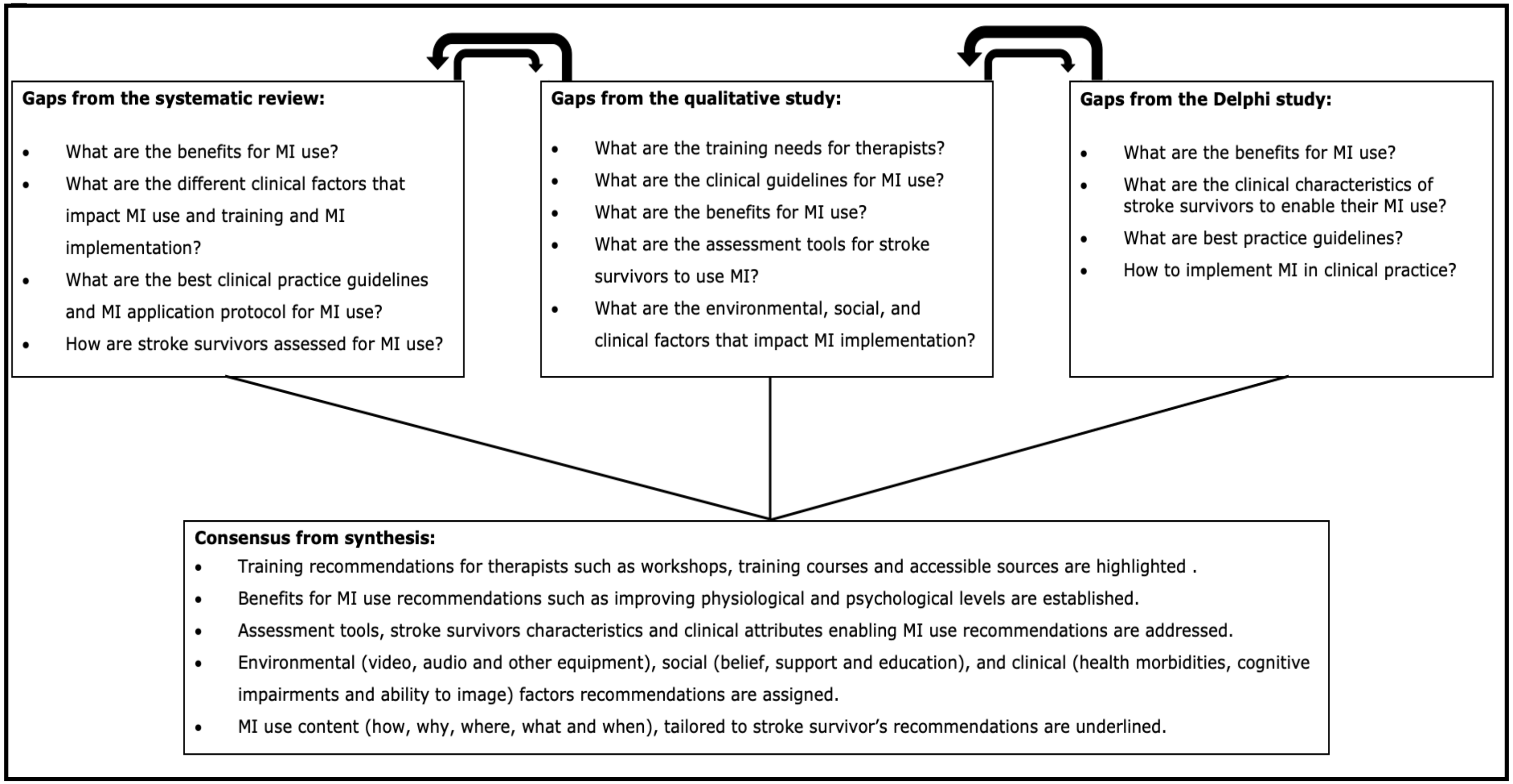

Figure 6.1 Methods for synthesising data.

6.3 Following a thread to synthesise data

The findings from each study in this research were synthesised together, where questions were highlighted, and further exploration was needed. Questions that were highlighted included: What are therapists training needs? What attributes do stroke survivors need to use MI? What tools are needed to assess these attributes? What are the benefits of MI use? What environmental and social settings are needed for MI use? How can therapists enhance patient engagement in MI? The method of synthesis went back and forth between studies until an answer was found in relation to the lack of evidence or strength of assumptions. Mostly, there was poor evidence from the systematic review, and clarity was achieved within the Delphi's findings. Each question will be explored in detail showing how a thread was followed to reach an answer.

The findings from the systematic review provided some evidence to support MI use in stroke rehabilitation and its effect on training outcomes. However, there were several issues that were poorly reported by the included trials, and which remained poorly understood. These included how therapists were trained to use MI; what stroke survivor attributes were important to ensure they could benefit from MI; whether stroke survivors should be screened for potential to benefit; and what assessment tools should be used assess for this purpose. In addition, what is the optimum protocol for MI training, and what environmental (e.g. setting, resources) factors can help implement MI in clinical practice.

The qualitative study highlighted further challenges in terms of therapists' training, the application of MI and factors enabling its use in practice, stroke survivors' attributes and necessary assessment tools. These findings were supported by the Delphi study, which helped explain and address recommendations for certain key items that could help in implementing MI.

These questions arose mainly from the qualitative themes that lacked clarity. For example, the need for training therapists and how therapists acquired experience and skills in MI or what skills need to be improved? The answers to these questions were also missing from the systematic review findings. How therapists were trained was not acknowledged. Regarding stroke survivor eligibility for MI training and what impacts their treatment success or enhances their engagement in therapy? What stroke survivor attributes determine their ability in imaging? How were stroke survivors assessed for their ability to image and how was task performance assessed? What assessment tools are needed to identify imaging ability or task performance? What are the benefits of MI use and training? What impact does MI have on different functional outcomes and other psychological attributes? What clinical guidelines and or protocols for MI use are available in literature?

In addition, to support the application of MI in clinical practice, what environmental factors might help in delivering MI or require enhancing. These issues remained unclear from the qualitative study and the systemic review and needed further exploration.

6.4.1 Therapists' training needs

The systematic review found that some therapists have sufficient training to use MI. However, most trials did not report how the therapists gained this experience or how they were trained to use MI. Where trials reported some information on therapists' experience, it was noted that the therapists were instructed in MI use and theory in a workshop led by an external expert or attended a two-hour briefing session which covered the theoretical background and some demonstration of standardised techniques. See figure 6.2 following a thread synthesis on what are therapists' needs for training.

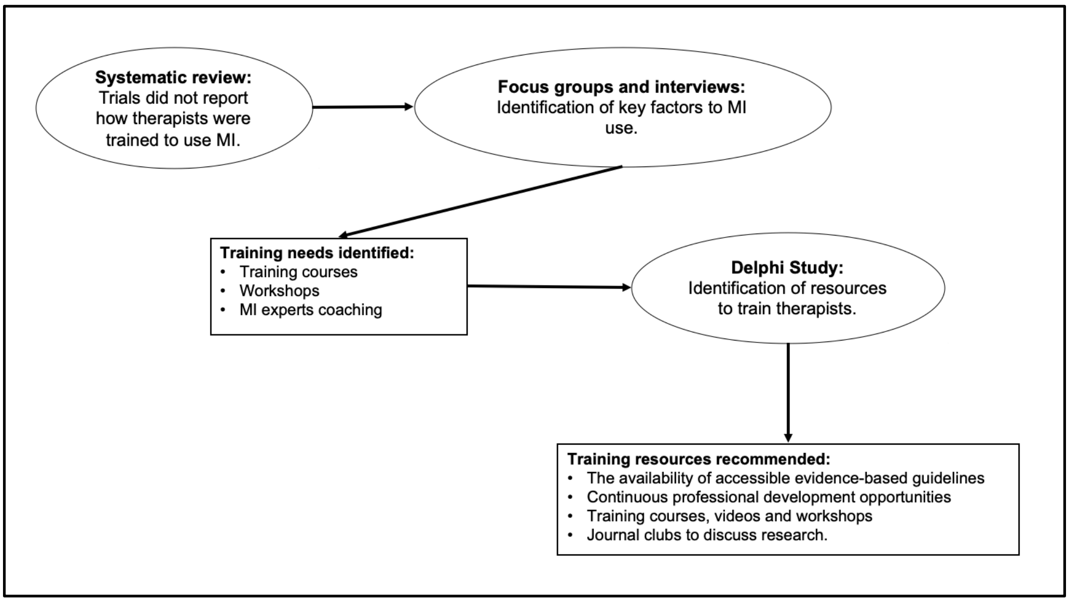

Figure 6.2 following a thread synthesis on 'What are therapists' needs for training?'

Similarly, the qualitative findings highlighted several factors that the therapists believed could impact its implementation. Their experience in its use and skills for training stroke survivors to use it, was a key factor holding them back from applying it in practice. This was also confirmed in interviews with the stroke survivors who believed that therapists had not encouraged them and didn't have the skills to do so. Based on the COM-B model several factors can impact capability behaviour, including therapists' skills and knowledge about the intervention, which in turn, can impact stroke survivors' ability to engage in MI training. These key factors were found to enable MI implementation in clinical practice.

The findings of the qualitative study indicated that very few therapists fully understood MI or its potential value for stroke rehabilitation. The participants highlighted a lack of training and experience in delivering it, stating that this was a major factor impeding its implementation. Even though most therapists were willing to use it, they would only do so if they were provided with training resources. However, none of the therapists identified resources that might help them improve their levels of experience.

However, the findings from the Delphi study suggested several ways the therapists could gain experience in MI delivery. The experts agreed on several resources, including, the availability of accessible evidence-based guidelines; CPD opportunities including training courses and workshops; watching videos explaining how to incorporate MI into practice and discussing research findings with colleagues in journal clubs and knowledge exchange meetings with academics these also could help enhance their skills.

The results of the Delphi survey indicated that therapists required more training in applying and delivering MI. Moreover, the resources needed to enhance therapists' skills were clarified, including scientific papers and peer-reviewed journals. These factors are crucial in optimising the therapists' skills, knowledge and experience therapist (Fairburn & Cooper, 2011). There are also evidence-based guidelines in place to support the belief that progressive career development is effective in enhancing the skills and experiences of therapists (Osborne & Brown, 2011). The Delphi survey results also suggest that workshops, training courses and discussing research findings with others can also be effective for this purpose.

All the experts involved in the Delphi had experience with using MI. However, most of them used protocols adapted from the field of sports psychology and none of them had attended any training courses or workshops. It would appear that training therapists in MI use, which is a key factor in the successful implementation of MI use in clinical practice, requires further exploration in research.

6.3.2 Stroke survivor ability & attributes in MI use

The findings from the systematic review suggest that some features of stroke could impact the effectiveness of MI when used in stroke rehabilitation. These include cognitive deficits, such as memory and attention, sensory impairments and other co-morbidities, such as cardiac problems, musculoskeletal problems, which could be contraindicative or negatively affect MI implementation and outcomes. However, there is insufficient evidence to support this, and conclusions are based on exclusion criteria applied in studies included in the systematic review, which differed across trials.

Moreover, therapists who partook in the qualitative study also highlighted the need to screen for stroke attributes before using MI in practice.

Therefore, it seemed important to identify which stroke attributes limit the ability of stroke survivors to engage in/be trained in MI use and thus limit its potential for effectiveness when used in stroke rehabilitation, so inclusion criteria for its clinical application could benefit from being specified.

Therapists acknowledged the importance of screening stroke survivors before engaging in MI to identify their ability to imagine or visualise to use MI. As suggested potential attributes that could impact intervention delivery. These included cognitive impairments, depression and medication causing drowsiness. This was supported by some stroke survivors, who acknowledged that having some cognitive impairments might hinder their ability in imagining. Therefore, it remained unclear what are these criteria and attributes.

Based on the COM-B behaviour change model, ‘capability’ is impacted by the stroke survivor’s capacity to engage in interventions and the therapist’s ability to monitor their condition and their progress in the intervention. Ultimately, identifying who can benefit from MI and how best to upskill therapists to train stroke survivors in its use could optimise recovery within rehabilitation. See Figure 6.3 below.

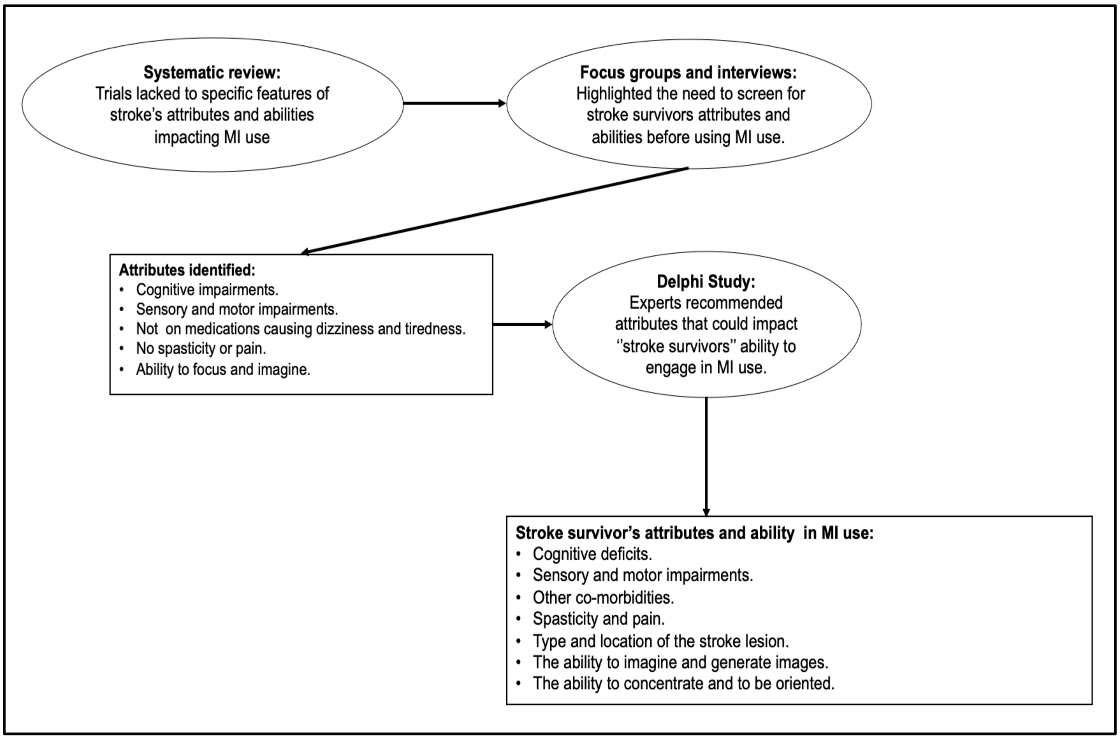

Figure 6.3 following a thread synthesis method on 'What is stroke survivor's ability & attributes in MI use?'

Looking at the findings from the Delphi study, the experts agreed on a potential list of stroke survivor attributes, that could impact their ability to engage in MI use. They agreed on most of these attributes because they believed they are prerequisites to MI training and may be associated with beneficial use of MI. These included cardiac problems, major musculoskeletal problems, neurological problems, medications that cause drowsiness, severe depression, dizziness or vertigo. Cognitive and sensory abilities, including capacity to understand and follow instructions; skills in communicating with others; in addition to levels of spasticity and pain; the type and location of the lesion; and the ability to imagine and generate images were considered important. Agreement was reached on patient attributes.

Patients need to be able to imagine and describe the imagining process, as well as able to identify objects and understand language and to communicate well. Furthermore, the patient needs to be able to concentrate and their ability to understand and follow instructions was considered a requirement for successful MI training.

The findings from the Delphi helped to identify a list of attributes recommended for use in screening for their capacity to engage in MI training. However, some of these attributes remain somewhat vague (e.g. which 'neurological problems' and what extent of attentional deficit or memory impairment prevents engagement) and thus require further research to clarify so that more stroke survivors can advantage from MI use.

Future research should test the relationship between patient attributes (e.g. working memory, attention and the ability to follow instructions) and MI engagement, and investigate whether these have an impact on MI training and if there is a way to overcome them by conducting brain imaging studies, such as fMRI and Transcranial Magnetic Stimulation (TMS) to help enhance MI training. Specifically, research should examine what sort of cognitive impairments impact on the patient's ability and capacity to engage in MI, and how to train those with cognitive impairments to help them benefit from MI.

6.3.3 Assessment tools for using MI

The prerequisite for using accessible tools to assess the stroke survivor's level and aptitude for MI use and training lacked clarity within the findings obtained from systematic review. With respect to stroke severity and the capability of stroke survivors to use MI, the review failed to elucidate appraisal tools. Those referenced in the included trials were not unique to stroke, thus required additional exploration. See Figure 6.4 Following a thread synthesis for 'what are the assessment tools for determining MI use?'.

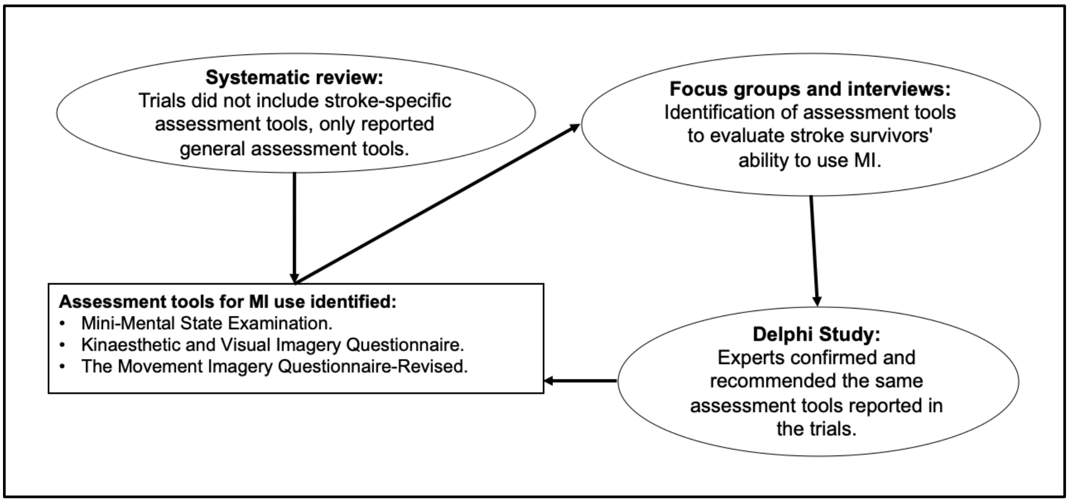

Figure 6.4 following a thread synthesis method for 'What are the assessment tools for determining MI use'?

Likewise, the qualitative study reported that therapists wanted methods of evaluating stroke patients' competence to participate in MI training.

However, how best to assess stroke survivor's ability to image and perform their MI task and which tools are available to do this remained unclear.

Following on from the findings of the qualitative study, the Delphi experts agreed on several assessment tools, such as the

Mini-Mental State Examination (Folstein, Folstein and McHugh, 1975), the Kinaesthetic and Visual Imagery Questionnaire (Malouin, Richards & Jackson, 2007), the Movement Imagery Questionnaire-Revised (Hall & Martin, 1997). They also identified other attributes needing assessment, which might cause conflict with MI use, such as cognitive decline, reduced attention capacity, language/communication impairments, working memory and sustained attention. These specific attributes to MI use would need administrative tools, which to date requires further investigation. It was also considered vital to assess additional characteristics more specific to stroke, i.e. degree of tone or spasticity and pain within afflicted limbs, indicated by a score < 2 on the modified Ashworth Scale and ≤ 4 (mild) on the pointed visual analogue scale, respectively, and the presence of stroke fatigue, using the fatigue assessment scale (FAS).

Therefore, while the Delphi experts highlighted some useful tools for assessing and stroke survivors' capacity for MI training, further investigation is warranted in this area. Namely, to determine which tools best estimate the stroke survivors' competency in imaging before training to confirm their appropriateness, and which ones enable the practitioner to predict the stroke survivor's ability to participate in MI training and the likelihood of a positive endpoint. The extent of attentional and working memory deficits likely to limit learning and engagement in MI training also remains unclear.

6.3.4 Benefits in MI utilization

The evidence obtained from the review suggested MI use improves mobility outcomes for walking and balance tasks. However, the findings regarding its impact on ADL, QOL, and participation outcomes were less clear due to limited studies. Furthermore, therapists acknowledged many potential benefits of MI use, concerning physical and psychological aspects. Additionally, stroke survivors believed MI had the potential to influence their confidence, self-esteem and emotional positivity. However, the lack of clarity regarding the benefits lead to the question, 'what are the benefits of MI use?' What impact does MI have on functional and psychological outcomes? See Figure 6.5 showing following a thread synthesis for 'What are the benefits of MI use?'

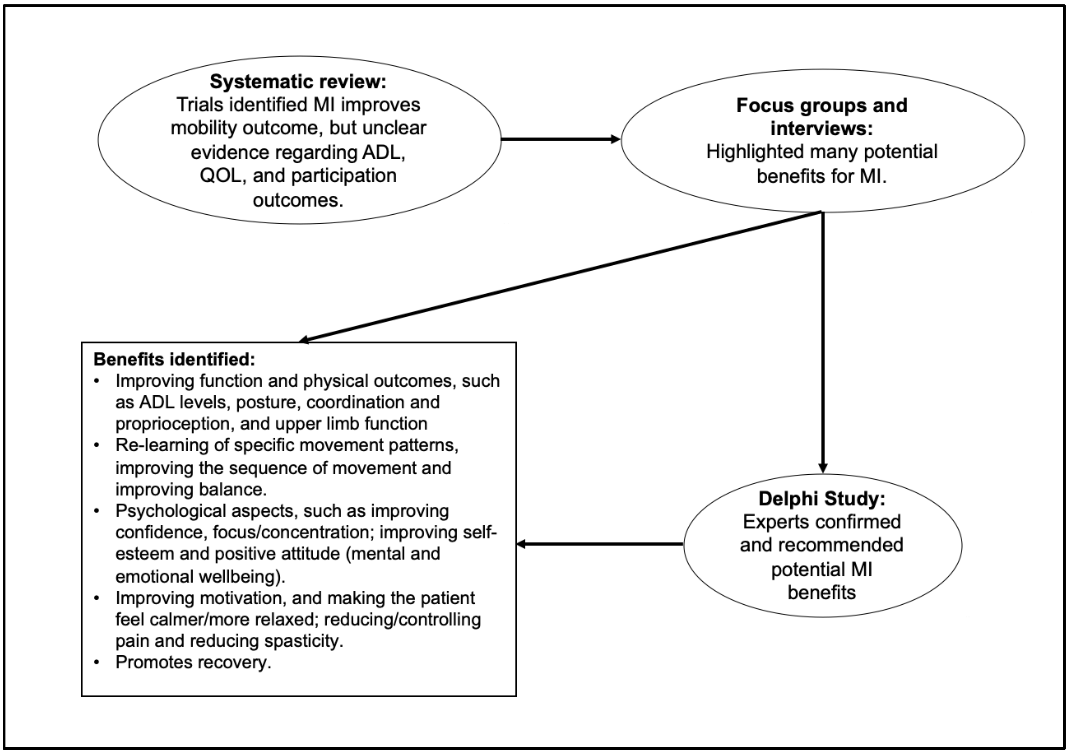

Figure 6.5 following a thread synthesis method for 'What are the benefits of MI use?'

These questions were explored in relation to the Delphi findings. The experts agreed on a list of MI benefits that included:

Improving function and physical outcomes, such as ADL levels, posture, coordination and proprioception, upper limb function, and specific movement capabilities. Re-learning of specific movement patterns, improving the sequence of movement and improving balance.

Psychological aspects, such as improving confidence, focus/concentration; improving self-esteem and positive attitude (mental and emotional wellbeing).

Improving motivation (the ability to sustain a positive attitude) and making the patient feel calmer/more relaxed.

Returning to the qualitative interview findings, stroke survivors believed that MI use led to a hopeful outlook and they were motivated to use it to promote their recovery. This is in contrast to the perspective of therapists who felt that stroke patients may not wish to pursue this form of therapy. Data implied that in fact stroke survivors and their carers held contrary opinions to the therapists with respect to MI. Appreciating that patients are motivated and anxious to regain their health and to seek answers to their issues. Stroke survivors may actively search for any information that assists them in finding treatments and recovery options. MI was not an alien concept, but one they had previously researched autonomously or with relatives or peers, expecting to gain experience in its use. These findings suggest that stroke survivors recognised MI's possible advantages during their recovery but were keen to be guided by an experienced therapist. This information followed on from the findings from both the therapists and the systematic review which inferred that stroke survivors received education and guidance from qualified therapists and were driven and knowledgeable about the advantages of MI in rehabilitation. Such data emphasise the importance of stroke survivors being entirely cognizant about the possible advantages of MI and the requirement for patient-centred educational initiatives with transparent objectives. The evidence from the review was unclear in addressing the benefits for MI use. On the other hand, the findings from the qualitative study, indicated that both therapists and stroke survivors acknowledge many physical and psychological benefits. The Delphi study highlighted a list of benefits and recommendations for MI use. Yet there are advantages in using MI that need further exploration, specifically in relation to its impact on psychological outcomes. This is a research gap.

6.3.5 Environmental and social setting

Potential factors enabling delivery of MI were highlighted in the qualitative study. These were re-inspected in relation to the findings of the systematic review. The majority of trials mentioned some 'equipment' for education, including visual and audio guides to assist in training MI and adapting the training environment when instituting MI in healthcare facilities. This raised certain questions such as, 'What equipment can assist in training stroke survivors in MI use? And 'What factors are required to enhance the environment to facilitate MI use in clinical practice and or social settings? See Figure 6.6 for following a thread synthesis for 'What environmental and social settings are needed for MI use?'

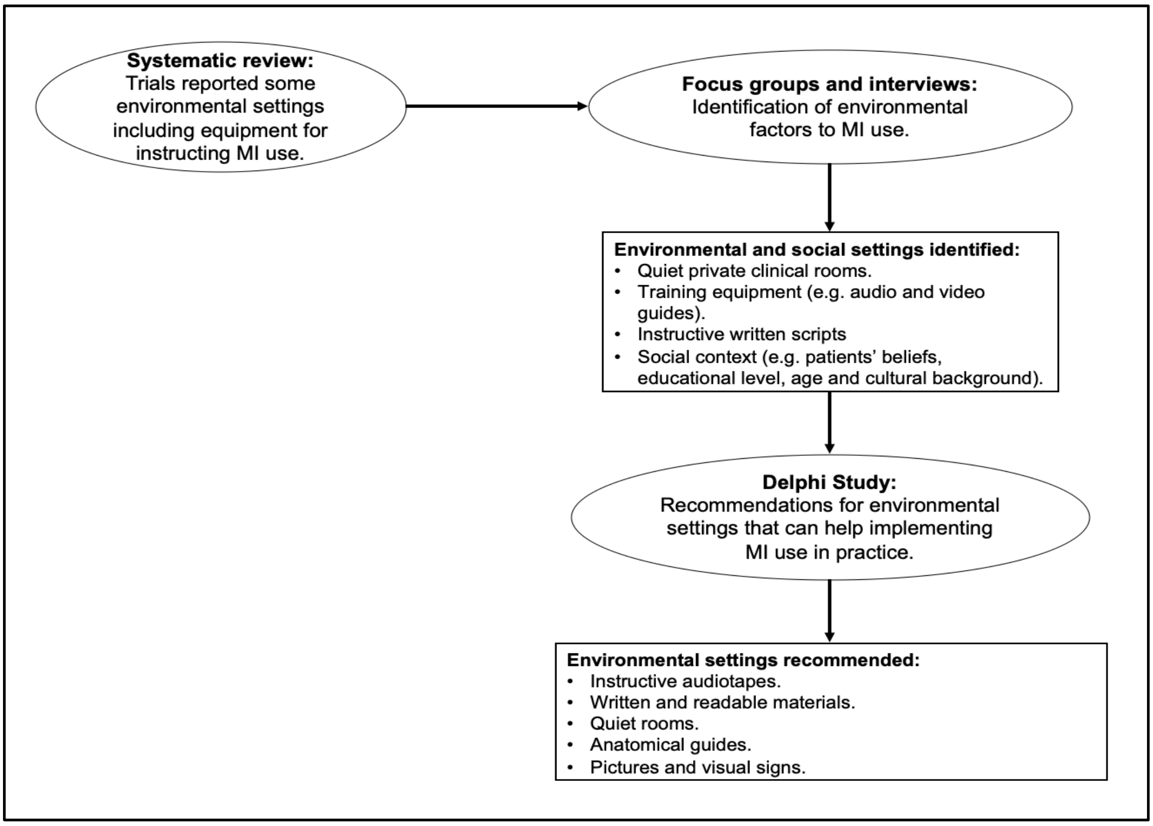

Figure 6.6 following a thread synthesis for 'What environmental & social settings are needed for MI use?'

The findings from the qualitative study suggest that therapists believed certain factors could help them deliver MI more successfully. These included environmental factors, such as providing quiet private rooms, and using training equipment, such as audio and video tapes, to encourage intervention acceptability and effectiveness. Therapists highlighted optimising MI use within the social context, by supporting patients' beliefs about intervention effectiveness and taking into consideration their educational level, age and cultural background.

These factors feature within the opportunity constituent of the COM-B framework that aids in behavioural improvement and encompasses both the social and physical environment to facilitate the anticipated activity.

These data imply that it is necessary for therapists to be aware of the effect of personal characteristics, social backgrounds and mind-sets that could influence patients' adherence to therapy. Enhancing the rehabilitation environment by offering a peaceful room and audio and video files as educational aids to expedite MI use and promote tolerance and efficacy of the treatment modality.

Successful rehabilitation programmes can be based on how well stroke recovery is fostered through several factors. One is through successful care giving from the rehabilitation facility, alongside the support of the caregiver (family) and the surrounding encouraging atmosphere. As well as the support received, appreciating the emotional and physical challenges that stroke survivors perceive is essential to successful rehabilitation.

Moreover, the Delphi experts recommended audiotapes and written material, which they acknowledged to be more acceptable and more pertinent than videotapes, DVDs or computers. This may be owing to previous experts, or possibly, to education in various aspects of MI, e.g. directed visual relaxation as opposed to a particular therapy for the upper limb. A visual format may have been perceived to require greater attention to maintain interest or to limit access to those with visual impairments, compared with an audio file, which is less demanding and more relaxing.

The Delphi experts may have considered that videos put excess stress on both stroke survivors and therapists, since this would have necessitated additional time to organise the presence of screens. It is also less time-consuming to offer audio media or reading material. This form of activity additionally facilitates heightened engagement with the therapists as videos are often easier to follow.

Experts agreed on several items, within the environmental setting and social context, which were lacking in previous literature, and necessary for MI use implementing in practice. They recommended optimising the rehabilitation environment by providing a quiet room with minimal distractions and resources such as audio tapes to assist training and encourage intervention acceptability and effectiveness. Regarding the social factors such as maintaining a good relationship between the therapist and patient during intervention delivery and identifying the patient's beliefs about using MI to improve recovery and identifying the patient's level of awareness of MI and its advantages and disadvantages and recognising their motivation for recovery. Enhancing patients' beliefs through two means; i) in treatment effectiveness and their own abilities to enhance positive changes in through health professionals, and ii) platforms providing information for the patient. This difference may be because the experts' views may not be based on up-to-date knowledge, alongside the absence of a strong evidence base in clinical practice.

Thus, further research is warranted to explore these enabling factors and the best way to address them.

6.3.5 Therapists, patient training & engagement

The trials in the systematic review did not report any factors that enhance successful patient training and engagement in MI use. The majority of trials described training in MI use in relation to the tasks and content of MI specifically but did not address the factors that enhance patient engagement.

From the qualitative study, numerous behavior impacting elements were described by the therapists, which, included the construct of motivation, i.e. the part played by the practitioner, the patient's trust in the therapy, individual goal management and rewarding positive emotions. See Figure 6.7 below on following a thread synthesis for 'How to enhance therapist-, patient engagement for MI use?

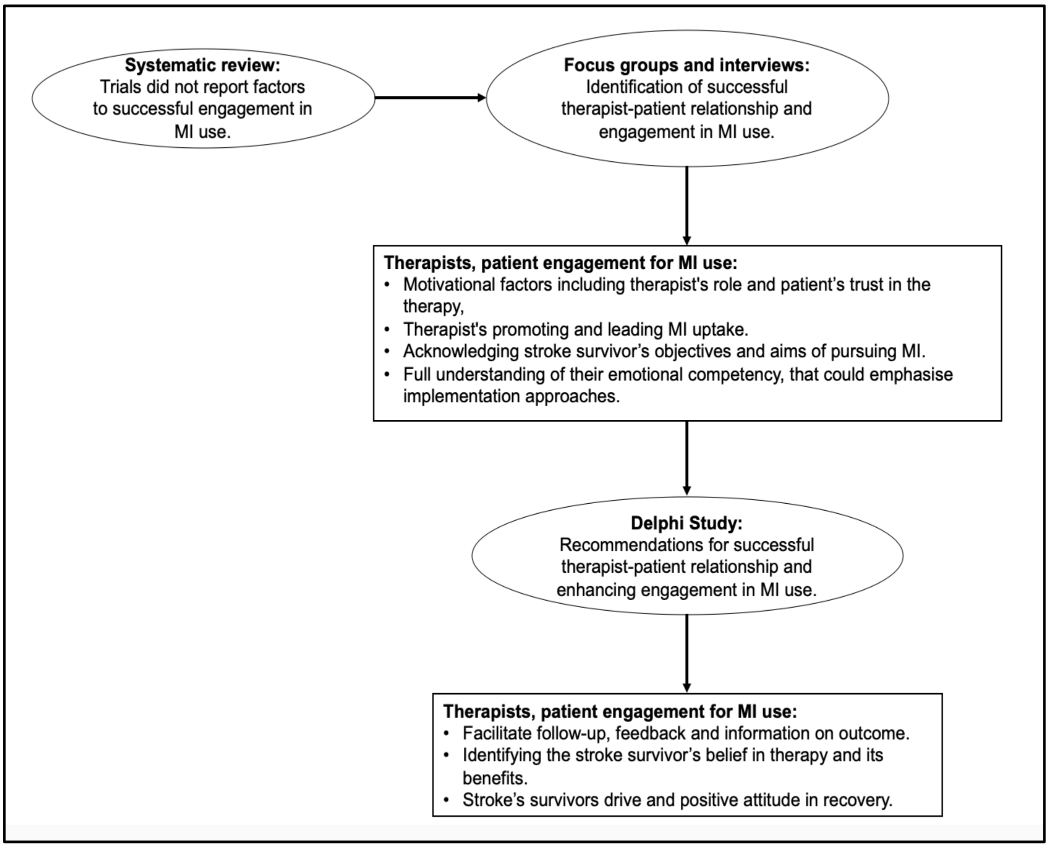

Figure 6.7 thread synthesis method for 'How to enhance therapist-patient engagement for MI use?'

These aspects are all ways to enhance acceptance and utilisation of MI. Furthermore, they acknowledge the part played by the practitioner in promoting and leading MI utilisation. Recognising elements that motivate patients could assist practitioners in facilitating the deployment of MI via their occupational responsibilities. This would optimise the practitioner-patient relationship and thus improve the stroke patient's commitment to MI. Furthermore, acknowledging the stroke patient's objectives and aims of pursuing MI, together with a full comprehension of their emotional competency, could emphasise implementation approaches.

This aspect was not specifically recognised in any of the trials in the systematic review, although in the Delphi study, agreement was attained, implying that two issues are critical in establishing the patient-practitioner relationship. These encompass preserving the latter during therapy, whilst invoking and sustaining successful engagement with MI. They can also promote the whole process and facilitate later patient follow-up to offer feedback and information on outcome. Additionally, identifying the patient's credence with respect to employing MI to enhance recuperation, the patients' degree of cognizance of MI and its benefits and limitations, and their drive to recover are also essential.

A further key facet is subsequent patient follow-up and delivering feedback on patients' progress with the MI programme.

The Delphi study inferred that particular elements may prevent the intervention from having a positive outcome. Some patients who have cognitive or perceptual dysfunction, fatigue, receptive language issues, poor drive or depressed affect may be less amenable to MI and find it challenging to comprehend the concept or to participate. Recognising whether the stroke survivor could actually achieve mental imagery was thought to be crucial, as many patients find this challenging. Engagement with MI has to be an active process with focus and cooperation from the patient; it is not possible to receive it in a passive manner. It was also necessary for practitioners to be self-assured and to offer a patient-centred package.

These aspects could incorporate the kind of occupations offered, patient degree of cognitive dysfunction, compliance and essentially, engaging with a practitioner with little experience in the utilisation of MI. These issues could all be rectified once MI had been deemed apposite by evaluating the patient for competency deficiencies. Moreover, providing patient-centric occupations, evaluating the patient's aptitude for imagery, surveillance for MI training and most significantly, educating the patient on utilisation of MI were emphasised.

There was a lack of consensus relating to ways in which to improve participation through a reinforcing setting, e.g. relatives and acquaintances. This was in contrast to the qualitative study, in which it was reported that both the practitioner and the patient stressed the value of relatives' and practitioner's backing for MI utilisation. This discrepancy may occur since the perspectives of the specialists may be outdated. In addition, there is little published evidence relating to MI. This research is new, and their decisions are simply founded on previous patient practice. A further possibility, in keeping with the data from the Saudi Arabian focus groups, is that at times, carers my inadvertently hinder patients by helping them with activities instead of promoting their autonomy.

The current literature relating to MI implies that there is little pragmatic value to be obtained from studies, principally owing to the lack of theoretical foundation for the evolution of this intervention in stroke patient recovery. Achieving a positive outcome from the implementation of an intervention could be directed via a spectrum of any potential choice of applied behavioural paradigms. The constituents and hypothetical constructs of these models are deployed to recognise a positive outcome of an intervention, an aspect that should be emphasised when choosing a behavioural framework (Palinkas et al., 2015; Hovmand & Gillespie, 2010).

Interventions that are inadequately documented in studies and variations within procedures for MI initiation in clinical practice have clouded the judgement of which protocol is more efficacious in stroke patients (French et al., 2020; Grol, 2001). Additionally, the dearth of available recommendations for its use in practice restricts any further progression in its application. It is therefore presumed that there are some elements that can assist in delineating clinical MI usage. However, until now recommendations have remained scarce, a fact which may be owing to approaches relating to the generalisation of information from studies on ways in which to best utilise MI. Such elements may persevere within a person’s ignorance of ways in which to apply MI in the clinical environment, lack of aptitude and experience. Moreover, the influence of incentives, environmental considerations and individual behaviours may also impact its utilisation (Glanz & Bishop, 2010; Michie et al., 2011).

Comprehending the possibility of new interventions for patient rehabilitation, e.g. MI, being implemented in clinical practice from a patient’s viewpoint could assist in the recognition and tackling of hindrances to implementation and planning therapy.

It could also promote participation and promote patients' faith in attaining their objectives.

Despite the fact that the deployment of MI is exhibited as being a de novo intervention, no unsurpassable hindrances were identified. Elements considered to be obstructive were equivalent to those relating to other forms of physical or occupational therapies, e.g. availability, guidance, or education with the backing of a career.

The pathway to enhance therapists' interaction with and education of stroke patients incorporates teaching skills and the ability to describe MI and how it works effectively for the patient; these aptitudes are essential for MI utilisation. A positive outcome requires the interaction of two aspects, i.e. the patient's criteria and the practitioner's aptitudes and experiences. Appraisal of the stroke patient's competencies prior to treatment can aid in the preparation of therapeutic approaches and clarify the way in which a patient can be managed (Leguerice, Donnell & Tate, 2009).

6.4 Conclusion

Synthesising the findings from studies and integrating the data from the qualitative and quantitative studies, helped generate more comprehensive understanding to interpreted data to identify existing research gaps, and areas, which lacked clarity or require further investigation in the use of MI in clinical practice. This highlights the need for future exploration.

The iterative and cyclical synthesis approach to data analysis helped in answering the questions generated from the systematic review and qualitative study that were followed back to the Delphi findings, and iteratively explored in more depth. This helped in producing a shortlist of recommendations for using MI in clinical practice.

The findings regarding therapists' need for training in MI use, stroke survivors' attributes and their ability to be trained in MI use, assessment tools for use with MI. As well as MI benefits, environmental and social factors, and therapist-patient engagement in MI use, which reached potential conclusions through the synthesis described in this chapter.

In conclusion, training therapist on MI use was poorly reported in clinical trials but was investigated further in depth in the focus groups and the findings were highlighted. The synthesis, drawing on the recommendations of the Delphi experts, provided evidence to help therapists improve their training in MI use and implement it in practice, by. Synthesising the findings from both the qualitative study and the Delphi survey helped further interpret the necessary stroke survivor attributes and have been used to generate best practice recommendations. Further, following the synthesis of the findings from the systematic review and Delphi on 'What are best tools to assess stroke survivor attributes and abilities to use MI?', helped to identify a list of the most important assessment tools, which was lacking from the qualitative study.

In regard to the benefits of MI use, the cyclical approach to synthesis helped generate a shortlist of recommendations which have been previously reported by the focus groups and were potentially lacking in the systematic review. Finally, although certain environmental settings were reported in the trials and several social factors were described by the focus groups, the Delphi study asserted a short list of recommendations.

Each question has been investigated thoroughly in relation to each study, in order to ensure robust evidence to underpin the recommendations for best practice in MI use. Further a discussion of these questions and findings is provided in Chapter Seven.

Chapter Seven: General Discussion and Conclusion

7.1 Overview

This chapter provides an overview of the findings. The theoretical implications of this PhD are discussed, in addition to how the findings contribute to the existing literature and in relation to the study limitations. Moreover, future research directions and implications for clinical practice are considered in relation to the findings.

The overall aim of this thesis was to identify factors that enable MI use in stroke rehabilitation in Saudi Arabia, and to determine best practice recommendations for the clinical application of mental imagery in stroke rehabilitation. This PhD is the first to explore the views and insights of therapists and stroke survivors in Saudi Arabia regarding the use of MI in stroke rehabilitation and is also the first to identify factors affecting its clinical use. Furthermore, the thesis has been guided through findings composed of primary data collected using mixed methods, as well as secondary data presented in a systematic review. The mixed method design included a qualitative study, alongside a consensus development method drawing upon key opinions gathered from a panel of experts, who instruct, or train stroke survivors in MI use in clinical practice or research.

The research questions addressed in this study were reported in the relevant chapters as follows:

1. Does MI practice combined with task-oriented training enhances rehabilitation to improve ADL, mobility, QoL and participation after stroke?
2. What are the factors affecting the implementation of MI with therapists and stroke survivors?
3. What are barriers to, and enablers of, the use of MI practice in stroke rehabilitation?
4. What are best practice consensus recommendations for MI use in stroke rehabilitation for clinical practice?

The systematic review in Chapter Two set out to investigate whether MI combined with task-oriented training improves performance of ADL tasks, mobility, QOL and participation after stroke. The findings from the systematic review identified a lack of clear and well-defined intervention protocols or clinical guidelines for MI use, despite MI being safe, and feasible to use at home without supervision.

Therapists' and stroke survivors' views were explored in Chapter Four, in addition to identifying the factors that could help implement MI effectively in stroke rehabilitation in Saudi Arabia. Focus group discussions with therapists and interviews were conducted with stroke survivors. The findings revealed essential enablement factors important for successful implementation of MI in stroke rehabilitation. Additionally, the participants' views highlighted some clinical behavioural domains and attitudes that were currently lacking in clinical practice (e.g., knowledge, skill, professional's role and patient's belief) can be enhanced to help implement MI use in practice. The limitations of this study were, that therapists' knowledge and experience did not illustrate how to implement MI in practice. Moreover, no guidelines for practice were identified, and no well-defined training approaches to equip therapists with the necessary skills and competency to deliver MI with confidence.

These findings lead to a Delphi survey (Chapter Five), which was informed by both the systematic review and the qualitative findings. The Delphi involved 18 experts in MI; and a total of 103 items related to increasing therapists' knowledge and skills in delivering MI and engaging patients in MI training. The study aimed to obtain the consensus of MI experts on best practice recommendations for the use of MI in stroke rehabilitation clinical practice, including recommendations regarding the minimum standards required for training therapists to facilitate MI and encourage stroke survivors to engage in the therapy. The Delphi resulted in a set of consensus statements, leading to best practice recommendations for developing therapists' knowledge and supporting the delivery of MI interventions in stroke rehabilitation in clinical settings that included benefits of MI, how to use MI, how frequently MI is used and MI intensity, and duration. In addition to modes and types assessment tools for MI, when to use MI, and where to use MI. This was in addition to the patient's attributes (e.g., patient's engagement in MI use, their health conditions, and patient's ability).

7.2 Discussion

7.2.1 MI use to improve recovery after stroke

Chapter Two examined whether MI assisted task-oriented training improved ADL, mobility, QoL and participation outcomes after stroke by conducting a systematic review.

The findings support the use of MI to help improve walking patterns and balance levels evidenced by two outcomes, the TUG test and the Berg balance test. MI participants had greater mobility (Balance) and were quicker than controls when trained for four weeks or more using MI in addition to physiotherapy. However, there was wide variation in MI intervention protocols and clinical practice, which made it too difficult to determine what worked for whom and therefore what should be implemented clinically and how.

These findings are in line with several studies (Dunsky & Dickstein, 2018; Dunsky & Dickstein 2008). For example, Dunsky and Dickstein (2018) developed an MI training protocol for improving gait after stroke. They used the PETTLEP model; a framework aimed to at helping athletes train in using MI by integrating different components (i.e., physical, environment, task, timing, learning, emotion and perspective). Their protocol helped therapists in applying structured MI intervention with stroke survivors to improve their walking abilities. After six-weeks of training, it helped improve gait performance, and it is rather based on the authors' previous studies and experience with MI rehabilitation programmes (Dunsky et al., 2006, 2008) to improve gait patterns following stroke. While their's 2008 study (Dunsky et al. 2008), aimed to investigate the feasibility of home-based motor imagery gait training after stroke. It included 17 stroke survivors trained to use MI for 15 minutes at home supervised by a physiotherapist for three days a week over six weeks to help improve gait impairments. Training was task specific and focussed on balance and walking exercises. Results showed improvement in walking and balance levels after MI use. The findings from this study suggest that the home exercise MI protocol can increase walking speed.

The systematic review findings in this thesis showed that MI training, combined with other standard therapy after stroke, enhanced recovery in walking and balance training between four to six weeks of MI use. In line with Guttman (2012) who reported significant improvement in 13 stroke survivors who used MI training combined with a sit to stand task training plan and produced better levels in performance after four weeks of MI use.

However, improvement in ADL levels following MI training was less clear. This may be due to 1) poorly defined ADL outcomes in the included studies, which meant that not enough data was available to perform a meta-analysis and 2) the definition of 'ADL' was heterogeneous across studies, which limited comparison. This is consistent with the findings of a review by Carrascoa and Cantalapiedrab in 2016 involving 23 trials, which found that MI improves ADL levels when combined with physiotherapy in rehabilitation. However, it was limited by heterogeneity of the intervention protocols for MI. They highlighted the need for further research to establish optimal MI training protocols and patient eligibility attributes to participate in the training.

Future research should explore MI interventions in stroke with clearly defined protocols and trials need to include larger samples of participants and investigate outcomes such as QOL and participation.

7.2.2 Views of therapists and stroke survivors

The qualitative study aimed to explore the views and insights of therapists and stroke survivors in Saudi Arabia regarding the use of MI in stroke rehabilitation and to identify barriers and enablers to its use at a clinical level. Four focus group discussions with 23 healthcare professionals, and 12 interviews with stroke survivors more than six months after stroke, took place in three healthcare facilities in Saudi Arabia.

The healthcare professionals regarded MI as a novel intervention. None were currently using it. They believed that more theoretical knowledge, skills and practical experience were essential for delivering MI successfully in stroke rehabilitation and that professional training courses and workshops were needed. The lack of knowledge in MI use and skill acquisition could be due to the lack of a research culture or recognition of the need for EBP in Saudi Arabia. Little current rehabilitation practice is evidence based.

For example, Al-Shehri et al., (2017) investigated the barriers impacting professionals in implementing EBP in in Saudi Arabian clinical practice, in terms of their behaviours, awareness and knowledge. Their findings highlighted a gap in therapists' understanding and application of the concept of EBP in Saudi Arabia. Therapists in Saudi reported no formal training in applying EBP and the authors identified an urgent need to integrate teaching about the use of evidence and the need for EBP to be built into undergraduate and postgraduate curricula. The findings also highlighted the need to develop the educational research environment context and teaching systems in Saudi Arabia to help improve the knowledge of practising physiotherapists and encourage them to implement evidence-based interventions and demonstrate proficiency in EBP. Additionally, the importance of providing new forms of training for therapists, which are cost-efficient and accessible for example online training courses (Fairburn & Cooper, 2011).

The stroke survivors on the other hand, suggested that they were more receptive to the idea of using MI, which might be due to their motivation in wanting to recover, and thus looking for potential therapies to help them improve. In addition to seeing the value for themselves, they considered it important that professionals using MI were experienced in its' use.

They supported the use of video and audio tapes to enhance their skill acquisition. Most stroke survivors had heard of, or experienced, MI and were motivated to use it in rehabilitation and were optimistic about its effects. However, they highlighted the importance of the therapist's role in training stroke survivors to use MI effectively and in suggesting potential benefits of use. This is in line with Epstein and Street's, (2011) report reviewing values of patient-centred care, in terms of what is appreciated to be acceptable as a good outcome for patients, and what makes patients desire one therapy over another. The findings of their report highlighted that patients are mostly familiar with having a passive role in care, and that role is merely satisfied by the physician asking them if they have any questions rather than involving them in decision-making about treatment and being more active in participation. Nowadays patients typically take a more active role in seeking their own information about their illness, and what therapies can work for them (Greenhalgh, 2009). Patients incorporating their views with those of the professional healthcare team through his knowledge and established abilities can help fosters engagement in care (Pomey et al., 2015).

The findings suggest that factors, including the therapist's knowledge, the patient's motivation and the patient's attributes, should be considered when designing interventions involving MI in stroke rehabilitation.

There is a need for best practice recommendations for clinical practice to be developed along with protocols for training stroke survivors in MI use and training for therapists in how to deliver mental imagery effectively in clinical practice.

Additionally, appreciating the potential benefits of MI for their stroke recovery may motivate stroke survivors, providing an optimum environment for learning and MI implementation. Stroke survivors were evidently more aware of, and receptive to, MI than the therapists realized. Clearly there existed more opportunities to utilize the benefits of MI in stroke rehabilitation and recovery than previously considered, and therapists should be trained to do so.

7.2.3 Best practice guidelines

The Delphi survey aimed to develop best practice recommendations for the use of MI by investigating the necessary factors and equipment required to facilitate the use of MI within stroke rehabilitation. Additionally, attributes of stroke survivors needed to engage with MI within the context of stroke rehabilitation that were identified.

Eighteen local, national and international clinical and academic experts in the use of MI in stroke reviewed and rated 116 items within 13 statements. Consensus was reached on 103 items related to increasing the therapist’s knowledge and engagement in MI and intervention experience (therapist’s knowledge and therapist’s engagement).

This resulted in a list of recommendations, for developing therapists’ knowledge and supporting the delivery of MI intervention in stroke rehabilitation clinical practice, which have previously been lacking in the literature.

Findings have shown that optimising the therapist’s knowledge and experience, skills and confidence is crucial to delivering MI successfully in clinical practice. Although stroke rehabilitation is increasingly supported by evidence, there is a lack of knowledge on the mechanisms for implementing this rehabilitation evidence in clinical practice (Eraut, 2000).

It is a challenge imposed upon the clinician to translate research findings into clinical practice through their skills, resources, and knowledge. However, one might argue that this challenge exists and is exacerbated by the lack of clinical guidelines and clear protocols to facilitate rapid implementation and clinician’s lack of familiarity with available evidence about the best knowledge transfer interventions to help translate research evidence into interventions for use in stroke rehabilitation. To ensure research is translated into clinical practice, also requires professional leadership (Wilder, 2014). Professional governing bodies need to support educational institutions in improving the link between academia and clinical practice, by up skilling clinicians with research skills and knowledge and creating clinical academic roles that extend the research environment and enable evidence to be translated more successfully in practice, thus closing the second translation gap (Black et al., 2015).

Physical therapy education in Saudi Arabia is influenced by many factors such as physical therapy educational programme models, the undergraduate professional course curriculum, as well as the capacity and spectrum of physical therapy practice in Saudi Arabia (Alghadir et al., 2015). In addition to the Saudi Physical Therapy Association (SPTA) aims to promote skills and provide training courses to help train all physical therapists practising in the country. This is the governing body equivalent to the Charted Society for Physiotherapy in the UK the Saudi Health Commission (CSP), their efforts are toward improving professions in Saudi Arabia. Although the government in Saudi Arabia has provided a huge youth education budget, in addition to investing in research development. However, the lack of postgraduate courses is a significant concern, such as introducing doctoral courses in physiotherapy (Al-Maghraby & Alshami, 2013; Bindawas, 2014).

The Delphi highlights the need for continuous education programmes and courses that are related to improve clinical skills that can help in developing clinical experience, which, will hopefully, in turn improve intervention delivery and treatment outcomes in Saudi Arabia.

In addition to tailoring, tasks that are meaningful, and directly linked to the personal goals of the patient was reported to be most effective in enhancing therapeutic engagement. This in line with Leach et al.'s (2010), qualitative interview report with eight therapists (Occupational therapists, Physiotherapists & Speech therapists) in a geriatric rehabilitation unit in Australia, which aimed to describe current practice in goal setting with stroke survivors in rehabilitation settings. The findings suggested that stroke survivors made an effort to work in order to gain recovery by fully adhering to their exercises in the rehabilitation therapy proposed by their therapists and agreed on goals between them.

Furthermore, the stroke survivor and the therapist must set goals that they believe are achievable and both must take part in deciding what personal goals can be achieved in rehabilitation plans. Many studies have supported the importance of personal goal setting that enhances effective therapeutic engagement (Baker et al., 2001).

The authors also reported that therapists listed some attributes that could work as barriers against the patient in completing their therapy, such as pain, depression, and cognitive impairments. However, Bright et al.'s (2015) review aimed to understand and define the engagement process through a description of an inter-process between therapist and patient as well as being a behaviour observed by the patient. The 31 articles included in their findings identified that the therapist plays an essential role in patient engagement by constructing the process around the patient's status and goals.

Another key finding in this Delphi was the content for MI use. This is in line with Braun's (2010) framework, which compared the four 'W' questions of imagery in sport psychology and the four 'W' questions of imagery in rehabilitation; this is referenced as the content of MI.

Firstly, the location, the 'Where' question (Braun, 2010), is the place therapy takes place. This was supported by the Delphi findings that MI can be practised or trained in a rehabilitation ward, or at home, or in a community therapist's practice. Munroe et al. (2000) explained that with their participants, similarly to my findings from the Delphi, the athletes practiced MI at home, at the gym or in bed in the morning.

Secondly the 'Where' might relate to the location of patient's performing imagery, or relates to the location of the imagined task, which can be similar places in their home or daily life activity. For the 'When' question, Braun reflects on their experience with patients and referred to this content as waiting for a session or treatment, or while practicing exercises or after their exercise. This is in line with Driediger et al. (2006) who interviewed injured athletes practising MI during and after rehabilitation programmes.

Benefits were used for the 'Why', and Braun (2010) mainly refers to this as improving skills and motor functions. In addition, improving pain levels, increasing confidence or helping to maintain a positive attitude, and motivating patients to recover were confirmed by several studies (Dickstein & Dutsch, 2007; Moseley, 2004).

The Delphi's findings were in line with Schuster et al. (2012), interviews with 11 stroke survivors in a rehabilitation centre in Switzerland, that showed similar responses around the use of MI. Findings showed MI can help in enhancing motivation, increasing confidence in performing movements, and preparing for physical practice, as well as improving physical functions, and as a procedure to practise impaired movements.

Braun (2010) described the 'What' as being what patients visualise and feel during imagery, and this differs between patients, as each stroke survivor has a preference to develop imagery skills. Also, the ease and vividness of imagery will mostly be dependent on the challenging effects of stroke. For example, stroke patients practising positive imagery may see themselves as healthy individuals, or may see themselves in a park walking, and so on. These points lead us to another essential finding, which is the assessment tools for MI use, as they can help in assessing a patient's attributes and ability to image before engaging in MI use.

Assessing mental capacity and the ability to image is essential. The initial step is using clinical judgment before fully engaging in the intervention to assess the patient's attributes, for example the vividness of the image and ease of use, MI ability level, cognitive impairments, and so on.

The findings from my Delphi indicate that using assessment tools can help to assess the stroke patient prior to training, and agreements were reached on several crucial points.

One was assessing the level of cognitive impairment (e.g. mild cognitive impairment, i.e. scoring above 24 on the MMSE test, and the ability to imagine could be determined by a score of greater than 60 on the KVIQ); both were seen as essential to prior engagement. This was in addition to assessing levels of the prominence of the image. For imagining the movement, this was a score of greater than 56 on the MIQ-RS. These findings are supported by those of Malouin et al. (2013), who acknowledged that effective MI necessitates the ability to image, and several instruments can be used to assess the ability to image, such as KVIQ, which is a subjective tool administrated by the therapist to inform whether the patient is able to image simple movement vividly (Malouin et al., 2007; 2009). These are lacking in clinical research and yet needed for further research, for MI use, and training.

Using these assessment tools, the therapist can decide whether a patient can engage in MI training to ensure a successful engagement. However, further research can be conducted to help further evaluate and determine whether indeed these are the right tools, as well as deciding who might benefit most from them.

7.3 Strengths and limitations

In the systematic review poorly defined intervention protocols, made it difficult to determine what works best and for whom which limits future research and clinical implementation for MI use in stroke.

The meta-analysis has shown that MI improves balance and walking abilities using varieties of protocols, some studies failed to show a clear effect of MI on ADL as an outcome, while others supported this approach. For instance, Verma et al. (2011) used the BI and found an improvement in level of ADL ability, whereas studies using the FIM (Polli et al., 2017), or the modified Ashworth scale (Hong et al., 2012; Levine, 2009; Bohannon et al., 1987) reported no difference between the MI intervention groups and controls. This might be due to differences in the intervention settings, or the type of task the participants were trained in as well as differences in the target of the task, e.g. whether these were instrumental self-care tasks such as shopping and cooking or basic personal activities of daily living such as bathing and feeding. Interestingly, two studies by Liu et al. (2004) and Liu (2009), which used a self-developed Likert-type-scale (7-point) to score trained and untrained ADL tasks, for example tasks such as preparing food, sweeping floors and going to the park, both found MI to be effective in improving ADL outcome.

The difficulty in determining clear evidence for the effectiveness of MI on ADL outcome in stroke survivors in this review could be explained by the way ADL was defined both as an intervention and as an outcome in the included studies. Later studies, which used comprehensive ADL measures, indicate that MI might influence improvement in ADL.

The findings from this review are consistent with the clinical interpretation and use of stroke scales reported by Kasner (2006). In his report he described the importance of understanding measurement instruments and the need for the necessary assessment domains to be valid and reliable, so that progress and recovery can be measured effectively and sensitively and capture occurring changes. It is important to select appropriate outcome measures to fit the intervention used in rehabilitation. Also, the scale needs to reflect true potential values of the patients' outcomes in their recovery stage.

Furthermore, when designing rehabilitation programmes that use MI, the ADL outcomes should reflect the intervention being measured. Activities of daily living may include interventions targeted at functional performance on a specific task. For example, reaching for a cup, where the intervention focus is at the impairment level i.e. dysfunction in the anatomical structure of the upper limb after stroke. In addition to interventions, aimed to promote independence in daily self-care activities, such as washing and dressing, toileting, bathing, transferring and eating and drinking (Katz et al., 1963). Other interventions targeted promoting functional independence in instrumental ADLs, which involve self-care within the household, including shopping, preparing and cooking food and folding and arranging clothes and sweeping (Kempen, 1995). In the latter the intervention is targeted at the activity and participation levels (ICF, 2012). Measurement tools should reflect either the functional task or the range of ADL activities targeted. As such the selected items from a global ADL measure may not be sufficiently sensitive or specific for the purpose of measuring the functional task. Thus, more appropriate and relevant ADL outcome measurement tools might be needed, which reflect improvements in functional performance in stroke survivors' daily activities targeted by in MI training.

My review also intended to examine MI use generally improving ADL ability rather than isolated abilities or functions of the upper limb. This was in line with the ICF; and the WHO's (2001) extensive report, examining the general performance of tasks and actions concerning activities of daily living, rather than specific bodily structural impairment. This was informed by findings of Liu et al. (2004) and Liu (2009) who studied the impact of MI on ADL improvement using ADL interventions including tasks such as making the bed, cooking food, unpacking groceries, sweeping the floor, going to the park, and folding the laundry.

The second explanation for the lack of clear impact of MI use and training on ADL level could be related to the different intensity and duration of MI application during the interventions. The issue of intensity is seen in the meta-analysis applied to the secondary outcome of mobility and balance, resulting in clinical heterogeneity with duration of time application.

Those studies, in which MI was applied for five weeks or more, showed significantly more improvement than those applied for four weeks or less. This is consistent with studies that have found positive effects of different intensity interventions on ADL in people with tetraplegia following spinal cord injury, using a one hour each day, five times a week, for 6-week intervention combining functional electrical stimulation with exercise therapy, to improve hand function on 13 spinal cord injury patients. The control group involved conventional therapeutic electronic stimulation (ES) combined with computer games played with a trackball. The intervention group comprised on the Rejoyce functional ES and computer games associated with ADL tasks with a garment-assisting grasp and release action used as tele-home therapy workstation. Their results showed clinical improvements in the intervention group compared to the controls where the participants had improved their grasp force grips (Kowalczewski et al., 2011). The findings of this study support the view that intensive functional training and long duration of treatment can help optimise recovery.

In Chapter Three, the interviews in Saudi Arabia offered insight into therapists' and stroke survivors' experiences and explored their perceptions concerning the use of MI in clinical practice in

Saudi Arabia. This is a novel intervention not currently studied in the Middle East, specifically in Saudi Arabia. This study was the first attempt to explore therapists' perceptions about using MI in stroke rehabilitation, as well as exploring stroke survivor's insights into being trained to use MI by therapists.

The participants in the focus group were from different professional backgrounds and different seniority levels, which might have influenced interaction and engagement within the group and limited their responses. However, given the data collection circumstances time-constraints and availability of therapists in the centres, this was the only possible method at that time.

Another issue was that all three facilities at the time I conducted my study were running low on stroke admissions, resulting in only two stroke survivors being recruited in the third facility. Again, the quest for stroke survivors with an understanding of MI was limited. Most of the recruited participants had only heard of MI but hadn't used it. A sample with experience of MI in their rehabilitation would have given greater insight into MI use.

7.4 Future research and directions

MI use in stroke rehabilitation could improve physiological and psychological outcomes in stroke recovery in Saudi Arabia. Although it might be a novel intervention not currently used by therapists in Saudi Arabia, it was found to have potential for application in stroke rehabilitation and has been used as a behaviour change intervention elsewhere.

Best practice recommendations for the use of MI in stroke rehabilitation are suggested. However, some recommendations were beyond the scope of this thesis, such as details of the training courses, details of MI transcripts and details of the MI session.

Although the recommendations suggest factors that would help implement MI in Saudi Arabia, details of how to formally intervene with stroke survivors is still lacking. For example, where there is no recommendation regarding image characteristics related to MI use, should this include imaging in colour or black and white, perspective or and position of the images, as well as the duration and the senses included such as whether to feel the movement or visualise it. For future exploration, structuring scripts specific to stroke and providing guidance and directions using this information during the training. As well as exploring factors of compliance and adherence to MI training and the patient’s ability to imagine what they are instructed to imagine, specifically in those patients with impaired cognitive levels who have difficulty in focusing on tasks (Malouin, Jackson & Richards, 2013).

It would be interesting in future work, to approach professionals who are experienced in using imagery with stroke survivors frequently and interview them individually about their experience to build on their skills and knowledge. It would be helpful also to have an insight into how these professionals train their patients, in terms of MI content and how they decide on which tasks to include the level of complexity of imagery and the intensity. It has been identified that intensity of therapy can have an impact on outcomes, however the precise amount is not clear from the literature. Further research should explore this (Page et al., 2011).

Future research should also investigate the amount of MI and the type of training in relation to the amount of physical practice, in addition to the amount of other incorporated instructions such as relaxation and mirror therapy. The different proportions between amounts of MI use in relation to physical practice might lead to different effect, which is an interesting indication to explore in future research.

Furthermore, approaching stroke survivors and exploring the views of those who have frequently engaged in MI, could offer more insight and support into active engagement factors. In particular, the benefits that goes beyond physical improvement, such as the psychological impact and effects on positive attitude and confidence.

Translating research findings regarding the use of MI into clinical practice has potentially been made easier by through the accomplishment the Delphi study. The method was appropriate because the Delphi dealt with the research question as it relates to practice needs, and where no definite protocols were found elsewhere.

For future work it will be interesting to look at MI use during rehabilitation with a group of stroke survivors undergoing MI training. To explore whether or not MI helps maintain recovery after discharge within a period of two years representing the time window wherein therapies can be most effective (Biernaskie, Chernenko & Corbett, 2004). This could be investigated through a mixed methods study with the research question; ‘to what extent does MI maintain effects and continue to improve recovery after stroke during and after treatment rehabilitation sessions?’

Additionally, it would be interesting to investigate integrating MI use after discharge as a plan for sustaining recovery and improving QoL. That would provide a more interesting representation of MI benefits.

The findings from the interviews provide a starting point for other researchers to examine remaining gaps within the knowledge base for MI and should encourage more research and interventions in Saudi Arabia and elsewhere to investigate the use of MI. Further studies could explore MI use as a home intervention in addition to its uptake in clinical sessions combined with PT or OT, to optimise treatment intensity and look at whether MI training at home can produce additional improvement compared with only MI in sessions.

It remains unclear which patient attributes and what levels of impairment affect engagement in MI. Future studies should test the relationship between patient's attributes and MI engagement. Attributes could include working memory, attention, and the ability to follow instructions. To investigate whether these have an impact on MI training and if there is a way to overcome that by conducting brain images such as fMRI and TMS to help enhance MI training. Specifically, research should examine what sort of cognitive impairments impact on the patient's ability and capacity to engage in MI, and how to train those with cognitive impairments to help them benefit from MI.

Further investigation is warranted for assessment tools for MI use, which includes the KVIQ and the MIQ-RS, measuring tools for MI, to have them translated and validated into the Arabic language for use in Saudi Arabia healthcare settings.

This study has presented valuable findings that underline the need for a culture of multi-disciplinary research and to cultivate this within the field of a healthcare educational body to improve knowledge. In line with this, my set of recommendations for MI use in clinical practice could bring more success for MI use in Saudi Arabia.

This PhD research programme involved the first qualitative study in Saudi Arabia that has looked at the use of MI with stroke, examining patients’ capacity to accept and engage in the implementation of such an intervention in rehabilitation.

Despite the fact that imagery is likely to be a safe, successful, cost-efficient technique and feasible to use at home without supervision, no studies comparing individuals with right and left hemisphere stroke or explored whether people with left sided strokes experience problems which are different to those with right sided strokes. For example, poor attention, ability to follow instructions and describe images or which tailor different MI modes to the individual. In the DRESS study, Walker et al. (2012), compared two approaches (neuropsychological Vs functional) to rehabilitating dressing after stroke. They found differences between right and left hemisphere strokes when in using the neuropsychological approach. Right hemisphere stroke survivors benefitted more, from the neuropsychological approach where damage was related to poor sustained attention and spatial deficit. However, participants with eft sided strokes, where impairment is related represented in apraxia and following instruction of the action didn't benefit from the approach.

Whereas each hemisphere processes information differently, people with right-sided stroke may have fewer problems with skilled movements and speech (Cengić et al., 2011; Kertesz and Hooper, 1982).

The findings from this study underline the importance of using different modes of MI and different perspectives in training to improve different outcomes. For example, using both modes of imagery; visual imagery and kinaesthetic imagery to improve activities of mobility and global ADL. This warrants further exploration in the future to investigate whether kinaesthetic imagery and internal visualised imagery training, can enhance muscle contraction, through the process of changing activity levels in the cortical motor network in the brain. Hence increasing muscle strength while external visualised imagery training had no significant effect in comparison as reported by Yao et al (2013). Similarly, in Chapter Five, both seeing and feeling the movement emerged as being more effective than just visualising the task, which is an interesting finding worth exploring in future research.

These findings suggest that planning interventions should be tailored to the task whilst also encouraging different types of imagery and modes. Previous research has indicated that motor-focused tasks were mainly explored with patients when using visual and kinaesthetic modes and resulted in positive outcomes, as Schuster et al.'s (2011) review reported, and as was also earlier established by Malouin et al. (2009) in training stroke survivors to use both modes to enhance effective imagery. However, it remains unclear whether all stroke survivors imagine in the same way or whether visual or a kinaesthetic imagery mode are facilitated by specific factors, such as increasing the time for relaxation that could enhance imagery ability perhaps with kinaesthetic imagery or more guided equipment to facilitate visual imagery.

This thesis has helped reveal the potential benefits of MI for use in stroke rehabilitation and described multiple types of imagery for promoting recovery in rehabilitation, as well as highlighting the need to train therapists for effective delivery.

The findings from this chapter underline the importance of using different modes of MI and different perspectives in training to improve different outcomes, for example using internal visual imagery to improve mobility and using external visual imagery to improve global ADL, this would be interesting to look at in the future. These findings are supported by previous literature. For example, Yao et al (2013) reported that kinaesthetic imagery and internal visualised imagery training can enhance muscle contraction, through the process of changing activity levels in the cortical motor network in the brain, hence increasing muscle strength while external visualised imagery training had no significant effect in comparison. Similarly, in Chapter Four, both seeing and feeling the movement emerged as being more effective than just visualising the task. These findings suggest that planning interventions should be tailored to the task, whilst also encouraging different types of imagery and modes, but this appears lacking in clarity in previous research and could be explored more in depth. While previous research by Schuster et al.'s (2011) and Malouin et al. (2009) reported when using visual and kinaesthetic modes and resulted in positive outcomes in training stroke survivors to use both modes to enhance effective imagery. However, it remains unclear whether all stroke survivors imagine in the same way or whether visual or a kinaesthetic imagery mode are facilitated by specific factors, such as increasing the time for relaxation that could enhance imagery ability perhaps with kinaesthetic imagery or more guided equipment to facilitate visual imagery. This notion requires further investigation in future research.

This thesis has helped reveal the potential benefits of MI for use in stroke rehabilitation and described multiple types of imagery for promoting recovery in rehabilitation, as well as highlighting the need to train therapists for effective delivery.

Additionally, there is a need for extensive cooperation and closer communication between academic and clinical bodies to create a more robust platform for EBP and ensure research is implemented in practice. As well as the funding and resources that need to be put in place for continuing professional development. As a result, this would help build up a more robust research environment linking healthcare organisations and universities, which can facilitate the use of evidence more effectively in practice.

Future studies should focus on optimizing MI by restructuring the environment for implementing MI in clinic practice, such as providing private rooms and supporting MI use by providing videos and encouraging the need to become instructive therapists. This is alongside spreading social awareness and promoting healthcare approaches to a wide range of public around MI use and health services.

7.5 Researcher's role reflection

It has long been accepted that transparency is a key factor in research studies and significantly affects both the nature and the experience of the study. It's essential to highlight my role as a researcher while undertaking the study as stated by Berger (2015) if the study design is to be reliable and valid.

In view of the fact that I am both a physiotherapist and a researcher, I recognised the need to clarify my personal beliefs about the use of MI in stroke rehabilitation.

Prior to starting this PhD, I participated in a broad range of courses, to hone my interviewing and data analysis skills. Working towards this PhD has shaped my views on the research field in general, and the use of MI in stroke interventions in particular.

In spite of the fact I had a positive attitude to MI use in rehabilitation on starting this PhD, I nevertheless found it difficult to identify situations where it should be used, along with the clinical presentations and possible indicators of where it could be applied

7.6 Conclusion

In conclusion, this thesis met the objectives of developing best practice recommendations for MI use in stroke in Saudi Arabia and gave greater insight into the use of MI by therapists and what factors could help implement its’ training in clinical practice.

Through the process of obtaining data from both the professionals and the stroke survivors in Saudi Arabia, and based on theoretical interpretation using the BCW framework, this helped in constructing conditions for MI use to promote its’ use in stroke. The data from the qualitative study informed the subsequent studies in guiding which factors may help when using MI in Saudi Arabia and for developing best practice guidelines. This further helped in identifying the different types of interventions, the capacity of training, and the optimum criteria for the stroke survivor to complete training in this therapy.

The results revealed that training courses and workshops are needed to help promote therapists’ knowledge, skills and confidence in MI use. Furthermore, a more robust research environment needs to be established between academics and healthcare professions that can facilitate the use of evidence more effectively in practice.

Additionally, environmental settings and social influence factors need to be supported to help enhance the patient’s engagement in MI use. Together with appreciating and understanding the potential benefits of MI in stroke recovery may motivate stroke survivors, since a positive attitude provides an optimum environment for learning and MI implementation. Therapists must have the support of their workplace and believe that the stroke survivors are receptive to treatment.

Both the patient and the therapist must believe the set goal is achievable.

Translation of the assessment tools, targeted training courses, and workshops to train therapists, and more randomised controlled trials, including defined outcomes, are recommended as the next stage of work to determine definite and specific protocols that would highly benefit stroke survivors in their recovery. Further work is needed to develop interventions including MI for stroke rehabilitation in Saudi Arabia.

References

Abu Kamel, A., Bond E. & Froelicher E., 2010. Stroke patients' caregivers: Their experiences and needs: A qualitative literature review (review articles), *Jordan Med J.,* (43), p. 4.

Adamson, J., Ben-Shlomo, Y., Chaturvedi, N., & Donovan, J., 2009. Exploring the impact of patient views on “appropriate” use of services and help seeking: a mixed method study. British Journal of General Practice, 59(564), pp. e226–e233.

Adamson, J., Beswick, A. & Ebrahim, S., 2004. Is stroke the most common cause of disability? *Journal of Stroke and Cerebrovascular Diseases,* 13, pp. 171-177.

Adler, M., & Ziglio, E., 1996. Gazing into the Oracle: The Delphi method and its application to social policy and public health. London: Kingsley Publishers.

Adler, P., & Adler, P., 1987. *Membership roles in field.*

Af'el-Hazmi, M., 1997. Early recognition and intervention for prevention of disability and its complications. *Eastern Mediterranean health journal,* 3, pp. 155.

Akins, R., Tolson, H. & Cole B., 2005. Stability of response characteristics of a Delphi panel: application of bootstrap data expansion. BMC, Medical Research Methodology. 5,37.

Al Yousuf, M., Akerele, T. & Al Mazrou, Y. (2002) Organization of the Saudi health system. *EMHJ - Eastern Mediterranean Health Journal*, 8 (4-5), pp. 645-653.

Al Khathaami, A., Al Bdah, B., Alnosair, A., & et al., 2019. Characteristics and outcomes of younger adults with embolic stroke of undetermined source (ESUS): a retrospective study. *Stroke research and treatment*.

Al-Eisa, E., Al-Hoqail, H., Al-Rushud, A.S., & et al., 2016. Awareness, perceptions and beliefs about physiotherapy held by physicians working in Saudi Arabia. *Journal of physical therapy science*, *28*(12), pp. 3435-3439.

Al-Jadid, M., 2013. Disability in Saudi Arabia. *Saudi medical journal,* 34, pp. 453-460.

Al-Maghraby M., & Alshami A., 2013. Learning style and teaching method preferences of Saudi students of physical therapy. J, Fam Community Med, , 20, pp. 192–197.

Al-Rajeh, S., Larbi, E., Bademosi, O., & et al., 1998. Stroke register: experience from the eastern province of Saudi Arabia. *Cerebrovascular Diseases*, *8*(2), pp. 86-89.

Al-Shehri, M., Alalawi, A., Alhasan, H. & Stokes, E., 2017. Physiotherapists’ behaviour, attitudes, awareness, knowledge and barriers in relation to evidence-based practice implementation in Saudi Arabia. *International journal of evidence-based healthcare*, *15*(3), p. 127.

Alahmari, K., & Paul, S., 2016. Prevalence of stroke in Kingdom of Saudi Arabia-through a physiotherapist diary. *Mediterranean Journal of Social Sciences*, *7*(1-S1), pp. 228-228.

Alessandro, S., Roberta, M., Marco, P., & et al., 2014. Functional MRI with motor imagery task show CNS effects and brain plasticity after botulinum toxin therapy in spastic hemiplegic stroke patients. Int J. Neurorehabilitation, 1(104), p. 2.

Alexanderson, K. & Hensing, G., 2004. More and better research needed on sickness absence. *Scand J Public Health*, 32, pp. 321–323.

Alghadir, A., Zafar, H., Iqbal, Z.A. & Anwer, S., 2015. Physical therapy education in Saudi Arabia. *Journal of physical therapy science*, *27*(5), pp. 1621-1623.

Alhashil, N., Alotaibi, M., Kontou, E., Fletcher-Smith, J. & Radford, K., 2016. Mental imagery practice with task oriented-training enhanced rehabilitation to improve ADL recovery, quality of life and participation after stroke: A Systematic Review Protocol. PROSPERO 2016: CRD 42016051995 Available from: http://www.crd.york.ac.uk/PROSPERO/displayrecord.php?ID=CRD42016051995

Alhazzani, A., Mahfouz, A., Abolyazid, A., & et al., 2018. Study of stroke incidence in the aseer region, Southwestern Saudi Arabia. *International journal of environmental research* *and public health*, *15*(2), p. 215.

Aljojo, N., 2017. Differences in styles of thinking 'In Light of Sternberg's Theory': A case study of different educational levels in Saudi Arabia. *JOTSE* 7(3), pp. 333-346.

Almekhlafi, M., 2016. Trends in one-year mortality for stroke in a tertiary academic center in Saudi Arabia. *Annals of Saudi medicine*, *36*(3), pp. 197-202.

Alsufyani A., 2020. Role of Treatment Theory and Enablement Theory for Restoring Health and Rehabilitation in Saudi Arabia. Cureus. 14;12(7), p. e9180.

Anderson, C., Jamrozik, K., Broadhurst, R., & Stewart-Wynne, E., 1994. Predicting survival for 1 year among different subtypes of stroke. Results from the Perth Community Stroke Study. *Stroke,* 25**,** pp. 1935-1944.

Aronson, J., 1994. A pragmatic view of thematic analysis. The Qualitative Report, 2, pp. 1–3. Retrieved from http://www.nova.edu/ssss/ QR/Back Issues/QR2-1/aronson.html

Arora, S., Aggarwal, R., Moran, A. & et al., 2011. Mental practice: effective stress management training for novice surgeons. *J Am Coll Surg*2, 12(12), pp. 225-233.

Aryasomayajula, S., Raithatha, A., Haywood, M., & et al., 2018. hands-on teaching, shadowing, and supported learning through acute clinics to help improve the confidence of and meet training needs for junior doctors. *Advances in medical education and practice*, *9*, p. 827.

Atkins, L., Francis, J., Islam, R., & et al., 2017. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science*, *12*(1), p.77.

Ayala, C., Croft, J. B., Greenlund, K. J., & et al., 2002. Sex differences in US mortality rates for stroke and stroke subtypes by race/ethnicity and age, 1995–1998. *Stroke,* 33**,** pp. 1197-1201.

Ayoola, A., Banzal, S., Elamin, A., & et al., 2003. Profile of stroke in Gizan, Kingdom of Saudi Arabia. *Neurosciences, Riyadh,* 8, pp. 229-32.

Baker, S., Edwards, R. & Doidge, M., 2012. How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research.

Baker, S., Marshak, H., Rice, G., & Zimmerman, G., 2001. Patient participation in physical therapy goal setting. Physical Therapy, 81(5), pp. 1118-1126.

Bandura, A., 1991. Social cognitive theory of self-regulation. *Organizational behavior and human decision processes*, *50*(2), pp.248-287.

Barcaccia, B., Esposito, G., Matarese, M., 2013. Defining quality of life: a wild-goose chase?

Barclay-Goddard, R., Stevenson, T., Poluha, W., & Thalman, L., 2011. Mental practice for treating upper extremity deficits in individuals with hemiparesis after stroke. *Stroke*, 42(11), pp. e574-e575.

Barclay-Goddard, R., Stevenson, T., Poluha, W., Thalman, L., 2020. Mental practice for treating upper extremity deficits in individuals with hemiparesis after stroke. Cochrane Database Syst Rev. 11; 2011(5):CD005950.

Baril, R., Clarke, J., Frisen, M., Stock, S., & Cole, D., 2003. The Work-Ready group. Management of return-to-work programs for workers with musculoskeletal disorders. Social Science and Medicine 57 (11), pp. 2101–2114.

Bartholomew, L., Parcel, G., Kok, G., Gottlieb, N., & Fernandez, M., 2011. Planning Health Promotion Programmes: An Intervention Mapping Approach (3rd ed.): Jossey Bass.

Beaucamp, T., Faden, R., Wallace, J.r., R., & Walters, L. (Eds), 1982. "Ethical issues in social science research". Baltimore, Maryland. The John Hopkins University Press.

Beninato, M., Gill-Body, K., Salles, S., Stark, P., Black-Schaffer, R. & Stein, J., 2006. Determination of the minimal clinically important difference in the FIM instrument in patients with stroke. *Archives of physical medicine and rehabilitation/ACRM.* 31, 87(1), pp. 32-9.

Berger, R., 2015. Now I see it, now I don’t: Researcher’s position and reflexivity in qualitative research. *Qualitative research*, *15*(2), pp. 219-234.

Bernhardt, J., Dewey, H., Thrift, A., Donnan, G., 2004. Inactive and alone: physical activity in the first 14 days of acute stroke unit care. Stroke, 35, pp. 1005–1009

Bernhardt, J., Chan, J., Nicola, I. & Collier, J., 2007. Little therapy, little physical activity: rehabilitation within the first 14 days of organized stroke unit care. *Journal of rehabilitation medicine*, *39*(1), pp. 43-48.

Biernaskie, J., Chernenko, G., & Corbett, D., 2004. Efficacy of rehabilitative experience declines with time after focal ischemic brain injury. *J. Neurosci*. 24, pp. 1245–1254.

Bindawas, S., Vennu, V., & Azer, S., 2013. Are physical therapy interns competent in patient management skills? Assessment of the views of clinical and academic physical therapists. J Phys Ther Sci, 25, pp. 649–655.

Bindawas, S., & Vennu, V., 2016 Stroke rehabilitation. A call to action in Saudi Arabia. Neurosciences (Riyadh). Oct; 21(4), pp. 297-305.

Bindawas, S., 2014. Physical Therapy Entry-level Education and Post-professional Training in Saudi Arabia: A Comparison of Perceptions of Physical Therapists from Five Regions. J Phys Ther Sci, pp. 1377–1382.

Black, A., Balneaves, L., Garossino, C., Puyat, J. & Qian, H., 2015. Promoting evidence-based practice through a research training program for point-of-care clinicians. *The Journal of nursing administration*, *45*(1), p. 14.

Bobath, B., 1990. Adult hemiplegia: evaluation and treatment. Elsevier Health Sciences.

Bohannon, R., & Smith, M., 1987. Interrater reliability of a Modified Ashworth Scale of muscle spasticity. *Phys Ther,* 67(7), pp. 206-207.

Booth, V., Masud, T., Connell, L. & Bath-Hextall, F., 2014. The effectiveness of virtual reality interventions in improving balance in adults with impaired balance compared with standard or no treatment: a systematic review and meta-analysis. *Clinical rehabilitation*, *28*(5), pp. 419-431.

Bovend'eerdt, T., Dawes, H., Sackley, C., Izadi, H. & Wade, D., 2010. An Integrated Motor Imagery Program to Improve Functional Task Performance in Neurorehabilitation. *Archives of Physical Medicine and Rehabilitation,* 91, pp. 939-946.

Bovend’eerdt, T., Dawes, H., Sackley, C. & Wade, D., 2012. Practical research-based guidance for motor imagery practice in neurorehabilitation. *Disability and rehabilitation,* 34, pp. 2192-2200.

Bowden, 2012. Sensorismotor Changes with Age and Stroke, PhD Thesis. Medical Faculty, University of New South Wales Australia.

Boyatzis, R., 1998. Transforming qualitative information: Thematic analysis and code development. Sage.

Braun, S., Kleynen, M., van Heel, T., & et al., 2013. The effects of mental practice in neurological rehabilitation; a systematic review and meta-analysis. Front Hum Neurosci, 7, p. 390.

Braun, S., Beurskens, A., Borm, P. & et al., 2006. The effects of mental practice in stroke rehabilitation: a systematic review. *Arch Phys Med Rehab*, 87(6), pp. 842-852.

Braun, S., Kleynen, M., Schols, J. & et al., (2008) Using mental practice in stroke rehabilitation: A framework. *Clinical Rehabilitation,* 22, pp. 579-591.

Braun, S., Beurskens, A., Kleynen, M. & et al., 2012. A multicenter randomized controlled trial to compare subacute 'treatment as usual'with and without mental practice'. *Journal of the American Medical Directors Association*, *13*(1), pp. 85-e1.

Braun, S., van Haastregt, J., Beurskens, A. & et al., 2010. Feasibility of a mental practice intervention in stroke patients in nursing homes. *BMC neurology*, *10*(1), p. 74.

Brazzelli, M., Saunders, D., Greig, C., & Mead, G., 2011. Physical fitness training for stroke patients. *Cochrane Database of Systematic Reviews* (11): CD003316.

Bright, F., Kayes, N., Worrall, L. & McPherson, K., 2015. A conceptual review of engagement in healthcare and rehabilitation. *Disability and rehabilitation*, *37*(8), pp. 643-654.

Brodie, M., Flournoy, R., Altman, D., Blendon, R., Benson, J. & Rosenbaum, M., 2009. Health information, the Internet, and the digital divide. *Health Affairs,* 19(6), pp. 255– 65.

Bryman, A., 2006. Integrating quantitative and qualitative research: how is it done? Qualitative research, 6, pp. 97-113.

Burridge, J., Murphy, M., Buurke, J. & et al., 2019. A Systematic Review of International Clinical Guidelines for Rehabilitation of People With Neurological Conditions. *Frontiers in neurology*, *10*.

Butler, A., & Page, S., 2006. Mental practice with motor imagery: evidence for motor recovery and cortical reorganization after stroke. *Arch Phys Med Rehabil*, 87(12, 2), pp. S2-S11.

Cahalin, L., Matsuo, Y., Collins, S. & et. al., 2008. Educational and professional issues in physical therapy—an international study. Physiother Theory Pract, 24, pp. 344–356, quiz 357–359.

Callow, N. & Waters, A., 2005. The effect of kinesthetic imagery on the sport confidence of flat-race horse jockeys. *Psychology of Sport and Exercise*, *6*(4), pp. 443-459.

Callow, N., Roberts, R., Hardy, L., Jiang, D. & Edwards, M., 2013. Performance improvements from imagery: evidence that internal visual imagery is superior to external visual imagery for slalom performance. *Frontiers in human neuroscience,* 7, p. 697.

Campbell, M., Fitzpatrick, R., Haines, A. & et al., 2000. Framework for design and evaluation of complex interventions to improve health. *BMJ2000*, 321, pp. 694–6

Cane, J., O'Connor, D. & Michie, S., 2012. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation science*, *7*(1), p. 37.

Canning, C., Ada, L. & O'dwyer, N., 1999. Slowness to develop force contributes to weakness after stroke. *Archives of physical medicine and rehabilitation,* 80, pp. 66-70.

Carolan, M. & Hodnett, E., 2007. With woman' philosophy: examining the evidence, answering the questions. *Nursing Inquiry,* 14(2), pp. 140–52.

Carr, J. & Shepherd, R., 2006. The changing face of neurological rehabilitation. *Brazilian Journal of Physical Therapy*, *10*(2), pp.147-156.

Carrasco, D. & Cantalapiedra, J. (2016) Effectiveness of motor imagery or mental practice in functional recovery after stroke: a systematic review. *Neurología (English Edition)*, *31*(1), pp. 43-52.

Carter, N., Bryant-Lukosius, D., DiCenso, A., and et al. (2014) The use of triangulation in qualitative research. In *Oncology nursing forum, 41(5).*

Cassidy, E., Reynolds, F., Naylor, S. & De Souza, L., 2011. Using interpretative phenomenological analysis to inform physiotherapy practice: An introduction with reference to the lived experience of cerebellar ataxia. *Physiotherapy theory and practice*, *27*(4), pp.263-277.

Cengić, Ljiljana, Vladimira Vuletić, Mladen Karlić, & et al., 2011. Motor and cognitive impairment after stroke. *Acta Clinica Croatica,* 50(4), pp. 463-467.

Chalmers,T., 1994. Clinical trials of treatment. *In The Oxford medical companion*, ed. J.A. Barondess & S. Lock, 147–50. Oxford, Oxford Univ. Press.

Champion, V. & Skinner C., 2008. The health belief model. See Ref. 39, pp. 45–65.

Chan, A., Tetzlaff, J., Gøtzsche, P. & et. al., 2013. SPIRIT 2013 explanation and elaboration: guidance for protocols of clinical trials. BMJ. 2013 Jan 8; 346, p. e7586.

Cheek, J., 1999. Postmodern and post-structural approaches to nursing research. Sage.

Chen, J., Lin, C., Wei, Y., Hsiao, J. & Liang, C., 2011. Facilitation of motor and balance recovery by thermal intervention for the paretic lower limb of acute stroke. *Clinical rehabilitation*, *25*(9), pp. 823-832.

Cherryholmes, C., 1992. Notes on pragmatism and scientific realism. Educational Researcher, 14, pp. 13-17.

Cho, H., Kim, J. & Lee, G., 2013. Effects of motor imagery training on balance and gait abilities zin post-stroke patients: a randomized controlled trial. *Clinical rehabilitation*, *27*(8), pp. 675-680.

Cifu, D., & Stewart, D., 1999. Factors affecting functional outcome after stroke: a critical review of rehabilitation interventions. *Archives of physical medicine and rehabilitation.* 1, 80(5), pp. S35-9.

Clarke, A., 1999. Evaluation research: An introduction to principles, methods and practice. Sage.

Clarke, D. & Forster, A., 2015. Improving post-stroke recovery: the role of the multidisciplinary health care team. *Journal of multidisciplinary healthcare,* 8, p. 433.

Clayton, M., 1997. Delphi: a technique to harness expert opinion for critical decision-making tasks in education. *Educational Psychology*, *17*(4), pp. 373-386.

Clément, C., 2019. Targets of Neuro-Technologies. In Brain-Computer Interface Technologie. Springer, Cham, pp. 49-95.

Coenen, M., Stamm, T., Stucki, G. & Cieza, A., 2012. Individual interviews and focus groups in patients with rheumatoid arthritis: a comparison of two qualitative methods. *Quality of life research,* 21**,** pp. 359-370.

Comte, A., 1998. Sociological Positivism. London: Sage. accountability theory and practice: Introduction to the human resource management review special edition, 14(2), pp.1-17.

Connelly, L., 2016. Trustworthiness in qualitative research. Med-surg Nursing, 25(6), pp. 435-437.

Connolly, D., 2005. Research methods: A guide to using the case study method to explore hospitality information technology phenomena. *Information Technology in Hospitality*, *4*(1), pp. 23-46.

Cott, C., 2004. Client-centred rehabilitation: client perspectives. *Disability and rehabilitation*, *26*(24), pp. 1411-1422.

Coupar, F., Pollock, A., Rowe, P., Weir, C. & Langhorne, P., 2012. Predictors of upper limb recovery after stroke: a systematic review and meta-analysis. *Clinical rehabilitation*, *26*(4), pp. 291-313.

Cox, A., Ullrich-French, S., Madonia, J. & Witty, K., 2011. Social physique anxiety in physical education: Social contextual factors and links to motivation and behavior. *Psychology of Sport and Exercise,* 12, pp. 555-562.

Crabtree, B. & Miller, W. eds.,1999. *Doing qualitative research*. Sage publications.

Craje, C., Van Der Graaf, C., Lem, F., Geurts, A. & Steenbergen, B., 2010. Determining specificity of motor imagery training for upper limb improvement in chronic stroke patients. *International Journal of Rehabilitation Research,* 33, pp. 359-362.

Creswell, J. & Clark, V., 2007. Designing and conducting mixed methods research. *Sage Publications*.

Creswell, J., 2014. *A concise introduction to mixed methods research*. SAGE publications.

Creswell, J. & Zhang, W., 2009. The application of mixed methods designs to trauma research. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies, 22(6), pp. 612-621.

Crisp, J., Pelletier, D., Duffield, C., Adams, A. & Nagy, S., 1997. The Delphi method?. *Nursing research*, *46*(2), pp. 116-118.

Crosbie, J., McDonough, S., Lennon, S., Pokluda, L. & McNeill, M., 2004-a. Virtual Reality in the Rehabilitation of the Upper Limb After Stroke: The User's Perspective. In Proceedings of the 5th International Conference on Disability. Oxford.

Cumming, J., 2002. Deliberate imagery practice: The development of imagery skills in competitive athletes, *Journal of sports sciences*, pp. 137-145.

Dalton, J., Bolen, S. & Mascha, E., 2016. Publication bias: the elephant in the review. *Anesthesia and analgesia,* 123, p. 812.

Davies, H., Powell, A. & Rushmer, R., 2007. Healthcare professionals' views on clinician engagement in quality improvement. *A literature review*, *4*.

Davis, D. & Taylor-Vaisey, A., 1997. Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. Canadian Medical Association Journal 157, pp. 408–16.

De Vries, S. & Mulder, T., 2007. Motor imagery and stroke rehabilitation: a critical discussion. *Journal of rehabilitation medicine,* 39, pp. 5-13.

Decety, J., & Jeannerod, M., 1996. Mentally simulated movements in virtualreality: does Fitts's law hold in motor imagery? Behav Brain Res; 72(7), pp. 127-34.

Decety, J., 1993. Should motor imagery be used in physiotherapy? Recent advances in cognitive neurosciences. Physiol. Theory Pract. 9, pp. 193-203.

Deetz, S., 2005. Critical theory. Engaging organizational communication theory & research: Multiple perspectives, pp. 85-111.

Denzin, N. & Lincoln, Y., (Eds.), 2000. Handbook of qualitative research (2nd ed.). Thousand Oaks, CA: Sage.

Denzin, N., 1978. The research act: A theoretical introduction to sociological methods (2nd ed.). New York, NY: McGraw Hill.

Diamond P., Felsenthal G, Macciocchi S., Butler D., & Lally-Cassady D., 1996. Effect of cognitive impairment on rehabilitation outcome. *Am J Phys Med Rehabil*, 75, pp. 40–43.

Dickstein, R. & Deutsch, J., 2007. Motor imagery in physical therapist practice. *Physical therapy*, *87* (7), pp. 942-953.

Dickstein, R., Deutsch, J., Yoeli, Y., & et al., 2013. Effects of integrated motor imagery practice on gait of individuals with chronic stroke: a half-crossover randomized study. *Archives of physical medicine and rehabilitation*, *94*(11), pp. 2119-2125.

Dijkerman, H., Ietswaart, M. & Johnston, M., 2010. Motor imagery and the rehabilitation of movement disorders: an overview. *The neurophysiological foundations of mental and motor imagery*, pp. 127-144.

Dijkers, M., Hart, T., Tsaousides, T., Whyte, J., & Zanca J., 2014. Treatment taxonomy for rehabilitation: past, present and prospects. Arch Phys Med Rehabil 2014;95(1 Suppl 1), pp. S6-16.

Dillman, D., 1991. The design and administration of mail surveys. Annu.Rev. Sociol. 17, pp. 225-19

Dobkin, B., 2004. Strategies for stroke rehabilitation. *The Lancet Neurology,* 3, pp. 528-536.

Dobkin, B. & Dorsch, A., 2013. New evidence for therapies in stroke rehabilitation. *Current atherosclerosis reports,* 15, pp. 1-9.

Dombovy, M., Sandok, B. & Basford, J., 1986. Rehabilitation for stroke: a review. *Stroke,* 17, pp. 363-369.

Donaldson, C, Tallis, R., & Pomeroy, V., 2009. A treatment schedule of conventional physical therapy provided to enhance upper limb sensorimotor recovery after stroke: expert criterion validity and intrarater reliability. Physiotherapy. 95(2), pp. 110-9.

Dorsey, M. & Vaca, K., 1998. The stroke patient and assessment of caregiver needs. *Journal of Vascular Nursing*, *16*(3), pp. 62-67.

Doyle, Jr, J., 2007. Child protection and child outcomes: Measuring the effects of foster care. *American Economic Review*, *97*(5), pp. 1583-1610.

Drew, C., Hardman, M. & Hosp, J., 2007. *Designing and conducting research in education*. Sage Publications.

Driediger, M., Hall, C. & Callow, N., 2006. Imagery use by injured athletes: a qualitative analysis. *Journal of Sports Sciences*, 24, pp. 261-272.

Duncan, P., Sullivan, K., Behrman, A. & et al., 2011. Body-weight–supported treadmill rehabilitation after stroke. *New England Journal of Medicine*, *364*(21), pp.2026-2036.

Duncan, P., Zorowitz, R., Bates, B., & et al., 2005. Management of adult stroke rehabilitation care a clinical practice guideline. *Stroke,* 36, pp. e100-e143.

Dunsky, A., Dickstein, R., Marcovitz, E. & et al., 2008. Home-based motor imagery training for gait rehabilitation of people with chronic poststroke hemiparesis. *Arch Phys Med Rehabil* 2008, 89(8), pp. 1580-1588.

Dunsky, A. & Dickstein, R., 2018. Motor imagery training for gait rehabilitation of people with post-stroke hemiparesis: Practical applications and protocols. *Global Journal of Health Science*, *10* (11), pp. 66-78.

Durlak, J. & Dupre, E., 2008. Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American journal of community psychology*, *41*(3-4), pp. 327-350.

Edlow, J., Malek, A. & Ogilvy, C., 2008. Aneurysmal subarachnoid hemorrhage: update for emergency physicians. *The Journal of emergency medicine*, *34*(3), pp. 237-251.

Eckstein, H., 2000. Case study and theory in political science. *Case study method*, pp.119-164.

Elkins, M., Moseley, A., Sherrington, C., Herbert, R. & Maher, C., 2013. Growth in the Physiotherapy Evidence Database (PEDro) and use of the PEDro scale.

Ellis, G., Mant, J., Langhorne, P., Dennis, M. and Winner, S., 2010. Stroke liaison workers for stroke patients and carers: an individual patient data meta-analysis. *Cochrane Database of Systematic Reviews*, (5).

Elwyn, G., Frosch, D., Thomson, R., & et al., 2012. Shared decision making: a model for clinical practice. *Journal of general internal medicine*, *27*(10), pp. 1361-1367.

Eng, K., Siekierka, E., Cameirao, M., & et al., 2007. Cognitive Virtual-Reality Based Stroke Rehabilitation. *World Congress on Medical Physics and Biomedical Engineering,* 14, pp. 1-6.

Epstein, R. & Street, R., 2011. The values and value of patientcantered care. Ann Fam Med, 9(2), pp. 100-103.

Epstein, R. & Peters, E., 2009. Beyond information: exploring patients' preferences. *Jama*, *302*(2), pp. 195-197.

Eraut, M., 2000. Non-formal learning and tacit knowledge in professional work. British Journal of Educational Psychology, 70(1), pp. 113–136.

Ericsson, K., 1996. (Ed) The road to excellence: the acquisition of expert performance in the arts and sciences, sports, and games. New Jersey: Lawerence Erlbaum Associates.

Evans, C., 1997. The use of consensus methods and expert panels in pharmacoeconomic studies. *Pharmacoeconomics*, *12*(2), pp. 121-129.

Ewers, P., 2017. Does training in psychosocial interventions reduce burnout rates in forensic nurses? Wiley Online Library, https://doi.org/10.1046/j.1365-2648.2002.02115.x

Facchini, S., Muellbacher, W., Battaglia, F., Boroojerdi, B. & Hallett, M., 2002. Focal enhancement of motor cortex excitability during motor imagery. *Acta Neurologica Scandinavica,* 105, pp. 146-151.

Fairburn, C. & Cooper, Z., 2011. Therapist competence, therapy quality, and therapist training. Behaviour research and therapy, 49(6-7), pp. 373-378.

Feigin, V., Barker-Collo, S., McNaughton, H., Brown, P. & Kerse, N., 2008. Long-term neuropsychological and functional outcomes in stroke survivors: current evidence and perspectives for new research. International Journal of Stroke, 3(1), pp. 33-40.

Fereday, J. & Muir-Cochrane, E., 2006. Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. International journal of qualitative methods, 5(1), pp. 80-92.

Feys H., De Weerdt, W., Selz, B., & et. al., 1998. Effect of a therapeutic intervention for the hemiplegic upper limb in the acute phase after stroke. Stroke. 29(4), pp. 785-92.

Fink, AJMR., 1984. Consensus methods: characteristics and guidelines for use. Am J Public Health. 74, pp. 979–983.

Finlay, L., 2011. Phenomenology for therapists: Researching the lived world, *John Wiley and Sons.*

Fisher, R., Gaynor C., Kerr M. & et al., 2011. A consensus on stroke: early supported discharge. Stroke. 42 (5), pp. 1392-7.

Fitch, K., Bernstein, S., Aguilar, M. & et al., 2001. Appropriateness Method (RAM) Santa Monica: RAND Corporation.

Folstein, M., Folstein, S. & McHugh, P., 1975. "Mini-Mental State”. A Practical Method for Grading the Cognitive State of patients for the Clinician. J Psychiat Res;.12, pp. 189-98.

Forster, A., Young J., Green J. & et. al., 2009. Structured re-assessment system at 6 months after a disabling stroke: a randomised controlled trial with resource use and cost study. *Age and Ageing* 38 (5), pp. 576–83.

Franklin, K. & Hart, J., 2007. Idea generation and exploration: Benefits and limitations of the policy Delphi research method. Innovative Higher Education, 31(4), pp. 237-246.

French, S., Green, S., O'Connor, D., & et al., 2012. Developing theory-informed behaviour change interventions to implement evidence into practice. Implementation Science, 7, p. 38.

Gale, N., Heath, G., Cameron, E., Rashid, S. & Redwood, S., 2013. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. BMC medical research methodology, 13(1), pp. 1-8.

Gearing, R., 2004. Bracketing in research: A typology. *Qualitative health research,* 14**,** pp. 1429-1452.

George, P., Heng, B., Wong, L., & Ng C., 2014. Determinants of health-related quality of life among community dwelling elderly. Ann Acad Med Singapore. 1, pp. 3-10.

Gerber, R., 2001. The concept of common sense in workplace learning and experience. Education and Training, 43 (2), pp. 72–81.

Geyh, S., Cieza, A., Schouten, J. & et al., 2004. ICF Core Sets for stroke. *Journal of rehabilitation medicine*, *36*, pp. 135-141.

Giacobbi, P., Poczwardowski, A. & Hager, P., 2005. A pragmatic research philosophy for sport and exercise psychology. The sport psychologist, 19(1), pp. 18-31.

Gill, T. & Kurland, B., 2003. Prognostic effect of prior disability episodes among nondisabled community-living older persons. *American Journal of Epidemiology,* 158, pp. 1090-1096.

Gillen, J. & Petersen, A., 2005. Discourse analysis. *Research methods in the social sciences*. *146*, p. 53.

Giorgi, A., 2006. Concerning variations in the application of the phenomenological method. The Humanistic Psychologist, 34(4), pp. 305-319.

Giorgi, A. & Giorgi, B., 2008. Phenomenological psychology. The SAGE handbook of qualitative research in psychology, pp. 165-178.

Glanz, K. & Bishop, D., 2010. The role of behavioral science theory in development and implementation of public health interventions. Annual review of public health, 31, pp.399-418.

Glaser, B. & Strauss, A., 1967. *The discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.

Glasgow, R. & Linnan L., 2008. Evaluating theory-based interventions. See Ref. 39, pp. 487–508

Goldstein, L., Adams, R., Alberts, M. & et al., 2006. Primary prevention of ischemic stroke: A guideline from the American heart association/American stroke association stroke council, *Stroke,* 37**,** pp. 1583-1633.

Goodman C., 1986. A Delphi technique: a critique, Journal of Advanced Nursing, 12, pp. 7129-734.

Gordon, L., 2019. Real research: Research methods sociology students can use. SAGE Publications.

Gorski, P., 2013. What is critical realism? And why should you care.

Goulding, C., 2005. Grounded theory, ethnography and phenomenology: A comparative analysis of three qualitative strategies for marketing research. *European journal of Marketing*

Granger C., Devis L., Peters M., Sherwood C. & Barrett J., 1979. Stroke rehabilitation: analysis of repeated Barthel Index measures. *Arch Phys Med Rehabil,* 60, pp. 14–17.

Grbich, C., 2004. New approaches in social research. Sage.

Green, J. & Britten, N., 1998. Qualitative research and evidence-based medicine. British Medical Journal 316, pp. 1230–1232.

Green, B., Jones, M., Hughes, D. & Willimas, A., 1999. Applying the Delphi technique in a study of GP's information requirements. Health and Social Care in the Community, 7(3), pp. 198-205.

Greenhalgh, T., 2009. Patient and public involvement in chronic illness: beyond the expert patient. *Bmj*, *338*, p. b49.

Gresham, Glen, E., Stason, William, B., Duncan, & Pamela W., 1997. Post-stroke rehabilitation, *Diane Publishing*, 65, p. 662.

Grier, S. & Bryant, C., 2005. Social Marketing In Public Health. Annual Review of Public Health, 26(1), pp. 319-339.

Griffiths, J., Blair-Stevens, C. & Parish, R., 2009. The integration of health promotion and social marketing. Perspectives in Public Health, 129(6), pp. 268-271.

Groenewald, C. & Bhana, A., 2016. "It was bad to see my [Child] doing this": Mothers' experiences of living with adolescents with substance abuse problems. *International Journal of Mental Health and Addiction,* 14, pp. 646-661.

Grol, R., 2001. Successes and failures in the implementation of evidence-based guidelines for clinical practice. Medical Care, 39(8), pp. 46-54.

Group, W.H.O.Q.O.L., 1994. Development of the WHOQoL: Rationale and current status. *International Journal of Mental Health*, 23(3), pp. 24-56.

Guba, E. & Lincoln, Y., 1994. "Competing paradigms in qualitative research". In N. Denzin and Y. Lincoln (eds.), Handbook of Qualitative Research. California: Sage. pp. 105-117.

Guest, G., Bunce, A. & Johnson, L., 2006. How many interviews are enough? An experiment with data saturation and variability. *Field methods,* 18, pp. 59-82.

Guest, G., Namey, E. & Mckenna, K., 2017. How many focus groups are enough? Building an evidence base for nonprobability sample sizes. *Field methods,* 29, pp. 3-22.

Guillot, A., Collet, C., Nguyen, V., & et al., 2009. Brain activity during visual versus kinaesthetic imagery: an fMRI study. *Human brain mapping*, *30*(7), pp. 2157-2172.

Guillot, A., Tolleron, C. & Collet, C., 2010. Does motor imagery enhance stretching and flexibility. *Journal of sports sciences*, *28*(3), pp. 291-298.

Gupta, V. & Jain, N., 2017. Harnessing information and communication technologies for effective knowledge creation. *Journal of Enterprise Information Management*

Guttman, A., Burstin, A., Brown, R., Bril, S. & Dickstein, R., 2012. Motor imagery practice for improving sit to stand and reaching to grasp in individuals with poststroke hemiparesis. *Topics in stroke rehabilitation*, *19*(4), pp. 306-319.

Habibis, D, & Walter, M., 2009. Social inequality in Australia discourses, realities and futures. Melbourne, Australia: Oxford University Press.

Hajek, V., Gagnon, S. & Ruderman, J., 1997. Cognitive and functional assessments of stroke patients: an analysis of their relation. *Archives of Physical Medicine and Rehabilitation,* 78, pp. 1331-1337.

Hall, C., Mack, D., Paivio, A. & Hausenblas, H., 1998. Imagery use by athletes: Development of the Sport Imagery Questionnaire. *International Journal of Sport*

Hansen, J., Ostergaard, B., Nordentoft, M. & Hounsgaard, L., 2013. The feasibility of cognitive adaptation training for outpatients with schizophrenia in integrated treatment. *Community Mental Health Journal,* 49, pp. 630-635.

Hardy, L. & Callow, N., 1999. Efficacy of external and internal visual imagery perspectives for the enhancement of performance on tasks in which form is important. *Journal of Sport and Exercise Psychology,* 21, pp. 95-112.

Harris, J. & Hebert, A., 2015. Utilization of motor imagery in upper limb rehabilitation: a systematic scoping review. *Clinical Rehabilitation*, *29*(11), pp.1092-1107.

Hartman-Maeir, A., Stroker, N., Ring N. & et. al., 2007. Activities, participation and satisfaction one-year post stroke. *Disabil Rehabil*, 29(7), pp. 559-56.

Hasson, F., Keeney, S. & McKenna, H., 2000. Research guidelines for the Delphi survey technique. Journal of advanced nursing, 32(4), pp. 1008-1015.

Hatano, S., 1976. Experience from a multicentre stroke register: a preliminary report. *Bulletin of the World Health Organization*; 54: 5, pp. 541-553.

Higgins, J., 2008. Cochrane handbook for systematic reviews of interventions version 5.0. 1. The Cochrane Collaboration. *http://www. cochrane-handbook. org*.

Hindfelt, B. & Nilsson, O., 1977. The prognosis of ischemic stroke in young adults. *Acta Neurol Scand*, 55, pp. 123– 30.

Hochberg, L., Serruya, M. & Friehs G., 2006. Neuronal ensemble control of prosthetic devices by a human with tetraplegia, *Nature,* 442(7099), pp. 164–171.

Hoenig, H., Duncan, P., Horner, R. & et. al., 2002. Structure, process, and outcomes in stroke rehabilitation. *Med Care.* ;40(11), pp. 1036–1047.

Hoffmann, T., Glasziou, P., Boutron I. & et. al., 2014. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ: British Medical Journal*, p. 348.

Hofgren, C., Björkdahl, A., Esbjörnsson, E. & Stibrant-Sunnerhagen, K., 2007. Recovery after stroke: cognition, ADL function and return to work. *Acta Neurologica Scandinavica*, *115*(2), pp. 73-80.

Holbrook, M. & Skilbeck C., 1998. Activities index for use with stroke patients, *Age Ageing*, 12(2), pp. 166-70.

Holmes, P. & Collins, D., 2001. The PETTLEP approach to motor imagery: A functional equivalence model for sport psychologists. *J Appl Sport Psychol*; 13, pp. 60–83.

Hong, I., Choi, J. & Lee, J., 2012. Cortical changes after mental imagery training combined with electromyography-triggered electrical stimulation in patients with chronic stroke. *Stroke*, *43*(9), pp. 2506-2509.

Horne, R.,1999. *Patients' beliefs about treatment. Journal of Psychosomatic Research, 47(6),* pp. 491–495.

Hosseini, S., Fallahpour, M., Sayadi, M., Gharib, M. & Haghgoo, H., 2012. The impact of mental practice on stroke patients' postural balance. *Journal of the neurological sciences*, *322*(1-2), pp. 263-267.

Hovmand, P. & Gillespie, D., 2010. Implementation of evidence-based practice and organizational performance. The journal of behavioral health services & research, 37(1), pp. 79-94.

Howell, K., 2016. Paradigm of inquiry: Critical theory and constructivism. In Corporate Governance in Africa. Palgrave Macmillan, London. pp. 29-46.

Hsu & Sandford, 2017. Delphi Technique. Practical Assessment, Research & Evaluation, 12(10), pp. 1-8.

Hunter, S., Crome, P., Sim, J. & et al., 2006. Development of treatment schedules for research: a structured review to identify methodologies used and a worked example of "mobilisation and tactile stimulation" for stroke patients. Physiotherapy.92, pp. 195–207.

Hwang, S., Jeon, H., Yi, C. & et. al., 2010. Locomotor imagery training improves gait performance in people with chronic hemiparetic stroke: a controlled clinical trial. *Clinical rehabilitation*, *24*(6), pp. 514-522.

Hyde, K., 2000. Recognising deductive processes in qualitative research. Qualitative market research: An international journal.

Ietswaart, M., Johnston, M., Dijkerman, H., & et al., 2011. Mental practice with motor imagery in stroke recovery: randomized controlled trial of efficacy. *Brain*, p. awr077.

Iles, R. & Davidson, M., 2006. Evidence based practice: a survey of physiotherapists' current practice. Physiotherapy Research International, 11(2), pp. 93-103.

Indredavik, B., Bakke, F., Slordahl, S. & et al., 1999. Treatment in a combined acute and rehabilitation stroke unit. *Stroke,* 30(5), pp. 917-923.

Indredavik, B., Bakke, F., Solberg, R. & et. al., 1991. Benefit of a stroke unit: a randomized controlled trial. *Stroke.* 1991(22), pp. 1026 –1031.

Intercollegiate Stroke Working Party, 2012. National clinical guideline for stroke, 4th edition. London: Royal College of Physicians.

Jackson, C., Eliasson, L., Barber, N. & Weinman, J., 2014. Applying COM-B to medication adherence: a suggested framework for research and interventions. *European Health Psychologist*, *16*(1), pp. 7-17.

Jackson, P., Doyon, J., Richards, C. & Malouin, F., 2004. The efficacy of combined physical and mental practice in the learning of a foot-sequence task after stroke: a case report. *Neurorehabil. Neural Repair,* 18, pp. 106–111.

Jackson, P., Lafleur, M., Malouin, F., Richards, C. & Doyon, J., 2001. Potential role of mental practice using motor imagery in neurologic rehabilitation. *Archives of physical medicine and rehabilitation*, *82*(8), pp. 1133-114.

Jeannerod, M., 1994. The representing brain, neural correlates of motor intention and imagery. *Behav. Brain Sci.,* 17, pp. 187-245.

Jeannerod, M. & Jacob, P., 2005. Visual cognition: a new look at the two-visual systems model. *Neuropsychologia*, *43*(2), pp. 301-312.

Jenkins, D. & Smith, T., 1994. Applying Delphi methodology in family therapy research. Contemporary Family Therapy, 16(5), pp. 411-430.

Jette, D., Latham, N., Smout, R. & et al., 2005. Physical therapy interventions for patients with stroke in inpatient rehabilitation facilities. *Physical therapy,* 85, pp. 238-248.

Johnson, S., Sprehn, G. & Saykin, A., 2002. Intact motor imagery in chronic upper limb hemiplegics: evidence for activity-independent action representations. J Cogn Neurosci. 14, pp. 841–852.

Jorgensen, H., Nakayama, H., Raaschou, H. & et. al., 1995. Outcome and time course of recovery in stroke. Part I: Outcome. The Copenhagen Stroke Study. A*rch Phys Med Rehabil*; 76: pp. 399–405.

Judd, C., Ryan, C. & Park, B., 1991. Accuracy in the judgment of in-group and out-group variability. *Journal of personality and social psychology*, *61*(3), p.366.

Kamper, S., Apeldoorn A., Chiarotto A. & et. al., 2015. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. BMJ. 2015(350), p. h444.

Kase, C., Wolf, P., Kelly-Hayes, M. & et. al., 1998. Intellectual decline after stroke: the Framingham Study, 29: pp. 805–812.

Kasner, S., 2006. Clinical interpretation and use of stroke scales. *The Lancet Neurology*, *5*(7), pp. 603-612.

Katz, S., Ford, A., Moskowitz, R., Jackson, B. & Jaffe, M., 1963. Studies of illness in the aged: the index of ADL, a standardised measure of biological and psychosocial function. *JAMA*, 1963, pp. 914–919.

Keeney, S., McKenna, H. & Hasson, F., 2011. The Delphi technique in nursing and health research. John Wiley & Sons.

Keith, R., 1997. The role of treatment theory. In: Fuhrer MJ, editor. Assessing medical rehabilitation practices: the promise of outcomes research. Baltimore: Paul H. Brookes; 1997, p 257-74.

Kellner, D., 1993. Critical theory today: Revisiting the classics. Theory, Culture & Society, 10(2), pp.43-60.

Kemmis, S., 2006. Exploring the relevance of critical theory for action research: Emancipatory action research in the footsteps of Jurgen Habermas. Handbook of action research, 4, pp.94-105.

Kempen, GIJM., 1995. Hierarchical Structure in ADL and IADL: Analytical Assumptions and Applications for Clinicians and Researchers. *Journal of Clinical Epidemiology*, 48, pp. 1299–1305

Kertesz, A. & Hooper, P., 1982. Praxis and language: the extent and variety of apraxia in aphasia. *Neuropsychologia*, *20*(3), pp. 275-286.

Khealani, B., Hameed, B. & Mapari, U., 2008. Stroke in Pakistan. *Journal of the Pakistan Medical Association,* 58, p. 400.

Kho, A., Liu, K. & Chung, R., 2014. Meta-analysis on the effect of mental imagery on motor recovery of the hemiplegic upper extremity function. *Australian Occupational Therapy Journal*, 61(2), pp. 38-48.

Kim, S., Lee, H. & You, Y., 2015. Effects of ankle strengthening exercises combined with motor imagery training on the timed up and go test score and weight bearing ratio in stroke patients. *Journal of physical therapy science*, *27*(7), pp. 2303-2305.

Kilgore, D., 2001. Critical and Postmodern Perspectives on Adult Learning. New Directions for Adult and Continuing Education, 2001(89), 53.doi:10.1002/ace.8

Kingston, A., Collerton J., Davies K. & et al., 2012. Losing the Ability in Activities of Daily Living in the Oldest Old: A Hierarchic Disability Scale from the Newcastle 85+ Study. *PloS one,* 7(2), p. e31665.

Kluding, P. & Gajewski, B., 2009. Lower-extremity strength differences predict activity limitations in people with chronic stroke. *Physical Therapy,* 89, pp. 73-81.

Koratamaddi, N., 2012. Stroke rehabilitation and neuroplasticity: efficacy and methods available. *Student Pulse,* p. 4.

Kowalczewski, J., Chong, S. & Galea Prochazka, A., 2011. In-home tele-rehabilitation improves tetraplegic hand function, *Neurorehabil Neural Repair*, 25, pp. 412-422.

Krakow, B. & Zadra, A., 2006. Clinical management of chronic nightmares: imagery rehearsal therapy. *Behavioral sleep medicine*, *4*(1), pp. 45-70.

Krauss, S., 2005. Research paradigms and meaning making: A primer. The qualitative report, 10(4), pp.758-770.

Kristjánsdóttir, Ó., Fors, E., Eide, E., & et al., 2013. A smartphone-based intervention with diaries and therapist-feedback to reduce catastrophizing and increase functioning in women with chronic widespread pain: randomized controlled trial. *Journal of medical Internet research*, *15*(1), p. e2249.

Krueger, R., 2014. Focus groups: A practical guide for applied research. Sage publications.

Kunz, R., & A. Oxman., 1998. The unpredictability paradox: Review of empirical comparisons of randomised and non-randomised clinical trials. *BMJ,* 317, pp. 1185–90.

Kumar, V., Chakrapani, M. & Kedambadi, R., 2016. Motor imagery training on muscle strength and gait performance in ambulant stroke subjects-a randomized clinical trial. *Journal of clinical and diagnostic research: JCDR*, *10*(3), p. YC01.

Kvale, S., 1996. InterViewing. London, Thousand Oaks (CA), and New Delhi: Sage.

Kwakkel, G, Wagenaar, R, & Koelman T., 1997. Effects of intensity of rehabilitation after stroke: a research synthesis. *Stroke* 28 (8): 1550–56.

Kwakkel, G., Van Peppen, R., Wagenaar, R. & et al., 2004. Effects of augmented exercise therapy time after stroke: a meta-analysis. *Stroke*, *35*(11), pp. 2529-2539.

Lai, S., Perera, S., Duncan, P. & Bode, R., 2003. Physical and social functioning after stroke: comparison of the Stroke Impact Scale and Short Form-36. Stroke, 34(2), pp. 488-493.

Lai, S., Studenski, S., Duncan, P. & Perera, S., 2002. Persisting consequences of stroke measured by the Stroke Impact Scale. *Stroke,* 33, pp. 1840-1844.

Langhammer, B. & Stanghelle, J., 2000. Bobath or motor relearning programme? A randomized controlled study. *Clinical rehabilitation*, *14*(4), pp.361-369.

Langhorne, P., Bernhardt, J. & Kwakkel, J., 2011. Stroke rehabilitation. *Lancet*, 377(9778), pp. 1693-1702.

Langhorne, P, Coupar, F. & Pollock A., 2009. Motor recovery after stroke: a systematic review. *Lancet Neurology* 8 (8), pp. 741–54.

Langhorne, P., Wagenaar, R. & Partridge, C., 1996. Physiotherapy after stroke: more is better. *Physiotherapy Research International* 1 (2), pp. 75–88.

Latham, D., Gross, M. & Witte, S., 2013. Preparing teachers and librarians to collaborate to teach 21st century skills: Views of LIS and education faculty. *School Library Research,* 16.

Laver, K., Lange, B., George, S., Deutsch, J., Saposnik, G. & Crotty, M., 2017. Virtual reality for stroke rehabilitation. *Cochrane database of systematic reviews*, (11).

Lawrence, E., Coshall, C., Dundas, R. & et. al., 2001. Estimates of the prevalence of acute stroke impairments and disability in a multiethnic population. *Stroke,* 32, pp. 1279-1284.

Lawton, M. & Brody, E., 1969. Assessment of Older People: self-maintaining and instrumental activities of daily living. *Gerontologist,* 9, pp. 179–186.

Leach, E., Cornwell, P., Fleming, J. & Haines, T. & 2010. Patient centered goalsetting in a subacute rehabilitation setting. Disabil Rehabil 2010(32), pp. 159-172.

Lebon, F., Collet, C. & Guillot, A., 2010. Benefits of motor imagery training on muscle strength. *J Strength Cond Res*, 24(6), pp. 1680-1687.

Lee, H., Kim, H., Ahn, M. & You, Y., 2015. Effects of proprioception training with exercise imagery on balance ability of stroke patients. *Journal of physical therapy science*, *27*(1), pp.1-4.

Lee, G., Song, C., Lee, Y., Cho, H. & Lee, S., 2011. Effects of motor imagery training on gait ability of patients with chronic stroke. Journal of Physical Therapy Science, 23(2), pp. 197-200.

Lemmer, B., 1998. Successive surveys of an expert panel: esearch in decision-making with health visitors. Journal of advanced nursing, 27(3), pp. 538-545.

Lequerica, A., Donnell, C. & Tate, D., 2009. Patient engagement in rehabilitation therapy: physical and occupational therapist impressions. *Disability and rehabilitation*, *31*(9), pp. 753-760.

Letswaart, M., Johnston, M., Dijkerman, H. & et. al., 2011. Mental practice with motor imagery in stroke recovery: randomized controlled trial of efficacy. *Brain*, *134*(5), pp.1373-1386.

Levin, M. & Therapy, O., 2011. Virtual reality: Rehabilitation applications in children with disabilities. *On the Uptake. Retrieved from* http://www*.neurodevnet.ca/sites/default/files/neurodevnet/download/Virtual% 20reality_english.pdf.Google Scholar*.

Levine, P., 2009. Testing spasticity: The Modified Ashworth Scale. *Adv Phys Ther Rehab Med*.

Lincoln, Y. & Guba, E.,1986. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New directions for program evaluation*, 30, pp. 73-84.

Lincoln, Y. & Guba, E., 1982. Establishing Dependability and Confirmability in Naturalistic Inquiry Through an Audit.

Linstone, H. & Turoff, M. eds., 1975. The Delphi method. Reading, MA: Addison-Wesley. pp. 3-12.

Liu, H., Song, L. & Zhang, T., 2014. Mental practice combined with physical practice to enhance hand recovery in stroke patients. *Behav Neurol*.

Liu, K., Chan, C., Lee, T. & Hui-Chan, C., 2004. Mental imagery for promoting relearning for people after stroke: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation,* 85(9), pp. 1403-1408.

Liu, K., 2009. Use of mental imagery to improve task generalisation after a stroke. *Hong Kong Med J.,* 15, pp. 37-41.

Locke, E. & Latham G., 2002. Building a practically useful theory of goal setting and task motivation. Am Psychol 2002(57), pp. 705-17.

Loisel, P., Lemaire, J., Poitras, S. & et al., 2002. Cost-benefit and cost-effectiveness analysis of a disability prevention model for back pain management: a six year follow up study. *Occupational and Environmental Medicine,* 59, pp. 807-815.

Lord, S., Mcpherson, K., Mcnaughton, H., Rochester, L. & Weatherall, M., 2004. Community ambulation after stroke: how important and obtainable is it and what measures appear predictive? *Archives of physical medicine and rehabilitation,* 85, pp. 234-239.

Lum, P., Godfrey, S., Brokaw, E., Holley, R. & Nichols, D., 2012. Robotic approaches for rehabilitation of hand function after stroke. *American Journal of Physical Medicine & Rehabilitation,* 91, pp. S242-S254.

Mackenzie, N. & Knipe, S., 2006. Research dilemmas: Paradigms, methods and methodology. *Issues in educational research*, *16*(2), pp.193-205.

Maher, C., Sherrington, C., Herbert, R., Moseley, A. & Elkins M., 2003. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Physical therapy*, 83 (8), p. 713.

Majid, M., Othman, M., Mohamad, S.F., Lim, S. & Yusof, A., 2017. Piloting for interviews in qualitative research: Operationalization and lessons learnt. *International Journal of Academic Research in Business and Social Sciences*, *7*(4), pp. 1073-1080.

Malouin, C., Richards, P., Jackson, M., Lafleur, & et. al., 2007. "The Kinesthetic and Visual Imagery Questionnaire (KVIQ) for assessing motor imagery in persons with physical disabilities, *Journal of Neurologic Physical Therapy*.31(1), pp. 20–29.

Malouin, F. & Richards, C., 2013. “Clinical applications of motor imagery in rehabilitation,” in *Multisensory Imagery*, eds S. Lacey and R. Lawson, New York, NY: Springer. pp. 397–419.

Malouin, F., Belleville, S., Richards, C., Desrosiers, J. & Doyon, J., 2004-b. Working memory and mental practice outcomes after stroke. *Arch. Phys. Med. Rehabil*. 85, pp. 177–183.

Malouin, F., Jackson, P. & Richards, C., 2013. Towards the integration of mental practice in rehabilitation programs. A critical review. *Frontiers in human neuroscience*, *7*, p. 576.

Malouin, F., Richards, C. & Durand, A., 2010. Normal aging and motor imagery vividness: implications for mental practice training in rehabilitation. *Arch. Phys. Med. Rehabil*. 91, pp. 1122–1127.

Malouin, F., Richards, C. & Durand, A., 2012. Slowing of motor imagery after a right hemispheric stroke. *Stroke Research Treatment*.

Malouin, F., Richards, C., Desrosiers, J., & Doyon, J., 2004-a. Bilateral slowing of mentally simulated actions after stroke. *Neuroreport,* 15, pp. 1349–1353.

Malouin, F., Richards, C., Durand, A. & Doyon, J., 2009. Added value of mental practice combined with a small amount of physical practice on the relearning of rising and sitting post-stroke: a pilot study. *J. Neurol. Phys. Ther*. 33, pp. 195–202.

Manstead, A. & Parker, D.,1995. Evaluating and extending the theory of planned behaviour. *European review of social psychology*, *6*(1), pp. 69-95.

Marin, T., Van Eerd, D., Irvin, E. & et. al., 2017. Multidisciplinary biopsychosocial rehabilitation for subacute low back pain. Cochrane Database Syst Rev. 2017(6).

Marshall, C. & Rossman, G., 2016. Designing qualitative research (6th ed.). Thousand Oaks, CA: Sage.

Martin, K., Moritz S. & Hall, C., 1999. Imagery use in sport: A literature review and applied model. The sport psychologist, 13, pp. 245-268.

Matsatsinis, N., Grigoroudis, E. & Samaras, A., 2005. Aggregation and disaggregation of preferences for collective decision-making. Group Decision Negot 14(3), pp. 217–232.

Mayo, Wood-Dauphinee, S., Cote, R. & et al., 2000. There's no place like home: An evaluation of early supported discharge for stroke. *Stroke.* 31(5), pp. 1016–1023.

McDermott, A., Kagan, A., Richards, c. & et. al., 2014. Task-oriented training-upper extremity. *Stroke Engine*.

McGlynn, E., Asch, S., Adams, J. & et. al., 2003. The quality of health care delivered to adults in the United States. N Engl J Med, 2003(348), pp. 2635–2645.

McKevitt, C., Fudge, N., Redfern, J., Sheldenkar, A., Crichton, S. & Wolfe, C., 2011. *UK stroke survivor needs survey*.

London: Stroke Association and Kings College London.

McKibbon, K., Lokker, C., Wilczynski, N. & et. al., 2010. A cross-sectional study of the number and frequency of terms used to refer to knowledge translation in a body of health literature in 2006: a Tower of Babel? Implement Sci 5:16.

McNamara, C., 1999. General guidelines for conducting interviews.

Meilink, A., Hemmen, B., Seelen, H. & Kwakkel, G., 2008. Impact of EMG-triggered neuromuscular stimulation of the wrist and finger extensors of the paretic hand after stroke: a systematic review of the literature. *Clinical Rehabilitation,* 22, pp. 291-305.

Memon, I., Abu-Shaheen, A., Heena, H. & Al-Tannir, M., 2019. Point prevalence study for stroke in Saudi Arabia: A cross-sectional survey. *Saudi Journal for Health Sciences*, *8*(2), p. 93.

Michie, S., Van Stralen, M. & West, R., 2011. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation science*, *6*(1), p. 42.

Miles, M. & Huberman, A., 1994. Qualitative Data Analysis, 2nd Ed., p. 10-12. Newbury Park, CA: Sage.

Miller, L., Murray, L., Richards, L. & et. al., 2010. Comprehensive overview of nursing and interdisciplinary rehabilitation care of the stroke patient: a scientific statement from the

American Heart Association. *Stroke*, *41*(10), pp. 2402-2448.

Ming, G. & Song, H., 2005. Adult neurogenesis in the mammalian central nervous system. *Annu. Rev. Neurosci,* 28, pp. 223-250.

Moher, D., Jadad, A. & Tugwell, P., 1996. Assessing the quality of randomized controlled trials: current issues and future directions. *International journal of technology assessment in health care,* 12, pp. 195-208.

Moher, D., Liberati, A., Tetzlaff, J. & Altman, D., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine*, *151*(4), pp. 264-269.

Moore, C., 1987. Delphi technique and the mail questionnaire. *Group techniques for idea building: applied social research methods*, pp. 50-77.

Moran-Ellis, J., Alexander, V., Cronin, A. & et. al., 2007. Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. Journal of mixed methods research, 1(1), pp.48-76.

Morris, J., Bernhardsson, S., Bird, M. & et al., 2019. Implementation in rehabilitation: a roadmap for practitioners and researchers. Disability and rehabilitation, pp. n1-10.

Morris, T., Spittle, M. & Watt, A., 2005. *Imagery in sport*, Human Kinetics.

Morse, J., 2015. Critical analysis of strategies for determining rigor in qualitative inquiry. Qualitative health research, 25(9), pp.1212-1222.

Moseley, G., 2006. Graded motor imagery for pathologic pain-A randomized controlled trial. *Neurology*, 67(12), pp. 2129–2134.

Moseley, G., 2004. Graded motor imagery is effective for long-standing Complex Regional Pain Syndrome. *Pain*, 108, pp. 192–198.

Moseley, M., Elkins, R., Herbert, D. & et al., 2009. Cochrane reviews used more rigorous methods than non-Cochrane reviews: survey of systematic reviews in physiotherapy. J Clin Epidemiol 2009, 62, pp. 1021–30.

Moustakas, C., 1994. Phenomenological research methods. Sage publications.

Mukherjee, D. & Patil, C., 2011. Epidemiology and the global burden of stroke. World neurosurgery, 76(6), pp. S85-S90.

Mulrow, C., 1994. Systematic reviews: rationale for systematic reviews. *Bmj,* 309, pp. 597-599.

Munroe, K., Giacobbi, P., Hall, C. & Weinberg, R., 2000. The four Ws of imagery use: Where, When, Why, and What. *The Sport Psychology,* 14, pp. 119-137.

Murphy, F., Barnard, P., Terry, K., Carthery-Goulart, M. & Holmes, E., 2011. SenseCam, imagery and bias in memory for wellbeing. *Memory (Hove, England),* 19, pp. 768-777.

Murphy, S. & Martin, K., 2002. The use of imagery in sport.

Nelson, W., Han, P., Fagerlin, A., Stefanek, M. & Ubel, P., 2007. Rethinking the objectives of decision aids: a call for conceptual clarity. Medical Decision Making, 27(5), pp. 609-618.

NICE, 2013. Stroke rehabilitation in adults: guidance (CG162). *National Institute for Health and Care Excellence - NICE*.

Nilsen, D., Gillen, G. & Gordon, A., 2010. Use of mental practice to improve upper-limb recovery after stroke: a systematic review. *Am J Occup Ther*, 64(5), pp. 695-708.

Nilsen, D., Gillen, G., Dirusso, T. & Gordon, A., 2012. Effect of imagery perspective on occupational performance after stroke: A randomized controlled trial. *American Journal of Occupational Therapy,* 66, pp. 320-329.

Nowell, L., Norris, J., White, D. & Moules, N., 2017. Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, *16*(1), p.1609406917733847.

Novakowski, N. & Wellar, B., 2009. Using the Delphi Technique in Normative Planning Research: Methodological Design Considerations. *environment & planning,* A 40, pp. 1485-1500.

Nudo, R., 2003. Functional and structural plasticity in motor cortex: implications for stroke recovery. Phys Med Rehabil Clin N Am, 14, pp. S57–S76.

NVivo, 10, QSR International. http://www.qsrinternational.com/products_nvivo.aspx. [Accessed January 30, 2018].

Nyberg, L., Eriksson, J., Larsson, A. & Marklund, P., 2006. Learning by doing versus learning by thinking: an fMRI study of motor and mental training. *Neuropsychologia* 44, pp. 711–717.

Nyein, K., Mcmichael, L. & Turner-Stokes, L., 1999. Can a Barthel score be derived from the FIM? *Clinical rehabilitation,* 13, pp. 56-63.

O'Cathain, A., Murphy, E. & Nicholl, J., 2010. Three techniques for integrating data in mixed methods studies. BMJ. 2010 Sep, 17(341), p. c4587. doi: 10.1136/bmj.c4587. PMID: 20851841.

O'Connor, A., 2003. Risk communication in practice: the contribution of decision aids. British Medical Journal, 327(7417), pp. 736-740.

O'Leary, A., 1985. Self-efficacy and health. *Behaviour research and therapy*, *23*(4), pp. 437-451.

Osborne, S., 1998. Naming the beast: delivering and classifying service innovations in social policy. Human Relations, 51, pp. 1133-54.

Osborne, S. & Brown, L., 2011. Innovation, public policy and public services delivery in the UK. The word that would be king?. Public Administration, 89(4), pp. 1335-1350.

Outpatient Service Trialists, 2004. Therapy based rehabilitation services for stroke patients at home. Cochrane Database of Systematic Reviews, Issue 4. [Art. No.: CD002925. DOI: 10.1002/14651858.CD002925]

Page, S., Levine, P. & Leonard, A., 2005. Effects of mental practice on affected limb use and function in chronic stroke. *Arch Phys Med Rehabil.,* 86, p. 399e402.

Page, S., Levine, P. & Leonard, A., 2007. Mental practice in chronic stroke: Results of a randomized, placebo-controlled trial. *Stroke*, 38(4), pp. 1293–1297.

Page, S., Dunning, K., Hermann, V., Leonard, A. & Levine, P., 2011. Longer versus shorter mental practice sessions for affected upper extremity movement after stroke: a randomized controlled trial. *Clinical rehabilitation,* 25, pp. 627-37.

Page, S., 2011. Retention of motor changes in chronic stroke survivors who were administered mental practice. *Archives of physical medicine and rehabilitation/ACRM*, 92(11), pp. 1741-1745.

Page, S., 2000. Imagery improves upper extremity motor function in chronic stroke patients: a pilot study. The Occupational Therapy Journal of Research, 20(3), pp. 200-215.

Page, S., Levine, P. & Leonard, A., 2005. Effects of mental practice on affected limb use and function in chronic stroke. Archives of physical medicine and rehabilitation, 86(3), pp. 399-402.

Page, S., Szaflarski, J., Eliassen, J., Pan, H. & Cramer, S., 2009. Cortical plasticity following motor skill learning during mental practice in stroke. Neurorehabilitation and neural repair, 23(4), pp. 382-388.

Paivio, A., 1985. Cognitive and motivational functions of imagery I human performance. *Canadian Journal of Applied Sport and Sciences,* 10, pp. 22-28.

Palinkas, L., Horwitz, S., Green, C., Wisdom, J., Duan, N. & Hoagwood, K., 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health,* 42, pp. 533-544.

Pandian, J., Arora, R., Kaur, P., Sharma, D., Vishwambaran, D. & Arima, H., 2014. Mirror Therapy in Unilateral Neglect After Stroke (MUST trial) A randomized controlled trial. *Neurology,* 83, pp. 1012-1017.

Parker, L. & Roffey, B., 1997. Methodological themes: back to the drawing board: revisiting grounded theory and the everyday accountant's and manager's reality. *Accounting, Auditing & Accountability Journal*, 10(2).

Parnabas, V., Parnabas, J. & Parnabas, A., 2015. The effect of Imagery on sports performance among handball players.

International Journal of Physical and Social Sciences, 5, p. 199.

Parry, R., 2004. Communication during goal-setting in physiotherapy treatment sessions. Clinical rehabilitation, 18(6), pp. 668-682.

Patel, A., Berdunov, V., Quayyum, Z., King, D., Knapp, M. & Wittenberg, R., 2020. Estimated societal costs of stroke in the UK based on a discrete event simulation. *Age and ageing*, *49*(2), pp. 270-276.

Patterson, A., 1997. Critical discourse analysis: A condition of doubt. *Studies in the cultural politics of Education*, *18*(3), pp. 425-435.

Patton, M., 2002. Two decades of developments in qualitative inquiry: A personal, experiential perspective. *Qualitative social work,* 1, pp. 261-283.

PEDro., 2018. *Statistics (English)*. [online] Available at: https://www.pedro.org.au/english/downloads/pedro-statistics/ [Accessed 18 Dec. 2018].

Perry, C., 1967. Principles and techniques of the Brunnstrom approach to the treatment of hemiplegia. *American Journal of Physical Medicine & Rehabilitation*, *46*(1), pp. 789-812.

Phellas, C., Bloch, A. & Seale, C., 2011. Structured methods: interviews, questionnaires and observation. *Researching society and culture,* p. 3.

Pheung-phrarattanatrai, A., Bovonsunthonchai, S., Heingkaew, V., Prayoonwiwat, N. & Chotik-anuchit, S., 2015. Improvement of gait symmetry in patients with stroke by motor imagery.

Phillips, A., Lewis, L., McEvoy, M. & et al., 2013. Protocol for development of the guideline for reporting evidence-based practice educational interventions and teaching (GREET) statement. BMC Med Educ. 13, p. 9.

Playford, E., Dawson, L., Limbert, V., Smith, M., Ward, C. & Wells, R., 2000. Goal-setting in rehabilitation: report of a workshop to explore professionals' perceptions of goal-setting. Clinical rehabilitation, 14(5), pp. 491-496.

Polit, D. & Beck, C., 2008. Nursing research: Generating and assessing evidence for nursing practice (8). Philadelphia, PA: Lippincott William & Wilkins.

Pollock, A., Baer, G., Campbell, P. & et al., 2014. Physical rehabilitation approaches for the recovery of function and mobility following stroke. *The Cochrane Library, (4)*.

Pollock, A., Baer, G., Pomeroy, V. & Langhorne, P., 2007. Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke. *Cochrane database of systematic reviews*, (1).

Polychronopoulos, P., Gioldasis, G., Ellul, J. & et al., 2002. Family history of stroke in stroke types and subtypes. *Journal of the neurological sciences*, *195*(2), pp. 117-122.

Prochaska, J., Redding, C. & Evers, K., 2008. The transtheoretical model and stages of change.39, pp. 97–121.

Pomey, M., Flora, L., Karazivan, P. & et al., 2015. The Montreal model: the challenges of a partnership relationship between patients and healthcare professionals. Sante Publique, 1(HS), pp. 41-50.

Porter, S., 2013. *Tidy's Physiotherapy, 15e*, Elsevier India.

Post-Stroke Rehabilitation Guideline Development Panel, US Department of Health and Human Services, & Public Health Service Agency for Health Care Policy and Research, 1996. Post-stroke rehabilitation: assessment, referral, and patient management: quick reference guide for clinicians. *Journal of Pharmaceutical Care in Pain & Symptom Control*, 4(4), pp. 57-95.

Prodinger, B., O'connor, R. J., Stucki, G. & Tennant, A., 2017. Establishing score equivalence of the Functional Independence Measure motor scale and the Barthel Index, utilising the International Classification of Functioning, Disability and Health. *Journal of rehabilitation medicine,* 49, pp. 416-422.

Quinn, P., 2002. Qualitative research and evaluation methods. Sage.

Rabin, R. & Charro, F., 2001. EQ-SD: a measure of health status from the EuroQol Group. *Annals of medicine*, *33*(5), pp. 337-343.

Rahman, M., 2017. The Advantages and Disadvantages of Using Qualitative and Quantitative Approaches and Methods in Language" Testing and Assessment" Research: A Literature Review. Journal of Education and Learning, 6(1), pp. 102-112.

Reid, K., Flowers, P., Larkin, M., 2005. Exploring lived experience. Psychologist 2005(18), pp. 20–23.

Review Manager (RevMan) [Computer program]. Version 5.4, The Cochrane Collaboration, 2020.

Robert, A. & Zamzami, M., 2014. Stroke in Saudi Arabia: a review of the recent literature. *The Pan African Medical Journal,* 17.

Robinson, R., 1997. Neuropsychiatric consequences of stroke. *Annu Rev Med*, 48: pp. 217–229.

Rocco, T., Bliss, L., Gallagher, S. & et al., 2003. The pragmatic and dialectical lenses: Handbook of mixed methods in social and behavioural research, pp. 595-615.

Rodgers, H., Bosomworth, H., Krebs, H. & et al., 2019. Robot assisted training for the upper limb after stroke (RATULS): a multicentre randomised controlled trial. *The Lancet*. 394(10192), pp. 51-62.

Rodgers, H., Mackintosh, J., Price, C. & et al., 2003. Does an early increased-intensity interdisciplinary upper limb therapy programme following acute stroke improve outcome?. *Clinical Rehabilitation*, *17*(6), pp. 579-589.

Rogers, E., 2003. Diffusion of innovations (5th ed.). New York: Free Press.

Rorty, R., 1982. Consequences of pragmatism. Minneapolis: University of Minnesota Press.

Rosenstock, I., Strecher V. & Becker M., 1988. Social learning theory and the health belief model. *Health Educ. Q.* 15(2), pp. 175–83.

Ryan, G., 2018. Introduction to positivism, interpretivism and critical theory. Nurse Researcher. 25(4), pp. 41-49.

Rowe, G., Wright, G. & Bolger, F., 1991. Delphi: A revaluation of research and theory. Technological forecasting and social change, 39(3), pp. 235-251.

Rushall, BS, & Lippman LG. (1997) The role of imagery in physical performance. International Journal for Sport Psychology, 29, pp. 57–72.

Sackett, D., & A., Oxman., 2003. HARLOT plc: An amalgamation of the world's two oldest professions. *BMJ,* 327, pp. 1442–45.

Saka, Ö., Mcguire, A. & Wolfe, C., 2009. Cost of stroke in the United Kingdom. *Age and ageing,* 38, pp. 27-32.

Salama, R., 2012. Caregiver burden from caring for impaired elderly: A cross-sectional study in rural Lower Egypt. *Italian J Public Health*, 9, pp. 4–10.

Salbach, N., Jaglal, S., Korner-Bitensky, N., Rappolt, S. & Davis, D., 2007. Practitioner and organizational barriers to evidence-based practice of physical therapists for people with stroke. Physical therapy, 87(10), pp. 1284-1303.

Sale, P. & Franceschini, M., 2012. Action observation and mirror neuron network: a tool for motor stroke rehabilitation. *European Journal of Physical and Rehabilitation Medicine,* 48, pp. 313-318.

Samaan, Z., Mbuagbaw, L., Kosa, D. et al., 2013. A systematic scoping review of adherence to reporting guidelines in health care literature. *J Multidiscip Healthc*, 6, pp. 169–188.

Sandrey, M. & Bulger, S., 2008. The Delphi method: An approach for facilitating evidence based practice in athletic training. Athletic Training Education Journal, 3(4), pp. 135-142.

Santos-Couto-Paz, C., Teixeira-Salmela, L. & Tierra-Criollo, C., 2013. The addition of functional task-oriented mental practice to conventional physical therapy improves motor skills in daily functions after stroke. *Brazilian journal of physical therapy*, *17*(6), pp. 564-571.

Saposnik, G., Kapral, M., Coutts, S., Fang, J., Demchuk, A. & Hill, M., 2009. Do all age groups benefit from organized inpatient stroke care?. *Stroke*, *40*(10), pp. 3321-3327.

Saposnik, G., Teasell, R., Mamdani, M. & et al., 2010. Effectiveness of virtual reality using Wii gaming technology in stroke rehabilitation: a pilot randomized clinical trial and proof of principle. *Stroke*, *41*(7), pp. 1477-1484.

Saudi Commission for Health Specialties (SCFHS), 2009. Professional Classification Manual for Health Practitioners, 5th ed. Riyadh, Saudi Arabia.

Saunders, D., Greig, C., Mead, G. & Young, A., 2009. Physical fitness training for stroke patients. *Cochrane Database of Systematic Reviews* (4): CD003316.

Schulz, K., Altman, D., Moher, D. & CONSORT Group., 2010. CONSORT 2010 statement: updated guidelines for reporting parallel.

Schuster, C., Butler, J., Andrews, B., & et al., 2012. Comparison of embedded and added motor imagery training in patients after stroke: results of a randomised controlled pilot trial. *Trials,* 13, p. 11.

Schuster, C., Glassel, A., Scheidhauer, A., Ettlin, T. & Butler, J., 2012. Motor imagery experiences and use: Asking patients after stroke where, when, what, why, and how they use imagery-a qualitative investigation. *Neurorehabilitation and Neural Repair,* 26 (6), pp. 726.

Schuster, C., Hilfiker, R., Amft, O. & et al., 2011. Best practice for motor imagery: a systematic literature review on motor imagery training elements in five different disciplines. BMC Medicine, 9(1). p. 75.

Schuster, C., Lussi, A., Wirth, B. & Ettlin, T., 2012. Two assessments to evaluate imagery ability: translation, test-retest reliability and concurrent validity of the German

KVIQ and Imaprax. *BMC Medical Research Methodology,* 12, pp. 127-127.

Seamark, D., Blake, S., Seamark. C. & Halpin, D., 2004. Living with severe chronic obstructive pulmonary disease (COPD): Perceptions of patients and their carers. An interpretative phenomenological analysis. Palliat-Med, 18, pp. 619–625.

Sharma, N., Pomeroy, V., & Baron, J., 2006. Motor imagery: a backdoor to the motor system after stroke?. Stroke, 37(7), pp. 1941-1952.

Shaw, J., Connelly, D. & Zecevic, A., 2010. Pragmatism in practice: Mixed methods research for physiotherapy. Physiotherapy theory and practice, 26(8), pp.510-518.

Silverman, D., 1998. Qualitative research: meanings or practices? Information Systems Journal, 8(1): 3-20.

Sinha, IP, Smyth RL, & Williamson PR. (2011) Using the Delphi technique to determine which outcomes to measure in clinical trials: recommendations for the future based on a systematic review of existing studies. PLoS Medicine. 8(1). p. e1000393.

Sitaram, R., Veit, R., Stevens, B. & et al., 2012. Acquired control of ventral premotor cortex activity by feedback training an exploratory real-time fMRI and TMS study. *Neurorehabilitation and Neural Repair,* 26, pp. 256-265.

Smith, A., Fisher, J., Schonberg, M. & et. al., 2009. Am I doing the right thing? Provider perspectives on improving palliative care in the emergency department. Annals of emergency medicine, 54, pp. 86-93. e1.

Smith, J., 2011. Evaluating the contribution of interpretative phenomenological analysis. Health psychology review, 5, pp. 9-27.

Song, K., Wang, L. & Wu, W., 2019. Mental practice for upper limb motor restoration after stroke: an updated meta-analysis of randomized controlled trials. *Topics in stroke rehabilitation*, *26*(2), pp.87-93.

Sordoni, C., Hall, C. & Forwell, L., 2000. The use of imagery by athletes during injury rehabilitation. Journal of Sport Rehabilitation, 9, pp. 329-338.

Sprigg, N., Selby, J., Fox, L., Berge, E., Whynes, D. & Bath, P., 2013. Very low quality of life after acute stroke: data from the efficacy of nitric oxide in stroke trial. *Stroke*, *44*(12), pp. 3458-3462.

Starks, H., & Trinidad, S., 2007. Choose your method: A compar- ison of phenomenology, discourse analysis, and grounded theory. Qualitative Health Research, 17, 1372–1380.

Starkweather, D., Gelwicks, L. & Newcomer, R., 1975. Delphi forecasting of health care organization. Inquiry, 12(1), pp. 37-46.

Streubert, H. & Carpenter, D., 1995. Qualitative research in nursing: Advancing the humanistic imperative. Philadelphia: J. B. Lippincott Company.

Stroke Association, 2018. State of the Nation: Stroke Statistics. 2018 (https://www.stroke.org.uk/resources/state-nation-stroke-statistics). [Accessed June 2018].

Stucki, G., 2005. International Classification of Functioning, Disability, and Health (ICF): a promising framework and classification for rehabilitation medicine. *Am J Phys Med Rehab*, 84(10), pp. 733-740.

Studenski, S., Duncan P., Perera S. & et. al., 2005. Daily functioning and quality of life in a randomized controlled trial of therapeutic exercise for sub-acute stroke survivors. *Stroke*, 36(8), pp. 1764-1770.

Sullivan, G. & Artino, J., 2013. Analyzing and interpreting data from Likert-type scales. Journal of graduate medical education, 5(4), pp. 541-542.

Sumsion, T., 1998. The Delphi technique: an adaptive research tool. British Journal of Occupational Therapy, 61(4), pp. 153-156.

Sun, J., Chi, L., He, Z. & et. al., 2019. NLRP3 inflammasome contributes to neurovascular unit damage in stroke. *Journal of drug targeting*, *27*(8), pp. 866-875.

Svetlana, L., & Dizon J., 2009. A systematic review on the effectiveness of mental practice with motor imagery in the neurologic rehabilitation of stroke patients. *IJAHSP*, 7(2), p. 10.

Synowiez, B. & Synowiez, P., 1990. Delphi forecasting as a planning tool. Nursing management, 21(4), pp. 18-19.

Szmelskyj, I. & Szmelskyj, A., 2017. Acupuncture for Infertility in Polycystic Ovary Syndrome. JAMA, 318(15), p. 1501.

Takeuchi, N, & Izumi S., 2013. Rehabilitation with poststroke motor recovery: a review with a focus on neural plasticity. *Stroke Res Treat,* 2013, p. 128641.

Tashakkori, A., Teddlie, C. & Teddlie, C., 1998. Mixed methodology: Combining qualitative and quantitative approaches (Vol. 46). Sage.

Teasell, R., Meyer, M., McClure, A. & et. al., 2009. Stroke rehabilitation: an international perspective. *Topics in stroke rehabilitation*, *16*(1), pp. 44-56.

Teijlingen Van, E., Rennie, A., Hundley, V., & Graham, W., 2001. The importance of conducting and reporting pilot studies: the example of the Scottish Births Survey, Journal of Advanced Nursing, 34, pp. 289-295.

Tetroe, J., Graham I., Foy R. & et. al., 2002. Health research funding agencies' support and promotion of knowledge translation: an international study. 86, pp. 125–155.

Thomas, D., 2003. A general inductive approach for qualitative data analysis.

Thorne, S., 2000. Data analysis in qualitative research. Evidence-based nursing, 3(3), pp. 68-70.

Timmermans, A, Verbunt, J., van Woerden, R., Moennekens, M., Pernot, D. & Seelen, H., 2013. Effect of mental practice on the improvement of function and daily activity performance of the upper extremity in patients with subacute stroke. Journal of the American Medical Directors Association, 14(3), pp. 204-212.

Tooth, L., McCluskey, A., Hoffmann, T., McKenna, K. & Lovarini M., 2005. Appraising the quality of randomized controlled trials: inter-rater reliability for the OT seeker evidence database. *J. Eval. Clin. Pract,* 11(6), pp. 547-55.

Truelsen, T., Begg, S. & Mathers, C., 2006. The global burden of cerebrovascular. *In Who Int*.

Tse, T., Douglas, J., Lentin, P. & Carey, L., 2013. Measuring participation after stroke: a review of frequently used tools. *Archives of physical medicine and rehabilitation,* 94, pp. 177-192.

Tuckett, A., 2005. Applying thematic analysis theory to practice: A researcher's experience. Contemporary Nurse, 19, pp. 75–87.

Uttam, M., Midha, D., & Arumugam, N., 2015. Effect of graded motor imagery on upper limb motor functions and quality of life in patients with stroke: a randomized clinical trial. *IJTRR,* 4(1), pp. 43-51.

Van Manen, M., 2007. Phenomenology of practice, Phenomenology and Practice, 1(1), pp. 11-30.

Van Peppen, R., Hendriks, H., Van Meeteren, N., Helders, P. & Kwakkel, G., 2007. The development of a clinical practice stroke guideline for physiotherapists in The Netherlands, 29(10), pp. 767-783.

Verma, R., Narayan Arya, K., Garg, R. & Singh, T., 2011. Task-oriented circuit class training program with motor imagery for gait rehabilitation in poststroke patients. *Topics in stroke rehabilitation*, *18*(1), pp. 620-632.

Vikasini rokalla, Sri Tulasi pilladi, Kiran prakash pappala, & et. al., 2016. Comparison of mental practice-based training and task oriented training for upper limb functional recovery in chronic stroke subjects. Journal of Health and Medical Research (AJHMR), 2(1), pp. 09-13, 2016.

Voss, D., Ionta, M., Myers, B. & Knott, M., 1985. Proprioceptive neuromuscular facilitation: patterns and techniques. Philadelphia, PA: Harper & Row. pp. 298-311.

Wade, D., Legh-Smith, J. & Hewer, R., 1985. Social activities after stroke: measurement and natural history using the Frenchay Activities Index. *International rehabilitation medicine,* 7, pp. 176-181.

Wade, D., 2009. Goal setting in rehabilitation: an overview of what, why and how. pp. 291-295.

Wade, D., 2020. What is rehabilitation? An empirical investigation leading to an evidence-based description.

Walker, M., Sunderland, A., Fletcher-Smith, J., Drummond, A., Logan, P., Edmans, J. & et al., 2012. The DRESS trial: a feasibility randomized controlled trial of a neuropsychological approach to dressing therapy for stroke inpatients. *Clinical Rehabilitation*, *26*(8), pp. 675-685

Walker, A. & Selfe, J., 1996. The Delphi method: a useful tool for the allied health researcher. British Journal of Therapy and Rehabilitation, 3(12), pp. 677-681.

Walshe, K., 2002. Principles for Best Practice in Clinical Audit: National Institute for Clinical Excellence. Abingdon, Oxon: Radcliffe Medical Press, Quality and Safety in Health Care, 11(4), pp. 392-392.

Warner, L. & McNeill, M., 1988. Mental imagery and its potential for physical therapy. Phys Ther, 68(13), pp. 516-21.

Webb, C. & Kevern, J., 2001. Focus groups as a research method: A critique of some aspects of their use in nursing research, Journal of Advanced Nursing, 33(6) pp. 798–805.

Weinberg, R., 2008. Does imagery work? Effects on performance and mental skills. *J Imagery Res in Sport Phys Activ*, 3(1), pp. 1-21.

White, A. & Hardy, L., 1995. Use of different imagery perspectives on the learning and performance of different motor skills. *British journal of Psychology,* 86, pp. 169-180.

Who.int., 2019. [online] Available at: https://www.who.int/workforcealliance/knowledge/resources/ghwa_mid_level_report_2013.pdf [Accessed 1 May 2019].

Whyte, E., & Mulsant B., 2002. Post stroke depression: epidemiology, pathophysiology, and biological treatment. Biol Psychiatry, 52, pp. 253–264.

Wijbenga, M., Bovend'Eerdt, T. & Driessen, E., 2019. Physiotherapy students' experiences with clinical reasoning during clinical placements: A qualitative study. Health Professions Education, 5(2), pp. 126-135.

Wilder, L., 2014. Reflections on "Moral" Multiculturalism and postmodern thought white voices in multicultural psychology education and leadership, p.25.

Williams, J., Odley, J., & Callaghan, M., 2004. Motor imagery boosts proprioceptive neuromuscular facilitation in the attainment and retention of range-of-motion at the hip joint. *J Sports Sci Med*, 3(3), pp. 160-166.

Williams, M. & Vogt, W. (eds), 2011. The Sage Handbook of Innovation in Social Research Methods, London: Sage

Williams, M., 2000. Interpretivism and generalisation. Sociology, 34(2), pp.209-224.

Williams, P. & Webb, C., 1994-a. Clinical supervision skills: a Delphi and critical incident technique study. Medical Teacher, 16(2-3), pp. 139-157.

Williams, P. & Webb, C., 1994-b. The Delphi technique: a methodological discussion. Journal of advanced nursing, 19(1), pp. 180-186.

Winstein, C., Stein, J., Arena, R. & et al., 2016. Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*, *47*(6), pp. e98-e169.

Woldag, H. & Hummelsheim, H., 2002. Evidence-based physiotherapeutic concepts for improving arm and hand function in stroke patients. *Journal of neurology,* 249, pp. 518-528.

Wolf, S., Winstein, C., Miller, J. & et al., 2008. Retention of upper limb function in stroke survivors who have received constraint-induced movement therapy, *The Lancet Neurology,* 7, pp. 33-40.

Wong, L., 2008. Focus group discussion: a tool for health and medical research. Singapore Med J, 49, pp. 256-60.

World Health Organization, 1997. WHOQOL: Measuring quality of life World health organization: Division of mental health and prevention of substance abuse. Geneva: WHO.

World Health Organisation (WHO), 2001. International Classification of Functioning, Disability and Health: ICF. World Health Organization.

World Health Organization, 2013. International classification of functioning, disability and health (ICF).

Yao, W., Ranganathan, V., Allexandre, D., Siemionow, V. & Yue, G., 2013. Kinaesthetic imagery training of forceful muscle contractions increases brain signal and muscle strength. *Frontiers in human neuroscience*, *7*, p. 561.

Yardley, L., Beyer, N., Hauer, K. & et al., 2005. Development and initial validation of the Falls Efficacy Scale-International (FES-I). *Age and ageing*, *34*(6), pp. 614-619.

Yu, T., Xiao, J., Wang, F. & et al., 2015. Enhanced motor imagery training using a hybrid BCI with feedback. IEEE Transactions on Biomedical Engineering, 62(7), pp. 1706-1717.

Yue, G. & Cole, K., 1992. Strength increases from the motor program: comparison of training with maximal voluntary and imagined muscle contractions. J Neurophysiol; 67, pp. 1114-23.

Zimmermann-Schlatter, A., Schuster, C., Puhan, M., & et al., 2008. Efficacy of motor imagery in post-stroke rehabilitation: a systematic review. *J Neuroeng Rehabil*, 5(1), p. 8.

Appendix 1.1. Copy of TIDieR checklist form

TIDieR
Template for Intervention Description and Replication

The TIDieR (Template for Intervention Description and Replication) Checklist*:

Information to include when describing an intervention and the location of the information

Item number	Item	Where located ** Primary paper (page or appendix number)	Other † (details)
	BRIEF NAME		
1.	Provide the name or a phrase that describes the intervention.	____________	____________
	WHY		
2.	Describe any rationale, theory, or goal of the elements essential to the intervention.	____________	____________
	WHAT		
3.	Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g. online appendix, URL).	____________	____________
4.	Procedures: Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities.	____________	____________
	WHO PROVIDED		
5.	For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given.	____________	____________
	HOW		
6.	Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.	____________	____________
	WHERE		
7.	Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features.	____________	____________
	WHEN and HOW MUCH		
8.	Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose.	____________	____________
	TAILORING		
9.	If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how.	____________	____________
	MODIFICATIONS		
10.‡	If the intervention was modified during the course of the study, describe the changes (what, why, when, and how).	____________	____________
	HOW WELL		
11.	Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them.	____________	____________
12.‡	Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.	____________	____________

** **Authors** - use N/A if an item is not applicable for the intervention being described. **Reviewers** – use '?' if information about the element is not reported/not sufficiently reported.

† If the information is not provided in the primary paper, give details of where this information is available. This may include locations such as a published protocol or other published papers (provide citation details) or a website (provide the URL).

‡ If completing the TIDieR checklist for a protocol, these items are not relevant to the protocol and cannot be described until the study is complete.

* We strongly recommend using this checklist in conjunction with the TIDieR guide (see *BMJ* 2014;348:g1687) which contains an explanation and elaboration for each item.

* The focus of TIDieR is on reporting details of the intervention elements (and where relevant, comparison elements) of a study. Other elements and methodological features of studies are covered by other reporting statements and checklists and have not been duplicated as part of the TIDieR checklist. When a **randomised trial** is being reported, the TIDieR checklist should be used in conjunction with the CONSORT statement (see www.consort-statement.org) as an extension of **Item 5 of the CONSORT 2010 Statement.** When a **clinical trial protocol** is being reported, the TIDieR checklist should be used in conjunction with the SPIRIT statement as an extension of **Item 11 of the SPIRIT 2013 Statement** (see www.spirit-statement.org). For alternate study designs, TIDieR can be used in conjunction with the appropriate checklist for that study design (see www.equator-network.org).

Appendix 2.1: Copy of PRISMA reporting guidelines

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	A systematic review with a meta-analysis on mental imagery practice with task oriented-training enhanced rehabilitation to improve ADL recovery, mobility, quality of life and participation after stroke.	68
ABSTRACT			
Structured summary	2	**Introduction:** Rehabilitation promotes post-stroke recovery. While mental imagery (MI) is a cost-effective method, its impact on outcomes compared to more traditional approaches, such as task-oriented training, remains unclear. This systematic review aims to determine whether MI assisted task-oriented training improves activities of daily living (ADL), mobility, quality of life (QoL) and participation outcomes after stroke. **Method:** Databases, including PubMed, Medline, CINAHL, and Cochrane, were searched. Studies reporting MI and task-oriented interventions in stroke were selected. Two reviewers individually screened all titles and abstracts. The quality of the included studies was evaluated using the Physiotherapy Evidence Database (PEDro) rating tool. Key features of the interventions (duration, dose, intensity) were described using TIDieR checklist. **Results:** Fifteen studies met the inclusion criteria; 12 Randomized Control Trials and three Controlled Clinical Trials. Methodological quality mean was 6.5 point (range 0-10 PEDro). Different outcome measures were used to assess ADL and mobility. Meta-analysis was performed with mobility outcome measures. Five studies had reported significant improvement in mobility (Time Up and Go Test) and three studies reported significant improvement in balance (Berg Balance Test) from MI use. Furthermore the 10-m-walk test for two studies indicated that MI could improve walking. **Conclusion:** Evidence from previous trials employing MI in stroke rehabilitation combined with conventional or standard physiotherapy and/or occupational therapy suggests its rehabilitation potential for improved ADL and mobility outcomes. Included studies indicated that MI is safe, cost-effective and feasible to use at home without supervision. Further investigation is needed to determine its use in clinical practice.	N/A in chapter
INTRODUCTION			
Rationale	3	Following a stroke, individuals experience impairment, shown in motor weakness and paralysis, leading to limitations in ADL, mobility, participation, and poor quality of life (WHO, 2001; Stucki, 2005). Other effects include the loss of speech or cognitive impairment, such as memory loss (Duncan et al., 2005). To enhance recovery after stroke, therapeutic approaches are used in rehabilitation programmes. Improvements in ADL and independent mobility generally lead to enhance overall QoL (Langhorne, Bernhardt & Kwakkel, 2011). Rehabilitation interventions can improve functional outcomes after stroke, including enhanced ADL, participation and QoL, as demonstrated in this critical comprehensive review of 79 trials, investigating the relationship associated between rehabilitation interventions and their impact on improving functional outcomes after stroke. The review by Cifu and Stewart, (1999) critically analysed the included evidence of trials to reveal factors that impacts functional outcomes after stroke such as timing of initiating rehabilitation plans, level of intensity of the intervention, type of interventions, and intervention settings. Their findings show that the type of rehabilitation programmes provided in multidisciplinary settings after stroke as well as increasing functional skills on early rehabilitation admission services, are the two important factors that seem to have the greatest impact on improving functional outcomes of the patients. Mental imagery is a technique involving creating and repeating mental images of visualised movements for motor tasks, without involving physical movement (Butler & Page, 2006). Previous systematic reviews including a large number of studies have already investigated the effect of MI on improving upper limb function and related ADL independency (Barclay-Goddard et al., 2011). They included trials, which focused on the effect of MI in upper limb function outcomes and recovery only. Unlike other reviews, this review in this chapter focuses on investigating the effect of MI on improving overall global activities of daily living and their impact on mobility, QoL and participation after stroke, rather than improvements in a specific function or tasks. Hence the focus is examining the individual's execution of tasks relative to their involvement in life situations (activity and participation) rather than improvement at a bodily or anatomical structure, dysfunction and/or impairment level as seen in previous reviews when their only focusing on a specific skill to the bodily function (Kho et al., 2014; Carrasco & Cantalapiedra, 2016). Previous reviews for example, the systematic review by Barclay-Goddard et al. (2011), updated and completed recently in 2020, included a total of 25 RCTs and cross-over trials studies, of adult participants with stroke who had impairments in upper extremity function and have undergone mental practice interventions to improve upper extremity movements or tasks. However, their outcomes measures focused mainly on activity limitations of the upper extremity, including arm and hand functions such as grasping a cup or folding a towel, in their review they included trails which examined dysfunction in precise segments of the body determining the effectiveness of MI in imp2roving upper limb dysfunction after stroke. Although they aimed to determine whether mental practice improves outcomes of upper extremity related to ADL independence rehabilitation after stroke, their findings provided no clear evidence of the effectiveness of MI in improving recovery of the upper limb function. Additionally, they found limited evidence on the ideal dosage of MI for use in clinical practice. Their findings suggest the lack of good methodological quality in designing trails in MI interventions, and the need for better-described interventions in this field of study. Likewise Harris and Herber conducted their review in 2015, that aimed to evaluate the effects of MI compared with other methods of excresies on the upper limb motor restoration after stroke. Their review focused on including RCTs cases, that recruited individuals with any neurological conditions, exploring the impact of mental practice with intervention group including treated with imagery combined with other treatments and a control group including stroke patients treated by another exercise method. The focus was on studies that incoprated the use of motor imagery of the upper limb as a primary intervention. They excluded any studies that covered the upper limb's assessment, as a minor part of the intervention, or if	69

		the motor imagery was implicit imagery (such as laterality recognition or mirror therapy). Studies using brain-computer interface technology were also excluded as the required equipment. A total of 48 RCTs, were included in their review where a sum of 38 studies involved individuals with stroke, five articles involved individuals with complex regional pain syndrome, and five trials for other neurological conditions. The authors have used the motor imagery PETTLEP model to help them extract elements of MI intervention implementation. This model is used in sports research and included (Physical, Environment, Task, Timing, Learning, Emotion, and Perspective). Many of the imagery elements were less described in the included trials, such as timing, learning, emotional perspective aspects. Therefore their review was limited by including low-quality RCTs which lacked in addressing and clarifying the clinical effects of MP as a rehabilitation intervention used to improve upper extremity function in stroke patients. MI was used and delivered inconsistently within different nerological population. This makes it difficult to determine its effective content and elements to help implement it in clinical practice. Additionally, using the PETTLEP model to extract their data for MI intervention could have impacted drawing on other factors and content of MI, and thus the interpretation of their results could have been limited also. Another review by Song et al., (2018), aimed to evaluate the effectiveness of MI intervention on the upper limb function recovery. They included studies that involved stroke undergoing MI treatment, randomised with three groups, one group using only MI intervention, the other combining MI with another type of exercise and the third group using only exercises. Studies that were not trails or studies that had any missing data analysis and had unclear statistical results were excluded. In their review they included 12 RCTs with 268 strokes. Their carried out a meta-analysis on the two included outcomes; the FMA and ARAT, which showed that MI intervention combined with other exercises is effective on improving upper limb recovery after stroke. However, their review encompassed heterogeneity that existed in the ARAT outcome measure due to several factors such as including trials that were conducted from different countries and were from different ethnic areas. Other factors also that could have impacted the heterogeneity level in their reported results was relative to the population	

		demographic distinction such as gender and age. Thus, the comprised heterogeneity in their review could have impacted the results and limited further interpretation of effective MI use. Finally, the review by Silva et al., (2020), aimed to assess the effects of MI for evaluating the ability to walk among people following stroke. They measured walking abilities outcomes using measurement tools such as the Functional Independence Measure (FIM), 10 Meter Walk Test (10MWT), and the Barthel Index (BI). As well as the Functional Ambulation Category (FAC), Timed Up and Go Test (TUG), and the Rivermead Mobility Index (RMT), their results included 21 RCTs total of 762 participants mean age ranged between 50–78 years old and the duration of treatment is 2-8 weeks. They included RCTs and cross over (applying to 1st phase data only) studies. Interventions of MI used with action observation only, or with physical activity tasks. The findings of their review have, shown a low certainty in the provided evidence in MI use which can benefit in the recovery in gait outcome measures compared to other therapies used in rehabilitation after stroke. Their review was also limited, by the high heterogeneity level in MI protocols used within the included studies, the review did not include any trials that were not published. Most, of the trail's methodological criteria failed to reach good level as explained by the authors for several reasons such as non-blinding for the outcome assessment, randomising incomplete outcome data these criteria might have used underestimation or overestimation for the effect of MI intervention. This could have impacted the findings in providing certain robust evidence for MI use as an intervention that can help benefit recovery in walking abilities used in rehabilitation after stroke. On the contrary, my review in this chapter focused on evaluating global ADL that may contribute to additional insight and knowledge to the existing body of literature. Reasons for including only ADL as a global broad range of ADL functional skill related to general self-care independence limitation after stroke such as eating, bathing and grooming tasks. This is different than what previous reviews have included, for example, including only the upper limb functions which covers only one sperate functional skill in the body.	

		Stroke rehabilitation programmes have been shown to maximise recovery after stroke through a multidisciplinary approach that includes physiotherapy, occupational therapy, psychology, and speech and language therapy. In RCT by Indredavik et al. (1991), involving 110 acute stroke survivors, they compared one group participating in a stroke rehabilitation programme in which a motor relearning approach and functional training techniques were applied by nurses trained under the supervision and guidance of expert physiotherapists. Compared to another group that was enrolled in a general ward programme only. Their findings show significant improvement in mortality rate and functional ability was recorded for the stroke rehabilitation group, leading to ADL and QoL enhancement as identified in the 10 year follow up (Indredavik et al., 1991; Indredavik et al., 1999). These studies suggest that effective rehabilitation programmes should include a focused rehabilitation program with an educated collaborative staff, appropriately trained to deliver a specific physiotherapy programme with interventions intended for stroke recovery in motor learning and functional techniques. Recently, neurorehabilitation theories with a focus on brain plasticity and the reaction of neural pathways have been more frequently used in rehabilitation after stroke, given that the reaction of neural pathways mirrors the mechanism and process of motor learning. Further, relatively new techniques such as computer-brain interface, virtual reality (Burdea et al., 1997-b) and robotic training (Bouzit et al., 2002) are currently available. However, their use is limited in clinical settings, and there are only a few studies were found with very small sample sizes conducted applying these techniques to support their use in clinical practice (Takeuchi & Izumi, 2013). This suggests the need to integrate more advanced techniques such as MI and task-oriented training in rehabilitation with stroke yet is lacking in previous literature. Task-oriented training is another technique defined in this review as an approach that focuses on performing a certain task a certain number of times to meet certain goals and attain a certain standard value. The technique of task-oriented in therapy can be referred to as task-specific, goal-directed, and functional-task-practice training approach, all of which relate to task-oriented training approach.	

		Furthermore, MI and self-guided task-oriented training is a low-cost, accessible approach that can be integrated in rehabilitation programmes with effects, as observed in reported stroke trial (Braun et al., 2010). The effectiveness of MI use was investigated in a systematic review by Braun et al., (2013). That included 16 RCTs involving 421 stroke survivors and 70 patients with Parkinson's disease. The review aimed to identify the benefits and any adverse effects of MI use and the extent to which levels of cognitive and functional activities are affected in neurological conditions including Parkinson's disease and stroke. The findings from the review show that MI training could have an effect on ADL function and cognition when compared to a relaxation therapy or a usual rehabilitation control group. However, the samples in the individual studies included of trials that were too small to reflect real-world populations (n=5 to n=39) (Braun et al., 2013). The results from the pooled effect from the meta-analysis including seven studies resulted in small effect size in MI in the ARAT outcome for arm and hand function. Although this could suggest that MI improves ADL, the small sample included made it is difficult to judge real effect of the intervention from the studies included. Thus, their findings were limited in their review and conclusion upon MI effectiveness was unclear. Accordingly, MI is being increasingly used with stroke survivors in clinical practice. An improvement in mobility performance, walking ability and balance was seen in a six-week treatment evaluating effect of gait performance with 17 stroke survivors (Dunsky et al., 2008). Further benefits were noticed for upper limb improvements and QoL enhanced in RCT involving 26 stroke survivors receiving MI treatment combined with physiotherapy and task-oriented training. Yet, these overall trials lacked any clear description of how they trained the patients to use MI. There is a need for further research with clear details strategies for training stroke on using MI in practice (Uttam, Midha & Arumugam, 2015).	
		In line with these findings, it has been proposed in systematic reviews that MI enhances rehabilitation programmes with the objective of improving functional recovery after stroke (Braun, Beursken & Borm, 2006). What requires further exploration and clarification is the specific design, intensity, duration, modality of delivery and content of MI alongside the influence of predictive indicators of outcome, barriers to and facilitators of its uptake and use in clinical practice in relation to stroke. Further, whilst the importance of imagery elements, such as inclusion of MI mode (visual or kinaesthetic) and perspective (internal visual or external visual) has been acknowledged, these still need to be addressed to a greater extent in intervention designs (Schuster et al., 2012). Moreover, the best design to apply to a given intervention and which measurement tools to employ to address stroke attributes (functioning level, lesion site, stroke type, onset of stroke and the ability to generate images) have yet to be determined. This limitation highlights the need to explore the variability of MI intervention designs developed for different stroke populations. To date, these issues have not been addressed in any systematic review. Previously, the effectiveness of using MI combined with physical practice interventions (practicing ADL, such as reaching for and grasping a cup) to improve upper limb function was assessed in a systematic review of three RCTs involving 73 stroke survivors by Svetlana and Dizon (2009). Greater improvements were identified in the group using MI compared to those receiving relaxation and physical practice. However, there was heterogeneity in the MI training protocols across the studies and in the MI intervention designs used, therefore it remains unclear which interventions are best suited to particular stroke characteristics or attributes of stroke survivors (Svetlana and Dizon, 2009). Further, the effect of MI on motor recovery of the upper extremities after stroke was evaluated in a systematic review that included six trials, and a total of 139 stroke survivors. The outcome measures were FMA-Upper Extremity (FMA-UE), the Action Research Arm Test (ARAT), the Motor Activity Log (MAL), the Motricity Index and the Arm Function Test and Barthel Index (BI) (Kho, Lui & Chung, 2014). The included studies yielded positive findings in favour of MI training when compared to physiotherapy alone, similar to Svetlana and Dizon's (2009) findings. Heterogeneity across these studies using different types of outcome measures indicated	
		the need to identify more accurate, better-standardised outcome measures tailored to patients' needs and at the same time proving effective in MI use and training monitoring progress.	
Objectives	**4**	The aim of this review was to investigate whether MI practice combined with task-oriented training could improve ADL, mobility, QoL, and participation performance and recovery after stroke. In addition to determine which MI protocols and treatments design are most effective in stroke rehabilitation. In order to help answer this research question, a few objectives need to be met and investigated within this review; These objectives are as following: 1. To determine the effectiveness of MI practice combined with task-oriented training on improving ADL performance and recovery after stroke (primary outcome). 2. To determine whether MI practice combined with task-oriented training improving mobility, QoL, participation performance and recovery after stroke (secondary outcomes). 3. To identify which MI practice treatment designs are the most effective for stroke, which is lacking in previous research.	75
METHODS			
Protocol and registration	**5**	This systematic review was prepared as a protocol and registered on PROSPERO database on the 23rd of November 2016 (CRD42016051995) (Alhashil et al., 2016). https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=51995	75
Eligibility criteria	**6**	**Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.** The review included studies that have been published since 1980. English language articles were retrieved. Moreover, reference sections of retrieved studies were examined for additional missed studies. PICOS of the review included: • Participants included: The studies included should have stroke participants experiencing functional limitation in activity of daily life and/or quality of life and participation. Stroke survivors with limitations in activities of daily living. Stroke patients aged 18 years and over, with hemiparesis, any stroke type (e.g. ischemic or haemorrhagic), involved at any stroke stage (e.g. acute stage 1 day-7 days; sub-acute stage 1 month- 3 months; and chronic stage 3-6 months up to 2 years or more). Exclude: Patients aged	77-88

		below 18 years, those with unknown diagnosis, cognitive impairment as defined by a standardized cognitive screening test (e.g. a score of less than 20 on the Modified Mini-Mental Status Test). • Intervention and comparator: Mental imagery practice is defined in this review as a cognitive process of creating or recreating an image of an experience representing rehearsal of specific motor or dynamic tasks performance that approximates a real experience in the mind only. Only primary studies investigating trials incorporating mental imagery practice with task oriented training in rehabilitation to improve ADL (limitation in activities of daily life due to a deficit in body function; ICF, WHO, 2013), improved mobility (gait and balance), and improving levels of quality of life and participation will be included in the study. The training intervention can be performed alone or in combination with other therapies. The focus was on any type of MI intervention, used either alone or in combination with standard therapy, in a rehabilitation programme compared to a control group that received standard therapy alone. Examples included MI practice with task-oriented training alone versus placebo, "sham" groups (e.g. listening to a recording on stroke information) and standard therapy control (i.e. progressive muscle strength training, repetitive task-oriented training or relaxation therapy). • Types of study: The review included published quantitative studies such as randomized control trials (RCTs), controlled clinical trials (CCTs) and cohort studies. Exclusion criteria: retrospective cohort studies case reports, and case studies. • Outcomes included in the studies in general, two types of outcomes were included, primary and secondary outcomes: • Primary outcomes included improving ADL performance (e.g. measured by the BI, and Functional Independence Measure (FIM) (Beninato et al. 2006). Limitation in completing or performing ADL and daily life tasks has been defined based on the World Health Organization (2001) classification of disability and health; this limitation can be due to structural deficit affecting physiological or psychological function, or due to impairment of an individual's functioning level. ADL (e.g. measured by the Barthel Index (BI) and Fugl-Meyer Assessment (FMA). Additional secondary outcomes, included mobility, for example, as measured by the Berg Balance Test (BBT) and/or Time Up and Go Test (TUG); Quality of life, as measured by health-related or stroke-specific quality of life measures such as the European Quality of Life Scale and the Stroke Specific Quality of Life (SS-QoL), and finally, participation, as measured by the Impact on Participation and Autonomy for participation. Other	
		secondary outcomes such as Quality of life was defined according to Barcaccia et al. (2013) as 'an individual's perception of their position in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns'. It is an extensive ranging concept affecting person's health status, psychological state, level of independence, social relationship, non-public beliefs and their relationship to significant features of their environment (WHO, 1997). Participation refers to involvement in life situations that are of value to the person. This can extend to fulfilling one's social role, or attaining personal goals, e.g. work, religion, prayers, interpersonal interaction and relations. One measure that has been adopted by some authors for example Timmermanns et al. (2013) used the Frenchay Activities Index (Wade, Legh-Smith & Hewer, 1985), to measure levels of independence and social participation. However, this tool is concerned with measuring ADL levels and may not in fact be a measure of this outcome. It does, however, reflect on broad range of ADL in this review.	
Information sources	**7**	The electronical database that was searched included: PubMed, Medline, CINAHL, PsycINFO, EMBASE, Cochrane Library, and PEDro. The search was conducted in November 2016. Additionally, a hand search was also performed to identify relevant studies that may have been overlooked during the electronic search. Keywords, such as "mental imagery", "motor imagery", "mental practice", "visual imagery practice", "task oriented", "task specific", "functional task", "stroke", "hemiparesis", "hemiplegic stroke", "ischaemic stroke", "post stroke", "acute stroke" and "chronic stoke" were used. Boolean "AND" and "OR", as well as truncation and wildcard operators, were applied throughout the process. Comprehensibility and clarity were ensured by applying broad MI-related terms such as "mind and body exercise" and "cognitive rehearsal". The search was limited to journals published in English. See Appendix 1-Copy of search strategies detailed across all included databases. Another reviewer (MA) helped in conducting the screening for the studies. While a third reviewer (SA) helped solved any discrepancies once presented between the two main reviewers.	76
Search	**8**	See Appendix 1-Copy for a full electronic search strategy detailed used for the PubMed database including any limits used, such that it could be repeated. In regard to information sources.	76

Study selection	**9**	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). Process for selecting studies for inclusion in the review. • The PROSPERO protocol registered was followed for the study selection and data extraction. Data of potential relevance to the study were extracted using a screening form (PICO-S) developed by the researcher (NA), and (MA) also helped in data extraction (See Appendix 2). The data extraction was conducted by the two researchers/reviewer independently before comparing results and removing any discrepancies through discussion. A third reviewer arbitrated any remaining points of contention. • Data was extracted on the following: participant demographics; description of intervention and programme; details of mental imagery training; primary outcome (activities of daily living); secondary outcomes (mobility, quality of life and stroke specific quality of life, participation, adverse events, and any other outcomes), and study design. The TIDieR checklist was also used in data extraction to help in describing MI interventions (Hoffmann et al., 2014). Extracted data also included information on the authors, year of publication, study design, setting, population, patients' demographic and baseline characteristics, recruitment and study completion, study variables, intervention details, control groups, methodology, outcomes, results, risk of bias information assessment tools, and study limitations. • Additionally, the methodological quality of included studies was evaluated by the two independent reviewers (NA) and (MA) using the Physiotherapy Evidence Database PEDro scale. PEDro was chosen as it is considered reliable (Maher et al., 2003) when measuring the internal validity of RCTs and statistical reports (Tooth et al., 2005). The scale comprises a checklist of 11 items with each item scored as 1 or 0 (yes=1 or no=0), where the highest mark (11) which is indicative of maximum quality (see Appendix 3). Ten items measure internal validity. These criteria include randomisation, baseline characteristics, blinding of assessors, missing data, between-group comparisons, concealed allocation, blinding of patients and blinding of therapists. In addition, one extra item measures and assesses external validity for the included patients.	84

Data collection process	**10**	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. • NA conducted the search and another reviewer (MA) helped in conducting the screening for the studies. While a third reviewer (SA) helped solved any discrepancies once presented between the two main reviewers. • Using EndNote X7 referencing system and software to import all citations identified from the search strategy, remove duplicates and screen for eligibility NA imported all citations and removed duplicates before sending the final library to a second researcher. The two researchers NA and MA then independently assessed all titles and abstracts using a PICO-S screening and selection tool and shortlist studies for inclusion. Any discrepancies were discussed. • Full texts were, obtained for all shortlisted articles and the two reviewers assessed them for inclusion in the review. The two reviewers compared their selections and discussed any discrepancies. Any remaining disagreements were decided through consultation with the third researcher. Any disagreement was resolved by consulting a third reviewer (SA); if the third reviewer's assessment agreed with one of the existing assessments (e.g. NA as the 1st rater), the consensus score was adopted as the final assessment. In cases where three reviewers had entirely different ratings, further discussion was held until consensus was reached.	80-84
Data items	**11**	**List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.** PICOS of the review will include: • Types of study: The review included published quantitative studies such as randomized control trials (RCTs), controlled clinical trials (CCTs) and cohort studies. Exclusion criteria: retrospective cohort studies case reports, and case studies. • Condition studied: Studies including stroke patients aged 18 years and over, with hemiparesis, any stroke type (e.g. ischemic or haemorrhagic), involved at any stroke stage (e.g. acute stage 1 day-7 days; sub-acute stage 1 month- 3 months; and chronic stage 3-6 months up to 2 years or more). Exclude: Patients aged below 18 years, those with unknown diagnosis, cognitive impairment as defined by a standardized cognitive screening test (e.g. a score of less than 20 on the Modified Mini-Mental Status Test). • Participants included: The studies included should have stroke participants experiencing functional limitation in activity of daily life and/or quality of life and participation. Stroke survivors with limitations in activities of daily living. • Intervention and comparator: Mental imagery practice is defined in this review as a cognitive process of creating or recreating an image of an experience representing rehearsal of specific motor or dynamic tasks performance that approximates a real experience in the mind only. Only primary studies investigating trials incorporating mental imagery practice with task oriented training in rehabilitation to improve ADL (limitation in activities of daily life due to a deficit in body function; ICF, WHO, 2013), improved mobility (gait and balance), and improving levels of quality of life and participation are included in the study. The training intervention can be performed alone or in combination with other therapies. • Outcomes included in the studies in general, the primary outcome ADL (e.g. measured by the Barthel Index (BI) and Fugl-Meyer Assessment (FMA). Additional secondary outcomes, mobility (e.g. measured by Berg Balance and Timed Get up and Go (TUG)). Quality of life (e.g. measured by Health-related quality of life (HRQOL) and Stroke Specific Quality of life (EuroQol; SS-QOL)). Participation (e.g. measured by Frenchay Activities Index (FAI) for participation).	86-90
Risk of bias in individual studies	**12**	**Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis:** The methodological quality of included studies was evaluated using the Physiotherapy Evidence Database PEDro scale. PEDro was chosen as it is considered reliable (Maher et al., 2003) when measuring the internal validity of RCTs and statistical reports (Tooth et al., 2005). The scale comprises a checklist of 11 items with each item scored as 1 or 0 (yes=1 or no=0), where the highest mark (11) which is indicative of maximum quality (see Appendix 3). Ten items measure internal validity. These criteria include randomisation, baseline characteristics, blinding of assessors, missing data, between-group comparisons, concealed allocation, blinding of patients and blinding of therapists. In addition, one extra item measures and assesses external validity for the included patients.	90-91
Summary measures	**13**	**State the principal summary measures (e.g., risk ratio, difference in means):** Findings regarding MI intervention were reported narratively using the TIDieR checklist to synthesise description of the MI content, type of MI, details of the task-oriented intervention, content, intensity, session duration, frequency, stroke characteristics and outcomes. Further, the intervention effect was reported according to the standardised mean change difference observed. Quantitative synthesis was undertaken when there was adequate scope in relation to the data to perform a meta-analysis, taking into consideration the number of patients, interventions used, and the outcome measures used to generate statistically significant effects between groups. Two methods were used to analyse the effect of interventions. In studies using the same outcome measure, the difference in means between the groups was used. When different studies assessed the same outcomes using different measures, alternatively, the standardised mean difference was used in the meta-analysis; otherwise, the individual effect of the outcome was reported in studies that were not included in the meta-analysis. Rev@Man software is programme used to help conduct and perform the meta-analysis and prepare the included study data and finalise the results with graphs.	89
Synthesis of results	**14**	**Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis:** The intervention effect was reported according to the standardised mean change difference observed. Quantitative synthesis was undertaken when there is adequate scope in relation to the data to perform a meta-analysis after taking into consideration number of patients, a comparison of the interventions and the different range of outcome measure to help generate statically power effect between groups. Two methods	93

		were used to analysis the effect of interventions. Using the difference in mean between the groups when the same outcomes measure is used in all studies. However, when different studies assess the same outcomes but uses different measure outcomes the standardised mean difference was used in the meta-analysis instead, otherwise individual effect of the outcome was reported.	
Risk of bias across studies	**15**	In the meta-analysis heterogeneity was tested to help test and provide intervention measure and content inconsistency as proposed by Higgins et al. to measure inconsistency (the percentage of total variation across studies due to heterogeneity) of effects across trials in using MI. The advantages of this measure of inconsistency (termed I^2) are that it does not inherently depend on the number of studies and is accompanied by an uncertainty interval." High levels of heterogeneity spotted in a meta-analysis was re-inspected for factors causing the high levels and re-analysing after removing. For example, a Meta-analyses were initially performed with all four studies and the pooled estimate showed a high level of heterogeneity (n=124; MD 4.3, 95% CI -3.2 to 11.7; I^2 = 96%) (Hwang 2010; Bruan et al., 2012; Hosseini et al., 2012; Lee et al., 2015), reported mobility outcomes using the Berg Balance Test (BBT). Subsequently, the characteristics of these studies were re-inspected for potential clinical factors causing heterogeneity. One possible cause for the heterogeneity source was suspected to be found in MI treatment courses lasting four, five, six and eight weeks, respectively. The different time duration of MI training may have produced differential effects. Furthermore, there were other sources, and might have caused this observed heterogeneity; for example, Braun et al. (2012) included only sub-acute stroke, while the rest included chronic cases. Another issue is the use of different modality of MI and prospective such as visual and kinaesthetic; Braun et al. did not specify the type while the other studies instructed the patients to use visual internal prospective combined with kinaesthetic modality. In very few instances, estimates of baseline mean or mean of ADL responses were obtained by the standard mean difference (SMD) which was calculated by the researcher (NA), instead of the mean difference (MD) due to the different scales of ADL using Revman@software (Higgins, 2008). For example	113-127
		the Two studies (Verma et al., 2011; Bruan et al., 2012) reported the use of MI combined with standard therapy involving the Bobath neurodevelopmental technique; in Verma et al. (2011) standard care was used (including training on homework tasks involving ADLs). In Bruan et al's (2012) study, in comparison to the control group using only standard therapy, multi-professional rehabilitation was used (e.g. physiotherapy, occupational therapy and speech therapy). Both studies measured ADL using the Barthel Index at two points during the 6 weeks with varying results over time. The SMD was calculated instead of the MD due to the different scales of ADL). Timmermanns et al. (2013) used BI to evaluate ADL, however, the data obtained were considered skewed and therefore, inappropriate for statistical testing. Some data obtained from the studies required transformation (processing) before they are suitable for analysis or for presentation in an evidence table. The study by Pollie et al. (2017) including 28 stroke survivors, measured ADL using the Functional Independence Measure (FIM), comparing MI to a standard therapy of active physical exercises and found no significant difference between the two groups (n=28; MD 20.4, 95% CI 1.91 to 38.89) after four weeks. Efforts were made to convert the FIM score into a BI score so that it could be entered in the meta-analysis since according to Nyein et al. (1999) and Prodinger et al. (2017) conceptual equivalence exists between the FIM and the BI. However, the Rasch interval metric equivalent between the two measures was lacking, therefore, it was not possible to establish a formula with which to conduct the conversion. One study by Hong et al. (2012), investigated the effect of MI use to improve upper limb motor functions after stroke. The study reported median change scores on the Barthel Index and modified Ashworth scale with n=14. MI training was compared against the control group, which included only standard therapy involving general functional electrical stimulation therapy. This study was not included in meta-analysis because there was no SMD nor MD to help report it and combine it with the other studies. There were two studies that compared the use of MI with other standard therapy such as functional training (Liu et al., 2004; Liu et al., 2009) and reported a Likert-type scale scores for the trained and untrained task	
		performance measure after three weeks of treatment with n=46. The findings revealed higher scores for the MI group than the standard care group. These studies also had not provided SMD nor MD to enter them in the meta-analysis. The Timmermans et al. (2013) study used the BI and Frenchay Activities Index (FAI) to measure ADL in a sample of 32 stroke survivors that underwent MI training with tailored functional tasks of upper limb while the control group were provided with standard treatment using NDT with functional tasks for six weeks and a follow-up at six and twelve months. Data was reported using Median Inter Quartile Range (IQR), thus the study was excluded from the previous statistical analysis of ADL due to skewed data. There was no clear acknowledgement of any significant differences between the MI group and the control group.	
Additional analyses	**16**	There was an attempt to the effect of ADL outcome within different measuring tools used across several studies, effort were made to convert the FIM score into a BI score so that it could be entered in the meta-analysis since according to Nyein et al. (1999) and Prodinger et al. (2017) conceptual equivalence exists between the FIM and the BI. However, the Rasch interval metric equivalent between the two measures was lacking, therefore, it was not possible to establish a formula with which to conduct the conversion.	105
RESULTS			
Study selection	**17**	• One thousand one hundred and forty-two articles were identified. • The electronic sources included: PubMed (n = 214), PsycINFO (n = 87), PEDro (n = 55), Medline (n = 230), Cochrane Library (n = 132), CINAHL (n = 121) and EMBASE (n = 303). • Four hundred and sixty-six titles and abstracts remained after duplicates or non-eligible papers were removed. • A further four hundred and forty-four records from these were excluded according to titles and abstracts. The remaining 22 papers were retrieved for full text. • Finally, 15 papers were included in this review	84

Study characteristics	**18**	For each study, the presented characteristics for which data were extracted depending on the PICOS screening and extracting sheet as follows: • Participants included: Fifteen studies were included involving 458 stroke survivors (283 men and 175 women). The mean age of patients ranged from 47 to 78 years. Time since stroke onset and trial participation ranged from 12.25 days to 1350 days. Most studies included stroke survivors in the chronic stage of recovery (≥ 6 months) n= 226 patients within 8 studies (Hwang et al., 2010; Lee et al., 2011; Cho et al., 2012; Hong et al., 2012; Hosseini et al., 2012; Lee et al., 2015; Kumar et al., 2016; Polli et al., 2015). While the sub-acute stage included n= 122 (Verma et al., 2011; Bruan et al., 2012; Timmermans et al., 2013; Pheung-Phrarattanatrai et al., 2015). Only two studies by the same author included patients in the acute stage (0–3 months) (n= 84) (Liu et al., 2004; Liu et al., 2009). One study by Kim et al. (2015) did not specify any stage. • Country: Twelve out of the fifteen included studies were trials conducted in Asian countries. Specifically, six studies were conducted in Korea (Hwang et al., 2010; Lee et al., 2011; Cho et al., 2012; Hong et al., 2012; Kim et al., 2015; Lee et al., 2015), two in China (Liu et al., 2004; Liu et al., 2009), two in India (Verma et al., 2011; Kumar et al., 2016), one in Iran (Hosseini et al., 2012) and one in Thailand (Pheung-Phrarattanatrai et al., 2015). The remaining three were conducted in Europe, including two studies in the Netherlands (Bruan et al., 2012; Timmermans et al., 2013) and one in Italy (Polli et al., 2015). Patients were recruited via health care centres including hospital, rehabilitation centres and nursing homes. Samples ranged from 14 to 49 stroke survivors. • Study type: Twelve studies were RCT designs and three used a CCT design study (non-randomised) (Hwang et al., 2010; Pheung-Phrarattanatrai et al., 2015; Pollie et al., 2017). • Intervention included studies compared MI use with task-oriented training, standard therapy in conventional rehabilitation or standard care. The type or mode of MI used in the included studies comprised visual, kinaesthetic or both modes. Furthermore, movement imagery and motor imagery (as defined in section 1.4) were used with the visual mode. Graded motor imagery type was used in one study only (Pollie et al., 2017). Visual imagery modality was used in five studies (Liu et al., 2004; Hosseini et al., 2012; Timmermans et al., 2013; Lee et al., 2015; Lee et al., 2011), while kinaesthetic imagery modality was employed by Kim et al. (2015). A combination of both modalities of imagery was	86-90
		employed in four studies (Cho et al., 2012; Hwang et al., 2010; Bruan et al., 2012; Kumar et al., 2016). Motor imagery was employed only by Verma et al. (2011). Three studies did not mention the type of imagery used (Hong et al., 2012; Liu et al., 2009; Pheung-Phrarattanatrai et al., 2015)	
Risk of bias within studies	**19**	**Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).** • The quality assessment for the included studies was an average methodological quality score that included studies was 6.5 out of (11) points on the PEDro scale, which is considered fair. • Randomisation was fairly clear in 12 out of 15p studies (Braun et al., 2012; Cho et al., 2013; Hong et al., 2012; Hosseini et al., 2012; Kim et al., 2015; Kumar et al., 2016; Liu 2004; Liu et al., 2009; Lee et al., 2011; Lee et al., 2015; Timmermmanns et al., 2013; Verma et al., 2011). • Concealment and allocation were absent for most studies (Liu et al., 2009; Hwang et al., 2010; Timmermanns et al., 2013; Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015; Pollie et al., 2017; Lee et al., 2015; Pheung-Phrarattanatrai et al.; 2015). Patient and therapist blinding were not possible for most of the studies, only four studies blinded the therapists (Braun et al., 2012; Cho et al., 2013; Hong et al., 2012; Liu et al., 2004). • One study had less than 85% missing data (Liu et al., 2009). Almost all the studies included participants'' eligibility criteria except for one (Kim et al., 2015). The baseline characteristics balancing criterion was achieved in all except for one study (Hong et al., 2012). All the studies conducted between group statistical comparisons, meeting this criterion. Three studies didn't establish the mean and variability statistics for the group outcomes (Cho eat al., 2013, Liu et al., 2009; Pheung-Phrarattanatrai et al.; 2015). • The provided level for methodological quality within the evidence obtained is somewhat worthy in supporting MI use in clinical practice (See Table 3. Average quality assessment for the included studies.	90-92
		• In the meta-analysis heterogeneity was tested to help test and provide intervention measure and content inconsistency as proposed by Higgins et al. to measure inconsistency (the percentage of total variation across studies due to heterogeneity) of effects across trials in using MI. • The advantages of this measure of inconsistency (termed I^2) are that it does not inherently depend on the number of studies and is accompanied by an uncertainty interval." High levels of heterogeneity spotted in a meta-analysis was re-inspected for factors causing the high levels and re-analysing after removing. For example, a Meta-analyses were initially performed with all four studies and the pooled estimate showed a high level of heterogeneity (n=124; MD 4.3, 95% CI -3.2 to 11.7; I^2 = 96%) (Hwang 2010; Bruan et al., 2012; Hosseini et al., 2012; Lee et al., 2015), reported mobility outcomes using the Berg Balance Test (BBT). • Subsequently, the characteristics of these studies were re-inspected for potential clinical factors causing heterogeneity. One possible cause for the heterogeneity source was suspected to be found in MI treatment courses lasting four, five, six and eight weeks, respectively. The different time duration of MI training may have produced differential effects. Furthermore, there were other sources, and might have caused this observed heterogeneity; for example, Braun et al. (2012) included only sub-acute stroke, while the rest included chronic cases. Another issue is the use of different modality of MI and prospective such as visual and kinaesthetic; Braun et al. did not specify the type while the other studies instructed the patients to use visual internal prospective combined with kinaesthetic modality. • In very few instances, estimates of baseline mean or mean of ADL responses were obtained by the standard mean difference (SMD) which was calculated by the researcher (NA), instead of the mean difference (MD) due to the different scales of ADL using Revman@software (Higgins, 2008). For example, the Two studies (Verma et al., 2011; Bruan et al., 2012) reported the use of MI combined with standard therapy involving the Bobath neurodevelopmental technique; in Verma et al. (2011) standard care was used (including training on homework tasks involving ADLs). In Bruan et al's (2012) study, in comparison to the control group using only standard therapy, multi-professional rehabilitation was used	

		(e.g. physiotherapy, occupational therapy and speech therapy). Both studies measured ADL using the Barthel Index at two points during the 6 weeks with varying results over time. • The SMD was calculated instead of the MD due to the different scales of ADL). Timmermanns et al. (2013) used BI to evaluate ADL, however, the data obtained were considered skewed and therefore, inappropriate for statistical testing. • Some data obtained from the studies required transformation (processing) before they are suitable for analysis or for presentation in an evidence table. The study by Pollie et al. (2017) including 28 stroke survivors, measured ADL using the Functional Independence Measure (FIM), comparing MI to a standard therapy of active physical exercises and found no significant difference between the two groups (n=28; MD 20.4, 95% CI 1.91 to 38.89) after four weeks. • Efforts were made to convert the FIM score into a BI score so that it could be entered in the meta-analysis since according to Nyein et al. (1999) and Prodinger et al. (2017) conceptual equivalence exists between the FIM and the BI. However, the Rasch interval metric equivalent between the two measures was lacking, therefore, it was not possible to establish a formula with which to conduct the conversion. • One study by Hong et al. (2012), investigated the effect of MI use to improve upper limb motor functions after stroke. The study reported median change scores on the Barthel Index and modified Ashworth scale with n=14. MI training was compared against the control group, which included only standard therapy involving general functional electrical stimulation therapy. This study was not included in meta-analysis because there was no SMD nor MD to help report it and combine it with the other studies. • There were two studies that compared the use of MI with other standard therapy such as functional training (Liu et al., 2004; Liu et al., 2009) and reported a Likert-type scale scores for the trained and untrained task performance measure after three weeks of treatment with n=46. The findings revealed higher scores for the MI group than the standard care group. These studies also had not provided SMD nor MD to enter them in the meta-analysis.	
		• The Timmermans et al. (2013) study used the BI and Frenchay Activities Index (FAI) to measure ADL in a sample of 32 stroke survivors that underwent MI training with tailored functional tasks of upper limb while the control group were provided with standard treatment using NDT with functional tasks for six weeks and a follow-up at six and twelve months. Data was reported using Median Inter Quartile Range (IQR), thus the study was excluded from the previous statistical analysis of ADL due to skewed data. There was no clear acknowledgement of any significant differences between the MI group and the control group.	
Results of individual studies	**20**	**For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.** See Table for results description in P. 94-99.	94-99
Synthesis of results	**21**	**Present results of each meta-analysis done, including confidence intervals and measures of consistency.** Regarding the the primary outcomes which is Activities of daily living (ADL) • Two studies (Verma et al., 2011; Bruan et al., 2012) reported the use of MI combined with standard therapy involving the Bobath neurodevelopmental technique; in Verma et al. (2011) standard care was used (including training on homework tasks involving ADLs). In Bruan et al's (2012) study, in comparison to the control group using only standard therapy, multi-professional rehabilitation was used (e.g. physiotherapy, occupational therapy and speech therapy). Both studies measured ADL using the Barthel Index at two points during the 6 weeks with varying results over time. The standard mean difference (SMD) was calculated by the researcher (NA), instead of the mean difference (MD) due to the different scales of ADL using Revman@software (Higgins, 2008). Timmermanns et al. (2013) used BI to evaluate ADL, however, the data obtained were considered skewed and therefore, inappropriate for statistical testing. • While the first study by Verma et al. (2011) used the original scoring system of BI (0-100), and found that BI scores were higher in the MI group (n = 30; SDM 1.33, 95% CI 0.52 to 2.13), the other study (Bruan et al. 2012) with n=32, used the modified BI (0-20) and found no significant	103-119
		difference between the two groups (n = 30; SDM 0.01, 95% CI 0.66 to 0.69). Meta-analysis was not possible due to the different outcome measure used (see Figure 4). • Functional Independence Measure outcomes for ADL measures: One study by Pollie et al. (2017) including 28 stroke survivors, measured ADL using the Functional Independence Measure (FIM), comparing MI to a standard therapy of active physical exercises and found no significant difference between the two groups (n=28; MD 20.4, 95% CI 1.91 to 38.89) after four weeks. Efforts were made to convert the FIM score into a BI score so that it could be entered in the meta-analysis since according to Nyein et al. (1999) and Prodinger et al. (2017) conceptual equivalence exists between the FIM and the BI. However, the Rasch interval metric equivalent between the two measures was lacking, therefore, it was not possible to establish a formula with which to conduct the conversion. • One study by Hong et al. (2012), investigated the effect of MI use to improve upper limb motor functions after stroke. The study reported median change scores on the Barthel Index and modified Ashworth scale with n=14. MI training was compared against the control group, which included only standard therapy involving general functional electrical stimulation therapy. The treatment programme comprised 20 minutes, five days per week, for four weeks. Their findings showed no significant difference between the two groups. • Two studies compared the use of MI with other standard therapy such as functional training (Liu et al., 2004; Liu et al., 2009) and reported Likert-type scale scores for the trained and untrained task performance measure after three weeks of treatment with n=46. The findings revealed higher scores for the MI group than the standard care group. Timmermans et al. (2013) used the BI and Frenchay Activities Index (FAI) to measure ADL in a sample of 32 stroke survivors that underwent MI training with tailored functional tasks of upper limb while the control group were provided with standard treatment using NDT with functional tasks for six weeks and a follow-up at six and twelve months. Data was reported using Median Inter Quartile Range (IQR), thus the study was excluded from the previous statistical analysis of ADL due to skewed data. There was no clear acknowledgement of any significant differences between the MI group and the control group. In summary the overall findings for measures of ADL were that MI use may potentially improve levels of	

		daily activities of life. In terms of the secondary outcomes, mobility • Similar to the primary outcomes, when reporting MI use combined with other standard therapy versus standard therapy alone, mobility was reported and findings were addressed using different scales or tests of mobility including the Berg Balance Test (BBT), Time Up and Go (TUG) test, 10-metre-walk test and gait speed. Meta-analyses were conducted for the BBT (Hwang, 2010; Bruan et al., 2012; Hosseini et al., 2012; Lee et al., 2015), TUG (Hwang et al., 2010; Cho et al., 2012; Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015) and 10-meter-walk test (Bruan et al., 2012; Cho et al., 2012). • The Berg Balance Test, four studies (Hwang 2010; Bruan et al., 2012; Hosseini et al., 2012; Lee et al., 2015) reported mobility outcomes using the Berg Balance Test (BBT). Meta-analyses were initially performed with all four studies and the pooled estimate showed a high level of heterogeneity (n=124; MD 4.3, 95% CI -3.2 to 11.7; I^2 = 96%). Subsequently, the characteristics of these studies were re-inspected for potential clinical factors causing heterogeneity. One possible cause for the heterogeneity source was suspected to be found in MI treatment courses lasting four, five, six and eight weeks, respectively (see Figure 5). The different time duration of MI training may have produced differential effects. Furthermore, there were other sources, and might have caused this observed heterogeneity; for example, Braun et al. (2012) included only sub-acute stroke, while the rest included chronic cases. Another issue is the use of different modality of MI and prospective such as visual and kinaesthetic; Braun et al. did not specify the type while the other studies instructed the patients to use visual internal prospective combined with kinaesthetic modality. • Timed Up and Go test, five studies (Hwang et al., 2010; Cho et al., 2012; Hosseini et al., 2012; Kim et al., 2015; Lee et al., 2015) reported mobility outcomes measured by the TUG test. Meta-analyses were performed with all five studies and the pooled estimate showed a high level of heterogeneity (n=144; MD -3.92, 95% CI -6.77 to -1.07; I^2=76%). Duration time of MI application ranged from four up to eight weeks, specifically, four (Kim et al., 2015; Hwang et al., 2010); five (Hosseini et al., 2012); six (Cho et al., 2012) and eight (Lee et al., 2015), weeks of MI course application. As with the BBT outcomes, findings for the TUG test for walking suggest that mobility outcomes were better the longer the duration of MI training (see Figure 6.). Re-inspection of the characteristics of these studies was performed by the researcher (NA) for potential clinical heterogeneity. Different duration of MI training is one plausible explanation for this. Others may be in stroke onset varying from acute to chronic, different age range and different types of MI use across all studies. However, other factors included wide variation in MI intervention protocols, thus, making it difficult to determine what works for whom and therefore what should be implemented clinically and how. • Gait speed, four studies (Hwang et al., 2010; Lee et al., 2011; Verma et al., 2011; Kumar et al., 2016) reported mobility measured by gait speed in meters per seconds (m/s). Meta-analyses were initially performed with all four studies and the pooled estimate showed a high level of heterogeneity (n=118; MD 0.08, 95% CI 0.00 to 0.15; I^2=51%). The findings showed no clear difference between the MI group compared to the control groups. In this case, the source of heterogeneity was investigated and identified onset of stroke as the source. Subsequently, Verma et al. (2011) was removed from the analysis due to onset of stroke (acute stroke = six weeks). The remaining three studies conducted with stroke survivors in the chronic stage (Kumar et al., 2016; Lee et al., 2011; Hwang et al., 2010) (≥ six months) showed no clear difference in the outcome, using gait measured in speed per metre (n=88; MD 0.03, 95% CI -0.01 to 0.08; I^2=0%). However, the study by Verma et al. (2011), which included sub-acute (0-3 m) stage stroke survivors, showed that gait speed increased in the MI group in a study of 30 sub-acute stroke survivors (MD 0.17, 95% CI 0.07 to 0.27) (see Figure 7.), suggesting that onset of stroke and different stages of recovery could differentially affect outcomes following MI use. • 10-meter walk test, the pooled estimate of the effect for the results of two studies (Braun et al., 2012; Cho et al., 2012) measuring mobility using the 10-meter walk test showed that MI use could potentially have an effect on walking n = 53; MD -0.21, 95% CI-3.51 to 3.09; I^2=34%), (See Figure 8.).	
		Considering another secondary outcome: • Among all studies included in this review, only one study by Pheung-Phrarattanatrai et al. (2015) reported an outcome measure for quality of life using the Fall Efficacy Scale-International (FES-I) for testing self-efficacy of falling. Although the FES-I is a tool used to measure and evaluate levels of fears regarding falls during physical activities and participation in life, improved levels of FES-I can impact physical functioning and QoL (Yardley et al., 2005). Due to insufficient data, no clear conclusion could be drawn from the findings as regards MI and its effect in helping to decrease fear of falling after stroke; additional information could not be obtained from the author of this study. • Likewise, participation was only reported by Timmermans et al. (2013) using the Frenchay Activities Index (FAI). The FAI is an instrument commonly used for measuring ADL across a broad range of actual activities patients have undertaken in the recent past. Basic levels of functioning in activities reflecting a higher level of independence and social participation instead focusing on issues related to self-care and mobility in general (Wade et al., 1985). However, in the Timmermanns et al. (2013) study, the FAI was used as a measure of participation after stroke, as also recognised by Tse et al. (2013). In this study the use of MI combined with standard therapy (includes exercise for functional and motor movements) was compared with a control group given neurodevelopmental therapy plus standard therapy. The findings showed no clear difference between the two groups. Similar to Pheung-Phrarattanatrai (2015), the data was unavailable, and further information could not be obtained from the author, therefore only the median interquartile (IQR) was reported.	
Risk of bias across studies	**22**	**Present results of any assessment of risk of bias across studies.** See (item 15).	113-127
Additional analysis	**23**	**Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression**. See (item 16).	105
DISCUSSION			

Summary of evidence	**24**	**Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers)**.	119-121
Limitations	**25**	**Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).** • Eighty percent (n=12) of the included studies were good quality RCTs, this can be regarded as a strength of the review, however, some were limited by a lack of blinded outcome assessment. Furthermore, as the intervention was an active intervention rather than passive process, neither therapist nor patients could be blinded to training on MI use. Similarly, as with other reviews reporting limitations, this review was a new topic in stroke rehabilitation, thus ongoing trials and newer publications of MI studies, might have been missed during the search. • Although comprehensive search strategies were used, it is possible that some studies were missed, especially in languages other than English. To help overcome this issue a search test was run initially, to ensure that all key studies identified during the development of the strategy were picked up, before finalising the actual search. Moreover, while the focus was on studies that included task-oriented training alongside MI, the lack of a definition for task-oriented training, resulted in screening a lot of non-relevant titles. • Methodological bias may have been introduced unintentionally, by the inclusion of studies with small samples. In addition, the difficulty in establishing statistically significant effect between groups may be compounded by differences in outcomes measured which most likely decreased the likelihood of finding an effect. • Although most studies included in the review were RCT designs, the MI interventions differ between studies. Furthermore, the search did specify ADL as the primary outcome, however, studies that had secondary outcomes for mobility, QoL and participation were included, to theoretically show the most significant effect of the intervention, thus, not many studies had a global ADL outcome measure but still were included as they had secondary outcomes that met the review objectives. These two strategies could either minimise any possible relative bias through the internal validity (criteria 2-11 on PEDro scale), including blinding of the stroke survivors, which was not possible and analysing outcome measures, or it can maximise generalizability through external validity (criterion 1), including baseline measures to assess stroke survivor's characteristics. Although most included studies in the review were RCTs, and randomisation was covered. • There was a slight drawback within the sound understanding of developed design strategies relative to implementing MI use, as well as the development of a theoretical intervention basis, and the definition of the components of the intervention (Campbell et al., 2000). Randomization is found to be a suitable method that helps limit bias and provide treatment effect that can be estimated and reliable (Chalmers 1994; Sackett, 2003). • The included studies have incurred gender and regional variation, where most patients were men and the trials predominantly conducted in Asia. This might limit generalisation. The review included 283 males and 175 females stroke survivors. This gender bias is in line with research evidence demonstrated worldwide, that there is a gender differential in mortality and morbidity examining interventions, some of which are related to neurological conditions (Yao 2012). • Moreover, stroke is more prevalent in men than women (Ayala at al., 2002). • Finally, previous research by Brodie et al., (2000) has acknowledged that in some countries, women could be socially disadvantaged in their need for health treatments, due to their lower levels of knowledge in regard to their health issues in society, compared to men (Habibis & Walter, 2009). The region where the trials were conducted was also noticed to vary across studies and included Asian countries, such as Korea, Thailand, India and Iran, while other trials were conducted in European countries, such as the Netherlands and Italy. However, it could be that a specific population could affect the application of the evidence internationally, relative to the nature of the intervention, and include influencing factors such as health care providers and different cultural settings. These gender and regional variations in the review could impact the results of MI use in stroke and might limit generalisation to the representative sample of studies. • Poor descriptions of MI in the included studies make it challenging to implement in clinical practice. For future intervention designs, the findings need to be described, designed and reported using the TIDieR guidelines for reporting interventions in trials (Hoffmann et al., 2014). Nevertheless, it is acknowledged that more research is needed to future examine the content of MI and explore how MI interventions fit alongside other standard rehabilitation interventions offered to stroke survivors. In this review, the use of MI combined with other standard therapy was included, however, it may be more relevant to explore its use as a stand-alone therapy. Additionally, the benefit of MI training and delivery with survivors of stroke is that it can be given with only basic instructions. Further research might explore the feasibility of implementing it as a therapy on its own with stroke survivors at home without the need for therapists' guidance (unguided MI use), as an independent and self-practicing therapy. Very few studies appeared to measure the impact/effect of MI on participation and QoL. Future studies need to examine the effect of using MI on improving levels of participation and QoL after stroke. • This review found the design of RCTs of MI practice lacking in the core outcome, which should be emphasised in future studies. The contradiction in results across the different studies implies no definite conclusion about the efficacy thus far, nor offers any clear or specific description of MI use or training in stroke in clinical practice. Clinicians can therefore deliver more effective MI interventions in clinical practice; once specific best practice guidelines and clear intervention descriptions are available. • Publication bias was not appropriate to conduct in this review, due to having less than 10 studies included in the meta-analysis (Dalton, Bolen & Mascha, 2016). • In summary, some limitations were present in the review, and the findings reported a lack of description of both the MI intervention and the standard rehabilitation comparator trials. The review has identified a potential for the use of MI in stroke rehabilitation in clinical practice when combined **with physiotherapy or occupational therapy. RCT are needed to determine of the effect of MI practice alone to support its effectiveness in clinical practice.**	130-136

		• This current review intended to examine whether MI could improve ADL abilities more generally, instead of improving isolated abilities or functions of the upper limb. ADL is a fundamental skill that is required to independently care for oneself such as eating, bathing, and mobility. • Limitations in general functional status stroke survivors and the inability to perform ADLs or accomplish essential activities results in the dependence of other individuals or using assistive devices • While ADLs could be combined into both basic personal ADLs, such as hygiene, grooming, dressing, toileting, transferring or ambulating, and eating which requires physical skills required to manage an individual's basic needs (Knigston et al., 2012). Instrumental ADLs are more complex activities that require more complex skills to help one live independently in the community, they include the ability to self-care and household tasks, such as shopping, cooking and sweeping. Further, managing finances, housekeeping, and laundry (Kempen, 1995) are also activities that require functional independence. • This review investigated the effect of MI training with tasks that are mostly related to ADLs and mobility outcomes. Studies where ADL was measured as an outcome, but which only focussed on activities pertaining to the upper limb were not included. This is because MI training for upper limb functions has been the focus of many previous reviews such as those by Song et al., (2019) and Harris et al., (2015). In addition to Barclay-Goddard et al.'s (2011) review, where they have only included the global ADL in their updated version in 2020. • Another limitation in this review was while defining the term ADL outcome before conducting the search, and assuming the term could have been distinguished from any other upper extremity assessment tools. This may have led to poor identification of the existing evidence within the resources. Thus, some evidence could have been missed during data screening and impacted retrieved results and eligibility criteria. The same applies to why the review was mostly looking at mobility and ADLs, but then only studies which used specific ADL assessments were included. As following, reading through the full text of the classes, it appeared that they indicated they are assessing ADL outcome through measurements of only upper limb function evaluation tools. i.e., Page et al., 2011; Page et al., 2009; Page et al., 2007).	

		It would be helpful if future trials included well-defined and sensitive outcome measures for detecting improvement in ADL ability and independence. • Timmermanns et al. (2013) used the Bathel Index evaluate ADL; however, the data obtained were considered skewed and therefore, inappropriate for statistical testing. Although the overall findings for measures of ADL were that MI use could potentially improve global activities of daily life, the inconsistency in tools used to measure ADL across the included studies suggest the data should be interpreted with caution to prevent over-estimating the effect. Other studies included in this review with skewed data. reporting only median and interquartile ranges were not included in the effect size comparison. Instead, they were reported qualitatively (i.e., Liu et al. 2009, 2004). This process may have underestimated the effect of ADL interventions. • This review may have synthesised fewer data from the literature compared to Barclay-Goddard et al.'s (2020) review which focused mainly on determining the effect of mental practice training on improving upper extremity impairments after stroke. In particular, it was enhancing functional activities for the upper extremity related to general activities of daily living and health-related quality of life. Thus, they have focused on outcomes related to activity limitation of the upper extremity, including the ability of the arm and hand to perform functional tasks such as grasping a cup or folding a towel. Some examples of upper extremity activity outcome measures included the Box and Block test, the Action Research Arm Test, Wolf Motor Function Test, and the Motor Activity Log. Further, the Fugl-Meyer Test of Sensorimotor Ability • Sensitive and specific search criteria were developed to include studies that had MI use and measured global ADL as an outcome, rather than those limited to measurement of impaired movement or upper limb function. It was often not possible to identify studies with a global measure of ADL at the abstract screening stage. It would be helpful in future research to only include trials that have conducted MI use with tasks being measured with any global ADL specific measuring tool. This was usually only possible from the detailed study description in the full paper and was primarily due to inconsistency in the use of subject headings or keywords defining ADL. It would be helpful if in future trials included well-defined and sensitive outcome measures for detecting improvement in ADL ability and independence in ADL.	

		• In return this may have impacted obtained results from the literature on available studies that have included ADL as an essential outcome and not for upper extremity functions. • Clinical implication, the review provides potential evidence for the clinical use of MI in improving physical function after stroke. Combining MI training with task- oriented training delivered in physical/occupational therapy sessions for four weeks or more may improve ADL and mobility performance levels after stroke. Furthermore, the findings of this review suggest the need for sensitive tools for measuring the effect of MI that are specific to or customised for stroke. • To date little is known about MI use in stroke rehabilitation, and specifically the impact of intervention in the long term; guided and unsupervised MI training can be integrated and combined with any explicit physical exercise or movement, using both sensory information of a kinaesthetic and visual nature to deliver more effective intervention. • Regular physiotherapy and/or occupational therapy in rehabilitation can sometimes involve passive engagement of stroke survivors, while MI use involves active participation in the intervention and processing, thus, MI use through unsupervised self-practice for stroke survivors needs to be encouraged at home and after discharge as suggested by the review's findings. • While the findings suggest that most trials have used clinical judgement to help candidates and include stroke intervention, there remains a need to develop assessment tools specific to stroke. Further, training should be given on motor images relevant to real life stroke (Dickstein et al., 2013) and monitoring process MI training including easiness and vividness throughout the training with feedback to help maintain effective MI use. This suggests evaluating and tailoring stroke survivor's needs and setting goals specific to the stroke survivor, using appropriate assessment tools, an issue that is lacking in previous literature. • At present, the findings of this review suggest that therapists need adequate training in MI use; this can ensure delivering MI effectively in stroke rehabilitation. Further, therapists should encourage patients to	

		practice MI at home without supervision and train them in MI as a supplementary method that would help increase the training time in rehabilitation. • Future studies need to employ high quality RCTs that include larger samples of stroke survivors with pre-defined outcome measures (for example, ADL outcome measure using the Barthel Index). Additionally, the dosage and session length should be increased gradually, to help optimise rehabilitation recovery. • Despite the limitations in this review, future clinical application and research for MI, to investigate how can therapists pre-scan stroke survivors for their eligibility, to identify those whose MI ability and cognitive level would allow them to benefit from this type of training. A further step might include progression monitoring, developing assessment tools specific to stroke, which can be also invested in future trials to help improve clinical judgment and progress of MI use; this was lacking in the included trials.	
Conclusions	**26**	**Provide a general interpretation of the results in the context of other evidence, and implications for future research.** The purpose of this review was to investigate MI use enhanced task-oriented training effect on ADL, mobility and QOL. The review found that differences in the ADL outcome measures used in the included trials, as well as discrepancies in the designs and protocols used in training MI made it difficult to determine the effect of MI training on stroke rehabilitation ADL outcomes. However, there was some evidence from previous trials combining MI with standard physiotherapy and/or occupational therapy in stroke rehabilitation to suggest its potential for improved mobility outcomes. While the included randomised trial studies indicated that MI could be used as a self-practice intervention and was feasible to use at home without supervision, the poorly defined interventions limit future research replication and clinical implementation. Therefore, further research is needed to determine MI use in clinical practice.	138
		Therapist and clinicians may consider utilizing MI in addition to their current treatment to improve ADL and mobility abilities after stroke during rehabilitation programmes. However, consideration should be given to stroke survivor's ability to imagine the necessary movement. There is no clear evidence regarding the ideal dosage of MI for training or what is best method of delivering MI or of training stroke survivors in its use or how this could be achieved alongside their conventional treatment. Moreover it remains unclear which patient' attributes are important for therapists and clinicians to consider before/ during training or what is the ideal content of MI training, such as the type of task imagined, how best to evoke imagery , and how to combine it with physical practice for best results. These are intervention elements that are poorly and inconsistently reported in the literature and need further exploration. There is also a need to identify more accurate, better-standardised outcome measures tailored to patients' needs which are useful both for monitoring progress and measuring outcomes	
FUNDING			
Funding	**27**	This research is supported through a PhD scholarship from Imam Abdurrahman Bin Faisal University, Kingdome of Saudi Arabia.	

Appendix 2.2. Copy Of Search Strategy

PubMed search strategy

1. "Cerebrovascular Accident Disorders"[MeSH] OR "Brain Injuries"[MeSH] OR "Nervous System Diseases"[MeSH] OR "Nervous System Diseases"[MeSH] OR "Hemiplegia"[MeSH] OR "Paresis"[MeSH] OR " hemiparesis "[MeSH]
2. stroke[tw] OR cerebrovascular[tw] OR cerebral vascular[tw] OR hemiplegic*[tw] OR paresis[tw] OR pareses[tw] OR hemipares*[tw] OR parapares*[tw] OR paretic[tw] OR hemiparetic[tw] OR post-stroke patients[tw] OR cerebral artery infarction *[tw] ischemic stroke[tw] OR hemorrhagic stroke [tw] OR….
3. #1 OR #2
4. "Imagery (Psychotherapy)"[MeSH] OR "Imagination"[MeSH:noexp]
5. imagery[tw] OR imagining[tw] OR imagination[tw] OR "mental representation"[tw] OR "motor ideation"[tw] OR "mental practice"[tw] OR "mentally practice"[tw] OR "mentally practicing"[tw] OR "mental practices"[tw] OR "mentally practiced"[tw] OR "mental rehearsal"[tw] OR "mental rehearsing"[tw] OR "mentally rehearsed"[tw] OR "mentally rehearse"[tw] OR "cognitive rehearsal" [tw] OR "cognitive rehearsing" [tw] OR "cognitively rehearse" [tw] OR "cognitively rehearsed" [tw] OR "covert rehearsal" [tw] OR "covert rehearsing" [tw] OR "covertly rehearse" [tw] OR "covertly rehearsed" [tw] OR "motor imagery" [tw] OR "visual imagery" [tw] OR "kinesthetic imagery"
6. #4 OR #5
7. "Upper Extremity"[MeSH]
8. "upper extremity"[tw] OR "upper extremities"[tw] OR "upper limb"[tw] OR "upper limbs"[tw] OR hand[tw] OR hands[tw] OR finger[tw] OR fingers[tw] OR arm[tw] OR arms[tw] OR shoulder[tw] OR shoulders[tw] OR wrist[tw] OR wrists[tw] OR ADL[tw] OR Daily Activity of Life[tw] OR Activities of Daily Life[tw] OR Daily Tasks[tw] OR Tasks of Daily Life[tw] OR QOL[tw] OR Quality of Life[tw] OR Health related Quality of Life[tw] OR Return to work[tw] OR Return to participation[tw] OR Participation[tw] OR Return to Leisure[tw] OR Return to Community[tw] OR Return to routine Life[tw]
9. #7 OR #8
10. #3 AND #6 AND #9

Appendix 2.3. Copy Of a PICO-S Screening Form

DATA EXTRACTION TOOL

Title of the Study:	
Study ID:	

Characteristics of Included Studies

1. Methods			
	Indicate as stated in the paper / journal		Location in text *(Page / figure / table)*
Objectives of the Study *(Indicate primary and secondary objectives)*	Primary objective:	Secondary objective:	
Study Design, *(I.e. randomised controlled trial, clinical controlled trial or prospective cohort)* Code S-1, S-2 & S-3			
Starting date of the study *(dd/mm/yyyy)*			
End date of the study *(dd/mm/yyyy)*			
Country			

2. Participants		
	Indicate as stated in the paper / journal	Location in text *(Page / figure / table)*
Participant population		
Description of the population from which the participants of the study were drawn *(i.e., rehabilitation centres, in clinic or at homes)* Code I-12		

Appendix 2.4. Copy of the PEDro Scale Form

PEDro scale		
1. Eligibility criteria were specified.	No ☐ Yes ☐	Where:
2. Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received).	No ☐ Yes ☐	Where:
3. Allocation was concealed.	No ☐ Yes ☐	Where:
4. The groups were similar at baseline regarding the most important prognostic indicators.	No ☐ Yes ☐	Where:
5. There was blinding of all subjects.	No ☐ Yes ☐	Where:
6. There was blinding of all therapists who administered the therapy.	No ☐ Yes ☐	Where:
7. There was blinding of all assessors who measured at least one key outcome.	No ☐ Yes ☐	Where:
8. Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups.	No ☐ Yes ☐	Where:
9. All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat".	No ☐ Yes ☐	Where:
10. The results of between-group statistical comparisons are reported for at least one key outcome.	No ☐ Yes ☐	Where:
11. The study provides both point measures and measures of variability for at east one key outcome.	No ☐ Yes ☐	Where:

The PEDro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht (Verhagen AP et al (1998). The Delphi list: a criteria list for quality assessment of randomised clinical trials for conducting systematic reviews developed by Delphi consensus. Journal of Clinical Epidemiology, 51(12): 1235-41). The list is based on "expert consensus" not, for the most part, on empirical data. Two additional items not on the Delphi list (PEDro scale items 8 and 10) have been included in the PEDro scale. As more empirical data comes to hand it may become possible to "weight" scale items so that the PEDro score reflects the importance of individual scale items.

The purpose of the PEDro scale is to help the users of the PEDro database rapidly identify which of the known or suspected randomised clinical trials (i.e. RCTs or CCTs) archived on the PEDro database are likely to be internally valid (criteria 2-9), and could have sufficient statistical information to make their results interpretable (criteria 10-11). An additional criterion (criterion 1) that relates to the external validity (or "generalizability" or "applicability" of the trial) has been retained so that the Delphi list is complete, but this criterion will not be used to calculate the PEDro score reported on the PEDro web site.

The PEDro scale should not be used as a measure of the "validity" of a study's conclusions. In particular, we caution users of the PEDro scale that studies which show significant treatment effects and which score highly on the PEDro scale do not necessarily provide evidence that the treatment is clinically useful. Additional considerations include whether the treatment effect was big enough to be clinically worthwhile, whether the positive effects of the treatment outweigh its negative effects, and the cost-effectiveness of the treatment. The scale should not be used to compare the "quality" of trials performed in different areas of therapy, primarily because it is not possible to satisfy all scale items in some areas of physiotherapy practice.

Notes on administration of the PEDro scale:	
All criteria Points are only awarded when a criterion is clearly satisfied. If on a literal reading of the trial report it is possible that a criterion was not satisfied, a point should not be awarded for that criterion.	
Criterion	**Description**
Criterion 1	This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.
Criterion 2	A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomization need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomization allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.
Criterion 3	Concealed allocation means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was "off-site".
Criterion 4	At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups' outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented.
Criteria 4, 7-11	Key outcomes are those outcomes, which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.
Criterion 5-7	Blinding means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be "blind" if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (eg, visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.
Criterion 8	This criterion is only satisfied if the report explicitly states both the number of subjects initially allocated to groups and the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.
Criterion 9	An intention to treat analysis means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.
Criterion 10	A between-group statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyze the data, the latter is often reported as a group Â~ time interaction). The comparison may be in the form hypothesis testing (which provides a "p" value, describing the probability that the groups differed only by chance) or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.
Criterion 11	A point measure is a measure of the size of the treatment effect. The treatment effect may be described as a difference in-group outcomes, or as the outcome in (each of) all groups. Measures of variability include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quintile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.

Appendix 4.1. COREQ checklist for qualitititve research

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist			
Domain 1: Research team and reflexivity			
Personal characteristics			
interviewer/facilitator	1	Which author/s conducted the interview or focus group?	The researcher myself, acted as a moderator, introducing the topic to the participants, probing for further discussion and assisting in guiding the flow of conversation.
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	I am a PhD candidate.
Occupation	3	What was their occupation at the time of the study?	Physiotherapist and researcher
Gender	4	Was the researcher male or female?	Female
Experience and training	5	What experience or training did the researcher have?	Prior data collection, I have undertaken some training courses in conducting interviews and FGD.
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Prior the 1st FGD, I have a colleagueship relation with the 1st FGD. While the 2nd one we met prior the discussion hour and got to know each other. The 3rd and 4th FGD, we met on the same day of discussion. Regarding the stroke interviews, there was no relation, however, I manged to build in a comfortable atmosphere prior the interview with a few of them when possible and when time allowed so.
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Regarding the 1st FGD, prior the meeting for the actual discussion I got to meet with them a week before and explain about MI and reasons for doing the research. In terms of the 2nd one, 3rd and 4th FGD, a few participants in each group have had known what is the reason for doing this research for example in the 2nd one, 3rd I have already met with head of department and discussed the topic with them which in turn the participated in the discussions.
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Seeing myself as a physiotherapist and researcher at the same time, I have taken into account my beliefs and views cautiously, when it came to MI use in stroke rehabilitation. The main facts around MI use in stroke and the Saudi context were set out in chapter one; to provide transparency on the impact of my own experience as a researcher through my work in this thesis. Before undertaking research during the PhD course, I enrolled on many courses, to develop my research skills in conducting interviews and analysing data. Fortunately, undertaking this PhD has helped shape my beliefs and attitudes towards the overall research field and specifically MI use in stroke interventions. Although I had a positive vision about MI use in rehabilitation and was amazed about its variety of uses, I still struggled to highlight the most important points of view in its' most and least uses, thus struggled to identify specific critical clinical presentations and potential characteristics where it might be applied. I had worked in the facility for nearly seven years, before setting out to come to the UK and study my Master's in 2011 in Wales. Thus, I have been working as a clinical physiotherapist in the educational hospital with stroke survivors for most of my career. I was appointed for several assignments in my job, such as training interns and summer students in basic clinical practice and provisional patient evaluation and planning treatments. Challenges have become more apparent since I embarked on my PhD and my skills as a researcher were less than my clinical skills. While conducting my qualitative research for both the focus group discussions and the interviews in Saudi Arabia, as a physiotherapist I encountered a positive point in being a professional; I recognised services that they were familiar with and was mindful around the systems they used in the facility. On the other hand, as a researcher physiotherapist within this environment it did pose potential challenges to my experience in identifying limits between a researcher and a clinician, where at times I found myself addressing matters in a more clinical manner than a researcher would, such as being more mindful about outcomes recovery in using specific exercises once a participant seeks advice, whereas as a researcher I should have held back my professional reflection and focused solely on the interview. During the qualitative interviews, information sheets were provided to the participants, both professionals and the stroke survivors, in both languages, information stating my role as a researcher was, highlighted at many points. In addition, it was noted that the study was looking at their views around MI use, and stroke survivors would still receive their health services, as allocated and no further sessions would be given as a bonus. Despite this, I found myself encountering many challenges in the real world. For example, some patients were keen to start using MI treatment, even though it was outlined in the participant information sheet that no treatment was included. They didn't understand my role as a researcher. However, after spending more time with the stroke survivor, I became more confidant in referring them back to their treating therapist or clinician for advice on their rehabilitation plans and their health concerns, after explaining that I was only there in the capacity of a researcher. At times I felt anxious in separating my roles as a clinician and a researcher, and my physiotherapy training might have surfaced when a stroke survivor discussed their health needs. However, many times I managed to sensibly reflect on my role and explain my boundaries.
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography,	Phenomenology was the methodological focus underpinning the study.

		phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Convenience sampling was employed for both the patient individual interviews and the therapist focus group discussions. Judgments on sample size were influenced by the extent of data needed to help answer the research questions, taking into consideration the available resources and the study approach.
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email.	Regarding the FGD, potential participants were identified by the heads of department from. I as the researcher communicated with the head of each of the centres a week before the groups were scheduled to take place. Then, the head of departments informed participants whom may be interested about the study and provided them with a participant information sheet (see Appendix 4.2), then they were invited to the study by the researcher and were screened for eligibility before setting time for the meeting. The participants for the one-to-one semi-structured interviews were identified and invited by the heads of department in the respective hospitals, and the treating therapists from the same centres as the therapists were recruited. The participants underwent screening for eligibility before being invited to participate in the study. Participants were eligible to be interviewed if they were at least 18 years of age, and were admitted because of having a stroke, and have been diagnosed by a physician, was confirmed in the patient records. In addition, participants have had received physical or occupational therapy interventions or were currently in a rehabilitation programme.
Sample size	12	How many participants were in the study?	23 participants in the FGD for the four groups. 12 stroke interviews.
Non-participation	13	How many people refused to participate or dropped out? Reasons?	One in group two, dropped out after signing the consent due to illness. two in group four, due to transport restriction. One stroke patient didn't show up for the interview. One stroke patient changed his mind and no longer wanted to be interviewed.
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	All data for both samples were collected from King Fahd Educational Hospital of Dammam University, Prince Sultan Rehabilitation Complex Centre and King Fahd Specialist Hospital
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	No, not any in the FGD. While in the stroke interviews most of them had their family or carer present during the interview.
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	Regarding the FGD, therapists were considered eligible for inclusion if they were physiotherapists or occupational therapists working at one of the participating hospitals and if they were qualified to degree level in rehabilitation exercise science, professional background physiotherapy or occupational therapy. The professionals were required to have at least two years' experience of working with stroke survivors to ensure that they had developed transferable skills and a wider understanding in managing stroke rehabilitation programmes. In terms of the stroke sample, the term stroke was defined in this study as a clinical condition resulting from a brain injury, caused by a clot or a bleed disrupting the blood flow to the brain cells; this included any type of stroke (ischaemic or haemorrhagic), at any stage (sub-acute stage 7 days to 3 months) or chronic stage [over 3 months or more] that had caused limitation in patient's physical function, motor performance, or cognitive levels at any level of severity (mild, moderate or severe). Stroke survivors were excluded if they were unable to communicate or it was not feasible to establish that they understood the study or if their condition was unstable.
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	In regard to the FGD testing: Prior to data collection in Saudi Arabia a pilot focus group was held in the UK on the 16th June 2017 with two participants, a physiotherapist and an occupational therapist, both of whom had more than 2 years of experience in stroke rehabilitation. Both read the information sheet and signed consent forms. Questions were established and developed to ensure they captured the required information and addressed the research questions. Amendments were made following the focus group discussion with the help of comments and feedback from the participants and the research team. Some questions were refined because they were identified as
	18		repetitive, leading, unclear or not relevant to the research questions (Majid et al., 2017). The use of a reflective diary also helped in altering, redefining or removing unclear questions. Regarding the interviews for the stroke: The interview guide for use with stroke survivors was piloted once before the main study, on 12th July 2017 with a 52-year-old male stroke survivor who volunteered for the interview. The interviewee's stroke had occurred six months earlier, and he had made an excellent recovery. His rehabilitation programme was therefore less intense than that of other stroke survivors. Once he had read the information sheet, he signed a consent form. The interview was timed and recorded, and notes were taken throughout. During the interview, the researcher noted whether the questions asked followed a linear process and avoided causing distress for the participants. The questions were examined to ensure that they captured the information they were intended to explore and addressed the research question. Piloting helped to test the interview topic guide and to practise interviewing skills prior to launching the project. The participant provided comments and feedback on some questions that he perceived as repetitive or closed-ended, and some leading questions were refined. The use of a reflective diary also helped in altering and redefining and in removing unclear questions (see Appendix 4.15-Reflective diary). Amendments were made to the topic guide following the pilot interview. Questions that were repetitive, leading, unclear or not relevant to the research questions were altered or removed. For example, the topic guide was focused on the rehabilitation programme that was given to the stroke survivor following their stroke and the queries were not relevant to MI use. Therefore, it was altered to include more relevant questions related to MI. Other questions were relevant to stroke survivors' dysfunctions and types of exercises provided to help improve or enhance their recovery, these were removed later to make the exploration of MI use more succinct (see Appendix 4.6/4.7 topic guide in two languages).
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	None

Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	I have used an audio recorder to collect data through.
Field notes	20	Were field notes made during and/or after the interview or focus group?	I have used a diary to reflect upon each FGD and stroke interviews.
Duration	21	What was the duration of the inter views or focus group?	Group discussion times ranged from 29:47 to 55.56 minutes (mean time = 40:9 minutes). The researcher acted as a moderator, introducing the topic to the participants, probing for further discussion and assisting in guiding the flow of conversation. Stroke interview times ranged from 11:17 to 36:29 minutes (mean time = 19:6 minutes).
Data saturation	22	Was data saturation discussed?	Regarding the focus group discussions, it is acknowledged that focus group saturation is defined within the inductive approach as needing five focus groups in order to reach saturation (Coenen et al. 2012; Kirchberger et al. 2009). Guest et al. (2017) concluded that with only two or three focus groups more than 80% of themes may be discovered from the data set during data analysis. Regarding the stroke interviews, when data saturation is reached, the researcher can decide whether to stop or to continue with the interviewing stage. In addition, a researcher has a critical need to decide whether to complete three steps simultaneously while conducting the project, specifically, the sampling process, data collection and data analysis, or whether to deal with each of them separately and sequentially. Whether having more interviews may help to achieve the desired outcome is less important than the quality of the analysed data, given the time and care required for the analysis. Hence, this study aimed for a relatively small sample size of 12 participants, which enhanced the planning (Smith et al., 2009), structuring and conduct of the interviews, as well as the transcription of the stroke survivor interviews (Adler & Adler, 1987; Baker et al., 2012). Moreover, there is evidence to suggest that a qualitative study featuring interviews with a sample size of 12 participants may be sufficient to reach the point of data saturation in a homogenous sample, when thematic analysis is used (Latham, 2013; Guest et al., 2006).
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction?	None,
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	Two.
Description of the coding tree	25	Did authors provide a description of the coding tree?	Only my-self provided a description of the coding tree.
Derivation of themes	26	Were themes identified in advance or derived from the data?	themes were derived from the data and then matched to the BCW framework.
Software	27	What software, if applicable, was used to manage the data?	Nvivo QSR software package (Version 11, Nvivo QSR).
Participant checking	28	Did participants provide feedback on the findings?	None
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Yes. Participant quotations were presented to illustrate the themes. Yes. Each quotation was identified by the participant number, line number.
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Yes, there consistency between the data presented and the findings.
Clarity of major themes	31	Were major themes clearly presented in the findings?	Yes, the major themes were clearly presented in the findings
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Yes, here was a description of diverse cases and discussion of minor themes was provided.

Appendix 4.2. Copy of the IRB-Nottingham University Research Ethics Committee Letter

University of Nottingham
UK | CHINA | MALAYSIA

Email: FMHS-ResearchEthics@nottingham.ac.uk

Faculty of Medicine &Health Sciences
Research Ethics Committee
c/o Faculty PVC Office
School of Medicine Education Centre
B Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham, NG7 2UH

29 June 2017

Mrs Najla Alhashil
PhD Student
c/o Dr Kathryn Radford
Associate Professor in Rehabilitation Research (Long-Term Conditions)
Division of Rehabilitation and Ageing
B 102, Medical School
Queen's Medical Centre Campus (QMC)
Nottingham University Hospitals
Nottingham
NG7 2UH

Dear Mrs Alhashil

Ethics Reference No: 44-1704 – **please always quote**	
Study Title: Mental Imagery Use in Stroke Rehabilitation	
Chief Investigator/Supervisor: Dr Kathryn Radford, Associate Professor in Rehabilitation Research (Long-Term Conditions), Division of Rehabilitation and Ageing.	
Lead Investigators/student: Mrs Najla Alhashil, PhD Student, Division of Rehabilitation and Ageing.	
Other Key Investigators: Dr Joanna Fletcher-Smith, Senior Research Fellow, Dr Eirini Kontou Senior Research Fellow, Division of Rehabilitation and Ageing.	
Type of Study: Mixed methods, overseas PG qualitative.	
Proposed Start Date: 01/07/2017	**Proposed End Date:** 31/01/2018 6 mths
No of Subjects: 46+	**Age:** 18+years
School: Medicine	

Thank you for submitting the above application which has been considered by the Committee at its meeting on 24 April 2017 and the following documents were received:

- FMHS REC Application form and supporting documents version 2.0: 23.03.2017.

These have been reviewed and are satisfactory and the study has been given a favourable opinion.

A favourable opinion is given on the understanding that the conditions set out below are followed:

1. A Favourable opinion is given on the understanding that all appropriate ethical and regulatory permissions are respected and followed in accordance with all local laws of the country in which the study is being conducted and those required by the host organisation/s involved.

2. Please submit copies of letters of approval from the IRB or equivalent at King Fahd Hospital University of Dammam Educational (KFH-UD), King Fahd Specialist Hospital, and Prince Sultan Rehabilitation Complex in Saudia Arabia for our records please.

3. You should follow the protocol agreed and inform the Committee of any changes using a notification of amendment form (please request a form).

4. You must notify the Chair of any serious or unexpected event.

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UK | CHINA | MALAYSIA

5. An End of Project Progress Report is completed and returned when the study has finished (please request a form).

Yours sincerely

pp Louise Sabir

Professor Ravi Mahajan
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

Appendix 4.3. Copy of the IRB-Dammam University Research Ethics Committee Letter

Kingdom of Saudi Arabia
Ministry of Education
University of Dammam
Office of the Vice President for
Research & Higher Studies

جامعة الإمام عبد الرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

المملكة العربية السعودية
وزارة التعليم
جامعة الإمام عبد الرحمن بن فيصل
وكالة الجامعة للدراسات
العليا والبحث العلمي

اللجنة الدائمة لأخلاقيات البحث على المخلوقات الحية
Institutional Review Board

IRB Number	IRB –PGS-2017-11-096		أيرب–بجس–٠٩٦–١١–٢٠١٧
Project Title	Mental Imagery Use in Stroke Rehabilitation		
Principal Investigator	Postgraduate Student / Najla Alhashil		
Supervisor	Dr. Matar Alzahrani		
College / Center	KFUH	**Department**	KFUH
Approval Date	26/04/2017		

The application was reviewed and approved at the University of Dammam IRB meeting on Wednesday, April 26, 2017.

Approval is given for six months from the date of approval. Projects, which have not commenced within three months of the original approval, must be re-submitted to the University Institutional Review Board (IRB) Committee. If you are unable to complete your research within the validation period, you will be required to request an extension from the IRB Committee.

On completion of the research, the Principal Investigator is required to advise the Institutional Review Board if any changes are made to the protocol, a revised protocol must be submitted to the Institutional Review Board for reconsideration.

Approval is given on the understanding that the "Guidelines for Ethical Research Practice" are adhered to. Where required, a signed written consent form must be obtained from each participant in the study group.

Dean of Scientific Research

Dr. Naif Nasser Almasoud

Stamp
جامعة الدمام
UNIVERSITY OF DAMMAM
عمادة البحث العلمي
Deanship of Scientific Research

CC. - Dean
Deanship of Scientific Research
- Director General
King Fahd Hospital of the University
- Director
Center for Research and Medical Consultations
- Supervisor General for Quality and Safety
King Fahd Hospital of the University
- Director
Monitoring Office for Research and Research Ethics
- Director
Pharmacy @ KFHU

Appendix 4.4. Copy of the IRB-Prince Sultan Rehabilitation Complex Research Ethics Committee

إيفاء
لرعاية ذوي الإعاقة

الرقم: ٤٤٢
التاريخ: ٢٤/١٠/١٤٣٨هـ
المشفوعات :

السيدة نجلاء الهشيل المحترمة

السلام عليكم

يسرنا اخباركم بانه تمت الموافقة على القيام بإداء بحثكم المعنون بـ " **استخدام تمارين التخيل الذهني في التأهيل لمرضى الشلل النصفي**" في عيادات التاهيل في جمعية ايفاء لرعاية ذوي الاعاقة (مجمع الامير سلطان)، على أن يتم اطلاعنا على نتائج الدراسة بعد اكتمالها، ونذكركم بأنه يحق للجمعية انهاء الدراسة في أي وقت إذا لم يتم الالتزام بالشروط الموقع عليها من قبلكم.

تمنياتنا لكم بالتوفيق الدائم

مدير الجمعية

سعد بن عبدالله المقبل

٢٤/١٠/٣٨هـ

Appendix 4.5. Copy of the IRB-King Fahd Specialist Hospital Research Ethics Committee Letter

Institutional Review Board Office
National Registration Number (H-05-D002)
IRB Number (IRB00008686)

وزارة الصحة
Ministry of Health

Research Executive Administration
King Khalid Medical City (REA-KKMC)

APPROVAL OF PROTOCOL

14/09/2017

Najla Abdulhadi Alhashil
PhD Candidate
Division of Rehabilitation and Ageing, School of Medicine,
University of Nottingham
Najla.Alhashil@nottingham.ac.uk

Dear Ms. Alhashil,

On *14/09/2017* the IRB reviewed the following protocol:

IRB Study Number	*EXT0338*
Title	**Mental imagery use in stroke rehabilitation**
Principle Investigator	Najla Abdulhadi Alhashil
Co-Investigator(s)	Maeedah Al-Thowaimer
Funding	The Saudi Arabia Cultural of Bureau Royal Embassy in The UK
IND	None
Type of Review	Initial Review
Documents Reviewed	• Study protocol version 1.3 dated 14/09/2017 • Mental Imagery Use in Rehabilitation-Demographic information (stroke survivor)_Final Version 1.0 dated 18/07/2017 received 22/08/2017 • Bilingual Informed Consent Form for Therapists_ Version# 3 dated 13/09/2017 • Bilingual Informed Consent Form for Stroke Survivor _Version #2 dated 21/08/2017 • Topic Guide for Interviews with Stroke Patients _Final version 1.0 dated 18/07/2017 • Topic Guide for Focus Groups with Therapists and Clinicians _Final version 1.0 dated 18/07/2017 • Nottingham Extended ADL Scale 2007

I am pleased to inform you that the IRB approved the protocol from ***14/09/2017*** to ***13/09/2018*** inclusive.
Before ***13/08/2018*** or within 30 days of ending the study, whichever is earlier, you are required to submit:

- A completed **CONTINUING REVIEW PROGRESS / STUDY CLOSURE REPORT** form
- The required documents as per the above mentioned form

Failure to seek continuing review approval before ***13/09/2018*** will result to the Approval's expiry to take effect on the indicated date.

IRB- EXT0338 Page 1 of 2

مستشفى الملك فهد التخصصي بالدمام
King Fahad Specialist Hospital-Dammam

Appendix 4.6. Copy of the Participant Information Sheet for Therapist

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Local Letterhead to be added

Participant Information Sheet
For the Therapist Focus Group Discussions

(Final version 1.0: 23/03/2017)

Title of Study: **Mental Imagery Use in Stroke Rehabilitation.**

Name of Researcher: **Najla Alhashil (Principle Investigator), Dr Kathryn Radford, Dr Eirini Kontou and Dr Joanna Fletcher-Smith**

You are being invited to take part in a focus group discussion as part of our research study, which is aimed at exploring the barriers to and enablers of mental imagery use in clinincal practice in rehabiltion preogrammes with stroke survivors. Before you decide to do so, it is important for you to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and discuss it with others should you wish. One of our team members will review this information sheet with you and assist you with any questions you might have. If any details of the study are unclear, or if you need further information, please let us know and we can assist you further. We can be contacted using the contact details listed at the end of this sheet. Take time to decide whether you wish to take part.

What is the purpose of the study?
Imagery refers to an experience you create in your mind using different senses (e.g., seeing yourself picking up a cup and feeling the cup while grasping it). It is often used by therapists to help stroke survivors learn and improve movement skills and improve functional recovery. However, therapist in Saudi Arabia have not yet been encouraged to use imagery during rehabilitation and we would like to understand why. This study aims to identify and explore what helps or hinders the use of imagery during stroke rehabilitation in Saudi Arabia.

We wish to identify and examine the barriers to and enablers of using imagery in rehabilitation programs and how this is encouraged by therapists, by talking to practitioners including physiotherapist and occupational therapist who are assessing and delivering rehabilitation programmes for stroke patients to help improve their recovery stage.

We hope that the study will allow practitioners and other healthcare professionals to more deeply understand what helps them more into encouraging the use of mental imagery technique in rehabilitation programs to enhance recovery post-stroke.

Page 1 of 4

We also hope that the findings from this study can help us introduce new cost-effective and risk-free techniques such as mental imagery practice in rehabilitation programs and recovery management plans to help assist in enhancing recovery stages in stroke survivors.

Why have I been invited?
You are being invited to take part in a focus group discussion because you are a qualified physiotherapist or occupational therapist, and you are assisting and delivering rehabilitation programmes with stroke survivors to help in improving their recovery. The aim of focus group discussion is to explore the therapists' perceptions and insights in regards to barrier to and enablers of encouraging effective imagery use with stroke survivors during their rehabilitation programmes to improve their recovery. We are inviting about 6-8 participants like you in each focus group (3-4 focus groups) to take part in this study.

Do I have to take part?
It is up to you to decide whether you wish to take part in this study or not. You should take some time to decide whether you want to participate. If you do decide to take part, you will be asked to sign a consent form and return this to Mrs. Najla Alhashil at the contact details provided below. You will also retain a copy of your consent form to keep along with this information sheet. You are free to withdraw from the study at any time without any given reasons.

What will happen to me if I take part?
If you wish to participate in this study, you will be contacted by telephone and a time will be arranged for you to join in the discussion group. Efforts will be made to arrange a convenient time for you, which will be confirmed via telephone. The focus group discussion will last approximately 60 - 90 minutes and will be held in a private meeting room in King Fahd Hospital University of Dammam Educational, King Fahd Specialist Hospital-Dammam, and Prince Sultan Rehabilitation Complex Humanitarian Services, Saudi Arabia.

The purpose of these focus groups is to discuss and identify issues related to barriers and enablers of encouraging the use of mental imagery in rehabilitation programmes with stroke patients. The findings from these focus groups will contribute to the final content of the developing of stage 2 from this study. The content of the discussion will be audio recorded and written notes will be taken purposely to document inaudible or contextual information. This content will be transcribed and analysed to identify the barriers to and enablers of encouraging mental imagery use in stroke rehabilitation programs.

Expenses and payments
You will be fully compensated for any costs incurred for your attendance at the focus group discussion (if necessary). We can also arrange transportation if you are likely to experience difficulties in getting to the location.

What are the possible disadvantages and risks of taking part?
We do not anticipate any disadvantages or risks for participants in the study. Efforts will be made to arrange the focus group discussion to take place at a time convenient for you.

Page 2 of 4

What are the possible benefits of taking part?

Information obtained from your partaking in the study would provide therapists with insight into factors affecting their use of imagery in rehabilitation targeted at recovery for stroke survivors. In addition, obtained evidence would help contribute to advancing new rehabilitative design services and would enhance the development of guidelines and protocols for imagery use with stroke in Saudi Arabia.

What happens when the research study stops?

If the study ends, we will report the findings and plan a subsequent stage 2 study.

What if there is a problem?

If you have a concern about any aspect of this study, you can contact the researcher (Mrs Najla Alhashil, Principal Investigator, on 00966561146633) who will do her best to answer your questions. If you remain unhappy and wish to make a complaint, please contact the hospital's Patient Affairs Department or main supervisor: Dr Kate Radford, telephone: 00441158230226, email: Kate.Radford@nottingham.ac.uk. Additionally, you can contact the Research Ethics Committee Administrator, c/o the University of Nottingham School of Medicine Education Centre, B Floor, Medical School Queen's Medical Centre Campus, Nottingham University Hospitals, Nottingham, NG7 2UH, telephone: 00441158231063, email: Louise.Sabir@nottingham.ac.uk.

Will my taking part in the study be kept confidential?

We will follow ethical and legal practice in conducting the research and all information related to you will be kept confidential.

Data collected from your participation in the study will be assessed by authorised persons from the University of Nottingham who are involved in the study. Other authorised persons may also review the data to verify that the study is being carried out correctly. All such personnel will maintain a duty of confidentiality to you as a research participant, and will do their best to meet this duty.

Information collected about you during the course of the research will be kept **strictly confidential**, stored in a secure and locked office, and on a password-protected database. Such information will be anonymised, and a unique code will be used so that you cannot be linked to the data.

Your personal data (address, telephone number) will be kept for six to twelve months after the study has concluded to allow us to inform you of the findings and possible follow-up studies (unless you advise us that you do not wish to be contacted). All other data (research data) will be kept securely for a period of seven years. During this time, all precautions will be taken by those involved to maintain your confidentiality; only members of the research team will have access to your personal data. After this time, all your collected data will be destroyed securely.

Although the information we collect about you in the interview will remain confidential, should you disclose anything to us which we feel puts you or anyone else at any risk, we may feel it necessary to report this to the appropriate persons.

What will happen if I don't want to carry on with the study?

Your participation is voluntary and you are free to withdraw at any time, without giving any reason. If you withdraw from the study, however, the information collected up to that point cannot be erased and may still be used in the project analysis.

What will happen to the results of the research study?

The findings of this study will be used to generate a questionnaire to help us explore further factors affecting the use of imagery in stroke rehabilitation. This will be sent to therapists in Saudi Arabia and the United Kingdom. The findings will be reported as a written dissertation and submitted to the University of Nottingham for the degree of Doctorate of Philosophy in Rehabilitation and Ageing. In addition, they will be submitted as a written report for publication to allow other healthcare professionals to benefit from the study. Note that you would not be identified in any such report or publication.

Who is organising and funding the research?

The study is organised by the Division of Rehabilitation and Aging, School of Medicine, University of Nottingham, UK and funded by the University of Dammam, Saudi Arabia.

Who has reviewed the study?

All research conducted in the University of Nottingham is reviewed by an independent group of people, called a research ethics committee, in order to protect your interests. This study has been reviewed and given a favourable opinion by the ethics committee of the University of Nottingham, Medical School.

Further information and contact details

If you have any questions or concerns about the study or wish to discuss participation, you can contact the principle researcher at the following address:

Mrs Najla Alhashil PhD Student University of Nottingham Division of Rehabilitation and Aging B 112, Medical School Queen's Medical Centre (QMC) Nottingham NG7 2UH Tel: +44(0) 1158230948 Mobile UK: 00447531123714 Email: msxna7@nottingham.ac.uk	Physiotherapist *MSc in Rehabilitation Sciences-UK* *BPhysio-BAppHSc-KSA* *Physiotherapy department* *King Fahd Hospital in Al Khober* *Dammam University.* Tel: +(013) 8966666/Ext 107116 Mobile KSA: 00966561146633 Email: n.hashil@uod.edu.sa

Finally, many thanks for reading this information sheet, which you should retain; if you agree to participate, we will ask you to sign a consent form, a copy of which you will receive.

Appendix 4.7. Copy of the Participants Consent Form for the Therapists

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

(Form to be printed on local headed paper)

CONSENT FORM – FOCUS GROUP
(Draft Version 1.0 / Final version 1.0: date 23/03/2017)

Title of Study: Mental imagery use in stroke rehabilitation

Names of Researchers: Najla Alhashil, Dr Kathryn Radford, Dr Eirini Kontou and Dr Joanna Fletcher-Smith

Name of Participant: **Please initial box**

1. I confirm that I have read and understand the information sheet version number 1.0 dated 23/03/2017 for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my medical care or legal rights being affected. I understand that should I withdraw then the information collected so far cannot be erased and that this information may still be used in the project analysis. ☐

3. I understand that relevant sections of my collected data may be looked at by the research group and other responsible individuals for monitoring and audit purposes. I give permission for these individuals to have access to these records and to collect, store, analyse and publish information obtained from my participation in this study. I understand that my personal details will be kept confidential. ☐

4. I understand that the focus group discussion will be recorded using an audio digital recorder for data analysis and that anonymous direct quotes from the interview may be used in the study reports and publication purposes. ☐

5. I understand that all data will be anonymous and confidential, with the exception of information revealed during the interview or focus group that is of concern and may need to be reported, for example due to posing potential risks to another person or myself or being related to criminal behaviour. ☐

8. I understand that information about myself that is recorded during the study will be kept in a secure database. If the data is transferred, they will be made anonymous. Data will be kept for seven years after the study has ended and then securely destroyed. ☐

9. Optional: I agree to my personal data being kept for six to twelve months after the end of the study so that I can be contacted about possible follow-up investigations. ☐

10. I agree to take part in the above study. ☐

____________________ ____________ __________________
Name of participant Date Signature

____________________ ____________ __________________
Name of person giving consent Date Signature

Focus group consent form Final version 1.0 23/03/2017
Three copies: one for participant, one for the project notes and one for the medical notes (Mental imagery use in stroke rehabilitation)

Appendix 4.8. Copy of the Participant Information Sheet for Stroke

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Local Letterhead to be added

Participant Information Sheet
For the Stroke Survivor Interviews

(Final version 1.0: 23/03/2017)

Title of Study: **Mental Imagery Use in Stroke Rehabilitation.**

Name of Researcher: **Najla Alhashil (Principle Investigator), Dr Kathryn Radford, Dr Eirini Kontou and Dr Joanna Fletcher-Smith**

You are being invited to take part in an interview as part of our research study, which is aimed at exploring the barriers to and enablers of mental imagery use in clinincal practice in rehabiltion preogrammes with stroke survivors. Before you decide to do so, it is important for you to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and discuss it with others should you wish. One of our team members will review this information sheet with you and assist you with any questions you might have. If any details of the study are unclear, or if you need further information, please let us know and we can assist you further. We can be contacted using the contact details listed at the end of this sheet. Take time to decide whether you wish to take part.

What is the purpose of the study?
Imagery refers to an experience you create in your mind using different senses (e.g., seeing yourself picking up a cup and feeling the cup while grasping it). It is often used by therapists to help stroke survivors learn and improve movement skills and improve functional recovery. However, therapists in Saudi Arabia have not yet been encouraged to use imagery during rehabilitation and we would like to understand why. This study aims to identify and explore what helps or hinders the use of imagery during stroke rehabilitation in Saudi Arabia.

We wish to identify and examine the barriers to and enablers of using imagery in rehabilitation programs and how this is encouraged by therapists, by talking to stroke patients undergoing rehabilitation after their stroke.

We hope that the study will allow practitioners and other healthcare professionals to more deeply understand what helps them more in encouraging the use of mental imagery technique in rehabilitation programs to enhance recovery post-stroke.

We also hope that the findings from this study can help us introduce new cost-effective and risk-free techniques such as mental imagery practice in rehabilitation programs and recovery management plans to help assist in enhancing recovery in stroke survivors.

Page 1 of 4

Why have I been invited?
You are being invited to take part in an interview because you have received or are receiving physiotherapy/occupational therapy that involves rehabilitation to assist in your recovery after a stroke. The aim of the interview is to explore stroke survivors' experiences of imagery use during rehabilitation and what factors helped or hindered its use. We are inviting about ten to twelve participants like you to take part in this study.

Do I have to take part?
It is up to you to decide whether you wish to take part in this study or not. You should take some time to decide whether you want to participate. If you do decide to take part, you will be asked to sign a consent form and return this to Mrs. Najla Alhashil at the contact details provided below. You will also retain a copy of your consent form to keep along with this information sheet. You are free to withdraw from the study at any time without having to give any reasons.

What will happen to me if I take part?
If you wish to participate in this study, you will be contacted by telephone and a time will be arranged for you to be interviewed. Efforts will be made to arrange a convenient time for you, which will be confirmed via telephone. The interview will last approximately 30-45 minutes and will be held in a private meeting room in King Fahd Hospital University of Dammam Educational, King Fahd Specialist Hospital-Dammam, and Prince Sultan Rehabilitation Complex Humanitarian Services, Saudi Arabia.

The content of the interview will be audio recorded and written notes will be taken purposely to document inaudible or contextual information. This content will be transcribed and analysed to identify the barriers to and enablers of encouraging mental imagery use in stroke rehabilitation programs.

Expenses and payments
You will be fully compensated for any costs incurred for your attendance at the interview (if necessary). We can also arrange transportation if you are likely to experience difficulties in getting to the location.

What are the possible disadvantages and risks of taking part?
We do not anticipate any disadvantages or risks for participants in the study. Efforts will be made to arrange the interview to take place at a time convenient for you.

What are the possible benefits of taking part?
Information obtained from your partaking in the study would provide therapist with insight into factors affecting their use of imagery in rehabilitation targeted at recovery for stroke survivors. In addition, obtained evidence would help contribute to advancing new rehabilitative design services and would enhance the development of guidelines and protocols for imagery use with stroke survivors in Saudi Arabia.

Page 2 of 4

What happens when the research study stops?

If the study ends, your legal rights won't be affected and you will continue to receive your usual care from the hospital.

What if there is a problem?

If you have a concern about any aspect of this study, you can contact the researcher (Mrs Najla Alhashil, Principal Investigator, on 00966561146633) who will do her best to answer your questions. If you remain unhappy and wish to make a complaint, please contact the hospital's Patient Affairs Department or main supervisor: Dr Kate Radford, telephone: 00441158230226, email: Kate.Radford@nottingham.ac.uk. Additionally, you can contact the Research Ethics Committee Administrator, c/o the University of Nottingham School of Medicine Education Centre, B Floor, Medical School Queen's Medical Centre Campus, Nottingham University Hospitals, Nottingham, NG7 2UH, telephone: 00441158231063, email: Louise.Sabir@nottingham.ac.uk.

Will my taking part in the study be kept confidential?

We will follow ethical and legal practice in conducting the research and all information related to you will be kept confidential.

Data collected from your participation in the study will be assessed by authorised persons from the University of Nottingham who are involved in the study. Other authorised persons may also review the data to verify that the study is being carried out correctly. All such personnel will maintain a duty of confidentiality to you as a research participant, and will do their best to meet this duty.

Information collected about you during the course of the research will be kept **strictly confidential**, stored in a secure and locked office, and on a password-protected database. Such information will be anonymised, and a unique code will be used so that you cannot be linked to the data.

Your personal data (address, telephone number) will be kept for six to twelve months after the study has concluded to allow us to inform you of the findings and possible follow-up studies (unless you advise us that you do not wish to be contacted). All other data (research data) will be kept securely for a period of seven years. During this time, all precautions will be taken by those involved to maintain your confidentiality; only members of the research team will have access to your personal data. After this time, all your collected data will be destroyed securely. Although the information we collect about you in the interview will remain confidential, should you disclose anything to us which we feel puts you or anyone else at any risk, we may feel it necessary to report this to the appropriate persons.

What will happen if I don't want to carry on with the study?

Your participation is voluntary and you are free to withdraw at any time, without giving any reason and without your legal rights or usual medical care being affected. If you withdraw from

the study, however, the information collected up to that point cannot be erased and may still be used in the project analysis.

What will happen to the results of the research study?

The findings of this study will be used to generate a questionnaire to help us explore further factors affecting the use of imagery in stroke rehabilitation. This will be sent to therapists in Saudi Arabia and the United Kingdom. The findings will be reported as a written dissertation and submitted to the University of Nottingham for the degree of Doctorate of Philosophy in Rehabilitation and Ageing. In addition, they will be submitted as a written report for publication to allow other healthcare professionals to benefit from the study. Note that you would not be identified in any such report or publication.

Who is organising and funding the research?

The study is organised by the Division of Rehabilitation and Aging, School of Medicine, University of Nottingham, UK and funded by the University of Dammam, Saudi Arabia.

Who has reviewed the study?

All research conducted in the University of Nottingham is reviewed by an independent group of people, called a research ethics committee, in order to protect your interests. This study has been reviewed and given a favourable opinion by the ethics committee of the University of Nottingham, Medical School.

Further information and contact details

If you have any questions or concerns about the study or wish to discuss participation, you can contact the principle researcher at the following address:

Mrs Najla Alhashil PhD Student University of Nottingham Division of Rehabilitation and Aging B 112, Medical School Queen's Medical Centre (QMC) Nottingham NG7 2UH Tel: +44(0) 1158230948 Mobile UK: 00447531123714 Email: msxna7@nottingham.ac.uk	Physiotherapist *MSc in Rehabilitation Sciences-UK* *BPhysio-BAppHSc-KSA* *Physiotherapy department* *King Fahd Hospital in Al Khober* *Dammam University.* Tel: +(013) 8966666/Ext 107116 Mobile KSA: 00966561146633 Email: n.hashil@uod.edu.sa

Finally, many thanks for reading this information sheet, which you should retain; if you agree to participate, we will ask you to sign a consent form, a copy of which you will receive.

Appendix 4.9. Copy of the Participants Consent Form for Stroke

The University of Nottingham

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(Form to be printed on local headed paper)

CONSENT FORM – INTERVIEWS
(Draft Version 1.0/ Final version 1.0: date 23/03/2017)

Title of Study: Mental imagery use in stroke rehabilitation

Names of Researchers: Najla Alhashil, Dr Kathryn Radford, Dr Eirini Kontou and Dr Joanna Fletcher-Smith

Name of Participant: **Please initial box**

1. I confirm that I have read and understand the information sheet version number 1.0 dated 23/03/2017 for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without my medical care or legal rights being affected. I understand that should I withdraw then the information collected so far cannot be erased and that this information may still be used in the project analysis. ☐

3. I understand that relevant sections of my collected data may be looked at by the research group and other responsible individuals for monitoring and audit purposes. I give permission for these individuals to have access to these records and to collect, store, analyse and publish information obtained from my participation in this study. I understand that my personal details will be kept confidential. ☐

4. I understand that the interview will be recorded using an audio digital recorder for data analysis and that anonymous direct quotes from the interview may be used in the study reports and publication purposes. ☐

5. I understand that all data will be anonymous and confidential, with the exception of information revealed during the interview or focus group that is of concern and may need to be reported, for example due to posing potential risks to another person or myself or being related to criminal behaviour. ☐

8. I understand that information about myself that is recorded during the study will be kept in a secure database. If the data is transferred, they will be made anonymous. Data will be kept for seven years after the study has ended and then securely destroyed. ☐

9. Optional: I agree to my personal data being kept for six to twelve months after the end of the study so that I can be contacted about possible follow-up investigations. ☐

10. I agree to take part in the above study. ☐

______________________ ______________ ____________________
Name of participant Date Signature

________________________ ______________ ____________________
Name of person giving consent Date Signature

Interview consent form Final Version 1.0 date **23/03/2017**
Three copies: one for participant, one for the project notes and one for the medical notes (Mental imagery use in stroke rehabilitation)

Appendix 4.10. Copy of Focus Group Discussion Topic Guide

INSTITUTIONAL REVIEW BOARD-IRB
APPROVED
Date 14/09/2017
Do not use after 13/09/2018
IRB Study No. RXT0338
KFSH-D

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Division of Rehabilitation and Ageing, School of Medicine,
University of Nottingham

Topic Guide for Focus Groups with Therapists and Clinicians

Welcome

I would like to thank you for agreeing to participate in this group discussion.

Introduction

My name is Najla Alhashil, and I am a postgraduate researcher at the University of Nottingham. Before we begin, it would be very much appreciated if you could read the information sheet and complete the consent form.

The Purpose of this Focus Group Discussion

This group discussion has been organised to explore the use of mental imagery (MI) during post-stroke rehabilitation programmes. In this context, *mental imagery* refers to the process by which an individual creates specific images of motor tasks in his or her mind and then rehearses these representations repetitively number of times without any physical output. Lately, the use of mental imagery in post-stroke rehabilitation has increased, but the specifics of its use remain unclear. We do not know exactly who is using it or how it has been incorporated into patients' rehabilitation, nor have we developed a comprehensive understanding of which factors help or hinder its use.
The group discussion will last approximately 60–90 min. Before we begin, I would like to ask you for your permission to audio record our discussion to ensure that I have a complete record of all the information you provide me.

Data obtained from this study will be included in a report, which will be submitted for publication in journals. However, your involvement will be kept strictly confidential, and your name will not appear in any published materials.

Final version 1:0, Date 18/07/2017

Topic guide for therapists focus group discussion

INSTITUTIONAL REVIEW BOARD-IRB
APPROVED
Date 14/09/2017
Do not use after 13/09/2018
IRB Study No. RC70338
KFSH-D

Prompts

Therapists and Clinicians

Many stroke patients partake in various rehabilitation programmes to assist their recovery and improve their ADL, mobility, quality of life (QOL) and life roles participation; however, the addition of mental imagery to their regular physical practice plans can help maximise the recovery stage.

General Prompts for Healthcare Professionals:

1. **Knowledge of MI** (Behavioural change wheel: BCW Capability)
   - 1.1 Have you heard of MI use before? Have you heard anyone mention it? Do you know of anyone who has used it?
     - 1.1.1 If yes, please elaborate more? In what way? What does MI means for you?
   - 1.2 Have you used it? Would you think of using it? In what terms would you use it (for example, as a substitute, combined or additional/continuous?
   - 1.3 Have you ever used MI specifically with stroke patients?
   - 1.4 Can you tell me about the principles of using it? Anything that you would consider while using it?
     - 1.4.1 Do you know of any theory, model or protocol that guides your use of MI?
     - 1.4.2 How did you know about MI? Have you read any articles about MI? Are you aware of good experience examples?

2. **Prospect** (BCW motivation [automatic and reflective])

2.1. Enablers

2.1.1 What motivated you to use MI in practice?

2.1.1.1 What would encourage you to use it more? Would workshops or additional training help?

2.1.2 Do you use MI at the rehabilitation clinic or in the patient's home? Where should it be used? Any specific type of stroke patients?

2.1.3 would you be able to give me an example of your MI use?

2.1.4 why do you use it?

2.1.5 when do you use it?

2.1.6 where do you use MI?

2.1.4.1 Do you use it before, during or after therapy?

2.1.7 What would help you to use it more often? Or would help you use it more? Would supportive peers or MI use with stroke guidelines help?

2.2 Barriers

2.2.1 Have you encountered any difficulties while using MI? If yes, what happened? Why?

2.2.2 Have you had a negative experience such as patient unable to image and no indefinite research findings and resources?

2.3 What has hindered your use of MI? Have patients been cooperative and understanding?

2.5 What would you consider when deciding to use imagery In the future?

2.5.1 Patients' characteristics e.g., stroke type, stroke outcome levels and ability to image?

2.5.2 Improving outcomes such as ADL, mobility, QOL and life participation?

2.5.3 Improving patient's confidence?

3. **Patient satisfaction** (BCW opportunity)

3.1 How did you find MI? What's your opinion? What are you feeling?

3.1.1 How would you feel about using it more frequently in the future?

3.1.2 Did you find it effective? Would you expect it to have an effect on recovery?

3.1.3 Did you notice any changes or improvements in recovery? Do you think it would make a difference?

3.2 How did your patient react to its use How do you believe they would react?

3.3 Did you find it was meaningful to you or your patient? Do you think it would be meaningful?

3.4 Are there factors that would make you more likely to use MI with stroke patients in the future?

3.4.1 Do you feel confident using it?

3.4.2 Do you feel knowledgeable enough to use it? How/explain?

3.4.2.1 Have you received training or guidelines?

3.4.3 Do you believe in mental imagery practice

3.4.4 What supports could be offered to you to help you use MI with stroke patients more frequently?

4. Is there anything else that you would like to add?

4.1 Is there anything else that you liked about MI

4.2 Is there anything else that you did not like about it?

4.3 Did you find it effective?

Appendix 4.11. Copy of Stroke Interview Topic Guide (English)

INSTITUTIONAL REVIEW BOARD-IRB
APPROVED
Date 14/09/2017
Do not use after 13/09/2018
IRB Study No. EAF0338
KFSH-D

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Division of Rehabilitation and Ageing, School of Medicine, University of Nottingham

Topic Guide for Interviews with Stroke Patients

Welcome

I would like to thank you for agreeing to participate in this interview.

Introduction

My name is Najla Alhashil, and I am a postgraduate researcher at the University of Nottingham. Before we begin, it would be very much appreciated if you could read the information sheet and complete the consent form.

The Purpose of this Interview

The purpose of this interview is to explore the use of mental imagery (MI) in post-stroke rehabilitation programmes. In this context, *mental imagery* refers to the mental process by which an individual creates specific images of motor tasks in his or her mind and then rehearses the representations repetitively number of times without any physical output. Lately, the use of mental imagery in post-stroke rehabilitation has increased, but the specifics of its use remain unclear. We do not know exactly who is using it or how it has been incorporated into patients' rehabilitation, nor have we developed a comprehensive understanding of which factors help or hinder its use.

This interview will last for approximately 30–45 min. Before we begin, I would like to ask you for your permission to audio record this interview to ensure that I have a complete record of all information you provide me.

Data obtained from this study will be included in a report, which will be submitted for publication in journals. However, your involvement will be kept confidential, and your name will not appear on any published materials of the study.

Final version 1:0, Date 18/07/2017 Topic guide for stroke interview

Prompts

General Prompts for Stroke Participants

1. Knowledge of MI (Behavioural change wheel: BCW Capability)

1.2 During your rehabilitation programme, have you ever heard of the use of mental imagery? Do you know anyone who has been encouraged to use it in their rehabilitation? Has anyone mentioned it to you?

1.3 Have you ever been encouraged to use imagery (e.g., imagine yourself, visualise managing your body positioning or moving you hand to reach for something)? Do you know anyone who has used this type of approach in their rehabilitation (or has mentioned using it)?

1.4 Could you tell me more about MI?

- 1.4.1 What does MI mean to you? Might mean to you?
- 1.4.2 What exactly do you image? Would image?
- 1.4.3 How would MI help you? In which way?

1.5 How would you feel if your therapist encouraged you to use MI during your exercise sessions in clinic or at home during your rehabilitation programme?

- 1.5.1 Would you prefer to do MI at home before coming to the exercise session? When would you use it? Might want to use it?
- 1.5.2 Would you prefer to do MI before, after the session or during the exercise sessions in clinic?

2. Prospect (BCW motivation [automatic and reflective])

2.1. Enablers

2.1.1 What would encourage you more to use MI more frequently as part of your rehabilitation programme?

2.1.1.1 How about watching videos, listening to audio-tape recordings reading through written scripts or following oral instruction?

2.1.2 Do you think it would be most useful at rehabilitation clinics or at home?

2.1.3 Do you think it would be more useful before, during or after therapy?

2.2 Barriers

2.2. Have you experienced any difficulties while using MI? Do you believe that you might come across difficulties while using MI? For instance, understanding or following basic instructions from you PT or OT?

2.2.2 Has anything hindered you from using it? Could anything stop you from using it? For instance, not offered a rational explanation or theory before encouraged to use it?

2.2.3 What would you consider when contemplating future MI use? For instance, would MI help extend session time or add more training time? Improving your independence levels, such as ADL, mobility, QOL and participation?

3. Patient satisfaction (BCW opportunity)

1.1 How did you find MI? What's your opinion? What are you feeling? How would you feel about using it more frequently in the future?
1.2 Did you find it effective? Would you expect it to have an effect?
1.3 Did you notice any changes or improvement in you recovery status? Do you think it would make a difference?
1.4 Did you find it was meaningful to you? Do you think it would be meaningful?
1.5 Do you believe that MI could help improve, for example, movement sequence or strategy? What about confidence and motivation?
1.6 Do you believe that using MI could help improve symptoms of mood and stress? What about feeling positive?
1.7 Do you believe that using MI could help improve post-stroke independence in ADL?, mobility, And QOL? And participation e.g. work?
1.8 How could MI help you?

4. Is there anything else you would like to add?

a. Is there anything else that you liked about MI
b. Is there anything else that you did not like about it?
c. Did you find it effective?

Appendix 4.12. Copy of Stroke Interview Topic Guide (Arabic)

دليل المواضيع الخاص بالمقابلات مع مرضى الجلطة الدماغية

مرحباً

أود أن أشكركم على موافقتكم على المشاركة في هذه المقابلة.

المقدمة

اسمي نجلاء الهاشل، وأنا باحثة دراسات عليا في جامعة نوتنغهام. قبل أن نبدأ، سيكون من دواعي تقديرنا الكبير أن تقرأ ورقة المعلومات وأن تكمل نموذج الموافقة.

الغرض من هذه المقابلة

الغرض من هذه المقابلة هو استكشاف استخدام التصور الذهني (MI) في برامج إعادة التأهيل ما بعد الجلطة الدماغية. في هذا السياق، يشير التصور الذهني إلى العملية العقلية التي يخلق الفرد بواسطتها صورًا محددة للمهام الحركية في ذهنه، ثم يتدرب باستمرار على العروض عدة مرات دون أي أداء جسدي. في الآونة الأخيرة، ازداد استخدام التصور الذهني في إعادة التأهيل ما بعد الجلطة الدماغية، ولكن لا تزال تفاصيل استخدامه غير واضحة. لا نعرف بالضبط من الذي يستخدمه أو كيف تم إدراجه في إعادة تأهيل المرضى، كما أننا لم نكون فهمًا شاملاً للعوامل التي تساعد أو تعيق استخدامه.

ستستمر هذه المقابلة لمدة 30 45 دقيقة تقريبًا. قبل أن نبدأ. أود أن أطلب منكم الإذن لتسجيل هذه المقابلة صوتياً لضمان أن يكون لدي سجل كامل يتكون من جميع المعلومات التي تزودونني بها.

سيتم تضمين المعلومات التي يتم الحصول عليها من هذه الدراسة في تقرير سيتم تقديمه للنشر في المجلات المتخصصة. ومع ذلك، سيتم الحفاظ على سرية مشاركتكم، ولن يظهر اسمكم في أي مواد يتم نشرها من الدراسة.

التحفيز

تحفيز عام للمشاركين المصابين بالجلطة الدماغية

1. **العلم بشأن بالتصور الذهني** (عجلة التغيير السلوكي: كفاءة عجلة التغيير السلوكي)

1.2 خلال برنامج إعادة التأهيل، هل سمعت مطلقاً عن استخدام التصور الذهني؟ هل تعرف أي شخص تم تشجيعه على استخدامه خلال إعادة تأهيله؟ هل قام أي شخص بذكره لك؟

1.3 هل سبق وتم تشجيعك على استخدام التصور '(على سبيل المثال .. تتخيل نفسك، أو تتصور التحكم في وضع جسمك أو تحريك يدك لالتقاط شيء ما)؟ هل تعرف أي شخص استخدم هذا النوع من النهج في إعادة تأهيله (أو ذكر أنه يستخدمه)؟

1.4 هل يمكن أن تخبرني بالمزيد عن التصور الذهني؟

1.4.1 ماذا يعني لك التصور الذهني؟ أو قد يعني لك؟

1.4.2 ما الذي تصورته بالضبط؟ أو قد صورة؟

1.4.3 كيف يساعدك التصور الذهني؟ بأي طريقة؟

1.5 كيف ستشعر إذا شجعك طبيبك على استخدام التصور الذهني أثناء جلسات التمرين في العيادة أو في المنزل أثناء برنامج إعادة التأهيل الخاص بك؟

1.5.1 هل تفضل أن تمارس التصور الذهني في المنزل قبل المجيء إلى جلسة التمرين؟ متى تستخدمه؟ أو قد ترغب في استخدامه؟

1.5.2 هل تفضل ممارسة التصور الذهني قبل، أو بعد الجلسة أو أثناء جلسات التمرين في العيادة؟

2. الإمكانية (تحفيز عجلة التغيير السلوكي [تلقائي وتأملي])

2.1 **العناصر التمكينية**

2.1.1 ما الذي يشجعك أكثر على استخدام التصور الذهني بشكل أكثر تواتراً كجزء من برنامج إعادة التأهيل الخاص بك؟

2.1.1.1 ماذا عن مشاهدة مقاطع الفيديو، والاستماع إلى التسجيلات الصوتية أو قراءة النصوص المكتوبة أو اتباع الإرشادات الشفهية؟

2.1.2 هل تعتقد أنه سيكون أكثر فائدة في عيادات إعادة التأهيل أو في المنزل؟

2.1.3 هل تعتقد أنه سيكون أكثر فائدة قبل أو أثناء أو بعد العلاج؟

2.2 الحواجز

2.2. هل واجهت أي صعوبات أثناء استخدام التصور الذهني؟ **هل تعتقد أنك قد تواجه صعوبات أثناء استخدام التصور الذهني؟ على سبيل المثال، فهم أو اتباع التعليمات الأساسية من أخصائي العلاج الطبيعي أو المعالج المهني الخاص بك؟**

2.2.2 هل قام أي شيء بإعاقتك عن استخدامه؟ هل يمكن لأي شيء أن يمنعك من استخدامه؟ على سبيل المثال، لم يتم تقديم تفسير منطقي أو نظرية منطقية قبل تشجيعك على استخدامه؟

2.2.3 ما الذي سوف تضعه في اعتبارك عند التفكير في استخدام التصور الذهني في المستقبل؟ على سبيل المثال، هل سيساعد التصور الذهني في تمديد وقت الجلسة أو زيادة وقت التدريب؟ أو في تحسين مستويات اعتمادك على نفسك، مثلاً في نشاطات الحياة اليومية، أو القدرة على الحركة، أو جودة الحياة والمشاركة؟

3. رضا المريض (فرصة عجلة التغيير السلوكي)

النسخة النهائية 1: 0. التاريخ 2017/07/18 دليل المواضيع الخاص بمقابلة الجلطة الدماغية

1.1 كيف وجدت التصور الذهني؟ ما هو رأيك؟ بماذا تشعر؟ ما هو شعورك حول استخدامه بشكل أكثر تكرارا في المستقبل؟

1.2 هل وجدته فعّالاً؟ هل تتوقع أن يكون له تأثير؟

1.3 هل لاحظت أي تغيّرات أو تحسّن في حالتك الشفائية؟ هل تعتقد أنه سيحدث فرقا؟

1.4 هل وجدته مجدياً بالنسبة لك؟ هل تعتقد أنه سيكون مجدياً؟

1.5 هل تعتقد أن التصور الذهني يمكن أن يساعد في تحسين، على سبيل المثال، تسلسل أو استراتيجية الحركة؟ ماذا عن الثقة والتحفيز؟

I.6 هل تعتقد أن استخدام التصور الذهني يمكن أن يساعد في تحسين أعراض المزاج والتوتر؟ ماذا عن الشعور الإيجابي؟

1.7 هل تعتقد أن استخدام التصور الذهني يمكن أن يساعد في تحسين الاعتماد على النفس في نشاطات الحياة اليومية ما بعد الجلطة الدماغية؟، والقدرة على الحركة، وجودة الحياة؟ والمشاركة، على سبيل المثال، في العمل؟

1.8 كيف يمكن للتصور الذهني أن يساعدك؟

4. هل هناك أي شيء آخر تود أن تضيفه؟

ا. هل هناك أي شيء آخر أعجبك فيما يتعلق بالتصور الذهني؟

ب. هل هناك أي شيء آخر لم يعجبك فيما يتعلق بذلك؟

ت. هل وجدته فعّالاً؟

Appendix 4.13. Copy of Reflective Diary

stroke interview (7)

PAT[redacted]07

01.08.2017
KFUH
in-patient ward Floor D
10:00 am

PAT.07 Is 60 Y/O Buesiniss man retired since ~~3 month~~ less 2 weeks, with Right Side paralysis it was a Ischemic stroke, Resulting in a mild dysfunction, Good muscle tone, medical History with BP +, his Rehabilitation Programme is strengthen 1st session.

The participant manages to feed + drink by it's own. However he still didn't try to walk alone by himself. He also doesn't Do any House-Hold work such as washing clothes and do shopping as he has his family doing that. PAT.07 was admitted to the hospital 2 weeks ago and was in the ICU, he just arrived to the ward two days ago as he got better and started recovery very fast.

Prior the Interview:- The therapist has Introduced me to the Participant and Explained The purpose of the study to the participant And the participant Showed intrest immediatly ~~the~~ I gave him the information sheet and he was read through, he didn't ask

Appendix 4.14. Copy of the Codebook for the Focus Group Discussion

Theme	Subthemes	Quotes
Therapist's view and knowledge (Capability)	**1) Therapist's skills and experience**	*"If just a small knowledge about it umm just read it in the internet or whatever, but no practicing, I think I will not give too much to that patient and of course he will not be happy with the result." AB.24 # 607-9* *"It's a new concept and it's a new technique how to deal with. Because they need special kind of treatment, you cannot treat them like any other patients. So, yes, I got this concept that some people they came from USA and the people came from Denmark." MA.16 # 484-487 DV.09 # 160-3* *"Uh, I think first we have to know about this itself like workshops or uh class, showing how to introduce this uh, protocol, guidelines, skills, progression of this, how this is the first things to do with the patient." HA.06 # 658* *"So they will accept, ok, such kind of theoretical"* MA.16 # 338 *"If I will be, um, given the chance to have a workshop I would be more comfortable." AM.11 # 225-227* *"Because mainly we are using it already but we don't know that this is the name of the treatment."* RC.02 (660-1) *"I mean, having my own technique but I don't know what's involved problems are compliance."* AM.11 (254-255) *"If it's, effective and it will show results then it will be okay for me to use it in the future especially if I'm, um, if I will be, given the chance to have a workshop I would be more comfortable."* AM.11 (225-227) *"He would not be convinced. So the best way is to show him the results. And from my experience, you know, I get the results, within the first sessions."* AD.07 (228-2) *"Make these things like enjoyable and interesting for this patient to just to be in therapy."* AD.07 (224-5)
Social influence and environmental factors (Opportunity)	**1) Social influence**	*"Maybe, it depends on the patient, because you know we have many patients, and some of the patients are educated and some of them highly educated. Some of them not educated. They came from different places, really and this I think this is not easy."* WA.04 (191-4) *"And the culture or education it depends on the person."* SA.23 (666) *"As OT we already have background about specific, personality, psychology, psychiatry and we introduced it since long time go with stroke patients but with certain patients not all, because, you know it's very complex pathology and you know, as Occupational Therapist, we did use it with a certain with a certain criteria, cognition, age, education, knowledge of their own body. They can imagine, they can have imagination or umm, I mean of their own body, position in the space and, stuff like this."* SA.23 (19-26)
Support and motivation factors (Motivation)	**1) Professional role/family**	*"So you try to encourage them. So, you know, you should, just do some exercises, imagine that you do these exercises, and that's all."* AD.07 # 357 10 *"I ask the patient to open the hand to encourage him or to make him to think real, in front of him, do it with your sound hand and see what will happen now, what if, what tools do you need to move your hand, this imagery is what we use."* SA.23 # 32-35 *"We would explain to the patient that this is uh, that this technique is used before with a lot of patient and there is a good outcome from this, so we will explain to the patient." NF.18 # 357-59* *"Showing how to introduce this by protocols, guidelines, skills, progression of this."* HA.06 (732-34) *"So they will accept, ok, such kind of theoretical, but as I said, you know, it's sometimes depend on the therapist who handles the patients but he has to prove to those patients that this works, okay, and he has to find the way to make it work, okay"* MA.16 (338-341) *"Family support is very important. Because the motivation, it will not come from the therapist alone, from family support."* RC.02 (502-30 *"Sometimes its great, when exercise in the mind, you know. So in this way, the patient will get encouraged."* AD.07 (243) *"In Mulligan techniques, there is technique we'll call the patient to try to punch the one in front of him. There is nobody in front of him. But*

Appendix 4.15. Copy of the Codebook for the Stroke Interviews

Theme	Subthemes	Quotes
Patient's awareness and knowledge (Capability)	**1) Patient's informed and MI sources of knowledge**	*"Yes I know about it, and I've read about it in books, 6 years ago, or more, and also from books, my husband learnt about it a lot, he encouraged me to read a lot, about positive energy and imagination"* PAT.11 (L 12-17) *"Yes I read, yes I have watched YouTube videos also."* PAT.08 (L 218-122) *"No there was some books, I know mental imaginary, I don't give it any importance. Yes I know about it, and I've read about it in books"* PAT.11 (9-12) *"I have no idea about MI."* PAT.01 (60-62) *"I was living in Canada, and I heard about MI there."* PAT.07 (16-18) "My sister told me that there's a doctor in Europe doing the mental imaginary training that gives a positive Energy and he told me about patients who come to his clinic." PAT.11 (34-36) *"Cardiac and surgical in Europe, and data centres for physical treatment and mental imagery training, before my illness, we were talking about what advanced technology they have reached in physical treatment we were discussing this issue"*

Social and environmental factors (Opportunity)	**1) Social influence**	*"According to their level, depends on their patience, step-by-step, depending on their education and social community, we have to proceed one by one to let them understand"* PAT.11 184-186. *"I see people, I see in the market and street, and in cinema and parking, no one is helping them, they only help them self's, depend on themselves"* PAT.07 (L 120-121) *"At home I depended fully on my self, though I have a wife, but I like to do everything by my self."* PAT.04 (126) *"I accept doing MI because its just mentally."* *PAT.04* (234) *"Three quarts of our illness is illusion, if I surrender, Ill never walk again, I will be broken for ever."* PAT.03 (217) *"When I was in Canada I have seen people on wheelchairs helping them self's and no one has helped them at all."* PAT.07 (109-110) *"Because abroad they respect life but here no."* PAT.08 (553) *"I don't need any therapist to help me, the educated person, who observes the Western world would know how life is, like me."* PAT.07 (66-67)
	2) Environment context & settings	*"If I see videos on YouTube everyday how to improve yourself and how to improve your skills and self-confidence, there's nothing particular about my illness, but when I do the training with a specialist, specialized in this field, of course things will change."* PAT.08 (609-612)

Support and motivation factors (Motivation)	**1) Professional role/family**	*"Me and my husband read a lot, he do the mental imagery training."* PAT.11 (L 274-275) *"Yes there are many lectures, I can get influenced by, and it can benefit me positively, it helps a lot"* PAT.10 (L 158-159) *"I have not been asked to do MI here at the hospital.* PAT.09 *L (23- 27) "No therapists have told me about MI, and I have not been encouraged by them to do it.* PAT.09 L (32-33) *"The therapists don't encourage me to do MI." PAT.*07 (46-45) *"If I were offered to use MI I would do it to improve my movement."* PAT.02 (71-76) *"No therapists have told me about MI and I have not been encouraged by them to do it."* PAT.09 (32-33) *"At hospital nobody asked me to do this to improve my movement." PAT.*01 (50-54) *"I have never been asked to do MI."* PAT.05 (50- and 60)
	2) Optimistic	"Motivation is the most important thing, it makes you believe and trust in imagination, what is the motive if it's all positive it will change your mood, and it will make you optimistic." PAT.11 (L 346-348) "I feel, optimistic, to do some imagery, it could be effective, with God's will, I will improve, for sure" PAT.02 (L 170-80)

Appendix 5.1. Copy of Example of Delphi Survey

The Use of Mental Imagery in Stroke Rehabilitation: A Delphi Survey

We are interested to know more about the use of Mental Imagery (MI) in stroke rehabilitation clinical practice. This survey is designed to help us understand what factors (including skills and training required for therapist), equipment (e.g. video, audio and written scripts) are required to facilitate the use of MI, and which stroke survivor's attributes are important in the use of MI in stroke rehabilitation.
From your perspective as an expert in using MI we are asking you to rate a series of statements regarding the use of MI. Your responses could help in developing guidance for the clinical application and training of MI in stroke rehabilitation.

Part 1: Information about you.

Please complete the following section by ticking the appropriate boxes or filling in a suitable response:

1. Gender

☐ Male ☐ Female

2. Where is your workplace?

☐ United Kingdom ☐ Africa ☐ European Union ☐ North America ☐ South America

☐ Middle East ☐ Asia ☐ Australia ☐ Other (Please state)

3. Are you?

☐ An academic ☐ Clinical ☐ Educator

☐ Technician ☐ Other

4. Highest qualification obtained?

☐ Bachelor degree ☐ Master degree ☐ PhD/Doctorate

☐ Other

5.a Have you had any additional training in the use of mental imagery (MI)?

☐ Yes ☐ No

5.b If yes, please give details of the course(s) undertaken and qualifications where relevant.

6. What is your professional background (e.g. physiotherapy**)?**

7. What is your job title?

8.a If you are a clinician, how many years have you been qualified?

8.b If you are a clinician, what is your specialism (e.g., neurology)?

9. If you are a clinician, how regularly do you use MI with stroke survivors?

☐ Every stroke patient ☐ Most of my patients

☐ Some of my stroke patients ☐ None of my stroke patients

10. Have you published any articles on the use of MI?

☐ Yes ☐ No

11. If yes, please state the number of articles you have published on the use of MI with stroke?

12. How would you describe your expertise in MI?

13. Please describe in detail your experience of using MI?

Part 2: Completing the survey

To complete the survey please rate each statement on the use of MI in stroke rehabilitation

Survey Round One:

This Delphi survey aims to develop best practice recommendations for the clinical application of mental imagery (MI) in stroke rehabilitation.

The statements in this round address knowledge about mental imagery and its application and ways of improving a person's skills in delivering MI in stroke rehabilitation. Additional statements concern the attributes of stroke survivors necessary to engage in MI during rehabilitation.

You are asked to rate each item using one of the following:

(5) **Very important** – an essential item that should be included in the list of recommendations.

(4) **Important** –a necessary item that should be included in the list of recommendations.

(3) **Neutral** – potential/ worthy of consideration for inclusion in the list of recommendations.

(2) **Somewhat important** – the item will be re-valued, and could be added as one of the least important items for the recommendations.

(1) **Not important**– the item should be discarded from the list of recommendations.

Items rated below 'necessary' will be included in subsequent rounds in order to reach consensus. Those deemed the least important will be listed in the report as an item with low importance level.

Below each statement is a comments box so you can provide any relevant comments, additional feedback or anything you consider important with regard to the items themselves or the overall statements.

It will take approximately 20-30 minutes to complete this round.

Part 2.1 the use of MI by clinical therapists.

Section 1: Increasing Therapist's knowledge in MI.
From your experience, which of the following are important for clinical therapist to improve their knowledge in the use of MI?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Shadowing with experts/ colleagues who have used MI in their clinical practice.	☐	☐	☐	☐	☐
2	Gaining additional qualifications e.g. Modules on MI in taught	☐	☐	☐	☐	☐

	courses at degree level.					
3	Attending other training courses or workshops.	☐	☐	☐	☐	☐
4	Reading about MI in scientific papers in peer reviewed journals.	☐	☐	☐	☐	☐
5	Reading online and blogs/ publications.	☐	☐	☐	☐	☐
6	Reviewing up-to-date clinical guidelines.	☐	☐	☐	☐	☐
7	Watching videos explaining how to incorporate MI into practice.	☐	☐	☐	☐	☐
8	Discussing research findings with colleagues/others (e.g., journal clubs, knowledge exchange meetings with academics)	☐	☐	☐	☐	☐
9	Practical/ clinical experiences on MI use.	☐	☐	☐	☐	☐

Please write anything else you consider important for improving therapists' knowledge on MI use?

Section 2: Therapist's engagement and practical experience.
From your experience, which do you think are important for therapists to improve their MI engagement skills with stroke survivors while using MI?

Statements	Not	Somewhat	Neutral	Important	Very

	Important	Important			Important
1 Maintaining a good relationship between the therapist and patient during the intervention delivery.	☐	☐	☐	☐	☐
2 Recognising levels of motivation for recovery within the patient.	☐	☐	☐	☐	☐
3 Identifying the patient's belief about using MI to improve recovery.	☐	☐	☐	☐	☐
4 Identifying the patient's level of awareness of MI and its advantages and disadvantages.	☐	☐	☐	☐	☐
5 Follow-up with the patient to provide feedback and results.	☐	☐	☐	☐	☐
6 Identifying a supportive environment (e.g. family and peers).	☐	☐	☐	☐	☐
7 Recalling and maintaining positive experience in MI use.	☐	☐	☐	☐	☐

Please write anything else you consider important in improving therapist's skills in engagement with stroke survivors while using MI?

Section 3: Benefits of using MI (effective).

Form your experience; what do you think are the most important benefits of using MI in stroke rehabilitation? MI use could improve?

Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1 Improve general ADL.	☐	☐	☐	☐	☐
2 Improve balance.	☐	☐	☐	☐	☐
3 Improve gait pattern, gait speed and gait cadence.	☐	☐	☐	☐	☐
4 Improve posture, coordination and proprioception.	☐	☐	☐	☐	☐
5 Improve upper limb function.	☐	☐	☐	☐	☐
6 Improve specific movement capabilities.	☐	☐	☐	☐	☐
7 Improve re-learning movement patterns.	☐	☐	☐	☐	☐
8 Improve sequence of movement.	☐	☐	☐	☐	☐
9 Help learn and adapt new/alternate approaches of movements and skills.	☐	☐	☐	☐	☐
10 Improve muscle strength.	☐	☐	☐	☐	☐
11 Improve joint flexibility.	☐	☐	☐	☐	☐
12 Help reduce/control pain.	☐	☐	☐	☐	☐
13 Help reduce spasticity.	☐	☐	☐	☐	☐
14 Help make the patient feel calmer/more relaxed.	☐	☐	☐	☐	☐
15 Improve confidence.	☐	☐	☐	☐	☐
16 Improve motivation (the ability to sustain positive attitude).	☐	☐	☐	☐	☐
17 Improve focus/concentration.	☐	☐	☐	☐	☐

18	Help improve self-esteem.	☐	☐	☐	☐	☐
19	Improve positive attitude (mental and emotional wellbeing).	☐	☐	☐	☐	☐
20	Improve memory.	☐	☐	☐	☐	☐
21	Improve adherence to rehabilitation programme.	☐	☐	☐	☐	☐
22	Improve quality of life.	☐	☐	☐	☐	☐
23	Improve participation including returning to work, life habits or community integration.	☐	☐	☐	☐	☐

Please write anything else you consider important to include in the benefits of using MI?

Section 4: From your experience, which of the following do you think are important for therapists to use when instructing/training stroke survivors in how to use MI?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Providing verbal instruction.	☐	☐	☐	☐	☐
2	Demonstrating the movement to the patient (e.g. pictures or posters).	☐	☐	☐	☐	☐
3	Using video clips or DVDs of the movement to demonstrate the movement pattern.	☐	☐	☐	☐	☐
4	Therapist using some equipment/objects to help explain the movement (e.g. dumbbells).	☐	☐	☐	☐	☐
5	Using written imagery scripts to help the patient imagine.	☐	☐	☐	☐	☐
6	Using audio imagery scripts to help patients imagine.	☐	☐	☐	☐	☐
7	Using anatomical aids (e.g. skeleton or dummies).	☐	☐	☐	☐	☐

Please write anything else you consider important to improve therapist's training in instructing and demonstrating for stroke survivors in using MI effectively?

Section 5: Assessment tools.
From your experience, what do you think are important for therapists to assess before or while using MI?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Levels of cognitive impairment (e.g. mild cognitive impairment i.e. score above 24 on the Mini-Mental State Examination (MMSE) test).	☐	☐	☐	☐	☐
2	Ability levels to imagine task (e.g. good level of imagining is score above 60 on Kinesthetic and Visual Imagery Questionnaire (KVIQ))	☐	☐	☐	☐	☐

3	Levels of prominence of the image (e.g. good level of imagining the movement i.e. score above 56 on the Movement Imagery Questionnaire-Revised Version (MIQ-RS)).	☐	☐	☐	☐	☐
4	Levels of vividness of the image of the movement task on stroke capacity relative tasks within the questionnaire mainly standing and walking (e.g. good level of vividness of the image is ≤3 on Vividness Movement Imagery Questionnaire (VMIQ)).	☐	☐	☐	☐	☐
5	Levels of tone of spasticity affected limbs (e.g. score below 2 on Modified Ashworth Scale).	☐	☐	☐	☐	☐
6	Levels of pain on affected limbs (e.g. mild point i.e. 4 or less on Visual Analogue Scale, pointed: 0-10).	☐	☐	☐	☐	☐
7	Levels of ADL limitation (e.g. Barthel Index).	☐	☐	☐	☐	☐
8	Mobility (e.g. UTG test or BBT test).	☐	☐	☐	☐	☐
9	Levels of QOL (e.g. health-related and stroke-specific quality of life tool).	☐	☐	☐	☐	☐
10	Participation (e.g. The Assessment of Life Habits (LIFE-H) tool).	☐	☐	☐	☐	☐
11	Fear of falling (e.g. Fall Efficacy Scale-International tool).	☐	☐	☐	☐	☐

Please write anything else you consider important for the therapist to assess stroke survivors before or during

the use of MI?

Section 6: Time (effective).

From your experience, please tell us when do you think MI should be used?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Before other treatment sessions (e.g. physiotherapy or occupational therapy).	☐	☐	☐	☐	☐
2	During / as part of other treatment sessions.	☐	☐	☐	☐	☐
3	Following other treatment sessions.	☐	☐	☐	☐	☐
4	Encouraging practice of MI outside treatment sessions (e.g. at home).	☐	☐	☐	☐	☐
5	Before practicing the specific task or exercise.	☐	☐	☐	☐	☐
6	While practicing the specific task or exercise.	☐	☐	☐	☐	☐
7	After practicing the specific task or exercise.	☐	☐	☐	☐	☐
8	Following discharge from the course of treatment sessions.	☐	☐	☐	☐	☐
9	While waiting for scheduled appointments for the course of treatment sessions.	☐	☐	☐	☐	☐
10	When no physical therapy or treatment appointments are available.	☐	☐	☐	☐	☐

Please write anything else you consider important in regards to time of using MI?

Section 7: MI application and delivery (effective).
From your experience, please let us know how you think MI should be applied?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Asking the patient to practice MI with the affected side when the patient is unable to perform the movement on that side.	☐	☐	☐	☐	☐
2	Asking the patient to perform the movement on the sound side, then on the affected, when unable to preform on the affected.	☐	☐	☐	☐	☐
3	Asking the patient to perform the movement on both sides; the sound side, then the affected when unable to perform on the affected.	☐	☐	☐	☐	☐
4	Sitting aside the patient and verbally describing the movement then visually demonstrating to the patient to help enhance imaging when patient is unable to preform at all.	☐	☐	☐	☐	☐
5	Asking the patient to describe the images, after the patient has practiced MI, to assure imaging process.	☐	☐	☐	☐	☐

6	The patient should perform the movement within limits of their comfort range and not induce pain.	☐	☐	☐	☐	☐
7	During the use of MI, ask the patient to practice MI and combine or integrate the imaging practice with the physical task together.	☐	☐	☐	☐	☐
8	Asking the patient to practice MI and then to complete a flow chart after sessions to assure progress.	☐	☐	☐	☐	☐
9	Using MI as alternation treatment.	☐	☐	☐	☐	☐
10	Using MI as a supplementary treatment.	☐	☐	☐	☐	☐
11	Using MI as a graded technique training.	☐	☐	☐	☐	☐

Please write anything else you consider important regarding MI application and delivery?

Section 8: MI length and duration.
From your experience, please tell us how long the MI programme (duration) should last with stroke survivors?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Sessions should run from 2 to 6 weeks.	☐	☐	☐	☐	☐

2 Sessions should be for a maximum of 2 weeks.	☐	☐	☐	☐	☐
3 Sessions should be up to 4 weeks only.	☐	☐	☐	☐	☐
4 Sessions should continue for more than 6 weeks.	☐	☐	☐	☐	☐

Please write anything else you consider important for improving MI length of application or duration within completed sessions?

Section 9: MI intensity and frequency (effective).
From your experience, please tell us how long the MI training sessions should last and how many times per a week?

Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1 Training the patient for 10 to 20 minutes.	☐	☐	☐	☐	☐
2 Training the patient for up to 1 hour.	☐	☐	☐	☐	☐
3 Training the patient up to 3 times per week.	☐	☐	☐	☐	☐
4 Training the patient up to 5 times per week.	☐	☐	☐	☐	☐
5 Training the patient 7 times per week.	☐	☐	☐	☐	☐
6 Training the patient once a day.	☐	☐	☐	☐	☐
7 Training the patient twice a day.	☐	☐	☐	☐	☐
8 Training the patient up to 3 times a day.	☐	☐	☐	☐	☐

Please write anything else you consider important for including in MI intensity and frequency?

Section 10: MI modes and perspective (effective).
From your experience, which modes and perspective do you think are important for therapists to use when applying MI with stroke survivors?

Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1 Instructing the patient to use visual imagery from any perspective (internal or external), as long as they are comfortable and able to imagine.	☐	☐	☐	☐	☐
2 Instructing the patient to use visual imagery using only internal visual imagery perspective.	☐	☐	☐	☐	☐
3 Instructing the patient to use visual imagery using only external visual imagery perspective.	☐	☐	☐	☐	☐
4 Instructing the patient to use the kinaesthetic mode.	☐	☐	☐	☐	☐
5 Instructing the patient to use both the visual and kinaesthetic modes.	☐	☐	☐	☐	☐
6 Instructing the patient to use any type of imagery as long as it involves movement images.	☐	☐	☐	☐	☐
7 Instructing the patient to use graded	☐	☐	☐	☐	☐

	imagery.					
8	Instructing the patients to use any type/mode of imagery as long as they are comfortable and able to imagine.	☐	☐	☐	☐	☐

Please write anything else you consider important for improving the use of MI and choosing which appropriate mode or/and prospective?

Part 2.2: Patient engagement in MI use.

Section 1: Health Condition of the stroke survivor using MI.
From your experience, which do you think are important and might contraindicate MI use and training with stroke survivors?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	The patient should not suffer from any cardiology problems (coronary artery disease).	☐	☐	☐	☐	☐
2	The patient should not suffer from any musculoskeletal problems (e.g. rheumatoid arthritis).	☐	☐	☐	☐	☐
3	The patient should not suffer from any severe neurological problems (e.g., epilepsy or seizures).	☐	☐	☐	☐	☐
4	The patient should not suffer from severe spasticity; muscle tone (e.g. scores above 2 on Modified Ashworths scale, pointed 0-4).	☐	☐	☐	☐	☐

5	The patient should not suffer from any bone fractures or joint dislocations.	☐	☐	☐	☐	☐
6	The general health condition should be good or normal (no hypertension or asthma).	☐	☐	☐	☐	☐
7	The patient should not be taking medications that cause drowsiness.	☐	☐	☐	☐	☐

Please write anything else you consider important and can contradict training the stroke survivor to use MI?

Section 2: *Stroke survivor*'s ability.
From your experience, which do you think are important for stroke survivor's to engage in MI use?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	Patient needs to be able to imagine.	☐	☐	☐	☐	☐
2	Patient needs to be able to identify objects (e.g., a pen or a bed).	☐	☐	☐	☐	☐
3	Patient needs to be able to recall things (e.g., dates, names and events).	☐	☐	☐	☐	☐
4	Patient needs to be able to understand language (e.g., naming a pen or a bed).	☐	☐	☐	☐	☐
5	Patient needs to be oriented (e.g., knowing the place, people and time).	☐	☐	☐	☐	☐
6	Patient needs to be able to communicate well (e.g., understand instructions and repeat).	☐	☐	☐	☐	☐
7	Patient needs to be able to describe imagining process.	☐	☐	☐	☐	☐

Please write anything else you consider important to the *stroke* survivor's abilities in using MI?

Part 2.3: Location of using MI (effective).

From your experience, where do you think are important locations to train on the use of MI by therapists?

	Statements	Not Important	Somewhat Important	Neutral	Important	Very Important
1	MI can be trained in rehabilitation centres or in clinics (e.g. specialised physiotherapy clinics).	☐	☐	☐	☐	☐
2	MI can be trained in nursing homes.	☐	☐	☐	☐	☐
3	MI can be encouraged and trained in their-own homes.	☐	☐	☐	☐	☐
4	MI can be trained in private settings (e.g. quiet rooms).	☐	☐	☐	☐	☐

Please write anything else you consider important to the location or place of using MI?

END OF THIS SURVEY

Please write down your initials only and your date of birth (e.g. NA/090678)?

MANY THANKS FOR COMPLETING THIS SURVEY

Appendix 5.2. Copy of the IRB-Nottingham University Research Ethics Committee Letter

University of Nottingham
UK | CHINA | MALAYSIA

Email: FMHS-ResearchEthics@nottingham.ac.uk

Faculty of Medicine & Health Sciences
Research Ethics Committee
c/o Faculty PVC Office
School of Medicine Education Centre
B Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham, NG7 2UH

28 September 2018

Mrs Najla Alhashil
PhD Student
c/o Dr Kate Radford
Associate Professor in Rehabilitation Research
Division of Rehabilitation and Ageing
B102, Medical School
QMC Campus
Nottingham University Hospitals
Nottingham
NG7 2UH

Dear Mrs Alhashil

Ethics Reference No: 102-1809 **– please always quote**	
Study Title: The Use of Mental Imagery (MI) in Stroke Rehabilitation: A Delphi Survey	
Short Title: Mental Imagery in Stroke Rehabilitation: Delphi	
Chief Investigator/Supervisor: Dr Kate Radford, Associate Professor in Rehabilitation Research (Long-Term Conditions), Rehabilitation and Ageing.	
Lead Investigators/student: Mrs Najla Alhashil, PhD student	
Other Key Investigators: Dr Eirini Kontou, Senior Research Fellow, Rehabilitation and Ageing.	
Type of Study: PhD, mixed methods qualitative/quantitative	
Proposed Start Date: 29.09.2018	**Proposed End Date:** 30/03/2019 8 mths
No of Subjects: 10+	**Age:** 18+years

The Committee considered this application at its meeting on 28 September 2018 and the following documents were received:

- FMHS REC Application form and supporting documents Draft 3.0 version 1.0: 10/09/2018

These have been reviewed and are satisfactory and the study has been given a favourable opinion.

A favourable opinion has been given on the understanding that:

1. The protocol agreed is followed and the Committee is informed of any changes using a notice of amendment form (please request a form).
2. The Chair is informed of any serious or unexpected event.
3. An End of Project Progress Report is completed and returned when the study has finished (Please request a form).

Yours sincerely

Professor Ravi Mahajan
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

Appendix 5.3. Copy of Participant Information Sheet

University of Nottingham
UK | CHINA | MALAYSIA

Faculty of Medicine & Health Sciences
School of Medicine
D 1409 Room D Floor
Medical School Campus
Queen's Medical Centre (QMC)
Nottingham, NG7 2UH

Dr Kate Radford
Tel: 00441158230226
Kate.Radford@nottingham.ac.uk
Dr Eirini Kontou
Tel: +44 (0) 115 84 68863
eirini.kontou@nottingham.ac.uk
Najla Alhashil PhD student
Tel: 0044115 8230947
Email: msxna7@nottingham.ac.uk

Local Letterhead to be added

Participant Information Sheet

The Use of Mental Imagery in Stroke Rehabilitation: A Delphi survey

(Final Draft 3.0 Version 1.0: 10/09/2018)

FMHS REC - ETHICS REFERENCE NO: 102-1809

Name of Researcher: **Najla Alhashil (Chief Investigator), Dr Kathryn Radford and Dr Eirini Kontou**

You are being invited to take part in this survey as part of a research study, which aims to develop best practice recommendations for the use of Mental Imagery (MI) in stroke rehabilitation. Before you decide to take part, it is important that you understand why the research is being done and what it would involve for you. Please take the time to read the following information carefully. If any details of the study are unclear, or if you need further information, please let us know by contacting us using the details listed at the end of this sheet. Please take the time to decide whether you wish to take part or not.

What is the purpose of the study?
MI is often used by therapists to help stroke survivors learn and improve their movement skills and recover function. The purpose of this study is to determine the necessary factors (skills and training required for the therapist) and equipment (e.g. video, audio, paper based scripts) required to facilitate the use of mental imagery within stroke rehabilitation. Furthermore to identify the attributes stroke survivors needed to engage with mental imagery within the context of rehabilitation and the necessary skills or training that must therapists have.

The information gathered will help us construct best practice recommendations of MI in stroke rehabilitation.

We hope the study will allow practitioners and other healthcare professionals to understand how to use MI to enhance recovery post-stroke.

Why have I been invited?
You are being invited to take part in this survey because you are either a researcher who has conducted research on MI use or published scientific papers on its use, or a health care professional, who has used MI or instructed others on its use in stroke rehabilitation. We are inviting about 10–12 experts like you to take part.

Do I have to take part?
It is up to you to decide whether you wish to take part in this study or not. If you do decide to take part, you will be asked to sign a consent form and return this to Mrs Najla Alhashil using the contact details provided below. You should also retain a copy of your consent form along with this information sheet. You are free to withdraw from the study at any time without giving a reason.

What will happen to me if I take part?
If you wish to participate in this study, you will receive an email with a survey attachment (word document) and the Bristol Online Survey link. You can chose, which method you prefer to complete the survey. You will also receive biweekly reminder emails. Furthermore, as part of developing consensus, your views will be gathered on three or five separate occasions, which means you might be asked to take part in the same survey more than once, until a consensus is reached. The survey will not take more than 20-30 minutes to complete each time.

Expenses and payments
No expenses will be paid.

What are the possible disadvantages and risks of taking part?
There are no known benefits or risks for you in taking part in this study.

What are the possible benefits of taking part?
The information obtained in the study may provide therapists with insight into factors that affect the use of MI targeted at stroke survivors' recovery in stroke rehabilitation. In addition, any evidence obtained may help design new services or enhance existing stroke rehabilitation services and lead to the development of best practice recommendations for the use of MI with stroke patients.

What happens when the research study ends?
If the study ends, we will report the findings and plan the write up for the PhD thesis.

What if there is a problem?
If you have a concern about any aspect of this study, you can contact the researcher (Mrs Najla Alhashil, Principal Researcher, telephone: 0044115 8230947, email: msxna7@nottingham.ac.uk) who will do her best to answer your questions. If you remain unhappy and wish to make a complaint, please contact the primary supervisor, Dr Kate Radford, telephone: 00441158230226, email: Kate.Radford@nottingham.ac.uk. Additionally, you can contact the Research Ethics Committee Administrator, c/o the University of Nottingham School of Medicine Education

University of Nottingham
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Najla Alhashil PhD student
Tel: 0044115 8230947
Email: msxna7@nottingham.ac.uk

Hospitals, Nottingham, NG7 2UH, telephone: 00441158231009, email: Louise.Sabir@nottingham.ac.uk.

Will my taking part in the study be kept confidential?

The data we collect do not contain any personal information about you, other than some demographic information, such as occupation, years of experience, level of education and number of publications. No-one will be able to link the data you have provided to the identifying information you have supplied. The data will be used only for academic purposes.

What will happen if I don't want to carry on with the study?

Your participation is voluntary and you are free to withdraw at any time, without giving any reason.

What will happen to the results of the research study?

The findings of this study will be used to help generate best practice recommendations for therapists who wish to deliver MI as a technique for enhancing stroke recovery.

Who is organising and funding the research?

The study is organised by the Division of Rehabilitation and Ageing, School of Medicine, University of Nottingham, UK and funded by the University of Imam Abdurrahman Bin Faisal, Saudi Arabia.

Who has reviewed the study?

All research conducted in the University of Nottingham is reviewed by an independent group of people, called a research ethics committee, in order to protect your interests. This study has been reviewed and given a favourable opinion by the ethics committee of the University of Nottingham, Medical School.

Further information and contact details

If you have any questions or concerns about the study or wish to discuss participation, you can contact the principle researcher at the following address:

Mrs Najla Alhashil
PhD Student
University of Nottingham
Division of Rehabilitation and Ageing
D 1409, Floor D, The Medical School Link
Queen's Medical Centre
Nottingham NG7 2UH
+44 (0) 115 82 30947
Email: msxna7@nottingham.ac.uk
Profile page:
https://www.nottingham.ac.uk/medicine/about/rehabilitationageing/people/najla.alhashil

Finally, many thanks for reading this information sheet, which you should retain; if you agree to participate, we will ask you to sign a consent form, a copy of which you will receive.

Appendix 5.4. Copy of Consent Form for Delphi Participant

Faculty of Medicine & Health Sciences
School of Medicine
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Queen's Medical Centre (QMC)
Nottingham, NG7 2UH

University of Nottingham
UK | CHINA | MALAYSIA

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Dr ~~Eirini Kontou~~
Tel: +44 (0) 115 84 66663
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Najla Alhashil PhD student
Tel: 0044115 8230948
Email: msxna7@nottingham.ac.uk

CONSENT FORM – Experts' opinions
(Draft Version 1.0 / Final version 1.0: date 10/09/2018)

Title of Study: The Use of Mental Imagery in Stroke Rehabilitation: A Delphi Survey

Names of Researchers: Najla Alhashil, Prof Kathryn Radford and Dr Eirini Kontou.

IRAS Project ID: FMHS REC - ETHICS REFERENCE NO: 102-1809

Please initial box

Name of Participant:

1. I confirm that I have read and understand the information sheet version number 1.0 dated (10/09/2018) for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time. I understand that should I withdraw then the information collected so far cannot be erased and that this information may still be used in the project analysis. ☐

3. I agree to take part in the above study. ☐

____________________	____________	____________
Name of participant	Date	Signature
____________________	____________	____________
Name of Person taking consent	Date	Signature

Experts Opinions consent form Draft 1.0 Final version 1.0 10/09/2018
Two copies: one for participant, one for the project notes (The Use of Mental Imagery in Stroke Rehabilitation: A Delphi Survey)

Appendix 5.5. Copy of Results of Delphi Round One

	Results of round one.				
Statement	Item	Percentage	Accepted & removed	Re-send to round 2	Importance
How to increase therapist's knowledge (9 items)					
	Shadowing with experts/ colleagues who have used MI in their clinical practice.	88.9%	✓		Important to very important
	Gaining additional qualifications e.g. Modules on MI in taught courses at degree level.	88.9%	✓		Important to very important
	Attending other training courses or workshops.	88.9%	✓		Important to very important
	Reading about MI in scientific papers in peer reviewed journals.	100%	✓		Important to very important
	Reading online and blogs/ publications.	44.4%		⌘	
	Reviewing up-to-date clinical guidelines.	83.3%	✓		Important to very important
	Watching videos explaining how to incorporate MI into practice.	83.3%	✓		Important to very important
	Discussing research findings with colleagues/others (e.g., journal clubs, knowledge exchange meetings with academics)	83.3%	✓		Important to very important
	Practical/ clinical experiences on MI use.	100%	✓		Important to very important