An Exploration of the Acceptance of Telerehabilitation in Saudi Arabia: Physiotherapists' and Patients' Perspectives

Ahmed Alanazi
School of Health Sciences
The University of Nottingham

Supervisors:

Professor Heather Wharrad
Professor of e-Learning and Health Informatics,
Faculty of Medicine & Health Sciences,
The University of Nottingham

Dr Fiona Moffatt
Associate Professor,
Physiotherapy and Rehabilitation Sciences,
Faculty of Medicine & Health Sciences,
The University of Nottingham

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Abstract

Background: Providing long-term treatment and monitoring for patients, especially those with neurological conditions, requires resources which are not always available. Consequently, finding innovative solutions that can ease the financial and physical burden of chronic conditions is essential. Telerehabilitation offers a potential solution to this challenge, and it was widely used during the COVID-19 pandemic, when face-to-face rehabilitation services could not be provided. However, despite its clinical effectiveness, previous studies suggest that its application may be impeded by users' concerns, and an inadequate understanding of the practical implications of the discipline. The number of people with chronic disabilities in the Kingdom of Saudi Arabia (KSA) exceeds one million, and these patients require regular sessions with physiotherapists; however, accessing rehabilitation services can be difficult and costly, especially for those in rural or remote areas. Although telerehabilitation was used in the Saudi healthcare system before the pandemic, no formal framework to support its implementation exists and the potential barriers to its wider adoption in the country have not been clearly identified. As a result, this study explores the acceptance of telerehabilitation among physiotherapists and patients with neurological conditions in KSA and proposes a potential strategy for its nationwide implementation which takes account of the country's large geographic area and its socio-religious context.

Methods: This study adopts a pragmatic philosophical paradigm and employs the Technology Acceptance Model (TAM) and the Unified Theory

of Acceptance and Use of Technology (UTAUT) models to identify the factors which influence Saudi physiotherapists' and patients' acceptance of telerehabilitation. It also utilises Q methodology to gather and analyse the data, introducing a novel online approach to data collection in response to the limits on face-to-face engagement as a result of the pandemic.

Results and discussion: The physiotherapist participants viewed telerehabilitation as beneficial, particularly for patients in rural or isolated areas, but they expressed concerns about data security, and the lack of training and technical support. The use of Q methodology enabled them to be categorised into three attitude-based groups: Advocates, who supported telerehabilitation for its cost-effectiveness; Pragmatists, who were open to healthcare technology but emphasised the need for better patient understanding of the uses of telerehabilitation; and Hesitants, who were uncertain and concerned about missing important clinical information. The patients with MS had varied perspectives, appreciating potential benefits, such as cost savings, but expressing concerns about data security and highlighting the lack of support from family and friends as a potential barrier. These patients were also categorised into three groups: Supporters, who recognised telerehabilitation's benefits but had concerns about a lack of suitable space at home and would prefer to be treated by a physiotherapist of the same gender; Rationalists, who accepted telerehabilitation's potential benefits but who thought more resources were required in order to accept it; and Resisters, who questioned its effectiveness over face-to-face rehabilitation.

Barriers to telerehabilitation acceptance included the lack of *facilitating conditions*, such as training, guidelines, and equipment, *individual differences* such as age, gender knowledge, digital literacy, and medical conditions, and *social influence*, such as lack of support and encouragement from physiotherapists and family and friends to use telerehabilitation. These findings informed the development of a logic model for a strategy to implement telerehabilitation in KSA, which considers religious and cultural beliefs in KSA, and addresses the barriers identified above. The model sets out the desired outcomes, necessary inputs, and activities for physiotherapists, patients and healthcare services. It also lists the short-term, medium-term, and long-term outputs, the assumptions on which the model is based, and the external factors which might affect its implementation, including the rapid rate of social change in KSA.

Conclusion: This study fills a gap in the literature by examining users' perceptions of telerehabilitation in KSA and identifying the barriers to its acceptance among two key stakeholders groups. The logic model contributes to society by outlining a strategy for the implementation of telerehabilitation in KSA, and, potentially, in other countries which share its cultural and religious values. The study also contributes to Q methodology by demonstrating an innovative method for online data collection and evaluating its effectiveness. In addition, the use of Q methodology in combination with the TAM and UTAUT models provides a methodology to assess user acceptance of healthcare technologies which could be used in other contexts. As such, the findings of this study are of

immediate value to policy makers and healthcare providers in KSA, but they also have wider implications. Future research in the Saudi context should focus on the feasibility of the proposed strategy, including cost-benefit analyses and practical trials, and exploring perceptions in other rehabilitation fields, such as occupational and speech therapy.

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List of Abbreviations

BI	Behavioural Intention
EE	Effort Expectancy
FC	Facilitating Conditions
ICT	Information and Communications Technology
ID	Individual Difference
KSA	Kingdom of Saudi Arabia
MoH	Ministry of Health
MS	Multiple Sclerosis
PE	Performance Expectancy
PEoU	Perceived Ease of Use
PU	Perceived Usefulness
SI	Social Influence
TAM	Technology Acceptance Model
UK	United Kingdom
US	United States
UTAUT	Unified Theory of Acceptance and Use of Technology
WHO	World Health Organization

Chapter 1: Introduction

1.1 Introduction

This thesis explores the acceptance of telerehabilitation among physiotherapists and patients with neurological conditions in the Kingdom of Saudi Arabia (KSA) in order to propose a potential strategy for its implementation in the country. Providing long-term treatment and monitoring for patients, especially those with neurological conditions, requires resources which are not always available; consequently, finding innovative solutions that can ease the financial and physical burden of chronic conditions is essential. Telerehabilitation offers a potential solution to this challenge, and there is evidence to support its effectiveness, especially in large countries, such as KSA, where access to healthcare in rural areas can be difficult. However, telerehabilitation has not yet become a well-established practice in the country, with studies indicating that its application may be impeded by users' concerns and an inadequate understanding of the practical implications of the discipline (Appleby et al., 2019, Niknejad et al., 2021). In addition, few published studies have addressed the use of telerehabilitation in KSA, and none consider the perspectives of physiotherapists or patients with neurological conditions, or the ways their views are shaped by the country's Islamic culture.

This research uses the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) models, together with Q methodology (Venkatesh et al., 2003), to investigate the

acceptability of telerehabilitation approaches in KSA in a population of physiotherapists and individuals with multiple sclerosis (MS). The rest of this chapter provides background information for this study, beginning by describing the healthcare system in KSA and the development of digital medicine, including telemedicine and telerehabilitation, in the country. It then provides an overview of MS as an example of a neurological disease, its prevalence and impacts on society in KSA, the use of rehabilitation to support patients with the condition, and the rationale for selecting them for this study. It goes on to discuss the impact of religion, namely Islam, on the healthcare sector in KSA, and how this might also affect telerehabilitation. The chapter concludes by outlining the significance of this study.

1.2 Healthcare System in Saudi Arabia

Saudi Arabia is the largest country in the Middle East and has a total area of over 2.15 million km^2 (Worlddata.info, n.d), making it one of the largest countries in the world. Moreover, the country has experienced significant population growth since the 1970s, reaching almost 34 million in 2021 (Statistics, 2021). In addition, while much of the population now resides in the major cities, notably Riyadh, the capital, and Jeddah, around 24% of Saudi nationals still live in rural areas (UN-Habitat, 2016), where healthcare can be more difficult to access. This has placed a strain on the healthcare services and led to calls for efficient, cost-effective solutions to ensure

accessible and sustainable healthcare across all regions (Almalki et al., 2012).

KSA operates a nationwide healthcare system where the government sponsors health services at no cost to Saudi nationals (Rahman and Alsharqi, 2019). This system is principally divided into three sectors: the Ministry of Health's (MoH) network of hospitals and primary healthcare centres, which are spread across the country; other state-run institutions, such as military or university hospitals, and private sector establishments (Al-Hanawi and Qattan, 2019). The MoH, being the largest healthcare provider, is accountable for more than half of the healthcare services in the country, supplying over 60% of the total (Almasabi, 2013). The remainder, approximately 40%, is provided by other governmental entities and private institutions. The need for healthcare services is increasing, yet studies suggest that the supplied resources remain insufficient (Al Otaibi, 2017), and this limits access to some services. For example, although healthcare is offered free of charge to Saudi nationals, high rates of demand mean that patients often face substantial delays before they can consult specialists (Al-Hanawi et al., 2020, Rahman, 2020). Private healthcare can enable patients to access treatment more quickly; however, costs can be high, and some treatments are not fully covered by private medical insurance. Thus, the country faces significant geographical and logistical challenges in providing healthcare services, particularly in remote and sparsely populated areas which has the potential to contribute to inequalities in health (Asmri et al., 2020).

In response to these challenges, KSA has launched an ambitious plan, known as Saudi Vision 2030, which, among other things, aims to develop the country's healthcare sector in line with international standards (Rahman and Al-Borie, 2021). This Vision, published in 2016, outlines a clear strategy to develop the necessary infrastructure and foster an environment that allows the public, private, and non-profit sectors to contribute to achieving economic development while devolving away from oil dependency by 2030 (Nurunnabi, 2017). As part of this initiative, the Digital Government Authority in KSA launched the "National Transformation Program" with a focus on providing integrated digital services to various sectors, including healthcare (Alharbi, 2018, Moshashai et al., 2020). The Saudi government directed the Ministry of Health (MoH) to deliver high-quality services and ensure coverage across the country, leading the MoH to initiate several projects to modernize health services using advanced technology (Noor, 2019). These include a digital health programme, which aims to harness technology to enhance healthcare services, including the integration of telehealth into the Saudi healthcare system (Hassounah et al., 2020).

1.3 Digital Health

According to the WHO (2020), digital health has the potential to promote equal access to good healthcare, make health systems more efficient, and support all parts of care, from disease prevention to end-of-life care. Different technologies, such as the Internet of Things, virtual care, remote monitoring, artificial intelligence, and big data analytics, can improve how

we diagnose diseases, make treatment choices, use digital therapies, run clinical trials, and manage care (Davenport and Kalakota, 2019). These technologies can also give healthcare professionals more evidence-based knowledge and skills, which leads to better healthcare overall (Latif et al., 2020). As a result, digital health has become an important part of healthcare goals globally (Fagherazzi et al., 2020). However, its full benefits can only be realised if it is delivered in an equitable, reliable, and sustained manner, with an emphasis on keeping data safe and secure (Brall et al., 2019, Jandoo, 2020). This requires support in terms of leadership, organizational structures, and workforce development (WHO, 2020).

1.3.1 Digital health in Saudi Arabia

Digital health has emerged as a transformative force within the healthcare sector in KSA, reflecting a significant shift towards technology-based healthcare solutions worldwide (MoH, 2018). This was partly inspired by the World Health Assembly (2005), who asked countries to make a plan for using technology in healthcare, and the United Nations General Assembly (2015) who recognised that digital technology could make health information and services cheaper and easier to reach (WHO, 2020). In response, the Saudi MoH has implemented a number of digital health initiatives, primarily aimed at improving the accessibility and quality of healthcare services (Al-Kahtani et al., 2022). These include the 'Mawid' and 'Seha' mobile applications, which provide patients with a digital platform for booking appointments and consulting healthcare professionals remotely, respectively (Alkhalifah et al., 2022), and, more recently, the

Seha virtual hospital, which uses innovative technologies to provide emergency, critical and specialised support to 130 hospitals across KSA (MoH, 2022)

Given the novelty of these innovations, there has been little research to date examining users' attitudes towards, them. However, within the context of this research, studies by Alharbi et al. (2021) and Alanzi et al. (2022) are noteworthy. Alharbi et al. (2021) conducted a cross-sectional study which aimed to assess patient satisfaction with the Seha mobile application. They found that the application had contributed to improved delivery and access to healthcare services in KSA, but that users' acceptance was influenced by their age, gender and the availability of technical support. However, the study did not consider concerns about data privacy, which has been identified as a key issue in relation to digital health (WHO, 2020). Alanzi et al. (2022) assessed the users' acceptance of the Mawid application during the COVID-19 outbreak; they found that it was an effective method to book appointments but that users raised concerns regarding the availability of stable internet connections and the clarity of the steps to book the appointments. In this case, concerns were also expressed about their data privacy (Alanzi et al., 2022).

1.4 Telemedicine

Telemedicine has been defined as "the use of telecommunication and information technology for the purpose of providing remote health assessments and therapeutic interventions. This could include video or

voice messaging services on mobile phones, computers, and tablets" (NHS, 2023). It offers an important means of extending healthcare services to wider geographical areas, especially to those in remote, rural locations (Ekeland et al., 2010, Nittari et al., 2020), and providing diagnoses, consultations, mentoring, and treatment for those who may ordinarily struggle to access these services (Wootton et al., 2006, Wootton et al., 2017). Another benefit associated with telemedicine may be seen in patients with chronic diseases where some signs and symptoms can be recorded at home, which may not necessarily be captured during clinical visits (Barlow et al., 2007, Li et al., 2021).

Telemedicine was used in KSA before the launch of the digital initiatives under Vision 2030, and the Saudi Telemedicine Network (STN) was founded in 2011 with the aim of establishing a roadmap for its use. Despite their subsequent collaborations with international telemedicine networks, such as Canada Health Infoway and Ontario Telemedicine Network (Alaboudi et al., 2015, Alshahrani et al., 2019), the research conducted for this study could identify no official guidelines for the use of telemedicine in KSA or any specialist training. However, a number of studies were identified which have explored the acceptance of telemedicine in the country, and those which are relevant to this research are discussed in the literature review chapter (See Chapter 2).

1.5 Telerehabilitation

The WHO delineates telerehabilitation as an intervention that delivers rehabilitation sessions at a distance using telecommunications, including telephone, emails, video calls, the Internet and virtual reality (WHO, 2016). These enable various rehabilitation services to be delivered, such as assessment, intervention, consultation, monitoring and education (Khan et al., 2015, Peretti et al., 2017, Seron et al., 2021). However, this thesis primarily focuses on a specific aspect of telerehabilitation: remote consultations that involve prescribing exercises through video or online platforms. Telerehabilitation aims to improve patient care by reducing the time and costs linked to this form of treatment, notably by reducing travelling time and costs for patients and for healthcare professionals who conduct domiciliary sessions (Dhurjaty, 2004, Kairy et al., 2009, McCue et al., 2010, Shaw et al., 2021). Furthermore, it can enable the discharge from hospital of inpatients who only need rehabilitation sessions as therapeutic sessions can be offered to them at their homes via telerehabilitation (Burdea, 2003, Dinesen et al., 2012, Zanaboni et al., 2016). In terms of its application, telerehabilitation has been used for different clinical purposes; for example, speech therapists have used it for assessing and treating neurological patients with speech disorders (Brennan et al., 2004, Mulfari et al., 2022), whilst occupational therapists have used it to supervise and monitor their patients, to encourage them to increase their physical activity, and improve their compliance with

rehabilitation plans (Keaton et al., 2004, Bezuidenhout et al., 2022, Fjeldstad-Pardo et al., 2018).

However, telerehabilitation is not designed to fully replace conventional rehabilitation, but rather to supplement existing provision (Rollnik et al., 2017). While there is evidence that face-to-face rehabilitation produces positive outcomes in terms of improving the quality of life, physical activity and fatigue in patients with chronic physical disabilities (Khan and Amatya, 2017), telerehabilitation appears to offers a way to overcome some of the barriers associated with conventional rehabilitation techniques that can affect patient compliance and adherence to rehabilitation plans (Anton et al., 2018). These include lack of access to healthcare services in rural areas and the difficulties some patients may have attending outpatient clinics due to their condition (Dávalos et al., 2009). As a result, telerehabilitation is particularly recommended in larger countries where the distance between where people live and healthcare services is considerable (Laver et al., 2013). Telerehabilitation therefore appears to offer a cost-effective solution to address the challenges regarding significant population growth and providing healthcare services in KSA, particularly in remote and sparsely populated areas. However, the question of whether it will be accepted by patients and practitioners in the country has yet to be fully explored.

1.5.1 The impact of COVID-19 on telerehabilitation services

The post-pandemic period provides a particularly valuable opportunity to assess attitudes towards telerehabilitation, as the COVID-19 pandemic saw

a transformation in the way rehabilitation services were delivered. Declared by the World Health Organization (WHO) in March 2020, the pandemic has had significant global impacts, transforming many aspects of life, including healthcare delivery (WHO, 2020). In particular, rehabilitation services faced unique challenges given their inherent reliance on physical interactions for assessments and interventions. The virus, primarily transmitted through direct, indirect, or close contact with infected people, necessitated social distancing and lockdown measures (Centers for Disease Control and Prevention, 2020). Therefore, many outpatient rehabilitation facilities had to reduce their services or close temporarily, particularly during the peak of the pandemic (Chang and Park, 2020). This led to delayed or disrupted care for patients, including those who required rehabilitation services for orthopaedic conditions or neurological disorders (Boldrini et al., 2020, Negrini et al., 2020). Inpatient rehabilitation also faced challenges. Strict infection prevention and control measures had to be implemented in inpatient rehabilitation to protect both patients and healthcare professionals (Wasilewski et al., 2022), and, in some cases, rehabilitation units or wards were repurposed for acute COVID-19 care (Thau et al., 2021). Furthermore, some patients were unable or unwilling to access rehabilitation services in person due to concerns about COVID-19 exposure (Lugo-Agudelo et al., 2021).

In response to the pandemic restrictions, many rehabilitation services had to quickly shift from in-person sessions to virtual sessions, including employing telerehabilitation technologies to deliver support (Wade, 2020).

This prompted the acceleration of technological adaptations and the widespread implementation of telerehabilitation solutions (Signal et al., 2020). However, it also necessitated new operational processes, with both practitioners and patients adjusting to new ways of delivering care, with little opportunity to provide them with training or support with equipment, at least in the short term.

1.5.1.1 Examining the use of telerehabilitation during COVID-19

As the WHO (2020) reported, while telemedicine was used before COVID-19, it took on a new significance during lockdown periods when face-to-face forms of healthcare were restricted. As a result, this study focuses on the period between March 2020, when the pandemic was declared, and December 2022, after the lockdown periods were over, to explore the acceptance of telerehabilitation among physiotherapists and patients in KSA, and the measures required to support its usage and development post-pandemic. By collecting and analysing data during this period, this study responds to calls for the challenges associated with the use of telerehabilitation, and other forms of telemedicine, during the pandemic to be identified, and remedial strategies proposed in order to support their wider usage and development in the post-pandemic period (WHO, 2020).

1.6 Overview of Neurological Diseases and Multiple Sclerosis

Neurological diseases are the second largest cause of morbidity and mortality worldwide after heart disease (Feigin et al., 2019), and they affect not only individuals, but also families, caregivers, and wider society (Feigin

and Vos, 2019). Furthermore, there is the added burden placed on the healthcare system, which increases as the number of patients with these conditions rises (Carroll, 2019). This issue is particularly significant in KSA, given its size and its increasing population (General Authority for Statics in KSA, 2019). A study conducted some 20 years ago by Al-Turaiki (2000) highlighted that approximately 3.7% of the Saudi population were affected by chronic disabilities, and a more recent study by Bindawas and Vennu (2018) confirmed a broadly similar figure (3.3% of the total population), with the most common type of disability being physical.

Multiple sclerosis (MS) is a chronic autoimmune neurodegenerative disease that affects the central nervous system, being the most common non-traumatic condition (Dobson and Giovannoni, 2019). The causes of MS are still uncertain, but a number of potential causes have been highlighted, including lack of sunlight and vitamin D, smoking, obesity, infections and genetic predisposition (Niedziela et al., 2014, Amato et al., 2019, Stys and Tsutsui, 2019). The number of patients with MS stands at approximately two and a half million worldwide, and it is more prevalent among young females, with a ratio of 2:1 in relation to its prevalence to males (Bezzini and Battaglia, 2017, Walton et al., 2020). MS can occur at any age but is most commonly diagnosed between 20 and 50 years old, and the median age of MS onset is typically around 30 years old (Howard et al., 2016). MS is considered a progressive disease, where symptoms tend to become worse with time, and patients live their entire life with the condition (Oh et al., 2018). This fact alone necessitates the need for quality rehabilitation

services that can help to manage the symptoms of MS and delay the onset of complications (Amatya et al., 2019).

In the context of Saudi Arabia, research suggests that the incidence of MS has increased significantly in recent decades, rising from 25 cases for every 100,000 people in 1988 (Yaqub and Daif) to 40.40 in every 100,000 by 2020 (AlJumah et al., 2020). According to AlJumah et al. (2020), the incidence among Saudi nationals was higher still at 60.95 in every 100,000, making them particularly worthy of investigation. The female-to-male ratio among the general population was found to be similar to the global ratio of 2:1, and 77% of patients were 40 years old or younger (AlJumah et al., 2020). Research exploring the quality of care for MS patients in KSA is scarce; however, a study by Al-Jadid (2013) found that only 1% of neurological patients in KSA have received what might be regarded as adequate healthcare and rehabilitation services, due in part to a major shortage of inpatient rehabilitation beds in the country, with around 8,000 more beds being required for neurological patients alone. In addition, Albejaidi (2010) highlighted a shortfall in the number of rehabilitation and medical centres required as a result of an increase in the number of road traffic accidents and the prevalence of neurological diseases in KSA. In this context, it is clear that the development of creative, affordable and viable solutions that can reduce the impact of neurological diseases on patients, families, caregivers, society and the healthcare system is urgently needed.

1.6.1 Rehabilitation for MS patients

The aim of rehabilitation in MS is to reduce its impact by helping patients to be independent in active daily living and increasing participation in their communities (Centonze et al., 2020). The general recommendation suggests having regular assessments in order to follow up the disease progression and monitor the patients' needs (Yamout et al., 2020). This includes support to enhance the general health of MS patients, which includes their psychological, physical and cognitive functions (Kim et al., 2019, Wendrich et al., 2019). Research indicates that early intervention is essential for patients who are newly diagnosed with MS (Riemenschneider et al., 2018) so providing timely access to treatment is important. However, selecting an appropriate starting point for the rehabilitation sessions is linked to the severity of the disease, the individual's current level of function and also their goals (Momsen et al., 2022), so rehabilitation plans vary according to the needs of each patient (Kesselring and Beer, 2005, Iodice et al., 2022). The use of physiotherapy has been shown to be effective where the range of motion of joints, muscles weakness, pain and general fatigue can all be enhanced (Latimer-Cheung et al., 2013), and collaboration between physiotherapists and MS patients can lead to an improvement in the psychological and physical functions of patients (Soelberg Sorensen et al., 2019). However, a Cochrane review conducted by Amatya et al. (2019) demonstrated that sustained engagement in rehabilitation sessions, in both inpatient and outpatient settings, may be required to achieve such improvements.

1.6.2 The rationale for selecting MS for this research

The choice of MS as an example of a neurological condition in this research was guided by two main factors: firstly, MS encompasses a wide range of neurological symptoms, such as issues with mobility, balance, pain, and fatigue (Dobson and Giovannoni, 2019). Therefore, by focusing on MS, the study can explore the acceptance of telerehabilitation across a spectrum of symptoms that are relevant to many other neurological conditions. Secondly, the median age of MS onset is typically around 30 years old, but the life expectancy for people with MS is only a few years less than in the general population (Hosseini et al., 2022). This makes this group a particularly useful example to examine, as they typically require longer-term treatment and management after diagnosis than a number of other conditions (Amatya et al., 2019). In addition, the median age suggests that patients with MS are more likely to include both digital natives and older people, who may not be as comfortable with technology, than other groups who require physiotherapy (Lavorgna et al., 2018).

1.7 The Influence of Religion on Healthcare in Saudi Arabia

As the birthplace of Islam, religion plays an important role in Saudi society, and it also exerts a strong influence on the healthcare system in KSA (Al-Shahri, 2002). Indeed, research indicates that Islam, as the predominant religion, shapes healthcare practices and policies significantly (Aldossary et al., 2008). For example, Islamic teachings regarding health and well-being, such as the importance of cleanliness, the prevention of harm, and the

preservation of life, have been shown to affect healthcare delivery (Halligan, 2006) and the principles of modesty and gender segregation within Islam have led to the implementation of gender-specific healthcare facilities and services (Aldosari, 2017), meaning men and women often have separate waiting areas, examination rooms, and hospital wards (Littlewood and Yousuf, 2000). While no previous studies have investigated the impact of Islamic beliefs and practices on telerehabilitation services in KSA, the researcher's experience as a physiotherapist in the country suggests that they are likely to be just as significant when services are delivered remotely.

1.8 Significance of the Study

Despite the significant progress that has been made in modernising the Saudi healthcare system, the large size of the country and the rising population can make it difficult to provide timely and effective healthcare services, especially in rural areas. This presents a particular challenge for individuals suffering from neurological conditions, such as MS, who typically require regular treatment over sustained periods, especially those who cannot access healthcare centres easily. The benefits associated with telerehabilitation suggest that it could provide an effective means to support these patients (Cherry et al., 2017); however, despite its increased use during the COVID-19 pandemic, little is understood about how patients and physiotherapists in KSA perceive telerehabilitation, and whether they would be willing to use it now the pandemic restrictions have been lifted.

In addition, although the Saudi Telemedicine Network was established in 2011 to create a roadmap for the implementation of telemedicine in the country, no official policies or formal guidelines governing its use could be identified by the researcher; this suggest that a comprehensive strategy to permanently incorporate telerehabilitation into the Saudi healthcare has not yet been established.

This study explores the factors which influence the acceptance of telerehabilitation among physiotherapists and patients with neurological conditions in KSA and proposes a strategy for its implementation in the country. Based on a review of the literature and the findings of two Q studies, it identifies the key drivers and barriers affecting acceptance of telerehabilitation in KSA and provides an evidence-based solution which takes account of cultural and religious beliefs in the country. In doing so, it provides valuable insights which can be used to guide and shape the future of telerehabilitation in KSA, enabling policymakers and healthcare providers to create more efficient systems that are tailored to the actual needs of both patients and healthcare professionals.

In conclusion, this chapter has introduced this study and explained the Saudi context in which it is set. It has described the healthcare system in KSA and the growth of digital health in the country. It has defined telerehabilitation as a branch of telemedicine, and explained the impact of the COVID-19 pandemic on its use. It has also provided a brief overview of neurological diseases, including their prevalence in KSA, and explained why

patients with MS were selected alongside physiotherapists as the focus of this study. The impact of Islamic beliefs and practices on the Saudi healthcare sector has also been described, and these have been identified as a potential barrier to the wider use of telerehabilitation. The chapter has concluded by highlighting the significance of the study. The next chapter provides a review of recent literature exploring user attitudes towards telerehabilitation, with a focus on the COVID-19 period.

Chapter 2: Literature Review

2.1 Introduction

Despite evidence suggesting the effectiveness of telerehabilitation (Khan et al., 2015, Peretti et al., 2017, Seron et al., 2021) and its rise to prominence during the COVID-19 pandemic, previous studies have suggested that its wider application may be impeded by users' concerns, and an inadequate understanding of the practical implications of the discipline (Scott Kruse et al., 2018). Although factors including clinical and cost effectiveness have been associated with the longer-term success and viability of telemedicine (Cherney and Van Vuuren, 2012); the aspects that influence users' acceptance of telerehabilitation most significantly have not yet been clearly identified (Niknejad et al., 2021). In order to identify the factors that affect the acceptance of telerehabilitation in Saudi Arabia, it is helpful to explore the challenges experienced by practitioners and patients in other countries and to compare them with the Saudi context. Therefore, this chapter begins by examining recent literature exploring user attitudes towards telerehabilitation around the world, paying particular attention to studies in other Gulf region countries, namely Kuwait and Iran, as they share many of the social, cultural, and religious features which characterise Saudi society. The methodology and key findings are discussed, emerging themes are identified, and conclusions are drawn at the end of each section. The chapter then explores research conducted within Saudi Arabia itself and

identifies the themes and factors that influence the acceptance of telerehabilitation, and telemedicine more broadly, within the country.

The recent COVID-19 pandemic provides an unprecedented opportunity to study the use of telerehabilitation. With face-to-face contact severely restricted in many countries by nationwide 'lockdowns', telerehabilitation, and other forms of telemedicine, provided a valuable way to support patients in a variety of medical contexts. As a result, this chapter examines studies conducted both before, during, and after the main COVID-19 lockdown periods, and considers whether there are any significant differences in their findings. However, while a number of studies have examined the use of telerehabilitation in the context of COVID-19, published research on telerehabilitation in KSA is very limited. Therefore, there was a need to broaden the scope to include studies exploring the use of telemedicine more broadly in order to help to identify the contextual factors that influence Saudi users' acceptance of telerehabilitation.

The overall aims of the literature review and the type of review presented are set out below. After that, the chapter explores the perceptions and acceptance of telerehabilitation by medical rehabilitation practitioners and patients during or after the COVID-19 pandemic, in developed and developing country contexts, and in the Gulf region in particular. The focus then shifts to KSA, where the attitudes of key user groups (patients and healthcare professionals) towards the use of telemedicine are considered. The themes and factors that influence use and acceptance in the country

are identified, and the influence of religion, culture, and social beliefs on acceptance of telerehabilitation and telemedicine more broadly are discussed. The chapter concludes by presenting the gap in the literature that this thesis seeks to fill and sets out its significance.

2.2 Aims of the Literature Review

The aims in conducting this literature review were three-fold. The first was to review the literature on the use of telerehabilitation during COVID-19, in both developed and developing country contexts, in order to identify the factors which influence users' acceptance of telerehabilitation and the barriers to wider user acceptance. The second aim was to review studies conducted in KSA to identify the contextual factors, notably cultural and religious beliefs, which could influence Saudi users' acceptance of telerehabilitation, based on their attitudes to telemedicine more broadly. The third aim was to identify gaps in the literature to guide the development of this study and the research questions. In addition, the methods and methodologies used in the studies reviewed here informed decisions about the most appropriate methodology for this study, and, once Q methodology had been selected, the literature review provided a concourse for use in the two Q studies (See Chapter 4).

2.3 Type of Literature Review

This chapter provides a narrative review of the literature rather than a systematic or scoping review. This approach was selected because the topic

being explored is relatively new and the number of available studies is limited, especially in the Saudi context. Therefore, it was necessary to broaden the scope beyond studies which explored telerehabilitation to include those which addressed telemedicine more broadly and which were conducted before the pandemic. As a result, the focus of and participants in the available studies were not homogeneous, making it difficult to establish clear inclusion or exclusion criteria. However, a systematic approach was used to select the studies included, and this is explained in the next section.

2.4 Search Strategy Adopted

In considering areas of relevance to this thesis, the different forms of telemedicine and their sub-groups were identified, with a focus on those specifically linked to telerehabilitation. The keywords of 'telemedicine', 'telerehabilitation', 'telecare', 'telehealth', and 'telephysiotherapy' were selected and applied with relevant search terms in order to identify published studies that explored the acceptance of telerehabilitation. The dates of March 2020 (the start of the pandemic) until the end of 2022 were set to identify studies which targeted the period during and after the COVID-19 lockdowns. The end date was also selected based on the time limits imposed by this doctoral research study. However, there were no set dates for studies that explored users' acceptance of telerehabilitation and telemedicine in KSA, and all available published studies were included to provide a more comprehensive picture of the context. The following

databases were used to identify articles and studies linked to this research: MEDLINE, CINAHL, EMBASE, PubMed, Web of Science (WoS), Allied and Complementary Medicine Database (AMED) and Cochrane Central Register of Controlled Trials (CENTRAL). In addition to the studies identified from these databases, the references used in those studies were also searched to find further studies that may be relevant to the review, forming part of those considered eligible for text screening. From the databases and the further searches conducted, a total of 23 studies were identified for inclusion in the literature review. 15 studies targeted the acceptance of telerehabilitation before, during and after the COVID-19 lockdowns (See Figure 2-1) and eight targeted the uses of telerehabilitation and telemedicine in KSA specifically (See Figure 2-2). These are discussed in the following sections.

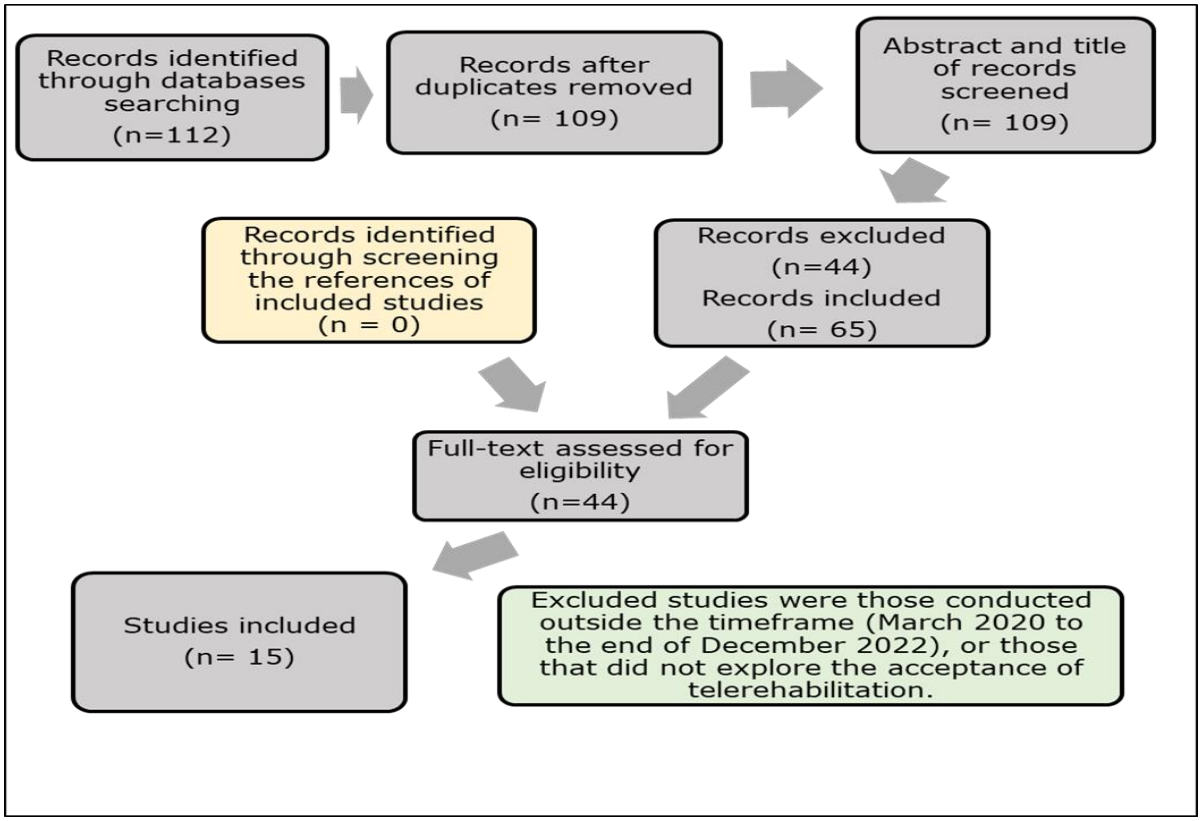

Figure 2-1: Process for selecting telerehabilitation studies during Covid-19

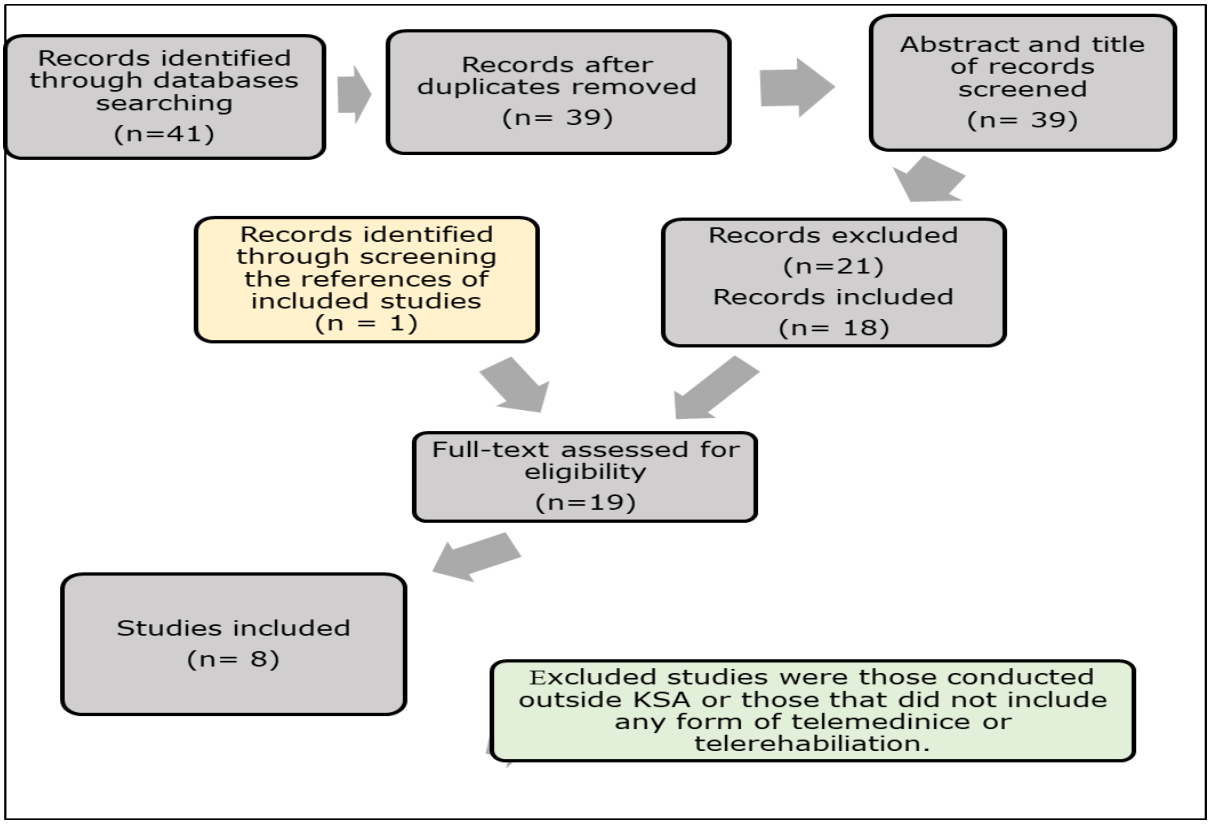

Figure 2-2: Process for selecting Saudi studies

2.5 Acceptance of Telerehabilitation During the COVID-19 Pandemic

This section focuses on studies that explore the perceptions and acceptance of telerehabilitation among medical rehabilitation practitioners and patients during and after the COVID-19 lockdowns. Studies conducted in developed countries or regions (namely, Europe, the United States [US], and Australia) are presented first, followed by those from developing countries or regions (namely Asia and Africa), then studies from countries which are near neighbours of KSA and share similar cultural and religious contexts, namely, Kuwait and Iran, are considered.

2.5.1 Acceptance in developed countries

Five studies exploring the acceptance of telerehabilitation in six European countries were published within the date range specified. These included the United Kingdom (UK) (Buckingham et al., 2022), Italy (Milani et al., 2021), Belgium and France (Dierick et al., 2021), Switzerland (Rausch et al., 2021) and Austria (Rettinger et al., 2021). Two studies came from the US (Saaei and Klappa, 2021, Sprianu et al., 2022), and one from Australia (Bennell et al., 2021). Table 2-1 below summarises these studies, detailing the country where each was conducted, the methods used, the participants involved, as well as the aim, findings, challenges identified, and the recommendations of each study.

All the studies aimed to explore the perceptions, feasibility, and attitudes towards telerehabilitation, especially during the COVID-19 lockdown period, among healthcare practitioners and patients. Overall, attitudes toward using telerehabilitation were generally positive; however, some resistance was identified, among both patients and practitioners.

In the UK, Buckingham et al., (2022) reported the findings of a cross-sectional study which explored the current uses of and the potential need for telerehabilitation in the UK. 247 healthcare practitioners, 72% of whom were physiotherapists and occupational therapists, were invited to participate in an online questionnaire, and most reported feeling more confident when they delivered video telerehabilitation consultation than in physical assessment session.

Table 2-1: Summary of the studies in developed countries

#	Author	Country	Sample	Design and methods	Emerging themes and challenges
1	Buckingham et al., 2022	UK	247 healthcare practitioners	Cross-sectional study	- Increased use of telerehab. since COVID-19. - Lack of training. - Lack of clear guidelines. - Cost of equipment. - Internet connections.
2	Milani et al., (2021)	Italy	23 patients	Cross-sectional study	- Patients' age. - Internet connections.
3	(Saaei and Klappa, 2021).	US	- 228 physiotherapists - 61 patients	Survey	- Increased use of telerehab. since COVID-19. - Lack of support. - Patients' digital literacy. - Official platform. - Privacy of data.
4	Sprianu et al., 2022	US	- 152 healthcare practitioners.	Questionnaire	- Lack of support. - Patients' digital literacy
5	Rettinger et al. (2021)	Austria	- 325 physiotherapists	Survey	- Lack of a clear framework.
6	Bennell et al. (2021)	Australia	- 207 physiotherapists - 401 patients	- Surveys - Qualitative open-ended questions	- Not suitable for all medical conditions. - Insurance coverage. - Cost.
7	(Dierick et al., 2021)	Belgium and France	- 107 physiotherapists - 68 patients	Questionnaire	- Lack of training. - Lack of clear guidelines.
8	(Rausch et al., 2021),	Switzerland	742 physiotherapists	Cross-sectional study	- Increased use of telerehab. since COVID -19. - Lack of training. - Lack of clear guidelines.

In addition, Rettinger et al. (2021) investigated the attitudes of physiotherapists, occupational therapists, and speech therapists toward telerehabilitation during the COVID-19 lockdown in Austria. They used an online survey to collect data from 325 participants and found they that physiotherapists reported positive attitude towards telerehabilitation.

In the US, Sprianu et al. (2022) followed Rettinger et al. (2021) by assessing the impact and advantages of using telerehabilitation during the COVID-19 lockdown in three areas: physiotherapy, occupational therapy, and speech-language therapy. They used questionnaires to collect their study data and received responses from 152 therapists. In addition, Saaei and Klappa (2021) conducted a survey with the aim of evaluating the attitudes of both physiotherapists and patients who visited an outpatients' clinic toward telerehabilitation. They received 228 responses from the physiotherapists and 61 from the patients. Positive attitudes towards telerehabilitation were reported in both studies and a number of advantages were identified: increased access to healthcare services, saving therapists’ time, and improved adherence to the patients’ rehabilitation plans.

In addition, in Australia, a mixed-methods study was conducted by Bennell et al. (2021) to explore the experiences of physiotherapists and patients who used video-based telerehabilitation during the COVID-19 outbreak. They used online surveys and qualitative open-ended

questions and received responses from 207 physiotherapists and 401 patients. They found that the majority of the patients considered the quality of telerehabilitation sessions via video to be the same or better than face-to-face sessions due to convenience, time saving, ease of access, and receiving more attention from the physiotherapists.

However, not all studies identified such positive perceptions. For example, Milani et al. (2021) conducted a study to test the acceptance of telerehabilitation during COVID-19 lockdown among patients with physical disabilities in Italy. 23 patients who were enrolled in a physiotherapy programme were asked if they were willing to receive telerehabilitation via video, and, while 11 agreed to take part in telerehabilitation video sessions, 12 refused. Among the participants who refused telerehabilitation, four said they didn't think it was useful for them, four did not have an internet connection at home, and four were unable to use any smart devices. The authors concluded that although telerehabilitation offered a good alternative intervention during the lockdown, the patients preferred face-to-face sessions.

Studies in Belgium and France (Dierick et al., 2021) and Switzerland (Rausch et al., 2021) also reported negative perceptions of telerehabilitation. Dierick et al. (2021) explored the intentions of physiotherapists and patients with musculoskeletal disorders towards using telerehabilitation during the second lockdown. Data were collected using an online questionnaire which was completed by 107

physiotherapists and 68 patients. They found that both patients and physiotherapists reported that they were not willing to use telerehabilitation in the future, although the patients were slightly more optimistic about possible future engagement. Rausch et al. (2021) conducted cross-sectional study to investigate the views of Swiss physiotherapists about using technologies to deliver 'remote therapy' to their patients during the COVID-19 lockdown. They surveyed 742 physiotherapists and they found that they did not believe that telerehabilitation was a suitable complement to conventional face-to-face physiotherapy in clinical settings and they did not intend to implement it after the lockdown period (Dierick et al., 2021). This might be due to the resistance to change and adopting new technology and the lack of confidence and interest in telerehabilitation as it was reported in both studies that the vast majority of participants had never used telerehabilitation before.

2.5.1.1 Emerging themes and challenges

A number of clear themes emerge from the studies in developed countries, including specific challenges to the use of telerehabilitation.

a) Increased use of telerehabilitation due to the COVID-19 pandemic

The increased use of telerehabilitation due to the COVID-19 pandemic is a consistent theme in many, notably in Switzerland, where a substantial increase was reported. Before the lockdown, only about 4% of physiotherapists had used such technologies with their patients, but this

rose to about 45% during the lockdown (Rausch et al., 2021). In the UK, by contrast, the vast majority of participants had already used video telerehabilitation sessions with their patients; however, usage had increased due to the COVID-19 lockdown (Buckingham et al., 2022). Equally, in the US, a large majority (73%) of physiotherapists indicated that the use of telerehabilitation methods had increased during the pandemic due to the lockdown, with 97% incorporating telerehabilitation sessions into their daily routine during this period (Saaei and Klappa, 2021).

b) Lack of specialist training

Despite the increased usage, the lack of specialist training for both therapists and patients was a common concern across almost all the countries. For example, in the UK, where telerehabilitation use was relatively high, only 19% of practitioners had received training on its uses (Buckingham et al., 2022). In Belgium and France, training provision was listed as one of the recommendations, both for patients and physiotherapists, to overcome resistance to change and enhance the positive perceptions of telerehabilitation (Dierick et al., 2021). In Switzerland comprehensive training and education were also recommended to address limited confidence and interest in telerehabilitation among physiotherapists (Rausch et al., 2021). In the US, Sprianu et al. (2022) found that the switch to telerehabilitation services during the pandemic had provided a range of benefits, but that over 40% of participants reported they had not received adequate

training. Overall, these studies suggest that providing training in the use of telerehabilitation could help to optimize the benefits of telerehabilitation, improve its acceptance among healthcare practitioners and patients, and ensure its effective implementation.

c) Need for clear protocols and guidelines

The need for standardized guidelines, regulations, and protocols and the lack of clear legal frameworks for telerehabilitation were also identified in the UK and Austrian studies. Buckingham et al. (2022) emphasized that despite the increasing use and potential benefits of telerehabilitation in the UK, there was an urgent need for specialist resources and standardized guidelines. This need for clear protocols was similarly identified by Rettinger et al. (2021) in Austria. Meanwhile, Saaei and Klappa (2021) and Sprianu et al. (2022) highlighted the lack of available technical support as a significant challenge in the US contexts, underlining the need to provide technological training as well. These findings suggest a need for more robust education and training programmes that emphasize evidence-based practice in respect of telerehabilitation and also address technical support requirements.

d) Patients' individual characteristics

Themes relating to patients' characteristics, including age, cognitive ability, and technological ability also emerged from the studies in Italy, Australia, and the US. In the Italian study, Milani et al. (2021) found that younger patients and those with better cognitive functions were more

familiar with using technology and more likely to choose the video option. Furthermore, in the Australian study by Bennell et al. (2021), physiotherapists found that video telerehabilitation sessions were not the right option for all of their patients, presumably due to the specific characteristics of each case or disease. Meanwhile, in the US, Saaei and Klappa (2021) reported that technology illiteracy was one of the challenges encountered with patients when implementing telerehabilitation, and Sprianu et al. (2022) also identified technology challenges for patients as a primary obstacle.

e) Data security

The privacy of patients' data also emerged as an important theme, notably in the study by Saaei and Klappa (2021) in the US in which concerns about security of data were explicitly mentioned. Although this issue was not prominent in the European studies, this is likely to reflect the fact that strict personal data regulations already exist within the EU (European Council, n.d.) rather than a lack of awareness about the importance of data protection.

f) Costs

The cost associated with rehabilitation services was also an emerging theme. For instance, the question of whether insurance companies would fund telerehabilitation emerged from the Austrian study, and, while physiotherapists in Australia were able to reduce the price of the sessions when they were delivered remotely (Bennell et al. 2021), the provision

of necessary equipment and resources for telerehabilitation was reported to be a challenge in the UK (Buckingham et al., 2022). This points to broader cost-related issues since acquiring appropriate devices and maintaining reliable internet connections involves expenses. In addition, in the US study, the need for an official platform to run remote sessions was mentioned (Saaei and Klappa, 2021), and, depending on the specific platform, this could require substantial financial resources.

g) Internet connectivity

The strength and reliability of internet connections were also identified as a significant challenge. In the UK study by Buckingham et al. (2022), the strength of the internet connections was reported as one of the main challenges. Similarly, among Italian patients with physical disabilities who refused telerehabilitation in the Milani et al. (2021) study, a lack of internet connectivity was a primary reason. This suggests that the availability and quality of internet access may significantly impact the effectiveness and feasibility of telerehabilitation, as poor or inconsistent internet connections could hinder communication, reduce the quality of therapy sessions, and limit the accessibility of these services.

The findings from these studies reveal divided opinions about the effectiveness of telerehabilitation. While the majority (Buckingham et al., 2022; Milani et al., 2021; Rettinger et al., 2021; Saaei and Klappa, 2021; Sprianu et al., 2022; Bennell et al., 2021) report positive perceptions, Dierick et al. (2021) and Rausch et al. (2021) reported negative

perceptions overall. While all the studies reported increased use of telerehabilitation due to COVID-19 pandemic, a number of significant obstacles to its widespread adoption remain. These include a lack of training, the need for standardized guidelines and legal frameworks, patients' characteristics influencing telerehabilitation usage, costs and insurance coverage, data security and privacy, and the reliability of internet connections.

Despite their status as developed nations with advanced healthcare systems and strong legislative systems, these studies suggest that, whilst telerehabilitation has become more established as a result of the pandemic, there are still issues to address. The lack of clear legal frameworks covering telerehabilitation and standardised guidelines in these countries means they cannot provide models of good practice for other countries to follow in this regard, so further research is required. However, these studies have helped this thesis consider the following issues: the importance of exploring the barriers to using telerehabilitation in the country of the study, secondly, the need to include participants of both genders, different ages, and areas of telerehabilitation (physiotherapy, occupational therapy and speech therapy); and finally, the need to focus on a specific population instead of a general population (Stroke, Multiple sclerosis and Parkinson).

2.5.2 Acceptance in developing countries

Four studies were identified from developing counties: India (D'Souza and Rebello, 2021), Philippines (Leochico et al., 2021), Nigeria (CE et al., 2021), and Ethiopia (Sidelil et al., 2021) (See Table 2-2). As was the case in the studies from Europe, the US and Australia, participants in these countries generally had positive attitudes towards using telerehabilitation, they also reported that telerehabilitation was widely used during the COVID-19 pandemic, and that video sessions were most commonly used. Like the previous studies, these also used questionnaires to gather data, but a broader range of participants were targeted across the studies, with CE et al. (2021) exploring the attitudes and awareness of Nigerian medical students towards the use of telerehabilitation. Again, a number of key challenges emerged, including the lack of available training for both students and qualified practitioners, no clear guidelines, and infrastructure issues (including a lack of IT support).

Table 2-2: Summary of the studies in developing countries

#	Author	Country	Sample	Design and methods	Emerging themes
1	(D'Souza and Rebello, 2021),	India	118 physiotherapists	Questionnaire	- Lack of training. - Lack of support. - Lack of guidelines. - Internet connections. - Privacy of data.
2	(Leochico et al., 2021)	Philippines	259 responses	Nationwide survey	- Lack of knowledge about telerehab. - Patients' medical conditions. - Lack of clear guidelines. - Cost.
3	(Mbada et al., 2021),	Nigeria	200 physiotherapy students	Cross-sectional study	- Teaching curriculum. - Lack of clear guidelines. - Patients' age.
4	(Sidelil et al., 2021).	Ethiopia	408 healthcare practitioners.	Cross-sectional study	- Lack of support. - Patients' digital literacy. - Security and privacy of data.

a) *Lack of training and support*

D'Souza and Rebello (2021) collected data from 118 physiotherapists around India through a self-reported questionnaire and evaluated their perceptions and experiences of using telerehabilitation during the COVID-19 pandemic. They found that around 80% of the participants had used telerehabilitation for the first time just after the pandemic started, and around 70% considered it a good option to deliver physiotherapy sessions during the lockdown periods. However, they also identified a lack of training, a lack of internet connectivity, and limited support from IT teams in their workplaces as significant barriers to the use of telerehabilitation within the country.

A similar nationwide survey in the Philippines was conducted by Leochico et al. (2021) with the aim of assessing the perceptions and experiences of physical medicine and rehabilitation specialists toward telerehabilitation during the lockdown periods. They received 259 responses and found that video sessions were the most commonly used method to contact patients online during the pandemic. However, 60% of the participants in their study reported that they did not have enough information about telerehabilitation to use it effectively, again indicating a need for further training.

Education and training were foregrounded in the Nigerian study by CE et al. (2021). They conducted a cross-sectional survey that aimed to

investigate the awareness and attitude of Nigerian physiotherapy students towards using telerehabilitation. They recruited 200 undergraduate students and found that their awareness of telerehabilitation was moderate, even though they were digital natives. Once the concept was explained to them, the participants identified multiple advantages, such as saving time and providing easy access to health services and expressed the need for telerehabilitation principles to be included in their curriculum to better prepare them for future practice.

In Ethiopia, Sidelil et al. (2021) conducted a cross-sectional study that aimed to assess the attitudes of healthcare professionals towards telerehabilitation and received 408 responses. They found that around 70% of participants had positive attitude toward telerehabilitation. In contrast to the other studies, Sidelil et al. (2021) did not explicitly mention lack of training as a barrier, but they noted that having knowledge about telerehabilitation was directly linked to its acceptance among healthcare professionals.

As was the case in the developed countries, these studies suggest that more resources and training are needed to ensure these healthcare professionals can effectively use telerehabilitation in their practice.

b) Patients' characteristics

Patients' characteristics, including age, medical condition, and technical ability, were again identified as playing a significant role in the adoption of telerehabilitation. CE at al.'s (2021) study in Nigeria, which was focused on physiotherapy students, examined the relationship between age and technical ability, and raised concerns that older generations with chronic conditions might struggle with the adoption of telerehabilitation due to possible difficulties in mastering the technology. This concern could extend to patients of older age groups in other countries as well. The age of the study participants was also a key consideration in both D'Souza and Rebello (2021) and Sidelil et al. (2021), where including younger participants was reported as creating a potential bias towards the acceptance of telerehabilitation, due to their more frequent engagement with technology.

Technical ability, which is closely tied to age, also emerged as a key consideration. In Ethiopia, Sidelil et al. (2021) found that digital literacy, along with owning a smartphone and having knowledge about telerehabilitation, directly influenced the acceptance of telerehabilitation. However, even though the Nigerian and Ethiopian studies engaged with a younger demographic, there were still concerns about whether they possessed the level of digital literacy required for the effective use of telerehabilitation services.

The medical condition of patients was also a factor. Leochico et al. (2021) found that rehabilitation specialists from the Philippines preferred to deliver telerehabilitation sessions only to patients they already knew and provide

face-to-face sessions to new patients. This may suggest concerns about the efficacy of telerehabilitation for certain medical conditions and underlines the value of in-person evaluation and treatment at the start of a rehabilitation programme.

c) Cost

A significant point in a developing country context is that the study in the Philippines found that the cost of private telerehabilitation sessions decreased if they were delivered remotely (Leochico et al., 2021), which may contribute to increasing the use of telerehabilitation in the future.

d) Data privacy

Concerns around privacy and data security were also prominent in these studies. In India, concerns around the privacy of data was identified as one of the key barriers to the use of telerehabilitation among physiotherapists (D'Souza and Rebello 2021), and, in Ethiopia, acceptance of telerehabilitation was directly linked to confidence in security and privacy of data (Sidelil et al., 2021). While neither (Leochico et al., 2021, CE et al., 2021) explicitly mentioned data privacy as a concern, these findings, alongside those of the previous set of studies, suggests that patients may be hesitant to engage with telerehabilitation services if they are not confident that their personal health information will be kept secure and confidential.

The themes that emerged from the studies in the developing countries were the same as those in developed countries, and this suggests these are likely

to be significant issues within the Saudi context of this study. However, it is important to explore the use and acceptance of telerehabilitation in countries close to Saudi Arabia, as their religion, culture, and social beliefs are similar. As a result, this section discusses two studies from Kuwait and one from Iran.

2.5.3 Acceptance in the Gulf Region

Given the narrow geographical scope of the Gulf region, only three studies which explored the use of telerehabilitation during the pandemic outside of KSA were identified (See Table 2-3). The studies from KSA itself are presented in 2.6 below. All three studies presented positive perceptions toward using telerehabilitation, but, in line with the previous studies, several challenges were also identified.

Albahrouh and Buabbas (2021) explored the perceptions of physiotherapists regarding the use of telerehabilitation during the COVID-19 pandemic in Kuwait. They first used a cross-sectional survey to collect data from 273 physiotherapists and then conducted semi-structured interviews with six physiotherapy department heads. They found that approximately 90% of the participants reported that they were willing to use telerehabilitation in their practice, and the findings from the semi-structured interviews revealed that managers thought that telerehabilitation was useful to reduce waiting lists, manage chronic conditions, save patients time and effort, and that it motivated them to do the prescribed exercises at home.

Table 2-3 Summary of the studies in the Gulf region

#	Author	Country	Sample	Design and methods	Emerging themes
1	Albahrouh and Buabbas (2021)	Kuwait	- 273 physiotherapists - 6 physiotherapy department heads	- Cross-sectional study - Semi-structured interviews	- Lack of training. - Lack of support. - Lack of clear guidelines. - Privacy of data. - Patients' age.
2	(Buabbas et al. 2022)	Kuwait	- 46 patients with musculoskeletal injuries - 8 physiotherapists	- Questionnaire - Semi-structured interviews	- Lack of knowledge. - Lack of clear guidelines. - Patients' level of education
3	Dadgar et al. (2021)	Iran	118 healthcare practitioners.	Questionnaire	- Lack of training. - Lack of clear guidelines and infrastructure.

In the second study in Kuwait, (Buabbas et al., 2022) was led by almost the same research group and investigated patients' satisfaction with the use of telerehabilitation to treat musculoskeletal injuries during the pandemic. They collect both quantitative and qualitative data from participants, using a self-reported questionnaire to collect responses from 46 patients with musculoskeletal injuries and conducting semi-structured interviews with eight physiotherapists. The patients had to try a telerehabilitation session before they participated in the questionnaire to ensure they could speak from personal experience. Analysis of the questionnaire data showed that the patients were satisfied with using telerehabilitation services from home. The physiotherapists who participated in the interviews reported that using telerehabilitation during the pandemic was a helpful alternative method to face-to-face therapy. They also noted that their patients typically preferred receiving video sessions via mobile applications, such as WhatsApp, which they use in their daily lives.

The third study was conducted by Dadgar et al. (2021) to assess the acceptance of using telerehabilitation by all rehabilitation professionals in Iran during the COVID-19 outbreak. They designed a questionnaire that measured the feasibility of telerehabilitation, attitudes towards it, and satisfaction with it. They received responses from 118 participants from different medical rehabilitation majors (occupational therapists, speech therapists, audiologists and psychologists). Overall, the authors found that the rehabilitation professionals in their study were satisfied with using

telerehabilitation with patients, and they concluded that telerehabilitation was feasible in Iran.

Despite the strong influence of Islam on social attitudes in Iran and Kuwait, these studies identified similar challenges to the widespread acceptance of telerehabilitation as those conducted in other countries. In Kuwait Albahrouh and Buabbas, (2021) reported that there was a lack of available training for therapists in conducting telerehabilitation, a lack of support from the IT units at hospitals, and concerns about the confidentiality of the data. They also identified the absence of written regulations for telerehabilitation practice and agreed guidelines as an issue. The study by Buabbas et al. (2022) also identified an urgent need for regulations and clear guidelines for using telerehabilitation with patients, while Dadgar et al., (2021) highlighted the importance of providing training to healthcare professionals in Iran and developing the infrastructure required to deliver telerehabilitation.

Regarding the patients' characteristics, cultural expectations were not considered, but the age and level of education of the patients were identified as potential challenges when implementing telerehabilitation (Albahrouh and Buabbas 2021). In this regard, Buabbas et al. (2022) found that younger and more educated participants showed a higher rate of satisfaction than older and non-educated participants.

The barriers identified by the physiotherapists in the first Kuwaiti study (Albahrouh and Buabbas, 2021) mirror those of D'Souza and Rebello

(2021) in India, reflecting the universality of these concerns. It is also noteworthy that, while telerehabilitation was positively received in both Kuwait and Iran, the Kuwaiti physiotherapists interviewed in Buabbas et al. (2022) preferred to meet new patients face-to-face and only suggested telerehabilitation for subsequent sessions. This echoes the findings of Leochico et al. (2021) in the Philippines and suggests that in-person meetings may be more appropriate for first appointments, with telerehabilitation used primarily for follow-up sessions.

Although these studies provide useful insights into the use of telerehabilitation in the Gulf region during the pandemic period, they have some limitations within the context of this research. For example, the response rate for Albahrouh and Buabbas (2021) was relatively low (around 35%), and it only included physiotherapists who work in the governmental sector in Kuwait, excluding those in the large private sector. In addition, as Dadgar et al., 2021 involved participants from different rehabilitation majors, limiting the results' applicability in the context of physical therapy, which is the focus of this study. Furthermore, as none of these studies mention the impact of religion, culture, or social beliefs on users, it is difficult to know whether the acceptance of telerehabilitation they portray was based on purely medical grounds or whether social and cultural requirements were also considered. In order to investigate this further, the following section explores studies conducted in KSA and highlights the cultural and social factors which have been found to influence user acceptance in the country.

2.6 Acceptance of Telemedicine and Telerehabilitation in Saudi Arabia

As mentioned above, the number of published studies on telerehabilitation in KSA is extremely limited. Therefore, in order to investigate the factors that might affect the successful integration of telerehabilitation into the Saudi healthcare system, it was necessary to broaden the scope of the literature review to include studies with a similar focus. As telerehabilitation is a form of telemedicine, this section begins by exploring the perspectives of users towards telemedicine in KSA in the period before COVID-19. It then focuses on studies on telerehabilitation in particular and its acceptance by healthcare professionals and patients. The section concludes by identifying the religious, cultural and social factors that have been found to influence the application of telemedicine and telerehabilitation in the country.

2.6.1 Acceptance of telemedicine in Saudi Arabia

Three studies were identified which explored telemedicine in the Saudi context; two explored the perspectives of physicians toward telemedicine rehabilitation (El-Mahalli et al., 2012, Albarrak et al., 2019), and one examined the views of the general population about telemedicine (Alshammari, 2019). The key features of these studies are summarised in Table 2-4.

Table 2-4 Summary of the telemedicine studies in KSA

#	Author	Sample	Design and methods	Emerging themes
1	El-Mahalli et al. (2012)	396 healthcare professionals	Cross-sectional study	- Saving time and money. - Lack of knowledge. - Lack of training and infrastructure. - Lack of support. - Lack of clear guidelines. - Privacy of data. - Patients' age.
2	Albarrak et al., (2019)	391 physicians	Questionnaire	- Lack of training. - Lack of clear guidelines.
3	Alshammari (2019)	781 responses	National survey	- Lack of trust in telemedicine. - Lack of awareness. - Lack of clear guidelines and infrastructure.

El-Mahalli et al. (2012) conducted a cross-sectional study of four hospitals in the Eastern region of KSA to evaluate healthcare professionals' perceptions about telemedicine and their willingness to use it. Participants were a mixture of physicians (281) and other specialists in applied medical sciences (115). Three of the hospitals involved in this study employed telemedicine while one did not. The authors delivered two types of questionnaires to the study participants, the first addressing healthcare professionals in hospitals who adopted telemedicine (144 responses, mean age= 40), while the second was intended for those who had not used it (252 responses, mean age= 37).

The key findings of this study were that only 33% of the healthcare professionals who worked in the hospitals that had already employed telemedicine actually engaged with it, and most of them were consultants who had more than twenty years of experience. However, both sets of respondents thought that providing care and management and saving time and money were the most valuable benefits of implementing telemedicine. In terms of barriers, it is significant to note that a lack of knowledge about the uses and applications of telemedicine was identified as the main challenge by both groups, followed by a lack of training and infrastructure. As this study was conducted over a decade ago (in 2012), this suggests that these are long-standing issues in relation to the use of telemedicine.

This idea is supported by Albarrak et al. (2019), who conducted another cross-sectional study to assess physicians' knowledge and perception about

telemedicine. They surveyed 391 physicians in KSA and produced similar findings to El-Mahalli et al. (2012), with 90% of respondents agreeing that telemedicine was a valuable way to provide healthcare services that would save time and money, and approximately 70% reporting that the number of training sessions, courses or conferences linked to telemedicine in KSA were insufficient. Conclusions from both of these studies suggest that telemedicine is seen as beneficial in the country, but there is a long-standing lack of specialist training provided by those in authority.

Although these two studies included large samples, some concerns regarding their sampling and design should be noted. Both included a high number of non-Saudi healthcare professionals (189 and 107 respectively), and it could be argued that this may not be truly representative of the actual context in KSA, as Saudi culture is strongly influenced by Islamic beliefs, and these shape and inform all aspects of life (Al-Shahri, 2002). Therefore, including more Saudi clinicians in studies of this kind are essential to ensure a more representative Saudi sample. Furthermore, neither study recruited participants from a range of different age groups: for example, participants aged above 50 represented only 6% in the Albarrak et al. (2019) study and 12% in El-Mahalli et al. (2012) study. Indeed, approximately 60% of the participants in the Albarrak et al. (2019) study were below the age of 30, so would have been relatively early in their medical careers.

Furthermore, the percentage of female physicians involved in Albarrak et al. (2019) study was just 23%; however, according to Althubaiti and Alkhazim (2014), female physicians in KSA constitute one-third of all Saudi physicians. It also appears that both Albarrak et al. (2019) and El-Mahalli et al. (2012) studies failed to address specific cultural and religious considerations that were likely to be meaningful to female participants. In particular, questions around their willingness to appear in video conferencing due to their religious beliefs and the general prohibition of females appearing in videos where they might be required to uncover their faces in front of non-related males warrants consideration. In addition, the El-Mahalli et al. (2012) study was conducted in the Eastern region and Albarrak et al. (2019) focused on the capital city, Riyadh, but neither examined the situation in the country as a whole.

Alshammari (2019) conducted a cross-sectional study which sought to explore the perceptions and experiences of telemedicine in the general population in KSA. He distributed a survey through various social media applications, such as Twitter, WhatsApp and Telegram, and received 781 responses. The findings showed that around 70% of the participants were interested in using telemedicine, and that a majority (60%) thought video calls via mobile devices were the best means of communication. However, 52% of respondents reported that they had not used the Seha mobile phone healthcare application or any other telemedicine services in KSA, and 51% had never used their mobile phone to seek any medical services or advice at all. Findings indicated that four specific factors affected participants

willingness to engage with telemedicine: a) a general lack of trust associated with using such technologies in a medical capacity; b) a lack of awareness of the effectiveness of telemedicine, c) a lack of information about the uses of telemedicine, and c) not having the desire to consult healthcare professionals remotely.

Despite the fact this study managed to gather a large amount of data from different areas in KSA, its results cannot be generalised for a number of reasons. Firstly, half of the participants were from Hail, a city in KSA, and around 12% were from villages situated in and around Hail, with just 38% from ten other cities in the country. In addition, around 85% of the participants were under 40 years old and 88% were female. Furthermore, there were no details confirming whether the participants were healthy or not. It seems that the study did not consider the fact that people in older age groups typically use more healthcare services than those who are 40 or below (Shrivastava et al., 2013). Therefore, testing the perceptions and experiences of older age groups too would generate more valuable outcomes for healthcare providers, as they tend to be one of the main targets of telemedicine. Finally, the author used only closed questions in the survey which guided the participants to select from pre-existing answers, so this limited the information being gathered by the author. The use of closed questions may not be the best choice when it comes to trying to evaluate perceptions and experiences in a particular area, as qualitative methods would provide more information and offer the space for the participants to express their views (Yaddanapudi and Yaddanapudi, 2019).

In conclusion, these three studies provide useful insights into the perceptions of both healthcare professionals and members of the public about implementing telemedicine in KSA, and a number of themes emerge. Firstly, they suggest that the concept and idea of implementing telemedicine is generally acceptable to both healthcare professionals and members of the public in the Kingdom; secondly, that there is a lack of knowledge and training about telemedicine and its applications; and, thirdly, that the patient's age, technological ability, and health condition are important factors to take into consideration. These echo the findings of the studies in other countries discussed above, suggesting that these are significant obstacles to the implementation of all forms of telemedicine. However, these studies also raise a number of issues which require consideration in respect of the present study: firstly, there is a need for studies that focus on the perspectives of Saudi healthcare professionals of different genders; secondly, that KSA is a big country and studies which look beyond the major cities are required, as telemedicine is particularly useful for patients who live in rural areas with limited access to healthcare services; and thirdly, that the reasons for people’s reluctance to engage with telemedicine require further investigation if telerehabilitation is to be fully incorporated into the Saudi healthcare system. With this in mind, the following section examines studies which explore the acceptance of telerehabilitation in KSA.

2.6.2 Acceptance of telerehabilitation in Saudi Arabia

Five studies were found in the literature that focused on telerehabilitation in KSA; three focused on exploring the viewpoints of patients (Alqahtani, 2019, Alsobayel et al., 2021, Algarni et al., 2022), and two on the perspectives of healthcare professionals (Aloyuni et al., 2020, Ullah et al., 2021) (See Table 2-5). This section is therefore divided into two parts: the first discusses the studies that focused on patients, while the second examines those conducted with clinicians.

2.6.2.1 Acceptance by Patients

Alqahtani (2019) conducted a study to assess the perception, awareness, and knowledge of a group of orthopaedic patients who had used telerehabilitation services at home. He recruited 90 patients, aged between 50 and 75, with problems such as lower back pain, knee pain, etc. The participants all received a telerehabilitation session in order to familiarise them with it, and they completed a questionnaire before and after the session. Their responses revealed an increase in their knowledge and awareness of telerehabilitation as a result of the session (from around 50% before the session to over 90% after it) and in their levels of satisfaction with telerehabilitation (from 64% before the session to 94% post session). Alqahtani also interviewed the participants to seek more information from them and reported that they appreciated the convenience of the sessions being at their home, as they did not have to travel to the clinic. However, no details were given about the number of participants interviewed nor about the type of telerehabilitation sessions which patients had received.

Table 2-5 Summary of the telerehabilitation studies in KSA

#	Author	Sample	Design and methods	Emerging themes
1	Alqahtani (2019)	90 patients	- Questionnaire - Interviews	- Increased levels of satisfaction. - Convenience.
2	Alsobayel et al. (2021)	95 patients	Quasi-experimental pre–post intervention	- Improved physical function and quality of life. - Increased levels of satisfaction
3	Algarni et al. (2022)	227 patients	Cross-sectional study	- Not the same quality as face to face. - Wrong diagnosis. - Willingness to recommend it to others - Safe, effective, and affordable option. - Confident in using technology. - Patients' age.
4	Aloyuni et al. (2020)	374 physiotherapists	National survey	- Adequate knowledge. - Low rate of use. - Technical issues. - Cost of the equipment.
5	Ullah et al. (2021)	- 82 Rehabilitation professionals	Questionnaire	- Lack of awareness. - Lack of knowledge. - Data privacy. - Cost of equipment.

Furthermore, the figures presented in Alqahtani's study were not legible, and, although the author referred readers to the appendices for access to the questionnaire, no appendices were provided with the article. Therefore, the results of this study should be taken with a degree of caution due to the absence of key details which might affect its quality and validity.

Alsobayel et al. (2021) conducted a study to assess the attitudes of patients with musculoskeletal conditions towards telerehabilitation; they also measured the impact of telerehabilitation on pain reduction, function, and quality of life. They recruited 95 participants, each of whom received two to three telerehabilitation sessions a week for six weeks. The treatment intervention was generic, including patient education, strengthening exercises, and aerobic exercises, and Google Meet was used to deliver all of the physiotherapy sessions remotely. Patients completed questionnaires prior to beginning the intervention and after receiving remote physiotherapy. The authors used a number of questionnaires: the Pain Self-Efficacy Questionnaire to assess the pain, the Patient-Specific Functional Scale to assess patients' function, and the Musculoskeletal Health Questionnaire to assess quality of life. They found a notable improvement in pain reduction, function, and quality of life when they compared the results at baseline and after six weeks. The authors also found that patients' satisfaction with their sessions was high, and that they would recommend telerehabilitation to other patients.

Algarni et al. (2022) conducted a cross-sectional study to explore the experiences of patients who received one or more telerehabilitation session during the COVID-19 pandemic. They included the responses of 227 participants from an outpatient rehabilitation department. The patients' cases varied, but around 75% had musculoskeletal injuries. Most of the participants noted that their physical functions had improved after the sessions and reported that they were satisfied with the telerehabilitation services overall; moreover, they stated that they would recommend telerehabilitation to others, especially during the pandemic, as it was a safe, effective, and affordable option. However, the study also found that around 60% of the participants believed telerehabilitation failed to offer the same quality as face-to-face sessions, and more than half believed that the physiotherapists struggled to diagnose them correctly during the session, with only 25% saying they were diagnosed and treated correctly.

The telerehabilitation sessions were accessed by 98% of the participants via smartphones, with the remaining 2% using laptops, desktops, or tablets. Although the vast majority of the participants claimed that they were confident in using technology and used the internet every day, the study also found a strong association between the age of both patients and physiotherapists and their ability to use technology effectively.

These studies suggest that patients in KSA are generally satisfied with telerehabilitation services and they consider it to be a practical method that can improve the physical function of patients in critical situations where

face-to-face sessions are not available. However, the main focus of these studies was on patients with musculoskeletal conditions only. In addition, the results were self-reported by the patients, and the ratio of male to female participants raises questions. Males made up approximately 65% of participants in the Algahtani et al. (2019) study and 90% in the Alsobayel et al. (2020) study, while females made up nearly 75% of participants in the Algarni et al. (2022) study. Also, while age was identified as a barrier in Algarni's study (2022), religion, culture, and social factors that could influence the acceptance of telerehabilitation in KSA were not investigated or considered. As a result, studies that include a more representative gender balance, which investigate patients with neurological conditions, and which consider factors such as religion, culture, and social beliefs will contribute to the body of knowledge about telerehabilitation in KSA.

2.6.2.2 Acceptance by Healthcare Professionals

Aloyuni et al. (2020) explored the knowledge of telerehabilitation and the barriers to its implementation in KSA from the perspective of physiotherapists. They used a national survey to collect their data, and they reportedly received 347 responses. Around 60% of the participants reported that they had adequate knowledge about telerehabilitation and around 30% claimed their workplace had telerehabilitation equipment; however, only around 20% said they were using telerehabilitation with their patients. The authors found that the main challenges to implementing telerehabilitation were technical issues and the cost of the equipment and

settings, echoing the findings of studies conducted in both developed and developing country contexts.

This study collected data from 13 cities around Saudi Arabia and recruited a large number of participants. However, the questionnaire used had 13 closed-ended questions, and as mentioned above, this may not be the most effective method to draw robust conclusions about physiotherapists' knowledge and their perceptions. In addition, one of these questions asked participants to indicate their specialty and the options included occupational therapists and speech therapists; therefore, it seems that the target was not only physiotherapists but all rehabilitation practitioners. Furthermore, in question five, all of the options forced the participants to select an answer that showed they already used telerehabilitation with their patients. There is also a concern about the actual number of participants in this study; the study reported that the total number was 374; however, in the methods section, the total of male and female participants is only 176. It appears therefore that the findings of this study should be taken with some caution due to concerns about the study's quality.

Ullah et al. 2021 investigated the knowledge and attitude of rehabilitation professionals toward telerehabilitation in Saudi Arabia. They distributed a questionnaire to 82 rehabilitation professionals who work in different cities in KSA, most of whom were physicians. Around 43% claimed a lack of knowledge about telerehabilitation, while 46% reported being aware of the uses of telerehabilitation but said they did not use it in their workplaces.

They identified cost as the main barrier to the successful implementation of telerehabilitation, but over half of the participants (52%) thought that concerns around the confidentiality of patients' data was also a risk factor.

It is important to mention that this study successively recruited rehabilitation professionals from different types of hospitals, including primary, secondary, and tertiary, which helps to generate more comprehensive findings. Similar to Aloyuni et al. (2020), their questionnaire used closed-ended questions; however, there are no other concerns about the quality of the questionnaire or the study in general. The findings of this study are helpful in understanding the knowledge and attitude of rehabilitation professionals toward telerehabilitation; however, they cannot be generalised to other medical rehabilitation specialists, such as physiotherapists, occupational therapists, or speech therapists, as most of the participants were physicians.

These studies present different views of the levels of awareness of telerehabilitation in KSA. Aloyuni et al. (2020) found that more than half of the physiotherapists who participated in their study had an adequate knowledge of telerehabilitation, which exceeds that of other local and global studies. However, the findings in Ullah et al. (2021) showed that more than half of the participants in their study were not aware of the uses of telerehabilitation. Nonetheless, both studies were in line with others in identifying the cost of telerehabilitation set up and equipment as a barrier to its implementation, and Ullah et al. (2021) also highlighted an important

theme that was mentioned in other studies, namely concerns about the privacy of users' data. Although these studies help to identify the factors which affect acceptance of telerehabilitation in KSA, they do not consider the impact of religious and cultural beliefs, so studies which address these topics directly are discussed below.

2.6.3 The influence of religion, culture, and social beliefs

As the birthplace of Islam, religion plays an important role in Saudi society and shapes many areas of life (Albougami, 2015). Cultural values reflect Islamic beliefs and tribal traditions which have evolved over centuries, even though the country is developing very rapidly (Almutari and McCarthy, 2012). However, it is striking that none of the published studies on telerehabilitation in KSA explored the impact of religious, cultural and social beliefs on its acceptance. As a result, there was a need to broaden this part of the literature review to include studies that shed light on these factors in relation to the acceptance of other forms of telemedicine in KSA.

Kaliyadan et al. (2013) highlights the potential impact of religious and cultural objections to being photographed, even if this is for medical purposes. As part of their study to compare the accuracy of teledermatology diagnoses with face-to-face diagnoses in clinical settings, the authors recruited 166 patients who received an initial in-person diagnosis, and then a skin lesion photo for each patient was sent to another doctor to give a second independent opinion remotely. The patients were also provided with a questionnaire to assess their satisfaction with the

second diagnosis. The overall level of satisfaction was high, with men showing a higher degree of satisfaction than women. However, 23 patients refused to have a photo of their skin lesion taken citing cultural and religious objections. Of these, all were Saudi nationals (although the study included 25% non-native participants) and almost all were female (21 females and 2 males). Indeed, of the 48 Saudi females in this study, 44% did not accept the teledermatology element due to their cultural and religious beliefs. This study was conducted ten years ago (in 2013) and Saudi society has changed considerably since then, however, such beliefs are deeply rooted, and this outcome suggests that they may also have a negative impact on the acceptance of other forms of telemedicine in KSA, including telerehabilitation, particularly amongst the female population.

A more recent study by Alkhalifah and Aldhalaan (2018) supports this idea. They conducted a descriptive review to highlight the current barriers and possible benefits of using telemedicine to provide healthcare services to children with autism and highlighted several issues related to culture and religion that could have a detrimental impact on Saudi families' use and acceptance of telemedicine. These included beliefs that women and men should work separately, that woman should cover their faces (by wearing hijab and niqaab/face veil), that pictures of women should not be taken if they may be seen by unrelated men, and that the presence of a male chaperone (relative/ family member) is required when a female patient has to see a male clinician for an intervention session (Al-Saggaf and Williamson, 2004, Elamin and Omair, 2010, Alqahtani, 2012, Al-Rowais et

al., 2012). Alkhalifah and Aldhalaan (2018) suggested that these beliefs could significantly affect the acceptance and use of telemedicine, especially when using video consultations between children's mothers and male clinicians. They also mention other barriers which align with those identified above, including the level of education of the children's mothers and the availability of smart devices and internet at the children's/patients' home to enable remote healthcare services. However, the primary value of this study is in highlighting potential social and cultural barriers to the acceptance of telerehabilitation in KSA which require further investigation.

These studies indicate that religion, culture, and social beliefs are important in a conservative country such as KSA and can impact healthcare provision. The findings suggest that measures such as asking patients and healthcare professionals whether they would prefer to do the telerehabilitation session with someone of the same gender, and trying to accommodate their preference wherever possible, would contribute to successfully integrating telerehabilitation into the Saudi healthcare system.

2.7 Gap in the Existing Literature and Rationale for the Study

Based on the literature review presented in this chapter, it is clear that there are very few studies focusing on telerehabilitation in KSA. Only five were identified for this study, three of which focused on exploring the viewpoints of patients with musculoskeletal conditions (Alqahtani, 2019, Alsobayel et al., 2021, Algarni et al., 2022); and two (Aloyuni et al., 2020, Ullah et al., 2021) which focused on healthcare professionals. Furthermore,

no studies have been published that specifically address the use of telerehabilitation with neurological patients in KSA. This shows that there is a clear gap in the literature about the use of telerehabilitation in KSA when it comes to telerehabilitation with neurological patients.

Ullah et al. (2021) investigated the knowledge and attitude of rehabilitation professionals toward telerehabilitation, and there are no concerns about the quality of the study in general. However, most of the participants were physicians. While Aloyuni et al. (2020) explored physiotherapists' knowledge of telerehabilitation in Saudi Arabia and the barriers to its implementation, this study was methodologically flawed, and this raises doubts about the quality of study. As a result, studies employing a more robust methodology are required to investigate the perceptions, knowledge, and willingness to accept telerehabilitation among physiotherapists in KSA. In addition, none of the studies reviewed above explored the influence of religion, culture, and social beliefs on implementing telerehabilitation in KSA, despite the fact that religion affects every area of life in the country. These gaps in the literature merit further consideration and investigation, providing a strong rationale and clear parameters within which this study can operate. Consequently, it includes two main studies: the first assesses Saudi physiotherapists' acceptance of the use of telerehabilitation while the second explores the perceptions of patients with MS regarding the use of telerehabilitation in the Kingdom.

2.8 Aims, Objectives and Research Questions

2.8.1 Research aim

In response to the gaps in the literature identified above, this study aims to explore the acceptance of telerehabilitation among Saudi physiotherapists and patients with a neurological condition (in this case MS) in order to identify the factors which affect their acceptance and propose a potential strategy for the implementation of telerehabilitation in the Saudi healthcare system.

2.8.2 Research questions

Drawing on the theoretical framework adopted for this exploration of the acceptance of telerehabilitation in KSA (See Chapter 3), the following research questions have been established to guide the study towards the research aim:

1. What are the factors which influence the acceptance of telerehabilitation among Saudi physiotherapists?
2. What are the factors which impact acceptance of telerehabilitation among Saudi patients with MS?
3. What are the main barriers to the acceptance of telerehabilitation among Saudi physiotherapists and patients with MS?
4. How might these barriers be overcome to support an effective implementation of telerehabilitation in KSA in the future?

2.8.3 Research objectives

In order to answer the research questions, the following objectives for the study have been identified:

a) To understand the factors which influence the acceptance of telerehabilitation globally, especially during the COVID-19 period;
b) To explore the levels of acceptance of telerehabilitation among physiotherapists in KSA using Q methodology;
c) To explore the levels of acceptance of telerehabilitation among patients with MS in KSA using Q methodology;
d) To identify the issues which most discourage physiotherapists and patients in KSA from accepting telerehabilitation;
e) To propose a logic model that will help integrate telerehabilitation into KSA's health care system in the short, medium and long term.

2.4 Conclusion

The studies presented in this chapter indicate a positive attitude toward the concept of using telerehabilitation among healthcare professionals and patients in both developed and developing country contexts. However, it is also clear that, while the use of telerehabilitation increased considerably during the pandemic, there remains an urgent need for training, guidelines, and the provision of supporting infrastructure globally. There is also widespread agreement that age, technological ability, and data privacy concerns are important factors that influence the acceptance of telerehabilitation. Furthermore, patients' individual medical conditions,

notably those which affect cognitive and functional abilities, are also significant considerations in the use of telerehabilitation. While the Saudi studies reflect both this overall positivity and these key concerns, they also identify specific issues pertaining to religious and cultural beliefs which may affect the implementation of telemedicine in the country.

Furthermore, in highlighting the significance of sampling and methodology in obtaining reliable data and drawing valid conclusions, this literature review has directly contributed to the methodology adopted for this study. Collectively, these studies have highlighted the importance of considering the barriers to using telerehabilitation within the context of country of the study and the need to include participants of both genders, of different ages, and from different backgrounds. Therefore, prior to setting up the two Q studies conducted as part of this research study, the personal characteristics of the participants were carefully considered in order to ensure samples were representative. These included age, gender, years of experience, and the work sector (governmental or private) for the physiotherapists, and factors such as age, gender, level of education, medical conditions, and place of residence (urban or rural) for patients. The literature reviewed here also provided a basis from which to develop the concourse for the two Q studies (see Chapter 4).

Having examined previous studies relating to the acceptance of telerehabilitation (and, in the case of KSA, of telemedicine more broadly), identified the research gap, explained the research aims and objectives and

set out the research questions, the next chapter introduces the theoretical framework and the philosophical assumptions which underpin this study.

Chapter 3: Theoretical Frameworks and the Philosophical Perspective of the Study

3.1 Introduction

This study is concerned with the acceptance of telerehabilitation, a form of telemedicine, which involves the use of technology as a medium of communication and exchange between healthcare professionals and patients. This chapter begins by presenting an overview of the key factors involved in the acceptance of new technology, drawing on two theoretical models which have been developed to facilitate user acceptance of technology, namely the Technology Acceptance Model (TAM) (Davis et al., 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). These models are discussed in detail and the case for combining them in this research project is made. Other studies of telerehabilitation that have employed TAM or UTAUT are then briefly discussed and their application in this study is explained. The chapter concludes by presenting the philosophical perspective of the thesis.

3.2 Overview - Accepting a New Technology

In order to evaluate the acceptance and potential usage of telerehabilitation in KSA, it is important to understand the factors which affect users' acceptance of new technologies. At the simplest level, users should have some prior knowledge or understanding of a new technology before using it (Venkatesh, 2000). In addition, research has shown that when new users

recognise the purpose of a particular system and what problems it can solve or alleviate, they are more likely to appreciate its benefits, and this, in turn, may push them to adopt it (Van Veldhoven et al., 2008). In this regard, research also indicates that the adoption rate for new technology increases when it is seen as being able to fulfil a perceived need (Reeder et al., 2011).

However, the issues of user expectation and experience must be considered, as what the user wants and expects may not be in accordance with what the new technology can actually deliver (Or and Tao, 2012). Therefore, designers need to ensure they are aware of, and able to meet, users' expectations during the development process. Equally, if the user interface and interaction are poorly designed, that can affect the individual's perceptions of how easy it is to use that technology (Kuo et al., 2013). Therefore, in order to increase acceptance, the aims and benefits of new technologies should be clearly communicated to potential users, and, ideally, they should also be involved in the design process, through user-centred design and co-design (Shah et al., 2009).

Cost is also a key, and the advantages of the new system should outweigh the costs associated with adopting it (Zhou et al., 2012). In particular, if the cost of the system is high, and its benefits are not clear, this is likely to lead to a low rate of adoption. Personal factors, such as the age of the users, can also have a detrimental effect on user acceptance of new technologies (Xue et al., 2012). For example, studies have shown that older people often demonstrate a lower acceptance rate than younger people (Or

and Tao, 2012, Zhou et al., 2012). These factors, therefore, need to be considered when trying to establish or assess a new technology.

A number of theoretical models have been developed to identify the key factors which influence user acceptance, notably the Technology Acceptance Model (TAM) (Davis et al., 1989) and The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). Both these models have informed this research and are discussed in more detail below, both as individual theories and in combination.

3.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was proposed by Davis in 1986 (Davis et al., 1989) and aims to assess users' acceptance of new technology before its official implementation. TAM is built on two constructs known as Perceived Usefulness (PU) and Perceived Ease of Use (PEoU) which direct the Behavioural Intention (BI) of the user with regard to the technology before their actual usage (Davis et al., 1989) (See **Error! Reference source not found.**). These constructs are used to determine those factors which may play a role in influencing users of new technology by posing the following questions: Is this new technology helpful for the users? (PU). Is this new technology easy for users? (PEoU) (Davis et al., 1989). relates to the idea that users are more likely to accept a new technology if they believe it will be useful, while PEoU relates to the idea that users are more likely to adopt a new technology when they find it simple to use.

In 1989, Davis and his colleagues conducted a study to assess the reliability of TAM, where they aimed to test the acceptance of 107 participants toward a computer system. Furthermore, Adams et al. (1992) led a study also aimed at examining the reliability of TAM and the ability of PU and PEoU to test a system's acceptance. Both studies found that TAM is a reliable model for effectively evaluating the behavioural intention of users toward a technology and their actual use and acceptance.

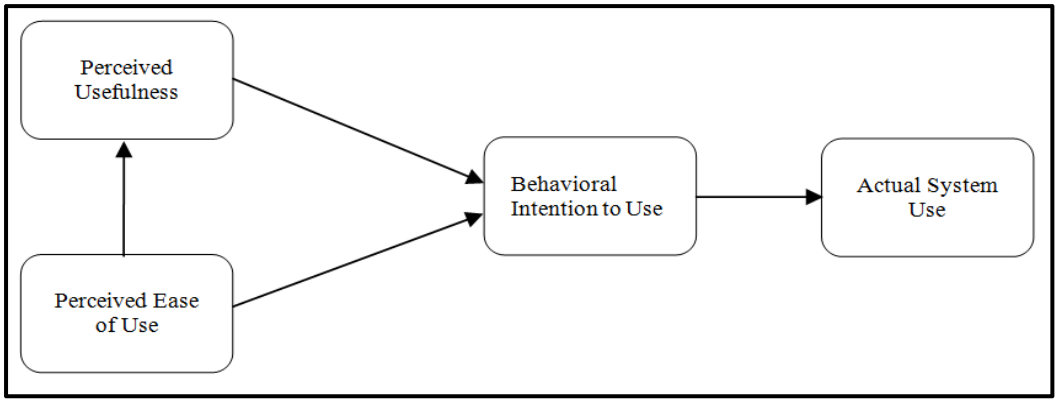

Figure 3-1: The Technology Acceptance Model (TAM) (Davis et al., 1989)

3.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT was launched in 2003 by Venkatesh and his colleagues with the goal being to merge the most rigorous existing models to test the acceptance of new technology. The models combined in UTAUT are the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behaviour (TPB), the theory that combines TAM and TPB, the Model of Personal Computer Use,

the Diffusion of Innovations (DOI) model, and the Social Cognitive Theory (SCT) (Venkatesh et al., 2003).

In order to test the new model, Venkatesh and his colleagues conducted a longitudinal study targeting the acceptance of employees toward a technology and found that UTAUT demonstrated an ability to cover up to 70% of the variance in behavioural intention (acceptance) of a technology and up to 50% of the variance in use (behaviour) (Tang and Chen, 2011, Venkatesh et al., 2003).

The theory has four fundamental constructs which can be used to directly determine the acceptance and use of a technology: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC). The first three echo the constructs in TAM, while SI introduces a social dimension and FC considers the scaffolding around the use of the technology (Venkatesh et al., 2003) (See Table 3-1). PE, EE and SI are direct determinants of the user's BI while FC is linked to the last stage which is the actual usage of the technology. These four constructs are associated with four variables: age, gender, experience, and voluntariness of use (Venkatesh et al., 2003) (See Figure 3-2).

Table 3-1: Definitions of constructs in UTAUT model (Venkatesh et al, 2003, p. 448)

Construct	Definition
Performance expectancy (PE)	The degree to which an individual believes that using the system will help him or her to attain gains in job performance
Effort expectancy (EE)	The degree of ease associated with the use of the system
Social influence (SI)	The degree to which an individual perceives that important others believe he or she should use the system
Facilitating conditions (FC)	The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system

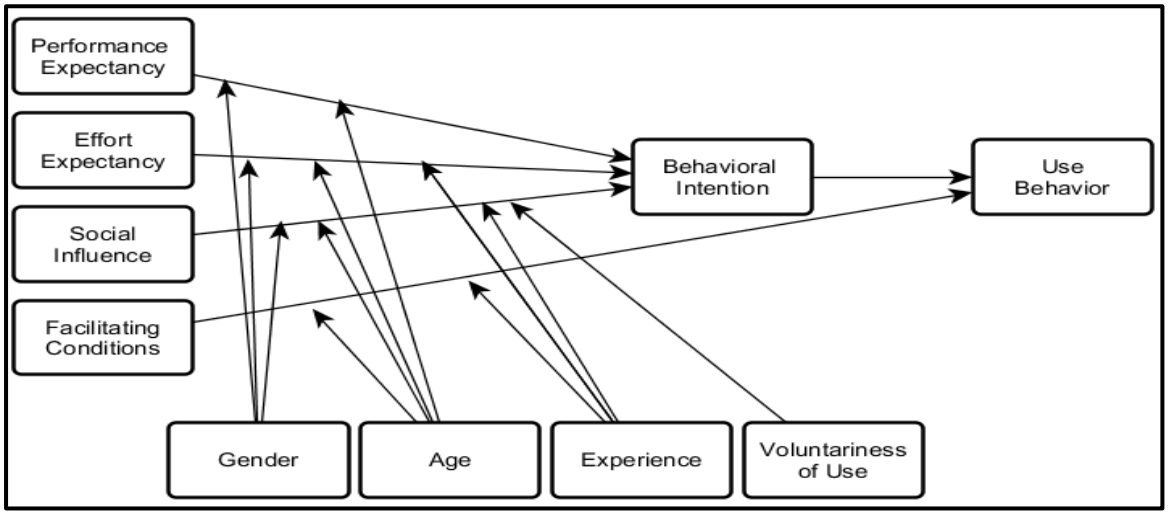

Figure 3-2: The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003, p. 447)

3.5 Combining TAM and UTAUT

The choice to use both the TAM and UTAUT models together as the theoretical framework for this study was based on the following factors. Although the TAM model addresses perceived usefulness and ease of use, it does not consider the importance of the external characteristics of technology users, such as gender, age, and experience (Li et al., 2013,

Petit dit Dariel, 2011). As these have been identified as important factors in relation to the acceptance of telerehabilitation in KSA, combining TAM with other models that include these characteristics, such as UTAUT, can be valuable. Furthermore, both models are commonly used to measure how healthcare professionals accept technologies for remote care (Heinsch et al., 2021) and using models that are widely used and proven to be effective in remote health care increases the quality and validity of this study.

3.6 Using TAM and UTAUT in Telerehabilitation Studies

Although both TAM and UTAUT have been used in relation to remote health care, very few studies have used them to explore telerehabilitation in particular. A review of the literature revealed only two: (Cranen et al., 2012, Cranen et al., 2011). Cranen et al. (2011) divided participants into two groups, an experimental group and a control group, with both receiving basic rehabilitation training. The experimental group was given the opportunity to use telerehabilitation for 15 minutes; the control group matched the experimental group in age and gender but did not use telerehabilitation. Both groups completed questionnaires based on the TAM model which were delivered twice - before and after the experiment. The findings revealed that the experimental group showed a significant improvement in perceptions of telerehabilitation in both PU and PEoU domains. By contrast, the control group did not show any significant difference in their perceptions.

Cranen et al. (2012), by contrast, used UTAUT to investigate the factors that influenced the acceptance and use of telerehabilitation services among patients with chronic conditions. They interviewed 25 patients, who were recruited from a rehabilitation centre in the Netherlands. The authors then organized the participants' responses according to UTAUT constructs, and found that this helped them to analyse the participants' willingness and perceptions toward using telerehabilitation services. Overall, the study found that the number of themes related to 'Social Influence' and 'Effort Expectancy' were relatively few in number, and that most were linked to 'Facilitating Conditions'.

3.6.1 Using TAM and UTAUT in this study

Both TAM and UTAUT were employed to inform the design, execution, and analysis of this study as part of the Q methodology employed (See Chapter 4). Once the literature review had been used to develop the concourse for the two Q studies, constructs from both the TAM and UTAUT models were used to categorise the statements for the Q sorts. These constructs were: *Perceived Usefulness* (PU), *Individual Differences* (ID) and *Behavioural Intention* (BI), *Performance Expectancy* (PE), *Effort Expectancy* (EE), *Social Influence* (SI), and *Facilitating Conditions* (FC). Table 3-2 shows how these constructs were used to categorise the statements. As the PU construct in TAM offers the same meaning as PE in UTAUT and TAM's PEoU equates to EE in UTAUT, both names are used in the table.

Table 3-2: Example of how TAM and UTAUT were used in the Q studies

Perceived Usefulness/ Performance Expectancy
❖ Telerehabilitation saves the money that I would pay for transport. ❖ Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.
Perceived Ease of Use/ Effort Expectancy
❖ I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital. ❖ Having the session remotely using telerehabilitation is easier than face-to-face sessions.
Social Influence
❖ My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them. ❖ The shift to remote study and working due to COVID-19 has had a positive impact on my acceptance of technology.
Facilitating Conditions
❖ I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation. ❖ Medical insurance companies should include telerehabilitation services under their medical cover.
Individual Difference
❖ I am happy to have video telerehabilitation sessions from physiotherapists of any gender. ❖ My age has nothing to do with my ability and skills to use telerehabilitation effectively.
Behavioural Intention
❖ I will use telerehabilitation when it becomes available in my hospital. ❖ COVID-19 has encouraged me to use telerehabilitation in the future.

The external characteristics of technology users in the UTAUT model, such as gender, age, and experience, were used to inform the sampling of both Q studies (See Chapter 4). The models also informed the analysis of the data from the two Q studies (See Chapters 5 and 6) and the discussion of the results which emerged (See Chapter 7).

3.7 Philosophical Perspective

A research paradigm refers to the beliefs and assumptions that form the theoretical foundation of the research and help in creating its plan (Kuhn, 1962). It can help to determine the most appropriate methodology as well as the methods to be used for data collection and analysis (Carter and Little, 2007). The paradigm for any research has a strong link to the epistemological stance of the researcher and how the researcher considers and collects knowledge (Corry et al., 2019). There is no one universal paradigm to suit all studies; however, it is fair to assume that the research paradigm is predominantly selected based on the researcher's beliefs regarding the truth, the topic of research, and the research question itself (Creswell, 2013).

In terms of the major paradigms, positivism is acknowledged as being one of the more well-known examples. This paradigm relates to the belief that there is a single knowable truth (reality) which can be obtained through an objective, accurate and replicable process (Avis, 2003). The positivist paradigm has been confirmed as a valid approach in healthcare studies (Winters and Ballou, 2004) and also in survey studies which aim to

determine the participants' characteristics (Ramnarayan et al., 2007). However, even though this approach generates data and knowledge, it cannot present human perceptions and the actions of humans (Creswell, 2013), as providing knowledge which is replicable to all human experience is not possible (Koch, 1999). Therefore, it can be reasonably concluded that positivism does not represent the most appropriate paradigm when exploring humans' experiences, as they differ from one individual to another, and therefore, producing one single reality is not feasible.

Another well-known paradigm is interpretivism, where the truth of knowledge (reality) is considered as being multiple, subjective and negotiated among the researcher and the participants in the research (Crotty, 2009). The interpretivist paradigm tends to use inductive approaches and is typically applied through qualitative studies, as it aims to elicit a deeper understanding of human and social reality (Neuman, 2013). However, the interpretivist paradigm has also been criticised in the literature for the high degree of subjectivity in outcomes and its apparent lack of ability to produce results which can be generalised (Mack, 2010).

The pragmatist paradigm can be used to combine both positivism and interpretivism, as it considers both the subjective and objective ways that help one to reach knowledge (Johnson and Onwuegbuzie, 2004). In pragmatism, the truth or knowledge (reality) is understood through practical outcomes instead of searching for absolute reality (James, 1975, Blackburn, 2005). There is also a concentration on language and

communication which leads one to consider a social or physical reality that could differ from the current absolute reality (James, 1975, Dewey, 1998). Based on this logic, pragmatists focus on what is useful for the current time (i.e. now), and, when applied to research, this manifests itself in the use of approaches or methods that are considered to be practical. This degree of flexibility helps the research to develop based on what works in conjunction with the topic and the research question (Creswell and Poth, 2016).

It has been argued that pragmatism is the most appropriate research paradigm when exploring the implementation of technology within the healthcare sector (Johnson and Onwuegbuzie, 2004, Scott and Briggs, 2009). Therefore, pragmatism is appropriate for this study, as it is aligned to the research design and the topic to be explored. Based on the pragmatist paradigm, the researcher needs to consider all of the possible methodologies that may fit the study and then select the most appropriate one for the research question, goals and topic. Therefore, no specific methodology was adopted before developing the aim, objectives and research question for this project. Furthermore, all of the stages and processes linked to this study, such as selecting the methodology, collecting the data, and analysing the findings, were conducted following the principles of pragmatism, which means selecting the most practical option at each stage, with a clear justification for the choices being established.

3.8 Conclusion

This chapter has introduced the TAM and UTAUT models that form the theoretical framework for this study and explained why they were adopted and how they have been used. It has also identified the theoretical perspective which shaped the research and explained why it was selected. The next chapter introduces the Q methodology which underpins the study and explains how it was applied and how the resulting data was analysed. It also addresses the ethical issues associated with the research and explains the steps taken to ensure confidentiality and protect personal data.

Chapter 4: Methodology

4.1 Introduction

This chapter begins by describing the Q methodology adopted for this study and explaining how it was applied in five steps: 1) creating the concourse, 2) creating the Q sample, 3) selecting participants, 4) performing the Q sort, and, finally, 5) factor analysis and interpretation. The second part of the chapter explains how the Q methodology was utilised to collect and analyse data in the two Q studies conducted for this research project: Study 1, which explores the acceptance of telerehabilitation among Saudi physiotherapists, and Study 2, which explores the views of Saudi patients with MS.

4.2 Q Methodology

William Stephenson created Q methodology in 1935 (Cross, 2005). The letter 'Q' refers to the form of factor analysis that is applied in the methodology when analysing the data (Watts and Stenner, 2012a) This methodology is designed to investigate subjectivity in a systematic manner (Brown, 1980, Van Excel and De Graaf, 2005, Ho, 2017), and it has been used in many areas of research, notably healthcare (Stenner et al., 2000, Stenner and Rogers, 2004, Paige and Morin, 2015, Stenner et al., 2015) education (Petit dit Dariel et al., 2013, Ha, 2016), business (Van Excel and De Graaf, 2005), transportation (Van Exel et al., 2011) and environment and agriculture (Davies and Hodge, 2012).

The methodology differs from qualitative approaches that rely mostly on the participants' narrative ability in expressing their viewpoints about a topic. With Q methodology, the participant is engaged in sorting/arranging pre-constructed statements according to his or her preference in a forced distribution (Brown, 1980), which is then subjected to factor analysis so as to uncover varying viewpoint/subjectivities regarding a topic of discourse (Webler et al., 2009, Watts and Stenner, 2012a, Ladan et al., 2019).

Q methodology usually recruits a small sample of participants which, it has been suggested, can adversely affect its ability to generalise findings (Valenta and Wigger, 1997, Van Excel and De Graaf, 2005). However, Van Excel and De Graaf (2005) argue that generalising the findings is not a concern of Q methodology, as the findings are represented viewpoints of a particular group of people which do not correlate directly with their number. In this regard, Thomas and Baas (1992) used the term 'substantive inference' to suggest that generalization in Q studies should focus on concepts/categories, theoretical propositions, and models of practice (Watts and Stenner, 2012a), and this is why Brown (1980) insisted that generalizations in Q are best thought of in terms of specimen and type. In light of this, Watts and Stenner (2012) claim that Q methodology still has a broad usage and appeal, as it concentrates on the concept of semantics in generalising the results rather than statistics.

4.3 Process of Conducting Q methodology

The process of Q methodology studies begins by formulating a research question or a set of questions. These then provide the focus for collating all the available information related to the topic; in Q methodology, this is referred to as the 'concourse'. Following this, statements are generated from the concourse, in order to create the 'Q sample'. The participants in the Q study are then selected, and they perform the Q sort followed by post-sort interviews, where they are asked about the reasons behind their selection in the Q sort. Finally, the data is analysed and interpreted. The process of conducting a Q study is illustrated in Figure 4-1, and each stage is described in detail below.

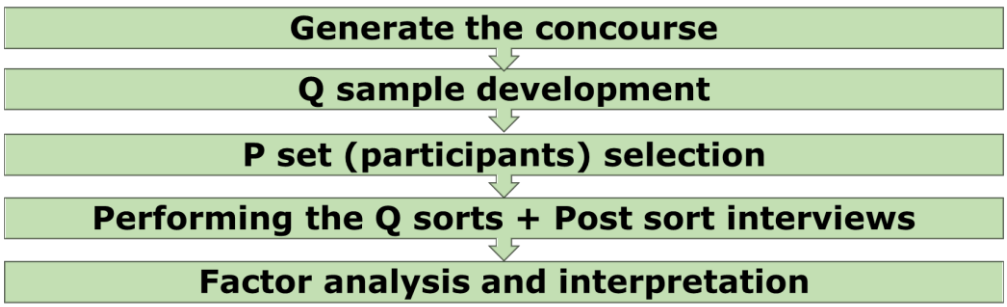

Figure 4-1: The process of conducting a Q study

4.3.1 Development of the concourse

The concourse in Q methodology refers to the sum of what has previously been said about the topic being explored. It should be gathered from all available sources, including published literature, public discussions on the topic, questionnaires, interviews and media, as appropriate to the topic (Paige and Morin, 2016). It may also be collected from other domains, such

as music and painting (Valenta and Wigger, 1997). Therefore, the concourse can be generated from many sources, with the most crucial point being that it represents all of the possible viewpoints linked to the topic (Ramlo, 2016).

4.3.2 Q sample development

The Q sample refers to the set of statements drawn from the concourse, which the participants use to complete the Q sort. There is no single correct path to follow when developing a Q sample; however, it should be easy for the participants to understand and attempt to cover all aspects of the topic explored without any overlap (Watts and Stenner, 2012b). Researchers can develop the Q sample through either a structured or unstructured method (Paige and Morin, 2015). Although both methods can generate themed statements from the concourse, the structured method has been shown to be more effective when evaluating the validity of the Q sample in terms of depth, readability, clarity and comprehensiveness (Stenner and Watts, 2012).

4.3.3 P-set (participants) selection

Participants in the Q study are called the P-set. It is important that there are sufficient participants in the P-set to perform factor analysis so their viewpoints can be compared (Van Excel and De Graaf, 2005). However, the number of participants in a Q study tend to be quite small, as the methodology does not rely on a large number of participants (McKeown and Thomas, 1988). For example, Brown (1980) suggests that the number of

participants should be between 40 and 60, but others suggest using a ratio between the number of statements and participants. Watts and Stenner (2012) have suggested that there should be one participant to two statements, while (Webler et al., 2009) have determined that the maximum ratio between participants and statements is one to three. Ratios based on the number of participants and themes taken from the concourse have also been suggested (Petit dit Dariel, 2011, Webler et al., 2009); however, this particular ratio may not be applicable for all Q studies, as not all of them identify themes from the concourse.

4.3.4 Performing the Q sorts

Once the Q sample and P-set are established, the participants perform the Q sort. Participants arrange the Q sample, comprising a set of cards containing one statement per card, onto a custom grid, according to the extent to which they agree or disagree with them (analogous to an Agree/Disagree Likert scale). The grid provides an inverted bell-shaped arrangement which is designed to encourage the participants to arrange the statements in a sequential way according to their viewpoints, but it obliges them to make choices by having fewer spaces at the extremes and more spaces in the middle for more neutral responses (Wright, 2013) (See Figure 4:2). To complete the data collection phase of the Q study, each participant is then interviewed in order to investigate the reasons behind their selection. The participants' grids are then stored for future analysis.

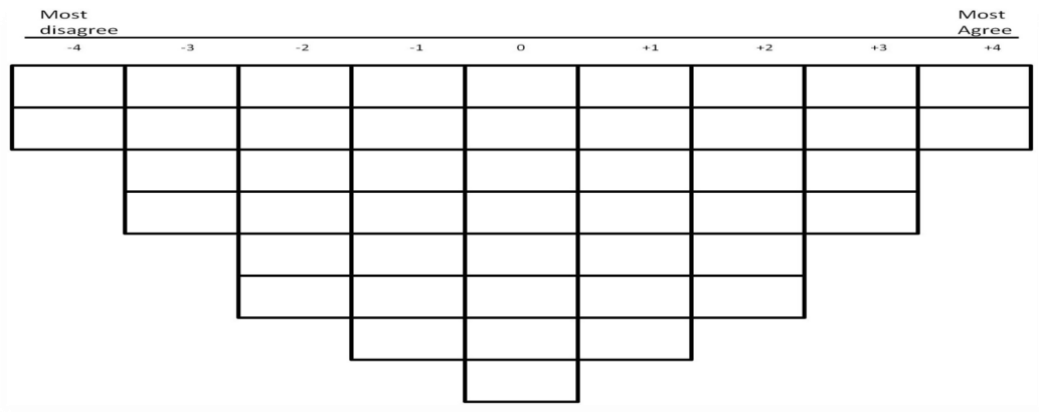

Figure 4-2: Grid for Q studies

4.3.5 Factor analysis and interpretation

In the final stage, the data from the Q sort activity are analysed using dedicated software programmes, such as Ken-Q and PQMethod, which are recommended for this purpose (Wright, 2013). The qualitative data from the post-sort interviews are considered as further data to inform and help the interpretation; however, they are seen as secondary data to the Q sort responses, which form the primary data set.

4.4 Q Study 1 and 2: Design and Procedure

Two Q studies were conducted for this research, the first evaluating physiotherapists' acceptance of the use of telerehabilitation in KSA (Study 1) and the second evaluating its acceptance among patients with MS (Study 2). The concourse for both studies was created from and informed by the literature review (See Chapter 2) and also by the opinions of the medical rehabilitation experts who participated in the pilot studies which were conducted before the two main studies.

4.4.1 Study configuration

Due to the effects of the COVID-19 pandemic, the two Q studies were conducted online with participants in KSA, who were either physiotherapists (Study 1) or patients with MS (Study 2). As the principal researcher is well established in the field of physiotherapy in KSA, he had access to a wide network of contacts from whom to select clinical gatekeepers who could provide access to patients with MS and to the physiotherapist populations. Two relevant gatekeepers were identified: the Saudi Physical Therapy Association and the ARFA Multiple Sclerosis Society. Information about the study was disseminated to potential participants through the gatekeepers, and they were then invited to contact the principal researcher directly. At no stage did the researcher have access to any databases containing personal or medical data for patients' with MS or for physiotherapists, and all recruitment for these studies was done through gatekeepers.

Participants were individually invited to take part in the Q sort. In line with the standard Q methodology, they were asked to place a set of statements relating to the use of telerehabilitation in KSA onto a Q-grid according to their subjective impressions. However, this was completed online on a secure web platform. After completing the Q sort, the participants were asked to provide written answers to post-sort questions that investigated why they had ordered the statements in that way. The post-sort questions were asked in this way as it was not practical to arrange online interviews with each participant immediately after they had completed their Q sorts. There was no randomisation of participants, as Q methodology is a two-

stage mixed-methods approach: the data collection stage is qualitative and this is followed by a quantitative analysis stage.

4.4.1.1 Phase One (Creating the concourse and Q sample)

This phase of the study involved a four-stage process:

i. Development of a pool of statements around the use of telerehabilitation in KSA. A total of 34 statements were created for Study 1 and 28 for Study 2. These statements were derived from a concourse, which included the literature review conducted for this study, the two theoretical frameworks (TAM and UTAUT), and the views of the medical rehabilitation experts who participated in the pilot studies;

ii. Iterative refinement of statements to eliminate ambiguities, repetitions, and to ensure relevance;

iii. Involvement of experts in both Q methodology and telerehabilitation, as well as stakeholders (physiotherapists and patients), to review the final set of statements;

iv. Translations and back-translations were conducted for the statements in Q Study 2, which was carried out in Arabic. This was done with the assistance of independent bilingual experts to ensure that the statements could be clearly understood in the Arabic language.

4.4.1.2 Phase Two (Main study)

After receiving ethical approval for the study, an online Q sort (statement sorting) invitation was sent via e-mail to physiotherapists (Study 1) or patients with MS (Study 2) by a recognised clinical gatekeeper. A participant information sheet was included in the e-mail. This explained that participation was voluntary, and that participants could withdraw from the study at any time. Volunteers who were willing to participate clicked on the link provided within the e-mail and were taken to a secure online platform to begin the sorting exercise. No personal log-ins were required nor downloading of any external apps.

The online Q sort involved participants positioning the statements on an online grid based on the extent to which they agreed or disagreed with them. This was done by dragging and dropping (on a laptop or PC) or by using the touch screen (on a smart phone). After completing the Q sort, the participants were asked to answer open-ended post-sort questions that aim to investigate the reasons behind their selections in the Q sort activity. The participant had to complete both the Q sort and post-sort questions in order to be able to submit their data, which was held on a secure server.

As Study 1 and Study 2 used different Q samples, their data was analysed separately. Both Ken-Q and PQMethod software are recommended for analysing the data in a Q study (Banasick, 2019), and Ken-Q analysis was used to analyse the participants' responses in both studies. Further details of the analysis are provided in Section 4.4.5 below.

4.4.2 Selection of participants

Neither the patients nor the physiotherapists in this thesis had utilised telerehabilitation sessions before participating in the study. The participants in both Q studies were determined purposively by employing a P-set matrix. The P-set matrix is used to guide researchers when selecting the study sample in Q studies, especially when a study seeks to ensure that a diverse cohort of participants is used (Brown, 2010, as cited in Petit dit Dariel (2011).

In order to generate the P-set matrix for each study, five characteristics were determined for each set of participants. These were gender, age group, experience, position, and sector for the physiotherapists, and age, gender, geographic location, level of education, and number of years since the onset of the disease for the patients with MS.

4.4.2.1 Physiotherapists (Study 1)

Each of the five characteristics of physiotherapists (gender, age group, experience, position, and sector) was then sub-divided into two categories. This gave a total of 32 possible combinations (2 [Gender] x 2 [Age] x 2 [Experience] x 2 [Position] x 2 [Sector]), or 32 P-sets (See Table 4-1). Physiotherapists also had to be Saudi citizens, so non-Saudi physiotherapists who worked in KSA were not included. They also had to be able to complete the Q sort online.

Table 4-1: P-set matrix for physiotherapists

Gender	Male	Female
Age	21-45 years old	45-65 years old
Experience	1-5 years	>5 years
Position	Staff	Head of department
Sector	Government	Private

According to the P-set matrix, a total of 32 participants were required to provide a diverse sample. Therefore, during the purposive sampling, 16 male and female participants were selected, with varying ages, experience, and positions, and from different sectors.

4.4.2.2 Patients with MS (Study 2)

Again, each characteristic (age, gender, geographic location, level of education, and disease onset) was divided into two categories, which yielded 32 possible combinations of (2 [Age] x 2 [Gender] x 2 [geographic location] x 2 [Level of education] x 2 [Disease onset]), for a total of 32 P-set (See Table 4-2). Furthermore, patients had to be Saudi citizens and to be able to read and write in Arabic; their MS also needed to be reasonably stable, and they had to be able to complete the Q sort online.

Table 4-2: P-set matrix of patients with MS

Gender	Male	Female
Age	18-45 years old	Above 45 years old
Geographic location	Urban	Rural
Level of education	High school or below	Degree or above
Disease onset	Less than 10 years	More than 10 years

4.4.3 Language of the Q studies

The first Q study (physiotherapists) was conducted in English while the second (patients with MS) was conducted in Arabic.

4.4.4 Duration of the Q studies

The duration of each participant's involvement during the study was around an hour for both the Q sort and the post-sort questions.

4.4.5 Data Analysis

The process of analysis in both studies began with the data entry stage, followed by a correlation matrix, and then factor extraction using the centroid method. The correlation matrix was generated by the Ken-Q software, based on the number of statements for each study and their positions on each participant's grid. The Q-sort matrix is not significant in itself, as the focus is on identifying the dominant perceptions of the group rather than comparing how closely individuals correlate, so it is best understood merely as a preparatory stage for factor analysis (Brown,

2004). The factor extraction method in both studies followed Watts and Stenner's (2012) recommendation to extract one factor for every eight participants. The final stage involved defining the Q sort and presenting the narrative interpretation for each factor.

In terms of retention, both studies used Kaiser-Guttman's criteria, which suggested extracting factors with eigenvalues greater than one (Brown, 1980). Secondly, both also followed the suggestion of retaining factors that have two or more significant loadings (Watts and Stenner, 2012). The significant loading was calculated following the formula: $2.58 \times 1 \div \sqrt{\text{number of statements}}$. Lastly, Humphrey's rule was applied to the extracted factors; this suggested that the highest two loadings of each factor should exceed the double of the standard error of the study (Watts and Stenner, 2012). The standard error was calculated by following the formula: $1 \div \sqrt{\text{number of statements}}$.

A crib sheet was used to aid in the interpretation of the factors. This was used to help the researcher identify the statements that were ranked high or low in a specific factor compared with other factors in the study (Watts and Stenner, 2012). In addition to the crib sheet, a table was created for each factor that showed the place of each statement in that factor. This was used to identify the distinguishing statements for each factor in the study. Each factor has distinguishing statements that set it apart from the others. This means that the participants placed those statements on the

grid in ways that were statistically significantly different from other factors in the study (Van Excel and De Graaf, 2005).

The qualitative data from the open-ended post-sort questions were also used to help with the Q-sort analysis.

4.4.5.1 Analysis of data from Study 1 (Physiotherapists)

The total number of Q sorts in this study was 32, so, in line with Watts and Stenner (2012), four factors were extracted. The significant loading of this study was $2.58 \times 1 \div \sqrt{34} = 0.44$. The standard error of the study was $1 \div \sqrt{34} = 0.17$. The double of the standard error was 0.34. After applying the criteria described above, three factors were identified as eligible: Factors 1, 2, and 4 (See Table 4-3).

Table 4-3: Eigenvalues and explained variance for Study 1

	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalues	10.748	1.9537	0.132	2.1921
% Explained variance	34	6	0	7
Factors that met the Kaiser-Guttman's criteria	✓	✓	x	✓
Factors that met the criteria to have two or more significant loadings	✓	✓	x	✓
Factors that met the Humphrey's rule	✓	✓	x	✓

26 participants had significantly loaded on the three study factors. Three participants (2, 6, and 14) were confounded, which means they had similar significant loads in more than one factor. Three participants (22, 29, and 32) were not loaded on any factor in the study. Table 4-4 below shows the factor loading for each Q sort in the study.

Table 4-4: Factor loading and defining the Q sample in Study 1

Confounding Q sort Non-significant loading

Participant / Q samples	*Factor 1*	*Factor 2*	*Factor 3*
1	0.2369	0.2603	0.7118
2	0.4729	0.3978	0.5343
3	0.2949	0.6982	0.1874
4	0.5838	0.1773	0.2463
5	0.4783	0.3395	0.2839
6	0.5055	0.5301	0.3132
7	0.0604	-0.027	0.5373
8	0.0647	0.6316	-0.1442
9	0.0482	0.6202	0.455
10	0.2161	0.3503	0.5944
11	0.5739	0.0998	0.2928
12	0.6308	0.2051	0.4654
13	0.0145	0.4487	0.1592
14	0.4918	0.4633	0.2001
15	0.7594	0.0906	0.064
16	0.3129	0.3599	0.648
17	0.6087	0.2525	0.0877

18	0.7127	0.3251	0.0721
19	0.3429	-0.0823	0.5318
20	0.1447	0.4679	0.1211
21	0.2128	0.6577	-0.0748
22	0.1165	0.1446	0.3969
23	0.5652	0.3307	0.4214
24	0.2855	-0.0444	0.6152
25	0.4291	0.4355	0.4524
26	0.0102	0.2707	0.7698
27	0.4411	0.2389	0.2815
28	0.1157	-0.2979	0.4656
29	0.4129	-0.1337	0.1514
30	0.6234	0.0557	0.1123
31	0.5992	0.0846	0.0608
32	0.3667	0.3121	0.1811
% Explained variance	18%	13%	15%

The three factors were rotated using Varimax rotation. The three-factor solution is described in Table 4-5. Factor 1 had 11 participants, who represented 34.4% of the study's participants. Factor 2 had 6 participants, who represented 18.7% of the study's participants. Factor 3 had 9 participants, who represented 28.1% of the study participants. Three

participants were confounded, and three participants did not load significantly on any factor in the study.

Table 4-5: Factor solution for Study 1

Factor	*No. of Participants*	*Percentage of participants (%)*
Factor 1	11	34,4
Factor 2	6	18.7
Factor 3	9	28.1
Confounding	3	9.4
Non-significant	3	9.4

4.4.5.2 Analysis of data from Study 2 (Patients with MS)

As in Study 1, four factors were extracted in this study, as it had 32 Q sorts. The significant loading of the study = $2.58 \times 1 \div \sqrt{28} = 0.49$. The standard error was $1 \div \sqrt{28} = 0.19$. The double of the standard error was 0.38. After applying the criteria set out above, three factors were identified as eligible: Factors 1, 2, and 3 (See Table 4-6).

Table 4-6: Eigenvalues and explained variance for Study 2

	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalues	5.8512	2.469	1.8288	0.2212
% Explained Variance	18	8	6	1
Factors that met the Kaiser-Guttman's criteria	✓	✓	✓	x
Factors that met the criteria of having two or more significant loadings	✓	✓	✓	x
Factors that met the Humphrey's rule	✓	✓	✓	x

18 participants significantly loaded on the three study factors. 14 participants were not loaded on any factor in the study. There were no confounded loads in Study 2. Table 4-7 shows the factor loading for each Q sort in the study.

Table 4-7: Factor loading and defining the Q sample in Study 2

Confounding Q sort Non-significant loading

Participant / Q samples	Factor 1	Factor 2	Factor 3
1	-0.0527	0.5327	0.0273
2	0.3184	-0.267	-0.188
3	0.5462	-0.1376	0.3928
4	0.5058	0.1508	-0.14
5	0.2541	0.547	-0.0512
6	0.0734	0.216	0.5227
7	-0.0685	0.1511	0.0779
8	-0.2909	0.4509	0.4297
9	0.6112	0.058	0.2129
10	0.3827	-0.0795	0.1493
11	0.5508	0.2137	0.3434
12	0.2136	0.4698	0.5719
13	0.7565	-0.0878	0.1524
14	0.0173	-0.2068	0.4473
15	-0.0685	0.0621	0.1814
16	0.1647	-0.1761	0.5533
17	0.3501	-0.0654	0.4918
18	0.4358	0.2245	-0.1171
19	0.4127	0.0858	0.2757
20	0.508	-0.0665	-0.1505
21	0.2299	-0.2632	0.0305
22	0.378	0.3788	0.5274
23	0.2474	0.3669	0.0132

Confounding Q sort Non-significant loading

24	0.617	0.1517	0.2246
25	0.5779	0.0413	0.2729
26	0.3287	-0.0027	0.5368
27	0.5384	-0.0738	0.175
28	0.0236	0.2677	-0.1176
29	0.3244	-0.4387	0.28
30	0.1674	-0.1756	0.3358
31	0.3976	0.0231	0.0283
32	0.245	0.5608	0.0692
% Explained variance	15%	7%	9%

The three factors in Study 2 were also rotated using Varimax rotation. The three-factor solution is described in Table 4-8 below. Factor 1 had 9 participants, who represented 28.1% of the study's participants. Factor 2 had 3 participants, who represented 9.4% of the participants. Factor 3 had 6 participants, who represented 18.7% of participants. 14 participants did not load significantly on any factor in the study.

Table 4-8: Factor solution for Study 2

Factor	*No. of Participants*	*(%)*
Factor 1	9	28.1
Factor 2	3	9.4
Factor 3	6	18.7
Non-significant	14	43.8

4.5 Data Storage

Data was securely stored on a computer with an encrypted password within a password-protected file. All data was stored on a secure dedicated web server with regular automatic backups. The study data was only accessible to the principal researcher and the doctoral supervisors. In compliance with the ICH/GCP guidelines, and in accordance with the University of Nottingham Code of Research Conduct and Research Ethics, the principal researcher will maintain all records and documents regarding the conduct of the study. These will be retained for at least 7 years, or for longer if required. If the principal researcher is no longer able to maintain the study records, a second person will be nominated to take over this responsibility.

4.6 Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee in the Faculty of Medicine and Health Sciences (FMHS) at the University of Nottingham before starting the study. Participants were provided with all of the relevant information about the study, including the participant information sheet, before they joined the study. The information sheet described the nature of the study and included other relevant information for participants, such as the study implications and constraints, to enable them to provide informed consent. All the participants were required to read and sign the consent form before joining the Q study online. A copy of the consent form is provided in Appendix III.

4.7 Confidentiality and Data Protection

Data Protection guidelines pertaining to confidentiality of, and access to personal information were observed. Furthermore, participants' names were written in code form to ensure their anonymity. Finally, data obtained from participants was only used for academic purposes, including discussion during supervision, informal meetings, or conferences, and in the writing of this thesis.

4.8 Study Finance

This project is part of a doctorate funded by the Ministry of Education in KSA. Any additional costs incurred in the course of this study were considered and met by the principal researcher.

4.8.1 Participant stipends and payments

Participants in the two Q studies were not paid or given any other incentive to take part.

4.9 Conclusion

This chapter has explained the Q methodology which underpins this study. It has also demonstrated that steps were taken to ensure that the research was conducted in an ethical manner and that participants' rights to confidentiality and date protection were respected. The next chapter presents the findings of the first Q study, which explored the acceptance of the use of telerehabilitation among physiotherapists in KSA.

Chapter 5: Results of Q Study 1 – Physiotherapists' Perceptions

5.1 Introduction

This chapter presents the results of the first Q study which explored the views of 32 Saudi physiotherapists (16 males and 16 females) who worked in private and government hospitals and clinics in KSA. All the participants were Saudi citizens and their ages ranged from 24-50. They included staff and heads of departments, with between 1 and 15 years of experience.

34 statements were used in the study, and the total number of Q sorts was 32 (representing 32 physiotherapists). After applying the criteria described in Chapter 4 (See 4.4.5.1), three factors were identified as eligible, and the participants were categorised into these factors according to the overall view of telerehabilitation their responses represented. The three factors were:

- Factor 1 (F1): Advocates of telerehabilitation;
- Factor 2 (F2): Hesitant towards telerehabilitation;
- Factor 3 (F3): Pragmatic towards telerehabilitation.

The findings from Q Study 1 are presented below as follows:

Firstly, a factor array for the whole study is presented, which shows the rank of each statement in all study factors;

Secondly, the consensus statements are presented; these are statements which were identified as being in similar positions in all factors after by-person factor analysis was applied, meaning participants in all factors

presented similar viewpoints about them (Brown, 1980). These viewpoints can be positive, negative, or neutral (Coogan and Herrington, 2011);

Thirdly, each of the three factors (F1, F2 and F3) is presented individually, with its crib sheet and distinguishing statements; these show the statements which were identified as most significant in each factor by comparison with the other factors (See Chapter 4). An interpretation of the factor is then provided, followed by a model Q sort linked to TAM and UTAUT. This shows how the 34 statements align with the constructs from the TAM and UTAUT models (PU/PE, SI, ID etc.), and illustrates their distribution across the Q-sort grid according to the participants' responses.

5.2 Factor Array

The score for each statement in each factor (known as the 'factor array') was calculated based on the participants' responses (where –4 = disagreed most and +4 = agreed most). These scores are shown in Table 5-1.

Table 5-1: Factor array for the statements across the three factors

No.	Statement	Rank		
		F1	*F2*	*F3*
1	Telerehabilitation increases my productivity compared to face-to-face rehabilitation as I can see more patients in a day.	-1	-2	-2
2	Using telerehabilitation improves patients care.	0	1	0
3	Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.	2	1	2
4	Telerehabilitation reduces the number of home visits to patients who required them.	1	1	2
5	Telerehabilitation reduces the cost of rehabilitation services.	4	2	0
6	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	2	2	-1
7	Using telerehabilitation facilitates better patient monitoring.	0	0	0
8	Telerehabilitation is helpful for patients who live far away from hospital and cannot attend face-to-face appointments regularly.	4	3	4
9	Telerehabilitation is most helpful when patients have severe disability.	-4	-3	-2
10	Telerehabilitation is only an effective method during critical times, such as COVID-19 where patients cannot come to the hospital.	-4	2	-2
11	Telerehabilitation sessions are easy to apply.	0	-1	-2
12	The aim of using telerehabilitation with patients is clear and understandable for me.	0	0	1

No.	Statement	Rank		
		F1	*F2*	*F3*
13	I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.	-3	3	-1
14	Delivering the session remotely by using telerehabilitation is easier than face-to-face sessions.	-2	-3	-3
15	I will recommend that other physiotherapists use telerehabilitation.	2	-2	-1
16	Patients and their carers should know the importance of telerehabilitation.	2	1	3
17	Physiotherapists in KSA think those who use technology with patients demonstrate more professional skills.	-2	0	1
18	Patients in KSA think that physiotherapists who use technology are more skilful and trusted than those who do not.	-3	-1	0
19	My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.	0	0	-3
20	Physiotherapists who are my role models use technology, such as telerehabilitation with their patients.	-1	-2	0
21	I will be able to get technical assistance if I have technical problems when using telerehabilitation with my patients.	-1	0	0
22	The security of the telerehabilitation platform is very important and patients' data must be protected.	3	4	2
23	I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	1	1	1

No.	Statement	Rank		
		F1	*F2*	*F3*
24	It is important to have clear and published local guidelines for using telerehabilitation before implementation.	1	3	4
25	Medical insurance companies should include telerehabilitation services under their medical cover.	1	0	-1
26	I think a special licence should be required for physiotherapists using telerehabilitation to ensure they are using it correctly.	-1	2	-4
27	I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.	-2	-1	-3
28	I am happy to deliver video telerehabilitation sessions for both genders.	0	-3	3
29	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	-3	-2	2
30	The patients' age does not affect the use of telerehabilitation, so I can deliver telerehabilitation sessions to all age groups.	-2	-4	-4
31	My clinical experience does not affect my ability to use telerehabilitation with my patients.	-1	-4	-1
32	I will use telerehabilitation with my patients when it becomes available in my hospital.	1	-1	1
33	I am always keen to try new approaches, such as telerehabilitation with my patients.	3	-1	1
34	COVID-19 has encouraged me to use telerehabilitation in the future.	3	4	3

These scores were used to identify the consensus statements in the study. These are presented and discussed in the next section, then each of the factors identified above (F1, F2 and F3) are presented and discussed.

5.3 Consensus Statements

In this study, 13 statements were categorised as consensus statements across all three factors. These are shown in Table 5-2.

Table 5-2: Consensus Statements in Q study 1

No.	Statement	Rank		
		F1	F2	F3
1	Telerehabilitation increases my productivity compared to face-to-face rehabilitation as I can see more patients in a day.	-1	-2	-2
2	Using telerehabilitation improves patients' care.	0	1	0
3	Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.	2	1	2
4	Telerehabilitation reduces the number of home visits to patients who require them.	1	1	2
7	Using telerehabilitation facilitates better patient monitoring.	0	0	0
8	Telerehabilitation is helpful for patients who live far away from hospital and cannot attend face-to-face appointments regularly.	4	3	4
9	Telerehabilitation is most helpful when patients have severe disability.	-4	-3	-2
12	The aim of using telerehabilitation with patients is clear and understandable for me.	0	0	1
14	Delivering the session remotely by using telerehabilitation is easier than face-to-face sessions.	-2	-3	-4
21	I will be able to get technical assistance if I have technical problems when using telerehabilitation with my patients.	-1	0	0

22	The security of the telerehabilitation platform is very important and patients' data must be protected.	3	4	2
23	I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	1	2	1
34	COVID-19 has encouraged me to use telerehabilitation in the future.	3	4	2

As the table demonstrates, the strongest positive consensus across all three factors related to the belief that telerehabilitation is a good option for patients who live in isolated places far from rehabilitation facilities (Statement 8). When asked about this in the post-sort interviews, three physiotherapists shared their clinical experiences:

> *"My hospital provides rehabilitation services to the entire population of the eastern province, which is the largest province in the kingdom. Many patients drive 1-3 hours twice a week to receive rehabilitation services, which affects their quality of life."* (Participant 24)
>
> "*I have a number of patients who live in nearby towns and come every two weeks for follow-up sessions, which could be done online, saving them time and effort*." (Participant 11)
>
> *"There are a lot of patients who cannot attend follow-up sessions in clinics due to various reasons, so telerehabilitation is a good solution."* (Participant 21)

The participants also consider the security of the telerehabilitation platform as a very important matter to protect patients' data (Statement 22). Participant 19 commented that:

"It is crucial to explain and make the data secure from any threats in order to promote using telehealth efficiently and persuade the clients to use this new service." (Participant 19)

Participant 20 linked this directly with patients' beliefs and mentioned the importance of privacy in their local community:

"In our community, patients need to feel that their information and privacy are protected, especially if they expose parts of their bodies." (Participant 20)

However, physiotherapists across the three factors agreed that telerehabilitation was not the best option for patients with severe physical disabilities (Statement 9). Participant 11 commented that:

"I would prefer to see severe *cases face-to-face to clearly see their progress." (Participant 11)*

Participant 12 linked this with the need for intensive sessions, specialist equipment, and also the safety of the patients, commenting that:

"Severe cases need intensive sessions and some equipment that is not available at home. Also, for the patients' safety, the carer or family might not understand the instructions from a distance." (Participant 12)

Participant 17 also mentioned the need to support carers of patients with severe disabilities, and the difficulty of providing this from a distance:

"Patients with severe disabilities require special treatment, and most of the time, their careers are afraid to do sessions without supervision, and some of them do not know how to take care of this properly. We cannot teach carers how to overcome this fear

through telerehabilitation; we have to see the patient face-to-face and give them special care." *(Participant 17)*

Furthermore, physiotherapists in all three factors disagreed with the idea that telerehabilitation sessions were easier than face-to-face sessions. For example, Participant 4 said that:

"Telerehabilitation sessions require some skills to make the session clearer. In face-to-face sessions, the explanation of the intervention or exercise can be easily demonstrated to the patients by doing it in front of them, whereas I believe this would be a bit confusing in telerehabilitation." (Participant 4)

In addition, Participant 13 commented that:

"A telerehabilitation session will not be easier for us because we cannot know the patients' condition and progress without doing hands-on assessments, which are not possible in telerehabilitation." (Participant 13)

In this context, it is significant that physiotherapists across all three factors indicated that they wanted to have training in using telerehabilitation with their patients in order to apply it in the most effective way (Statement 23).

Despite these reservations, physiotherapists across all study factors believed that telerehabilitation could be an effective solution in terms of reducing pressure and demand in outpatient clinics (Statement 3). They noted that most visits in the outpatient clinics are follow-up sessions, and these could be delivered remotely, thereby reducing waiting times for patients and improving the service provided. Participant 25 noted that:

"In physiotherapy practice, there is a huge pressure on the physiotherapy clinics. Therefore, a lot of patients usually wait a long time to be seen by a physiotherapist. Using telerehabilitation might help reduce the pressure on outpatient clinics and provide better rehabilitation services." (Participant 25)

Participant 5 added that:

"Patients who require monitoring and follow-up should not attend all visits face-to-face, and alternatives such as telerehabilitation should be considered." (*Participant 5)*

Participant 12 said that:

"The most common outpatient cases are chronic cases that require follow-up only, so telerehabilitation will help reduce our waiting list." (*Participant 12)*

There was also agreement that telerehabilitation sessions could be a way to reduce the number of home visits that patients need (Statement 4). Participant 28 supported this view, but pointed out that each patient's suitability for telerehabilitation must be carefully assessed:

"When following up with patients who require home visits, most of the revaluation can be done remotely. However, those patients must be assessed for eligibility to be enrolled in telerehabilitation sessions. If the patient is eligible, the frequency of home visits will significantly decrease with no effect on the quality of service." (Participant 28)

However, despite this, participants in all three factors disagreed with the idea that telerehabilitation would increase their individual productivity

because it would enable them to see more patients compared to face-to-face rehabilitation (Statement 1).

Physiotherapists across all factors thought that the COVID-19 outbreak had made them more likely to use telerehabilitation in the future (Statement 34). Participant 10 commented that:

> *"In COVID 19, there was a real situation in which we needed to help patients without face-to-face contact." (Participant 10)*

Participant 20 added that:

> *"Closing physiotherapy outpatient departments for months during COVID-19 lookdown made it harder to deal with musculoskeletal conditions, and early intervention, which was possible with telerehabilitation, could have helped a lot of patients avoid complications they didn't need."* (*Participant 20)*

Participant 15 reported that telerehabilitation services were not used in his workplace until the first COVID-19 lockdown:

> *"The COVID-19 lockdown was the first time for me and my workplace to be officially introduced to telerehabilitation services, and we had them running for a couple of months, and I personally found it a very practical method to continue serving patients in such a critical time."* (*Participant 15)*

Participant 31 also commented on the impact of the pandemic, saying:

> "*COVID-19 teaches us that we can treat patients remotely*." (*Participant 31)*

Although physiotherapists across all three factors were generally positive about the use of telerehabilitation, some statements received neutral responses. Participants were neutral about the idea that telerehabilitation could improve patient care and facilitate better patient monitoring (Statements 2 and 7), and they also took a neutral stand about whether the aim of applying telerehabilitation with patients was clear to them (Statement 12). On the technical side, they were also neutral about their ability to access technical assistance if they faced issues while using telerehabilitation with their patients (Statements 22).

In conclusion, 13 statements were found to be consensus statements, meaning physiotherapists across the three factors shared similar views about them. There was a strong agreement that telerehabilitation can benefit patients who live in remote locations by providing them with access to rehabilitation services without the need to travel to hospitals. There was also consensus that telerehabilitation has the potential to decrease the burden on outpatient clinics and reduce the number of home visits required. However, the participants did not believe that telerehabilitation would increase their productivity compared to in-person sessions, nor did they think it was an appropriate solution for patients with severe disabilities. They had a neutral stance on whether the purpose of using telerehabilitation was clear to them, and they were uncertain about its effectiveness in improving patient care and monitoring. Some doubts were also expressed about the availability of technical assistance during the implementation of telerehabilitation, but participants were neutral about

this overall. The security of the telerehabilitation platform was considered a crucial issue to safeguard patient data, and the physiotherapists supported the establishment of specialist training programmes prior to implementation to ensure that telerehabilitation is used effectively. Finally, the study found that the COVID-19 pandemic had led to an increase in the acceptance of telerehabilitation among physiotherapists, and they believed that it provided an opportunity to enhance rehabilitation provision in future.

5.4 Factor 1: Advocates

11 participants loaded significantly in Factor 1, which means their significance loading was equal to or above 0.44 (See 4.4.5.1). They represent 34.4% of the study participants, and the eigenvalue was 10.748 (See Table 5-3).

Table 5-3: Participants/ Q samples in Factor 1

No.	Participant No.	Q samples loading
1	4	0.5838
2	5	0.4783
3	11	0.5739
4	12	0.6308
5	15	0.7594
6	17	0.6087
7	18	0.7127
8	23	0.5652
9	27	0.4411
10	30	0.6234

11	31	0.5992
Eigenvalue	10.748	
Percentage (%)	34.4%	

5.4.1 Crib sheet for Factor 1

The crib sheet for Factor 1 is presented in Table 5-4. This was used to help the researcher identify the statements that were ranked higher or lower in this factor by comparison with the other factors (Watts and Stenner, 2012).

Table 5-4: Factor 1 Crib Sheet

No.	**Highest Ranked Statements**	**Rank**
8	Telerehabilitation is helpful for patients who live far away from hospital and cannot attend face-to-face appointments regularly.	4
5	Telerehabilitation reduces the cost of rehabilitation services.	4
No.	**Statements Ranked Higher in F1 Array than Other Arrays**	**Rank**
33	I am always keen to try new approaches, such as telerehabilitation with my patients.	3
6	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	2
15	I will recommend that other physiotherapists use telerehabilitation.	2
3	Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.	2
32	I will use telerehabilitation with my patients when it becomes available in my hospital.	1
23	I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	1
25	Medical insurance companies should include telerehabilitation services under their medical cover..	1
19	My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.	0

11	Telerehabilitation sessions are easy to apply.	0
7	Using telerehabilitation facilitates better patient monitoring.	0
No.	**Statements Ranked Lower in F1 Array than Other Arrays**	**Rank**
12	The aim of using telerehabilitation with patients is clear and understandable for me.	0
2	Using telerehabilitation improves patients care.	0
7	Using telerehabilitation facilitates better patient monitoring.	0
21	I will be able to get technical assistance if I have technical problems when using telerehabilitation with my patients.	-1
17	Physiotherapists in KSA think those who use technology with patients demonstrate more professional skills.	-2
13	I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.	-3
18	Patients in KSA think that physiotherapists who use technology are more skilful and trusted than those who do not.	-3
29	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	-3
No.	**Lowest Ranked Statements**	**Rank**
9	Telerehabilitation is most helpful when patients have severe disability.	-4
10	Telerehabilitation is only an effective method during critical times, such as COVID-19 where patients cannot come to the hospital.	-4

5.4.2 Distinguishing statements for Factor 1

As explained in Chapter 4, each factor has distinguishing statements that set it apart from the others. This means that the participants placed those statements on the grid in ways that were statistically significantly different from other factors (Van Excel and De Graaf, 2005). The distinguishing statements for F1 are shown in Table 5-5.

Table 5-5: Distinguishing Statements for Factor 1

No.	Statement	Rank		
		F1	F2	F3
5	Telerehabilitation reduces the cost of rehabilitation services.	4	2	0
33	I am always keen to try new approaches	3	-1	1
15	I will recommend that other physiotherapists use telerehabilitation.	2	-2	-1
19	My supervisors/managers think that I should use technology, such as telerehabilitation	0	0	-3
28	I am happy to deliver video telerehabilitation sessions for both genders.	0	-3	3
26	I think a special licence should be required for physiotherapists using telerehabilitation to ensure they are using it correctly.	-1	2	-4
27	I prefer to deliver telerehabilitation sessions only to patients who are the same gender	-2	-1	-3
30	The patients' age does not affect the use of telerehabilitation, so I can deliver telerehabilitation sessions to all age groups.	-2	-4	-4
17	Physiotherapists in KSA think those who use technology with patients demonstrate more professional skills.	-2	0	1
13	I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.	-3	3	-1
18	Patients in KSA think that physiotherapists who use technology are more skilful and trusted	-3	-1	0
29	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	-3	-2	2
10	Telerehabilitation is only an effective method during critical times, such as COVID-19, where patients cannot come to the hospital.	-4	2	-2

5.4.3 Interpretation of Factor 1

Participants in Factor 1 were classified as 'Advocates'. They expressed optimistic views towards telerehabilitation, and they believed that it could reduce the cost of rehabilitation services, both for clinics and for patients (Statement 5). For example, Participant 28 commented that:

> *"Telerehabilitation does not need beds, chairs, or assessment tools in the clinic, so it may lower the cost of rehabilitation services." (Participant 28)*

Participant 23 linked this to a decrease in costs for patients:

> "*Telerehabilitation will save patients money because it requires less effort from us*." (*Participant 23)*

These physiotherapists expressed a willingness to use telerehabilitation with their patients when it becomes available in their workplace, and they think insurance companies should include telerehabilitation services under their medical coverage (Statement 25, 32 and 33). Participant 16 mentioned that:

> *"I want to use it with patients with chronic conditions or those who mainly need guidance and a specific exercise programme and who have difficulty coming to the clinic in a regular manner." (Participant 16)*

Furthermore, they also wanted to encourage other physiotherapists to use it (Statement 15). Participant 18 commented that:

> "*I would recommend using telerehabilitation as it is a good option for following up on cases*." (*Participant 18)*

However, despite their support for the use of telerehabilitation, they did not think using technology as a tool in their clinics would enhance their professional reputation with their peers or their patients (Statements 17 and 18).

Physiotherapists in this factor would not be deterred from using telerehabilitation for fear of making mistakes or missing critical information during the session (Statement 13). However, they felt it could not replace face-to-face sessions and should only be used as a supplementary method when needed (Statement 6). Participant 31 said that:

> "*Face-to-face rehabilitation is more effective than telerehabilitation, so it is preferred*." (*Participant 31)*

Participant 12 commented that:

> *"Acute cases and new patients require a few sessions face-to-face, particularly for psychological and social support."* (*Participant 12)*

Regarding the age of patients or physiotherapists, they believed it could be a challenging issue that may affect the successful implementation of telerehabilitation in their clinics (Statements 29 and 30). Participant 23, for example, linked age with the patients' ability to use the technology:

> *"Old patients might not have good skills or knowledge of using a smart phone which would not help them to use this type of services."* (Participant 23)

Physiotherapists in F1 also strongly believed that the effectiveness of telerehabilitation extends beyond the COVID-19 lockdown periods, and it

should continue to be used in future (Statement 10). Participant 12 stated that:

> *"The uses of telerehabilitation should not be limited to COVID-19; it can be used for chronic cases and patients who live far away from hospitals."* (Participant 12)

In conclusion, physiotherapists in Factor 1 were optimistic about telerehabilitation because they believed it would lower the cost of rehabilitation services. They intended to use telerehabilitation when it became available and also wanted to encourage other physiotherapists to use it. However, they would prefer to use it only when necessary, as they did not believe it could replace face-to-face sessions. They also believed that the age of the user was significant, and this could be a limiting factor in some cases. Nonetheless, overall, they felt that the benefits of telerehabilitation extended beyond its utility during the COVID-19 lockdowns, when face-to-face contact was severely restricted.

5.4.4 Model Q sort for Factor 1

As explained in Chapter 3, the TAM and UTAUT models identify a number of constructs which affect users' acceptance of new technologies. The model Q sort presented in

Table 5-6 was compiled based on the participants' responses in Factor 1 and illustrates the construct represented by each statement and the distribution of the statements within this factor.

Table 5-6: Model Q sort for Factor 1

-4 (Disagree most)	-3	-2	-1	0 (Neutral)	+1	+2	+3	+4 (Agree most)
9- Telerehabilitation is most helpful when patients have severe disability.	13- I hesitate to use telerehabilitation for fear of missing critical information	14- Delivering the session remotely is easier than face-to-face sessions.	21- I will be able to get technical assistance	12- The aim of using telerehabilitation with patients is clear and understandable for me.	4- Telerehabilitation reduces the number of home visits to patients who required them.	6- Using telerehabilitation should be considered as a supplementary method	34- COVID-19 has encouraged me to use telerehabilitation in the future.	8- Telerehabilitation is helpful for patients who live far away
10- Telerehabilitation is only an effective method during critical times.	18- Patients in KSA think that physiotherapists who use technology are more skillful and trusted than those who do not.	27- I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.	20- Physiotherapists who are my role models use technology	19- My supervisors/managers think that I should use technology	32- I will use telerehabilitation with my patients when it becomes available in my hospital	15- I will recommend that other physiotherapists use telerehabilitation	22- The security of the telerehabilitation platform is very important and patients' data must be protected	5- Telerehabilitation reduces the cost of rehabilitation services.
	29- My age has nothing to do with my ability and skills to use telerehabilitation effectively.	30- The patients' age does not affect the use of telerehabilitation	26- I think that a special licence for using telerehabilitation should be required	28- I am happy to deliver video telerehabilitation sessions for both genders.	24- It is important to have clear and published local guidelines for using telerehabilitation	3- Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.	33- I am always keen to try new approaches, such as telerehabilitation with my patients.	
		17- Physiotherapists think if they use technology it will demonstrate more professional skills	31- My clinical experience does not affect my ability to use telerehabilitation with my patients.	2- Using telerehabilitation improves patients' care.	23- I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	16- Patients and their carers should know the importance of telerehabilitation.		
			1- Telerehabilitation increases my productivity	11- Telerehabilitation sessions are easy to apply.	25- Medical insurance companies should include telerehabilitation			
				7- Using telerehabilitation facilitates better patient monitoring				

Perceived usefulness/Performance expectancy (PU/PE)

Perceived ease of use/ effort expectancy (PEoU/EE)

Social influence (SI)

Facilitating conditions (FC)

Individual difference (ID)

Behavioural intention (BI)

The model Q sort shows that out of 10 statements representing PU/PE (yellow) seven were ranked between 0 (neutral) and +4 (agree most). The three statements representing BI (red) were ranked between +1 to +3. Similarly, five statements out of seven representing FC (pink) were ranked between +1 to +3. However, all four statements representing SI (blue) were ranked between 0 to -3. As for the statements representing PEoU/EE (green) and ID (grey), all of them were ranked between 0 to -3.

When analysing the placement of each statement on the Q-sort grid, it is important to consider whether it is a positive or negative statement, and the implications of these results are discussed in Chapter 7.

5.5 Factor 2: Hesitant

Six participants loaded significantly in Factor 2. They represent 18.7% of the participants, and the eigenvalue in Factor 2 was 1.95 (See Table 5-7).

Table 5-7: Participants/ Q samples in Factor 2

No.	Participant No.	Q samples loading
1	3	0.6982
2	6	0.6316
3	8	0.6202
4	13	0.4487
5	20	0.4679
6	21	0.6577
Eigenvalue	1.9537	
Percentage (%)	18.7%	

As in Factor 1, the crib sheet for Factor 2 is presented first, followed by the distinguishing statements, and a descriptive narrative interpretation. Finally, a model Q sort linked to TAM and UTAUT is provided.

5.5.1 Crib sheet for Factor 2

The crib sheet for Factor 2 is presented in Table 5-8.

Table 5-8: Factor 2 Crib Sheet

No.	Highest Ranked Statements	Rank
34	COVID-19 has encouraged me to use telerehabilitation in the future.	4
22	The security of the telerehabilitation platform is very important and patients' data must be protected.	4
No.	**Statements Ranked Higher in F2 Array than Other Arrays**	**Rank**
13	I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.	3
10	Telerehabilitation is only an effective method during critical times, such as COVID-19 where patients cannot come to the hospital.	2
6	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	2
26	I think a special licence should be required for physiotherapists using telerehabilitation to ensure they are using it correctly.	2
23	I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	1
2	Using telerehabilitation improves patients care.	1
7	Using telerehabilitation facilitates better patient monitoring.	0
19	My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.	0
21	I will be able to get technical assistance if I have technical problems when using telerehabilitation with my patients.	0
No.	**Statements Ranked Lower in F2 Array than Other Arrays**	**Rank**
7	Using telerehabilitation facilitates better patient monitoring.	0
12	The aim of using telerehabilitation with patients is clear and understandable for me.	0

33	I am always keen to try new approaches, such as telerehabilitation with my patients.	-1
32	I will use telerehabilitation with my patients when it becomes available in my hospital.	-1
20	Physiotherapists who are my role models use technology, such as telerehabilitation with their patients.	-2
1	Telerehabilitation increases my productivity compared to face-to-face rehabilitation as I can see more patients in a day.	-2
15	I will recommend that other physiotherapists use telerehabilitation.	-2
14	Delivering the session remotely by using telerehabilitation is easier than face-to-face sessions.	-3
28	I am happy to deliver video telerehabilitation sessions for both genders.	-3
No.	**Lowest Ranked Statements**	**Rank**
31	My clinical experience does not affect my ability to use telerehabilitation with my patients.	-4
30	The patients' age does not affect the use of telerehabilitation, so I can deliver telerehabilitation sessions to all age groups.	-4

5.5.2 Distinguishing statements for Factor 2

The distinguishing statements for Factor 2 are shown in Table 5-9 below.

5.5.3 Interpretation of Factor 2

Participants in Factor 2 were classified as 'Hesitant'. They appeared to be more hesitant about the use of telerehabilitation, and they were anxious about implementing it with their patients because they were worried about missing critical information when conducting therapeutic sessions remotely (Statement 13). As a result, if telerehabilitation becomes available in their workplace, they would prefer not to use it, nor were they keen to try new

Table 5-9: Distinguishing Statements for Factor 2

No.	Statement	Rank		
		F1	F2	F3
13	I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.	-3	3	-1
10	Telerehabilitation is only an effective method during critical times, such as COVID-19 where patients cannot come to the hospital.	-4	2	-2
26	I think a special licence should be required for physiotherapists using telerehabilitation to ensure they are using it correctly.	-1	2	-4
5	Telerehabilitation reduces the cost of rehabilitation services.	4	2	0
19	My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.	0	0	-3
17	Physiotherapists in KSA think those who use technology with patients demonstrate more professional skills.	-2	0	3
27	I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.	-2	-1	-4
33	I am always keen to try new approaches, such as telerehabilitation with my patients.	3	-1	-3
29	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	-3	-2	-4
32	I will use telerehabilitation with my patients when it becomes available in my hospital.	1	-1	1
15	I will recommend that other physiotherapists use telerehabilitation.	2	-2	-1
28	I am happy to deliver video telerehabilitation sessions for both genders.	0	-3	0
31	My clinical experience does not affect my ability to use telerehabilitation with my patients.	-1	-4	2

approaches with their patients (Statement 23 and 33). Furthermore, they agreed that physiotherapists who use telerehabilitation should be required to have a special licence in order to ensure its proper use (Statement 26). Participant 6 said that:

> *"The licence will help to make sure that every physiotherapist knows how to use telerehabilitation correctly, which can build trust quickly between patients and physiotherapists." (Participant 6)*

Participant 13 also supported this idea, commenting that:

> *"Everyone now, even non-physiotherapists, can talk about treating some conditions without providing evidence, so the licence might help patients to know who is authorised and who is not." (Participant 13)*

They also believed that the clinical experience of the physiotherapists was equally important, regardless of whether it is a remote or face-to-face session, and they thought this might be negatively affected if they only saw patients remotely (Statement 31). Participant 3 stated that:

> *"The technology here is used as a connection between the patient and the physiotherapists, so clinical experience is still as important as a face-to-face physiotherapy session." (Participant 3)*

Participant 8 said that:

> *"If I completely shift my way to see patients through telerehabilitation, my hands-on skills might be diminished and weakened with time." (Participant 8)*

They did not believe that their role models in the physiotherapy profession relied on technology in their treatment plans (Statement 20), and they would not recommend that other physiotherapists use it (Statements 15). Participant 21 commented that:

> *"Most of my role models in physiotherapy would prefer face-to-face sessions in the clinic." (Participant 21)*

They also believed that telerehabilitation was only effective during critical times, such as the COVID-19 pandemic, when patients could not come to the rehabilitation clinics in person (Statement 10).

As in Factor 1, these physiotherapists also thought that the age of both patients and clinicians may affect the implementation of telerehabilitation (Statements 29 and 30). Participant 3 indicated that:

> *"Older people may not have access to technology, and if they do, they may not know how to use it properly." (Participant 3)*

Participant 21 mentioned that:

> *"Elderly patients don't use technology as well as younger people do, which could make it hard for the physiotherapist to give the session remotely to this age group." (Participant 21)*

Physiotherapists in Factor 2 also expressed a strong reluctance to deliver telerehabilitation sessions to patients of both genders (Statement 28), suggesting that they would prefer to deliver them only to patients of the same gender. Participant 8 ascribed this to religious beliefs:

> *"This is based on our religion." (Participant 8)*

To sum up, physiotherapists in Factor 2 were hesitant towards telerehabilitation, and they would prefer not to use it in future. They agreed that a special licence should be required for telerehabilitation practitioners, and that the clinical experience of the physiotherapists was equally important whether the session was remote or face-to-face. If they were to deliver telerehabilitation sessions in future, they would prefer to provide them to patients of the same gender, possibly due to religious beliefs. Additionally, they feel that the age of patients and clinicians may affect the implementation of telerehabilitation, and they viewed it as effective only during critical times, such as the COVID-19 pandemic.

5.5.4 Model Q Sort for Factor 2

A model Q sort for Factor 2 is presented in Table 5-10. As explained above, when analysing the placement of each statement on the grid, it is important to consider whether it is a positive or negative statement, and the implications of these results are discussed in Chapter 7.

Table 5-10: Model Q sort for Factor 2

-4 (Disagree most)	-3	-2	-1	0 (Neutral)	+1	+2	+3	+4 (Agree most)
31- My clinical experience does not affect my ability to use telerehabilitation with my patients.	9- Telerehabilitation is most helpful when patients have severe disability.	29- My age has nothing to do with my ability and skills to use telerehabilitation effectively.	27- I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.	25- Medical insurance companies should include telerehabilitation	3- Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.	10- Telerehabilitation is only an effective method during critical times,	24- It is important to have clear and published local guidelines for using telerehabilitation	34- COVID-19 has encouraged me to use telerehabilitation in the future.
30- The patients' age does not affect the use of telerehabilitation	14- Delivering the session remotely is easier than face-to-face sessions.	20- Physiotherapists who are my role models use technology	33- I am always keen to try new approaches, such as telerehabilitation with my patients.	7- Using telerehabilitation facilitates better patient monitoring	4- Telerehabilitation reduces the number of home visits to patients who required them.	6- Using telerehabilitation should be considered as a supplementary method	13- I hesitate to use telerehabilitation for fear of missing critical information	22- The security of the telerehabilitation platform is very important and patients' data must be protected
	28- I am happy to deliver video telerehabilitation sessions for both genders.	1- Telerehabilitation increases my productivity	11- Telerehabilitation sessions are easy to apply.	12- The aim of using telerehabilitation with patients is clear and understandable for me.	23- I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	26- I think that a special licence for using telerehabilitation should be required	8- Telerehabilitation is helpful for patients who live far away	
		15- I will recommend that other physiotherapists use telerehabilitation	18- Patients in KSA think that physiotherapists who use technology are more skilful and trusted than those who do not.	19- My supervisors/managers think that I should use technology	16- Patients and their carers should know the importance of telerehabilitation.	5-Telerehabilitation reduces the cost of rehabilitation services.		
			32- I will use telerehabilitation with my patients when it becomes available in my hospital	17- Physiotherapists think if they use technology it will demonstrate more professional skills	2- Using telerehabilitation improves patients' care.			
				21- I will be able to get technical assistance				

	Perceived usefulness/Performance expectancy (PU/PE)		Social influence (SI)		Individual difference (ID)
	Perceived ease of use/ effort expectancy (PEoU/EE)		Facilitating conditions (FC)		Behavioural intention (BI)

As the model Q sort shows, all the statements representing FC (pink) were ranked between 0 to +4. Two out of three statements representing BI (red) were ranked -1. All the statements representing SI (blue) were ranked between 0 to -2. Three out of four statements representing PEoU/EE (green) were ranked between 0 to -3. The five statements representing ID (grey) were ranked between -1 to -4 and two of them were ranked -4. Eight out of ten statements representing PU/PE (yellow) were ranked between 0 to+3. The implications of these results are discussed in Chapter 7.

5.6 Factor 3: Pragmatic

Nine participants significantly loaded in Factor 3. They represent 28.1% of the study participants. The eigenvalue was 2.19 (See Table 5-11).

Table 5-11: Participants/ Q samples in Factor 3

No.	Participant No.	Q samples loading
1	1	0.7118
2	7	0.5373
3	11	0.5944
4	16	0.648
5	19	0.5318
6	24	0.6152
7	25	0.4524
8	26	0.7698
9	28	0.4656
Eigenvalue	2.1921	
Percentage (%)	18.7%	

As in Factors 1 and 2, the crib sheet for Factor 3 is presented first, followed by the distinguishing statements and the descriptive narrative interpretation. Finally, a Model Q sort linked to TAM and UTAUT is shown.

5.6.1 Crib sheet for Factor 3

The crib sheet for Factor 3 is presented in Table 5-12.

Table 5-12: Factor 3 Crib Sheet

No.	Highest Ranked Statements	Rank
24	It is important to have clear and published local guidelines for using telerehabilitation before implementation.	4
8	Telerehabilitation is helpful for patients who live far away from hospital and cannot attend face-to-face appointments regularly.	4
No.	**Statements Ranked Higher in F3 Array than Other Arrays**	**Rank**
28	I am happy to deliver video telerehabilitation sessions for both genders.	3
16	Patients and their carers should know the importance of telerehabilitation.	3
3	Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.	2
29	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	2
4	Telerehabilitation reduces the number of home visits to patients who required them.	2
23	I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	1
32	I will use telerehabilitation with my patients when it becomes available in my hospital.	1
17	Physiotherapists in KSA think those who use technology with patients demonstrate more professional skills.	1
12	The aim of using telerehabilitation with patients is clear and understandable for me.	1

20	Physiotherapists who are my role models use technology, such as telerehabilitation with their patients.	0
21	I will be able to get technical assistance if I have technical problems when using telerehabilitation with my patients.	0
18	Patients in KSA think that physiotherapists who use technology are more skilful and trusted than those who do not.	0
No.	**Statements Ranked Lower in F3 Array than in Other Arrays**	**Rank**
7	Using telerehabilitation facilitates better patient monitoring.	0
2	Using telerehabilitation improves patients care.	0
5	Telerehabilitation reduces the cost of rehabilitation services.	0
25	Medical insurance companies should include telerehabilitation services under their medical cover.	-1
6	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	-2
11	Telerehabilitation sessions are easy to apply.	-2
1	Telerehabilitation increases my productivity compared to face-to-face rehabilitation as I can see more patients in a day.	-3
19	My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.	-3
14	Delivering the session remotely by using telerehabilitation is easier than face-to-face sessions.	-3
No.	**Lowest Ranked Statements**	**Rank**
26	I think a special licence should be required for physiotherapists using telerehabilitation to ensure they are using it correctly.	-4
30	The patients' age does not affect the use of telerehabilitation, so I can deliver telerehabilitation sessions to all age groups	-4

5.6.2 Distinguishing statements for Factor 3

The distinguishing statements for Factor 3 are shown in Table 5-13.

Table 5-13: Distinguishing Statements for Factor 3

		Rank

No.	Statement	F1	F2	F3
28	I am happy to deliver video telerehabilitation sessions for both genders.	0	-3	3
16	Patients and their carers should know the importance of telerehabilitation.	2	1	3
29	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	-3	-2	2
17	Physiotherapists in KSA think those who use technology with patients demonstrate more professional skills.	-2	0	1
33	I am always keen to try new approaches, such as telerehabilitation with my patients.	3	-1	1
20	Physiotherapists who are my role models use technology, such as telerehabilitation with their patients.	-1	-2	0
5	Telerehabilitation reduces the cost of rehabilitation services.	4	2	0
13	I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.	-3	3	-1
15	I will recommend that other physiotherapists use telerehabilitation.	2	-2	-1
6	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	2	2	-1
10	Telerehabilitation is only an effective method during critical times, such as COVID-19 where patients cannot come to the hospital.	-4	2	-2
19	My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.	0	0	-3
27	I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.	-2	-1	-3
26	I think a special licence should be required for physiotherapists using telerehabilitation to ensure they are using it correctly.	-1	2	-4

5.6.3 Interpretation of Factor 3

Physiotherapists in this factor were classified as pragmatic about the use of telerehabilitation. While they could see its value, especially for patients who struggled to attend in-person appointments (Statement 8), they thought

that it was important to have clear published guidelines for using telerehabilitation before implementation (Statement 24). Participant 16 stated that:

> *"It will be very important to establish national guidelines for telerehabilitation to avoid confusion and make sure that both physiotherapists and patients get better results, especially in the way of delivery, the amount of delivery, the age group of patients, and the condition or diagnosis of the patients who should receive this type of treatment." (Participant 16)*

Participant 1 also highlighted the importance of published guidelines by stating that:

> *"As a professional physiotherapist, our practice must be evidence-based." (Participant 1)*

These participants felt that the success of telerehabilitation was linked to the awareness of patients and their carers about its uses (Statement 16). Participant 7 commented that:

> *"Patients and carers should understand the benefits and uses of telerehabilitation before trying it." (Participant 7)*

They also thought that patient age was a key factor, as delivering telerehabilitation sessions could be more difficult with both older and very young patients. For example, Participant 25 said that:

> *"The patient's age is very important when using telerehabilitation, and from my experience, it is difficult to use telerehabilitation with older patients with cognitive impairment, speech or visual problems, and less skill in using technologies. Also, with children*

or younger patients, as they can easily become distracted and disengage from therapeutic tasks." (Participant 25)

However, they did not consider their age as a challenge to implementing technology effectively (Statement 29), with Participant 7 commenting that:

"I think there is no age limit to learn something new." (Participant 7)

Despite this willingness to use new technologies, physiotherapists in this factor thought that telerehabilitation sessions were not easy to apply. Participant 28 commented that:

"Personally, I do not think it is easy to apply telerehabilitation since it is different from conventional intervention. It comes with its own problems, and the physiotherapist should know how to run a telerehabilitation session." (Participant 28)

However, they did not believe there was a need for a special licence to use telerehabilitation approaches with patients and thought that effective training would be enough. Participant 1 said that:

"It just needs simple instruments and software." (Participant 1)

Participant 16 also commented that:

"I think online training will be enough to acquire the minimal skills needed to deliver telerehabilitation." Requiring a licence may be challenging in the future, especially if there are some fees for this service and its renewal." (Participant 16)

In addition, in contrast to the participants in Factor 2, physiotherapists in this factor were ready to deliver telerehabilitation sessions to all patients regardless of their gender (Statement 28). Participant 19 commented that:

> *"Gender has nothing to do with telerehabilitation, since there is no direct contact with patients." (Participant 19)*

Although these physiotherapists believed the uses and benefits of telerehabilitation were not limited to circumstances such as the COVID-19 lockdown (Statement 10) and they intended to use it with their patients (Statement 32), they would not recommend that other physiotherapists implement the technology (Statement 15). They also assumed that their supervisors and managers would not care whether they used telerehabilitation or met their patients face-to-face for rehabilitation sessions (Statement 19).

In conclusion, the physiotherapists in Factor 3 were pragmatic about the use of telerehabilitation. They were willing to use it with patients of both genders, but they thought clear and accessible guidelines were essential for its successful implementation. They also thought that patients and their caregivers needed to be educated about the benefits of telerehabilitation for it to work effectively. They did not feel that a special licence to provide telerehabilitation was required, as long as adequate training was provided, and they were confident in their ability to use technology in their practice, regardless of their age. However, they thought that the age of the patient was critical. While these physiotherapists planned to use telerehabilitation

and other new technologies with their patients, they did not think it was easy to apply sessions remotely and they did not intend to recommend the use of telerehabilitation to their colleagues and peers.

5.6.4 Model Q Sort for Factor 3

A model Q sort for Factor 3 is presented in Table 5-14. The model shows that seven out of ten statements representing PU/PE (yellow) were ranked between 0 to -2. Five out of seven statements representing FC (pink) were ranked between 1 to +4. All the statements representing BI (red) were ranked between +1 to -3. Four out of five statements representing SI (blue) were ranked between 0 to -3. Three out of four statements representing PEoU/EE (green) were ranked between -1 to -3. Two out of five statements representing ID (grey) were ranked between +2 to +3. The implications of these results are discussed in Chapter 7.

Table 5-14: Model Q sort: Factor 3

-4 (Disagree most)	-3	-2	-1	0 (Neutral)	+1	+2	+3	+4 (Agree most)
26- I think that a special licence for using telerehabilitation should be required	19- My supervisors/managers think that I should use technology	11- Telerehabilitation sessions are easy to apply.	13- I hesitate to use telerehabilitation for fear of missing critical information	20- Physiotherapists who are my role models use technology	23- I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.	3- Using telerehabilitation reduces the pressure and demand in the outpatients' clinics	28- I am happy to deliver video telerehabilitation sessions for both genders.	24- It is important to have clear and published local guidelines for using telerehabilitation
30- The patients' age does not affect the use of telerehabilitation	14- Delivering the session remotely is easier than face-to-face sessions.	1- Telerehabilitation increases my productivity	25- Medical insurance companies should include telerehabilitation	7- Using telerehabilitation facilitates better patient monitoring	32- I will use telerehabilitation with my patients when it becomes available in my hospital	29- My age has nothing to do with my ability and skills to use telerehabilitation effectively.	16- Patients and their carers should know the importance of telerehabilitation.	8- Telerehabilitation is helpful for patients who live far away
	27- I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.	9- Telerehabilitation is most helpful when patients have severe disability.	15- I will recommend that other physiotherapists use telerehabilitation	21- I will be able to get technical assistance	17- Physiotherapists think if they use technology it will demonstrate more professional skills	4- Telerehabilitation reduces the number of home visits to patients who required them.	34- COVID-19 has encouraged me to use telerehabilitation in the future.	
		10- Telerehabilitation is only an effective method during critical times,	6- Using telerehabilitation should be considered as a supplementary method	2- Using telerehabilitation improves patients' care.	12- The aim of using telerehabilitation with patients is clear and understandable	22- The security of the telerehabilitation platform is very important and patients' data must be protected		
			31- My clinical experience does not affect my ability to use telerehabilitation with my patients.	5- Telerehabilitation reduces the cost of rehabilitation services.	33- I am always keen to try new approaches, such as telerehabilitation with my patients			
				18- Patients in KSA think that physiotherapists who use technology are more skilful and trusted				

Perceived usefulness/Performance expectancy (PU/PE)

Perceived ease of use/ effort expectancy (PEoU/EE)

Social influence (SI)

Facilitating conditions (FC)

Individual difference (ID)

Behavioural intention (BI)

5.7 Conclusion

Physiotherapists across all three factors agreed that telerehabilitation is useful for patients who live far from hospitals and that it can reduce demand on outpatient departments and cut the number of home visits required. However, they did not think it would increase their productivity or work for patients with severe disabilities and they had concerns about data security. They agreed that the COVID-19 pandemic had provided an opportunity to increase its use, but they were neutral about whether its purpose and effectiveness was clear. They strongly supported the introduction of training programmes and formal guidelines to support its effective use.

The physiotherapists in Factor 1 had a positive attitude towards using telerehabilitation as a way to reduce the cost of rehabilitation services. They planned to incorporate it into their practice and to advocate for its use among their colleagues. Although they thought that the advantages of telerehabilitation extended beyond the COVID-19 period, they recognized that it could not completely replace in-person sessions, and they would only use it when necessary. They also expressed the view that the feasibility of using telerehabilitation may depend on the age of the patient.

Physiotherapists in Factor 2 were more reluctant to use telerehabilitation due to concerns about licencing, clinical experience, treating patients of the opposite gender, and the age of patients and clinicians. They only viewed it as effective during critical times, such as the COVID-19 pandemic, when patients could not attend clinics in person.

The physiotherapists in Factor 3 tended to have more pragmatic attitudes towards the use of telerehabilitation. They felt confident in their ability to use the technology, and they were willing to use it with patients of both genders. However, they thought that clear guidelines and patient education were crucial for its success, and, while they planned to use telerehabilitation with their patients they did not intend to recommend it to their peers.

This chapter has reported the results of the first Q study which explored the perceptions of Saudi physiotherapists towards the use of telerehabilitation in KSA. The next chapter presents the results of the second study which explored the acceptance of telerehabilitation among Saudi patients with MS.

Chapter 6: Results of Q Study 2 – Patients' Perceptions

6.1 Introduction

This chapter presents the results of the second Q study which explored the acceptance of telerehabilitation among 32 patients with MS (16 males and 16 females). All the participants were Saudi citizens, living in urban or rural areas of KSA. Their ages ranged from 18 to 55, and they had varying education levels, from high school or below to degree level or above.

28 statements were used in the study, and the total number of Q sorts was 32 (representing 32 patients). As in Q study 1, after applying the criteria, three factors were identified, and the participants were categorised according to the overall view of telerehabilitation their responses represented. The factors identified in this study were:

- Factor 1 (F1): Supporters
- Factor 2 (F2): Rationalists
- Factor 3 (F3): Resisters

The results of this Q study are presented in the same way as in the previous study. A factor array for the study is presented first, followed by the consensus statements are presented. Each factor is then presented individually with its crib sheet and distinguishing statements. An interpretation of the factor is provided, followed by a model Q sort. A summary of the study is provided at the end.

6.2 Factor Array

Table 6-1 below presents the factor array for this study.

Table 6-1: Factor array across the three factors

No.	Statements	Rank		
		F1	F2	F3
1	Telerehabilitation saves the money that I pay for transport.	2	2	1
2	Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.	3	1	3
3	Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.	4	0	1
4	Telerehabilitation improves my regular attendance in the rehabilitation programme.	4	1	-3
5	Telerehabilitation improves my engagement in the rehabilitation programme.	1	-1	2
6	Using telerehabilitation enhances the package of care that I receive from hospital.	3	-3	-1
7	I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended.	0	2	2
8	The aim of using telerehabilitation is clear and understandable for me.	-2	-1	-1
9	I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.	-4	-3	-2
10	Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	3	0	0
11	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	1	-2	4
12	My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them.	-1	0	-3
13	My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	-3	-2	-2

14	The shift to remote study and working due to covid-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	1	2	-1
15	I am confident that my personal and health details will be secure if I use telerehabilitation.	-1	0	-1
16	I have a device at home that allows me to contact my physiotherapist remotely.	-1	1	2
17	I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	2	-1	4
18	I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	-1	1	3
19	I can obtain the equipment that my physiotherapists may suggest for using at home.	-2	-2	-2
20	I lack confidence in telerehabilitation as it is very new and information is limited.	-4	-4	-4
21	I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	-3	4	-3
22	I want to have practical training on how to use telerehabilitation before starting to use it.	1	4	0
23	Medical insurance companies should include telerehabilitation services under their medical cover.	0	-1	3
24	I need a carer or a family member with me during telerehabilitation sessions at home.	-3	-4	-4
25	I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	-2	3	1
26	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	0	3	0
27	My prior knowledge about using technology would help me when using telerehabilitation.	0	3	0
28	I will use telerehabilitation when it becomes available in my hospital.	2	-3	1

6.3 Consensus Statements

In this study, eight statements were categorised as consensus statements across all three factors, meaning patients with MS across the three study factors shared the same views about them (See Table 6-2).

Table 6-2: Consensus Statements in Q Study 2

No.	Statement	Rank		
		F1	F2	F3
1	Telerehabilitation saves the money that I pay for transport.	1	2	-2
7	I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended.	0	2	2
8	The aim of using telerehabilitation is clear and understandable for me.	-2	-1	-1
13	My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	-3	-2	-2
15	I am confident that my personal and health details will be secure if I use telerehabilitation.	-1	0	-1
19	I can obtain the equipment that my physiotherapists may suggest for using at home.	-2	-2	-2
20	I lack confidence in telerehabilitation as it is very new, and information is limited.	-4	-4	-4
24	I need a carer or a family member with me during telerehabilitation sessions at home.	-3	-4	-4

Most of the participants agreed that telerehabilitation would save them money on transportation (Statement 1). Participant 11 commented that:

> *"I do not have sufficient coverage for transportation and travel costs so telerehabilitation will save my money."* (Participant 11)

Participant 18 supported that by saying:

"Telerehabilitation will save money and effort, especially with crowds and hot weather, as heat negatively affects people with multiple sclerosis." (Participant 18)

Moreover, they were also generally confident that the use of telerehabilitation would help them to complete the programmes their physiotherapists had recommended (Statement 7). Participant 30 stated that:

"The atmosphere at home will be more comfortable and the time is open." (Participant 30)

Patients also indicated that they had confidence in the usability of telerehabilitation, despite the fact that the available information was limited (Statement 20). Participant 17 expressed the belief that:

"The medical field is improving, and its development is linked with technology. It is not a lack of confidence in linking the two fields together, but I believe that it will become mandatory in the coming years to decrease pressure on hospitals." (Participant 17)

While Participant 4 added that:

"I have no doubts that telerehabilitation will be applied with high efficacy." (Participant 4)

Participant 1 also highlighted the value of telerehabilitation during the pandemic:

"During the COVID-19 pandemic, telerehabilitation was the only available option." (Participant 1)

However, despite this, they felt that the aim of using telerehabilitation was not clear and understandable for them (Statement 8). Participant 18 mentioned that:

> *"I have never read about telerehabilitation."* (Participant 18)

Participant 10 also linked this to the pandemic:

> *"I think after the COVID-19 crisis, it became necessary to know more about telerehabilitation."* (Participant 10)

Patients across all three study factors were also unsure about the security of their personal and health data (Statement 15). For example, Participant 29 stated that:

> *"I am not convinced about the safety of using my data."* (Participant 29)

Furthermore, patients also expressed doubts about whether they could obtain any equipment that their physiotherapists may suggest for using at home (Statement 19). Participant 5 suggested that cost may be an issue:

> *"Not everyone can afford to buy therapeutic devices."* (Participant 5)

Participants 26 and 27 also mentioned cost and concerns about availability:

> *"Therapeutic devices may not be available in Saudi Arabia, and their prices may be exaggerated."* (Participants 26)

> *"I need an additional financial budget, and the treatment devices are very expensive."* (Participants 27)

However, the patients did not feel they required any help or support, for example from a carer or family member, during telerehabilitation sessions at home (Statement 24). Participant 13 stated that:

> *"My general health is good, and now I don't any need help."* (Participant 13)

Participant 24 was also confident s/he had the necessary technical skills:

> *"I can use technological devices effectively on my own."* (Participant 24)

In respect of family members, none of the patients reported that their family or friends had recommended telerehabilitation, or any other technology, to be used within their treatment plan (Statement 13), and some expressed concerns that their family members would not accept it. Participant 11 said that:

> *"My family and friends do not have any information or idea about telerehabilitation."* (Participant 11)

Participant 27 reported that:

> *"My family has never mentioned telerehabilitation to me, and I think it will be difficult to convince them about it."* (Participant 27)

In conclusion, eight consensus statements were identified in this Q study. These indicated that the participants thought telerehabilitation would reduce the costs associated with travelling to hospitals and clinics and also save them time and effort. They were also confident that they could complete telerehabilitation sessions successfully from home, and they did

not think they would require help or support during the telerehabilitation session, for example, from a carer or a family member. However, they felt that the equipment required to complete sessions may be expensive. Overall, they believed in the usability of telerehabilitation, despite the fact that the purpose of using it was unclear to them. They also expressed concerns that their family members knew very little about telerehabilitation, leading some to suggest that their family and friends might not accept its use as part of their treatment programme.

6.4 Factor 1: Supporters

Nine participants loaded significantly in Factor 1, representing 28.1% of the study participants. The eigenvalue in Factor 1 was 5.8512 (See Table 6-3).

Table 6-3: Participants/ Q samples in Factor 1

No.	Participant No.	Q samples loading
1.	3	0.5462
2.	4	0.5058
3.	9	0.6112
4.	11	0.5508
5.	13	0.7565
6.	20	0.508
7.	24	0.617
8.	25	0.5779
9.	27	0.5384
Eigenvalues	5.8512	
Percentage (%)	28.1	

6.4.1 Crib sheet for Factor 1

The crib sheet for Factor 1 is presented in Table 6-4.

Table 6-4: Crib Sheet for Factor 1

No.	Highest Ranked Statements	Rank
3	Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.	4
4	Telerehabilitation improves my regular attendance in the rehabilitation programme.	4
No.	**Statements Ranked Higher in F1 Array than Other Arrays**	**Rank**
10	Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	3
2	Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.	3
6	Using telerehabilitation enhances the package of care that I receive from hospital.	3
28	I will use telerehabilitation when it becomes available in my hospital.	2
1	Telerehabilitation saves the money that I pay for transport.	2
No.	**Statements Ranked Lower in F1 Array than Other Arrays**	**Rank**
7	I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended.	0
26	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	0
27	My prior knowledge about using technology would help me when using telerehabilitation.	0
16	I have a device at home that allows me to contact my physiotherapist remotely.	-1
18	I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	-1

15	I am confident that my personal and health details will be secure if I use telerehabilitation.	-1
8	The aim of using telerehabilitation is clear and understandable for me.	-2
25	I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	-2
19	I can obtain the equipment that my physiotherapists may suggest for using at home.	-2
21	I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	-3
13	My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	-3
No.	**Lowest Ranked Statements**	**Rank**
20	I lack confidence in telerehabilitation as it is very new and information is limited.	-4
9	I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.	-4

6.4.2 Distinguishing statements for Factor 1

The distinguishing statements for Factor 1 are presented in Table 6-5.

Table 6-5: Distinguishing Statements for Factor 1

No.	**Statement**	**Rank**		
		F1	F2	F3
3	Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.	4	0	1
4	Telerehabilitation improves my regular attendance in the rehabilitation programme.	4	1	-3
10	Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	3	0	0
6	Using telerehabilitation enhances the package of care that I receive from hospital.	3	-3	-1

17	I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	2	-1	4
28	I will use telerehabilitation when it becomes available in my hospital.	2	-3	1
11	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	1	-2	4
18	I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	-1	1	3
25	I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	-2	3	1
13	My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	-3	-2	-2
9	I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.	-4	-3	-2

6.4.3 Interpretation of Factor 1

Participants in Factor 1 were classified as 'Supporters' of telerehabilitation. They thought that telerehabilitation would help patients who could not attend face-to-face appointments regularly to complete their rehabilitation programme (Statements 3 and 4). Patients 3, 9, 13 and 25 described their own experiences of this:

> *"Physiotherapy sessions can be easily delivered remotely, and this has already made my attendance easier, as it is difficult to go outside the house during COVID-19."* (Participant 3)

> *"I always find it difficult to attend face-to-face physiotherapy sessions due to my work and study."* (Participant 9)

> *"Telerehabilitation offers flexibility, I am a full-time worker and mother at the time, and I hope telerehabilitation will be*

implemented soon, which suits this fast-paced era and the pressures of diverse responsibilities." (Participant 13)

"Patients with MS frequently experience general fatigue, making it difficult to visit the hospital in person, and many patients travel from rural areas to large cities to attend rehabilitation sessions, making regular attendance difficult." (Participant 25)

They also thought that having sessions remotely using telerehabilitation was easier than face-to-face, and this would enhance the overall care they received from hospitals or clinics (Statements 6 and 10). There were no issues with internet access, as they indicated that they have it at home (Statements 17); however, some said they did not have a suitable space at home to do their exercises and receive telerehabilitation sessions. Participant 3 commented that:

"I do not have space at my home."

Participant 9 added that:

"Most of us do not have a space for exercise at home."

Despite this, most patients in Factor 1 had positive attitudes toward telerehabilitation and intended to use it when it becomes officially available to them (Statements 28). However, they expressed a strong preference for receiving video sessions from physiotherapists of the same gender, and the qualitative data suggests this is due to religious and social factors. As with the physiotherapists, some patients explicitly referenced their religious beliefs in this context; for example, Participant 27 stated that:

> *"In Islam, it is forbidden for a stranger to see a woman who is not one of his* mahrams[1]*, so the female patient must be seen by a female physiotherapist and the male patient by a male physiotherapist; otherwise, I will never do telerehabilitation."*

Others did not mention religion directly but indicated that social and cultural concerns around interactions between different genders were a barrier. Participant 4 commented that:

> *"Since I am a woman, it is difficult for me to communicate with the physiotherapist through the camera if he is male."*

Participant 20 expressed that:

> *"As a female, I do not prefer that my physiotherapist be a man. I am sure that female physiotherapists are available, so why should I go to a male physiotherapist?"*

To sum up, patients in Factor 1 are optimistic about using telerehabilitation when it becomes available and have positive attitudes towards it. However, they expressed concerns about being treated by physiotherapists of the opposite gender, which may limit their use of telerehabilitation. In addition, they were concerned about the potential cost of equipment and the lack of a suitable space at home for exercising and attending virtual sessions.

[1] This refers to a concept in Islamic law which relates who a person may or may not lawfully marry. *Mahrams* include family members with whom marital relationships are unlawful, for example, fathers, brothers, and sons for a woman. However, *mahrams* can also be gained through marriage, so spouses become each other's *mahrams*, and, if their children marry, their sons- or daughters-in-law also become their *mahrams*. A woman is not required to observe hijab in the presence of her *mahrams* (Al-Islam.org, 2023).

6.4.4 Model Q Sort for Factor 1

A model Q sort for Factor 1 is presented in Table 6-6. The model shows that two out of three statements representing SI (blue) were ranked between -3 to -1. The statement representing BI (red) was ranked +1. Eight out of ten statements representing FC (pink) were ranked between 0 to -4. Two out of three statements representing PEoU/EE (green) were ranked between -2 to -4, and two out of three statements representing ID (grey) were ranked between in 0. All statements representing PU/PE (yellow) were ranked between 0 to +4.

As noted in Q Study 1, when analysing the placement of each statement, it is important to consider whether it is a positive or negative statement. The implications of these results are also discussed in Chapter 7.

Table 6-6: Model Q sort: Factor 1

-4 (Disagree most)	-3	-2	-1	0 (Neutral)	+1	+2	+3	+4 (Agree most)
20- I lack confidence in telerehabilitation as it is very new and information is limited.	21- I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	8- The aim of using telerehabilitation is clear and understandable for me.	16- I have a device at home that allows me to contact my physiotherapist remotely.	7- I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended..	11- Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	17- I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	10- Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	3- Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly
9- I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.	24- I need a carer or a family member with me during telerehabilitation sessions at home.	25- I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	18- I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	23- Medical insurance companies should include telerehabilitation services under their medical cover.	14- The shift to remote study and working due to covid-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	28- I will use telerehabilitation when it becomes available in my hospital.	2- Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.	4- Telerehabilitation improves my regular attendance in the rehabilitation programme.
	13- My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	19- I can obtain the equipment that my physiotherapists may suggest for using at home.	15. I am confident that my personal and health details will be secure if I use telerehabilitation.	26- My age has nothing to do with my ability and skills to use telerehabilitation effectively.	5- Telerehabilitation improves my engagement in the rehabilitation programme.	1- Telerehabilitation saves the money that I pay for transport.	6- Using telerehabilitation enhances the package of care that I receive from hospital.	
			12- My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them.	27- My prior knowledge about using technology would help me when using telerehabilitation.	22- I want to have practical training on how to use telerehabilitation before starting to use it.			

Perceived usefulness/Performance expectancy (PU/PE)

Perceived ease of use/ effort expectancy (PEoU/EE)

Social influence (SI)

Facilitating conditions (FC)

Individual difference (ID)

Behavioural intention (BI)

6.5 Factor 2: Rationalists

Just three participants loaded significantly in Factor 2. They represent 9.4% of the study participants, and the eigenvalue was 2.47 (See Table 6-7).

Table 6-7: Participants/ Q samples in Factor 2

No.	Participant No.	Q samples loading
1	1	0.5327
2	5	0.547
3	32	0.5608
Eigenvalues	2.469	
Percentage (%)	9.4	

6.5.1 Crib sheet for Factor 2

The crib sheet for Factor 2 is presented in Table 6-8.

Table 6-8: Crib Sheet for Factor 2

No.	Highest Ranked Statements	Rank
21	I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	4
22	I want to have practical training on how to use telerehabilitation before starting to use it.	4
No.	**Statements Ranked Higher in F2 Array than Other Arrays**	**Rank**
27	My prior knowledge about using technology would help me when using telerehabilitation.	3
26	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	3
25	I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	3

7	I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended.	2
1	Telerehabilitation saves the money that I pay for transport.	2
14	The shift to remote study and working due to COVID-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	2
15	I am confident that my personal and health details will be secure if I use telerehabilitation.	0
12	My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them.	0
No.	**Statements Ranked Lower in F2 Array than Other Arrays**	**Rank**
3	Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.	0
10	Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	0
5	Telerehabilitation improves my engagement in the rehabilitation programme.	-1
23	Medical insurance companies should include telerehabilitation services under their medical cover.	-1
17	I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	-1
11	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	-2
19	I can obtain the equipment that my physiotherapists may suggest for using at home.	-2
6	Using telerehabilitation enhances the package of care that I receive from hospital.	-3
28	I will use telerehabilitation when it becomes available in my hospital.	-3
No	**Lowest Ranked Statements**	**Rank**
24	I need a carer or a family member with me during telerehabilitation sessions at home.	-4
20	I lack confidence in telerehabilitation as it is very new and information is limited.	-4

6.5.2 Distinguishing statements for Factor 2

The distinguishing statements for Factor 2 are presented in Table 6-9.

Table 6-9: Distinguishing Statements for Factor 2

No.	Statement	Rank		
		F1	F2	F3
21	I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	-3	4	-3
22	I want to have practical training on how to use telerehabilitation before starting to use it.	1	4	0
27	My prior knowledge about using technology would help me when using telerehabilitation.	0	3	0
26	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	0	3	0
4	Telerehabilitation improves my regular attendance in the rehabilitation programme.	4	1	-3
2	Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.	3	1	3
3	Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.	4	0	1
17	I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	2	-1	4
11	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	1	-2	4
28	I will use telerehabilitation when it becomes available in my hospital.	2	-3	1

6.5.3 Interpretation of Factor 2

Participants in Factor 2 were classified as 'Rationalists' in relation to the use of telerehabilitation. They could see how telerehabilitation could be helpful, and they thought their healthcare provider would assist with any technical

problems that might occur during their sessions (Statement 21). They also opposed the idea that telerehabilitation should only be used as a last resort (Statement 11), and they did not regard age as a barrier to (Statement 26). Participant 1 stated that:

> *"Age is just a number, and it is not going to affect me using telerehabilitation."* (Participant 1)

Participant 32 commented that:

> *"The matter is always health, not age."* (Participant 32)

These participants were also unconcerned about the gender of the physiotherapist delivering their video telerehabilitation sessions (Statement 25). Participant 5 commented that:

> *"The most important thing for me is the physiotherapist's knowledge, and their gender is not important to me at all."* (Participant 5)

However, despite acknowledging the advantages telerehabilitation could bring them, they were very reluctant to use it in future (Statement 28), possibly because of the lack of personal contact. For example, Participant 5 said:

> *"No, I do not want to make this decision because I believe it will result in a loss of direct communication with my physiotherapist, which is always helpful to him in following up on my case."* (Participant 5)

They also identified a lack of internet access at home, which would prevent them benefitting from telerehabilitation sessions. Participant 1 said:

"I live in a rural area with poor internet access, and there are patients who cannot afford to pay for the internet service, and they should be considered." (Participant 1)

Participant 5 stated that:

"I do not have internet in my home." (Participant 5)

Responses to other statements indicated that lack of knowledge about technology in general and telerehabilitation in particular may also be an issue for this group. They expressed the view that prior knowledge about using technology would help when using telerehabilitation (Statement 27), and they showed a strong preference for receiving training in telerehabilitation before they participated in video sessions (Statement 22). Participant 1 said that:

"If telerehabilitation is the only option, as it was during COVID 19, I would definitely need practical training to get the most out of it." (Participant 1)

Participant 5 thought that:

"In order to have a remote session without mistakes and injuries, training is important for us." (Participant 5)

Participant 32 also commented that:

"I think it is important to teach patients how to use the platform and what they should do before, during, and after the remote session in order to save time and reduce the possibility of misunderstood instructions." (Participant 32)

To sum up, patients in Factor 2 can see the potential value of telerehabilitation but they have practical concerns which limit their willingness to use it. They do not regard their age or the gender of the physiotherapist as a barrier; however, the lack of internet access where they live is a significant obstacle. They are also unwilling to use telerehabilitation unless they obtain instruction first.

6.5.4 Model Q Sort for Factor 2

A model Q sort for Factor 2 is presented in Table 6-10. The model shows that all the statements representing ID (grey) were ranked +3. Statements representing SI (blue) were ranked between -2 to +2. All the statements representing PEoU/EE (green) were ranked between 0 to -3. Two statements representing FC (pink) were ranked -4, two were ranked +4, and the rest were between -2 to +1. The statement representing BI was ranked -3, and five out of eight statements representing PU/PE (yellow) were ranked between 0 to+2. As noted above, the implications of these findings are explored in Chapter 7.

Table 6-10: Model Q sort: Factor 2

-4 (Disagree most)	-3	-2	-1	0 (Neutral)	+1	+2	+3	+4 (Agree most)
24- I need a carer or a family member with me during telerehabilitation sessions at home.	9- I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.	11- Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	5- Telerehabilitation improves my engagement in the rehabilitation programme.	15. I am confident that my personal and health details will be secure if I use telerehabilitation.	4- Telerehabilitation improves my regular attendance in the rehabilitation programme.	7- I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended..	28- My prior knowledge about using technology would help me when using telerehabilitation.	21- I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.
20- I lack confidence in telerehabilitation as it is very new and information is limited.	6- Using telerehabilitation enhances the package of care that I receive from hospital.	19- I can obtain the equipment that my physiotherapists may suggest for using at home.	8- The aim of using telerehabilitation is clear and understandable for me.	12- My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them	18- I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	1- Telerehabilitation saves the money that I pay for transport.	27- My age has nothing to do with my ability and skills to use telerehabilitation effectively.	22- I want to have practical training on how to use telerehabilitation before starting to use it.
	28- I will use telerehabilitation when it becomes available in my hospital.	13- My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	23- Medical insurance companies should include telerehabilitation services under their medical cover.	3- Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly	17- I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	14-The shift to remote study and working due to covid-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	26- I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	
			16- I have a device at home that allows me to contact my physiotherapist remotely.	10- Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	2- Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home			

Perceived usefulness/Performance expectancy (PU/PE)

Perceived ease of use/ effort expectancy (PEoU/EE)

Social influence (SI)

Facilitating conditions (FC)

Individual difference (ID)

Behavioural intention (BI)

6.6 Factor 3: Resisters

Six participants significantly loaded in Factor 3. They represent 18.7% of the study participants. The eigenvalue in Factor 3 was 1.83 (See Table 6-11).

Table 6-11: Participants/ Q samples in Factor 3

No.	Participant No.	Q samples loading
1.	6	0.5227
2.	12	0.5719
3.	16	0.5533
4.	17	0.4918
5.	22	0.5274
6.	26	0.5368
Eigenvalues	1.8288	
Percentage (%)	18.7	

As in Factor 1 and 2, the crib sheet for Factor 3 is presented below, followed by the distinguishing statements and a descriptive narrative interpretation. A model Q sort is also provided.

6.6.1 Crib sheet for Factor 3

The crib sheet for Factor 3 is presented in Table 6-12.

Table 6-12: Crib Sheet for Factor 3

No.	Highest Ranked Statements	Rank
17	I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	4
11	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	4
No.	**Statements Ranked Higher in F3 Array than Other Arrays**	**Rank**
23	Medical insurance companies should include telerehabilitation services under their medical cover.	3
2	Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.	3
18	I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	3
16	I have a device at home that allows me to contact my physiotherapist remotely.	2
5	Telerehabilitation improves my engagement in the rehabilitation programme.	2
7	I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended.	2
25	I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	1
No.	**Statements Ranked Lower in F3 Array than Other Arrays**	**Rank**
26	My age has nothing to do with my ability and skills to use telerehabilitation effectively.	0
22	I want to have practical training on how to use telerehabilitation before starting to use it.	0
10	Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	0
27	My prior knowledge about using technology would help me when using telerehabilitation.	0
15	I am confident that my personal and health details will be secure if I use telerehabilitation.	-1

14	The shift to remote study and working due to COVID-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	-1
19	I can obtain the equipment that my physiotherapists may suggest for using at home.	-2
21	I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	-3
12	My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them.	-3
4	Telerehabilitation improves my regular attendance in the rehabilitation programme.	-3
No.	**Lowest Ranked Statements**	**Rank**
20	I lack confidence in telerehabilitation as it is very new, and information is limited.	-4
24	I need a carer or a family member with me during telerehabilitation sessions at home.	-4

6.6.2 Distinguishing statements for Factor 3

The distinguishing statements for Factor 3 are presented in Table 6-13.

Table 6-13: Distinguishing Statements for Factor 3

No.	Statement	Rank		
		F1	F2	F3
17	I have the internet at my home that allows me to receive telerehabilitation sessions effectively.	2	-1	4
11	Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.	1	-2	4
23	Medical insurance companies should include telerehabilitation services under their medical cover.	0	-1	3
3	Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.	4	0	1
28	I will use telerehabilitation when it becomes available in my hospital.	2	-3	1
14	The shift to remote study and working due to COVID-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	1	2	-1
12	My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them.	-1	0	-3
4	Telerehabilitation improves my regular attendance in the rehabilitation programme.	4	1	-3

6.6.3 Interpretation of Factor 3

Patients with MS in Factor 3 were classified as 'Resisters in relation to the use of telerehabilitation, expressing a strong preference for face-to-face sessions, even though they had the infrastructure required for telerehabilitation, including a home internet connection (Statement 17), appropriate space to do exercises (Statement 18), and a device that allows them to contact their physiotherapist remotely (Statement 16). Nor did these patients regard the gender of the physiotherapist as an issue (Statement 25). However, they did not believe that telerehabilitation could

replace face-to-face rehabilitation, and they thought it should be used a supplementary method only. Participant 12 stated that:

> *"Depending on the nature of my work and my experience in distance education, and how many courses and events I attended from a distance, the technology is very useful, but I think it should be limited to the narrowest limits of practice. Telerehabilitation could be a waste of time and resources if I perform the exercise incorrectly, and the physiotherapist might not notice that."* (Participant 12)

Participant 16 said that:

> *"Face-to-face physiotherapy sessions are essential, and remote sessions cannot replace them."* (Participant 16)

Participant 22 mentioned that:

> *"There is no doubt that remote rehabilitation cannot supplement face-to-face therapy, as the presence of a physiotherapist is sometimes required."* (Participant 22)

Despite this, they thought that insurance companies should cover telerehabilitation services as part of their medical coverage (Statement 23).

Participant 12 said that:

> *"Not all patients are able to afford the cost of the remote sessions, and there is the possibility that some patients will need devices according to their health status, so telerehabilitation should be covered by insurance."* (Participant 12)

Participant 17 thought that:

> *"Health insurance is a fundamental human right, and any treatment plan that aids the patient's recovery must be covered by insurance companies."* (Participant 17)

Although these participants accepted that telerehabilitation could save time and increase their engagement (Statement 2), they did not believe that it would improve the regularity of their attendance in the rehabilitation programme (Statement 4), and the qualitative data suggests this is due to their preference for face-to-face engagement. Participant 26 said that:

> *"I always prefer to be supervised by physiotherapists during my face-to-face rehabilitation sessions."* (Participant 26)

Participant 6 said that:

> *"I may not like the remote sessions, I may want help from a physiotherapist during the session that requires him to physically be with me, and I may also do the exercises in the wrong way. So, I prefer face-to-face rehabilitation over remote rehabilitation."* (Participant 6)

Furthermore, the shift to remote study and work as a result of COVID-19 did not appear to have encouraged them to use telerehabilitation in future (Statement 14). Indeed, Participant 26 expressed the opposite view:

> *"I honestly hated the technology during COVID-19 because it negatively affected my interactions with people."* (Participant 26)

Nor did they believe that their physical therapist would suggest telerehabilitation for them in future (Statement 12). Participant 6 said that:

"My physiotherapist has never talked with me about remote rehabilitation." (Participant 6)

To sum up, despite having the necessary infrastructure to do sessions from home and accepting that it could save time and increase engagement, patients in Factor 3 did not think telerehabilitation would increase their own regular participation in the rehabilitation programme. The change to remote study and employment brought about by COVID-19 had not made them more likely to accept telerehabilitation in future, and it may actually have had a negative effect, as they have a strong preference for face-to-face interactions rather than online engagement with their physiotherapists.

6.6.4 Model Q Sort for Factor 3

A model Q sort for Factor 3 is presented in Table 6-14. As the model shows, all the statements representing SI (blue) were ranked between -3 to -1. The statement representing BI (red) was ranked +1. Six out of ten statements representing FC (pink) were ranked between 0 to -4 and two were ranked -4. All the statements representing PEoU/EE (green) were ranked between -2 to 0. Two out of three statements representing ID (grey) were ranked between in 0, and Five out of eight statements representing PU/PE (yellow) were ranked between 0 to+4. The implications of these results are discussed in Chapter 7.

Table 6-14: Model Q sort: Factor 3

-4 (Disagree most)	-3	-2	-1	0 (Neutral)	+1	+2	+3	+4 (Agree most)
24- I need a carer or a family member with me during telerehabilitation sessions at home.	21- I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.	9- I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.	15- I am confident that my personal and health details will be secure if I use telerehabilitation.	27- My age has nothing to do with my ability and skills to use telerehabilitation effectively.	3- Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly	16- I have a device at home that allows me to contact my physiotherapist remotely.	23- Medical insurance companies should include telerehabilitation services under their medical cover.	17- I have the internet at my home that allows me to receive telerehabilitation sessions effectively.
20- I lack confidence in telerehabilitation as it is very new and information is limited.	6- Using telerehabilitation enhances the package of care that I receive from hospital.	19- I can obtain the equipment that my physiotherapists may suggest for using at home.	8- The aim of using telerehabilitation is clear and understandable for me.	22- I want to have practical training on how to use telerehabilitation before starting to use it.	18- I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	26- I am happy to have video telerehabilitation sessions from physiotherapists of any gender.	2- Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home	11- Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.
	5- Telerehabilitation improves my engagement in the rehabilitation programme.	13- My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.	6- Using telerehabilitation enhances the package of care that I receive from hospital.	10- Having the session remotely by using telerehabilitation is easier than face-to-face sessions.	1- Telerehabilitation saves the money that I pay for transport.	7- I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended..	18- I have a good space at home where I can do my exercises and receive telerehabilitation sessions.	
			14- The shift to remote study and working due to covid-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.	28- My prior knowledge about using technology would help me when using telerehabilitation.	28- I will use telerehabilitation when it becomes available in my hospital.			

	Perceived usefulness/Performance expectancy (PU/PE)		Social influence (SI)		Individual difference (ID)
	Perceived ease of use/ effort expectancy (PEoU/EE)		Facilitating conditions (FC)		Behavioural intention (BI)

6.7 Conclusion

Patients with MS across the three factors identified in this study believed that telerehabilitation would reduce their transportation costs. They also supported the usability of telerehabilitation, despite the limited availability of information about it, and they were confident that they could successfully complete sessions from home without requiring assistance from a carer or family member. However, they were uncertain about the purpose of using telerehabilitation and felt that the equipment required for the sessions may be expensive. They also expressed concerns that their family and friends knew little about telerehabilitation and this may lead to them opposing its use as part of their treatment programmes.

Three distinct viewpoints about telerehabilitation were identified in this study. Patients in Factor 1 were positive towards telerehabilitation and willing to use it when it became available. However, they had concerns about being treated by a physiotherapist of the same gender, possibly due to their religious and social beliefs, and some thought their homes were not conducive to exercising and participating in virtual rehabilitation sessions. Patients in Factor 2 were more pragmatic towards telerehabilitation; they did not consider their age was a barrier, and they were not concerned about gender; however, they were not willing to use telerehabilitation unless they received training first. Furthermore, they identified limited internet access as a particular challenge. Patients in Factor 3 were more negative about using telerehabilitation. Although they had the necessary infrastructure at

home, they did not believe that using telerehabilitation would improve their participation in their rehabilitation programme because they lack confidence in it. The shift to remote interactions during COVID-19 did not encourage them to use telerehabilitation and may actually have discouraged them as they place greater value on face-to-face engagement.

Chapter 7: Discussion

7.1 Introduction

The aim of this thesis is to explore the acceptance of telerehabilitation among physiotherapists and patients with neurological conditions in KSA in order to propose a potential strategy for its implementation in the country. Two different Q methodology studies were conducted to explore the topic from the point of view of physiotherapists, and patients with neurological conditions, in this case MS. The following research questions were established:

1. What are the factors which influence the acceptance of telerehabilitation among Saudi physiotherapists?
2. What are the factors which impact acceptance of telerehabilitation among Saudi patients with MS?
3. What are the main barriers to the acceptance of telerehabilitation among Saudi physiotherapists and patients with MS?
4. How might these barriers be overcome to support an effective implementation of telerehabilitation in KSA in the future?

This chapter discusses the results of the two Q studies presented in Chapters 5 and 6 in relation to the theoretical framework (See Chapter 3) and the literature review (See Chapter 2) in order to answer the research questions. It begins by discussing the factors which influence the acceptance of telerehabilitation among both Saudi physiotherapists and

patients with MS, drawing on constructs from the TAM and UTAUT models (hereafter referred to as 'user acceptance factors'), and identifying areas of cross-over. A logic model is then employed to propose a strategy for the adoption of telerehabilitation to enhance the provision of physiotherapy services for patients with neurological conditions within KSA based on the findings of this research study.

The consensus statements which emerged from the two Q studies provide an overview of the perceptions of the participants in each study. Analysis of the consensus statements across the two studies suggests that both physiotherapists and patients see the benefits of telerehabilitation. However, both studies reveal concerns about the use of telerehabilitation, especially among the patients. The user acceptance factors which exerted the strongest positive and negative influences on the participants are discussed in detail below, starting with the physiotherapists and moving on to the patients. The analysis begins by considering the factors identified in the consensus statements, before going on to address the factors associated with each of the groups which emerged from the Q studies.

7.2 RQ1: What are the factors which influence the acceptance of telerehabilitation among Saudi physiotherapists?

Analysis of the Q sorts produced by the physiotherapists' study indicates that they regarded telerehabilitation as an appropriate solution to offer to patients in remote areas, who would otherwise need to travel long distances to attend in-person rehabilitation sessions, and to patients who usually

receive home visits. Delivering sessions remotely was expected to reduce the number of home visits physiotherapists were required to make and to reduce the demand in outpatient clinics, leading to shorter waiting lists in outpatient physiotherapy departments. Viewing these findings through the lens of the TAM and UTAUT models indicates that the most influential user acceptance factor which influences physiotherapists is therefore *perceived usefulness/performance expectancy* (PU/PE). This is in line with previous research which has shown that the acceptance of technology is strongly predicted by the concept of "perceived usefulness" (TAM) and "performance expectation" (UTAUT) and that these factors are among the most influential in determining whether individuals are willing to embrace a particular technology or not (Rouidi et al., 2022).

However, although the physiotherapists thought telerehabilitation would be useful for their patients, they did not believe it would make their workload lighter or increase their productivity. This suggests that *effort expectancy/perceived ease of use* (EE/PEoU) of telerehabilitation, by contrast, may not be influential in determining Saudi physiotherapists' acceptance of telerehabilitation. Similar results were discovered by Edo et al. (2023), who conducted a cross-sectional study integrating the TAM and UTAUT models to investigate why healthcare workers in Nigeria adopted digital health technologies. They found that PEoU did not have a notable impact on the intention of health workers to adopt technology. However, other recent research, including Sitthipon et al. (2022), who found a positive association between EE and intention to adopt a specific technology

and Rouidi et al. (2022) who found that healthcare professionals' beliefs about new technologies were influenced by their perceptions of its ease of use.

Sitthipon et al. (2022) applied the UTAUT model as part of their methodology to predict the acceptance of telemedicine among the Thai population during the COVID-19 pandemic. Given the focus on telemedicine and the pandemic, these findings are particularly significant in the context of this study and appear to challenge its findings. However, Rouidi et al. (2022), who used the TAM and UTAUT models to investigate the acceptance and use of telemedicine technology by health professionals globally suggest a potential connection between the acceptance of telerehabilitation among Saudi physiotherapists and their beliefs regarding its EE or PEoU. They found that health professionals were more likely to exhibit a high level of intention to use a technology if they had a positive perception of their skills in relation to that technology. This suggests that providing specialist training in the use of telerehabilitation could enhance Saudi physiotherapists' perceptions of its ease of use as they gain knowledge and skills related to its proper utilization. As such, any strategy to implement telerehabilitation in KSA must include the provision of comprehensive training to ensure physiotherapists are confident in their use of the technology.

This focus on the significance of prior knowledge in shaping attitudes and intentions towards adopting new technologies in the healthcare domain

highlights the importance of *facilitating conditions* (FC), in this case, the scaffolding required to support the use of telerehabilitation. While physiotherapists in this study were generally positive about the benefits of telerehabilitation, they identified a number of key requirements in this regard, including appropriate training, mechanisms to safeguard patients' data, and the provision of technical assistance to support the delivery of telerehabilitation sessions. This is in line with the findings of Liu et al. (2015), who found that FC and PE were key determinants of technology acceptance among therapists in a Canadian hospital.

7.2.1 Factors which affect the three distinct groups

As the consensus statements show, the physiotherapists who participated in this study showed broad agreement in relation to telerehabilitation, both in terms of their positive and negative perceptions. However, the use of Q methodology enables the research to identify and describe a range of viewpoints within each user group, even if they are held by a small number of individuals (Watts and Stenner, 2005). In this study, this enabled further analysis of the factors which affected these physiotherapists' acceptance of telerehabilitation and segmentation of the participants into three groups according to their prevailing beliefs: Advocates, Pragmatists, and Hesitants.

7.2.1.1 Advocates

As their name suggests, the Advocates had the most positive views of telerehabilitation, and they were influenced by three main factors. They saw it as an effective way to reduce the cost of rehabilitation sessions, and

were, therefore, influenced by its *perceived usefulness/performance expectancy* (PU/PE) from an economic perspective. They also had a strong intention to use telerehabilitation, indicating that *behavioural intention* (BI) was a stronger factor for them than the other groups. Their willingness to advocate for telerehabilitation also indicated a desire to exercise their *social influence* (SI) by promoting telerehabilitation to their colleagues.

Rodić et al. (2023) also found a positive relationship between perceived usefulness and intention to use healthcare technologies with patients among healthcare professionals in a Serbian rehabilitation clinic, and Blumenthal et al. (2018) also found a direct association when they examined physiotherapists' attitudes towards using healthcare technology. These studies highlight the importance of perceived usefulness and positive attitudes in the acceptance and intention to use healthcare technologies, and the findings of this study suggest they play an equally important role in relation to the acceptance of rehabilitation, especially among advocates.

In terms of identifying physiotherapists to lead on the implementation of telerehabilitation in the Saudi healthcare system, these participants would be ideal candidates: they had no doubts about missing critical information during remote sessions, no particular concerns about treating patients of the opposite gender, and they strongly disagreed that telerehabilitation was only useful during critical times, such as the Covid-19 pandemic. However, despite their advocacy of telerehabilitation, they expressed some concerns about certain *individual differences* (ID), specifically the potential impact of

users' age, both in respect of their patients' technical capabilities and their own ability to use telerehabilitation effectively as they get older.

In line with this, Segrelles-Calvo et al. (2017) found that physiotherapists' level of satisfaction with telemedicine was influenced by their age and prior experience. However, neither Rodić et al. (2022) or Blumenthal et al. (2018) found a significant link between the age of physiotherapists and their ability to adopt or accept technology in the context of medical rehabilitation. In addition, no qualitative data was provided by the advocates to explain their concerns; therefore, additional research is required to gain a deeper understanding of the relationship between age and acceptance of telerehabilitation among this group of physiotherapists.

7.2.1.2 Pragmatists

The Pragmatists also showed strong *behavioural intention* (BI) through their desire to try new technology; however, while *social influence* (SI) was also a significant factor in this group, it operated in different ways. For example, while they believed that their use of telerehabilitation would enhance their colleagues' perceptions of their professional skills, they would not actively encourage others to use it. However, they strongly believed that both patients and their families or caregivers should understand the value and importance of telerehabilitation, and this suggests that they might be prepared to exercise their own social influence with their patients. This perspective contrasts with the findings of Liu et al. (2015), who found that SI had minimal impact on therapists' acceptance of new rehabilitation

technologies in Canada, and Rouidi et al. (2022), who reviewed studies from a range of countries, and found that SI was the weakest predictor of acceptance. However, Kwee-Meier et al. (2016) who explored the acceptance of wearable locator technology among cruise-ship passengers, reported social influence as the strongest predictor of acceptance and highlighted the need to consider the unique characteristics and dynamics of each study's context. Despite the fact that Kwee-Meier et al. (2016) were not investigating the healthcare sector, their focus on a local context is particularly significant in relation to this study. In a tribal-based society such as KSA, in which members of extended families have traditionally relied on each other for guidance and support (Alyousef, 2022), SI is likely to be more significant than elsewhere, and this underscores the importance of considering social, religious and cultural factors when developing a strategy to implement telerehabilitation in KSA.

In the Saudi context, it is noteworthy that pragmatists also had no particular concerns regarding the gender of the patients involved in their sessions, and, in contrast to the advocates, they did not consider their age would negatively affect their use of telerehabilitation, aligning with the findings of Blumenthal et al. (2018) and Rodić et al. (2023). However, in their desire for training before they use telerehabilitation with their patients, they were strongly influenced by (the absence of) *facilitating conditions* (FC). It is possible that this group prioritise promoting knowledge and awareness of telerehabilitation to facilitate acceptance and to minimise challenges that might arise from patients and caregivers.

However, none of the physiotherapists in this group commented on this directly, so further research could explore this in more detail.

Overall, this group are in favour of telerehabilitation, but they do not regard cost-saving as a particular benefit, nor would they advocate for it with their colleagues. In terms of implementing telerehabilitation in KSA, this group would benefit from engagement with advocate physiotherapists, who could promote the usefulness of telerehabilitation; however, their emphasis on the importance of patients, caregivers and family members understanding the value and importance of telerehabilitation suggest they could play a valuable role in developing information about telerehabilitation for these groups.

7.2.1.3 Hesitant

The Hesitant group are the smallest group among the physiotherapists, comprising only 6 out of the 32 physiotherapist participants in this study. In contract to the other two groups, they are very uncertain about using telerehabilitation for fear of missing critical clinical information which may affect the quality of the treatment they are providing to their patients. They also feel that telerehabilitation sessions are more difficult to apply than face-to-face sessions. This indicates that *effort expectancy/perceived ease of use* (EE/PEoU) is a key factor in determining this group's attitudes and intentions regarding the adoption of telerehabilitation in the future. This is in line with Sitthipon et al. (2022), who highlighted the significance of "EE" in relation to users' adoption of technology, and (AlQudah et al., 2021),

who found that users' belief in the ease of use of a technology directly influenced their intentions to adopt it.

Social influence (SI) factors also appear to have a more negative effect on this group then others, for example, they are not happy to deliver video telerehabilitation sessions to both genders, they do not think their supervisors would encourage them to use telerehabilitation, and they do not believe it would enhance their colleagues' perceptions of their professional skills. As noted in relation to the pragmatist group above, the impact of SI on technology acceptance may vary according to contextual and societal characteristics, leading to diverse dynamics and outcomes (Kwee-Meier et al. 2016). Indeed, in this study, despite the collectivist nature of Saudi society (Cassell & Blake, 2012), impact varied within the physiotherapist groups, underscoring the value of utilising a methodology such as Q which enabled all viewpoints to be thoroughly explored.

Overall, this group accepted that telerehabilitation offered benefits, but they wanted to limit its use. While they agreed that telerehabilitation would reduce costs, they thought it should only be used where there are no other options, such as during the Covid-19 lockdowns, that practitioners should have a special licence, and that they should not treat patients of the opposite gender. While the findings of Rouidi et al. (2022) suggest that their concerns about PEoU may be addressed through training and skills development, the qualitative comments provided in this study suggest that SI may be a more significant factor in this group. As Participant 8 explained,

their reluctance to deliver sessions to patients of both genders is due to their religious convictions, and these are unlikely to be changed by training or advocacy. Therefore, while there is the potential to maintain the male-to-male and female-to-female consultations currently available within the Saudi healthcare system, the fact that gender is not an issue for the other two groups suggests that they would be better placed to enact the implementation of telerehabilitation in KSA in the initial stages.

7.2.1.4 Conclusion

The adoption of telerehabilitation among physiotherapists in KSA appears to be significantly influenced by several key factors, varying across the three groups. For the Advocates, PU/PE (from an economic standpoint), BI, and SI played a vital role in their enthusiasm to use telerehabilitation. Despite some concerns about the influence of ID, such as age, on the effectiveness of the technology, they intended to actively promote the use of telerehabilitation to their peers.

BI and SI were also important factors in the Pragmatist group, although their approach to SI was more patient-oriented, aiming to increase awareness and understanding of telerehabilitation among patients and carers. FC, such as promoting knowledge and awareness of telerehabilitation, were also a high priority for this group to encourage patient acceptance. However, cost-saving was not seen as a significant benefit, and they did not intend to use their SI to actively promote the use of telerehabilitation to their peers.

Lastly, the Hesitant group showed high levels of uncertainty regarding the adoption of telerehabilitation, mainly stemming from and concerns about EE/PEoU, notably the fear of missing critical clinical information during remote sessions. Social influence (SI) also impacts this group negatively, with concerns over delivering sessions to both genders and the perception that their supervisors would not encourage them to use it with their patients.

In relation to integrating telerehabilitation into the Saudi healthcare system, Advocates would be the ideal candidates to lead its implementation as they are enthusiastic and support the use of telerehabilitation, seeing its economic and practical benefits. Pragmatists are also open to using technology, and while they would benefit from engagement with advocate physiotherapists, they could be key in educating patients and carers about the use of technology in healthcare. The Hesitant group, with their reservations and concerns, may not be suitable for leading roles in early implementation, but their perspectives are valuable and need to be considered to develop an inclusive approach to telerehabilitation adoption.

7.3 RQ2: What are the factors which impact acceptance of telerehabilitation among Saudi patients with MS?

The number of consensus statements among the patients is lower than that among the physiotherapists, reflecting a diversity of viewpoints regarding the adoption of telerehabilitation. This may not be surprising, as one of the aims of the study was to have a diverse sample in contrast to some of the

studies in the literature review. In addition, unlike the physiotherapists, these participants do not share professional values and affiliations – all they have in common is their Saudi nationality and their MS diagnosis. Nonetheless, analysis of the results of the second Q study indicates that the most influential user acceptance factor for these patients is *facilitating conditions* (FC), and that this has both positive and negative effects.

Overall, patients with MS expressed confidence in telerehabilitation, although it is a new method and their information about it is limited. They also believed that they could be fully independent during telerehabilitation sessions at home, meaning there would be no need for a carer or a family member to help them during the sessions. They also assumed they would be able to complete the remote rehabilitation programme as recommended. This finding aligns with research by Apolinário-Hagen et al. (2018), which suggests that individuals with long-term disabling conditions, such as MS, base their intention to adopt new technology on their perception of available resources, including knowledge and support options. However, while FC had a positive influence on patients, their chief concerns also relate to this factor: firstly, the security of their data, and secondly, their ability to access the equipment that physiotherapists may suggest using during telerehabilitation sessions.

In addition, like the physiotherapists, *perceived usefulness/performance expectancy* (PU/PE) was found to exert a positive influence on the patients, as they believed it would save them money; in this case reducing the

transport costs they normally pay when attending face-to-face rehabilitation sessions. This finding is also consistent with existing literature, as previous studies have shown that PE is the strongest predictor of technology acceptance among patients with MS (Apolinário-Hagen et al., 2018, Breil et al., 2019). However, they also expressed doubts about *effort expectancy/perceived ease of use* (EE/PEoU) relating to the fact that the aims of using telerehabilitation were not clear to them.

Furthermore, as with the hesitant physiotherapists, *social influence* (SI) appeared to exert a negative influence, as patients indicated there was no support or encouragement from their family or friends to use technology in general in their rehabilitation programme. Thus, while this factor does not feature strongly in the consensus statements of the physiotherapists, it does affect those of the patients. As the qualitative data suggests this might be linked to cultural and religious norms within wider society, this is explored in more detail below.

7.3.1 Factors which affect the three distinct groups

As with the physiotherapists, while patients with MS showed agreement in some aspects of telerehabilitation, the use of Q methodology enabled three distinct groups to be identified based on their viewpoints towards telerehabilitation: Supporters, Rationalists, and Resisters.

7.3.1.1 Supporters

The Supporters valued the *perceived usefulness/performance expectancy* (PU/PE) of telerehabilitation, as they believed it was an effective way to

help them increase their attendance and compliance with rehabilitation sessions and enhance the package of care that patients receive from hospitals. This is in line with Taiwo et al. (2013), who identified this factor as the strongest predictor of technology acceptance. *Effort expectancy/perceived ease of use* (EE/PEoU) was also significant for them, as they strongly believed that having sessions remotely was easier than face-to-face sessions, and the level of care was the same as they would receive in clinic-based sessions. Similar findings emerged from Kim et al. (2015), who found that the high intention to use electronic health in a tertiary university hospital in South Korea was linked to high performance expectations.

Like the advocate physiotherapists, these patients also expressed a strong desire to use telerehabilitation when it was available to them, showing that *behavioural intention* (BI) was also an important motivating factor for this group. This intention did not appear to be affected by *social influence* (SI) from family or friends, as these patients did not report receiving encouragement to incorporate technology, such as telerehabilitation, into their treatment plan from those closest to them.

However, despite all the positive acceptance the supporters exhibited, they also expressed concerns about the *facilitating conditions* (FC), specifically the lack of suitable spaces at home that can be used for doing exercises and receiving remote sessions and poor internet access. They also expressed a strong preference for only receiving video telerehabilitation

sessions from physiotherapists of the same gender, and, again, the qualitative data suggests this is due to their religious and social beliefs. As with the hesitant physiotherapists, this indicates that *social influence* (SI) in the form of cultural and religious beliefs, has a significant impact on these patients' willingness to accept telerehabilitation.

It is evident that these patients are the most positive about telerehabilitation, and any strategy to implement telerehabilitation in KSA should address their concerns. For example, the separation of genders that is provided in clinical settings could be maintained in online settings, and alternative venues could be provided for patients to receive their sessions outside their homes. Rooms with the necessary technical and physiotherapy equipment could be prepared, ideally in local primary health care centres, to enable patients to receive sessions remotely in an appropriate setting.

7.3.1.2 Rationalists

Analysis of the results for the Rationalists suggests that they linked their acceptance of telerehabilitation with its *facilitating conditions* (FC). For example, they wanted to receive practical training before starting to use telerehabilitation and, unlike the other two groups, they assumed their hospital would offer assistance with any technical problems that they may face during sessions. As mentioned above, this is in line with Apolinário-Hagen et al. (2018), who found that individuals with long-term disabling conditions, such as MS, base their intention to adopt new technology on their perception of the available training, resources and support. In

addition, this group were also different in that they considered the *individual differences* (ID) of users to be significant and thought that prior knowledge about using technology would help them use telerehabilitation. However, they did not consider age an important element and they did not think it would affect their ability to use telerehabilitation effectively.

Although Rationalists acknowledged the *perceived usefulness* (PU/PE) of telerehabilitation in saving their time and improving their regular attendance, they did not intend to use it when it became available to them. This indicates that *behavioural intention* (BI) was a negative factor for this group at the time of the study. However, the qualitative data suggests that they would accept telerehabilitation as a method of treatment if adequate information and training was provided, and they could see that the infrastructure required was available to them.

7.3.1.3 Resisters

Resisters also highlighted the importance of the *facilitating conditions* (FC) for telerehabilitation, notably internet connectivity in their homes and the need to include telerehabilitation services under medical insurance coverage. However, in contrast to the other groups, they did not appear to value the *perceived usefulness/performance expectancy* (PU/PE) of telerehabilitation: they did not think it would improve their regular attendance in the rehabilitation programme, and they felt strongly that it could not replace face-to-face rehabilitation.

Despite these doubts, this group's *behavioural intention* (BI) in respect of adopting telerehabilitation was higher than that of the rationalist group. Analysis of the qualitative data suggests that their resistance was not necessarily directed towards telerehabilitation itself, but rather towards the rising use of technology in general, and during the pandemic in particular. For example, Participant 26 claimed that the COVID-19 lockdown and working from home had negatively affected his interactions with people, and he did not want to lose the human interactions which were part of his treatment. This group also indicated that they had not received guidance from their physiotherapists about the advantages of using technology, such as telerehabilitation, in rehabilitation sessions, or any encouragement to do so. This suggests that *social influence* (SI), particularly the desire for human engagement, operated in more complex ways within this group, and that, rather than encouraging them to use telerehabilitation, their experiences during COVID-19 restrictions may actually constitute a barrier. These concerns may reflect the collectivist, relationship-driven nature of Saudi society (Cassell & Blake, 2012), and any plan to implement telerehabilitation in the country should incorporate in-person interactions as well as online sessions.

7.3.1.4 Conclusion

As was anticipated by the diversity of the patient population recruited for this study, the three groups identified perceived telerehabilitation differently, but PU/PE, BI and SI emerged as the most influential factors.

Supporters valued telerehabilitation's PU/PE, believing it was a useful and convenient way to attend rehabilitation sessions and that it offered a similar level of care to in-person sessions. Their BI towards telerehabilitation was also positive; however, they were concerned about FC, especially in respect of the suitability of their home environments for telerehabilitation sessions, and Social Influence (SI) affected their willingness to interact with physiotherapists of the other gender due to their religious and social beliefs.

Rationalists also recognised the PU/PE of telerehabilitation, but they primarily linked their acceptance of telerehabilitation to its FC, emphasising practical training before usage. They exhibited lower BI than the Supporters; however, their willingness to adopt telerehabilitation may increase with adequate training and infrastructure. Resisters also highlighted the importance of FC, notably internet connections at home and medical insurance coverage. Although they did not appear to value telerehabilitation's PU/PE, doubting its ability to replace face-to-face rehabilitation, their BI in respect of adoption was higher than that of the Rationalists, suggesting their resistance may be directed towards the rising use of technology in general, rather than telerehabilitation specifically.

7.4 RQ3: What are the main barriers to the acceptance of telerehabilitation among Saudi physiotherapists and patients with MS?

The barriers to the acceptance of telerehabilitation among Saudi physiotherapists and patients with MS can be divided into three categories:

Firstly, the lack of facilitating conditions, which includes the need for comprehensive training and protocols or guidelines, along with concerns over data privacy and security, and the associated costs of equipment. Secondly the need to recognise individual differences, namely: age, gender, knowledge about telerehabilitation, digital literacy, and patients' medical condition. Lastly, the effects of social influences, which include the lack of recommendations from physiotherapists and support from family, carers, and friends for the use of telerehabilitation. Each of these barriers is discussed in relation to the findings of previous studies below.

7.4.1 Lack of Facilitating Conditions

The responses from both physiotherapists and patients identified the lack of scaffolding to support the use of telerehabilitation as a barrier to its implementation in KSA, with the need for specialist training, the introduction of established protocols and guidelines, and measures to protect data privacy emerging as key issues. While cost-saving was identified as one of the benefits of telerehabilitation, the potential additional costs involved, including for specialist equipment, home internet access, and possibly charges for the treatment itself, also acted as a barrier.

7.4.1.1 Need for Training

Both physiotherapists and patients called for dedicated training in how to use telerehabilitation correctly and effectively, echoing calls made in other recent studies, both in developed and developing country contexts. Buckingham et al. (2022) reported an urgent need for physiotherapist

training in the UK, as did Sprianu et al. (2022) in the US. Furthermore, D'Souza and Rebello (2021) reported that the lack of training in using telerehabilitation was one of the main barriers to its use in India, and both Dadgar et al. (2021) in Iran and Albahrouh and Buabbas (2021) in Kuwait highlighted the importance of providing training to healthcare professionals. Previous studies in KSA have also identified a lack of training as a key issue (El-Mahalli et al., 2012, Albarrak et al., 2019); however, the fact that El-Mahalli et al. identified this problem as far back as 2012 suggests that there has been little progress in this area in the intervening decade, despite the increased use of telerehabilitation during the pandemic. However, none of the studies mentioned above specify exactly what the nature of this training would be.

7.4.1.2 Need for protocols or guidelines

These Q studies identified an obvious absence of well-defined protocols or guidelines to direct the use of telerehabilitation among both patients and physiotherapists, and the literature indicates that this is a problem globally. Recent studies from Europe (Buckingham et al., 2022; Dierick et al., 2021; Rausch et al., 2021; Rettinger et al., 2021); developing countries (D'Souza and Rebello, 2021; Leochico et al., 2021; Mbada et al., 2021); the Gulf region (Albahrouh and Buabbas, 2021; Buabbas et al., 2022; Dadgar et al., 2021); and lastly Saudi Arabia (El-Mahalli et al., 2012; Albarrak et al., 2019; Alshammari, 2019) have consistently identified a lack of clear guidelines as a major barrier to the effective use of telerehabilitation. The findings of this study suggest that the development of clear clinical

guidelines to support physiotherapists in their use of telerehabilitation would improve their confidence and standardise their practices. Therefore, any strategy for the implementation of telerehabilitation should prioritise the development of guidelines and protocols.

7.4.1.3 Concerns about data privacy and security

The findings of this study show that protecting the privacy of patients' data is essential if telerehabilitation is to be accepted by physiotherapists and patients with MS in KSA. This is in keeping with recent studies in the literature. D'Souza and Rebello (2021) found that physiotherapists in India viewed data privacy as a crucial challenge that needed to be addressed for the broader acceptance of telerehabilitation, and Saaei and Klappa (2021) identified data privacy as a major concern in the practise of telerehabilitation among physiotherapists and patients in the US. Sidelil et al. (2021) also highlighted healthcare practitioners' concerns about data security in respect of telerehabilitation in Ethiopia, and similar findings were reported in Kuwait (Albahrouh and Buabbas, 2021). In KSA, concerns about data privacy were voiced by healthcare professionals in studies by El-Mahalli et al., (2012) and Ullah et al., (2021), with the latter specifically highlighting rehabilitation professionals' concerns about user data privacy in telerehabilitation.

In line with these concerns, the WHO's global digital strategy identifies health data as sensitive personal information which requires a high level of protection and security (World Health Organisation, 2020). Although it

recognises that it is important to encourage the sharing of health data for the good of the public, this should be done with the patient's permission. The processes involved should also be trustworthy, ensure patient privacy, make digital systems secure, and protect against harmful or wrong use (WHO, 2020). This indicates that the adoption or development of a secure platform is an essential part of any strategy to implement telerehabilitation in KSA.

7.4.1.4 Costs

This study found that the use of telerehabilitation could potentially reduce costs by helping to balance demand in outpatient departments, reducing travel expenses and the need for home visits, and providing a way to reach patients in remote areas. However, it may also introduce costs related to getting the necessary equipment, ensuring patients have a reliable internet connection at home, and managing treatment costs if these services are not free or covered by medical insurance. These findings are also supported by recent literature. The issue of providing the necessary equipment for telerehabilitation was identified a barrier to its implementation in the UK (Buckingham et al., 2022), and a study by Saaei and Klappa (2021) in the US found the need for an official IT platform presented a potentially costly barrier. Similarly, the strength and reliability of internet connections were identified as barriers to using telerehabilitation in India, Italy, and the UK (D'Souza and Rebello, 2021; Milani et al. 2021; Buckingham et al., 2022). Two previous studies in KSA also identified the cost of telerehabilitation set up and equipment as a barrier to its implementation (Aloyuni et al., 2020;

Ullah et al., 2021). While cost-saving has been identified as a benefit of the use of telerehabilitation, the Saudi government will also need to ensure that sufficient funding is provided to support its implementation. This would include the costs within the healthcare services themselves, including IT upgrades, and, ideally help to meet equipment costs for patients too.

7.4.2 Need to recognise Individual Differences

Individual differences refer to the varying characteristics of individuals, such as age, gender, experience, and education, which may influence their acceptance and usage of technology. Care was taken to ensure that the study population for each Q study included a representative range of demographic and other characteristics. The findings of the studies indicate that a number of these individual differences need to be recognised if telerehabilitation is to be implemented successfully in the Saudi healthcare system.

7.4.2.1 Age and gender

The patients with MS who participated in this study did not express any concern about their age impacting their use of telerehabilitation, with Participant 1 stating that "*Age is just a number, and it is not going to affect me using telerehabilitation*". However, the physiotherapists in this study strongly emphasised that the patient's age can pose a challenge to the successful implementation of telerehabilitation, both with the elderly and the very young. There claims are supported by numerous studies which *found that patient age could be a barrier to telerehabilitation* (El-Mahalli et

al., 2012; Albahrouh and Bubbas, 2021; Milani et al., 2021; Mbada et al., 2021; Algarni et al., 2022).

This study also found that the gender of both physiotherapists and patients could act as a barrier within KSA, particularly if preferences for a same-gender interaction during these sessions were not fulfilled. This was a particular concern for the most reluctant participants, namely the "Resisters" patient sub-group and the "Hesitant" physiotherapists. While gender was not identified as a barrier to the acceptance of telerehabilitation in other countries, previous studies in KSA have identified it as a potential issue in relation to other forms of telemedicine (Kaliyadan et al., 2013; Alkhalifah and Aldhalaan 2018).

Despite the absence of available statistics on the number and gender distribution of physiotherapists in KSA, the researcher's field experience suggests that accommodating these gender preferences in telerehabilitation sessions should be feasible. Therefore any strategy to implement telerehabilitation in KSA should ensure that the gender separation which is available in face-to-face settings is also available online.

7.4.2.2 Lack of knowledge and digital literacy

The study also found that a lack of knowledge about the uses and benefits of telerehabilitation and a lack of digital literacy among patients could present a significant barrier to the adoption and effective use of telerehabilitation services. This is supported by previous research which indicates that patients and healthcare professionals who do not fully

comprehend the potential benefits, applications, and procedures related to telerehabilitation are likely to be more hesitant or resistant to adopting it (Buabbas et al. 2022, Leochico et al., 2021; Ullah et al. 2021).

The findings also suggest that patients who are not familiar with the technology involved may also struggle to engage effectively in remote rehabilitation sessions, which can impact the overall efficacy of the treatment. This echoes broader concerns within the digital health literature (Saaei and Klappa, 2021; Sidelil et al.; 2021, Sprianu et al., 2022), and underlines the importance of digital literacy for the successful implementation of health technologies. In respect of the implementation of telerehabilitation, this indicates that the provision of technical training for patients and healthcare professionals should be an integral part of the strategy.

7.4.2.3 Patients' medical conditions

This study also identified the medical condition of the patient as a potential barrier to the use of telerehabilitation, as it might not be appropriate in some cases. This is in line with previous studies which have found that certain medical conditions can limit a patient's ability to fully engage in telerehabilitation programmes; for instance, severe neurological conditions or physical impairments could make it difficult for patients to independently operate the technology required for telerehabilitation or to perform certain exercises without physical assistance (Bennell et al., 2021; Leochico et al., 2021). These findings underline the importance of assessing patients'

suitability for telerehabilitation, and any strategy to implement it in KSA should include the development of clear assessment criteria.

7.4.3 Effects of Social Influence

Although there is no consensus in the literature on the impact of social influence on the acceptance of new technology, the need to consider contextual and societal characteristics (Kwee-Meier et al. 2016) is particularly important in this study. As noted above, as part of a collectivist-oriented, tribal-based society, Saudis place particular value on personal recommendations, especially those from members of their extended family (Alyousef, 2022). In this context, the absence of recommendations from physiotherapists, as well as the lack of support and encouragement from family members, carers, and friends, constitute significant barriers to the successful adoption of telerehabilitation in KSA. Indeed, the findings of this study highlight the importance of personal relationships and face-to-face interactions in promoting acceptance of telerehabilitation in KSA, and efforts to encourage positive social influences may help to overcome the dislike and mistrust of digital engagement, made worse by the COVID-19 pandemic, which the most resistant patients expressed.

These findings suggest that physiotherapists can play a vital role in endorsing telerehabilitation as a viable and effective treatment option and in guiding patients towards this option, especially when levels of awareness are generally low. Similarly, the support of family members, friends, and carers is crucial in helping patients feel comfortable and motivated to use

telerehabilitation. Therefore, any strategy to implement telerehabilitation in a society which values social influences, such as KSA, should seek to raise awareness among physiotherapists, patients and members of the patients' families.

7.4.4 Conclusion

The barriers to the acceptance of telerehabilitation among Saudi physiotherapists and patients with MS identified in this study relate primarily to the lack of facilitating conditions, the need to recognise individual differences, and the lack of positive social influences. These findings are broadly in line with other studies, but the impact of individual differences and social influence seem to be particularly significant in the Saudi context. The preference for sessions to be delivered by someone of the same gender as the patient, for example, appears to be specific to KSA, and reflects the prevailing religious beliefs in the country. Equally, the importance of recommendations from practitioners and support from family members reflects the tribal, collectivist nature of Saudi society and culture.

The importance of respecting cultural and religious beliefs in healthcare delivery is paramount (Sahin and Maldonado-Duran, 2019), and understanding such preferences may significantly enhance the acceptance and effectiveness of telerehabilitation services within KSA. Despite the absence of available statistics on the number and gender distribution of physiotherapists in KSA, gender separation is already practised within the Saudi healthcare system (Aldosari, 2017), and the researcher's field

experience suggests that accommodating these gender preferences in telerehabilitation sessions should be feasible. Efforts should also be made to encourage physiotherapists, families, carers, and friends to play a positive role in encouraging patients to use telerehabilitation as part of their treatment.

7.5 RQ 4: How might these barriers be overcome to support the effective implementation of telerehabilitation in KSA in the future?

The findings of this study suggest that the use of telerehabilitation has the potential to reduce healthcare costs and enhance patient care, especially for patients in rural areas. However, its successful adoption in KSA requires a systematic strategy which recognises the factors which drive acceptance in the country and the barriers which must be overcome. As a result, this section presents a logic model (Skivington et al., 2021) to guide the implementation of telerehabilitation in the Saudi healthcare system, building on the data and analysis presented so far to propose a strategy which addresses the challenges identified above. However, it is important to note that this model was originally developed for patients with MS, therefore, it might require adjustments when applied to patients with other medical conditions.

7.5.1 Developing a logic model for the implementation of telerehabilitation in Saudi Arabia

A logic model is typically used to demonstrate how an intervention is expected to work and to highlight the steps through which the desired outcomes are to be achieved (WK-Kellogg-Foundation, 2004). According to the Office for Health Improvement and Disparities in the United Kingdom (2018), the logic model serves as a robust framework for devising, executing, and assessing public health interventions. It elucidates the required resources, the activities to be executed, and the anticipated outcomes of the intervention. The use of a logic model has several additional benefits: it helps to ensure that the intervention is well planned, executed, and evaluated, it enables stakeholders to understand the goals of the intervention, and identifies the resources and activities required to achieve those goals (Davidoff et al., 2015). As a result, logic models are often mandatory in research proposals involving implementation, as funding agencies require them to provide a clear explanation of the problem the intervention is seeking to address, how it will be applied, and how it will lead to the desired outcomes (Petersen et al., 2013). The following sub-sections discuss these points in relation to the intervention proposed here.

7.5.1.1 Problems this intervention is seeking to address

Before a logic model can be developed, the problems the intervention is seeking to address should be clearly identified. The literature review conducted for this study, the data gathered through the two Q studies, and

the researcher's own experience in the field, identified the following as the key issues in relation to the implementation of telerehabilitation in KSA:

- Lack of training;
- Lack of official guidelines (both nationally and internationally);
- Need to protect data privacy;
- Cost to patients (equipment; internet access; medical insurance);
- Access to suitable spaces for sessions and required equipment;
- Lack of digital literacy;
- Lack of confidence in using the technology (physiotherapists and patients);
- Not suitable for all medical conditions;
- Need to accommodate cultural and religious expectations (e.g. relationship-oriented society and gender separation);
- Lack of support from wider society (e.g. family, friends, carers)

7.5.1.2 Desired Outcomes

Outcomes in a logic model represent the tangible benefits or improvements expected to result from the activities outlined in the model, and these can be categorised as short-term, medium-term, or longer-term (Knowlton and Phillips, 2012). The implementation of this model is anticipated to produce the following outcomes, which will address the barriers identified above.

Short-term outcomes:

1. Increased physiotherapist competency in providing telerehabilitation services (through training and published guidance);

2. Increased patient awareness and understanding of telerehabilitation;
3. Increased numbers of patients and healthcare providers using the telerehabilitation;
4. Improved patient access to rehabilitation services in remote areas;
5. Increased patient access to rehabilitation equipment;
6. Enhanced adherence to the recommended rehabilitation programmes due to reduced travel and equipment costs and increased convenience;
7. Increased patient satisfaction with telerehabilitation services due to enhanced access, convenience, and effectiveness;
8. Improved data security and management for telerehabilitation services.

Longer-term Outcomes:

1. Decreased waiting lists and reduced burden on outpatient departments due to increased capacity to provide services remotely;
2. Decreased healthcare costs associated with outpatient departments, home visits, neurological rehabilitation services, and travel and missed appointments;
3. Improved functional abilities and cognitive skills of patients participating in telerehabilitation;
4. Integration of telerehabilitation into standard healthcare practices and curricula, leading to its widespread acceptance and use;
5. Expansion of telerehabilitation services across the country, increasing accessibility for all eligible patients;
6. Enhanced knowledge sharing and collaboration with international

organizations.

7.5.2 A model for the implementation of telerehabilitation in Saudi Arabia

It is anticipated that this project would be implemented under the auspices of the Saudi MoH, as the chief governmental body responsible for health in KSA. The model below presents the resources (inputs), activities, and outputs required to achieve the outcomes detailed above. It also identifies the assumptions which underpin the model and the external factors which may impact its implementation (See Figure 7-1). Further details of the individual elements are provided below the model, with the exception of the desired outcomes as these have already been explained (See 7.5.1.2).

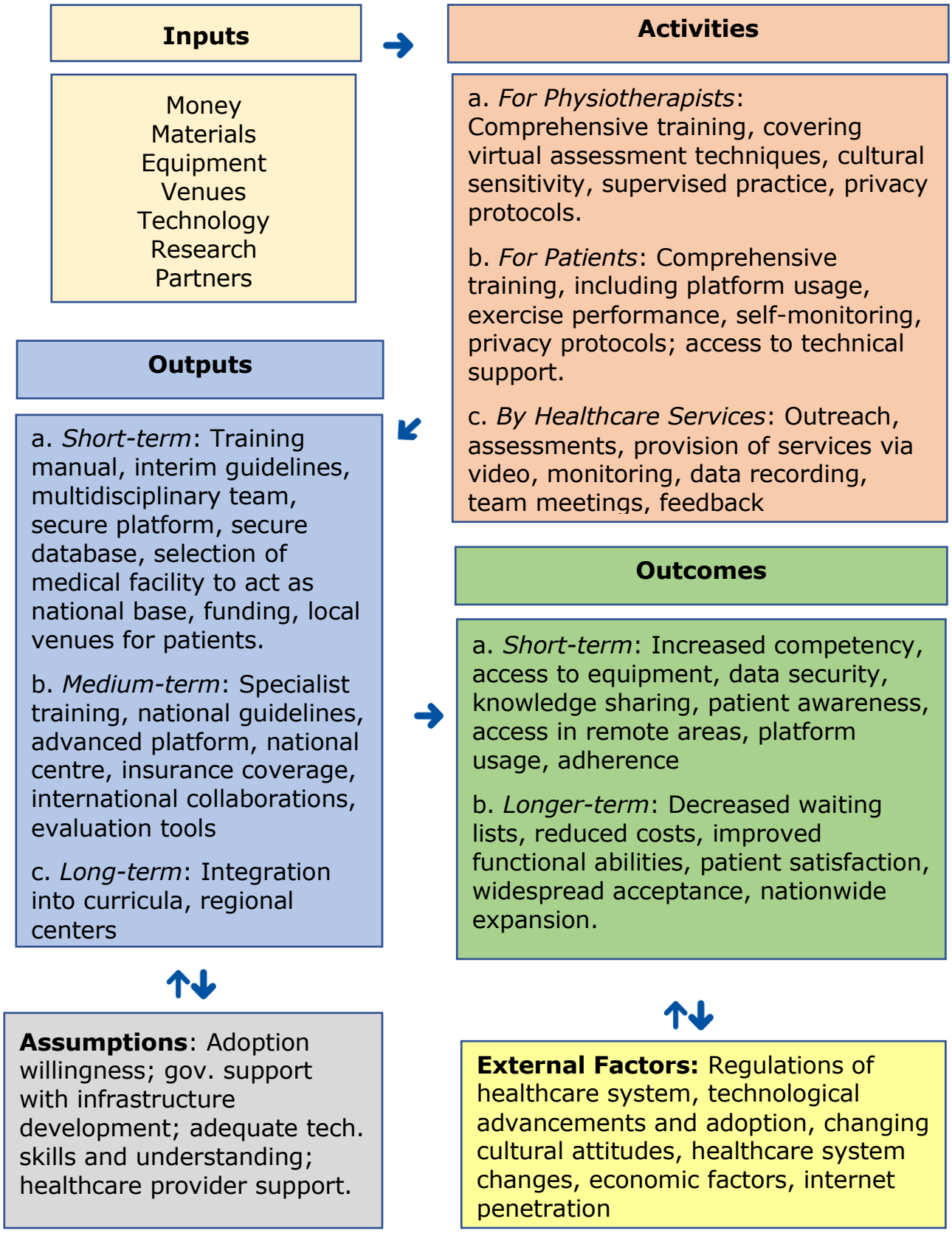

Figure 7:1: A logic model for the implementation of telerehabilitation in Saudi Arabia

7.5.2.1 Inputs / resources required

Before implementing any new intervention, is important to identify what resources are required in order to achieve the desired outcomes (Smith et al., 2020). The implementation of telerehabilitation in KSA will involve several critical inputs and resources, as follows. Firstly, adequate funding is needed to procure the necessary resources and cover operational costs. Materials could include any written guides or physical items required for the telerehabilitation process, while equipment encompasses technology such as laptops, software, and therapeutic devices to be used during the remote session. The project also involves adopting a secure platform, such as the existing Seha e-health platform operated by the MoH, which possesses video conferencing capabilities ideal for telerehabilitation. The venues, in this context, refer to locations for the rehabilitation team and for patients who do not have suitable space at home. Research findings, particularly those specific to the Saudi healthcare system and technology use, will provide invaluable data and insights to direct the project. Finally, partnerships with healthcare providers and technology firms globally will be instrumental in successfully launching and sustaining telerehabilitation in KSA.

7.5.2.2 Activities

These will involve three distinct groups: physiotherapists, patients and healthcare services.

7.5.2.2.1 Activities for Physiotherapists

In order to provide physiotherapists with the necessary knowledge and skills for telerehabilitation, several activities have been identified. These start with a comprehensive training programme in which physiotherapists learn about the utilisation of the telerehabilitation platform and associated software. This training extends to include instruction on virtual assessment techniques, the prescription of exercises, monitoring and adapting treatment plans remotely, and the importance of cultural sensitivity in patient interaction. To ensure continuous development and proficiency in the field, physiotherapists are offered ongoing training and support, allowing them to increase their telerehabilitation skills over time. Additionally, they will be given the chance to apply their new knowledge in a supervised environment, encouraging best practice and demonstrating competency. Lastly, as part of this training programme, a significant emphasis is placed on privacy and security protocols to ensure the secure handling of patient data in a remote environment. Technical support will be easily accessible to assist physiotherapists with any issues that may arise.

7.5.2.2.2 Activities for Patients

Patient training forms a significant part of the implementation of the telerehabilitation programme. To begin with, eligible patients are invited to participate in a tailored training programme that familiarises them with the telerehabilitation platform and the associated software. This includes education on platform navigation, correct exercise execution, self-

monitoring techniques, and how to report any issues or concerns they may encounter. In the medium term, patients gain access to a platform that displays their prescribed exercises, as determined by their physiotherapists. This platform will also allow patients to record the frequency of their home exercises, thereby enabling physiotherapists to conduct remote follow-ups effectively. To ensure the smooth operation of the platform, technical support will be readily available to patients, assisting them in troubleshooting any issues they may experience. Lastly, patients will receive education on privacy and security protocols to ensure they understand the importance of safeguarding their information while using the telerehabilitation platform.

7.5.2.2.3 Activities for Healthcare Services

Several key activities are undertaken to ensure the smooth delivery of healthcare services. The process begins with outreach and training for both physiotherapists, patients and members of the patients' families, focusing on the benefits of telerehabilitation, especially for patients with neurological conditions, and those in rural areas or who cannot attend face-to-face rehabilitation sessions regularly. Healthcare providers then conduct comprehensive assessments to identify patients who are eligible for these services, taking into account criteria such as their ability to use technology, and physical and cognitive assessments. Once identified, patients receive services such as exercises, education, and self-management support via video conferences. Their progress is regularly monitored by

physiotherapists, who adjust treatment plans if needed. In addition to this, patient data is securely recorded in a database for evaluation purposes. Regular team meetings are held to discuss progress, challenges, and future plans, promoting cohesion and efficient problem-solving (Kauffeld and Lehmann-Willenbrock, 2012). Lastly, feedback is actively sought from both patients and healthcare providers to drive continuous improvement of the services (Ivers et al., 2012).

7.5.2.3 Outputs

Outputs in a logic model represent items, actions or accomplishments which facilitate the attainment of the desired outcomes (McLaughlin and Jordan, 2015). The short-, medium-, and long-term outputs of this intervention are set out below.

Short-term outputs

In the short term, the telerehabilitation project entails several essential activities. First, the completion of a training manual for physiotherapists in telerehabilitation and the development of interim guidelines and protocols. This is followed by the establishment of a multidisciplinary team consisting of trained healthcare practitioners and IT technicians. Next, specialised training sessions for team members are provided to ensure a solid understanding of the project requirements and goals. The project will also involve the adoption of a secure platform, such as the Seha platform, with video conferencing capabilities suitable for telerehabilitation. Additionally, a secure database for storing patients' data and a medical facility to house

the telerehabilitation team must be selected. Financial support is provided for patients to acquire the necessary equipment for their treatment. There is also a focus on identifying suitable venues, such as local primary healthcare centres, for patients who lack internet access or a suitable space at home for the online sessions, with staff at those venues given the necessary training to facilitate the telerehabilitation services. Lastly, the project works closely with medical insurance companies to ensure telerehabilitation is covered.

Medium-term outputs

In the medium term, the telerehabilitation project shifts focus to broader, more sustainable goals. This includes developing a national training programme in telerehabilitation for healthcare practitioners and establishing formal national guidelines and norms for telerehabilitation in line with international standards. Additionally, the project aims to foster international collaborations with global organisations, such as the WHO, and specialist telerehabilitation organisations to keep up with best practice. The development of a more advanced telerehabilitation platform that allows healthcare practitioners to send messages to patients and enables patients to see examples of their prescribed exercises and record their completion online should also be initiated. The establishment of a national centre for telerehabilitation in KSA is another major medium-term aim that will centralise telerehabilitation activities, resources, and research in the country, fostering collaboration and improving efficiency in remote

healthcare delivery. Lastly, identifying suitable evaluation tools to assess the effectiveness of this intervention by comparison with face-to-face rehabilitation, for instance, by measuring patients' satisfaction, patients' physical and mental improvements, cost savings, or any other improvements in access to care.

Long-term outputs

In the long term, the telerehabilitation project in KSA seeks to further integrate telerehabilitation into the wider healthcare system. One major initiative involves introducing telerehabilitation into medical and healthcare curricula at universities in order to educate future healthcare professionals. Moreover, the project aims to expand its reach by developing regional centres for telerehabilitation. These centres would allow all eligible patients, not just those with chronic conditions, to access the service, thus broadening the impact of telerehabilitation across the country.

7.5.2.4 Assumptions

Assumptions in a logic model represent beliefs about how the intervention is expected to work or achieve the desired outcomes (Hayes et al., 2011). The logic model for implementing telerehabilitation in KSA is predicated on several key assumptions. Firstly, it assumes that physiotherapists, healthcare providers, and patients will be receptive to adopting the telerehabilitation approach. Secondly, that the existing technology infrastructure in KSA is robust enough to effectively support the deployment of telerehabilitation services. Thirdly, that physiotherapists will

be able to adapt their skills to a virtual environment while maintaining the same quality of care. Fourthly, that patients will possess the necessary understanding and capability to utilise the technology involved in telerehabilitation. Finally, that healthcare providers, such as hospitals and outpatient departments, will support this initiative and incorporate it into their existing service offerings.

7.5.2.5 External Factors

External factors within the context of a logic model encompass the cultural, economic, political, and demographic influences that can affect the success of the intervention (McLaughlin and Jordan, 2015). Several external factors could potentially impact the implementation of telerehabilitation in KSA. Firstly, the regulations governing healthcare and telehealth, including data privacy laws and licencing requirements, could affect the rollout and operation of the service. Secondly, the pace of technological advancements and adoption rates could influence the project's progress and effectiveness. Thirdly, as this study has demonstrated, cultural attitudes towards telerehabilitation in KSA could also impact patient receptivity and participation. Fourthly, changes in the broader healthcare system, such as shifts in policy or funding, could directly affect the resources and support available for the project. Fifthly, economic factors, such as overall funding for healthcare and patients' ability to afford the necessary equipment, could likewise have significant implications. Lastly, the extent of internet penetration and the quality of internet services across different regions in KSA could determine the reach and quality of the telerehabilitation services.

7.6 Conclusion

This chapter has investigated the factors that influence the acceptance of telerehabilitation among Saudi physiotherapists and patients with MS. Physiotherapists in this study supported telerehabilitation for its benefits, notably for remote patients and those requiring home care. However, they expressed concerns about data security, and the need for training and technical support. Patients with MS also exhibited diverse views on telerehabilitation. While recognising potential benefits such as cost savings, they raised concerns about data security, equipment access, clarity of objectives, and a lack of social encouragement. Three patient groups were identified based on their attitudes: Supporters, Rationalists, and Resisters, each with their own unique acceptability levels and concerns.

The potential barriers to the acceptance of telerehabilitation were then identified based on the primary and secondary data gathered for this study. These were: a) the lack of *facilitating conditions*, including comprehensive training, formal guidelines, data security, and required equipment inpatients; homes; the need to respect *individual differences*, such as age, gender, knowledge about telerehabilitation, digital literacy, and individuals' medical conditions; and *social influences* such as the absence of recommendations from physiotherapists and support from family and friends to use telerehabilitation. Concerns related to gender were identified as a challenge specific to the Saudi context, as was the significance of social influence, both of which reflect religious and cultural beliefs in the country.

Finally, a logic model for implementing telerehabilitation in KSA was proposed which aims to address the barriers identified. This sets out the desired outcomes in the short, medium, and long term, identifies the necessary inputs, and lists the required activities for physiotherapists, patients and healthcare providers. It also itemises the short-term, mid-term, and long-term outputs for healthcare services, articulating the assumptions on which the model was based, and identifying the external factors which may impact the project's success. In doing so, it provides an evidence-based strategy for the implementation of telerehabilitation in KSA and enables stakeholders to understand the goals of the project and how they could be achieved. The next chapter describes the contribution to Q methodology this study makes.

Chapter 8: Developing an Online Q Methodology for this Study

8.1 Introduction

Faced with the challenges of conducting Q studies during the COVID-19 pandemic, when face-to-face activities were severely restricted, novel approaches to collecting the research data for this study had to be considered. The use of digital tools to conduct interviews and focus groups was widely adopted during this period (Rashid and Yadav, 2020), and using an online approach, whereby participants could complete their Q sorts and provide qualitative data without having to meet the researchers, appeared to offer a practical solution in this study. However, there was no established process for conducting a Q study remotely, and there were no digital platform designed specifically for this purpose.

This chapter describes the contribution to Q methodology this thesis makes and is based on a previously published article (Alanazi et al., 2021).[2] Using the Q studies in this research as a case study, the chapter describes the conversion of the data collection phase of Q methodology to an entirely online process. It also provides an evaluation of the usability and integrity of the approach, considering the benefits and drawbacks of remote data collection in a Q-study. In doing so, it offers a novel solution for online data

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collection in a Q study which has the potential to reduce costs, enhance participant recruitment, and provide greater convenience to both participants and researchers.

8.2 Rationale for the focus on process and participants

Several studies in the literature have utilised online methods to conduct Q studies, notably (Davis and Michelle, 2011, van Exel et al., 2015, Jeffares and Dickinson, 2016, Walker et al., 2018, Lutfallah and Buchanan, 2019). However, the focus of these studies was typically on the topic of the study in question rather than on the online Q-methodology process itself. In addition, to the best of the researcher's knowledge, no studies have yet examined the experiences of Q-methodology researchers or participants who used an online Q-platform while conducting the study. In order to address these gaps in the literature, this chapter focus on two aspects of online Q methodology: firstly, how to develop an online Q-study process using open-source software, and, secondly, examining the opinions of researchers and participants who had used the software in order to identify the challenges and benefits from the perspectives of all end-users.

8.3 Developing the online Q study

Implementing Q methodology online is a challenging task as it involves simulating all the steps that are performed in face-to-face settings. During the COVID-19 pandemic, participation in Q-methodology studies was

achievable only through the use of online Q-methodology software, which had to be affordable, manageable and intuitive for the users.

8.3.1 Establishing the technological platform

In order to develop software capable of supporting online Q methodology, a number of options were reviewed, and an open-source tool called Easy-htmlQ V1.1, which is freely available via the GitHub repository for open software development, was selected (Banasick, 2019). This software provides complete user documentation, and simple editing of included Extensible Markup Language (XML) files allowed for easy customisation of the application for the purposes of this project.

Easy-htmlQ is fully compliant with Google Firebase, a powerful, secure, and free to use mobile application development platform for creating databases, and this was used to provide secure database storage facilities once a participant had completed their Q sort study and submitted their data. Google Firebase is password protected but easily accessible by the researcher using access credentials. JSON (JavaScript Object Notation) files were used to store small and simple quantities of data; these can be modified with a text editor, and, as they use open standard file formats, they can be easily transferred into other applications, notably analysis software. In this case, the researcher was able to export all the data within Google Firebase into Ken-Q Analysis, an open-source application designed to support Q methodology (Banasick, 2019). The Ken-Q analysis provided the statistical outputs for the data set collected from participants' Q sorts.

8.3.2 Procedure for conducting the study online

The study information and consent form for the Q studies were sent via e-mail to the study participants. Each participant had to read all the study details, and they were asked at the end of the file to choose between 'NEXT – I consent to take part' or 'EXIT - I do not give consent'. Participants who consented were then able to access the main study pages. No personal log-in details were required nor downloading of any external apps.

A description of the project, together with guidelines on use of the software, were provided for participants on the opening study pages. The guidelines were placed in small pop-up windows that were presented to the participants before each step in the case study. These included clear instructions about what the participants needed to do at each stage. There were five steps in total, each of which required participants to complete a specific action. Participants were able to go back to any previous step in the study and continue again from that point, but everything had to be completed before the study could be submitted. Figure 8-1 shows the steps of the study and the instructions presented to the participants.

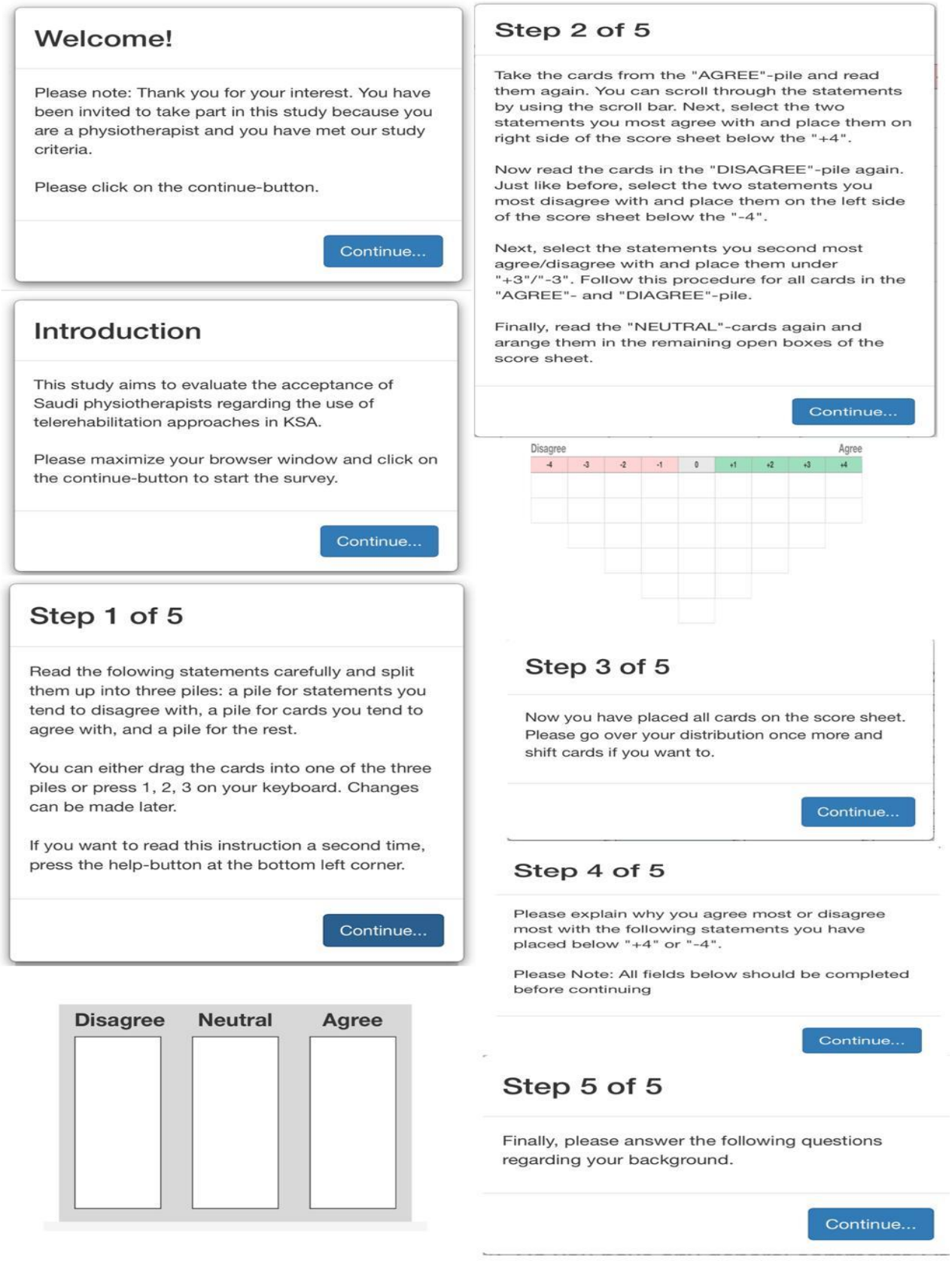

Figure 8:1: The guidance presented to the participants at each stage

8.3.3 Gathering the qualitative data

In traditional face-to-face Q studies, the post-sort interviews are usually conducted immediately after the Q-sort activity. This is because the participant has to explain the reasons behind their selections in the Q sort, so it is best to ask them about it as soon as the activity has been completed (Watts and Stenner, 2012a). In the online Q methodology, it is difficult to ensure that every participant is interviewed shortly after completing the Q-sort activity online; however, any delay increases the risk that participants will forget their answers and the rationale for their choices. In order to address this, the online Q methodology created for this research used open-ended questions to be answered online immediately following the Q sort as an alternative to the traditional interviews.

8.4 Pilot evaluation of the online Q methodology

8.4.1 Pilot evaluation participants

In order to evaluate the online Q methodology developed for this research, it was important to consider the perspectives of both participants and other Q-methodology researchers regarding the conduct of these Q studies. Therefore, the physiotherapists who had completed the first online Q study (Study 1) were approached, and three of them (P1-P3) volunteered to participate in semi-structured interviews to talk about their experiences of using the online approach. Two experienced Q-methodology researchers (P4 and P5) also volunteered to complete the same online Q sort as the study participants to experience the process themselves. They then

participated in the semi-structured interviews in order to evaluate the online platform and the study process from the perspective of an expert researcher (See Table 8-1).

Table 8-1: Overview of pilot study participants.

Physiotherapists who participated in Q Study 1 (Physiotherapists)	Participant 1 (P1) Participant 2 (P2) Participant 3 (P3)
Q-methodology researchers (who volunteered to complete Q Study 1 before being interviewed)	Participant 4 (P4) Participant 5 (P5)

8.4.2 Data collection and analysis

The semi-structured interviews for the pilot evaluation (n=5) were conducted online and were audio-recorded. The same interview guide was used for all the interviews. Analysis of the qualitative data collected was carried out using thematic analysis (Braun and Clarke, 2006). The data were organized in tabular format in order to make sense of them (Creswell, 2013). After all the interviews were transcribed, the next stage involved searching for similar information from the participants' responses to generate the main themes in a single document (Braun and Clarke, 2006). Expressions showing similar information were highlighted to aid identification. The developed themes were checked repeatedly to conclude whether it was acceptable to split, merge, or rename similar themes containing similar information (Ary et al., 2018, Braun and Clarke, 2006, Creswell, 2013).

8.4.3 Results

Four themes were identified: convenience, recruitment, cost, and challenges.

Convenience

All the participants in the semi-structured interviews believed that completing an online Q study was more convenient than face-to-face Q methodology. For example, Participant 1 thought that it provided more convenience in terms of time and space:

> *"The online experiment is more convenient, more handy; I can do it through my phone at my workplace or at my home at any time. So it will give me the opportunity to do it in my best time and my convenient place in any part of the day.'' (Participant 1)*

This comment was supported by Participant 2, who also noted that being able to complete the Q study online at home helped to reduce distractions:

> *"The setting was very relaxed. I took my cup of tea, and I answered all the questions without any interference from any other circumstances''. (Participant 2)*

Both the expert researchers (Participant 4 and Participant 5) thought that conducting Q methodology online could reduce the researcher's workload by comparison with traditional Q methodology, especially in relation to the time and effort involved in data collection. Participant 4 commented that:

> *"In face to face, once they finish doing the sorting, you might want to copy it* [the participant's Q sort] *into a shorter template, maybe an A4 page, to document what they have done, so that you can transfer that into the system when you want to do the analysis. But with online Q methodology, as soon as they do it, it* [the data] *is already there." (Participant 4)*

P5 agreed, but highlighted the benefits for the participants too:

> *"It will be easier and more convenient for them to do your study. And also, for the researcher to do it online; it's much easier and much better organized and much easier to extract the data''.* (Participant 5)

Recruitment

All the participants thought that doing the Q study online would facilitate participant recruitment. For example, Participant 1 highlighted the difficulties related to transport and time in face-to-face studies:

> "The most important point for me, it's the opportunity for me to be a part of this experiment because if it was face to face, I didn't think so I will be able to be a part of it because it's difficult for me to commute and meet you face to face''. (Participant 1)

Participant 2 thought the outbreak of COVID-19 provided the catalyst and opportunity for the development of Q methodology online rather than the traditional approach, noting that:

> *"If you asked me to participate face to face during the beginning of COVID-19, I would say I'm sorry, I can't, because I was very conservative about the whole COVID-19''thing.* (Participant 2)

Participant 5 made a similar comment, suggesting that conducting Q methodology online was the most appropriate way of completing data collection during the COVID-19 pandemic:

> *"I think it is the only way and better way to do during these days due to the social distancing and all these measures to prevent COVID from spreading out''.* (Participant 5)

Participants 3 and 4 also thought that the use of online studies more generally would help to enable wider (global) participation in a time efficient way. P3 mentioned that:

> *"You can involve as many people as you can from different countries, you are not restricted by the place''.* (Participant 3)

P4 stated that:

> *"I think online Q is seamless because in just one night, it can be sent across the world to get data and you can get the responses back within the shortest possible time''.* (Participant 4)

Cost

The Q-methodology researchers (Participants 4 and 5) held different views about whether conducting Q methodology online would decrease the financial cost of conducting Q studies. Participant 5 thought that it would make resource utilisation more efficient:

> *"It is going to reduce a lot of waste - time waste and money waste''.* (Participant 5)

However, Participant 4 claimed that the money and resources, which are normally used for logistics, would simply be used in other ways, for example, to pay for internet access to enable people to participate in the study online:

> *"It is just that you have not used money for logistics in terms of transportation, but that has now been pushed to the participant, who is not going to use their own data. It depends on where you are going to do the study. But I think in developed settings, like where I did my study and where I am right now, you will still use that particular money."* (Participant 4)

Challenges

All the participants raised some concerns about conducting Q-methodology studies online. For example, Participant 1 highlighted the importance of providing clear instructions for completing Q methodology online, commenting that this would help participants develop a better understanding of what was required and increase their confidence:

> *"I think online questions should be done more carefully. It has to be clear for everyone. All participants have to understand it. Many people, I think are afraid to join the online version studies because they think it's difficult or complicated or they cannot ask a person. But what I experienced with your experiment was the process was easy and clear."* (Participant 1)

Participants 2 and 3 agreed that the reliability of the internet connection could be a potential challenge, and this might also affect participants' confidence in participating in the study online. The former stated that:

> *"If the internet connection is bad, it will affect the participants".* (Participant 2)

The latter also commented that it was a concern:

> *"Nothing like that happened to me, but I would consider if the internet connection was not very good. Maybe that would make me uncomfortable. But it's something to consider. It is so worrisome to think about it".* (Participant 3)

Participant 4 believed that the most difficult challenge in conducting research in this way would be the technical aspects related to the development of a Q-methodology platform:

> *"I think the difficult part is building the platform from scratch; once you do it, I think everything is easier because it is your work".* (Participant 4)

Participant 5 raised ethical concerns, and stressed that it was essential that both the researcher and the platform protected participant's personal information, pointing out that:

> *"There might be privacy issues, especially with online studies, and especially for sensitive topics for us. The participant might be unhappy to discuss it online".* (Participant 5)

8.5 Discussion

Conducting any face-to-face research, including Q-methodology studies, became very difficult during the COVID-19 pandemic due to the restrictions imposed to limit the spread of the virus. However, the development of an online platform and a methodology for conducting Q sorts online enabled the Q studies in this research to continue despite the lockdown periods. Whilst there are obvious challenges when conducting studies online, in this small study, several benefits were identified when conducting Q-methodology studies online. These could be summarised as potentially lowering costs, enabling wider recruitment, and providing greater convenience for all involved.

With respect to the literature, a number of other studies have incorporated online Q methodology, though none have made the process itself their primary focus. Davis and Michelle (Davis and Michelle, 2011) suggested that the online approach could reduce costs and increase the reach/scope and recruitment, both of which are broadly analogous with the findings of

this study. However, in terms of cost, this study found that these may actually be comparable to the face-to-face approach, particularly if internet access has to be provided to enable participants to be involved in the study. The findings of this study also support those of (Davis and Michelle, 2011, van Exel et al., 2015), who used an online Q methodology to collect their study data and attracted participants from 10 different countries, something they attributed to the ability of the online methodology to facilitate the recruitment of participants. In addition, Jeffares and Dickinson (Jeffares and Dickinson, 2016) used an online Q methodology to collect their study data; however, they conducted post-sort interviews after the participants had completed their Q sorts online. As discussed above, this way of conducting an online Q study does not seem to be practical unless the interviews happen immediately after performing the Q sort, and this is difficult to achieve in practice. Therefore, this study incorporated open-ended questions into the online platform instead of using interviews. These questions asked participants to explain their selections and appeared right after the Q-sort activity was completed, thereby reducing the possibility of them forgetting their reasons or missing out important information or points linked to the topic.

Regarding the convenience of the online method, (Walker et al., 2018) and Lutfallah and Buchanan (Lutfallah and Buchanan, 2019) tested online software that allowed participants to complete the Q sort on a computer instead of relying on paper-based data collection. Their aim was to reduce the researcher's workload by eliminating the need to record the

participants' answers in the Q-sort activity and then manually enter the data into the analysis software. Both studies found that using online software saved the researchers' time and potentially reduced the risk of data being recorded incorrectly. These findings also mirror those of this study in terms of the convenience that is realised as a result of using online software to collect Q-methodology data. However, it should be noted that both Walker et al. (2018) and Lutfallah and Buchanan (2019) tested this method in a face-to-face setting, where the participants and researchers were in the same location and the participants used smart devices to test the Q-methodology software.

The challenges identified by the participants in this study apply to online research in general and are not unique to Q methodology online. These issues concern clarity of study guidelines, stability of internet connections, technical issues linked to the platform, and privacy of data (Moreh, 2019, Newman et al., 2021, Rice et al., 2017). Therefore, it is imperative for the research team to ensure that instructions for their studies are clear and unambiguous, as it is not possible for them discuss these with the participants in real time (Granello and Wheaton, 2004, Moreh, 2019). Furthermore, the research team should possess the necessary skills and competence to assist with technical issues that may arise during the study, including checking internet connection quality with participants beforehand (Moreh, 2019). Finally, it is important for the researchers to ensure the privacy of the study data and reassure participants about data security, confidentiality and anonymity (Lobe, 2017).

8.6 Conclusions

The COVID-19 pandemic transformed the way previously reliable and established work practices were carried out. Amidst this, Q-methodology researchers were obliged to find alternative ways of conducting Q-methodology studies, as face-to-face studies were no longer possible. This chapter has demonstrated that using open-source technology, such as Easy-HtmlQ V1.1, Ken-Q Analysis, and Google Firebase, provides a functional method for executing Q-methodology studies, as these proved to be simple, effective, and user friendly. Other potential advantages of conducting Q-methodology studies online were identified, including cost reductions, enhanced participant recruitment, and greater convenience to both participants and researchers during the research process. Therefore, future online Q-methodology studies should also disseminate any useful sources or programmes that would improve and facilitate the conduct of Q-methodology studies online. The next chapter provides a conclusion to this research study.

Chapter 9: Conclusion

9.1 Introduction

This chapter provides a conclusion to this research study and sets out its contributions. It begins by outlining the advantages of employing Q methodology alongside the TAM and UTAUT models which formed the theoretical framework. It goes on to summarise the main findings derived from the two Q studies and considers their implications. It then identifies the contributions to knowledge, to Saudi society, and to Q methodology which this thesis makes. It concludes by acknowledging the limitations of the study and proposing possible directions for future research.

9.2 Using Q methodology and the TAM and UTAUT models

One of the key strengths of the Q methodology is its ability to identify and describe a range of existing viewpoints on a specific topic, even when those views are held by a small number of individuals (Brown, 1980, Van Exel and De Graaf, 2005, Watts and Stenner, 2012a). This has been particularly beneficial in this thesis, as it both highlighted the complexity and diversity of attitudes toward telerehabilitation among the participants and facilitated the identification of the distinct groups within them based on common perceptions, attitudes and beliefs. This has enabled a comprehensive understanding of how different individuals perceive the possible benefits of and barriers to the implementation of telerehabilitation in KSA, illustrating that acceptance is not a binary condition, but rather a spectrum of attitudes

and concerns. For instance, Supporters, who viewed telerehabilitation positively, still raised concerns about facilitating conditions, such as the availability of adequate space for remote sessions.

The application of the TAM and UTAUT models, with their focus on user acceptance, allowed for a deeper exploration of the factors influencing the acceptance of telerehabilitation among the participant populations. For example, TAM provided a basis to understand the perceived ease of use (PEoU) and perceived usefulness (PU) of telerehabilitation, while the UTAUT model broadened this scope by including factors such as social influence (SI) and facilitating conditions (FC) and individual difference (ID), which proved to be particularly influential in the Saudi context.

The integration of these models with the Q methodology adopted for this study provided a comprehensive, multi-faceted approach to understanding the acceptance of telerehabilitation as a form of technology. This approach recognised that acceptance is not only about the characteristics of the technology itself, but also about individual's expectations, experiences, and the context in which the technology is used. The integration of TAM and UTAUT with Q methodology allowed for the personalisation of these models, going beyond general acceptance factors to explore individual perceptions and the socio-cultural influences within the local context, as evidenced by the preference for same-gender physiotherapists due to religious beliefs.

9.3 Summary of the Main Findings

9.3.1 Physiotherapists' perceptions (Q Study 1)

Saudi physiotherapists identified telerehabilitation as a beneficial solution, particularly for patients in remote areas or those requiring home visits, indicating that PU/PE was the primary factor positively influencing their acceptance. However, they expressed concerns regarding data security, the need for proper training, and the availability of technical support during telerehabilitation sessions, suggesting that concerns about the lack of FC is the greatest barrier to its acceptance among Saudi physiotherapists.

This study has also identified three distinct groups of physiotherapists in KSA based on their views towards telerehabilitation: Advocates, Pragmatists, and Hesitant. Advocates support telerehabilitation due to its cost-effectiveness and intend to promote it actively, and they would be well-placed to lead on its implementation within the healthcare system. Pragmatists are also open to the use of telerehabilitation, but they believe in the importance of improving patient and carer understanding of telerehabilitation before using it officially, and are therefore well-positioned to make a contribution in this area. The Hesitant group, by contrast, is uncertain about telerehabilitation, fearing missing critical information and believing it should only be used when no other options are available. As such, they should not be targeted for inclusion in the early stages of implementation or expected to deliver telerehabilitation sessions until they

have received further training and become more confident in their capabilities.

9.3.2 Patients' perceptions (Q Study 2)

The patients showed more diverse viewpoints towards telerehabilitation adoption, with fewer consensus statements than the physiotherapists. However, FC also emerged as the key factor affecting their acceptance, in both positive and negative ways, with concerns about data security and lack of equipment (including internet access) emerging as potential barriers. PU/PE was also found to exert a positive influence, notably in terms of enhanced convenience and reduced transportation costs. However, patients' were concerned about the lack of clarity about the objectives in using telerehabilitation and what it would involve, and they reported a lack of social encouragement from family, carers and friends, indicating that EE and SI are also barriers for patients with MS in KSA.

As with the physiotherapists, three distinct groups were identified: Supporters, Rationalists, and Resisters. Supporters acknowledged the benefits and convenience of telerehabilitation but were concerned about its suitability for their homes and would prefer to receive care from physical therapists of the same gender. Rationalists accepted the potential of telerehabilitation, but they believed it requires more training and resources in order to be accepted. Resisters expressed a very strong preference for face-to-face rehabilitation, but this reluctance appears to stem from

broader resistance to the increased use of technology in society in general rather than objections to telerehabilitation specifically.

9.4 Implications of the Main Findings

While previous research has explored the acceptance of telerehabilitation in other countries (See Chapter 2), its acceptance in KSA had not been robustly tested before this study, nor had the impact of factors such as religion and culture been examined in this context, despite the central role they play in Saudi society (See Chapter 1). As a result, these findings have significant implications for the practical implementation of telerehabilitation within the Saudi healthcare system, notably in terms of contextual acceptability, policy and training development, and the value of multidisciplinary collaborations. The findings also have implications for other researchers as they demonstrate the value of the online Q methodology developed for the study.

9.4.1 Contextual acceptability

Understanding the perceptions of key users towards telerehabilitation is crucial for its successful integration into the Saudi healthcare system. By exploring the attitudes and concerns among physiotherapists and patients with MS and identifying the factors which influence them most strongly, these findings laid the foundations for a targeted and context-specific strategy to successfully implement telerehabilitation in KSA. A logic model demonstrating how this could be enacted was presented in Chapter 7.

9.4.2 Policy and training development

The barriers to the acceptance of telerehabilitation in KSA identified in this study, notably the absence of clear protocols, guidelines, and training, should be addressed by policymakers and healthcare administrators in KSA. This includes the development of policies and training programmes to facilitate the adoption of telerehabilitation and strategies to address other concerns, from ensuring adequate technical training and support are available to promoting awareness of telerehabilitation's benefits to physiotherapy practitioners and to patients and their families.

9.4.3 Promoting multidisciplinary collaboration

While this study focuses on physiotherapy, the literature indicates that the potential benefits of telerehabilitation it identifies could apply to other forms of rehabilitation, including occupational therapy and speech therapy. Therefore, healthcare providers and administrators should be encouraged to foster multidisciplinary collaborations to deliver comprehensive telerehabilitation services, both within KSA and internationally. This approach could lead to more coordinated and comprehensive patient care, and the development of a national centre for telerehabilitation forms one of the medium-term outputs of the strategy developed in the logic model.

9.4.4 Facilitating online Q methodology research

In addition to the implications for healthcare in KSA, this study has also showcased the feasibility and effectiveness of using an online Q methodology for attitudinal research. This study may therefore inspire and

guide future researchers to adopt similar approaches, potentially increasing the number of online Q methodology studies. This would be particularly beneficial in research exploring perceptions and attitudes in healthcare and in other contexts where in-person data collection might be challenging.

9.5 Contributions

This study aimed to explore the acceptance of telerehabilitation among Saudi physiotherapists and patients with a neurological condition (in this case MS) in order to identify the factors which affect their acceptance and propose a potential strategy for the implementation of telerehabilitation in the Saudi healthcare system. In achieving this aim, it makes three significant contributions:

9.5.1 Contribution to literature

The acceptance of telerehabilitation among physiotherapists and patients with MS in KSA was not explored or well-understood prior to this research. Furthermore, building on the call by the WHO to explore ways to implement telerehabilitation in healthcare systems post-pandemic. The thesis has managed to shed light on this subject and its findings seem instrumental in broadening the understanding of the current landscape, user acceptance, perceived benefits, and potential barriers. It also establishes a foundation for future work, shaping potential strategies for increasing telerehabilitation acceptance among these critical stakeholders.

9.5.2 Contribution to society

The second major contribution of this thesis is the proposed logic model for implementing telerehabilitation which considers the drivers and barriers to its acceptance within the socio-cultural and healthcare landscape of KSA. The model is informed by analysis of previous studies which have examined the acceptance of telerehabilitation and of telemedicine more broadly (See Chapter 2) and the findings of the two Q studies described in Chapters 5 and 6. These are supplemented by the researcher's understanding of the overall healthcare ecosystem in KSA based on his professional experiences as a physiotherapist in the country. The model provides a conceptual framework to guide stakeholders through the intricate process of planning, establishing, and evaluating telerehabilitation services and outlines the key components in terms of resources, activities, outputs, and outcomes which are required for the successful implementation of telerehabilitation.

This model therefore contributes to Saudi society by offering an evidence-based, context-specific model for KSA, which takes account of the religious and cultural barriers to its acceptance in the country. This will be of value to Saudi policymakers and healthcare providers seeking to optimize the delivery of physiotherapy services in KSA, particularly for patients with neurological conditions. In addition, by addressing the religious and cultural barriers which arise within KSA, the model is likely to be applicable in other conservative Islamic societies, notably the Gulf states and Iran. Furthermore, by addressing globally recognised barriers, such as the lack of guidance and training, concerns about data privacy, and equipment

costs, the model has relevance beyond the Gulf and could be used to inform strategies for increasing telerehabilitation acceptance more broadly (Bennell et al. 2021, Leochico et al., 2021, Buckingham et al., 2022, Sprianu et al., 2022).

9.5.3 Contribution to Q methodology

Lastly, this thesis also demonstrates methodological innovation in respect of the conduct of Q methodology studies, necessitated by the unprecedented circumstances of the COVID-19 pandemic. In response to the constraints imposed by the pandemic, which precluded the traditional face-to-face format, an approach was developed to effectively implement the Q methodology online. This adaptation facilitated all stages typically conducted in a face-to-face study, from participant recruitment and Q sorting to post-sort interviews, data collection, and analysis, to be carried out remotely. This methodological innovation was evaluated and shown to increase accessibility for participants, allow for greater geographical reach, to reduce the time and cost involved in travel and logistics, and potentially to increase participation rates. This study therefore provides a blueprint for other researchers to conduct online Q methodology studies in a robust, reliable, and ethical manner, significantly extending the capabilities of researchers in the health and rehabilitation sciences and beyond.

9.6 Limitations

Although this research has generated significant insights, like all studies, it is subject to some limitations:

9.6.1 Novelty of Q online methodology

Although this study has demonstrated the value of the online Q methodology developed in response to the COVID-19 pandemic, the novelty of the method was also a limitation. For example, as no previous studies had used the online methodology before, there was no clear guidance about how to gather the data, and the researcher had little previous experience to draw on. As a result, the capacity to collect demographic data at the beginning of the Q sort was not included when the technical aspect of the process was being developed, and it was too difficult to accomplish this retrospectively. This meant it was not possible to identify participants by age or gender based purely on their Q sort. However, very few of the statements reference age or gender, and the qualitative data provided in the comments helped the researcher to draw conclusions about the participants' genders in some cases. Future studies conducted using this methodology should find a technical solution which enables demographic data to be included and matched to Q sorts.

9.6.2 Remote data collection

The fact that the data was collected remotely meant that it was not possible for the researcher to observe how carefully the participants completed their Q sorts. Building a timer facility into the platform would help to indicate how long each participant took to complete it.

9.6.3 Self-reported data and small sample size

All the data is self-reported, and the sample size is relatively small. However, the aim of Q methodology is to gather varied perspectives to provide a snap-shot of opinions amongst the target group rather than to produce findings which can be generalised (Webler et al., 2009, Watts and Stenner, 2012a, Ladan et al., 2019). Nonetheless, care was taken to ensure that the participants selected were reflective of the wider Saudi physiotherapist and MS patient groups (See 4.4.2).

9.6.4 Societal changes

This study provides a snap-shot of attitudes towards the acceptance of telerehabilitation in KSA during the COVID-19 pandemic and the primary data was gathered in 2020. However, the country is currently experiencing a period of rapid economic and social change (Moshashai et al., 2020), and social attitudes are likely to be affected by this. The impact of the pandemic on people's attitudes may also reduce over time. The findings of this study should therefore be considered within this context. However, the collectivist nature of Saudi society (Cassell and Blake, 2012) and the key role religion plays are unlikely to change significantly (Hoffman, 2022), so they are likely to continue to exert an influence on physiotherapists' and patients' attitudes towards telerehabilitation, although possibly to a lesser extent.

9.6.5 Researcher Influence

In this thesis, the potential influence of the main researcher may be considered as a limitation. The inherent subjectivity of the researcher's

personal beliefs, experiences, and background might have shaped various stages of the research process. However, this issue was effectively managed through the application of rigorous methodology, in this case, Q methodology, and a comprehensive peer review of the entire research process. Consequently, potential biases stemming from the researcher's subjective viewpoints were reduced, ensuring a more reliable and valid interpretation of the research results.

9.7 Direction for future research

The thesis has explored the acceptance and perceptions of telerehabilitation among physiotherapists and patients with MS in KSA. In light of the findings and the need for a deeper understanding of the practical and economic viability of telerehabilitation, the following directions are suggested:

9.7.1 Feasibility studies

Future research should focus on conducting robust feasibility studies of telerehabilitation in KSA. This includes assessing the technological infrastructure, patients' and physiotherapists' technological capabilities, and the potential impact of age on users’ ability to use telerehabilitation effectively. Furthermore, the suitability of patients' home environments to receive telerehabilitation sessions could also be explored.

9.7.2 Practical trials

While this study has assessed perceptions towards telerehabilitation, there is a need for practical trials that measure the effectiveness of

telerehabilitation in improving physical function in patients with neurological conditions. These should use reliable outcomes to compare the effectiveness of telerehabilitation with face-to face rehabilitation. Such trials would help to address some of the concerns expressed by participants in this study about the perceived usefulness and performance expectancy of telerehabilitation. It could also inform the development of guidelines and best practices for the implementation of telerehabilitation in KSA.

9.7.3 Cost-benefit analysis

It is crucial to conduct comprehensive cost-benefit analyses of implementing telerehabilitation in the Saudi healthcare system. Such analyses should consider direct costs, such as equipment and software, training for healthcare providers, and ongoing technical support, as well as indirect costs, such as patient travel expenses. Additionally, the benefits, such as increased access to care, reduction in outpatient clinic demand, and potentially improved health outcomes, should also be quantified. Such an analysis would provide valuable insights into the economic viability of the model proposed here and help to inform policy decisions.

9.7.4 Exploring other rehabilitation fields

This study has focused on physiotherapy; however, telerehabilitation extends to other rehabilitation fields, such as occupational therapy and speech therapy. Future research should explore the perceptions and acceptance of telerehabilitation among occupational therapists and speech

therapists. This would provide a broader perspective on the potential of telerehabilitation to enhance healthcare provision in KSA.

This thesis has explored the acceptance of telerehabilitation in KSA, focusing on physiotherapists and patients with MS, as a representative neurological condition. It has identified the influencing factors and barriers among these populations, including their cultural, social, and religious beliefs. It has then proposed a potential strategy for the implementation of telerehabilitation in KSA which addresses these barriers with the aim of promoting its successful integration into the Saudi healthcare system.

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Appendices

11.1 Appendix I: Dissemination of the Research

Publications

Alanazi, A.S., Wharrad, H., Moffatt, F., Taylor, M. and Ladan, M., 2021, November. Q Methodology in the COVID-19 Era. In Healthcare (Vol. 9, No. 11, p. 1491). Multidisciplinary Digital Publishing Institute.

Conferences

1. 38th Annual Q Conference in Orlando, Florida (Panel Speaker)
2. Allied Health Postgraduate Research Conference 2022
3. The 4th Medical Education Informatics International Conference 2021
4. Rehab 2021- Living and ageing with long-term conditions 2021. A joint conference of the British Society of Rehabilitation Medicine, Society for Research in Rehabilitation and the Association of Chartered Physiotherapists for People with Learning Disabilities.
5. University 21 Health Sciences Group Annual meeting in Dublin 2020 (Poster presentation)
6. Allied Health Postgraduate Research Conference 2019 (Poster presentation)

Research projects

1. *Train the Trainers of Carers in Facilities with Neuro Disabled Subjects*, an EU Erasmus+ Project, which aimed to create training programmes for carers of neurodisabled subjects living in various facilities. 2019 - 20.

2. *ReHiN - Refugees Health Integration Project*, a collaborative action research project between Karolinska Institutet (Sweden), University of Nottingham (UK), Aristotele University Thessaloniki (Greece) and Universitat Politècnica de València (Spain). 2021 - 22

11.2 Appendix II: Ethical Approval

University of Nottingham
UK | CHINA | MALAYSIA

Faculty of Medicine & Health Sciences
Research Ethics Committee
Faculty Hub
Room E41, E Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham, NG7 2UH
Email: FMHS-ResearchEthics@nottingham.ac.uk

26 June 2020

Ahmed Alanazi
PhD student
Room B316, E-Learning and Health Informatics
School of Health Sciences
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham
NG7 2UH

Dear Mr Alanazi

Ethics Reference No: FMHS 23-0520 **– please always quote**	
Study Title: Use of Telerehabilitation Approaches in Patients with Multiple Sclerosis in the Kingdom of Saudi Arabia – Patient and Physiotherapist Acceptance (Q- Study)	
Chief Investigator/Supervisors Professor Heather Wharrad, Professor or E-learning and Health Informatics, Dr Fiona Moffatt, Assistant Professor, Physiotherapy and Rehabilitation Sciences, School of Health Sciences.	
Lead Investigators/student: Ahmed Alanazi, PhD student, School of Health Sciences.	
Proposed Start Date: 01/07/2020	**Proposed End Date:** 31/12/2020

Thank you for responding to the comments made by the committee at its meeting on 22nd May 2020 and the following revised documents were received:

- FMHS REC Application form and supporting documents version 1.0: 26.06.2020
- Letters of support: arfa Multiple Sclerosis Society dated 2020/06/04 and Saudi Physical Therapy Association dated June 2020.

These have been reviewed and are satisfactory and the study is approved.

Approval is given on the understanding that:

1. 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. The protocol agreed is followed and the Committee is informed of any changes using a notice of amendment form (please request a form).
3. The Chair is informed of any serious or unexpected event.
4. An End of Project Progress Report is completed and returned when the study has finished (Please request a form).

Yours sincerely

Dr Bethan E Phillips, Associate Professor
Clinical, Metabolic & Molecular Physiology, Medical Sciences & Graduate Entry Medicine
Acting Chair, Faculty of Medicine & Health Sciences Research Ethics Committee

11.3 Appendix III: Online Information and Consent: Physiotherapists

Faculty of Medicine & Health Sciences, School of Health Sciences

Information and Consent page for an Online Q study

Title of Study: Use of Telerehabilitation Approaches in the Kingdom of Saudi Arabia –Physiotherapist Acceptance

Research Team:

- Professor Heather Wharrad, Professor of e-Learning and Health Informatics, Faculty of Medicine & Health Sciences, The University of Nottingham.
- Dr Fiona Moffatt, Faculty of Medicine & Health Sciences, The University of Nottingham.
- Mr Ahmed Alanazi, PhD student, School of Health Sciences, The University of Nottingham.
-

Research Ethics Ref: FMHS 23-0520

This study aims to evaluate the acceptance of Saudi physiotherapists regarding the use of telerehabilitation approaches in KSA.

Thank you for your interest. You have been invited to take part in this study because you are a physiotherapist and you have met our study criteria. Please read through this information before agreeing to participate by ticking the 'yes' box below. You may ask any questions before taking part

by contacting the researcher (details below). Taking part is entirely voluntary.

What is Telerehabilitation and Telemedicine:

Telerehabilitation is the delivery of rehabilitation services remotely instead of face to face in a clinic. These services are delivered using the internet and telecommunication networks, such as the telephone, video calls, e-mail and virtual reality.

Telemedicine is an umbrella term used for any medical services that are provided remotely using the internet which includes Telerehabilitation.

What will happen to me if I take part?

This study uses a research approach called Q methodology which involves doing a simple sorting exercise online. We will ask you to sort some statements about the use of telerehabilitation. You will then rank these statements in relation to how you agree or disagree with them. We will also ask you to answer a few questions that aim to provide a little more information about why you placed some of the statements in particular positions. The process is online, and it will take no more than an hour for both the Q sorting and the post-sort questions. All your responses will be confidential, and all data is anonymised and stored securely.

How will I do the sorting exercise?

We will send you a link to access on your computer which will give you access to the Q sort. It is simple and also user friendly. You will see a set of statements which you will order according to whether you agree or disagree. All your responses will be stored on a secured server at the University of Nottingham. You will not need to download anything onto your computer to take part in the study.

What are the possible benefits of taking part?

We hope that this work will have a beneficial impact on patients care in the future. Your participation in this study will help us to understand the acceptance of physiotherapists to telerehabilitation. This will help is to plan telerehabilitation services in Saudi Arabia.

What are the possible disadvantages and risks of taking part?

We do not anticipate you will experience any distress or discomfort as a result of taking part in this study. There will be no impact on your clinical care, which will continue as usual.

What will happen if I don't want to carry on with the study?

Your participation is voluntary, and you can end the study at any time and withdraw your data by clicking the EXIT button/closing the browser. The data will only be uploaded on completion of the Q sort by clicking the SUBMIT button on the final page. After this point it will not be possible to withdraw your answers.

Who will know I am taking part?

No one will know you have taken part in this study because we will not ask for your name or any other personal ID during this study. Your IP address will not be visible to or stored by the research team because an online survey platform is being used which enables this detail to be filtered out before it is transferred to the research team. As with any online related activity the risk of breach is possible, but this risk is being minimized by using a platform that sits on an encrypted webpage.

What will happen to your data?

When you have clicked the submit button at the end of the Q sort, it will be uploaded into a password-protected database with a code number. The research team will not be able to see who it is from and for this reason it will not possible to withdraw the data at this point. Your data (research data) will be stored in a password-protected folder sitting on a restricted

access server at the University under the terms of its data protection policy. Data is kept for a minimum of 7 years and then destroyed.

This Q sort is part of a PhD research project and the answers received from all participants will be combined in a password-protected database ready for analysis. The results will be written up as a dissertation and may be used in academic publications and presentations. A report will be provided for the funder of this research. The overall anonymised data from this study may be shared for use in future research and teaching (with research ethics approval).

The only personal data we will receive is your e-mail if you contact us to ask further questions or need support. This will be received and handled separately from your completed Q sort and it will not be possible to link the sets of data. Your e-mail address will only be kept as long as needed to resolve your query. It will then be destroyed. For further information about how the university processes personal data please see: https://www.nottingham.ac.uk/utilities/privacy.aspx/

Who is organising and funding the research?

This research is organised by the University of Nottingham and funded by Ministry of Higher Education, Saudi Arabia.

What if there is a problem?

If you have a concern about any aspect of this project, please contact the Chief investigators Professor Heather Wharrad and Dr Fiona Moffatt or the Principal Investigator Ahmed Alanazi, who will do their best to answer your query. The researchers will acknowledge your concern and give you an indication of how he/she intends to deal with it. If you remain unhappy and wish to complain formally, you can do this by contacting the FMHS Research Ethics Committee Administrator, c/o The University of Nottingham, Faculty PVC Office, B Floor, Medical School, Queen's Medical

Centre Campus, Nottingham University Hospitals, Nottingham, NG7 2UH. E-mail: FMHS-ResearchEthics@nottingham.ac.uk

Contacts for further information

Principle investigator: o Ahmed Alanazi, e-mail: msxaa104@nottingham.ac.uk
Chief investigators: o Professor Heather Wharrad, e-mail: Heather.Wharrad@nottingham.ac.uk o Dr Fiona Moffatt, e-mail: ntzfm@nottingham.ac.uk

I have read and understood the above information, I confirm that I am 18 years old or older and by clicking the NEXT button to begin the online Q study, I indicate my willingness to voluntarily take part in the study, I understand that my answers are anonymous, I understand the overall anonymized data from this study may be used in the future for research (with research ethics approval) and teaching purposes.

NEXT – I consent to take part (click this link to access Q-Study)

EXIT - I do not give consent

11.4 Appendix IV: Statements and Post-Sort Questions: Physiotherapists

1- Telerehabilitation increases my productivity compared to face-to-face rehabilitation as I can see more patients in a day.

2- Using telerehabilitation improves patients' care.

3- Using telerehabilitation reduces the pressure and demand in the outpatients' clinics.

4- Telerehabilitation reduces the number of home visits to patients who require them.

5- Telerehabilitation reduces the cost of rehabilitation services.

6- Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.

7- Using telerehabilitation facilitates better patient monitoring.

8- Telerehabilitation is helpful for patients who live far away from hospital and cannot attend face-to-face appointments regularly.

9- Telerehabilitation is most helpful when patients have severe disability.

10- Telerehabilitation is only an effective method during critical times, such as COVID-19 where patients cannot come to the hospital.

11- Telerehabilitation sessions are easy to apply.

12- The aim of using telerehabilitation with patients is clear and understandable for me.

13- I hesitate to use telerehabilitation for fear of missing critical information which may affect treatment, safety or effectiveness.

14- Delivering the session remotely by using telerehabilitation is easier than face-to-face sessions.

15- I will recommend that other physiotherapists use telerehabilitation.

16- Patients and their carers should know the importance of telerehabilitation.

17- Physiotherapists in KSA think that if they use technology with their patients, it will demonstrate that they have more professional skills than those who do not.

18- Patients in KSA think that physiotherapists who use technology are more skilful and trusted than those who do not.

19- My supervisors/managers think that I should use technology, such as telerehabilitation in rehabilitation sessions with my patients.

20- Physiotherapists who are my role models use technology, such as telerehabilitation with their patients.

21- I will be able to get technical assistance if I have technical problems when using telerehabilitation with my patients.

22- The security of the telerehabilitation platform is very important and patients' data must be protected.

23- I want to have training on how to use telerehabilitation with my patients in order to apply it correctly.

24- It is important to have clear and published local guidelines for using telerehabilitation before implementation.

25- Medical insurance companies should include telerehabilitation services under their medical cover.

26- I think that a special licence for using telerehabilitation should be required, where physiotherapists should meet certain requirements related to data protection and the ability to use the technology correctly.

27- I prefer to deliver telerehabilitation sessions only to patients who are the same gender as me.

28- I am happy to deliver video telerehabilitation sessions for both genders.

29- My age has nothing to do with my ability and skills to use telerehabilitation effectively.

30- The patients' age does not affect the use of telerehabilitation, so I can deliver telerehabilitation sessions to all age groups.

31- My clinical experience does not affect my ability to use telerehabilitation with my patients.

32- I will use telerehabilitation with my patients when it becomes available in my hospital.

33- I am always keen to try new approaches, such as telerehabilitation with my patients.

34- COVID-19 has encouraged me to use telerehabilitation in the future.

The post-sort questions:

1. How do you interpret the items you ranked on the extreme end of the sort and what implication those items have in the context of your overall viewpoint?

Agree (+4)

-

-

Disagree (-4)

-

-

2. Do you think the sample statements provided covered the area of the use of telerehabilitation in Saudi Arabia?
3. Are there any additional items you might have included in your own sample statements, what are they and why do you think they are important?

4- Do you have any general comments? If yes, please write it.

11.5 Appendix V: Approval for Collecting Data from Physiotherapists

جامعة الملك سعود
إدارة الجمعيات العلمية
الجمعية السعودية للعلاج الطبيعي
Saudi Physical Therapy Association

To whom it may concern,

We are writing to confirm that we are willing to help Ahmad Alanazi in the following study: Use of Tele-rehabilitation approaches in the Kingdom of Saudi Arabia – Physiotherapists Acceptance.

We will link Ahmed with our members who want to participate in his research.

If you require further information, please do not hesitate to contact me.

Sincerely,

Ali Albarrati, PT, MSc, PhD

Associate Professor
President of Saudi Physical Therapy Association
Cardiorespiratory Rehabilitation Consultant
College of Applied Medical Sciences
King Saud University, Riyadh, Saudi Arabia
P.O Box 10219, Riyadh 11433
Tel:+966118064624
Email: Albarrati@ksu.edu.sa

11.6 Appendix VI: Online Information and Consent: Patients with MS

Arabic Version

كلية الطب وعلوم الصحة بجامعة نوتنجهام

معلومات الدراسة ونموذج الموافقة

عنوان الدراسة

القبول المحتمل لمرضى التصلب اللويحي في السعودية لطرق التأهيل الطبي عن بعد

فريق البحث

١- البرفيسور هيذر ورد

بروفيسور في التعليم الإلكتروني والمعلوماتية الصحية

كلية الطب وعلوم الصحة بجامعة نوتنجهام

٢- الدكتورة فيونا موفات

استاذ مساعد

كلية الطب وعلوم الصحة بجامعة نوتنجهام

٣- احمد العنزي

باحث دكتوراه

كلية الطب وعلوم الصحة بجامعة نوتنجهام

رقم الموافقة الاخلاقية للبحث

FMHS 23-0520

تهدف الدراسة إلى تقييم القبول المحتمل لمرضى التصلب اللويحي في السعودية لاستخدامات طرق التأهيل الطبي عن بعد

نشكر لك اهتمامك بالدراسة .انت مدعو للمشاركة بهذه الدراسة لانك احد مرضى التصلب اللويحي وهي العينة المستهدفة في هذه الدراسة .فضلاً قم بقراءة جميع معلومات الدراسة قبل الموافقة على المشاركة .إذا كان لديك أي

استفسار لا تتردد بالتواصل مع الفريق البحثي للدراسة الموجودة بياناتهم في نهاية هذا الملف .المشاركة في الدراسة اختياري وغير اجباري

ماهو الطب الاتصالي والتأهيل الطبي عن بعد؟

التأهيل الطبي عن بعد هو ايصال خدمات التأهيل الطبي عن بعد بدلا من العلاج المباشر وجها لوجه في العيادة .يتم استخدام التقنية والتي تشمل الإنترنت ووسائل الاتصال مثل المكالمات الصوتية ومكالمات الفديو والتطبيقات والواقع .الافتراضي

الطب الاتصالي هو المظلة الكبرى لجميع الخدمات الطبية التي تقدم عن بعد باستخدام التقنية والتي تشمل خدمات التأهيل الطبي عن بعد

ماذا سيحدث إذا شاركت بالدراسة؟

هذه الدراسة تستخدم منهجية كيو التي تحتوي على نشاط ترتيب العبارات على شبكة ، سيطلب منك ترتيب عبارات مكتوبة في نفس موضوع البحث وسيكون ترتيب من العبارات التي تتفق معها إلى العبارات التي لا تميل إلى الاتفاق معها أو انها أقل اهمية بالنسبة لك .بعد ذلك سيطلب من الإجابة على عدد من الاسئلة التي تهدف لمعرفة الأسباب خلف اختياراتك في نشاط ترتيب العبارات .كل هذه العملية ستكون عن بعد ويتوقع أن لا تستغرق منك اكثر من ساعة لنشاط العبارات والإجابة على الاسئلة .جميع اجابتك ستعامل بسرية ولن يطلع عليها الا الفريق البحثي للدراسة

كيف اقوم بنشاط ترتيب العبارات؟

سنقوم بإرسال رابط الدراسة لك عن طريق الإيميل الخاص بك .موقع الدراسة سهل و واضح ومشروح به جميع ..الخطوات المطلوبة منك

ماهي فوائد الدراسة؟

نطمح أن تساعدنا نتائج هذه الدراسة في فهم القبول المحتمل لمرضى التصلب اللويحي تجاه استخدام التأهيل الطبي عن بعد .هذه الدراسة بلا شك ستكون مفيدة لمرضى التصلب اللويحي حيث ستساعد في تحسين خدمات التأهيل .الطبي المقدمة لهم

هل هناك اضرار محتملة نتيجة المشاركة في هذه الدراسة؟

.لا يوجد اي ضرر محتمل من مشاركتك في الدراسة

هل سيحدث شيء إذا قررت الانسحاب من الدراسة؟

المشاركة اختيارية ويستطيع المشارك الانسحاب في أي وقت .سيتم حفظ مشاركتك في حالة واحدة وهي إذا قمت .باكمال الدراسة على الموقع الالكتروني

هل يستطيع احد معرفة انني مشارك بهذه الدراسة؟

.لا احد يتسطيع معرفة انك مشارك بالدراسة لأننا لا نطلب اسم أو اي معلومات شخصية عن المشارك في الدراسة

ماذا سيحدث لبيانات الدراسة؟

إذا انتهيت من المشاركة في للدراسة سيتم حفظ مشاركتك على قاعدة بيانات إلكترونية محمية بكلمة مرور .وسيتم .حفظ بيانات الدراسة في قاعدة البيانات لمدة لا تقل عن ٧ سنوات ومن ثم سيتم حذفها

هذه الدراسة جزء من مشروع دكتوراه وسيتم تضمين نتائج في الرسالة و سيتم ايضا استخدام البيانات لاغراض بحثية كالنشر في المجلات العلمية والمشاركة في المؤتمرات العلمية .جميع البيانات ستحفظ على شكل رموز ولا .يمكن من خلالها التعرف على هوية المشاركين بالدراسة

البيانات الشخصية الوحيدة التي سنحصل عليها من قبلك هو ايميلك الشخصي حتى نتمكن من إرسال رابط الدراسة .لك وسيتم حذفت بعد انتهاء الدراسة

من الذي يدعم هذه الدراسة؟

.الدراسة مصممة من قبل جامعة نوتنجهام في بريطانيا بدعم من وزارة التعليم في السعودية

إذا حدثت هناك أي مشكلة أو كان لديك أي استفسار ، فضلا تواصل مع الفريق البحثي للدراسة الموضح بياناتهم ادناه

الباحث الرئيسي احمد العنزي E-mail: msxaa104@nottingham.ac.uk
مشرفين البحث البرفيسور هيذر ورد E-mail: Heather.Wharrad@nottingham.ac.uk الدكتورة فيونا موفات E-mail: ntzfm@nottingham.ac.uk

لقد قرأت وفهمت جميع المعلومات الخاصة بالدراسة .وأقر أن عمري أكبر أو يساوي ١٨ عام وبالنقر على الزر .ادناه سأقوم بابتداء الدراسة .أوكد موافقتي و رغبتي في المشاركة تطوعيا بالدراسة

أوافق على المشاركة – NEXT (اضغط هنا للدخول لصفحة الدراسة)

لا أوافق على المشاركة - EXIT

11.7 Appendix VII: Statements: Patients with MS

Arabic Version

١- التأهيل الطبي عن بعد سيحفظ المال الذي انفقه على الموصلات عندذهابي للمستشفى أو العيادة.

٢- سيساعدني التأهيل الطبي عن بعد في حفظ الوقت عندما أحصل على الجلسة العلاجية من المنزل.

٣- يعتبر التأهيل الطبي عن بعد حل مفيد وفعال عندما لا اتمكن من حضور الجلسات العلاجية في العيادة أو المست شفى.

٤-سيرفع التأهيل الطبي عن بعد من نسبة حضوري وانتظامي في الجلسات العلاجية.

٥- سيرفع التأهيل الطبي عن بعد من تفاعلي مع خطة التأهيل الخاصة بي.

٦- إضافة التأهيل الطبي عن بعد في خطتي العلاجية سيحسن من الخدمات التي احصل عليها من المستشفى أو الع يادة الخاصة بي.

٧- أنا متأكد أنني سأكون قادر على إتمام برنامجي التأهيلي عن بعد مثلما يطلب مني اخصائي العلاج الطبيعي.

٨- الهدف من التأهيل الطبي عن بعد واضح ومفهوم بالنسبة لي.

٩- أنا متردد لاستخدام التأهيل الطبي عن بعد بسبب انني قد لا أحصل على نفس الخدمة المقدمة عند حضوري للعي ادة أو المستشفى.

١٠- الحصول على الجلسة العلاجية عن بعد من المنزل يعد أسهل بالنسبة لي من الحضور للعيادة أو المستشفى.

١١- يجب أن يكون التأهيل الطبي عن بعد مساعداً للجلسات العلاجية في العيادة وأن لا يحل محلها بشكل كامل.

١٢- اخصائي العلاج الطبيعي الخاص بي يعتقد أنني لابد أن أستخدم التقنية في علاجي ومنها استخدام التأهيل الطبي عن بعد.

١٣- عائلتي واصدقائي يوصوني بإستخدام التقنية في العلاج مثل التأهيل الطبي عن بعد.

١٤- التحول للدراسة عن بعد والعمل عن بعد بسبب فيروس كورونا له تأثير إيجابي في تقبلي لاستخدام التقنية بشكل عام.

١٥- أنا متأكد أن بياناتي الشخصية والصحية ستكون محفوظة بشكل آمن إذا استخدمت التأهيل الطبي عن بعد.

١٦- لدي جهاز كمبيوتر أو محمول في المنزل يمكنني من خلاله التواصل مع اخصائي العلاج الطبيعي عن بعد.

١٧-لدي إنترنت في منزلي يمكنني من خلاله الحصول بفعالية على الجلسة العلاجية عن بعد.

١٨- لدي مساحة ومكان مناسب في منزلي يمكنني من خلاله القيام بالتمارين المطلوبة أثناء الجلسة العلاجية عند بعد.

١٩- استطيع احضار ما قد يطلبه اخصائي العلاج الطبيعي مثل الاجهزة أو بعض المستلزمات الخاصة بالتمارين لاست خدامها في المنزل.

٢٠- لدي ضعف ثقة في التأهيل الطبي عن بعد لانه يعتبر مجال حديث والمعلومات المتوفرة عنه محدودة .

٢١- اعتقد أن المستشفى أو العيادة الخاص بس ستوفر لي الدعم إذا واجهت مشكلة تقنية عند استخدامي للتأهيل ا لطبي عن بعد.

٢٢- أرغب بالحصول على تدريب عملي في التأهيل الطبي عن بعد قبل البدء في استخدامه في الجلسات العلاجية.

٢٣- يجب أن تغطي شركات التأمين الصحي جلسات التأهيل الطبي عن بعد من ضمن خدماتها المقدمة للعملاء.

٢٤- احتاج لشخص أو عضو من عائلتي يساعدني اثناء الحصول على جلستي العلاجية عن بعد من المنزل.

٢٥- لا يوجد لدي أي مشكلة في الحصول على جلسة التأهيل الطبي عن بعد من أي مختص فالعلاج الطبيعي سواء كا ن ذكر أو أنثى.

٢٦- عمري لن يؤثر على قدرتي ومهارتي في الحصول على جلسة التأهيل الطبي عن بعد بشكل فعال.

٢٧- معلوماتي السابقة عن استخدام التقنية بشكل عام ستساعدني عند استخدام التأهيل الطبي عن بعد.

٢٨- سأستخدم التأهيل الطبي عن بعد عندما يصبح خياراً متاحاً لي في المستشفى أو العيادة.

11.8 Appendix VIII: Statements and Post-Sort Questions: Patients with MS

1- Telerehabilitation saves the money that I pay for transport.

2- Telerehabilitation is helpful to save my time where I can take the rehabilitation sessions from home.

3- Telerehabilitation is helpful for me as I cannot attend face-to-face appointments regularly.

4- Telerehabilitation improves my regular attendance in the rehabilitation programme.

5- Telerehabilitation improves my engagement in the rehabilitation programme.

6- Using telerehabilitation enhances the package of care that I receive from hospital.

7- I am confident that I can complete my telerehabilitation programme as my physiotherapist has recommended.

8- The aim of using telerehabilitation is clear and understandable for me.

9- I hesitate to use telerehabilitation for fear of not receiving the same care as face-to-face services in hospital.

10- Having the session remotely by using telerehabilitation is easier than face-to-face sessions.

11- Using telerehabilitation should be considered as a supplementary method, as it cannot replace face-to-face rehabilitation.

12- My physiotherapist thinks that I should use technology, such as telerehabilitation in rehabilitation sessions with them.

13- My family and friends suggest that I use technology such as telerehabilitation in my treatment plan.

14- The shift to remote study and working due to covid-19 has had a positive impact on my acceptance of technology and encouraged me to use telerehabilitation in the future.

15. I am confident that my personal and health details will be secure if I use telerehabilitation.

16- I have a device at home that allows me to contact my physiotherapist remotely.

17- I have the internet at my home that allows me to receive telerehabilitation sessions effectively.

18- I have a good space at home where I can do my exercises and receive telerehabilitation sessions.

19- I can obtain the equipment that my physiotherapists may suggest for using at home.

20- I lack confidence in telerehabilitation as it is very new and information is limited.

21- I think my hospital will offer assistance regarding technical problems that I may face when using telerehabilitation.

22- I want to have practical training on how to use telerehabilitation before starting to use it.

23- Medical insurance companies should include telerehabilitation services under their medical cover.

24- I need a carer or a family member with me during telerehabilitation sessions at home.

25- I am happy to have video telerehabilitation sessions from physiotherapists of any gender.

26- My age has nothing to do with my ability and skills to use telerehabilitation effectively.

27- My prior knowledge about using technology would help me when using telerehabilitation.

28- I will use telerehabilitation when it becomes available in my hospital.

The post-sort questions:

4. How do you interpret the items you ranked on the extreme end of the sort and what implication those items have in the context of your overall viewpoint?

Agree (+4)

-

-

Disagree (-4)

-

-

5. Do you think the sample statements provided covered the area of the use of telerehabilitation in Saudi Arabia?
6. Are there any additional items you might have included in your own sample statements, what are they and why do you think they are important?

4- Do you have any general comments? If yes, please write it.

11.9 Appendix IX: Approval for Collecting Data from Patients with MS

نـــوقـــظ آمالنا لنتخطى آلامنا

جمعية أرفى للتصلب العصبي المتعدد
برقم (782) تأسست عام 1437 – 2016

arfaMS
أرفى للتصلب المتعدد

To whom it May concern

We are writing to clarify that we have been contacted by **Ahmed Alanazi** who is a PhD researcher at the University of Nottingham. We are willing to facilitate the recruitment of participants for his project: Use of Telerehabilitation Approaches in Patients with Multiple Sclerosis in the Kingdom of Saudi Arabia – Patient Acceptance..

Thank you for your trust

جمعية أرفى للتصلب العصبي المتعدد لخدمة المجتمع وتنمية العمل الاجتماعي
Arfa Multiple Sclerosis Society
برقم ٧٨٢

Faisal bin Odeh Al-Ohali

Deputy Chairman of the Board

2020/06/04

arfa_MS arfaMS
www.arfams.org.sa Info@arfams.org.sa +966 53 900 9582 +966 13 818 9534
الدور الثالث مكتب 306، برج الإداد، حي المنتزه، الدمام، المنطقة الشرقية، المملكة العربية السعودية، 34242