

# **DEPRESSION AND APHASIA AFTER STROKE**

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## ABSTRACT

**Background:** Post-stroke depression (PSD) is a common phenomenon and has a negative impact on rehabilitation, recovery and quality of life. About one third of stroke patients suffer communication problems, including aphasia, which is a condition that mainly affects their ability in understanding and/or producing language. The frequency of depressive symptoms in post-stroke aphasia has been difficult to determine as most studies have excluded stroke patients with aphasia due to methodological limitations. As a result, depression remains often under-diagnosed and untreated in these patients.

**Objectives:** The purpose of this thesis was 1) to develop and validate a revised version of the Visual Analogue Mood Scales (VAMS), and 2) to identify factors which may be associated with low mood in stroke patients with aphasia.

**Method:** The items *Happy* and *Energetic* of the VAMS were reversed for a more consistent format. All participants completed a questionnaire including the revised version of the VAMS (VAMS-R), the Hospital & Anxiety Depression Scale (HADS), but also four key items of the VAMS-R which were repeated with and without verbal descriptors to assess their content and test-retest reliability.

Aphasic stroke patients were recruited both from hospital and community settings and completed assessments at recruitment and at six months follow up. Participants were assessed on measures of communication, cognition, mood, activities of daily living, and disability associated with living with aphasia. Carers also completed assessments of caregiving strain and satisfaction with care at six months follow up.

**Results:** The VAMS-R showed good evidence of validity and reliability in a community sample of 50 older adults and in 71 stroke patients with aphasia.

In the main study, 132 aphasic stroke patients were invited to take part, 71 consented and completed baseline assessments and 63 were followed up at six months. Most participants (n=47) were recruited in the community, 38 were men, mean age was 70 years old and the mean time post-stroke was 15 months.

Almost half of the aphasic stroke patients recruited had low mood at baseline (55%) and at follow up (44%) based either on their self-report or the observer-rated mood scores. Physical impairment, demographic and medical information, ADL and leisure activities were not shown to be significant predictors of depression. Communication impairment was significantly related to low mood, but was not predictive of self-report mood outcomes at both end points. Disability and emotional consequences living with aphasia were predictive of low mood and accounted for 37% of the variance in self-report mood scores at recruitment and for 48% of the variance at follow up. Baseline language battery scores and follow up Carer Strain Index scores were predictive of the observer-rated mood scores at follow up.

**Conclusions:** The VAMS-R, VASES and SADQ-21 could be used to screen for symptoms of low mood in aphasic stroke patients who cannot complete conventional mood assessments that rely on verbal communication. The main factors found to predict low mood in stroke patients with aphasia were disability associated with living with aphasia, carer strain and communication impairment. The factors identified are amenable to psychological intervention and future research should address interventions for the management of post-stroke depression in aphasia. The need to include people with aphasia in future post-stroke depression research is also highlighted.



## **PRESENTATIONS & DISSEMINATION**

**-Kontou, E. et al. (2006).** The development of a modified version of the Visual Analogue Mood Scales. Poster presented at the Making New Connections Conference-2, London. [Best Poster Award]

**-Kontou, E. et al. (2007).** Development of a modified version of the Visual Analogue Mood Scales. Poster presented at the British Psychological Society National PSIGE Conference, Nottingham.

**-Kontou, E. et al. (2007).** Aphasia and mood after stroke. Poster presented at the British Aphasiology Society International Conference, Edinburgh.  
[Travel Prize Award]

**-Kontou, E. et al. (2007).** Aphasia and mood after stroke. Poster presented at the 2<sup>nd</sup> UK Stroke Forum Conference, Harrogate.

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# 1. CHAPTER ONE: LITERATURE REVIEW

## 1.1 Introduction-Thesis structure

Mood problems are common after a stroke and there is evidence that they can have a negative impact on rehabilitation and quality of life. Many studies have focused on this phenomenon, but findings are still inconclusive. Stroke patients with aphasia are often excluded from most stroke studies due to the methodological and practical limitations associated with their recruitment to this type of research. This thesis aims to present previous and current findings in the area of post-stroke depression and more specifically in the context of stroke patients with communication problems, also known as aphasia.

The first chapter of this thesis introduces key terms of this research such as stroke, aphasia, and depression and then reviews previous literature on post-stroke depression in general, but also in the case of aphasia. It also summarises mood assessments currently used to assess this phenomenon in clinical settings and in research practice. The last section of this chapter identifies factors that may be related to post-stroke depression in aphasia and develops a theoretical model to guide the design of the present study. Chapter two presents a study on the development and validation of a revised version of the Visual Analogue Mood Scales (VAMS-R) (Stern, 1997). Previous research has shown that the format of the positive mood items (*Happy* and *Energetic*) can be improved to provide more reliable and valid responses. The revised version was tested for its validity and reliability in a community sample before used as a mood measure in the main study of this thesis. In chapter three, the methodologies used for the main study are summarised. Study design and procedures are explained and each measure is also discussed in terms of its previous use, evidence for its reliability and validity and alternatives that might



have been used. Chapter four describes all statistical analyses performed and their subsequent results. This information is discussed critically and presented in relation to previous research in post-stroke depression in general and in particular in the case of aphasia in Chapter five. Strength and limitations of this research are also considered in the same chapter. This work concludes with Chapter six, which briefly summarises the purpose of this research and presents key findings that could be used to inform future clinical practice and research.

## 1.2 Chapter outline

This chapter is divided in four different parts. *Part one* provides key information about stroke, aphasia and depression in general. It also presents common emotional consequences after stroke and introduces the phenomenon of post-stroke depression. *Part two* summarises mood assessments that are frequently used to assess post-stroke depression. It reports frequent limitations in the assessment of depression in stroke patients and especially in those with communication or other cognitive problems. *Part three* reviews previous literature on post-stroke depression, but also presents the main risk factors that have been found to be significantly associated with depressive symptoms after stroke. The last section of this part provides a summary of studies that have assessed depression after a stroke that have included people with aphasia. *Part four* presents a theoretical model of post-stroke depression in aphasia by taking into consideration risk factors identified by previous literature. This model integrates previous literature and serves as a framework for the main study of this thesis looking at factors relating to low mood in aphasia. The evaluation and further development of this model can be explored by future studies in order to inform the content of preventive and therapeutic interventions for mood problems after stroke.

## **PART 1: STROKE, APHASIA & DEPRESSION**

### **1.3 Stroke**

A stroke refers to a medical emergency that can cause permanent neurological damage, several medical complications or even death. Stroke is a major health problem not only in the UK, but also in all countries worldwide and it imposes a significant health and economic burden (DoH, 2007; Truelsen et al., 2005). More importantly, it has a sudden and often dramatic impact on the person and its family (NICE, 2008). It is a very common condition and it simply refers to a blood clot or a bleed in the brain which can leave lasting damage, affecting mobility, cognition or communication. The next section will define a 'stroke' in more detail according to worldwide medical criteria.

#### **1.3.1 Definition of Stroke**

Stroke is a condition in which part of the brain is suddenly severely damaged or even irreversibly destroyed. It is a very common phenomenon for older adults and can be caused directly or indirectly by a stressful and unhealthy lifestyle, the presence of certain medical conditions (e.g. diabetes, high blood pressure, increased levels of cholesterol, atrial fibrillation), or other predisposing factors (e.g. heredity) (Caplan, 2006; Ebrahim & Harwood, 1999). A stroke, or also known as cerebrovascular accident (CVA), is a clinical syndrome rather than a homogeneous condition. It was first mentioned in the medical literature by Hippocrates (460 to 370 BC) as 'apoplexy' (Greek word meaning struck with violence) in order to describe the phenomenon of sudden paralysis. The word 'stroke' is now the medical term used as a fairly literal translation of the original Greek term. To date, many definitions of stroke have been proposed to reflect the nature of this condition and its associated signs and symptoms.

Stroke can be simply defined as *“the sudden loss of blood supply to a region of the brain leading to permanent tissue damage”* (Robinson, 1998, p.3). However, the most popular and widely used definition of stroke is that offered by the World Health Organisation (WHO) in the 1970s (World Health Organisation, 1978): *“A syndrome of rapidly developing clinical signs of focal or global disturbance of cerebral function, with symptoms lasting 24 hours or longer, or leading to death, with no apparent cause other than of vascular origin”* (Aho et al., 1980, p. 114). This excludes transient ischaemic attack (TIA) (also known as mini-stroke), which occurs when the blood supply to the brain is briefly interrupted and has similar symptoms to stroke, but they do not last more than 24 hours. It also excludes any other haemorrhage or infarction due to brain trauma, infection or tumour.

Stroke signs and symptoms typically start suddenly and depend on the area of the brain affected. It is important to distinguish between different types of stroke as each has different consequences. Stroke is a heterogeneous medical condition, with clear pathological subtypes and with a number of underlying causes (Royal College of Physicians, 2000). There are a number of classifications of stroke available, none of which is ideal, however according again to the cerebrovascular disease classification of the World Health Organisation (WHO), the most common type of stroke is “ischaemic” that accounts for approximately 80-85% of cases, and the second major type is “hemorrhagic” that accounts for 15-20 % of cases (Robinson, 2006; Ebrahim & Harwood, 1999). Ischaemic stroke is due to interruption of the blood supply, while haemorrhagic stroke is due to rupture of blood vessels causing bleeding into the brain. Four common reasons that can cause ischaemia are the following: thrombosis (a blood vessel is obstructed by a blood clot), embolism (a blood clot from elsewhere in the body travels through the vascular system and blocks an artery supplying the



brain), systemic hypoperfusion (general decrease in blood supply) and venous thrombosis (a blood clot that forms within a vein). Still, many ischemic strokes are of unknown origins and cannot be explained by the above mechanisms. Haemorrhagic stroke refers to a haematoma (blood clot) that prevents blood flow to surrounding tissue causing swelling. A distinction is also made between those haemorrhagic strokes that cause bleeding inside the brain and those that cause bleeding inside the skull, but outside the brain. The extent of brain damage in this type of stroke depends on the site, speed and volume of the bleed.

Brain imaging is essential in most stroke patients in order to identify the site and extent of brain damage, but also the cause of stroke. The distinction between different types of stroke is more accurate when a computerised tomography (CT) scan is performed within two weeks after a stroke. Magnetic resonance imaging (MRI) scans are more sensitive than CT scans at detecting certain types of stroke. However, most hospitals routinely use CT scans, as they are less expensive and quicker to perform. Other diagnostic tests used to confirm the cause of stroke are echocardiography, carotid or Doppler ultrasounds, or positron emission tomography (PET). The cause of stroke is still undetermined in many stroke patients despite the use of sophisticated diagnostic techniques (Stroke Association, 2006b; Poole & Chimowitz, 1994).

There are various classification systems for acute ischaemic stroke. For instance, Bamford et al. (1991) proposed the Oxfordshire Community Stroke Project classification (also known as Bamford classification), a clinically useful classification that defines sub-types of stroke based on the localisation of brain damage and relates prognosis to the features of each subtype of stroke.

### **1.3.2 Stroke classification**

Classification of stroke and its pathological cause has a great prognostic value and it can significantly influence future treatment plans (Mant et al., 2004). There are different subtypes of stroke, which are associated with different causes, symptoms and consequences. Classification approaches can rely either on diagnostic technologies (e.g. CT and MRI scans) or anatomical classification based on the site of arterial occlusion (e.g. internal carotid artery, middle cerebral artery or vertebral artery). Therefore, stroke diagnosis and classification is not consistent across the literature due to the different classification systems available. Clinical diagnosis of stroke can also be affected by factors such as poor history, unusual clinical manifestations, and progressing neurological signs.

According to Bamford (1991), stroke refers to a heterogeneous group of conditions with similar signs and symptoms. Therefore, an alternative approach is to classify cerebral infarcts according to the size and site of the infarct, and this can be achieved by using the clinical signs and symptoms alone. The classification system proposed by Bamford (1991) is shown in Table 1.1. This classification system is based on clinical findings and it is currently considered the best classification available (Wolfe, 1996). It was developed as part of a community study and many stroke patients were not assessed in the acute phase after their stroke. However, Lindley et al. (1993) reported moderate to good inter-observer agreement using this classification in stroke patients assessed within the first week after a stroke. They also reported that stroke patients can be classified quickly, validated against a CT scan and each subtype has a relatively predictable prognosis. The following proportions were found for a first ever stroke according to these classification criteria in the Oxfordshire Community Stroke Project (Bamford, 1991): TACS (17%), PACS

(34%), POCS (24%), LACS (25%). Stroke patients classified as TACS were found to have greater lesions and this type has been associated with the worst prognosis with high mortality rates and poor functional recovery (Bamford et al., 1991).

Another, but not as widely used and more difficult to apply is the TOAST (Trial of ORG 10172 in Acute Stroke Treatment) classification. It classifies subtypes of ischaemic stroke based on its underlying pathological cause and on clinical symptoms (Mant, Wade, Winner, 2004). The anatomical classification of cerebral infarcts (National Institute of Neurological Disorders and Stroke, 1990) has also been used by some clinical trials as it can be applied rapidly and easily to almost all patients. However, it is often difficult to determine the site of arterial inclusion without proceeding to invasive vascular investigation as for example the occlusion of the internal carotid artery may result in major or no infarction at all (Bamford, 1991).

Table 1.1: Bamford stroke classification

STROKE CLASSIFICATION	SIGNS & SYMPTOMS
<b>-TAC:</b> Total Anterior Circulation stroke	A combination of the following: <ul style="list-style-type: none"><li>• New, higher cerebral dysfunction</li><li>• Homonymous visual field defect</li><li>• Ipsilateral motor and/or sensory deficit of at least two areas out of face, arm and leg</li></ul>
<b>-PAC:</b> Partial Anterior Circulation stroke	<ul style="list-style-type: none"><li>• No drowsiness</li><li>• Two out of three criteria of TAC</li></ul> <i>OR</i> <ul style="list-style-type: none"><li>• Higher cerebral dysfunction alone</li></ul> <i>OR</i> <ul style="list-style-type: none"><li>• Motor/sensory deficit more restricted than those classified as LAC (e.g. confined to one limb)</li></ul>
<b>-LAC:</b> Lacunar stroke	<ul style="list-style-type: none"><li>• Pure motor</li><li>• Pure sensory</li><li>• Sensori-motor</li><li>• Ataxic hemiparesis</li></ul>
<b>-POC:</b> Posterior Circulation stroke	One or more of the following: <ul style="list-style-type: none"><li>• Affecting brainstem, cerebellar or occipital lobes</li><li>• Ipsilateral cranial nerve palsy with contralateral motor and/or sensory deficit</li><li>• Ipsilateral motor and/or sensory deficit</li><li>• Cerebellar dysfunction without ipsilateral motor deficit</li><li>• Isolated homonymous visual field defects</li></ul>
<p>A single localization may be classified as TACS, TACI, or TACH depending on aetiology (S for Syndrome, I for Infarction, H for Haemorrhage)</p> <p><i>Source:</i> Oxfordshire Community Stroke Project classification (Bamford, 1991; Bamford et al., 1991)</p>	



### **1.3.3 Incidence and prevalence of stroke**

It is the most common and serious neurological disorder in the world and accounts for half of all acute hospitalisations for neurological disease (Robinson, 2006). Stroke is the third most common cause of death in the developed world after heart disease and all cancers (Ebrahim & Harwood, 1999; Wolfe, 1996). This holds true for the UK as well, where stroke is the third most common cause of death, and therefore it should be a focus of attention for policy makers and healthcare professionals (Royal College of Physicians, 2008). Clearly, the high incidence and prevalence rates of stroke have a major social and economic impact on every community (Spencer et al., 1997). For instance, it is estimated that approximately 110,000 people suffer a stroke each year in the England and Wales (Department of Health, 2001). According to the UK Stroke Association's stroke statistics, there are 87,700 first ever strokes and 53,700 recurrent strokes. This is equivalent to someone having a stroke every five minutes with 25% of strokes occurring in people aged less than 65 years (Stroke Association, 2006b).

Methodological differences between studies make difficult to decide whether stroke is more or less common in different parts of the world (Truelsen, Ekman, & Boysen, 2005; Ebrahim & Harwood, 1999). Despite any possible geographical variation, it has been adequately supported that stroke is the third leading cause of death in the western world (Gupta et al., 2002). For instance, it is estimated that about 6 out of every 1,000 people of all ages are suffering the devastating consequences of stroke worldwide (Spencer et al., 1997). Studies of stroke incidence have also shown that this condition varies dramatically with age, since it affects 200 individuals per 100,000 population under the age of 45, and more than 8,000 per 100,000 population

over age 75 (Robinson, 2006; Spencer et al., 1997). Cerebrovascular accidents can occur regardless of age and gender, but the prevalence rates still remain higher among females and those individuals over 65 years of age (i.e. 60% of stroke victims are women, and 88% are over 65 years old) (Gupta et al., 2002). Stroke causes over 60,000 deaths each year in the UK (Stroke Association, 2006b). Despite a steady decline in the incidence and mortality rates of stroke over the past years, its prevalence has remained constant because of the increased rates of long-term survival (Caplan, 2006; Ebrahim & Harwood, 1999). Data from 14 different European countries including the UK estimated almost 1 million new stroke incidents and 6 million people surviving a stroke (Truelsen, Ekman, & Boysen, 2005). The mean survival time of stroke patients can range from five to seven years, and those who survive the stroke event are frequently left with a variety of long-lasting physical, cognitive, and psychosocial impairments (Royal College of Physicians, 2000). Thus, the number of stroke survivors in the population is increasing, but still many among them are estimated to experience moderate to severe disabilities.

#### **1.3.4 Stroke care and economic costs**

Several government policies, guidelines and statements on stroke care have been produced in the last few years to identify priorities for optimum models of stroke care. For instance, all people with a suspected stroke should be admitted directly to a specialist acute stroke unit, which is a hospital unit staffed by a specialist stroke multidisciplinary team (NICE, 2008). In 2002, 82% of hospitals had a stroke unit, but direct admission to a stroke unit was not a standard procedure as only one third of all people suffering a stroke were admitted in a stroke unit (Mant, Wade, & Winner, 2004). However, the more recent National Sentinel Audits (RCP, 2008/2009)

reported an increasing number of hospitals with acute stroke beds. Specifically, 96% of hospitals in England now offer specialist acute stroke care and 29% of patients admitted to a stroke unit on the same day of their stroke and 57% were admitted either the same day or the following day.

Stroke patients who are not fully recovered or not suitable for discharge at their own home after completion of their acute hospitalisation and treatment should be treated in a specialist rehabilitation unit with an experience multi-disciplinary team (Bowen et al., 2008; DoH, 2007). Stroke care costs the National Healthcare System (NHS) in the UK a total of around £7 billion per year with every patient who suffers a stroke costing approximately £15,000 over five years with additional informal costs of £29,000 (Department of Health, 2005). Costs include hospitalisation, rehabilitation and community support.

A greater number of acute stroke units could have saved the NHS over £82 million as they have been associated with reduced mortality rates and fewer medical complications in hospital (Department of Health, 2005). Stroke can also have a significant financial impact on the individuals suffering this condition, but also their families through loss of income, house changes and the cost of private support and home nursing. Continuity of care is an important aspect following a stroke, therefore there are both short-term and long-term costs making the lifetime costs of managing a stroke patient enormous and difficult to estimate (Truelsen, Ekman, & Boysen, 2005).

### **1.3.5 Consequences of stroke**

Stroke is not only a life threatening and debilitating condition, but it is also a common cause of adult disability in the UK (Royal College of Physician, 2000). The National Service Framework for Older Adults (Department of Health, 2001) states

that stroke has a major impact on people's lives and the needs of stroke patients are often very complex. The consequences of stroke can be diverse depending on the site and extent of brain damage and its effects can be transient or permanent and mild or severe. Most spontaneous recovery of impaired functions occurs in the first three months after stroke, some improvement until six months, and little or no further change later on (Ebrahim & Harwood, 1999). About one-third of stroke survivors do not achieve functional independence and they have to face a range of physical, cognitive, communication, and psychosocial problems. Many stroke survivors adapt well even to severe impairments caused by their stroke, but others with only minimal neurological impairments remain significantly disabled (Kelly-Hayes et al., 1998).

It is believed that independent functioning after stroke largely depends on the type and degree of impairments. However, impairments alone do not define the level of disability, and additional factors, such as rehabilitation and psychosocial environment, are often relevant in the determination of functional outcome (Kelly-Hayes et al., 1998). The World Health Organisation (WHO, 2000) considers the impact of impairments on everyday life. For instance, '*impairment*' refers to the physical or cognitive effect (e.g. hemiparesis or hemianopia), '*activity limitation*' refers to the functional consequence of the impairment (e.g. inability to concentrate), and '*participation restriction*' is what is caused by the impairment (e.g. not been able to go out socially). The effects of stroke can be divided into the following four broad categories: 1) physical (motor and sensory deficits), 2) cognitive (difficulties with attention, concentration, memory and perception), 3) communication (aphasia and dysarthria) and 4) psychosocial problems (depression, anxiety, anger, emotional lability, reduced activity levels and social participation).



### **1.3.5.1 Physical and cognitive impairments**

The term 'stroke' incorporates the sudden onset of a variety of prominent and persistent neurological impairments due to focal or diffuse brain damage (Spencer et al., 1997). Impairments resulting from stroke vary in type and severity because they highly depend in the extent and site of lesion. Stroke can affect motor, sensory, cognitive, language, and other functions depending on the areas of the brain areas involved (Kelly-Hayes, et al., 1998).

Post-stroke neurological impairments, irrespective of type and severity, can significantly disrupt an individual's ability to perform daily activities and to maintain his/her occupational status (Drummond & Walker, 1995). There are several well-documented deficits associated with the onset of stroke. For instance, motor impairments are very frequent, usually with involvement of the face, arm, and leg, alone or in various combinations. Besides impairments of motor function, stroke can cause significant sensory deficits (e.g., visual loss, numbness), language difficulties (e.g., aphasia, dysarthria), and problems in complex cognitive processes (i.e. attention, memory, perception, executive functioning) (Royal College of Physicians, 2008; Kelly-Hayes et al., 1998). Cognitive deficits have been found in almost one third of stroke patients and the domains most likely to be affected were memory, orientation, language, attention and visuospatial functions (Nys et al., 2007; Nys et al., 2005a; Pohjasvaara et al., 1998). Nys et al. (2007) found that disorders of executive function and visual perception were the most common in the first weeks following a stroke. However, any of these impairments and difficulties may be confusing and distressing for patients and may also adversely affect their ability to live independently and participate in the rehabilitation process (Royal College of Physicians, 2008; 2004).

van Zandvoort et al. (2005) suggested that early neuropsychological evaluation in the early stages after stroke could improve discharge decision and planning of rehabilitation strategies in order to improve recovery outcomes.

#### **1.3.5.2 Psychosocial effects**

Stroke is a major cause of long-term disability not only with physical, but also with psychosocial consequences for stroke patients and their carers (Kotila et al., 1998). Research to date has mostly investigated the physical consequences of stroke, but over the last years the core of interest has moved toward a number of stroke-related psychosocial problems (Gupta, et al., 2002). A stroke can be a devastating and stressful experience that affects the emotional health of patients themselves, but also of their families, who are faced with the prospect of caring for a disabled individual (Thompson et al., 1989). Although not all individuals who had suffered a stroke and their families will have to deal with extreme emotional alternations, it is still common even for mildly impaired stroke patients to experience the so-called “emotional sequelae of stroke” (Nelson et al., 1993). An audit on emotional distress in an acute stroke unit showed that approximately 60% of stroke patients scored within the possible clinical disorder range on mood screening measures (Macniven et al., 2005). The exact nature, course and aetiology of mood changes after stroke have been the focus of intensive research. However, the traditional medical model of care often fails to identify or adequately address the psychosocial problems faced by stroke survivors (Andersen et al., 1995). Even rehabilitation services have focused more on physical and cognitive impairments, and less attention has been paid to the psychosocial effects of stroke (Gupta et al., 2002). But over the years, more qualitative and quantitative studies have confirmed the clinical impressions concerning the emotional impact of stroke (Berg et al., 2003; Kotila et al., 1998).

### **1.3.5.3 Communication problems**

Stroke can affect communication in many and different ways and communication impairments are quite common in the acute phase of stroke. Loss or impairment of language is one of the most challenging problems in the rehabilitation of stroke patients and a significant barrier to their independent living (Pedersen et al., 1996; Pedersen et al., 1995). Based on past and present evidence, it has recently been estimated that approximately 30% of stroke patients have a communication problem that may interfere with their ability to return to a functional independent life (Parr et al., 2003; Parr et al., 1997).

Despite this background, the frequency of communication difficulties after stroke has not been frequently investigated due to methodological limitations (Engelter et al., 2006; Parr et al., 1997; Scarpa et al., 1987). Estimates of post-stroke aphasia range widely and this variability has been attributed to the time after stroke that patients are assessed, as well as to the assessment methods used (Kauhanen et al., 2000a/2000b).

However, it has been estimated that up to one third of stroke patients have communication problems during the acute phase (Townend, Brady, & MacLaughlan, 2007a/2007b; Engelter et al., 2006; Parr et al., 2003; Kauhanen et al., 2000a/2000b).

The frequency of aphasia can vary from 20% to 38% in the acute phase and from 12%-28% after six months (Laska et al., 2001; Pedersen et al., 1995; Kotila, 1984).

Data concerning the incidence of various types of language disorders have also been reported from some community-based stroke studies. Wade et al., (1986) analysed data from a relatively large sample of stroke patients recruited from the community, and the proportion of aphasic patients was 20% within three weeks of stroke, but only 12% six weeks later. More importantly, the same study reported that despite the evidence from formal language assessments there were a significantly greater



number of stroke patients and their carers that thought they had communication difficulties (i.e., 44% of patients & 57% of carers). Another study found that 33% of stroke survivors were aphasic the first three weeks after stroke (Scarpa et al., 1987). Other sources reported that 38% of 881 patients with acute stroke have presented aphasia-related deficits at admission, and 19% of them at discharge (Pedersen et al., 1995). Kauhanen et al. (2000a/2000b) diagnosed aphasia in 34% of stroke patients during the acute phase, and two thirds of them remained aphasic twelve months later. It is worth noting that speech and language disorders following stroke are often described with the terms 'aphasia' or 'dysphasia'. Although 'aphasia' means 'total inability to communicate' and dysphasia means 'impaired ability to communicate' both are generally used to mean the same thing, and to describe any difficulty with communication following injury to the brain. In this study, the term aphasia is used since it intends to include stroke patients with a broad range of communication difficulties (mild to severe aphasia).

Other common communication problems that can often be diagnosed with or without the presence of aphasia are dysarthria and dyspraxia. 'Dysarthria' is a motor deficit, which refers to problems forming the right word due to muscle weakness (Heilman & Valenstein, 1993). It can also affect breathing and the ability to produce sounds, so speech sounds slurred or flat. 'Dyspraxia' (or also known as apraxia of speech) is characterised by inability to speak clearly due to a difficulty in planning the movements necessary for speech. It occurs when the oral-motor muscles do not or cannot obey commands from the brain, or when the brain cannot reliably send those commands (Heilman & Valenstein, 1993).



## 1.4. Aphasia

### 1.4.1 What is Aphasia?

‘Aphasia’ (sometimes also called ‘dysphasia’) can be used to describe any partial or total loss of language ability due to brain damage. Specifically, aphasia is an acquired language disorder associated with problems in language formulation or/and comprehension (Bradshaw & Mattingley, 1995; Heilman & Valenstein, 1993).

*Aphasia refers to ‘any large group of language disorders involving defect or loss of the power of expression by speech, writing, signing, or of comprehending spoken or written language due to injury or disease of the brain (Dorland, 2003).*

Aphasia is considered a major cause of disability by stroke patients and their families as it was found to be associated with more physical problems and less participation in social activities (Pedersen et al., 1996; Wade et al., 1986). Aphasia may be temporary or permanent, and the exact nature of spontaneous or gradual recovery patterns among different aphasic patients is often unknown (Basso, 1992; Kertesz & McCabe, 1977). For example, about half of the people who show signs of aphasia can recover completely within a few days or even months after the acute event, but there are still a number of people that suffer from a permanent form of aphasia. However, the greatest improvement occurs in the first six months after brain damage and the first two to three months are the most important (Kauhanen, 1999; Kertesz & McCabe, 1977). Recovery rates from aphasia vary and depend upon physiological, cognitive, and psychosocial factors (Code, 2001). Hillis (2007) suggested that early recovery from aphasia depends on mechanisms of tissue restoration and later recovery on the reorganisation of neural networks underlying language or other compensatory mechanisms.

Acquired aphasia can be due to brain damage to the left hemisphere of the brain, such as in the case of vascular damage (stroke) or trauma (head injury) (Carlson, 2001; Bradshaw & Mattingley, 1995). Stroke is the most common cause of aphasia (Basso, 1992; Wahrborg, 1991). Other less common causes can be head injury, brain tumours, and neuro-degenerative disorders, and for this reason among other reasons it remains difficult to determine with certainty the incidence of this neuropsychological disorder (Carlson, 2001; Parr et al., 1997). It is also difficult to determine the actual frequency of post-stroke aphasia due to methodological differences between studies, such type of aphasia, diagnostic criteria and assessments used, the time of evaluation and the selection of the study population (Wade et al., 1986). However, it has been estimated that aphasia and its associated communication problems is a common effect of stroke affecting almost one third of all stroke patients depending on the diagnostic criteria, the time of evaluation and the selection of the study population.

#### **1.4.2 Classification of Aphasia**

There are several important models that aim to describe the main clinical features or symptoms of aphasia according to the presence and/or absence of impairments in different language functions such as impairments on verbal fluency, comprehension, repetition, and naming (Wahrborg, 1991). It is important to keep in mind that aphasia refers to language impairments that can affect many aspects of communication including speech, writing, reading, gesture, and comprehension of spoken and written language and it can be very mild to severe (Code & Herrmann, 2003). It should be noted that it is a condition not produced by a sensory (deafness, poor vision), perceptual (agnosia) or motor problem (apraxia, dysarthria) (Royal College of Physicians, 2008; Carlson, 2001).



Aphasia is a highly complex condition and its categorization has traditionally been based according to the area of the brain that has been damaged based on the original models of language processing (such as the Wernicke-Lichtheim-Geschwind model) (Wahrborg, 1991). Aphasic language impairments may be cortical or sub-cortical (left thalamic or basal ganglia lesions) and they are often broadly categorised as non-fluent (expressive aphasia) versus fluent (receptive aphasia) (Clark, 1994). Non-fluent aphasic classification includes global, Broca's and transcortical motor aphasia types and fluent aphasic classification includes Wernicke's, transcortical sensory, conduction and anomic aphasia types. Table 1.2 summarises different types of aphasia according to site of brain damage. However, any type of aphasia should be studied not only in relation to the location of brain damage, but also in relation to its extent and severity (Basso, 1992).

Aphasic disorders mostly, but not always, involve cortical, left hemisphere dysfunction of two closely adjacent and interconnected areas that are responsible for producing and understanding speech: a) *Broca's area*, a region of the inferior left frontal lobe which is involved in speech production, & b) *Wernicke's area*, a region of auditory association cortex found on the left temporal lobe which is involved in speech perception (Carlson, 2001; Bradshaw & Mattingley, 1995). These predominantly left-hemisphere regions perform most semantic and nearly all syntactic language functions, but still the strong hemispheric specificity of language remains an everlasting debate (Heilman & Valenstein, 1993). For the majority of people language functions are usually located in the left hemisphere of the brain, thus damage to this side is linked to the development of aphasia. The left hemisphere of the brain is dominant for language skills in 99% of right-handed people (Wahrborg, 1991). However, some patients may have subtle communication problems associated

with their right, non-dominant language hemisphere, and some left-handed people have language areas in both hemispheres of the brain, so they can develop aphasia from damage to either side (Basso, 1992). Pedersen et al. (1995) reported a higher incidence of post-stroke aphasia due to right-side lesions in women as compared to men. Thus, it has been suggested that women's functional organisation of the brain for language function may involve both hemispheres.

Many existing aphasia tests, including the two most widely used for clinical and research purposes which are the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass, Kaplan, & Barresi, 2000) and the Western Aphasia Battery (WAB) (Kertesz, 1982), aim to classify people into 'diagnostic groups' using the above traditional classification system. However, this traditional classification has often been proven problematic and it has been shown that less than half of aphasic patients fit into these categories or there are differences in classification between different tests (Hillis, 2007; Ferro & Kertesz, 1987).

More recently, information-processing models have been introduced, which emphasize the functional breakdown of the language processes and the specific nature of the deficit in each individual rather than an objective categorisation of general deficit (Hillis, 1993). It has also been suggested that different types of aphasia and variability in language impairments after stroke may be related to different degrees of cortical hypoperfusion caused by large vessel stenosis (Hillis, 2007; Hillis et al., 2004).



Table 1.2: Classification of aphasia based on localisation of brain damage

TYPES OF APHASIA	SITE OF DAMAGE
<ul style="list-style-type: none"><li>• <b>Broca's</b> A type of expressive aphasia in which there is impairment of the ability to speak and write but there is understanding of many written and spoken words</li></ul>	Expressive-motor aphasia  Motor association cortex of frontal lobe Anterior frontal lobe
<ul style="list-style-type: none"><li>• <b>Wernicke's</b> A type of receptive aphasia in which speech is articulated but has gross errors in grammatical structure and content</li></ul>	Receptive-sensory aphasia  Posterior temporal or parietal lobe
<ul style="list-style-type: none"><li>• <b>Conduction</b> Characterized by normal comprehension but inability to repeat words correctly</li></ul>	Associative aphasia  Arcuate fasciculus Lesions in the pathways connecting Broca's and Wernicke's areas
<ul style="list-style-type: none"><li>• <b>Global</b> Aphasia involving all the functions of spoken or written language and comprehension</li></ul>	Expressive and receptive aphasia  Portions of temporal & frontal lobe
<ul style="list-style-type: none"><li>• <b>Anomic/Nominal</b> Defective recall of names of objects or words, with intact abilities of comprehension and repetition</li></ul>	Nominal aphasia  Inferior temporal
<ul style="list-style-type: none"><li>• <b>Transcortical</b> A type of conduction aphasia believed to be caused by a lesion of a pathway between the speech centre and other cortical centres</li></ul>	Large lesions in brain areas other than the hemisphere dominant for language
- transcortical motor	Frontal lobe, anterior to Broca's area
- transcortical sensory	Cortex near the junction of temporal, parietal, and occipital lobes
- mixed transcortical	

### 1.4.3 The Assessment of Aphasia

Inclusion and exclusion criteria of aphasic stroke patients as well as aphasia assessment methods have not been consistently reported across studies on depression after stroke (Townend, Brady, & McLaughlan, 2007a/2007b). It is recommended that all brain-injured patients should be systematically screened for communication impairments (Spencer et al., 1997).

The examination of aphasia aims at a) diagnosis of language-related impairments, b) measurement of the level of performance and detection of change over time, and c) comprehensive assessment of language-related skills and abilities as a guide to therapy (Goodglass et al., 2000). A number of aphasia tests are available, from comprehensive language batteries (e.g., *Boston Diagnostic Examination*, Goodglass et al., 2000; *Western Aphasia Battery*, Kertesz, 1982) to tests that just examine specific areas of language performance (e.g., *Boston Naming Test*, Kaplan et al., 2001; *Graded Naming Test*, McKenna & Warrington, 1983), and from simple screening tests (e.g., *Sheffield Screening Test for Acquired Language Disorders*, Syder, 1993; *Frenchay Aphasia Screening Test*, Enderby et al., 1987) to tests that assess language in everyday communication contexts (e.g., *Communication Activities of Daily Life*, Holland et al., 1999; *Pragmatics Profile of Communication Skills in Adults*, Dewart & Summers, 1996).

Byng et al., (1990) examined in detail four major and widely used language batteries- the Minnesota Test for Differential Diagnosis of Aphasia (MTDDA) (Schuell, 1965), the Porch Index of Communicative Ability (PICA) (Porch, 1967), the Diagnostic Aphasia Examination (BDAE) (Goodglass et al., 2000), and the Western Aphasia Battery (WAB) (Kertesz, 1982). The study demonstrated that none of these tests



fulfil their role adequately, as none revealed the nature of the language impairment itself or controlled for variables that may affect aphasic performance.

More recent approaches to formal language assessment, like the Psycholinguistic Assessment of Language Processing (PALPA) (Kay et al., 1997), have taken into account and tried to remedy these problems. Although the PALPA has showed many advantages compared to previously use language batteries, it suffers some limitations too. For example, it is lengthy language assessment and requires extensive knowledge about models of language processing to decide which subtests to administer and how to interpret the results (Swinburn et al., 2004).

Swinburn et al. (2004) recently developed the Comprehensive Aphasia Test, which is a battery of tests that aims to assess comprehensively language performance, to screen for associated cognitive deficits, but also to briefly investigate the disability associated with the presence of aphasia and within an individual's everyday life. The aim of this test was to overcome the shortcomings of previous assessments cited above by integrating different aspects of communication assessment in a single, brief, and research-based battery that can be used both by clinicians and researchers.

Many clinicians and researchers prefer to evaluate communication within its everyday and social context using assessments of functional communication. However, these assessments although very useful they do not provide any information on the nature of the communication impairment itself, they have poor reliability, and they often rely on proxies' observations (Sacchett & Marshall, 1992).

It is almost an established principle when planning rehabilitation following stroke to assess for aphasic deficits (Byng et al., 1990). Formal and/or informal language assessment is essential to identify any intact, partially, or fully lost language functions to understand the natural history of aphasia, and to develop effective

treatments (Code, 2001). Speech and language therapy is often offered in aphasic stroke patients in order to assess the level of communication impairment and its impact on everyday life, but also to help people overcome or adapt to a range of communication difficulties. A systematic review on the effect of speech and language therapy could not determine whether it is effective or not for people with aphasia after stroke (Greener, Enderby & Whurr, 1999). Most of the trials reviewed were relatively poor methodological quality and included outcomes measures assessing different types of communication or other measures of functioning. Different aphasia tests are available to gather information about the nature and extent of communication impairments and to assess change over time either due to spontaneous recovery or due to the effect of intervention such as speech and language therapy.



## 1.5 Psychological problems after stroke

Stroke can cause many different effects, with some healthcare professionals recognising not only the physical effects, but also psychological effects of stroke either as a direct result of brain damage or as an indirect consequence of the changes that take place on individual lives following a stroke (Hosking et al., 1996). Suffering a serious illness such as a stroke, hospitalisation, or coping with temporary or permanent disabilities that affect many areas of everyday life can lead to a range of psychological problems (Stroke Association, 2006a). Fatigue, hopelessness, lack of motivation, and reduced participation in activities due to low mood can affect functional recovery and rehabilitation outcome after stroke (Herrmann et al., 1998, Kotila et al., 1999). Post-stroke mood problems have been associated with a number of other negative outcomes such as longer hospitalisation (Cushman, 1988; Ebrahim et al., 1987), lower quality of life (Jaracz et al., 2002), and increased mortality rates (Bozikas et al., 2005; House et al., 2001).

Common emotional consequences after a stroke have been previously reported in stroke literature:

- *Depression/Low mood*-it is probably the most common psychological effect of stroke (Astrom, Adolfsson, & Asplund, 1993; Barker-Collo, 2007).
- *Anxiety*-when symptoms become excessive, persistent and have a significant impact upon everyday life (Gillespie, 1997; Astrom, 1996).
- *Apathy*-it refers to the lack of motivation or enthusiasm and it is either the direct result of post-stroke depression or a symptom of changes in the brain (Robinson, 2006; 1997).

- *Emotional lability/Emotionalism*-sudden and exaggerated episodes of laughing or crying with no apparent reason and beyond control from the patient (Robinson, 2006; 1997).
- *Catastrophic reactions*-short-term emotional reaction in response to a demanding event/task (Carota et al., 2001; Starkstein & Robinson, 1988).
- *Personality changes*-behavioural changes such as irritability, aggressiveness, anger, and disinhibition (Santos et al., 2006; Stone et al., 2004; Aben et al., 2002; Kim et al., 2002).

The two mood disorders that have been mostly investigated in the context of stroke are depression and anxiety. It is often difficult to distinguish between anxiety and depression symptoms and address them separately in the context of stroke. For instance, sleep disturbances, restlessness, concentration difficulties and fatigue are the four out of six symptoms of generalized anxiety disorder and they overlap with symptoms characteristic of major depressive disorder. High co-morbidity of anxiety and depression has also been found in previous stroke studies and both can negatively affect daily functioning, interpersonal relationships and quality of life after stroke (Astrom, 1996; Burvill et al., 1995a). Anxiety disorders found in stroke patients are generalised anxiety disorder and agoraphobia (House et al., 1991) with symptoms such as worrying about changes in functional abilities, avoiding social interactions, and being afraid of a recurrent stroke. Many common symptoms of anxiety such as being tired, lack of energy, sleep disturbances, and difficulties in concentration may be the result of the stroke itself rather than of an anxiety disorder. Diagnostic systems such as DSM-IV-TR (American Psychological Association, 2000) and ICD-10 (World Health Organisation, 1992) give priority to depression over anxiety in that if there is both anxiety and depression the diagnosis of major



depression is given. Anxiety or other psychiatric disorders have not been as widely studied as depression following a stroke. This is also because depression is the most common psychological problem after stroke and it received much research attention during the last decades often at the expense of other mood disorders. Still, most studies on depressed mood in stroke patients have excluded people with aphasia and findings are inconclusive on the aetiology of post-stroke depression in this large subgroup of stroke patients (Townend, Brady, & MacLaughlan, 2007a).

This study will focus on post-stroke depression in people with aphasia, as this is considered a frequent consequence of stroke that can have an adverse effect on cognitive function (Nys et al., 2007), functional recovery (Kotila et al., 1999; Herrmann et al., 1998) and survival (House et al., 2001; Morris et al., 1993). The next section will outline the term '*depression*' in general psychology and psychiatry. It will also briefly summarise the most influential theories of depression that can also be applied in the area of stroke. This thesis was concerned with depression after stroke as a continuum rather than a diagnostic category and with symptoms of low mood rather than a formal clinical diagnosis of depression.

### **1.5.1 General depression**

Depression is the most commonly presented psychiatric disorder affecting at least 20% of people in the general population at some point in their lives (Babin, 2003). It will be useful to consider popular definitions of depression and its impact in the general population, although, it has been argued that depressive symptoms following stroke differ from other forms of depression seen in the general population or psychiatric patients (Clark & Smith, 1998). However, other evidence has suggested that post-stroke depression does not differ qualitatively from general depression and



that general information about depression may also be valid when applied in the stroke population (Nicholl et al., 2002).

The term '*depression*' can be used to describe a wide range of symptoms from a brief negative mood to a medically defined clinical syndrome (Gelder et al., 2001). Being 'depressed' is often synonymous with being 'sad', but both clinical and non-clinical depression can refer to more than one feeling. Depression describes an 'experience of unhappiness' or 'distress' or a 'clinical syndrome' characterised by a cluster of symptoms in affect, cognition, and behaviour (Lindsay & Powell, 1994).

Depression is often characterised as a mood disturbance that negatively affects a person's thoughts, feelings, perception, behaviour, and physical well-being. Depressive symptoms are classified in four major psychological domains: affective (e.g., apathy, sadness, hopelessness), cognitive (e.g., self-blame, loss of motivation), behavioural (e.g., lack of energy, psychomotor agitation) and physiological (e.g., sleep, eating, sexual problems) (Clark & Smith, 1998). Periods of low mood and sadness are normal and inherent aspects of human experience, but are usually brief and not to a degree that causes impairment of functioning (Gelder et al., 2001).

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychological Association, 2000) and to the International Classification of Diseases (ICD-10) (World Health Organisation, 2007) the main criteria for the presence of clinical depression are severity, duration, and extent of distress. It is important to note that the ICD-10 classification system covers a range of depression severity, and it is different to DSM-IV regarding some symptoms (American Psychological Association, 2000). Nevertheless, broad similarities are evident, both in DSM-IV and the ICD-10, for the main clinical features of mood disorders (Gelder et al., 2001). Therefore, based on the DSM classification system,

the essential feature for a Major Depressive Episode is a period of at least two weeks during which there is either depressed mood or the loss of interest or pleasure in nearly all activities. Additional diagnostic criteria need to be met to establish the presence of the clinical form of depression.

### **1.5.2 Theories of Depression**

The main focus of this work is to review existing models of post-stroke depression and to develop a model specific to stroke patients with aphasia. However, it is important to set this work in context by briefly considering the main theoretical models of depression. The extent to which these models of primary depression, which is the depression that does not occur in the context of a medical condition/illness, can be applied to post-stroke depression will also be considered.

Psychoanalytic theories recognised depression as a specific disorder that was based on emotional trauma early in life. They have also emphasised the role of unconscious conflicts associated with grief and loss. Based on Freudian concepts, it is suggested that the real or imagined loss of a valued object in early childhood may be the central factor leading to depression if the individual is confronted with a significant loss or disappointment later in life. Early attachment experiences, and level of self-esteem can also be important factors in predisposing an individual to depression (as cited in Babin, 2003; Gelder et al., 2001).

Cognitive theories of depression conceptualise depression as a disorder associated with thought processes. The most popular and influential contributions in this area are Beck's cognitive theory of depression (1976) and Seligman's learned helplessness model (1975) (as cited in Gelder et al., 2001). The basic idea of Beck's theory is that thoughts can be interpreted in a negative way leading to cognitive biases that can be accepted without rational questioning. These negative 'automatic'



thoughts can cause the presence of various behavioural, somatic, motivational, cognitive and affective symptoms of depression. The theory of learned helplessness suggests that people are left vulnerable to depressive symptoms when they tend to attribute negative outcomes to internal stable factors, while positive outcomes to external specific factors. Both these theories can be applied in the case of stroke as inaccurate beliefs and expectations are often developed about physical and cognitive losses and life after stroke (Grober et al., 1993). Depressed stroke patients are more prone towards a negative cognitive style and report more negative thoughts than non-depressed stroke patients (Noble, 1993). Nicholl et al. (2002) also suggested that depressed stroke patients show an increase in negative cognitions, thus the cognitive model of depression can be applied in this population.

The behavioural approach to depression is based on the notion that depression is due to low rates or lack of positive reinforcement from the environment (Champion & Power, 2000). According to the behavioural theory of depression, access to positive reinforcement is linked to the availability of reinforcement in the environment and the way in which individuals interpret potentially reinforcing events (Gelder et al., 2001). The behavioural approach can also be applicable to stroke. Stroke results in the loss of functional independence and the reduction of everyday activities. Low activity levels and reduced participation in social activities may contribute to symptoms of low mood. Behavioural approaches may explain mood problems at the acute and later stages of stroke. Stroke patients are often unable to return to the lifestyles prior to their stroke and this may be a source of distress. For instance, 65% of stroke patients up to six months after their stroke reported difficulties in returning to pre-stroke social and leisure activities (Mayo et al., 2002). Astrom et al. (1992) found that social and leisure activities were significantly reduced after stroke.



Drummond (1990) also reported a decrease in leisure activities in stroke patients assessed at one year after stroke. These studies demonstrate that a significant number of stroke patients are faced with reduced activity levels and social isolation, and lack of positive reinforcement, which may lead to symptoms of depression.

There are also physiological/biological theories of depression that suggest there are genetic and/or physiological components to depression (Carlson, 2001). These theories suggest that depression may be directly or indirectly associated with certain aspects of biological predisposition (e.g. heredity), physiological abnormalities of specific brain structures, or neurochemical imbalances due to depletion of neurotransmitters such as norepinephrine, serotonin, and dopamine (Gelder et al., 2001). The extent of the neuroanatomical correlates of depression is not yet fully understood, but the most common neurotransmitters implicated in depression are norepinephrine and serotonin. It has been suggested that stroke may negatively affect the circuits controlling these neurotransmitters and this may be related to post-stroke depression (Ramasubbu et al., 1998). The relationship between location and extent of damage in specific brain structures has also been studied extensively in the case of post-stroke depression, but the lesion location argument still remain controversial with some studies supporting this relationship (Shimoda & Robinson, 1999; Astrom et al., 1993; Lipsey et al., 1984; Robinson & Price, 1982) and a recent systematic review and a meta-analysis rejecting this popular hypothesis (Carson et al., 2000; Singh et al., 1998).

Prior to considering the relationship between aphasia and depression in stroke patients, it is important to summarise research to date in post-stroke depression (PSD), evidence on its prevalence, natural course and complex aetiology.

## 1.6 Post-Stroke Depression (PSD)

Depression is the most common mood problem after the onset of stroke and it can occur either several months post-stroke and soon after the acute event (Kelly-Hayes et al., 1998; Robinson, 1997). However, it is widely accepted that the early recognition and management of depression is an important aspect at any stage of stroke rehabilitation (Turner-Stokes & Hassan, 2002). Symptoms include crying, loss of energy, lack of motivation, lack of interests, loss of appetite, and insomnia. There is no clear and universally accepted definition of post-stroke depression, since some studies have defined this phenomenon based on international classification systems (e.g., DSM, ICD), whereas others have used rating scales (e.g., self-report or/and observer-rated measures) (Spencer et al., 1997; Turner-Stokes, & Hassan, 2002). House (1996) argued that the use of the term '*post-stroke depression*' (PSD) as diagnostic category encouraged the notion that depression after stroke is a specific syndrome, while research evidence so far does not entirely support this.

The DSM-IV classification system has provided the framework for most research definitions of depression and it has been adapted in the specific context of general medical conditions, such as stroke (Turner-Stokes, & Hassan, 2002). The current DSM version suggests that if both depressive symptoms and a general medical condition are present, then the appropriate diagnosis would be a Mood Disorder Due to a General Medical Condition, and it needs to be determined whether the mood disturbance is the direct physiological consequence of a specified medical condition (e.g., multiple sclerosis, stroke, Parkinson's disease). However, it is often the case where the Major Depressive Disorder can also be the psychological consequence of having the General Medical Condition, so it may be difficult to establish an aetiological relationship between the mood disturbance and the general medical



condition itself. It is suggested that a careful and comprehensive assessment of multiple factors is necessary for establishing the aetiological relationship between the mood disturbance and the general medical condition. Many stroke patients do not meet the diagnostic criteria for major depression or depressive disorder due to a medical condition, but still exhibit significant symptoms of low mood (Morris et al., 1992; House et al., 1991). In most studies the majority of stroke patients are found to experience mild-to-moderate depression symptoms (only 9% of all patients can be classified as severely depressed), thus not suggesting a pathological state, but possibly a simple reaction to the level of disability (Kotila et al., 1998; Spencer et al., 1997; Wade, 1992). Although, the depression suffered following a stroke is often unlikely to be a ‘clinical’ depression, it is important to also state the criteria for Mood Disorder due to a General Medical Condition using the DSM-based definition (American Psychological Association, 2000). These are presented in Table 1.3.

Table 1.3: DSM-IV Depressive Disorder criteria due to a General Medical Condition

Depressive Disorder due to a General Medical Condition
<div><div>A. A prominent and persistent disturbance in mood predominates in the clinical picture and is characterized by either (or both) of the following:<div><div>1. depressed mood or markedly diminished interest or pleasure in all, or almost all, activities</div><div>2. elevated, expansive, or irritable mood</div></div></div><div>B. There is evidence from the history, physical examination, or laboratory findings that the disturbance is the direct physiological consequence of a general medical condition.</div><div>C. The disturbance is not better accounted for by another mental disorder (e.g., Adjustment Disorder with Depressed Mood in response to the stress of having a general medical condition).</div><div>D. The disturbance does not occur exclusively during the course of a delirium.</div><div>E. The symptoms cause clinically significant distress or impairment in social, occupational, or other important area of functioning.</div></div>
Source: American Psychiatric Association. <i>DSM-IV-Revised</i> (2000).



It has been proposed that in stroke patients, major depression should be distinguished from minor depression (Robinson, 2006). Interestingly, both hospital (Kauhanen et al., 1999; Federoff et al., 1991) and community studies (Burvill et al., 1995; House et al., 1991) have proposed at least two different types of post-stroke depression: a) *major depression*, which meets DSM-IV criteria of major depression and occurs in up to 25% of stroke patients, and b) *minor depression*, which is a mild and brief form of depressed mood with no more than two criteria of major depression and occurs in up to 30% of stroke patients (Turner-Stokes, 2003; Gupta et al., 2002; Robinson, 1997). House et al. (1991) challenged that this categorical distinction between major and minor depression and suggested that depression diagnosis should be based in symptom severity than specific content.

#### **1.6.1 Prevalence and incidence of post-stroke depression**

A consensus on the frequency of depressive symptoms post-stroke has not yet been reached, but it has been estimated to be the most common neuropsychiatric consequence of stroke (Robinson, 2006). The reported prevalence rates of depression after stroke vary widely due to methodological limitations across studies (Whyte & Mulsant, 2002). Reports on estimates of post-stroke depression prevalence range from as low as 25% to as high as 79% (Kneebone & Dunmore, 2000; Gordon & Hibbard, 1997). However, a systematic review of 51 observational studies conducted between 1977 and 2002 on the frequency of depression post-stroke concluded that there is uncertainty regarding its frequency, but it estimated an average frequency of 33% (Hackett et al., 2005). Stroke patients experience changes in their emotional status that range from simple emotional reactions (e.g. low motivation, indifference, frustration) to more complicated depressive symptoms (loss of appetite, insomnia, feelings of worthlessness) (Robinson, 2006; Nelson et al., 1993). Many studies have

reported different prevalence rates for symptoms of minor and major depression. Prevalence rates of minor emotional problems range from 10-40%, whereas those of major emotional problems range from 3-68% (Lincoln et al., 2003a; Spencer et al., 1997). For instance, Kauhanen et al., (1999) reported that at 3 months post-stroke, the prevalence of major depression was 9%, whereas of minor depression 44%. Townend et al. (2003) reported a cumulative prevalence of depression of 33% (16% major and 17% minor). However, when rates for all post-stroke emotional changes were combined for the purpose of a systematic literature review, they were significantly higher, but still varying across different studies ranging from 3-68% (Spencer et al., 1997). This striking variation in the rates of emotional problems after the onset of stroke can be attributed to fundamental methodological problems in this research area, such as various definitions of PSD, different assessment measures of mood, different population samples, varying inclusion and exclusion criteria, severity and type of stroke, time post-stroke, age and gender differences (Gupta et al., 2002; Clark & Smith, 1998; Nelson et al., 1993).

There is also evidence that hospital-based studies have shown higher rates of depression than community-based studies, probably reflecting differences in sample composition (e.g., stroke severity, level of disability, time after stroke) (Fleminger et al., 2003; Clark & Smith, 1998). The systematic review on the frequency of post-stroke depression conducted by Hackett et al. (2005) found only slight differences in pooled estimates between hospital-based and rehabilitation-based studies and between acute, medium- and long-term time after stroke. However, longitudinal studies are more informative in providing prevalence rates of depression over time at different stages after stroke. A 3-year longitudinal study by Astrom et al. (1993) found that 60% of depressed patients within the first three months after stroke have recovered by



three years. Kauhanen et al. (1999) reported that 21% of stroke patients became depressed after their hospital discharge. Andersen et al. (1994) reported that patients not depressed at one month became depressed up to four months after their stroke. These findings suggest that prevalence rates of depression fluctuate between the acute and chronic stages after stroke, and therefore it is important to assess mood both early after stroke and after hospital discharge.

Another issue related to the course of post-stroke depression is its time of onset (Robinson, 2006; Lincoln et al., 2003a). Timing of assessments for depression after stroke is important as it corresponds to different stages of recovery. Prevalence of post-stroke depression clearly varies over time with an apparent peak at 3 to 6 months after stroke and a subsequent decline at later stages. Most studies have focused on the prevalence of depression within stroke patients at a given time during the first year post-stroke (Fleminger et al., 2003). A large study in Finland (Kotila et al., 1998) that recruited patients from a stroke register over two years in four different districts compared the incidence of depression at three and twelve months after stroke. The study's findings supported that both early-onset (i.e. 3 months post-stroke) and delayed-onset (i.e. 1 year post-stroke) depressive symptoms are equally prominent among stroke patients (Kotila et al., 1998). Astrom et al. (1993) suggested that the frequency of post-stroke depression was 25-30% in the first three months, went down to 16-19% at 1-2 years, and went up again to 29% at the end of third year. The prevalence of depression among 5-year first-ever stroke patients from a large community-based population in the North East Melbourne Stroke Incidence Study was 17%, which is a similar finding to the 14% prevalence among 3- to 5-year stroke patients in the Oxfordshire Community Stroke Project (Paul et al., 2006).



Aphasic stroke patients may have higher rates of depression than those without communication problems (Robinson & Benson, 1981; Kauhanen et al., 2000). Specifically, Kauhanen et al., (1999) found that the presence of aphasia was associated with minor and major symptoms of depression among stroke patients. Results suggested that 58% of the aphasic stroke patients had minor depression and 12% had major depression at 3 months post-stroke, and 25% had minor depression and 35% at twelve months. Despite this available evidence, it is important to note that few studies have investigated the frequency of depressive symptoms in aphasic stroke patients.

Overall, the estimation of post-stroke depression rates is difficult because of the different methods used for selecting study populations and the different diagnostic methods used for assessing this phenomenon in stroke patients. Some studies have been criticised for small study samples (Morris et al., 1992; Robinson et al., 1986; Robinson & Price, 1982), for the exclusion of patients with aphasia and other cognitive deficits (House, 1987), and the use of self-report measures or diagnostic criteria which may not be suitable for use with all stroke patients (Gordon & Hibbard, 1997). There are also differences in estimates of depression using self-report measures compared to diagnostic interviews (Lincoln et al., 2003a).

### **1.6.2 Effects of depression**

Despite the lack of clear consensus on the frequency and time onset of post-stroke emotional problems, it is believed that it is a common phenomenon that can impede rehabilitation outcomes (Pohjasvaara et al., 2001; Parikh et al., 1990). Research to date has attempted to evaluate the numerous clinical consequences of the emotional sequelae of stroke. A strong relationship has been found between depression and negative functional outcomes due to fatigue, lack of hope, and lessened motivation

for active participation in rehabilitation (Gupta et al., 2002; Thompson et al., 1989). It is also of great interest the indirect financial impact of stroke patients' emotional health, since unrecognised and untreated emotional problems have been related to increased use of health care services, longer hospitalisation, greater morbidity and mortality from medical illness or suicide (Spencer et al., 1997). Numerous studies have also underlined an association between post-stroke depression and severe physical impairment, poor cognitive function, and reduced social/occupational activity (Berg et al., 2003; Turner-Stokes, & Hassan, 2002; Hermann et al., 1998). Moreover, Bozikas et al. (2005) revealed that depressed stroke patients died at a significantly earlier age than those without depression. Other studies have also found that the risk of dying was 3.5 times higher for depressed than non-depressed stroke patients within the period of 10 years following the acute event (Robinson, 1997). Thus, several studies have set out to determine the predictors of post-stroke depression in order to prevent or remedy its adverse effects. Numerous physiological and psychosocial variables have been identified on the development of mood disturbances following a stroke.

## **PART 2: MOOD ASSESSMENTS**

### **1.7 The assessment of post-stroke depression**

This section presents a summary of the issues related to the assessment of mood problems after stroke. Being assessed in order to receive the right help is very important for the effective management of mood problems after a stroke. The identification of suitable assessments to recognise these problems is essential for all stroke patients, but also for those with aphasia or other cognitive deficits.

#### **1.7.1 Clinical Guidelines**

Several clinical guidelines indicate the need to be alert to symptoms of depression after stroke. The possibility of depression should be considered in all patients following acquired brain injury such as a stroke, so it is important for general practitioners (GPs) or any other clinicians to identify those individuals at risk (Turner-Stokes & ManWalter, 2005). In particular, the importance of recognising and treating depression in stroke patients is acknowledged in the National Clinical Guidelines for Stroke (Royal College of Physicians, 2004) which state that: *“Patients should be screened for depression and anxiety within the first month of stroke, and their mood kept under review. In those patients who can respond to it, a standardised questionnaire may be used for screening, but any clinical diagnosis should be confirmed by clinical interview”* (p.53). Moreover, the National Institute for Clinical Excellence in primary care and general hospital settings clearly identified the need for recognition and screening of depression in patients with significant physical illnesses causing disability, such as stroke. The National Service framework for Older People (Department of Health, 2001) also suggested the need of considering emotional problems in stroke rehabilitation: *“Rehabilitation will vary according to needs but might include...clinical psychology for patients with*



*problems affecting intellectual function or mood”* (p.67). The British Psychological Society’s guidelines for psychological services for stroke survivors and their families (BPS, 2002) also clearly recommended that routine mood assessments should be in place for every specialist stroke service.

Assessment of stroke patients’ emotional status is important for several reasons. From a clinical perspective, recovery rates have been shown to improve when changes of emotional functioning are investigated (Nelson et al., 1993). Diagnosis of mood disturbances after stroke is essential since it has been shown that they can negatively interfere with the process of rehabilitation (Parikh et al., 1990) and contribute to increased morbidity and mortality (Gupta et al., 2002; House et al., 2001; Pohjasvaara et al., 2001). More importantly, mood assessments are reviewed for the purpose of this study to understand depression in aphasia after stroke and suitable ways to assess this phenomenon. There are many and different types of diagnostic and screening mood measures that can be used to assess a variety of symptoms of ‘low mood’ or ‘depression’ in stroke patients.

### **1.7.2 Limitations in the assessment of depression**

Diagnosis of post-stroke depression can be a complex task (Gordon & Hibbard, 1997). The accuracy of various depression-screening tools for use in stroke patients has been documented in the literature. However, a number of variables can make difficult the diagnosis of depression or low mood after a stroke. For example, test availability as well as the presence of problems in attention, cognition, and language (Nelson et al., 1993). Diagnosis of post-stroke depression can be complicated by the overlapping stroke-related physical symptoms, such as fatigue (Williams et al., 2007). In addition, stroke patients may not be always provide accurate reports of their post-stroke status, as they sometimes tend to minimise or exaggerate their

physical, cognitive and/or affective problems (Lincoln et al., 2003a). Another problem is time of assessment, especially in the case of a medical condition that is shown to vary with time (Spencer et al., 1997). Mood assessments undertaken at different time intervals after stroke can result in different findings which can explain the variation observed in prevalence rates between hospital-based and community-based studies (Turner-Stokes & Hassan, 2002).

A communication difficulty (among other cognitive problems) is among the main reasons why assessment of stroke patients' psychological status may sometimes be extremely difficult and problematic (Royal College of Physicians, 2008; Rickards, 2005). The process of mood assessment via clinical interviews or self-report questionnaires is highly dependant on verbal communication and this can be problematic in people with communication impairments such as aphasia (Berg et al., 2009). Nelson et al. (1993) found that 72% of stroke patients were unable to reliably respond to verbal interviews regarding their mood. Many studies have excluded stroke patients on the basis of their aphasic symptoms because most standardized assessments of mood disorders are questionnaires and their format is often impractical or inappropriate for use in people with language impairments. The exclusion of aphasic stroke patients or patients with other cognitive impairments, is likely to underestimate the prevalence of depressed mood in stroke.

However, self-report picture-based scales and observer-rated scales have been developed to overcome this problem. It has also been supported that it is preferable to assess aphasic stroke patients for emotional problems by a clinical interview. However, clinical interview with an aphasic stroke patient can be a challenging experience even for the most experienced speech pathologists, psychologists, and/or physicians (Wahrborg, 1991). Recent studies have aimed to develop nonverbal-based



depression screening tools or adapt existing mood measures, but many of them have not been actually validated them with aphasic stroke patients (Townend, Brady, & McLaughlan, 2007b).

Some studies aimed to determine the accuracy and utility of different mood measures for the assessment of mood problems in stroke patients. For instance, House et al., (1989) examined four different methods for assessing mood disorder in stroke patients: the Beck Depression Inventory, a visual analogue mood scale, a nurses' depression rating, and a carers' depression rating and concluded that none of these measures was entirely satisfactory for use with stroke patients. Berg et al. (2009) compared the Beck Depression Inventory, Hamilton Rating Scale for Depression, Visual Analogue Mood Scales, a proxy assessment, and Clinical Global Impression of the nursing and study personnel, in addition to the DSM diagnostic criteria and concluded that none of these measures were superior from the others to assess depression after stroke.

### **1.7.3 Different types of measures**

Multi-modal assessment of mood disorders after stroke using clinical interview, self-rating scales and information from staff or relatives is important (British Psychological Society, 2002). The use of self-report rating scales such as the General Health Questionnaire, in conjunction with a clinical interview may improve detection of mood problems instead of relying to a single type of mood assessment (Ebrahim et al., 1987).

Many clinicians just ask patients the very basic question "Do you often feel sad or depressed?" to screen for depressive symptoms following a stroke and it provides a good screening assessment of depression as long as there is a reliable 'yes/no' response (Eriksson et al., 2004; Watkins et al., 2001a; Mahoney et al., 1994).



However, Laska et al. (2007) found that almost a third of aphasic stroke patients lacked a reliable 'yes/no' response and therefore this may not be an appropriate method for stroke patients with cognitive impairments. Moreover, some researchers have suggested that this single-item method is not as simple as it may appear as it is common for many patients to feel sad, but not depressed and also that a dichotomous response does not provide a sensitive outcome measure against which to assess the effectiveness of treatment or slight mood improvements and it can only be recommended for screening purposes (Royal College of Physicians, 2005). A number of multi-item depression scales have been developed and can be used to quantify post-stroke depressive symptoms in a more sophisticated manner.

Evidence from review studies on the diagnosis and severity of depressive symptoms after stroke has identified four types of assessments tools and diagnostic criteria that have been used in research and clinical practice: a) *clinical structured interview*, b) *self-report questionnaires*, c) *picture-based scales* & d) *observer-rated measures*. It has been recommended that both clinicians and researchers should decide which mood measures are appropriate for use in stroke patients based on the following issues: a) purpose of mood assessment-screening/formal diagnosis, b) setting-acute, rehabilitation/community, & c) presence/absence of communication problems.

#### **1.7.3.1 Diagnostic criteria and clinical interviews**

The clinical interview has typically been considered as the 'gold standard' in the diagnosis of depressive symptoms after stroke. The clinical interview is often based on formal classification systems such as the DSM-IV and/or ICD-10. These criteria are well defined and recognised, so they are frequently used for the diagnosis of depression in clinical and research settings. Therefore, the majority of stroke studies have used these criteria for the diagnosis of post-stroke depression. It has been

argued that these diagnostic criteria are suitable for use in stroke research (Federoff et al., 1991; Lipsey et al. 1986). For example, Federoff et al. (1991) assessed the reliability of DSM criteria and showed that 3% of the depressed patients may have been over-diagnosed and 5% of the non-depressed patients may have been under-diagnosed.

However, clinical interviews using these criteria are time-consuming and can only be conducted by trained professionals. Many healthcare professionals are not trained to conduct these interviews or they are not practical when assessing a large number of stroke patients, therefore their use is often limited both in clinical or research practice. Moreover, it has been reported that classifying stroke patient as depressed or not using such classification systems is not always objective and consistent (Lincoln et al., 2003a). For example, some studies have used DSM classification criteria for major depression and others for adjustment disorder or depression due to a medical condition. The provision of a diagnostic category is not as informative assessing the severity of depression using standardised questionnaires to monitor change over time (Turner-Stokes & Hassan, 2002).

Moreover, the diagnosis of depressed mood in psychiatric interviews is frequently based upon informal interpretations of behaviours such as crying, withdrawal from activities, changes in appetite and sleep (Code & Hermann, 2003). Although, these symptoms are often observed by carers, nurses, and/or other health professionals and can be strongly associated with low mood, they may not be a reliable guide for assessing clinical depression (Sutcliffe & Lincoln, 1998).

#### **1.7.3.2 Self-report measures**

The first obvious advantage of self-report measures is that they are relatively brief and easy to administer, so they are maximally useful and practical when screening



large number of patients (Sutcliffe & Lincoln, 1998). A number of measures have been developed to quantify depression in the general population, which are often used with other populations such as older adults and medically ill patients. Popular self-report depression questionnaires with stroke patients include the Beck Depression Inventory, the Zung Self-Rating Depression Scale, the Geriatric Depression Scale, the General Health Questionnaire, the Hamilton Rating Scale of Depression, and Wakefield Depression Inventory (Lincoln et al., 2003). However, few of them have been developed and validated in stroke populations, and there are often unsuitable for use with aphasic patients (Aben et al., 2002).

The General Health Questionnaire (GHQ-30) and the Hospital Anxiety & Depression Scale (HADS) are among the most commonly used mood measures after stroke. O'Rourke et al. (1998) compared these two scales in a sample of stroke patients and found that both had similar levels of sensitivity and specificity for diagnosing mood disorders six months after stroke. They also recommended that the choice of mood measures has to be based on issues of practicality, acceptability to patients and availability of evidence on their validity and reliability.

The Geriatric Depression Scale also is available in a short form which has been shown to be an effective measure to assess depression in general elderly populations, but it has not been specifically evaluated in the context of stroke. Questions included such as "Is it easy for you to make decisions?" or "Is your mind as clear as it used to be?" may be confounded by the effects of stroke, and it is possible that it is not appropriate for use with stroke patients. Creed et al. (2004) recommended using the Geriatric Depression Scale (GDS) as an interview rather than a self-assessment questionnaire as they found that this way it could be used effectively with the majority of aphasic stroke patients included in their study.



Berg et al. (2003) excluded stroke patients who could not be interviewed on the Hamilton Rating Scale for Depression (HRSD) and could not complete the Beck Depression Inventory (BDI) because of aphasia. Stroke patients with severe cognitive or language impairments were also not considered able to complete the General Health Questionnaire (GHQ) and the Hospital & Anxiety Depression Scale (HADS) (O'Rourke et al., 1998).

Williams et al. (2005) recommended the PHQ-9 depression scale as a brief screening measure for post-stroke depression, which is based on nine DSM-IV symptoms of depression and it was found to be sensitive to change over time as well as to discriminate well between depressed and non-depressed stroke patients. The British Psychological Society/Royal College of Physicians concise guide for stroke including recommendations for psychologists and psychiatrists suggested the PHQ-9 as a suitable screening measure for mood problems after stroke (Bowen et al., 2008).

Stroke patients with language, cognitive and perceptual problems have a disadvantage when using self-report measures. Self-report measures tend to have low specificities and predictive values as the inclusion of somatic symptoms leads to high false positives (Goldberg, 1985). It should be also noted the patient's ability to describe mood may not be objective due to lack of insight and judgment (Lincoln et al., 2003), so it has been suggested to use observer-rated measures, when information about the patient is based on the evaluation of a third party such as a relative, friend or carer (Turner-Stokes & Hassan, 2002).

#### **1.7.3.3 Picture-based scales**

It has been argued that the most reliable method to assess internal mood states by directly asking the patients (Stern, 1999). This is often not possible for people with more than mild communication impairments with clinical interviews or standardised

self-report questionnaires. Picture-based scales are quick to administer and they have been developed for use in patients with communication problems. They do not require sophisticated use of language and they aim to overcome the language difficulties of stroke patients by using pictorial material (Brumfitt & Sheeran, 1999a/1999b). Turner-Stokes (2003) suggested the use of visual analogue scales or other non-verbal support in order to reliably determine the presence of depression in all stroke patients. For example, Stern and colleagues (1997) has developed the Visual Analogue Mood Scales (VAMS) to assess eight distinct mood states (i.e., sad, afraid, tired, angry, confused, tense, tense, happy, energetic). Some studies have supported the use of the Visual Analogue Mood Scales (VAMS) in aphasic stroke patients (Bennett et al., 2006; Arruda, Stern, & Somerville, 1999; Stern et al., 1997). There is also the Visual Analogue Self-Esteem Scale (VASES) by Brumfitt & Sheeran (1999a), which measures self-esteem as a distinct concept, but closely related to mood. Low self-esteem is indirectly linked with low mood as an index for poor psychosocial adjustment (Brumfitt & Sheeran, 1999b). It has been suggested that self-esteem is an important predictor of mood and a poor view of self is directly related to the development of anxiety and depression (Heatherton & Polivy, 1991). Vickery (2006) proposed that the VASES may be a useful tool in identifying stroke patients at risk for low mood as it does not appear to be influenced by potential confounding factors that may be seen following a stroke. However, it is also suggested that although suitable it should be used with caution in people with very severe communication impairments. Both the VAMS and the VASES are non-verbal and picture-based scales which depend on facial expressions and the use of schematic faces as a direct method to describe emotion and to represent positive as well as negative mood states (Code & Herrmann, 2003). Another basic screening



measure for use in clinical settings is the Depression Intensity Scale Circles (DISCs), which is a simplified visual analogue scale specifically designed for people with cognitive or communication difficulties which measures sadness or depression using six shaded circles depicting severity of sadness or depression during the assessment (Turner-Stokes et al., 2005b).

#### **1.7.3.4 Observer-rated measures**

It also advised that information from multiple sources is often required to assess mood in stroke patients (Gordon & Hibbard, 1997). Information can be gathered from stroke patients themselves, but also a carer or relative and this is particularly useful for aphasic stroke patients who are often unable to participate in clinical interview or complete traditional self-report questionnaires. Many stroke patients are also unable to successfully complete self-report visual analogue scales, so alternative ways to assess depression have also been explored (Price et al., 1999). Approximately, 25% of stroke patients may be unable to use self-report measures and assessments from a secondary informant such as family members or nursing staff can typically substitute or complement the patient's own report of symptoms (Williams et al., 2006). One suggestion is to involve a family member or caregiver in the assessment of depression in patients who have had a stroke (Kneebone & Dunmore, 2000). One objection to this argument is that judgements by carers and nurses may not be reliable, but still may be the ultimate solution for aphasic patients who are unable to complete self-report measures (Sutcliffe & Lincoln, 1998). There are few questionnaires currently available that are based on observable behaviour associated with depression such as the Signs of Depression Scale (SODS), the Stroke Aphasic Depression Questionnaire (SADQ), and Aphasic Depression Rating Scale (ADRS) (Bennett et al., 2006; Benaim et al., 2004). These behavioural depression



rating scales have been designed for patients with communication problems and should be completed either by a nurse, a carer or/and another member of the rehabilitation team simply by observation and not by interviewing (Benaïm et al., 2004). Information from carers and nurses shows potential to improve screening of depression following a stroke (Lightbody et al., 2007b). Lightbody et al. (2007a) investigated the utility of the Montgomery-Asberg Depression Rating Scale, when administered by a nurse, in identifying depression in stroke patients and found that it is a useful tool in detecting post-stroke depression. Several studies suggested that observer-rated measures can be valid, reliable, sensitive and specific assessment tools for the evaluation of depression in aphasic patients, however they suffer from few methodological issues that need to be addressed, such as their sensitivity to subtle changes (Benaïm et al., 2004). Berg et al. (2009) have suggested that proxy ratings should be used with caution as proxies often rate patients' depression as more severe than patients themselves and this may be explained by symptoms of their own emotional distress. Groom et al. (2003) assessed the validity and reliability of SADQ and SODS in patients with multiple sclerosis and found that there were no significant differences on the responses of different members of the multidisciplinary team when completing these observer-rated measures. The SADQ was not found to be significantly influenced by carers' mood, but the SODS was significantly influenced by carers' mood, thus considered a less valid observational measure.

#### **1.7.4 Mood measures for aphasic stroke patients**

There are many diagnostic measures of depression but few of them have been standardised for use with brain-damaged individuals such as stroke patients. Although some of the existing popular assessments of depression have frequently been used in stroke studies, most of them need further work on aspects of reliability,

validity, sensitivity, and specificity for use with stroke populations in the hospital and the community. It seems necessary to evaluate existing measures or develop new for use with language impaired stroke patients. Most existing mood measures are too dependant on verbal communication and this restricts their use with some people with moderate to severe aphasia (Brumfitt, 1998). It has also been suggested that multiple sources of information are required from patients, carers and healthcare professionals to assess mood after stroke (Gordon & Hibbard, 1997).

Mood questionnaires may be simplified to a 'yes/no' format for people use with communication problems or careful observations over time are required to this subgroup of stroke patients (Bowen et al. 2008). Laska et al. (2007) investigated depression diagnosis and severity rating for aphasic stroke patients using DSM-IV criteria and they found that this method was possible for almost two thirds of aphasic patients (67% at recruitment) included in this study, with feasibility increasing over time (100% at 6 months follow up).

Many studies have developed mood measures for use with aphasic stroke patients (Stern, 1997), assessed the reliability and validity of existing traditional mood measures (Thomas & Lincoln, 2006) or have adapted existing measures. A recent review systematic evaluation on the adaptation of depression diagnostic methods from stroke patients with aphasia has identified a total of sixty studies, which have included people with aphasia (Townend, Brady, & McLaughlan, 2007). This review classified 22 studies as having conducted mood assessments with all aphasic patients even those with severe aphasia and 38 studies only with mild cases of aphasia. Most studies used clinical interviews to assess mood after stroke in people with aphasia, with only six out of the sixty studies identified using self-report mood measures. However, they suggest that adaptive methods for aphasic stroke patients such as

using informants, clinical observation or modifying questionnaires and interview schedules should be treated with caution as they may not often provide reliable results.

Table 1.4 summarises mood measures that can be used in stroke patients with aphasia and there is some evidence on their validity and reliability in the context of stroke.



Table 1.4: Mood measures for stroke patients with aphasia

MOOD MEASURES	Description	Validation
<b>Signs of Depression Scale (SODS)</b> (Watkins et al., 2001b; Hammond et al., 2000)	- a 6-item scale of observable mood symptoms  -completed by staff on hospital wards	-validated early after stroke using the Montgomery Asperg Depression Rating Scale  -cut-off scores, evidence on sensitivity and specificity (Bennett et al., 2006; Watkins et al., 2001b)
<b>Stroke Aphasic Depression Scale (SADQ)</b> (Lincoln et al., 2000; Sutcliffe & Lincoln, 1998)	-a 10-item community version and a 21-item hospital version to assess mood using observed behaviours  -completed by nursing staff, carers or relatives	-validated using the Hospital Anxiety & Depression Scale, Wakefield Depression Inventory (WDI)  -Turner-Stokes & Hassan (2002) recommended the SADQ in an integrated care pathway for post-stroke depression for people with non-verbal abilities  -cut-off scores, sensitivity, specificity evidence (Bennett et al., 2006; Sackley et al., 2006; Leeds et al., 2004)
<b>Aphasic Depression Rating Scale (ADRS)</b> (Benaim et al., 2004)	-a 9-item observer-rated measure  -completed by member of the rehabilitation team	-validated in aphasic stroke patients using the Hamilton Depression Rating Scale (HDRS) and a visual analogue scale  -evidence on its validity and reliability only from the original study (Benaim et al., 2004)

<p><b>Visual Analogue Mood Scales (VAMS)</b> (Stern, 1997)</p>	<p>- a measure of 8 visual analogue unipolar scales</p> <p>- self-report measure completed by patients with support (communication aids) if necessary</p>	<p>-evidence on validity and reliability (Bennett et al., 2006; Arruda et al., 1999; Stern, 1999; Nyenhuis et al., 1997; Stern et al., 1997)</p> <p>-not yet validated in aphasic stroke patients</p>
<p><b>Visual Analogue Self-Esteem Scale (VASES)</b> (Brumfitt &amp; Sheeran, 1999)</p>	<p>- a 10-item scale to assess self-esteem in aphasic patients using bipolar pictures</p> <p>-self-report measure completed by patients</p>	<p>-validated using the General Health Questionnaire and the Hospital Anxiety &amp; Depression Scale</p> <p>-evidence on validity and reliability in stroke patients (Bennett et al., 2006; Vickery, 2006)</p>
<p><b>Depression Intensity Scale Circles (DISCs)</b> (Turner-Stokes et al., 2005)</p>	<p>-a graphic rating scale depicting six circles with an increasing proportion of dark shading</p> <p>-self-report mood measure</p>	<p>-validated in stroke and acquired brain injury using the Beck Depression Inventory (BDI), DSM-IV criteria</p> <p>-evidence on validity and reliability in stroke patients (Turner-Stokes et al., 2005)</p>

## **1.8 Treatments for depression after stroke**

The previous sections of this chapter highlighted that although depression is an important and very common consequence of stroke that may be significantly related to a variety of biopsychosocial variables, it is not recognised or treated in all stroke patients (Kotila et al., 1998; Astrom et al., 1993).

Post-stroke depression was once accepted as an inevitable consequence of stroke and this approach diminished the view that it may be a treatable and reversible condition (Vogel, 1995). Depression is not an irreversible consequence of stroke and much can be done to help those who experience symptoms of low mood (Kneebone & Dunmore, 2000). Mood problems after stroke are typically treated either pharmacologically or psychotherapeutically. Antidepressant medication is often used and can generally be effective (Eriksson et al., 2004). The management of post-stroke depression in the acute phase after stroke is mainly pharmacological (Paolucci, 2008). However, it may not always be appropriate to prescribe antidepressants as they may interact with existing medications which are often prescribed after stroke for coexisting medical problems, they can have side effects, and many patients do not comply with treatment (Turner-Stokes & ManWalter, 2005). For instance, Lipsey et al. (1984) found that one-third of patients failed to complete course of treatment or suffered side effects. This does not suggest that antidepressants should not be used or that they are ineffective, but there is also a need to evaluate psychological treatments that can be used as an alternative or in combination with medication (Laidlaw et al., 2003).

Emotional support can minimise the loss of independence following a stroke, and help patients and their carers to manage the consequences of stroke (Department of Health, 2001) Psychological treatment of post-stroke mood problems can provide



individuals with the coping skills and techniques to treat and/or to prevent any depressive symptoms. Some studies have indicated that cognitive-behavioural therapy (CBT) may be an appropriate and beneficial treatment for some stroke patients (Lincoln et al., 1997; Kemp et al., 1992). A review of cognitive-behavioural therapy in the elderly by Kober, Brodaty, & Anstey (1996) suggested that this intervention is more effective than no therapy or placebo and is recommended for use in older adults. However, traditional psychological treatments such as CBT are often difficult to be applied in stroke due to the cognitive and communication impairments often experienced by stroke patients. Modifications of some techniques are often required by taking into consideration different factors such as cognitive abilities, functional limitations and level of awareness after a stroke in order to determine appropriate treatment planning and intervention.

Behavioural approaches can be employed as an alternative in treating post-stroke depression in patients with communication or other cognitive problems as they are more concrete, practical and focus on behaviour change and environmental manipulation with the use of any intact communication skills such as writing or yes/no responses (Grober et al., 1993). Behavioural treatments have been found effective at treating depression in the general population (Robinson et al., 1990). There is some indication that behavioural treatments may be effective for the treatment of low mood in aphasic stroke patients by increasing activity levels (e.g. everyday activities, hobbies, social interactions) and a randomised controlled trial has been set up to further evaluate this, but to date the results have not been published.

Overall, there is inconclusive evidence on the effectiveness of psychological interventions for depression after stroke (Lincoln & Flannaghan, 2003; Lincoln et al.,

2003b). Few randomised controlled clinical trials have been done to effectively evaluate whether pharmacological or psychological depression treatments improve mood outcomes after stroke. Two recent Cochrane Library reviews have examined determinants of post-stroke depression and summarised interventions for preventing depression after stroke (Hackett et al., 2008a) and intervention for treating depression after stroke (Hackett et al., 2008b). The latter review included a total of seventeen trials, thirteen trials of pharmacological treatments and four trials of psychological treatments to determine whether any of them can improve mood outcomes in stroke patients. This review recommended that there is not sufficient evidence to support the use of any type of treatment for the appropriate management of post-stroke depression and that more research is required.

Recently, only few studies on the treatment of post-stroke depression have reported some positive findings on this important topic. For instance, Robinson et al. (2008) investigated whether treatment pharmacological treatment or problem-solving therapy early after stroke will result in lower incidence of depression over 12 months compared with placebo. Antidepressants and/or problem-solving therapy were found able to decrease the frequency of acute post-stroke depression.

Motivational interviewing which is a specific talk-based therapy approach to support and build patients' motivation has been found to be effective in improving patients' mood at 3 months after stroke (Watkins et al., 2007). Williams et al., (2007) reported findings of a randomised controlled trial evaluating a care management program for acute post-stroke depression in a relatively large sample. The active management approach involving recognition of depressive symptoms, initiation of antidepressant treatment as well as monitoring progress and adherence to treatment was found to be more effective than usual care in improving depression outcomes.

Leisure rehabilitation has also reported a positive effect on psychological well-being following a stroke, but this approach was not specifically designed to address post-stroke mood problems (Drummond & Walker, 1996).

Although some trials have demonstrated improvements in depressive symptoms following a stroke, the results remain inconclusive regarding which type of treatment is more effective for all stroke patients including those with communication problems such as aphasia or other cognitive impairments which are often not eligible for inclusion in relevant stroke research (Thomas, 2007). The purchase of psychological or other support treatments for stroke patients is largely dependent on evidence of their effectiveness from large clinical trials with similar methods and treatment approaches to allow replication studies. Methodological differences across studies for assessing mood problems and the choice outcome measures used to identify any improvements in mood scores are among the problems that should be addressed in future research for the treatment of post-stroke depression.



## **PART 3: FACTORS RELATING TO DEPRESSION AFTER STROKE**

### **1.9 Aetiology of post-stroke depression**

Depressive symptoms in all disabling neurological conditions have a complex and multi-factorial aetiology (Rickards, 2005). Depression can develop either as a direct result of biological effect of brain damage or/and as an indirect reaction to the significant losses associated with it (Kelly-Hayes et al., 1998). The unpredictable and uncontrollable nature of a stroke finds its survivors particularly vulnerable to emotional alterations (Rickards, 2005). Many studies have attempted to estimate the prevalence of depressive syndromes after stroke, to investigate its relation with psychiatric mood disorders, and to identify clinical or contextual variables with which it may be associated. Most researchers have focused either on the primary biological mechanisms related to stroke which affect neural circuits responsible for mood regulation (Robinson and colleagues group), while many others on the psychological and social stressors that emerge as a result of stroke (Herrmann & Wallesch, 1993).

It is evident that post-stroke emotional status is related to a mixture of biological and psychosocial factors. Consequently, it is important to emphasize the need for a bio-psycho-social approach to the study of post-stroke depression in future studies. Different type of factors that have been found to be associated or not with the development of depressed mood after stroke will be summarised.

#### **1.9.1 Demographic factors**

Demographic factors such as age, gender, marital status and living arrangements may be related to the development of mood problems after stroke.

## Age

Older people may be more prone to low mood as a result of the age-related physical and psychological changes (Snowdon, 2001). Older age has been found to be associated with mood problems after stroke (Kauhanen et al., 1999; Kotila et al., 1998; Hermann et al., 1998; Spencer et al., 1997; Sharpe et al., 1994; Robinson, 1982).

Other studies have found a relationship between younger age and emotional problems after a stroke (Barker-Collo, 2007; Paradiso & Robinson, 1998; Burvill et al., 1995b). All these studies only assessed stroke patients early after stroke (1 to 4 months), so this association seems to be valid only in the acute stages post-stroke. Paolucci et al. (1999) assessed patients early after stroke and reported that depression rates were lowest in patients who were less than 45 years old or patients who were older than 85 years old. Keppel & Crowe (2000) suggested that stroke has a negative impact on perceptions of body image and self-esteem status of younger stroke patients. Perhaps stroke is an expected consequence of ageing, therefore affecting less the emotional status of older than younger stroke patients. However, low mood has been found to be common in non-stroke older adults over 65 years old (Snowdon, 2001).

Many other studies reported no significant relationship between age and mood after stroke (Thomas & Lincoln, 2008; Thomas & Lincoln, 2006; Cassidy et al., 2004; Kellermann et al., 1999; Andersen et al., 1995; Astrom et al., 1993).

The majority of studies did not report a significant relationship between age and mood after stroke. Comparison across studies is difficult because of the wide age distribution in most study samples. Different findings between studies may be due to differences in the methodologies used such as timing and location of assessments or



recruitment of younger versus older participants. The recruitment methods may significantly affect the age of the sample as older people may be less likely to respond to postal questionnaires or may be less likely to take part in a research study. However, people aged over 65 years old are more likely to suffer a stroke than other age groups, so they are more likely to be invited to take part in stroke research.

### Gender

Epidemiologic data worldwide demonstrate that there is a higher prevalence of depression in women compared to men in the general population (Weissman & Olfson, 1995). If women are more prone to depression it can be assumed that when faced with the event of a stroke, they would be more likely to become distressed than men. Therefore, it has been suggested that depression is more likely to occur among women than men stroke patients (Gupta et al., 2002). Several studies investigated the relationship between gender and mood after stroke and some have found that depression is more common or severe in women compared to men (Paolucci et al., 2006; Carod-Artal et al., 2000; Paolucci et al., 1999; Andersen et al., 1995; Herrmann et al., 1998; Kotila et al., 1998; Paradiso & Robinson, 1998; Ng et al., 1995; Sharpe et al., 1994). However, other studies have found gender to be unrelated to mood after stroke both at the early and later stages (Cassidy et al., 2004; Kauhanen et al., 1999; Kellermann et al., 1999; Astrom et al., 1993).

Research on gender differences in mood problems after stroke is inconclusive with almost two-thirds of the studies supporting the view that gender is not related with mood. The relationship between gender and depression is also possibly influenced by factors such as socioeconomic, educational, marital and occupational status which have been found play a role in the prevalence of depression in the general population.



### **Marital status and living arrangements**

The relationship between marital status and mood after stroke has been investigated in some studies. Being married seems to be an important determinant of depression and quality of life after stroke, especially for stroke patients with aphasia (Kauhanen, 1999). In stroke, patients' marriage may have positive effects such as emotional and practical support, but on the other hand it may also have negative effects such as caregiver burden and more arguments between spouses. Stroke may lead to changes in the interactions between spouses and a swift in family roles (Anderson et al., 1995; Evans et al., 1994). Unmarried or divorced people with mild expressive aphasia may be at greater risk of developing depression following their stroke due to social isolation (Barrett & Gonzalez-Rothi, 1998).

Therefore, marital status may affect emotional reaction after stroke, but the relationship between marital status and depression is still not clear. Some studies have not found an association between marital status and depression after stroke (Thomas & Lincoln, 2008; Carod-Artal et al., 2000; Herrmann et al., 1998; Paradiso & Robinson, 1998; Sharpe et al., 1994).

Living arrangements have also been considered with some studies reporting an association between mood and living arrangements after stroke. Mood may be influenced by living arrangements, such as living at own home, in a nursing home or in a hospital (Hosking et al., 1996). Andersen et al. (1995) suggested that living alone one year after stroke increased the possibility of becoming depressed. Thomas & Lincoln (2008) found that living arrangements at the time of stroke was not significantly related to emotional distress at six months. Living alone was found to be a risk factor for depression while stroke patients were assessed in hospital but not three years after their stroke (Astrom et al. 1993). Kellerman et al. (1999) found that

those who were living alone prior to their stroke tended to score better on mood scores as compared to those living with others, but this difference was not statistically significant. Other studies also found that living alone was not a risk factor for post-stroke depression (Berg et al., 2003; Dennis et al., 2000; Kotila et al., 1998). There is some evidence suggesting that depression is higher for those living in nursing homes (Burvill et al., 1995b; Sharpe et al., 1994), but this may be the direct result of suffering a more disabling stroke and have less family support. Overall, living arrangements do not seem to be an important risk factor for the development of mood problems after stroke.

### **1.9.2 Biological factors**

Methodological limitations, among other things, have been the main reason why the causal relationships underlying the emotional health of stroke patients have not yet been adequately clarified. Several studies have attributed emotional changes after stroke to organic factors such as the extent and site of lesion, as well as biochemical changes in the brain (Turner-Stokes, 2003). Considerable research has focused on the neuro-anatomical correlates of depression in stroke patients. Nevertheless, the relationship between stroke patients' emotional status and lesion location has been among the most controversial areas of stroke research, since some studies have reported a relationship with right brain lesions, others with left, others with both or none (Bhogal et al., 2004; Dennis et al., 2000; Nelson et al., 1993). Computerized tomography (CT) studies have also linked post-stroke mood states with greater lesion volume (House et al., 1990; Nelson et al., 1993), whereas functional imaging studies such as positron emission tomography (PET) have associated post-stroke emotional status to depletion of serotonin receptors (Robinson, 2006; Gupta et al., 2002). In the early 1980s, Robinson and co-workers proposed an influential model of neuro-



anatomical correlates of post-stroke depression, in which the presence of post-stroke depression was linked with anterior parts of the left hemisphere (i.e. frontal cortex and basal ganglia) and/or an interruption of the monoaminergic neural pathways linking the brainstem to the cerebral cortex (Gainotti et al., 1997). Some studies have supported this relationship between left anterior brain lesions as the most important predictor of post-stroke depression in the acute phase (Astrom et al., 1993; Herrmann et al., 1993; Robinson et al., 1984), while other studies have made opposing claims (Pohjasvaara et al., 1998; Herrmann et al. 1995).

However, findings have not supported the hypothesis that emotional disturbances after stroke are the direct consequence of specific anatomical structures or physiological factors (Wade, 1992; Thompson et al., 1989) and such biological models have been criticised on methodological grounds (Gainotti et al., 1999). Several systematic reviews of literature on the role of lesion location to the development of post-stroke depression have focused on the usual methodological limitations (i.e. timing, sampling, analysis, assessment methods). Specifically, Gainotti et al. (1997) pointed out the problem of selection bias, since a significant proportion of stroke patients with left-hemisphere lesions are systematically excluded because of their language problems.

Future research on lesion location and post-stroke depression should address several issues, including measures of mood, post-stroke assessment intervals, sample size and composition (Bhogal et al., 2004). Nevertheless, there are findings more consistent with a psychological rather than a neurological model of post-stroke depression (Gainotti et al., 1999; Andersen et al., 1995).



### **1.9.3 Medical co-morbidities**

Other medical or psychiatric conditions might influence the development of mood problems following a stroke. This section summarises studies on the relationship between a previous stroke and previous history of depression with post-stroke depression.

#### **Previous stroke**

Some studies have investigated whether stroke patients who have suffered a previous stroke are at greater risk for depression. Stroke patients who had suffered a previous stroke are often excluded from this type of research, suggesting that it is difficult to determine whether their emotional reactions are due to the current or previous stroke. (Berg et al., 2003; Paolucci et al., 1999; Spencer et al., 1995; Sharpe et al., 1994; Starkstein et al., 1989). Higher rates of depression in people who have had a previous stroke were reported in some studies (Paolucci et al., 2006; Dennis et al., 2000; Hosking et al., 2000; Andersen et al., 1995). Other studies have found no significant relationship between a previous stroke and depression (Desmond et al., 2003; Beekman et al., 1998; Pohjasvaara et al., 1998; Parikh et al., 1990).

Although, there is not enough evidence to support the relationship between a previous stroke and depression, it is important to include stroke patients who had suffered a previous stroke in future studies to investigate this further.

#### **History of depression prior to stroke**

It can be assumed that previous history of depression might influence the development or severity of depressive symptoms after stroke, but there is little evidence to support this. Few studies have excluded stroke patients with a documented history of depression (Berg et al., 2003, Hosking et al., 2000; Kauhanen et al., 1999; Paolucci et al., 1999; Spencer et al., 1995). It has been argued that

excluding stroke patients with a personal history of depression or other psychiatric problems is justifiable due to the great difficulty to find out whether these patients were depressed prior to their stroke or as a result of their stroke at the time of assessment.

However, some studies have found that a personal history of depression is related to post-stroke depression (Herrmann et al., 1998; Paradiso & Robinson, 1998; Pohjasvaara et al., 1998; Andersen et al., 1995; Ng et al., 1995) and others found no evidence to support this relationship (Cassidy et al., 2004; Desmond et al., 2003; Sharpe et al., 1994; Astrom et al., 1993).

Research including stroke patients with a history of depression or other psychiatric disorders should report methods used to establish this as this is often not documented in all medical notes and other methods are often not available to ascertain psychiatric history.

#### **1.9.4 Disability factors**

Stroke can cause several physical problems and it is important to consider the relationship between mood and associated disabilities. Early onset post-stroke depression for hospitalised patients may develop due to limited ability to perform basic self-care or other everyday activities and late onset depression for patients who have returned back home due to realisation that these activities are still difficult to perform and some of their abilities before the stroke may never be recovered. Many researchers have investigated the relationship between functional independence and the ability to perform activities of daily living (ADL) after a stroke with post-stroke depression.



Many stroke-related studies have examined the relationship between stroke severity and patients' emotional state (Berg et al., 2003; Spencer et al., 1997; Sharpe et al., 1994). Evidence from such studies has supported the view that depression after stroke was more prevalent in hospital-based samples than in community-based samples reflecting the different level of disabilities of stroke patients while in hospital compared to those who returned living in the community (Clark & Smith, 1998). This was explained by the fact that hospital-based studies include participants with more severe disabilities that predispose them to higher levels of emotional distress (Clark & Smith, 1998). Although, the presence of reactive depression symptoms due to physical disability has been supported by several studies, it is still a complex reciprocal relationship.

However, stroke-related disability and functional impairment, as measured by standardised measures, is an important predictor of stroke patients' emotional status either on its own or in combination with other variables (Berg et al., 2003; Singh et al., 2000; Kotila et al., 1998). It is well demonstrated in the literature a strong correlation between the development of post-stroke depression and poor scores on the Rankin Scale or Barthel Index. (Bogousslavsky, 2003).

Most studies support the relationship between disability and post-stroke depression. For example, Pohjasvaara et al. (1998) reported that disability at 3 months following a stroke was a significant predictor of depression later on suggesting that greater disability in the early stages after stroke may be a risk factor for late onset depression. Astrom et al. (1993) found that dependency in activities of daily living was not related to acute major depression, but at 3 months it was an important predictor of depression. Therefore, it is important to investigate the level of disability as a result of a stroke in relation to post-stroke depression.



Post-stroke depression is also related to dependence in activities of daily living (Kotila et al., 1998; Astrom et al., 1993; Sinyor et al., 1986). Other possible psychosocial risk factors include restriction of activities of daily living as well as leisure activities (Drummond & Walker, 1995; Chemerinski et al., 2001). For stroke patients in the community it is also important to assess not only basic restriction of self-care activities, but also the restriction of a broader range of activities such as extended activities of daily living and leisure activities which have a significant impact on social interactions.

### **1.9.5 Cognitive factors**

It is still a matter of controversy whether cognitive deficits contribute to the development of post-stroke depression, or they are a consequence of the presence of post-stroke depression (Robinson, 1997; Burvill et al, 1997).

There are very few studies of post-stroke depression and cognitive function, which have been conducted using neuropsychological tests for the diagnosis of cognitive impairment. Most studies have used the Mini Mental Status Examination to detect deterioration of cognitive functions rather than a detailed neuropsychological assessment (Kase et al., 1998; Downhill & Robinson, 1994; Sharpe et al., 1994; Robinson et al., 1986).

Some studies have reported a greater degree of cognitive impairment in depressed stroke patients than in non-depressed ones (Kauhanen et al., 1999; Downhill & Robinson, 1994; Sharpe et al., 1994; Robinson et al., 1986). For instance, Downhill & Robinson (1994) reported that the frequency and severity of cognitive deficits were significantly greater in patients with major depression than in patients without depression and this relationship was stronger at the acute phase after stroke but was also present up to one year later. Kauhanen et al. (1999) found that the

neuropsychological tests of depressed patients were significantly worse in almost all areas of cognitive functioning in comparison with tests of non-depressed patients.

Cognitive impairment has also been reported as a predictor for depression (Saxena, 2006; House et al., 1990; Andersen et al., 1995). Moreover, some studies have found that patients with aphasia were more likely to experience emotional problems than those without aphasia, thus a relationship has been suggested between the presence of cognitive difficulties and depression (Spencer et al., 1997). Although some studies have found an association between depressive symptoms and cognitive impairment, other studies contradict the presence of this association (Berg et al., 2003; Kase et al., 1998). For instance, Kase et al. (1998) found that cognitive decline was not related to post-stroke depression, but it is important to note that these findings were based on a single self-report mood questionnaire and cognitive functions were assessed using the Mini Mental Status Examination (MMSE). The present knowledge of the association between cognitive deficits and depression is still contradictory. Therefore, it is important to investigate the relationship between cognitive impairments and post-stroke depression.

#### **1.9.6 Psychosocial factors**

##### **Social support**

Stroke patients must adjust their lifestyles and learn to cope with the activity limitations that may follow from their disability. They experience many stresses and social support may facilitate coping and adaptation (McColl, 1995). Lack of social support and positive reinforcement from the environment are related to the development of depression both in stroke patients and healthy elderly (Berg et al., 2003).



Social support can range from relationships with neighbours and significant others or formal support from the wider social environment. MacColl (1995) made a distinction between 'received support', which refers to an objective measure of actual support provided and 'perceived support', which refers to a subjective measure of the support provided. Social support has been studied in the context of stroke and the relationship between social support and mood.

An association between depression and impaired social functioning has been reported (Andersen et al., 1995; Astrom et al., 1993; Parikh et al., 1987). For instance, Astrom et al. (1992) suggested that contact with friends and neighbours declined early after stroke and remained lower in stroke patients than in the general elderly population. Spencer et al. (1995) reported that more satisfaction with the amount of social contacts at six months after stroke was related to better mood. Carod-Artal et al. (2000) found that social support was an important predictor of post-stroke depression.

### *Quality of life*

Many studies have shown a relation between depression and quality of life of stroke patients, but the direction of this relationship is largely unknown (King, 1996; Angeleri et al., 1993; Astrom et al., 1992). Depressed mood has been linked to reduced life satisfaction in long-term survivors of stroke (Astrom, Asplund, & Astrom, 1992). The presence of depression has been linked with low quality of life after stroke (Paolucci et al., 2006; Carod-Artal et al., 2000). King (1996) reported that greater depression, less social support, and lower functional status predicted one third of the variance in quality of life scores and contributed to prediction of domain quality of life. In this study, depression was the strongest predictor of overall, psychological, and health QOL.



Kauhanen (1999, 2000a) found that minor depression was significantly associated with impairment on several quality of life domains with the strongest associations for physical and social functioning domains.

### **Coping**

Adjustment to a major life event such as a stroke requires coping strategies to overcome the limitations of motor, cognitive and emotional consequences (Finset & Andersson, 2000). It is reasonable to suggest that maladaptive coping strategies may be associated with depressive symptoms following a stroke. However, the relationship between coping and post-stroke depression has not been widely studied. For instance, Finset & Andersson (2000) found that avoidant coping strategies were associated with depression in stroke and brain injured patients. On the other hand, Herrmann et al. (1997) reported that coping styles were not significantly related with depression in stroke patients six months after stroke. Coping style and coping resources are considered important factors in stroke patients with aphasia (Code & Herrmann, 1999; Hemsley & Code, 1996)

### **Caregiver outcomes**

There are adverse consequences on family members responsible for providing care and support to stroke patients and especially to those with aphasia such as symptoms of depression and increased levels of stress (Draper et al., 2007; Berg et al., 2005; van de Heuvel et al., 2001; Le Dorze & Brassard, 1995). Therefore, the relationship between post-stroke depression and the emotions experienced by caregivers has also been considered. Kotila et al. (1998) reported that patients' depression scores at 3 months after stroke were significantly associated with the severity of depression among their caregivers. Other studies have also supported the relationship between caregiver strain and patients' emotional health (Berg et al., 2005; van den Heuvel et

al., 2001). It has been reported that caregivers of aphasic stroke patients perceived greater difficulty with tasks and had more negative-related outcomes than caregivers of non-aphasic stroke patients (Bakas et al., 2006). It has also been suggested that psychosocial problems after stroke in aphasia often cause shifts in responsibilities and functions within the family environment as well as changes in relationships among family members (Hemsley & Code, 1996). The effect of caregiver stress on stroke patients' mood is an important factor that is amenable to intervention via stroke caregiver support, education and training programmes (Draper et al., 2007).

## **1.10 Post-Stroke Depression: The Case of Aphasia**

### **1.10.1 The relationship between depression and aphasia**

The previous section summarised some factors that have been associated with post-stroke depression. The majority of studies on post-stroke depression have not included people with aphasia. Although there is no theoretical background to support an argument that risk factors for depression in aphasic stroke patients may be different to those in people without aphasia, some factors such as type and severity of communication impairments or level of social support may be particularly important in the study of post-stroke depression in aphasic patients.

Depression is a devastating, but still often an unrecognised and untreated problem in stroke patients who have suffered communication problems such as aphasia (Barrett & Gonzalez-Rothi, 1998). Anecdotal evidence and clinical experience has shown that aphasia may significantly contribute to the severity and persistence of depression. The impact of loss or impairment of communication may result in significant emotional reactions (Robinson & Benson, 1981). Herrmann et al. (1993) suggested that moderate to severe aphasic stroke patients are an important subgroup in the investigation of post-stroke depression and they should not be excluded from research due to methodological limitations. However, the review of the literature on post-stroke depression highlighted that most studies have excluded patients with aphasia (Townend, Brady, & McLaughlan, 2007; Fleminger et al., 2003; Damecour & Caplan, 1991). Therefore, findings on post-stroke depression may be biased and not fully representative.

The inclusion of aphasic stroke patients would result in more accurate prevalence estimates of post-stroke depression. Therefore, the exclusion of aphasic patients reported in several studies makes difficult to estimate the prevalence of this



phenomenon in this group of stroke patients (Paolucci, 2008). There is some variation in the frequency of post-stroke depression in aphasia reported by some studies, which have included aphasic patients. Damecour & Caplan (2001) observed low rates (15%), Laska et al. (2007) slightly higher rates (24%) and Kauhanen et al. (2000b) the highest rates (70% at 3 months and 62% at one year after stroke).

Thomas & Lincoln (2006) showed that mild communication impairment as measured on a basic language-screening test was related to depression and was the strongest predictor of depression diagnosis and severity. Aphasia also appears to be related to depression with some recent studies indicating an increased risk of depression in aphasic stroke patients with mild to severe communication impairments in different language modalities (Kauhanen et al., 1999). Another important issue is the sensitivity among health professionals and members of the multidisciplinary team in detecting communication problems and depression (Creed et al, 2004). People with aphasia often do not recognise depressive symptoms in order to seek treatment, and there is also a tendency by healthcare professionals to under-diagnose depression in aphasia as the loss of communication abilities makes diagnosis more difficult and challenging (Barrett & Gonzalez-Rothi, 1998). According to Creed et al., (2004) speech and language therapists tend to miss symptoms of low mood in aphasic patients, while psychologists and psychiatrists often fail to pay attention to the nature of aphasic deficits. Clearly, it is of direct interest to further investigate the relationship between aphasia and depression following stroke.

Aphasia is typically associated with left-hemisphere damage and greater stroke severity (Kauhanen et al., 2000; Wade et al., 1986). Aphasia has also been shown to be related to the severity of motor deficits and ADL impairments during the early stages after stroke as aphasic patients have suffered a more severe stroke and larger

lesions (Wade et al., 1986). Anecdotal evidence has suggested that in the early days after the stroke it is common for many aphasic patients to feel distressed, sad and upset when they start realising the loss of multiple functions and especially the loss of the ability to speak (Parr et al., 1997). In the first three months after stroke, the presence of aphasia, left hemisphere lesions and living alone were found as important predictors for the development of depression (Astrom et al., 1993). However, it is not only the first emotional reactions to aphasia, but also the later overwhelming realisation for lost language skills, and the unknown prospects of recovery (Parr et al., 1997). People with aphasia are left to face the task of learning to live with an impairment that affects every aspect of their lives. Distress and frustration are prominent not only early after the acute event, but also later on when returning home and trying to cope with the psychosocial consequences of aphasia. Another reason why some people with aphasia felt cut-off, lonely, or sad is because they cannot communicate such feelings to others (Parr et al., 2004). Bearing this in mind, it is necessary to discuss factors that are related to the likelihood of low mood in aphasic stroke patients for the early, medium, and late stages of stroke recovery (Hackett et al., 2005).

Most research of aphasia recovery has focused on socio-demographic (e.g., age, & gender), physiological (e.g. site & extent of lesion), cognitive (e.g., restoration, compensation, & reorganisation), and language factors (severity & type of aphasia) (Basso, 1992; Pedersen et al., 1995; Code, 2001). There is now good evidence that emotional state and psychosocial adjustment can contribute to the amount of recovery from aphasia. Code (2001) has recently proposed a multifactorial framework for recovery from aphasia, in which it was emphasised the importance of



psychosocial factors, such as the psychological consequences of aphasia and their impact on well-being, quality of life, social functioning, and activity level.

A direct relationship may be due to damage in areas of the brain that are related to language function, while an indirect relationship may be due to cognitive slowing, reduced motivation, poor response and participation in rehabilitation (Code, 2001).

Interestingly, some studies reported more frequent and severe depressive symptoms in non-fluent aphasics than in fluent and global aphasics (Kauhanen et al., 2000a/2000b; Robinson & Benson, 1981). However, depression in aphasia during the acute stage may have a biological basis and therefore can be related to site of lesion and neurobiochemical imbalances (Code & Hermann, 2003). Other factors such as severity and type of aphasia, as well as degree of cognitive and physical impairments can be involved in later phases after stroke (Kauhanen et al., 1999).

Post-stroke aphasia has a significant impact on patients' emotional state. Low mood, anxiety, and loss of interest are among the negative emotional reactions that are often observed in stroke patients with communication problems (Code & Hermann, 2003).

People with aphasia experience significant changes in their self-image, self-esteem, which often lead to social isolation (Barrett & Gonzalez-Rothi, 1998). This withdrawal from social activities may also negatively affect families and caregivers of people with aphasia. Although few studies have suggested specific risk factors for the development of depression in aphasic stroke patients, it appears that multiple factors are involved in determining the presence or absence of depression in aphasic stroke patients and those may vary during different stages of recovery (Code et al., 1999).

Communication is very important for everyday functions and social relationships. Therefore, aphasia results in a sudden inability to function in everyday social, leisure



and occupational activities (Code, Hemsley, & Herrmann, 1999). Natterlund (2009) suggested that everyday activities change considerably with the onset of physical disabilities and aphasia. In chronic aphasia, severity of language deficits has been found to be the most important factor affecting the amount of time spent in social activities. Language impairments may lead to social isolation and depression (Clark, 1994). People with aphasia have been found to generally receive social support from close relatives, but less support from the healthcare and social systems (Natterlund, 2009). They have also reported that they often need different kinds of social support to help them manage their aphasia and everyday activities and to improve their participation in society. It has been suggested that feelings of happiness comes from interactions with others (Code & Herrmann, 2003). Code (2003) also found that effectiveness of communication in chronic aphasics is also affected by the time they spend out of the house interacting with others.

### **1.10.2 Studies on post-stroke depression and aphasia**

A recent review on the exclusion and inclusion criteria for people with aphasia in post-stroke depression research has identified that almost half of the studies (n=60, 46%) reported aphasic participants (Townend, Brady, & McLaughlan, 2007a). According to this review, thirty six (28%) of these studies reported both exclusion (moderate to severe aphasia) and inclusion of aphasia (mild to moderate aphasia). The range of aphasic participants was between 5 and 60 with just two studies (Hermann et al., 1993; Robinson & Benson, 1981) recruiting only aphasic stroke patients. Three studies (2%) did not report any exclusion of people with aphasia and did report some inclusion of aphasic participants. Twenty one (16%) studies reported that people with aphasia were not excluded and that some participants had aphasia (range=5-48). Numbers were only available from 13 of these studies. It is evident from this review that many studies do not clearly report the inclusion or exclusion of aphasic participants to enable generalizability of findings to the clinical population or replication of studies. The reviewers also noted some inconsistencies in the numbers of aphasic patients reported between publications for the same study (duplicate publications).

Table 1.5 summarises key studies (n=17) on the prevalence and aetiology of post-stroke depression and on mood screening methods that have included stroke patients with aphasia. Duplicate publications, pharmacological or psychological treatment studies or those studies that they do not clearly report the number of aphasic participants they have not been included in this summary.

Table 1.5: Studies of post-stroke depression including people with aphasia

Study	Sample	Mood Assessments	Key Findings
Astrom <i>et al.</i> (1993)	n=80, O 20 aphasics	-DSM criteria	<ul style="list-style-type: none"> <li>Aphasia, left anterior brain damage and living alone are related to PSD in the acute phase after stroke.</li> </ul>
Benaïm <i>et al.</i> (2004)	n=50, S 29 aphasics	-ADRS	<ul style="list-style-type: none"> <li>ADRS is a valid, reliable, sensitive, specific for use in aphasia in acute stroke.</li> </ul>
Bennett <i>et al.</i> (2006)	n=100, S 21 aphasics	-SADQ (hospital and community version), SODS, VAMS, VASES	<ul style="list-style-type: none"> <li>SADQ versions and SODS were appropriate screening methods for PSD. VAMS and VASES had no clear cut-offs but correlated with HADS and recommended for assessing severity.</li> </ul>
Berg <i>et al.</i> (2003)	n=100, O 14 aphasics	-only DSM criteria -Self-report questionnaires (BDI, HRSD could not be completed by aphasics	<ul style="list-style-type: none"> <li>Depressive symptoms are frequent and with little change in prevalence (23%-29%) during 18-month follow up. Aphasia was assessed with the Western Aphasia Battery, but not investigated as a risk factor.</li> </ul>
Cassidy <i>et al.</i> (2004)	n=50 33 aphasics	DSM criteria, HADS	<ul style="list-style-type: none"> <li>20% major depression, female gender was a predictor of depression, but not to functional disability.</li> </ul>
Creed <i>et al.</i> (2004)	n=44, S 23 aphasics	-GDS	<ul style="list-style-type: none"> <li>GDS can be used as an interview rather than a self-report questionnaire in 89% of aphasic patients.</li> </ul>
Gainotti <i>et al.</i> (1997)	n=149, O 23 aphasics	-14 could not be assessed using DSM criteria or self-report measures -9 completed a visual analogue scale	<ul style="list-style-type: none"> <li>Left frontal lesions are not a major determinant of PSD.</li> </ul>



Hosking <i>et al.</i> (2000)	n=79, O 60 aphasics	- the study assessed severity of depression with a self-report questionnaire	<ul style="list-style-type: none"> <li>Predictor variables at 3 months post-stroke included gender, age, history of previous stroke, and hemispheric location of stroke.</li> </ul>
Kauhanen <i>et al.</i> (1999; 2000a; 2000b)	n=106, O 36 aphasics	DSM criteria	<ul style="list-style-type: none"> <li>70% of aphasics were depressed at 3 months and 62% at 12 months. PSD was associated with aphasia and other cognitive deficits at 3 and 12 months after stroke.</li> </ul>
Kellermann <i>et al.</i> (1999)	n=82, O 22 aphasics	-DSM criteria -Self-report questionnaire (BDI)	<ul style="list-style-type: none"> <li>Acute aphasic stroke patients had higher depression scores.</li> </ul>
Starkein & Robinson (1988)	n=103, O 17 aphasics	-a form of a Visual Analogue Mood Scale, Zung Self Rating Depression Scale, HADS, a Nurse's Depression Rating Scale	<ul style="list-style-type: none"> <li>Nine of them (53%) showed depression (29% major depression; 24% minor depression. Non-fluent aphasic stroke patients had a significantly higher frequency and severity of depression than fluent and global aphasics.</li> </ul>
Thomas & Lincoln (2008)	n=100, O 21 aphasics	-Self-report mood measures (VAMS, VASES)	<ul style="list-style-type: none"> <li>Mild aphasics included using a screening language test. Expressive communication and level of disability in personal activities of daily living were related distress.</li> </ul>
Studies including <u>only</u> aphasic stroke patients			
Robinson & Benson (1981)	n=25, O	-a form of a Visual Analogue Mood Scale, Zung Self Rating Depression Scale, HADS, a Nurse's Depression Rating Scale	<ul style="list-style-type: none"> <li>Strong correlation between lesion size and depression. Non-fluent aphasics had greater frequency and severity of depression than fluent and global aphasics.</li> </ul>
Damecour & Caplan (1991)	n=54, O	-a form of a visual analogue mood scale, semi-structured interview using the Zung Self-Rating Depression Scale	<ul style="list-style-type: none"> <li>Severity of depression was not related with lesion size or location. Wernicke's aphasics do not experience depression less often or less severe than Broca's aphasics</li> </ul>

Hermann <i>et al.</i> (1993)	n=42, O	Cornell Depression Scale (CDS)	<ul style="list-style-type: none"> <li>No significant difference was found between acute and chronic aphasic patients. Non-fluent aphasia was related with higher depression rates, but only for acute patients.</li> </ul>
Kuroda & Kuroda (2005)	n=25, O	Observational Profile of Communication (OPC) for assessing communicative ability and psychological status	<ul style="list-style-type: none"> <li>The severity of communication problems does not appear to be related to psychological status.</li> </ul>
Laska <i>et al.</i> (2007)	n=89, S	DSM criteria, MADRS	<ul style="list-style-type: none"> <li>67% of participants had a DSM diagnosis at baseline and 100% at six months follow up and this was related to degree of aphasia</li> </ul>

**Table Abbreviations:**

n= number of participants in the study; O= observational study; S=screening methods study

ADRS: Aphasic Depression Rating Scale; BDI: Beck Depression Inventory; DSM: Diagnostic Statistical Manual; GDS: Geriatric Depression Scale; HRSD: Hamilton rating Scale for Depression; MADRS: Montgomery-Asberg Depression Rating Scale; PSD: Post-Stroke Depression; SADQ-H: Stroke Aphasic depression Questionnaire-Hospital version; SODS: Signs of Depression Scale; VAMS: Visual Analogue Mood Scales; VASES: Visual Analogue Self-Esteem Scale



Astrom et al. (1993) found that aphasia was an important predictor of post-stroke depression only at the acute phase of stroke (at one and three months post stroke), but not later on indicating that different factors may be responsible for late onset depression in aphasia. Among longer-term stroke patients no relationships between aphasia and depression was found (Pohjasvaara et al., 1998; Sharpe et al., 1994). The non-fluency of aphasia has shown to be significantly related to post-stroke depression by some researchers (Thomas & Lincoln, 2008; Hermann et al., 1993; Robinson & Benson, 1981), but not by others (Starkein & Robinson, 1988). The relationship between fluent aphasia (receptive communication impairment) and depression is thought to be caused by the better awareness of their impairments compared to those with non-fluent aphasia (expressive communication impairment), and presumably increasing the severity of their depression ratings. On the contrary, Damecour and Caplan (1991) suggested that depressive symptoms rated by proxies were more severe for fluent aphasics (receptive aphasia) either at the acute or more chronic stage of aphasia. Kauhanen et al. (2000b) also reported an increase of major depression in fluent than in non-fluent aphasics during the follow up period. These contradicting findings may be explained to different study samples and assessments used or other methodological limitations.

Kauhanen et al. (2000a, 2000b) found that two-thirds of aphasic patients were depressed according to DSM criteria (major and minor depression) at the acute phase post stroke and 12 months later. The prevalence rate of major depression increased from 11% to 33% during the one year follow-up period.

Thomas and Lincoln (2008) assessed 100 hospitalised stroke patients at one-month post-stroke to identify factors relating to emotional distress in the first month following a stroke. Twenty one participants were classified as aphasic using the



Sheffield Screening Test and the Visual Analogue Self-Esteem Scale was used as a self-report, picture-based of emotional distress that could be completed by all patients. They found that expressive communication problems and dependence in personal activities of daily living were significant predictors of emotional distress at one month post stroke. It was also reported that expressive communication problems, emotional distress at one month post stroke and greater stroke severity were also significant predictors of emotional distress at six months post stroke.

Very few studies have exclusively investigated depressive symptoms in patients with aphasia. Robinson and Benson (1981) investigated the frequency and severity of depression following brain damage in 25 hospitalised male patients with aphasia (18 were stroke patients) using four mood measures (a visual analogue mood scale, the Hamilton Depression Scale, a nurses' rating scale and the Zung Self Rating Depression Scale). Non-fluent aphasic patients (expressive aphasia) reported greater frequency and severity of depression than fluent (receptive aphasia) or global aphasic patients. Findings from this small scale study by Robinson and Benson (1981) were also supported in another study including only patients with aphasia by Herrmann et al. (1993), which investigated depression in a group of 33 patients with acute (less than 3 months) and chronic aphasia (more than six months). This study reported that depression is common in aphasia, but there are not significant differences in mood scores between acute and chronic aphasics.

Laska et al. (2007) assessed depression in 89 acute stroke patients with aphasia at three and six months follow up using DSM-IV criteria and a structured interview using the Montgomery-Asberg Depression Rating Scale (MADRS). During this 6-month period, the cumulative occurrence of depression was 24% (12% minor depression, 12% major depression), which is consistent with previous findings in

stroke patients (Hackett et al., 2005). In this study it was also found that symptoms of emotionalism (tearfulness and pathological crying or laughing) at baseline were common in acute aphasic patients and that emotionalism was a significant predictor of depression.

Paolucci et al. (2006) conducted a large scale multicentre observational study on post-stroke depression and reported that some people with milder forms of aphasia were included, but the number of aphasic participants was not clearly stated. Post-stroke depression was associated with female gender, aphasia, previous stroke and severe disability. They also concluded that patients with aphasia were included as long as they had no major communication difficulties that would not allow them to complete a visual analogue mood scale and they acknowledged that a number of stroke patients with aphasia were not included because they couldn't complete this scale. They proposed the use of an observer-rated measure that would reduce selection bias in future studies.

Quite a few studies reported that mood problems are common in acute and chronic aphasia. Most findings are based on small sample sizes (with the exception of the study by Paolucci et al., 2006) from cross-sectional studies, which were exploratory rather than based in theory. Exploratory studies are not based on a theory, which integrates previous literature and has identified those factors that are most likely to be associated with post-stroke depression. Longitudinal studies with larger sample sizes are needed to assess the relationship of post-stroke depression and aphasia both in hospital (acute stage) and community (chronic stage) settings using appropriate diagnostic and screening methods and a theoretical model based on previous literature.



## **PART 4: THEORETICAL MODEL OF POST-STROKE DEPRESSION AND APHASIA**

### **1.11 Development of a theoretical model for the study of mood in stroke and aphasia**

Literature in post-stroke depression has shown that mood problems are common after stroke. Despite some variability in methods and prevalence reports across studies in post-stroke depression, about one third of stroke patients recruited from hospital and/or community settings become depressed at different times following their stroke. There is also significant evidence that low mood can have many negative outcomes and mood problems should be diagnosed, monitored and treated at any time during stroke recovery and rehabilitation. Research studies are needed to investigate this phenomenon in people with aphasia, who are often excluded from stroke research due to methodological reasons.

Several biological, psychological and social factors were identified in the literature to be associated with mood in stroke patients. Most studies have focused either on biological or other psychosocial factors in isolation. The aetiology of depression in the context of acquired brain injury and in particular of stroke has been shown to be multi-factorial, so it is important to understand how and why it occurs in order to determine effective treatments to maximise the effects of rehabilitation and recovery. Therefore, findings from previous literature in post-stroke depression highlighted the need for an integrated bio-psycho-social model to understand the development of low mood in all stroke patients and in particular to those with aphasia.

A model of depression after stroke has been proposed by Herrmann & Wallesch (1993), which considered both neuro-anatomical and psychosocial factors. Primary, secondary and tertiary causes of post-stroke depression were identified that may play



a role in different stages following a stroke. It was suggested that biological/organic factors are important at the acute stages after stroke, and psychosocial factors at the later stages. Code et al. (1999) have referred to this model in the context of aphasia as it takes into account the individual differences in the way people respond to stroke and aphasia.

Thomas (2006) also proposed a theoretical framework for the study of emotional distress following stroke. This framework considered five main areas that play an important role in the study of emotional problems after stroke: 1) background variables (previous stroke, history of depression, pre-stroke independence), 2) demographic characteristics (age, gender, marital status, living arrangements), 3) stroke information (lesion location, severity of stroke), 4) disability level (activities of daily living, aphasia), and 5) psychosocial aspects (locus of control, coping strategies, social support, cognitions).

The models of post-stroke depression are scarce in the literature and not specific to aphasia. The present study integrated information presented in models of post-stroke depression previously described, but also used key findings from the literature to develop a theoretical model for the study of post-stroke depression in people with aphasia. The theoretical model proposed to direct the research in this thesis is shown in Figure 1.1. It introduces two sets of factors: biological and psychosocial. Biological factors are demographic, background or other stroke-related factors that may be significant at the early stages after stroke and psychosocial factors are those that may be significant at later stages after stroke.

It is not an exhaustive model and does not represent the inter-relationships between factors. If many inter-relationships were included then the model would be too complex and more difficult to investigate. Also, the very nature of the post-stroke

depression and aphasia makes impractical and unethical the investigation of multiple factors via many and different questionnaires or battery of assessments. The framework proposed here will only be used to direct the main study of this thesis and some variables will be assessed longitudinally in a sample of patients with aphasia at the acute and later stages following their stroke to identify which are significantly associated with mood. The model of post-stroke depression in aphasia includes a range of biological and psychosocial factors that may operate either directly or indirectly as risk factors for the development of low mood at the acute and later stages of post-stroke aphasia. Biological factors such the site, extent of brain damage and cognitive as well as communication impairments are considered as primary reactions, while psychological and social factors such as disability and emotional consequences of aphasia, as well as reduced activity levels and social participation may be seen as secondary reactions to drastically changed life circumstances following a stroke (Wahrborg, 1991).

#### **1.11.1 Biological factors (background & stroke-related factors)**

Demographic variables such as gender and age were considered. Age and gender were not found to be related to measures of psychological distress in aphasia (Thomas & Lincoln, 2008; Kuroda & Kuroda, 2005). It is predicted that demographic variables will not be significantly associated with low mood or that they will not account for a large amount of variance in mood scores as these variables have not consistently been found to be significantly associated with post-stroke depression by previous studies. It is also important to record demographic information in order to describe the study sample and allow comparison with other studies. Stroke characteristics that are considered important are lesion location as well as type and severity of stroke. These will influence the level of disability and



indirectly may be related to low mood. Stroke severity and functional outcomes are factors that have been found to be more consistently associated with post-stroke depression in the literature (Bogousslavsky, 2003). These characteristics are also important to record, as this would allow comparison with other similar stroke studies. Other relevant background variables included were pre-stroke functional independence, previous stroke, and other related medical conditions. The relationship between physical disabilities caused by stroke and mood were also assessed. Most studies evaluating this relationship have only considered functional independence on personal activities of daily living, such as washing and dressing. Cognitive and communication impairments were also assessed. The type of aphasia and its impact on different language modalities is expected to be an important factor in post-stroke depression and aphasia.

### **1.11.2 Psychosocial factors**

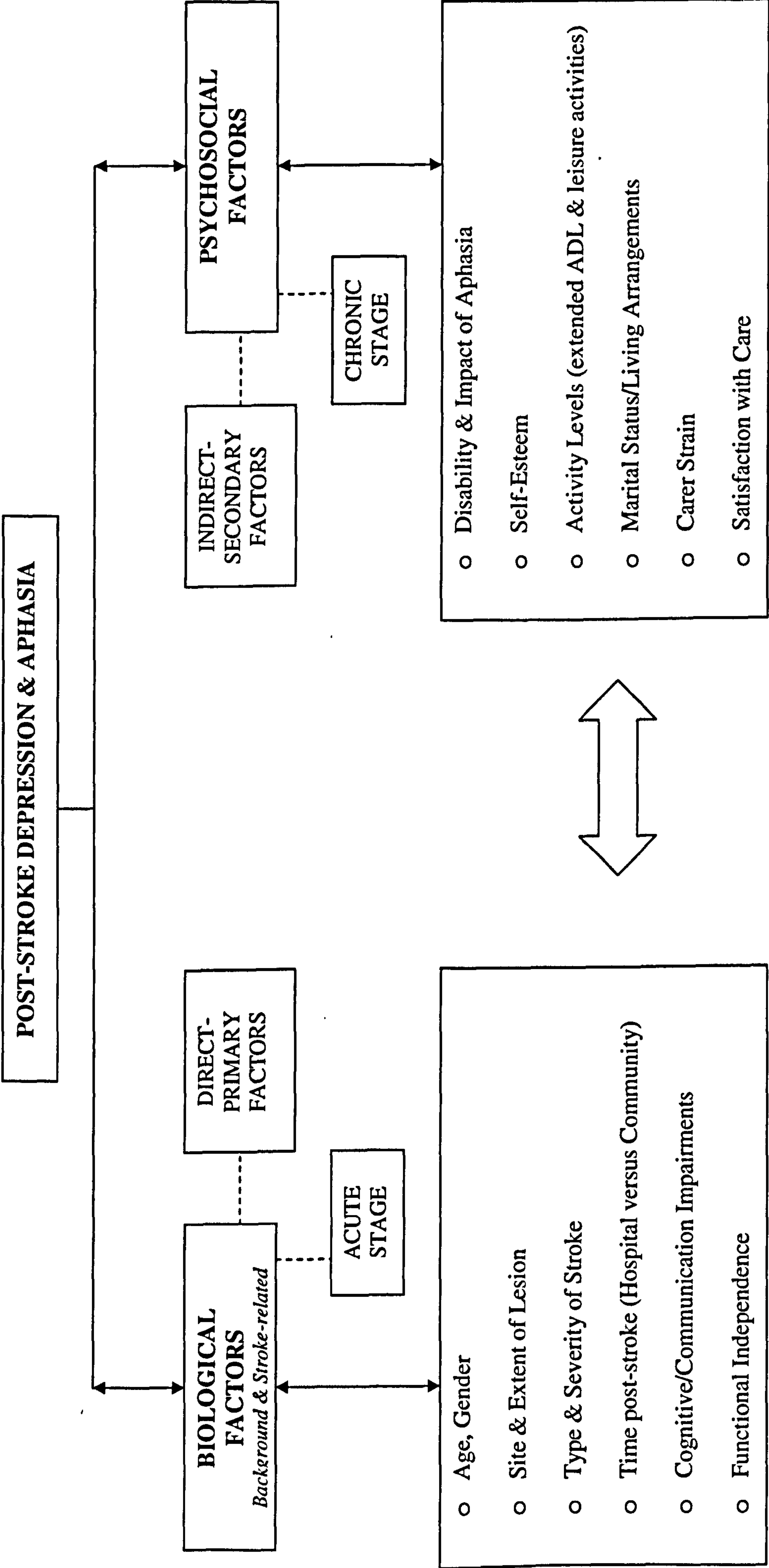
Psychological and social variables were also included as factors that may influence mood in aphasia following a stroke. The inclusion of measures of extended activities of daily living and leisure activities to assess the relationship between activity level and depression was also considered in the present study. These measures indicate level of functional independence, but they also provide an indirect measure of level of independent living and social participation. The disability and emotional consequences associated with living with aphasia were also considered to assess the impact of aphasia on everyday life. These factors are predicted to account for a large amount of variance in mood scores of aphasic stroke patients. Additional factors such as marital status and living arrangements, satisfaction with care and carer strain would be included as they may be important in the study of post-stroke depression in aphasia.



This framework was required, as previous research studies have not often been based on a theoretical rationale. It is still unclear which factors would be associated with low mood in aphasic stroke patients, as this has not been widely studied in previous stroke literature. This framework will be used to guide the main study of this thesis, but also as a starting point in the study of post-stroke depression in stroke patients with aphasia.

This thesis includes two studies: 1) a small-scale pilot study that was conducted in order to develop and validate a mood measure for future use in stroke patients with aphasia, and 2) the main study of this thesis that investigated factors relating to mood in post-stroke aphasia. This study aims to pilot a revised version of the Visual Analogue Mood Scales in a community sample, but also briefly assess the consistency between two self-report, picture-based mood measures (VAMS-R and VASES) and an observer-rated measure in stroke patients with mild to severe aphasia (SADQ-21). It introduces a theoretical framework in the study of depression in aphasic stroke patients to guide future research, which should include people with aphasia.

Figure 1.1: Theoretical model of post-stroke depression in aphasia



## **2. CHAPTER TWO: DEVELOPMENT AND VALIDATION OF THE VISUAL ANALOGUE MOOD SCALES-REVISED (VAMS-R)**

### **2.1 Chapter outline**

This chapter describes a study on the development and validation of a revised version of the Visual Analogue Mood Scales (VAMS) (Stern, 1997). In order to investigate mood in stroke patients with communication problems, the positive items (*Happy* and *Energetic*) of the Visual Analogue Mood Scales were reversed in response to the findings of Bennett et al. (2006) and the revised VAMS version was validated in a community sample of older adults. This chapter includes findings on construct validity and internal consistency of the revised scale and these are discussed in terms of its application as a mood measure in stroke patients with aphasia.

### **2.2 Introduction**

The importance of accurate assessment and diagnosis of mood problems in patients who have suffered a stroke was outlined in the literature review section of this thesis. Screening for mood disorders can be undertaken using validated instruments and/or by clinical interview and observation. There are several methods to measure internal mood states, but most of them rely on verbal communication (Stern, 1996). There are many limitations to the use of traditional standardised measures of depression, especially when used with neurologically ill patients. Clinical interviews and/or verbally based self-completed questionnaires are commonly used to assess mood problems, but may not be suitable for use with people with language and other cognitive deficits (Stern, 1999). Existing verbal self-report assessments are often presented in an adapted format, but they still may be problematic and unreliable.



Lengthy assessments that rely on intact cognitive abilities with complicated response formats are inappropriate for neurologically impaired patients (Stern, 1997).

Because of these difficulties, some authors (Brumfitt & Sheeran, 1999b; Stern, 1999) have suggested the use of non-verbal, picture-based screening measures such as the visual analogue scales.

Visual Analogue Scales (VAS) have been frequently used to measure a variety of health outcomes in social and behavioural research and have been described as simple and quick to administer self-report measures (Torrance, Feeny, & Furlong, 2001; Wewers & Lowe, 1990). Visual analogue scales were first described by Aitken (1969) as measures of mood states that do not require a high degree of verbal sophistication, and therefore could frequently be used with a wide range of patients. These non-verbal mood scales have been specifically designed for use with people with communication difficulties or with other cognitive impairments such as executive dysfunction and memory problems (Stern, 1997). Visual analogue scales are simple, quick, easy-to-administer, and as efficient as other more complex, time-consuming mood self-rating or observer rating scales (Killgore, 1999; Lindsay & Powell, 1994; Aitken, 1969).

A typical visual analogue scale consists of a straight line, usually 100 mm long, with labelled, sometimes bipolar endpoints, such as 'depressed' and 'not at all depressed' or whatever other constructs suit the assessment's purpose (Killgore, 1999; Lindsay & Powell, 1994). During their administration, individuals are asked to place a single mark along a straight vertical line to reflect their current mood state. Instructions can be given either by gesture or verbal expression but both methods can be used depending on the patients' abilities to understand the task and provide meaningful responses (Stern, 1997).

The Visual Analogue Mood Scale (VAMS) (Stern, 1997) consists of eight simple cartoon faces and their verbal descriptors, which describe a broader range of mood states (i.e., afraid, confused, sad, angry, tired, tense, happy, energetic). Each cartoon face describing a mood state is placed at the end of a vertical 10 cm line with a neutral face placed at the other end of the line. On all items the neutral face is always placed at the top of this vertical line. Specifically, on negative mood items *Afraid*, *Confused*, *Sad*, *Angry*, *Tired* and *Tense*, the neutral face is at the top; for the positive mood items *Happy* and *Energetic*, the neutral face is also at the top. Each of these eight unipolar mood scales are presented on separate A4 pages and for each one the respondent is required to make a single mark on the vertical line to indicate the extent to which each mood state represents their feelings at the time of the assessment. The scales are presented in a vertical orientation to overcome invalid responses due to cognitive impairments such as hemianopia and inattention (Price et al., 1999; Nyenhuis et al., 1997).

The VAMS is a short measure that was specifically designed for use with people with communication disorders by using schematic faces and single words to represent a range of mood states (Nyenhuus et al., 1997). It has been standardised in a young and older adult sample and a clinical sample of psychiatric patients (Stern, 1997; Stern et al., 1997). Although, many validation studies by the same lead researchers (Temple et al., 2004; Nyenhuus et al., 1997; Stern, 1997; Stern et al., 1997) have been conducted over the years on a variety of samples, such as healthy individuals of all ages, psychiatric patients, and patients with dementia, it is only recently that some studies have examined their validity when used in other neurologically impaired patients (Bennett et al., 2006; Stern et al., 2004; Code & Herrmann, 2003; Arruda et al., 1999; Arruda et al., 1996).



The validity of the VAMS has been investigated in acute and rehabilitation stroke in-patients and has been shown to correlate highly with other standardised depression scales, such as the Profile of Mood States (POMS) and the Hospital and Anxiety Depression Scale (HADS) (Bennett et al., 2006; Arruda et al., 1999).

Arruda et al. (1999) examined the validity of the VAMS in 41 stroke patients. Correlations between the VAMS and POMS scales were high. It was reported that the VAMS has good convergent and discriminant validity when administered to acute or post-acute stroke in-patients. Some studies have assessed its validity, but most of them have failed to consider measures of reliability or cut-off scores for use with stroke patients.

The assessment of mood states in people with dementia is also a challenging clinical task due to the associated difficulties, so the validity of VAMS as a simple and non-verbal pictorial mood measure has been investigated in this population (Temple et al., 2004). The authors found good evidence on its convergent and discriminant validity and it was concluded that VAMS can be used in patients with dementia.

However, Price et al., (1999) suggested that many healthy elderly participants are unable to successfully complete self-report visual analogue scales, and this suggestion has shown to have implications for the stroke population too. Moreover, findings from a recent study by Bennett et al. (2006) suggested that the internal consistency of the VAMS increased when the items *Happy* and *Energetic* were excluded from the analysis both in geriatric control and stroke participants. The internal consistency of the VAMS without items *Happy* and *Energetic* was much higher ( $\alpha=.73$ ) than that of the VAMS with these items ( $\alpha=.45$ ). It was also noted during administration of the original VAMS that both participant groups failed to notice that the polarity of the scales is sometimes reversed (i.e., the neutral face is at



the top both for positive and negative mood items). Verbal comments were also used to prompt participants that items placed at the bottom of the vertical line can also be descriptive of positive mood states. However, they failed to notice this and they still marked all items as if the cartoon face at the bottom was always describing a negative emotion. Therefore, it has been suggested that the original VAMS can be modified and improved by using a different and more consistent format where positive mood states are placed at the top and negative mood states at the bottom.

In order to assess the validity and reliability of this modified version, the Visual Analogue Mood Scales (Stern, 1997) was administered to older adults living in the community. The utility of these brief scales will be presented as a specific assessment method of internal mood states for this population. This study was undertaken as a preliminary step to adapt and evaluate available mood measures for stroke patients with communication difficulties.

The VAMS was revised in response to the findings of Bennett et al. (2006). The rationale behind the VAMS-R was to develop a reliable and valid measure. The revised version therefore included the original items *afraid*, *confused*, *sad*, *angry*, *tense* items in their standard format and the items *happy* and *energetic* reversed. Data were also collected on content validity and test-retest reliability to further evaluate the psychometric properties of the scale.

The aims of the present study were:

- To revise the VAMS by reversing positive items, *Happy* and *Energetic* as recommended in a previous study by Bennett et al. (2006).
- To evaluate the internal consistency and test-retest reliability of the revised scale in a sample of healthy older adults.
- To evaluate the relationship between the scale under investigation and a ‘gold standard’ criterion measure (Hospital Anxiety & depression Scales by (Zigmond & Snaith, 1983) administered at a similar time (concurrent validity).

2.3 Method

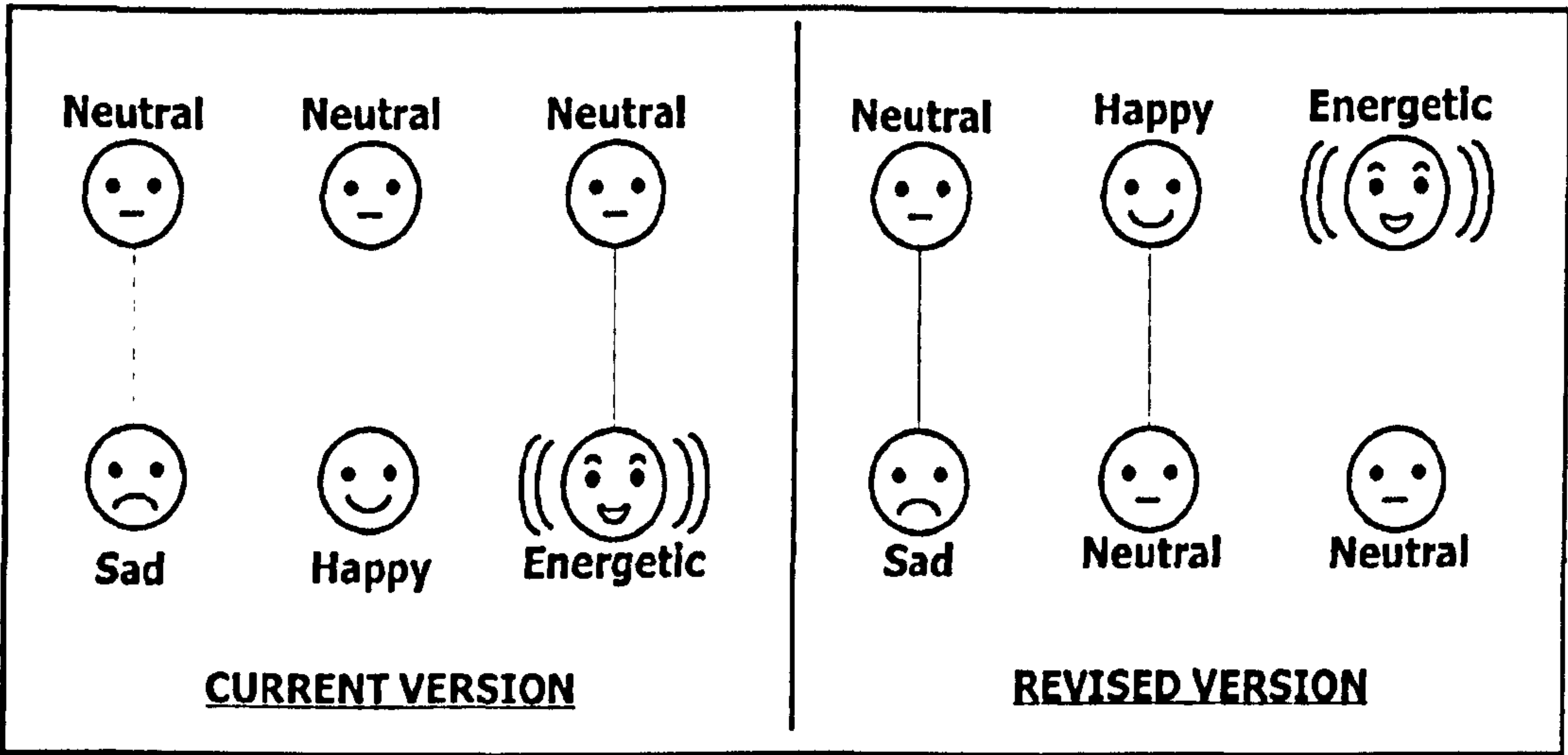
2.3.1 Design

This study was a cross-sectional and correlational design.

2.3.2 Development of the modified version of the Visual Analogue Mood Scales (VAMS-R)

The findings from a previous study by Bennett et al. (2006) were reviewed to modify the original VAMS and improve its internal consistency as an 8-item mood measure. Figure 2.1 shows the revisions made to the two positive items in order to produce the revised version of the Visual Analogue Mood Scales (VAMS-R). The two revised items can be found in Appendix A.

Figure 2.1 Revisions to the Visual Analogue Mood Scales (VAMS) (Stern, 1997)



The Visual Analogue Mood Scales revised (VAMS-R) consisted of 6 items of the original VAMS (i.e. *afraid*, *confused*, *sad*, *angry*, *tired* and *tense*) and the 2 revised items (i.e. *happy*, *energetic*). Each of the VAMS-R lines were exactly 100 mm in length and each scale’s raw score was the distance measured from the top end of the line (i.e. neutral, energetic or tired) to the middle of the participant’s mark on the line. All scales had a range of possible scores from 0 to 100, with 0 representing the presence of positive mood states. For all items in the original version of the VAMS a



low score was representing the absence of each mood state, even for positive mood items *Happy* and *Energetic* (Stern, 1997). In the original version both positive and negative items were scored from 0 to 100 based on the distance in mm from the top 'Neutral' pole. It has been suggested that reverse-scored items can have an effect on a scale's internal consistency (Field, 2005). The modifications made on these two positive mood items resulted in a consistent scoring system where a score of zero could be viewed as either the lack of negative mood states or the endorsement of positive mood states.

### 2.3.3 Participants

A prospective comparison of the revised version of the VAMS and the Hospital Anxiety and Depression Scale (HADS) was in a community sample of older adults. It is believed that depressive symptoms or any other changes in mood are a natural part of the ageing process. An epidemiological study by Burvill et al. (1997) has reported that the nature and frequency of depressive symptoms is not very much different between stroke patients and older adults with similar levels of physical disability due to different ageing factors that are present in both populations. Therefore, healthy older participants were identified and invited to take part in the study. They were recruited from a range of sources, such as day centres, community and other local social groups, in order to gain a representative sample of older adults living in the community. The researcher (EK) aimed to recruit a sample size comparable to the study by Bennett et al. (2006) (i.e.,  $n \geq 50$ ), but more importantly enough participants to meet the minimum requirements for an exploratory factor analysis of an 8-item questionnaire.

### **Inclusion Criteria**

Participants who met the following criteria were eligible to take part in the study:

- They were over the age of 55 years old.
- They were able to understand the aim of the study and they were able to give informed consent.

### **Exclusion Criteria**

Participants who met the following criteria were not recruited into the study:

- They had previously suffered a stroke or they had any other physical or mental disability that would prevent them providing accurate responses.
- If they were blind or deaf as this would preclude standardised administration of the scale.
- If they were non-English speaking or had any other communication difficulties that restricted their ability to understand the questionnaire.
- If they did not consent to participate.

## **2.3.4 Measures**

### **Participant Questionnaire**

All participants were assessed on a self-administered postal questionnaire, which included the Hospital and Anxiety Depression Scale (HADS) by Zigmond & Snaith, (1983) and an extended modified version of the VAMS. Participants' gender and age were also recorded.

The items *Happy* and *Energetic* were reversed and a revised version of the VAMS was included in the questionnaire as described in section 2.3.2. In addition to the VAMS-R, four non-word VAMS items (i.e. *sad*, *happy*, *energetic*, and *tired*) were included in order to evaluate the validity of these items without the associated verbal descriptors. These items were identical to the standard VAMS-R items with the



exception of having all the words removed (i.e., “Neutral” and/or the mood descriptors). This was an attempt to estimate how a language-impaired individual would experience the VAMS-R by relying only on the presentation of cartoon faces (Neynhuis et al., 1997; Stern et al., 1997).

Another set of these four items with labels was also included at the end of the questionnaire to investigate the test-retest ( $r_{tt}$ ) reliability of the VAMS-R within a very short test-retest interval. Test-retest reliability is typically assessed within a longer time interval, but a short duration between completing the two sets of items was considered more appropriate when measuring mood states which can be transient and unstable (Stern et al., 1997). Therefore, test-retest reliability was tested within the same questionnaire where each participant completed the repeated items followed by other intervening items with and without labels.

- Visual Analogue Mood Scales (VAMS) (Stern, 1997)

Depressed mood can be identified by using visual analogue scales, which are simple and cognitively undemanding picture based measures (Ahearn, 1997). The Visual Analogue Mood Scales (VAMS) consist of eight visual analogue unipolar scales: ‘afraid’, ‘confused’, ‘sad’, ‘energetic’, ‘tired’, ‘happy’ and ‘tense’. Respondents should indicate the point along the vertical line that best describes how they are currently feeling and each scale is scored from 0 to 100. The VAMS usually take no more than 10-15 minutes to complete and most respondents, even those with communication problems are able to grasp the nature of the task and provide meaningful responses (Stern, 1997). Stern (1997) suggested a cut-off of 50 on the ‘sad’ item to identify possible depression or anxiety. However, Bennett et al. (2006) found that a cut-off of 22/23 on the ‘sad’ item provided the best balance between sensitivity and specificity.



- Hospital Anxiety Depression Scale (HADS) (Zigmond & Snaith, 1983)

The participants were also asked to complete the Hospital Anxiety & Depression Scale (HADS) (Zigmond & Snaith, 1983). The HADS was included as a measure of emotional distress to evaluate the concurrent validity of the VAMS-R. It was designed to detect the presence and severity of mood disorders, such as anxiety and depression while excluding physical indicators of psychological distress. Its advantages are the separate anxiety and depression subscales, the low memory demands and the acceptably phrased questions.

The HADS is a brief, valid, reliable and widely used mood measure (Bjelland et al., 2002; Crawford et al., 2001; Herrmann, 1997). It is a screening questionnaire comprised of two subsections for anxiety and depression. There are 14 items, seven related to anxiety symptoms and seven related to depressive symptoms. Each question gives four response options scored 0,1,2,3, with high scores indicating the presence of anxiety or depression. The authors have suggested the following cut-off scores: 7 or less=no significant symptoms, 8-10=borderline, and 11 or more=significant symptoms.

### **2.3.5 Ethics**

The study was granted ethical approval by the Nottingham University School of Psychology Ethics Committee. Informed consent was obtained from all participants completing this questionnaire.

### **2.3.6 Procedure**

The researcher invited participants who met the inclusion criteria to take part in the study. Participants were given the 'Information for Participants' sheet to read in which the purpose of the study and what it involved was explained. Participants who agreed to take part in the study were asked to sign a consent form.

Written informed consent was obtained from all participants who agreed to take part in this study and completed the study's questionnaire. The participants were asked to complete in their own time the 'Participant Questionnaire' and return it using a pre-paid envelope. In most cases, questionnaires were self-administered using the directions and examples on the front page of each scale. However, additional instructions were provided when necessary and a few participants completed the questionnaires while the researcher was also present.

### **2.3.7 Data Analysis**

Data were analysed using the Statistical Package for Social Sciences (SPSS) Version 15 and 16. Descriptive statistics were used to describe the sample and to screen the data. Tests of normality were also used to assess the normality of the distribution of scores. Most data were not normally distributed, therefore non-parametric statistics were employed. Correlations were calculated to investigate the relationship between the VAMS-R and the HADS and the relationship between the items with and without their verbal descriptors. All correlations were two-tailed for this analysis and for all other correlations in this chapter. The two-tailed tested tests are used when the researcher is not making any specific prediction concerning the direction of the relationship between the variables (Pallant, 2007).

Test-retest reliability ( $r_{tt}$ ) analyses were also examined using Spearman's ( $\rho$ ) correlations. The internal consistency of the modified version of the VAMS (VAMS-R) was determined using Cronbach's ( $\alpha$ ) alpha analysis. Exploratory factor analysis was also used to assess the scale's composition and factor structure.



## 2.4 Results

### 2.4.1 Participant characteristics

Seventy healthy older participants living in the area of Nottinghamshire were identified for inclusion in the study. Of these 70 participants, 7 (10%) did not meet the inclusion criteria, 11 (15.71%) did not return the questionnaire. A total of 52 (74.29%) healthy older adults returned the questionnaire using the pre-paid envelope provided. However, two questionnaires were not appropriately completed and were not included in the analysis. The age range of the remaining fifty participants, who were included in the analyses, was from 55 to 88 years of age (Mean=66.70, SD=9.68) with 21 men and 29 women. Participant characteristics and distribution of scores on questionnaires are shown in Table 2.1.

Descriptive statistics (skewness values) also provided information regarding the distribution of scores on all variables in order to decide whether parametric or non-parametric statistics will be used in the analysis. The HADS and VAMS-R were positively skewed, with skewness values of .848 and 1.351 respectively. The skewness value provides an indication of the symmetry of the distribution and positive skewness values indicate that scores are clustered at the lower distribution. (Pallant, 2007). The normality of the distribution of scores was also assessed using the Kolmogorov-Smirnov statistic. HADS total, anxiety and depression scores ( $p=.030$ ,  $p=.019$ ,  $p=.007$ ) significantly differ from the normal distribution. Although, the VAMS-R total scores did not significantly differ from the normal distribution ( $p=.055$ ), all other VAMS-R item scores did differ, therefore non-parametric statistics were used for further data analysis. Therefore, median (middle score) and interquartile range (the middle 50% of scores) were used to describe data collected.



Table 2.1: Descriptive statistics for HADS and VAMS-R

	Older Adults				
Gender					
Male: Female	21 (42%):29 (58%)				
	n	Range of possible scores	Range	Median	IQR
Age	50	55-99	55-88	66.70 (9.67)*	
HADS-Anxiety	50	0-21	1-20	6.00	5.00
HADS-Depression	50	0-21	0-10	3.00	4.00
HADS-Total	50	0-42	2-25	9.00	7.00
VAMS-R Total	50	0-800	50-713	189.00	189.00

\* Mean (Standard Deviation), IQR: Interquartile Range

2.4.2 Relationship between VAMS-R scores and demographic information

Construct validity of the VAMS-R was assessed by examining the relationship between VAMS-R and HADS scores. Spearman’s correlations showed that there was no significant correlation between age and HADS scores ( $r=.256$ ,  $p=.067$ ), but a significant correlation between age and VAMS-R scores ( $r=.460$ ,  $p<.01$ ). There was no significant difference between the scores on the HADS for men (mean=8.90, SD=5.18) and women (mean=11.59, SD=6.12) ( $U=222.50$ ,  $p=.106$ ). VAMS-R scores did not significantly differ between men (mean=195.67, SD=108.41) and women (mean=260.10, SD=162.05) ( $U=228.00$ ,  $p=.133$ ).

2.4.3 Relationship between HADS and VAMS-R

The validity of the VAMS-R was measured by correlating the scores on each of its eight items with the scores obtained on the HADS anxiety and depression subscales, and HADS total. Spearman’s (rho) correlations are shown in Table 2.2. Significant correlations ranged from .296 to .633. Any correlation coefficients between +/- .30 to .49 suggest a moderate relationship between variables, while those between +/- .50 to 1.0 suggest a strong relationship (Pallant, 2007). The VAMS-R total was moderately correlated with all HADS scores ( $p < 0.01$ ). The VAMS-R scales with the highest correlations with the HADS total scores were the *Afraid* ( $r = .59$ ) and *Tense* ( $r = .54$ ). The item *Sad* correlated significantly ( $r = .46$ ) with the HADS total, the HADS anxiety subscale, but not with the HADS depression scale. Item *Energetic* was the only item that was not significantly correlated with any of the HADS scores.

Table 2.2: Correlations between HADS and VAMS-R

	HADS Total	HADS Anxiety	HADS Depression
VAMS-R Total	.62**	.59**	.49**
Afraid	.59**	.63**	.30*
Confused	.48**	.47**	.29*
Sad	.46**	.50**	.24
Angry	.32*	.40**	.12
Energetic	.27	.22	.26
Tired	.44**	.38**	.42**
Happy	.45**	.41**	.41**
Tense	.54**	.52*	.42**
* Correlations significant at 0.05 level (two-tailed)			
** Correlations significant at 0.01 level (two-tailed)			

2.4.4 Content validity

The nature of the content depicted by the two modified items *Happy*, *Energetic* and their opposite mood states *Sad*, *Tired* was also investigated. All correlations between the four original (with labels) and without label items were significant ( $p<0.01$ ), indicating that when linguistic information is not available for each of these scales the meaning of the cartoon faces remained is clear to the respondents. Correlations between items with and without their verbal descriptors can be found in Table 2.3. The correlation coefficients for each scale were the following: Energetic=. 77, Tired=.37, Happy=.76, Sad=.75.

Table 2.3: Correlations between items with and without labels

	Energetic No Label	Happy No Label	Tired No Label	Sad No Label
Energetic	.77**			
Happy		.76**		
Tired			.37**	
Sad				.75**
** Correlation is significant at the .01 level (two-tailed)				

2.4.5 Test-retest reliability

Test-retest correlations ( $r_{tt}$ ) were calculated for the *Happy*, *Sad*, *Energetic*, *Tired* items. Table 2.4 displays the descriptive statistics for the scores of original and repeated items. The scores between original and repeated items were also compared using Wilcoxon signed-rank test and no significant difference was found between the *Sad*, *Happy*, *Tired* and *Energetic* scores at Time 1 and Time 2.



Table 2.4: Descriptive and comparison statistics for original and repeated items

	Original (Time 1)		Repeated (Time 2)		Comparison  P
	Median	IQR	Median	IQR	
Happy	13.50	19.00	18.00	17.00	.495
Sad	14.00	14.00	14.00	14.00	.325
Energetic	32.00	34.00	40.50	39.00	.541
Tired	37.50	29.00	42.00	33.00	.302

IQR: Interquartile Range

Spearman’s correlations showed that all original items were significantly correlated. Results indicated a mean test-retest reliability of .77 ( $p<.01$ ). Specifically, test-retest reliability coefficients for items *Energetic*, *Tired*, *Happy*, *Sad* were .81, .85, .63, .79, respectively. Therefore, all four items indicated high test-retest reliability within a very short test-retest interval. Correlations between original and repeated items are described in Table 2.5.

Table 2.5: Correlations between original and repeated items

	Energetic Repeated	Happy Repeated	Tired Repeated	Sad Repeated
Energetic	.81**			
Happy		.63**		
Tired			.85**	
Sad				.79**
** Correlation is significant at the .01 level (two-tailed)				

#### 2.4.6 Internal reliability of the VAMS-R

Each scale of the original VAMS was considered a single item, therefore precluding the use of measures of internal consistency. The VAMS-R was also tested as a scale with multiple items that can be used as a single measure of depressive and anxiety symptoms.

The most common indicator of a scale's internal consistency is Cronbach's Alpha ( $\alpha$ ) coefficient. A scale is considered to be reliable and to have good internal consistency if its alpha coefficient is above .70 (Field, 2005; Pallant, 2007). The internal consistency of the modified version of the VAMS-R was high ( $\alpha = .76$ ). With short scales (e.g., scales with less than 10 items) such as the VAM-R, it is common to find low alpha values, therefore inter-item correlations for all items were also considered. Inter-item correlations greater than .3 indicate that each item is measuring something similar to the scale as a whole (Pallant, 2007). Item-total correlations and alpha coefficients if item deleted are presented in Table 2.6. Item-total correlations were all around .3 (values ranged between .26-.58) and correlations were lower for items *Happy* (.26) and *Energetic* (.35). Alpha value was slightly increased when either of these items was deleted. Therefore, none of these items were considered to be excluded from further analyses.

Table 2.6: Item-total correlations and alpha values for VAMS-R

Items	Median	IQR	Item-Total Correlation	Cronbach's Alpha ( $\alpha$ ) if item deleted
1. Afraid	10.00	11.00	0.58	0.73
2. Confused	12.00	19.00	0.64	0.71
3. Sad	14.00	14.00	0.50	0.74
4. Angry	13.00	19.00	0.37	0.75
5. Energetic	32.00	34.00	0.35	<i>0.77*</i>
6. Tired	37.50	29.00	0.57	0.72
7. Happy	13.50	19.00	0.26	<i>0.78*</i>
8. Tense	24.00	38.00	0.62	0.71

*\*Higher values in italics*

IQR: Interquartile Range

Guttman's split-half coefficient was also high (.70) indicating that the scale had good internal reliability. Split-half reliability coefficients are summarised in Table 2.7. Split-half reliability methods randomly slit the data set into two and if a scale is reliable should correlate. The correlation between the two halves of the scale was .56. This is lower than the Cronbach's alpha ( $\alpha$ ) (.76) previously reported for the overall scale which is considered a more reliable method of internal consistency as there are several ways in which a set of data can be split into two and this can affect results (Field, 2005).



Table 2.7: Split-half reliability statistics for VAMS-R

Cronbach's Alpha	Value
-Form A	.73
-Form B	.61
Correlation between Forms	.56
Guttman Split-Half Coefficient	.70
Form A: <i>Afraid, Confused, Sad, Angry</i> Form B: <i>Energetic, Tired, Happy, Tense</i>	

2.4.7 Exploratory Factor Analysis of the VAMS-R

Exploratory Factor Analysis (EFA) was conducted on the VAMS-R to assess the number of factors underlying the 8 items which were designed and developed to assess positive and negative mood states. This method of statistical analysis can be used to test a hypothetical factor structure and it involves three stages: pre-analysis checks, factor extraction and factor rotation. EFA will either confirm whether the VAMS-R has a two-factor structure of depression and anxiety items or identify a different factor structure based on no expectations prior to the analysis (Ferguson & Cox, 1993).

a) *Pre-analysis checks*

There are several reasons for performing pre-analysis checks. First of all, it is important to ensure that the sample has a stable population structure and that each of the scale items are properly scaled and free from bias. Moreover, this would confirm whether the data are appropriate for the application of EFA.

One of the most important ways of achieving a consistent factor structure is to have an adequate sample size. The size of sample can be determined by a number of factors such as the number of participants per variable (Field, 2005). Here, the criterion was set using the subjects to variables ratio of 6.25:1 which satisfies the optimum recommendation of 2:1 (Ferguson & Cox, 1993). The ratio of variables to expected factors was 4:1 and of subjects to expected factors 25:2. All 50 participants included in the statistical analysis provided completed data on the VAMS-R. It is recommended that if communalities are equal or higher than 0.6 then smaller samples (less than 100) may be adequate when performing a factor analysis (Field, 2005). Prior to extraction all communalities were equal to 1 and after extraction all communalities except for *Angry* item (0.522) were >0.6 (0.667-0.872).

The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy for the item-total correlations was 0.716, which any value between 0.7 and 0.8 is considered to be good (Field, 2005). The Bartlett test of sphericity was highly significant ( $\chi^2=130.922$   $p<.001$ ) indicating that the method of factor analysis was appropriate. Multicollinearity or singularity (variables that are highly correlated  $r>0.8$ ) were not detected by looking at the determinant of the R-matrix which was 0.056 (greater than the necessary value of .00001) (Field, 2005). The correlation matrix (R-matrix) is presented in Table 2.8. This R-matrix was also used to check the significance levels for any values greater than .05. Each variable on the diagonal elements of the anti-image correlation matrix were also above the minimum recommended value of .5 (.560-.783). Therefore, no items were considered for exclusion before performing the analysis. Data were considered suitable for exploratory factor analysis and this was conducted on the scale with all 8 items included.



Table 2.8: Correlation R-Matrix

	Confused	Sad	Angry	Energetic	Tired	Happy	Tense
Afraid	.379 <i>p</i> =.003	.548 <i>p</i> <.001	.315 <i>p</i> =.013	.150 <i>p</i> =.149	.261 <i>p</i> =.033	.486 <i>p</i> <.001	.533 <i>p</i> <.001
Confused		.558 <i>p</i> <.001	.374 <i>p</i> =.004	.315 <i>p</i> =.013	.480 <i>p</i> <.001	.098 <i>p</i> =.250	.627 <i>p</i> <.001
Sad			.395 <i>p</i> =.002	.038 <i>p</i> =.396	.190 <i>p</i> =.093	.247 <i>p</i> =.042	.470 <i>p</i> <.001
Angry				-.076 <i>p</i> =.301	.292 <i>p</i> =.020	.192 <i>p</i> =.091	.352 <i>p</i> =.006
Energetic					.574 <i>p</i> <.001	.098 <i>p</i> =.250	.316 <i>p</i> =.013
Tired						.156 <i>p</i> =.140	.394 <i>p</i> =.002
Happy							.131 <i>p</i> =.182
Determinant=.056							



*b) Factor extraction*

The Kaiser 1 heuristic (K1) method extracts as many factors with eigenvalues greater than 1. Eigenvalues provide an estimate of variance associated with a factor. Table 2.9 presents the K1 summary of eigenvalues >1.0 and identified three factors (Eigenvalues 3.348, 1.404, 1.045), accounting for almost 73% of the variance. These values were produced by principal component analysis (PCA) and represent the variance accounted for by each underlying factor.

Table 2.9: Summary of eigenvalues

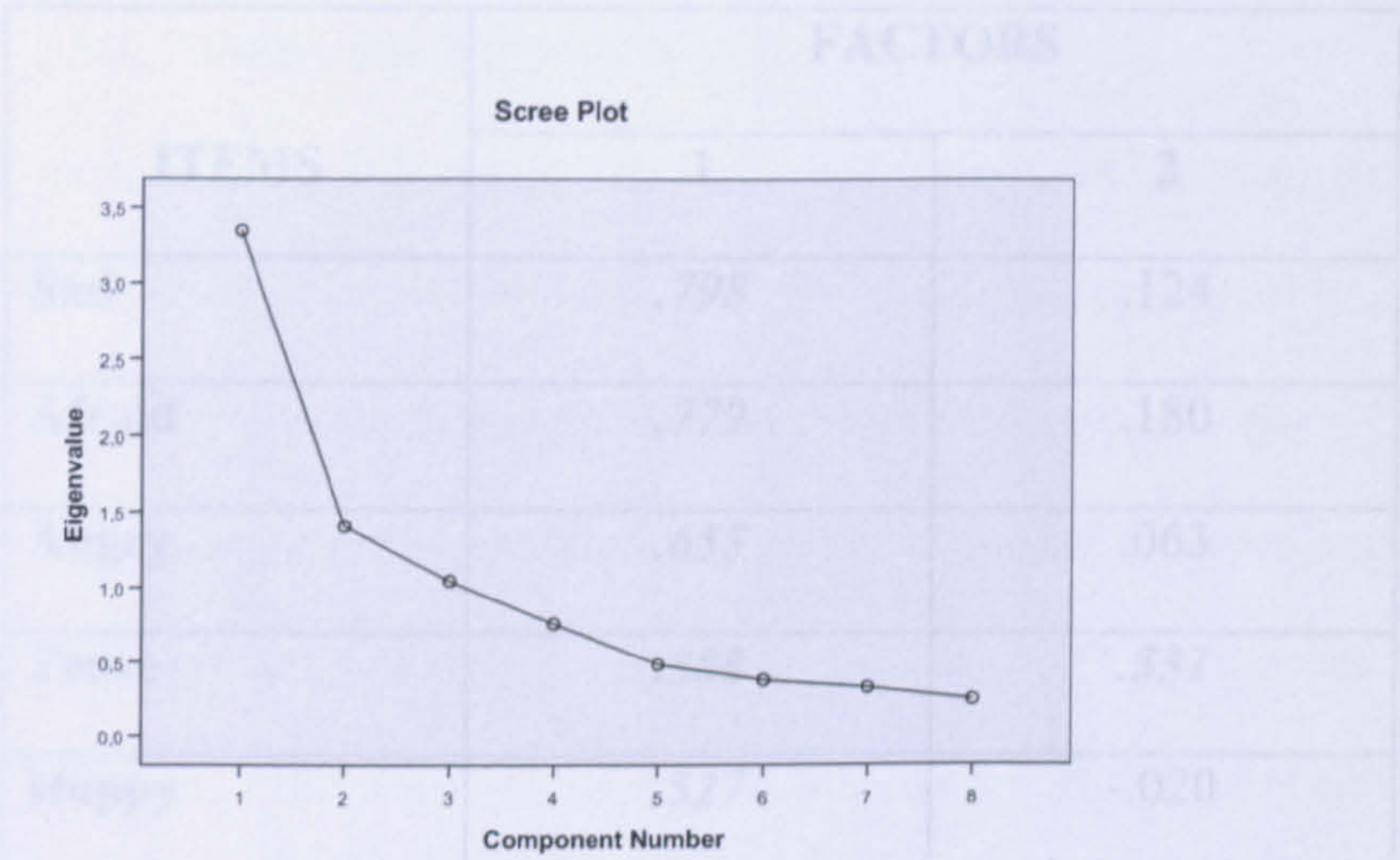
Factor	Eigenvalues	
	Total	% of Variance
1	3.348	41.855
2	1.404	17.556
3	1.045	13.062
4*	.759	9.485

\* rejected as the eigenvalue is <1.0

However, this extraction method is known to over-factor and is less accurate when there fewer than 30 variables (Field, 2005). Therefore, this factor model solution was also confirmed by the application of a scree plot, in which factors are presented on the x-axis and eigenvalues on the y-axis. The scree plot is shown in Figure 2.2. The existence of two factors was also confirmed by the application of the scree plot. However, it was shown that factors 1 and 2 explained much more of the variance than the remaining factors and that the point of inflexion in the shape of the plot was below the third factor. Therefore, two factors were extracted based on the scree plot and the a priori hypothesis of a two factor structure of ‘positive’ and ‘negative’ mood states. These two factors accounted for 60% of the total variance.



Figure 2.2: Scree plot



c) Factor rotation

Two factors were extracted using principal component analysis. The extraction method produced factor loadings for every item on every extracted factor. Orthogonal rotation was used based on the assumption that the factors were unrelated and because it is an extraction method that simplifies the interpretation of factors (Field, 2005). In theory, it is also possible that the underlying factors, anxiety and depression, may or may not be related. So, the two factor model was considered further using an orthogonal rotation (varimax) and this rotation method converged in three iterations. The rotated factor matrix is shown in Table 2.10. The minimum recommended loading for each item to load onto a factor is .4 (Field, 2005). Using this criterion, all items, except items *Energetic* and *Tired* were loaded on factor 1. The items *Tense*, *Energetic*, *Tired*, and *Confused* were loaded on factor 2. Cross loadings (variables that load on more than one factor/component and the difference between the loadings is  $<0.2$ ) were also observed for items *Tense* and *Confused*. The items which loaded onto factor 1 seemed to relate to depressive symptoms and the items which loaded onto factor 2 seemed to relate to a different factor referring more to energy levels than positive mood states.



Table 2.10: Rotated Factor Matrix

ITEMS	FACTORS	
	1	2
Sad	.798	.124
Afraid	.779	.180
Angry	.655	.063
Tense	.588	.531
Happy	.527	-.020
Energetic	-.126	.871
Tired	.172	.823
Confused	.550	.583

Note: Items are sorted by size of factor loadings

In summary, correlations between each of the VAMS-R items and the HADS were high, except for the items *Energetic* and *Tired*. Test-retest correlations for the *Energetic*, *Tired*, *Happy*, *Sad* items were significant ( $p<0.01$ ). Content validity for the items without verbal descriptors was also high ( $p<0.01$ ). Item-total correlations ranged from 0.26-0.62 and these correlations were lower for positive items. Internal consistency of the revised version was high ( $\alpha=.76$ ). Alpha values slightly increased when deleting positive items *Happy* and *Energetic*. A two-factor structure of the VAMS-R has been found between ‘negative’ (items *Afraid*, *Sad*, *Angry*, *Tense*, *Confused*) and ‘energy levels’ (items *Happy* and *Energetic*).



## **2.5 Discussion**

### **2.5.1 Validity and Reliability of the VAMS-R**

Each item of the original VAMS has been used as a single mood measure, but previous findings have suggested that a single-item visual analogue scale can only moderately predict classification of mood disorders (Killgore, 1999). The full 8-item revised version was explored as a single screening measure for mood problems, such as depression and anxiety. Based on findings from the present study, it is suggested that this revised version of the VAMS can be used as a multi-item mood measure. The VAMS-R was shown to have high internal consistency with Cronbach's alpha values indicating that all items of the scale were homogeneous and they measured something similar. Alpha coefficients did not significantly increase when removing any of the items. Based on these findings collected in a sample of older participants living in the community it can be suggested that no items should be removed from the scale.

The internal consistency of the VAM-R was significantly higher than the original version. It was also comparable to the one reported by Bennett et al. (2006), in which the items *Energetic* and *Happy* were removed from the original version in order to improve the scale's internal consistency. For the present study positive mood items were reversed, but no changes were made to the original scoring guidelines.

The VAMS-R was also shown to have good concurrent validity as it correlated significantly with the total and subscale scores of the HADS. The HADS correlated with all items of the VAMS-R, except the modified item *Energetic*. The *Sad* and *Angry* items did not significantly correlate with the HADS depression subscale.

The items with and without the verbal labels produced similar scores, which is consistent with previous studies with healthy young and elderly people (Stern, 1997; Stern et al., 1997), indicating that the faces themselves can be descriptive of the mood states.

Good test-retest reliability within the same assessment period suggested that participant's responses were consistent and stable within the time completing the questionnaire. The test-retest interval was very short as the items were administered twice within the same questionnaire, so it is possible that this resulted to high estimates of reliability due to practice effects. Therefore, further investigation of test-retest reliability for a longer time period between assessments is also recommended.

The modified version of the VAMS showed a two-factor structure in which all items except items *Happy* and *Energetic* loaded highly onto factor 1. These two factors accounted for over half of the variance in the scores. On a theoretical level, these two factors may be related and some items may be characteristic both of 'positive' and 'negative' mood states. However, the method of factor analysis does not allow drawing specific assumptions regarding factor identification. Factor analysis was used to identify common themes among items that loaded highly on each factor. It has shown that the VAMS-R is composed of two subscales. By looking at the items that were loaded on each factor it is possible that factor 1 was related to negative mood and that factor 2 was descriptive of energy levels. These findings are consistent with the two-factor structure reported by Nyenhuis et al. (1997) with Factor 1 referring to 'negative mood' and Factor 2 to 'energy'. The graphical representation of the factor analysis (i.e., Figure 2.2-Scree plot) also confirms the two-factor structure of the questionnaire.



Items *Confused* and *Tense* were loaded onto both factors suggesting a relationship between the factors and that both of these items may be used to assess depression and level of energy. It is possible that items which loaded on both factors (*Confused* and *Tense*) or positive mood states (*Happy*) refer to a third factor that was not identified in this factor analysis or that the two-factor structure represents two distinct underlying constructs. Therefore, findings should be replicated in a larger sample size to confirm this two-factor structure and also explain the variance not accounted in this analysis.

These findings support the use of the VAMS-R in healthy older people living in the community. This study has also confirmed that the format of the positive mood items was problematic, especially when assessing the reliability of the full 8-item scale.

The revised format of the positive items seemed more suitable for use in healthy older adults. Further investigation of whether this revised format helps stroke patients respond better and more consistently when assessed using this mood measure is required. Price et al. (1999) suggested that stroke patients have some difficulty using visual analogue scales, and this consistent format may overcome this problem.

Overall, the present study has provided evidence for the applicability of the VAMS-R as a simple and short measure of mood states. It was shown to have good concurrent validity, internal consistency, content reliability and test-retest reliability. It is a simple and short self-report measure that can be used to detect symptoms of low mood in healthy older adults. The revised version consistent report is more suitable and places less cognitive demands as it assesses mood using a consistent response format both for positive and negative items. The items *Happy* and *Energetic* could be excluded from the scale as they do not seem to directly assess a negative



mood state, although their inclusion when calculating the VAMS-R total does not affect the internal consistency of the overall scale.

### 2.5.2 Methodological limitations

When evaluating these results, a number of limitations must be kept in mind. First, these data were collected from a non-clinical, community sample and cannot be directly generalised to clinical and neurological populations without further validation. Very few participants had low scores on either of the measure indicating mood problems as median scores were relatively low. The recruitment method used in this study could have also increased the possibility of selection bias in the sample. The sources of recruitment were opportunistic such as day centres and community groups, therefore the sample may not be truly representative of a healthy elderly population. It is likely that those participants who did not consent to take part in the study had lower mood than those who did finally decide to participate, as lack of interest and motivations may be indicating the presence of depression.

It is also important to acknowledge that the choice of correlations for reliability and in particular for test-retest reliability is a controversial one. Significant correlations between two assessment points do not necessarily mean that there is an agreement as they can overestimate the true correlation for small sample sizes or there might be a perfect correlation if the points lie along any straight line (Bland & Altman, 1995). Other methods could be considered such as intraclass correlation coefficients (ICC) and Bland-Altman plots. Moreover, estimates of correlation are often sensitive to the nature (*i.e.*, heterogeneous) and size (*i.e.*, few participants) of the study sample. Multiple correlations were performed between the VAMS-R items and the HADS subscales, so it is possible that this increased the likelihood of Type I errors.

### **2.5.3 Clinical and research applications of the VAMS-R**

Based on these findings, it is recommended to use the VAMS-R with older adults, but more evidence is required for the screening ability (i.e. criterion validity and cut-off scores) of this version in neurologically and language impaired patients. The VAMS-R and HADS were significantly correlated and this raises the question of why a new mood measure was proposed to be used with older adults. An advantage of the VAMS-R over traditional measures of mood is that it relies more on pictorial rather than linguistic information. It is simpler and quicker than other measures of mood. It is a cognitively undemanding measure that may be suitable for older people with cognitive deficits. It can also become a valuable measure to use with neurologically impaired patients.

It is still unknown whether this modified version of the VAMS is reliable and valid when used with people with cognitive deficits. Scales that have been validated in a particular population may not necessarily be either valid or useful when used with other populations. It has been suggested that stroke patients are less likely than an age-matched control group to complete visual analogue scales accurately (Price et al., 1999). Therefore, it is important to also test its utility in a clinical sample of neurologically impaired patients. It is difficult to extend VAMS-R application beyond a healthy older population unless its validity and reliability is further investigated. Further studies should also evaluate whether the VAMS-R is sensitive to mood changes and whether it can be used to monitor the effectiveness of psychological therapies. Finally, it is recommended that when VAMS is used as a single mood measure, the positive mood items should be replaced with those modified in the present study. However, because there was no significant impact on alpha values when each VAMS item was removed from the scale, it is suggested that



a 6-item version, including only the negative mood items, can also be used to screen for depression.

## 2.6 Conclusion

Visual analogue mood scales are easy measures that can be used by any healthcare professionals to identify those at risk for mood problems and those who need further assessment by qualified professionals such as a clinical psychologist, mental health nurse or their GPs. It is suggested that the VAMS-R can be used with older people living in the community. It is a non-verbal and cognitively undemanding mood measure, since the schematic faces themselves were found to be descriptive of mood states. The revised version of the VAMS is recommended as a suitable assessment of mood for elderly people with communication problems or dementia. This revised version of the VAMS should also be tested in a sample of hospitalised older adults.

To conclude, the present study supports the suggestions that were made by Bennett et al. (2006). A revised version of the VAMS was developed that can be used in clinical practice and future research studies. The modifications made to two original VAMS items *Happy* and *Energetic* improved the reliability of the full 8-item scale and confirmed that the original format of these items was problematic. Accurate assessments of subjective mood states of people with neurological disorders are needed in both clinical and research settings. Therefore, further validation of the revised version is required with other populations, such as neurologically impaired patients. Future studies will be needed to test this version's screening ability when used in patients with cognitive and language impairments including stroke, dementia, and brain injury. The next study presented in this thesis will also investigate the psychometric properties of the revised VAMS in a sample of acute and post-acute stroke patients with communication problems.

### **3. CHAPTER THREE: METHOD**

#### **3.1 Chapter outline**

This chapter outlines the study design, methods and assessments used in the main study of this thesis. The process of recruitment to the study is summarised. Baseline and follow up assessments are described and reasons for their selection justified. Methodological and ethical considerations while conducting this research are also discussed.

#### **3.2 Design**

This study was a prospective longitudinal cohort study design. Patients were assessed at two time points. Baseline assessments were carried out when patients were recruited and follow-up assessments were also carried out at six months ( $\pm 2$  weeks) after the completion of baseline assessments. This design was chosen to examine mood problems in stroke patients with aphasia, to identify which factors are related to low mood in the same group of patients and whether any of these factors related to changes in mood over time. It was conducted in collaboration with a group of researchers and it was the first part of a randomised controlled trial for psychological treatments of depression in aphasic stroke patients (*CALM project -Communication & Low Mood*). The researcher (EK) was responsible for recruitment in the first part of the study and only those patients identified with low mood were referred to the treatment trial. This thesis was focused on information collected from all aphasic stroke patients to investigate which factors are related to low mood.

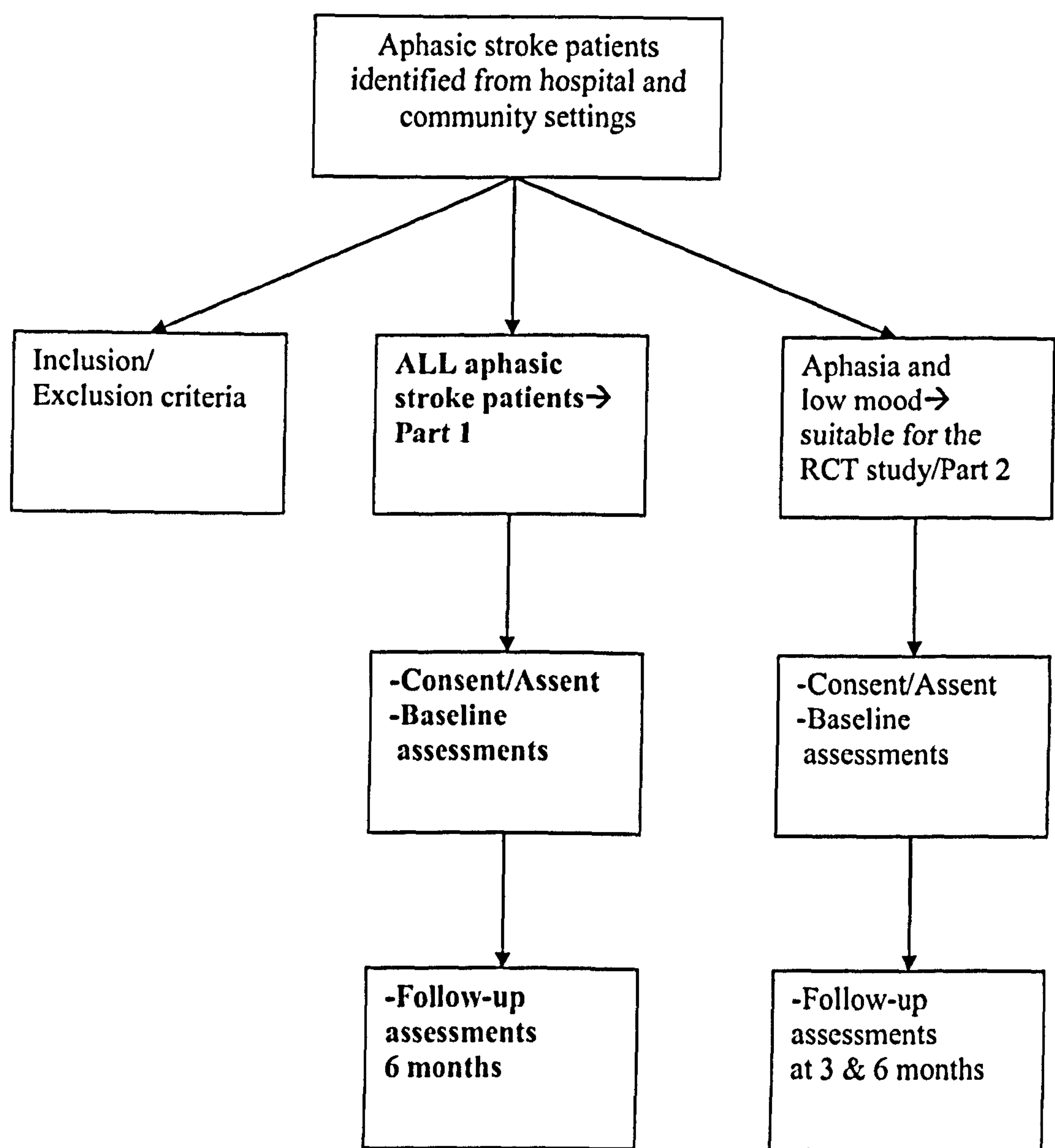
In summary, participants who met the study's inclusion criteria were invited to take part both from hospital and community settings. The aim of the present study was to include stroke patients with any type or severity of aphasia both at the early and the more chronic stage post-stroke. Patients were recruited in hospital at least a month



after their stroke. This is because the first few weeks many stroke patients may experience adjustment reactions rather than a more stable mood state. They may also be medically unstable, confused, and therefore may be unable to give consent and understand the purpose of a research study. Therefore, it was considered more appropriate to recruit people at least a month post-stroke. Community patients were recruited any time after their stroke. Follow-up assessments were carried out at six months after baseline assessments. A flow chart summarising the design used in this study may be found in Figure 3.1.

Stroke patients with aphasia were identified from hospitals (Nottingham University Hospitals), stroke databases, speech and language therapists' referrals and local support groups. If a patient met the study's inclusion criteria, he/she was invited to take part in the study.

Figure 3.1: Flow chart study design





### **3.3 Selection of participants**

Stroke patients with aphasia were identified and invited to take part between June 2005 and July 2007. Patients from hospital settings were identified by a documented diagnosis of stroke and aphasia in their medical records and those from community settings were referred through a network of speech and language therapists and other healthcare professionals. Patients admitted to stroke rehabilitation wards at Queen's Medical centre (ward F21) and Nottingham City Hospital (wards Berman, Beeston and Newell) were identified based on ward staff referrals and by consulting patient medical notes. An additional referral source for admission to the study was through the Nottingham University Hospitals Stroke Services database and the Community Stroke Team database. Some patients were also identified through several local networks, community rehabilitation centres, self-help groups, as well as organisations and charities supporting stroke patients with aphasia.

Recruiting patients from a range of sources enabled the researcher (EK) to identify more patients who were representative of the aphasic stroke population. This also ensured that a greater number of patients could take part in the study with any severity of aphasia both in the early and later stages after their stroke. To encourage recruitment from other healthcare professionals, a newsletter was sent every few months to stroke services within the area of Nottingham including information on the progress of the study so far and requesting further support in the recruitment of patients. We also distributed an information poster to regularly inform stroke survivors with aphasia, their relatives and staff working on the stroke services.

Patients were recruited at least four weeks post-stroke to ensure they were medically stable and were able to understand the consent and assessment procedures.

Careful attention was also given to develop additional accessible and aphasia-friendly information to convey the nature of the project to those patients with more severe communication problems. Patients who were able to sign the study's Consent Form were recruited and invited to complete baseline assessments. In many cases, family members, carers and/or friends were also given information about the study and were also asked to be involved in the consent process by signing a carer/relative Assent Form (see Appendix B).

### **Inclusion and exclusion criteria**

The inclusion criteria for this study were chosen to allow a representative sample of stroke patients with aphasia.

*Patients were eligible for inclusion in the study if:*

- They had been diagnosed with a stroke according to the ICD-10 World Health Organisation definition and this would be documented in their medical notes by a Consultant Stroke Physician.
- They had been diagnosed with aphasia from a Speech and Language Therapist.
- They were at least four weeks after their stroke. This ensured that patients were not assessed too early after their stroke, as they may experience transient adjustment reactions in the early days rather than a low mood state.
- They were conscious, alert and well enough to be approached for consent/assent, to answer questions and complete the assessments.

*Patients were excluded from the study if:*

- They were blind and/or deaf. This is because the assessments could not be administered in a standardised way.



- They had a documented history of dementia. This is because these patients' responses may be affected by insufficient insight and be related to these conditions rather than stroke.
- They have a history of depressive disorder and/or other psychiatric/mental disorder in the five years preceding their stroke. It should be noted that a number of exclusion criteria have been set for practical reasons and to avoid the possibility of pre-morbid disposition to emotional disorders.
- They were unable to speak and understand English prior to their stroke as the study assessments were in English language.
- They lived more than 40 miles from the recruiting centre. This is because of practical reasons to visit and complete assessments at their place of residence.

### **3.4 Power of the study**

The sample size required for the present study has not been informed using a formal statistical power calculation. A power calculation was performed for the randomised controlled trial study using one of the primary outcome measures (SADQ-21) and it was estimated that 180 participants (allowing for attrition rates) will need to be recruited to the study (See Appendix B-Information for Participants/Carers). However, this study was only a part of the main RCT, and therefore it was limited by practical time considerations and resources, so the researcher (EK) intended to recruit as many participants as possible within the two-year recruitment period to meet the basic requirements for the statistics conducted (i.e. number of predictor variables included in the multiple regression analyses) and to obtain a larger sample size compared to other studies on post-stroke depression and aphasia. The intended sample size for this part of the study was verbally explained and justified to all the participants invited to take part as it wouldn't meet the target of the RCT.

### **3.5 Ethical considerations**

The study was reviewed and ethically approved by the Nottingham Local Research Ethics Committee (see Appendix B). The study was also approved by the Research and Development Department of the Nottingham Queen's Medical centre in March 2005 and of the Nottingham City hospital in May 2005.

All patients and carers were given information sheets explaining the purpose and nature of the study and these can be found in Appendix B. Informed consent/assent was requested from patients and/or their carers/relatives. It is important to mention that patients who decided to take part in the study were free to withdraw at any time and without giving a reason and this would not affect their future standard care. All information gathered was kept confidential and anonymous and it was coded with a participant number.

The researcher invited stroke patients with aphasia either in hospital or in the community to take part in the study and those who were interested to find out more about the study were given an *Information for Patients* and/or *Information for Carers* sheet (for those people with severe communications problems who wished their relatives/carers to be involved in the process). The researcher also explained the study and according to ethical guidelines both participants and their carers were given the opportunity to read the information at their own time and then decide whether they wished to take part (BPS code of ethics and conduct, 2009). Those who signed a consent form and/or their relatives/carers signed an assent form were given a copy of the information sheet and the signed consent/assent form to keep for the records. Then, they were invited to complete baseline and follow-up assessments unless they informed the researcher that they decided to withdraw before the end of the study.



### **3.6 Demographic and clinical data**

The researcher collected demographic and clinical data from patients' hospital medical records. A data collection form was used (see Appendix C) to record personal and background information which is summarised in Table 3.1.

Information on demographic characteristics (e.g., age, gender) and on pre-stroke functional status (pre-stroke Barthel Index, living arrangements, marital and employment status) was recorded. Moreover, patients' clinical status at the acute post-stroke phase and information about the medical condition itself (date of stroke, type of stroke, time post-stroke, previous stroke) were also gathered for patients recruited in the hospital. The Bamford classification as documented in the medical notes was included as a descriptor of the sample's stroke characteristics (Bamford et al., 1991). Findings from CT (Computerised Tomography) and/or MRI scans (Magnetic Resonance Imaging) were also recorded to confirm stroke classification as they are used to indicate the location and severity of brain damage. The presence of other relevant medical conditions such as high blood pressure, high cholesterol, heart disease/atrial fibrillation, diabetes was also recorded. Discharge plans were also useful to record for hospital patients in order to obtain information about the patients' long-term care after hospital discharge.

For stroke patients recruited in the hospital, these data were obtained from their medical notes. For patients recruited in the community, the researcher requested access to their medical records, but whenever that was not possible some of the information was retrieved from the Nottingham University Hospitals Stroke Database.

Table 3.1: Information for data collection form at recruitment

INFORMATION	SOURCE
<p><b>Demographic details</b></p> <ul style="list-style-type: none"> <li>○ Age</li> <li>○ Gender</li> <li>○ Employment status <i>(i.e. with spouse, with others, alone)</i></li> <li>○ Marital status <i>(i.e. single, married, divorced, widowed)</i></li> <li>○ Living arrangements <i>(i.e. employed, retired, unemployed)</i></li> </ul>	<p>Medical notes (if necessary discussed and confirmed with patient and/or carer)</p>
<p><b>Stroke details</b></p> <ul style="list-style-type: none"> <li>○ Date of stroke</li> <li>○ Stroke classification <i>(i.e. PACS, TACS, LACS, POCS)</i></li> <li>○ Side of lesion</li> <li>○ Side of weakness</li> </ul>	<p>Medical notes (CT and/or MRI scan details, Bamford classification)</p>
<p><b>Medical history</b></p> <ul style="list-style-type: none"> <li>○ Previous stroke</li> <li>○ Pre-stroke functional status <i>(Barthel Index)</i></li> <li>○ History of psychiatric/psychological problems</li> <li>○ Other relevant medical conditions</li> </ul>	<p>Medical notes (if necessary discussed and confirmed with patient and/or carer)</p>



### **3.7 Summary of assessment methods**

Patients who consented to take part in the study completed some questionnaires to assess their communication, mood and activity level. Some of these assessments were carried out twice during the course of the survey study, both at recruitment and at 6 months follow-up. The most important criterion in choosing outcome measures for a research study is that they should be relevant to its purpose (Ebrahim & Harwood, 1999). A measure should be familiar to most professionals and researchers involved in stroke rehabilitation so that the study's findings could be communicable and could be compared with other studies or evidence from clinical practice.

It is also essential that they have been scientifically tested to ensure their psychometric properties, such as reliability, validity, and sensitivity to change.

The choice of measures for research may not be the same as that used for clinical work and it largely depends on what you want to measure, the type of setting and time constraints (British Society of Rehabilitation Medicine, 2000). Wade (1992) proposed some basic requirements upon which to evaluate measures for use in stroke rehabilitation research. These are briefly summarised and were taken into consideration when selecting the measures to be used in this study.

- **Standardisation**

It refers to a standard method for administration with clear instructions that can be used consistently.

- **Validity**

There are different types of validity which ensure how well a scale does in fact measure what it is intended to measure and how well it meets its purpose.

- construct validity

- criterion validity

- content validity

- **Reliability**

It is when a scale measures something consistently even under different testing conditions

- test-retest reliability
- inter-rater reliability
- intra-rater reliability

- **Sensitivity & Specificity**

These concepts refer to the proportion of true positives and false negatives respectively.

The reasons why different measures were selected to be used at baseline and at 6 months follow-up assessments are discussed and the administration and psychometric properties of each assessment are reviewed in more detail in the following sections of this chapter.



Table 3.2: Summary of assessment methods

INFORMATION	ASSESSMENTS	TIME POINT
Language/Cognition	-Sheffield Screening Test for Acquired Language Disorders (patient) -Comprehensive Aphasia Test (patient) a) Cognitive Screen b) Language Battery c) Disability Questionnaire	-Baseline  -Baseline <i>(only Disability Questionnaire at follow-up)</i>
Disability & Activities of Daily Living (ADL)	-Barthel Index (patient and/or carer) -Nottingham Extended Activities of Daily Living (patient and/or carer help) -Nottingham Leisure Questionnaire (patient and/or carer help)	-Baseline -Baseline & follow-up  -Baseline & follow-up
Mood	-Visual Analogue Mood Scales (patient) -Visual Analogue Self-Esteem Scales (patient) -Stroke Aphasic Depression Questionnaire-hospital version (nurse or carer)	-Baseline & follow-up -Baseline & follow-up -Baseline & follow-up
Disability & Impact of Aphasia	-Disability Questionnaire (patient)	-Baseline & follow-up
Carer Strain	-Caregiver Strain Index	-Follow-up
Satisfaction with Care	-Satisfaction with Care Scale for patient and/or carer	-Follow-up

### **3.7.1 Baseline Assessments**

After recruitment the patients who agreed to take part in the study completed baseline assessments assessing cognition, language, mood, and activities of daily living. The researcher was trained to carry out these assessments with the patients and aimed to complete them over two or three one-hour sessions either at the hospital or at their place of residence. A relative or carer was also asked to complete some questionnaires.

#### **3.7.1.1 Language**

##### **Sheffield Screening Test for Acquired Language Disorder (SST)**

**(Syder et al., 1993)**

The Sheffield Screening Test for Acquired Language Disorders (SST) (Syder et al., 1993) is a brief test of language ability that does not require test users to be either speech therapists or/and psychologists. It provides information on receptive and expressive communication performance in order to identify the presence of high-level communication problems in adults. It is not a detailed language assessment, but can detect the presence of a communication problem and determine whether patients require further assessment. The SST comprises two sections: 1) receptive skills and 2) expressive skills. The receptive skills section includes questions of graded difficulty, such as verbal comprehension of single words, comprehension of a sequential and a complex demand, recognition of differences in meaning between words, and comprehension of two short narratives. The expressive skills section requires verbal responses to questions related to word finding, sequencing, word description and verbal reasoning. Based on the manual (Syder et al, 1993), the total maximum score is 20, the maximum score for the receptive skills is 9 and for the expressive skills is 11. Cut-off scores are available from three different age groups (59 and under=17, 60-69=16, 70 and over=15), but usually failing of three or more items indicates a



communication problem. Normative data and data from stroke patients are presented in the manual. It has been recommended as a brief and suitable measure for the assessment of language difficulties in stroke patients (Blake et al., 2002). Al-Khawaja, Wade, & Collin (1996) found the SST a good predictor for the screening and diagnosis of aphasia. They compared the SST with the Frenchay Aphasia Screening Test (FAST; Enderby et al., 1987), another simple and short language screening test in a sample of neurologically impaired patients. Significant correlations were found between receptive and expressive skills scores in the two tests, as well as between total scores. The SST also had 89% sensitivity, 90% accuracy, and 100% specificity in detecting aphasia and these values were higher than those found for the FAST.

The SST has additional advantages, as it can detect high-level speech difficulties, which are more likely to occur in a community sample, it is not affected by visual neglect and does not require specific test materials, but it is a simple paper-and-pencil test. The SST has been used in previous stroke research (Sackley et al., 2008; Thomas & Lincoln, 2006/2008) and was recommended as a brief screening measure for language difficulties in stroke to determine whether a full and more comprehensive language assessment is required (Blake et al, 2002). The SST is administered using the standardised manual instructions and if required items are only repeated once. It takes ten to fifteen minutes to complete depending on the patient's level of communication.

The receptive, expressive and total scores were calculated for the SST. It has been suggested that the total SST score is a more accurate indicator of communication ability than either the receptive or expressive sections alone (Blake et al, 2002).



### **Comprehensive Aphasia Test (CAT) (Swinburn, Porter, & Howard, 2004)**

The most widely used aphasia tests are tests batteries comprising a range of subtest of many communication-related functions (Spreen & Risser, 2003; Lezak, 1995). Byng et al., (1990) examined in detail four major and widely used language batteries- the Minnesota Test for Differential Diagnosis of Aphasia (MTDDA) (Schuell, 1965), the Porch Index of Communicative Ability (PICA) (Porch, 1967), the Diagnostic Aphasia Examination (BDAE) (Goodglass et al., 2000), and the Western Aphasia Battery (WAB) (Kertesz, 1982) and concluded that none of them revealed the nature of the language impairment itself.

The Comprehensive Aphasia Test (CAT) (Swinburn, Porter, & Howard, 2004) is a language battery, which was developed for people who have acquired aphasia. The battery includes a cognitive screen, a language battery and a disability questionnaire. One of the main advantages of this battery is that the assessment of language impairment is completed by the examination of co-existent cognitive and disability factors. The cognitive screen assesses cognitive abilities across a range of tasks that can affect rehabilitation. The language battery contains subtests for a range of language abilities including both expression and comprehension. The disability questionnaire aims to explore the psychosocial impact of impairment from the perspective of the person with aphasia.

The authors of the CAT suggest that it is a relatively brief and easy to score language test compared to other widely used language batteries such as the Boston Diagnostic Aphasia Examination and the Psycholinguistic Assessment of Language Processing (PALPA) (Swinburn, Porter, & Howard, 2004). Aphasia test batteries differ in organisation, number of subtests, and the level of difficulty and complexity to which the examination is carried out (Lezak, 1995). Therefore, the choice of language

assessment should be determined by the purposed of the examination (Spreen & Risser, 2003).

The CAT can be used with people who have both global-severe and specific-mild language impairments. It is a newly developed language assessment therefore most evidence on its psychometric properties is found in the manual. The psychometric properties were well documented in a group of non-aphasic control subjects and in people with chronic aphasia. There is sufficient evidence on each section's construct, predictive and concurrent validity. Test-retest reliability was found to be lower for scores of individual subtests than for combined total scores of different sections. Inter-rater reliability was measured using video recordings of four people with different severity and type of aphasia while being assessed by different people. Based on this it was found that there was excellent agreement between assessors for almost all the subtests of the CAT.

The authors recommended that if the assessment is spilt over a number of sessions, the cognitive and the language sections should be completed together in one session and the disability questionnaire in a separate session.

The researcher administered all subtests of the cognitive screen, some subtests of the language section and the full disability questionnaire over two sessions each lasting approximately 45 to 60 minutes. The directions for administration in the manual were followed to ensure standardised assessment of aphasia for all study participants.

The CAT was not completed by those stroke patients with aphasia who had a score  $\leq 5$  on the Sheffield Screening Test because people with very severe communication problems would not be able to attempt the CAT and that formal language testing may not be appropriate or possible at this stage.

The authors suggested that formal language assessment of aphasia with the CAT should take place between 3-6 weeks post-stroke, once a patient is medically stable and rapport can be established. All stroke patients in hospital settings were invited to take part in the study at least a month after their stroke and all baseline assessments, including the CAT, were not completed at the very early days after their stroke when other factors can affect test administration and performance. The full battery and each of the three sections will be described in more detail.



### **1) Cognitive Screen**

This first part of the CAT is a selection of cognitive subtests to screen for cognitive deficits associated with the presence of aphasia. This brief cognitive screen was used to assess the impact of cognitive functioning on mood scores. It includes six subtests including line bisection, semantic memory, word fluency, recognition memory, gesture object use and arithmetic.

The impact of visual neglect was assessed using the *line bisection* task. The *semantic memory* subtest was used to assess whether people with aphasia can establish a semantic association between one picture and another in the presence of other related and unrelated pictures. A *word fluency* test was also included within the cognitive screen since poor performance in word fluency tasks with picture naming can be indicative of executive problems. The *recognition memory* test screened for non-verbal recognition memory problems using items from the semantic memory subtest. The next subtest uses pictures of everyday objects and participants are asked to gesture their use. This *gesture object use* test assesses for apraxia which is a deficit that is closely related with the presence of aphasia. The last subtest identifies *arithmetic* problems as respondents are presented with simple calculations and they have to choose the correct answer from a choice of five. The only subtests scores that can be combined from this section are the semantic memory and the recognition memory individual scores to provide a summed memory score.

## **2) Language Battery**

The second and largest part of the CAT assesses language abilities. It consists six parts with a total of 27 subtests. Not all language subtests were administered for the purpose of this research study for practical reasons in order to limit the number of sessions needed to complete all baseline assessments. The authors suggested that the Comprehensive Aphasia Battery (CAT) can be completed over two sessions each lasting approximately an hour and this can be often difficult to accomplish for when assessing stroke patients in hospital or at home for the purpose of the research study. Lengthy assessments would increase drop-out rates either at baseline or at follow assessments.

The researcher selected certain subtests of the CAT to administer which assessed language impairments that may be related to the development and course of low mood in aphasia. Specifically, the researcher selected 10 out of 27 subtests that cover a wide range of language functions such as comprehension of spoken and written language, naming, reading, repetition, and writing. The remaining subtests referred to more specific language abilities such as repetition of digit strings or writing to dictation that would be useful and more appropriate in the clinical assessment of aphasia. The subtests chosen were representative for the assessment of key verbal functions to determine the nature and severity of communication impairments in this sample of aphasic stroke patients (Lezak, 1995).

These following subtests from this battery were used in this study to assess language performance of aphasic stroke patients:

### **1) Spoken Language**

- Comprehension of spoken words
- Comprehension of spoken sentences

## **2) Written Language**

- Comprehension of written words
- Comprehension of spoken paragraphs

## **3) Repetition**

- Repetition of words

## **4) Naming**

- Naming objects

## **5) Reading**

- Reading words
- Reading function words

## **6) Writing**

- Writing-copying
- Writing picture names

The factor structure of the language battery was tested and it demonstrated a three – factor model, with one factor for all comprehension and writing subtests, a second for repetition and spoken picture description and a third for naming and reading subtests. There is some evidence on its concurrent validity as it was found that the CAT scores correlated highly with the Frenchay Aphasia Screening Test (FAST) in a sample of 21 people with aphasia at six weeks after their stroke (Swinburn et al., 2004).



### **3) Disability Questionnaire**

The final part of the CAT is a questionnaire relating to aspects of disability and emotional problems associated with the presence of aphasia. It is a quantitative questionnaire that also allows obtaining qualitative information while the person with aphasia responds to specific questions. The aim of the Disability Questionnaire (DQ) is to incorporate the views and perceptions of the person with aphasia and the impact of their communication impairments on his/her everyday life. It is considered important to obtain the individual's own view of any communication problems and their impact on their everyday life and emotional well-being (Parr et al., 1997).

The DQ is divided in four different but closely related sections: 1) disability, 2) intrusion, 3) self image and 4) emotional consequences. The disability section is also divided in four parts that are looking at disability in terms of different language modalities such as talking, understanding, reading, and writing. The summed scores from the different parts of the disability section make the total *disability* score. The summed scores from the intrusion, self image and emotional consequences sections make up the total *impact* score. The total disability and impact scores combined give a total score disability questionnaire score. For each question there is a rating scale, ranging from 0 to 4. Verbal descriptors for the rating vary for each section. High scores indicate greater disability associated with specific communication problems. Specifically, the higher the score, the more the negative impact of communication difficulties for the person with aphasia.

### **3.7.1.2 Disability and Activities of Daily Living (ADL)**

#### **The Barthel Index (Collin et al, 1988)**

There are quite a few ADL measures available (Wade, 1992), but the Barthel Index (Collin et al, 1988) is among the most popular and widely used assessment of personal ADL for stroke research. It can be used to assess degree of independence from any physical and/or verbal help in personal self-care activities. There are many and different versions of the BI, but the most popular and one recommended for use is that published by Wade & Collin (1988).

The Barthel Index (Wade & Collin, 1988) is widely used in stroke research as a measure to assess basic self-care activities. It includes ten items related to feeding, bathing, grooming, dressing, bladder control, bowel control, toileting, chair/bed transfer, mobility, and stair climbing. The Barthel Index is an established measure of disability with strong reliability and validity data, but it has shown to have low sensitivity for high level functioning (Wade, 1992). It should be used as a record of what a patient does and not as a record of what a patient could do (Wade, 1992).

Based on the response categories, items were scored 0/1, 0/1/2 and/or 0/1/2/3 with a maximum score of 20. A higher score was indicative of greater independence and less disability. This scoring method was proposed by Collin et al (1988) and was preferred over the original scoring system (Mahoney & Barthel, 1965) in which each item was scored from 0-5, providing a possible total score of 100. It has been suggested that the index should be completed from the 'best available source' (Wyller, Sven, & Bautz-Holter, 1995). However, comparison between patient or relatives' and other healthcare professionals scoring has shown some deviation but this observation was not considered clinically and/or statistically significant (Ranhoff & Laake, 1993).



The BI is usually preferred both in clinical research and practice over more complex scales. It has been used in many stroke studies, therefore allowing comparison to findings from other studies. It is easy and quick to complete either by any healthcare professional or by self-report. Administration and scoring takes about five minutes.

Its validity and reliability is well-documented in stroke patients (Wade, 1992) and it is considered a useful indicator of functional independence. The BI is sensitive to detect changes in functional levels and to predict functional outcome after stroke (Kwon et al., 2004; Wyller, Sveen, & Bautz-Holter, 1995). It is a one-dimensional index among stroke patients and its single sum-score can be used to assess basic ADL functions.

For some patients in hospital the pre-stroke BI was recorded in the medical notes, for all others the patient and/or carer were asked to complete it during the first baseline assessment. The post-stroke BI was also completed with the patient or/and the carer (or the nurse if the patient was in hospital at the time of the assessment). Items were read aloud and repeated if required, especially for those patients with more severe communication problems.

#### **Nottingham Extended Activities of Daily Living Scale (Nouri & Lincoln, 1987)**

More complex activities of daily living, such as everyday tasks that are performed to maintain independence in the home and community were assessed using the Extended Activities of Daily Living (Nouri & Lincoln, 1987). This 22-item questionnaire consists of four subscales: Mobility (1-6 items), Kitchen (items 7-11), Domestic (items 12-16) and Leisure (items 17-22). The scale records what participants have actually done the last week. Responses were scored on a four point scale that answers of 'No' and 'With help' scored 0 (dependent) while 'On my own



with difficulty' and 'On my own' scored 1 (independent). The overall total score was between 0-22 and scores for each sub-scale were also obtained.

It was developed for use with stroke patients living in the community as it is concerned with how stroke patients actually function when they are at home. It measures a higher level of function than other ADL measures such as the Barthel Index (Gladman et al, 1993). Its validity (Lincoln & Gladman, 1992) and reliability (Gompertz et al., 1993; Nouri & Lincoln, 1987) in stroke have been well-documented. It is the most popular among other favourable EADL measures used in stroke such as the Rivermead ADL or the Frenchay Activities Index (Turner-Stokes & Turner-Stokes, 1997). Each section of the EADL has been shown to be valid and unidimensional with good construct validity (Gladman et al., 1993). Test-retest reliability over two weeks was also found to be good for the majority of the items (Nouri & Lincoln, 1987).

Questions and answers were also read aloud, if required, for participants who had reading problems. For those participants with severe communication problems, the EADL was completed with assistance from a carer or relative.

#### **Nottingham Leisure Questionnaire (N-LQ) (Drummond & Walker, 1995)**

The Nottingham-Leisure Questionnaire (Drummond & Walker, 1995) was developed to measure level of participation in leisure activities in the elderly or following disabling conditions such as a stroke (Drummond & Walker, 1995). It has been used to assess leisure-time and recreational activities in many trials evaluating the effect of occupational therapy intervention (Walker et al., 2004; Parker et al., 2001; Logan et al., 1997). The original Leisure Questionnaire was shortened, its response categories reduced from five to three and layout and instructions simplified to improve self-completion (Drummond et al, 2001). Therefore, the shortened version

of the Nottingham Leisure Questionnaire seemed more suitable for use with aphasic stroke patients since it simply lists 30 leisure items and has three possible response categories (regularly, occasionally, never). All items were scored from 0-2 and higher scores denoted a greater number of leisure activities and/or greater frequency of activities. It includes a wide range of leisure activities such as walking, gardening, shopping and cooking for pleasure, collecting things, and volunteer work (a copy of the full questionnaire can be found in Appendix C).

The validity and reliability of this questionnaire was tested using patients from a randomised controlled trial comparing different forms of occupational therapy for stroke patients (Drummond et al., 2001). The results showed that higher NLQ scores were associated with higher scores on the Nottingham Extended Activities of Daily Living Scale (NEADL). Participants use all the activities listed and the questionnaire was relevant for both males and females. It was also found to be reliable as a postal questionnaire with good test-retest reliability, but its validity as a postal measure depends on residential status, emotional health and ADL activity.

The respondents were asked to record the number of activities and the amount of time spent doing them over the last few weeks prior to the assessment. For patients with severe communication problems the questionnaire was completed with help from their carers or relatives.

### **3.7.1.3 Mood**

#### **Visual Analogue Mood Scales (VAMS) (Stern, 1997)**

Many self-report mood measures are not appropriate for use with stroke patients with communication problems, due to high demands on verbal ability. Non-verbal techniques, such as descriptive faces of mood states placed at both ends of a continuum, can be used to enhance aphasic stroke patients' comprehension and



understanding (Robinson & Benson, 1981). The VAMS is a non-verbal measure of internal mood states developed specifically for neurologically impaired patients, specifically those who experience communication problems. It is a short measure that includes a range of emotions and is not affected by visual problems such as hemianopia and neglect.

The VAMS is completed by the patient to assess eight mood states (afraid, confused, sad, angry, energetic, tired, happy, tense) using unipolar scales presented on separate pages. Each of the eight scales consist a 100 mm vertical line, a drawing of a 'neutral' face and a drawing of a 'mood' face placed either at the top and/or the bottom of this line.

The validity and reliability of the VAMS has been investigated in healthy young and older adults, and psychiatric patients (Bennett et al., 2006; Nyenhuis et al., 1997; Stern, 1997). Recent studies have also provided evidence on its psychometric properties for use with stroke patients (Bennett et al, 2006; Arruda et al, 1999) and people with dementia (Temple et al., 2004). Based on this study's findings a modified version of the VAMS (VAMS-R) was developed and validated for use in this study. The positive items 'Happy' and 'Energetic' were reversed for a more consistent format and this resulted in a higher internal consistency ( $\alpha=.76$ ) than the one reported by Bennett et al. (2006) including these items ( $\alpha=.45$ ), but similar to that reported when these items were deleted ( $\alpha=.73$ ). More details on the development and validation of this version are presented in Chapter 2 of this thesis.

The modified version of Visual Analogue Mood Scales (VAMS-R) (Stern et al., 1997) was used to assess mood of aphasic stroke patients and in particular the 'Sad' item of this measure (optimum cut-off point for low mood  $<50$ ). A cut-off score of 50 on the sad item has been found to have sensitivity of .078 and specificity of 0.88



to detect low mood, but still this should not be used as the only criterion for a formal clinical diagnosis of depression (Stern, 1997).

The VAMS-R was completed with the participants and it took five to ten minutes to complete. The researcher explained the instructions using the example item on the first page of the assessment. The patient was instructed to make a mark somewhere along the 100mm horizontal line to indicate how strongly they feel the depicted mood, if at all.

#### **Visual Analogue Self-Esteem Scale (Brumfitt & Sheeran, 1999a)**

The Visual Analogue Self-Esteem Scale (VASES) (Brumfitt & Sheeran, 1999a) is a short and easy to administer pictorial measure that possesses good psychometric properties. It has been developed to meet the needs of people with aphasia and at present it is among the few available non-verbal means for measuring mood states in that population. It was designed to measure self-esteem, which is considered to be one aspect of mood. It has been suggested that low self-esteem is related to the development of depressive symptoms and general emotional distress (Vickery, 2006). Previous research has shown that the VASES can measure depression and anxiety as well as self-esteem (Brumfitt & Sheeran, 1999b).

The VASES has a consistent format, does not rely on intact verbal communication and it is not a cognitively demanding measure. It consists 10 bipolar pictures representing self-descriptive evaluations with written labels above the pictures such as 'confident-not confident' or 'optimistic-not optimistic'. Responses are selected by choosing one of two signs (++) representing 'very true of me' and + representing 'true of me') or 0 (representing 'neutral') under whichever picture-label is more descriptive of the individual on that construct. Each item is scored from 1 to 5 and high scores indicate higher level of self-esteem. Each picture represents the opposing

end of a construct and the ten items are: 'not being understood-understood', not confident-confident', 'cheerful-not cheerful', 'outgoing-not outgoing', 'mixed up-not mixed up', 'intelligent-not intelligent', 'angry-not angry', 'trapped-not-trapped', 'not optimistic-optimistic' and 'frustrated-not frustrated'.

There is also a 'depressed-not depressed' item which is used as a practice item and is not normally included when adding the total score. For this study the VASES total score was obtained with and without this practice item as the total score including the 'depression' item has been found to have better internal consistency (Bennett et al, 2006). A cut-off total score of <32 without the practice item has been shown to be related with high levels of emotional distress (Vickery, 2006). The VASES total score can be used as a baseline measure and then during the rehabilitation process to monitor any changes over time (Brumfitt, 1998).

Reliability and validity of the VASES was established in a large sample of students and two small samples of people with aphasia (Brumfitt & Sheeran, 1999b). Internal consistency and re-test reliability were found to be very good in both populations. It was also demonstrated that it has good construct validity as the 10 final items were loaded on a single factor. It was also significantly correlated with other mood measures (General Health Questionnaire and Hospital & Anxiety Depression Scale) and self-esteem measures (Rosenberg Self-esteem Scale and Semantic Differential Measure of Self-Esteem). The VASES was also shown to have better reliability, validity and acceptability than the VAMS in a group of people with multiple sclerosis (Groom et al., 2003).

The researcher completed the VASES with the participant and it took about 10-15 minutes to complete. Firstly, the participant was asked to decide which of the two pictures was most descriptive of them and then to choose one of the two signs



representing whether that was true or very true of them. If the participant expressed a neutral opinion on a construct they selected zero as a response. Some stroke patients with severe aphasia were unable to follow the instructions and complete the scale. Some others even if they responded to the pictures they did not complete the assessment when the researcher was not able to validate their ability to choose reliably between positive and negative items.

### **Stroke Aphasic Depression Questionnaire-hospital version (SADQ-21)**

**(Sutcliffe & Lincoln, 1998)**

The Stroke Aphasic Depression Questionnaire (SADQ) (Sutcliffe & Lincoln, 1998) is a 21-item questionnaire that was developed on the basis of questionnaire items that reflect observable behaviours associated with low mood. A nurse or carer completes the SADQ in relation to the patient. It was designed for patients that may not be able to complete satisfactorily either verbal or picture-based mood measures even provided appropriate support and assistance. It relies exclusively on external observation of the patients' emotional behaviour.

The utility of the SADQ as an indicator of emotional distress completed by a proxy rater has been shown in care home and rehabilitation settings (Sackley et al., 2006; Leeds et al., 2004). There is also a shortened version, the SADQ-10 which is more suitable for screening purposes and includes items that can differentiate better between those with high scores from those with low scores on depression questionnaires. A revised version was also developed for patients in hospital. This study used the 21-item hospital version SADQ as this has also been validated in a sample of hospitalised stroke patients and it has been found to correlate better than the community version with the Wakefield Depression Inventory (Lincoln et al., 2000). Moreover, feedback from in-patient and community studies when the measure



was originally validated suggested some difficulties with response categories when answering some of the questions and this was addressed by the revised version (Sutcliffe, 1997). Specifically, the hospital SADQ consists the same 21 items as the original SADQ, but its response categories were changed from 'often', 'sometimes', 'rarely' and 'never' to 'every day this week', 'on 4 to 6 days this week', 'on 1 to 4 days this week' and 'not at all this week'. The internal consistency of this revised version has been found to be high (Cronbach's  $\alpha=.82-.84$ ) (Bennett et al., 2006; Lincoln et al., 2000). The hospital version of the SADQ can also evaluate a greater range of behaviours related to patients' mood than other observational mood measures such as the Signs of Depression Scale (SODS) (Groom et al, 2003). Turner-Stokes and Hassan (2002) suggested that the SADQ can be used in an integrated care pathway for depression in stroke for those patients who cannot complete scales that rely on verbal communication.

The SADQ-21 was completed by a nurse for hospital patients and by a carer/relative for patients in the community. In some cases, the questionnaire was left with a pre-paid envelope so it could be returned by post within a few days after. Reminders by telephone or/and by post if questionnaires were not returned and any missing or unclear responses in returned questionnaires were clarified by telephone if this was possible. Each item was scored from 0-3 with items 4,7,12,15,16,17,18,20 and 21 scored from 3 for 'Not at all this week' to 0 for 'Every day this week' and for all other items scoring is reversed. Items responses were summed to provide a total score ranging from 0-63, with higher scores indicating greater emotional distress. A total score of 17/18 was identified as the optimum cut-off score when validated in a sample of stroke patients (Bennett et al, 2006).

### **3.7.2 Follow-up assessments**

Participants were assessed on primary and secondary measures six months after completion of baseline assessments. Some of the baseline assessments were also repeated at six months follow-up. The researcher visited the patients to complete assessments to measure mood (VAMS-R, VASES, SADQ-21), activities of daily living (N-EADL, N-LQ) and communication-related aspects of disability (Disability Questionnaire). Some additional questionnaires were included to assess caregiver strain (CSI) and patient and/or care satisfaction with care (SWC).

#### **3.7.2.1 Carer Strain Index (CSI) (Robinson, 1983)**

The Carer Strain Index (Robinson, 1983) has been used to assess carer strain in the context of care of the elderly and specifically in stroke. Its validity is well-established in the original paper. It is a brief measure comprising 13 statements to identify physical and psychological stressors on caregivers. The scores ranged from 0-13 and a high score indicated a high level of caregiver strain. A modified version of the Carer Strain Index was used in this study. Scoring categories were changed from yes/no to never/rarely/sometimes/often. The method of scoring was 0,0,1,1 to classify carers to those who were experiencing strain and those who were not. 'Never' and 'rarely' was compared with an answer of 'no' while 'sometimes' and 'often' was compared with an answer of 'yes' on the original version of the CSI. This slightly modified version was preferred over the original because it has been shown to be easier for carers to understand and complete (Blake, 2001). A straight answer of 'yes' or 'no' is more difficult to choose if a situation may occur sometimes or not very often. It has been suggested that adjective scales can provide more information and are more reliable than 'yes'/'no' dichotomous scales (Thornton & Travis, 2003; Streiner & Norman, 1996).

Its psychometric properties were well-tested in the original paper by Robinson (1983). It was also stated that there are no significant differences between CSI scores among men and women or differences in scores based on the relationship of the carer to the patient. However, it was found that younger carers had higher CSI scores. van Exel et al. (2004) compared different caregiver burden scales for stroke patients and suggested that the CSI is more feasible for assessing caregiver strain in stroke than other longer and more complex measures such as the Sense of Competence Questionnaire (SCQ) or the Caregiver Reaction Assessment (CRA).

#### **3.7.2.2 Satisfaction with Care Scale (SWC)-Patient & Carer version**

The Satisfaction with Care Scale was included in order to obtain some information on patients' and/or their carers' satisfaction with different services and support they received after their stroke. This short questionnaire was designed and adapted based on the satisfaction with care questionnaires that were used in a study evaluating a stroke family support organiser (Lincoln et al., 2003) and a study evaluating cognitive assessment in stroke rehabilitation (McKinney et al., 2002). The Satisfaction with Care Scale was used to get an overall impression of whether the services met the patients' and carers' needs using horizontal visual analogue scales ranging from 0-100% satisfaction.

It included three questions which were related to patient and/or carer satisfaction with relevant aspects of their care post-stroke. The questions referred to satisfaction with emotional support, help for their communication problems and the overall hospital and community services they have received since their stroke. The respondents were asked to put a mark on a 10 cm horizontal line at the place it shows how satisfied they are with different services and support received themselves or the person for whom they care since their stroke. All questions were scored from 0



(representing 'Totally dissatisfied with the care received') to 100 (representing 'Totally satisfied with the care received'). High scores indicated higher satisfaction with services and support received. Scores from all three questions were summed to obtain a total score that ranged from 0 to 300. For those patients with severe aphasia only the carer version was completed.

### **3.8 Methodological issues**

There are several methodological issues that can arise when conducting a research study with stroke patients in general and especially with those with communication problems. Some of these issues were taken into consideration in the design and methodology of the present study. Aphasic stroke patients are mostly elderly individuals who may experience a range of physical and cognitive difficulties and this should be taken into account when choosing the type and number of assessments used. Assessments need to be brief and easy to administer because stroke patients may easily get tired and experience concentration difficulties. These practical issues were considered when assessing patients in hospital or at home.

Participants were recruited both from hospital and community settings to get a broad and representative sample of stroke patients with aphasia any time after their stroke. For stroke patients in hospital who are still at the early stage post-stroke the process of consent and completion of baseline assessments may be more difficult than for those patients recruited in the community. Many hospitalised stroke patients could not take part because of practical issues or medical complications. Hospital wards are often busy and noisy environments and this can make the process of recruitment and informed consent even more challenging, especially for those stroke patients who are still confused, medically unstable or have suffered severe communication problems.

If the researcher could not approach some patients in the hospital due to ill health or other practical limitations, permission was requested by their relatives/carers to contact and invite them to the study at a later stage.

Different recruitment sources were used to increase sample size and therefore statistical power. Recruitment in post-stroke depression studies can be very difficult due to a number of reasons such as severity of stroke and aphasia. In most cases, stroke patients with aphasia had suffered a severe stroke and were also left with a range of other physical and cognitive problems. Another problem that affects recruitment rate is the inherent nature of mood problems as many people do not feel comfortable to discuss how they feel and in particular those with low mood may not be interested to take part mainly because of their depressive symptoms (e.g. withdrawal, loss of interest).

Mood was assessed using mainly standardised self-report scales, complemented by an observer-rated measure. The purpose of the study was to investigate whether there are stroke patients with aphasia who experiences symptoms of low mood rather than to confirm the presence of depression using a formal clinical diagnosis. The terms 'low mood' or 'depression' are used interchangeably in this thesis to describe a wide range of depressive symptoms rather than a clinical syndrome defined by diagnostic criteria. Self-report and observer-rated mood measures designed for people with aphasia were preferred over a clinical interview which is based on widely accepted diagnostic criteria for depression. This method would not have been feasible since the study's participants had communication problems that would not allow them responding to many of the questions. Moreover, diagnostic classifications have not shown to be consistent when used as a method of assessing depression in stroke patients (Lincoln et al., 2003).

The use of questionnaires provided more information about the severity of mood problems and such measures are more likely to be used in the future to screen routinely all stroke patients with communication problems. Additional questionnaires were also selected to assess level of disability and activities of daily living.

### 3.9 Procedure and data collection

All stroke patients with a documented diagnosis of aphasia who met the study's inclusion criteria were invited to take part in the first part the study. Stroke patients in hospital were approached by their bedside and were invited to take part in the study while those in the community were sent an invitation notice by post. Participants who were able to provide informed consent or/and for whom their relative or carer provided assent took part in the first part of this study and completed baseline assessments. It is important to note that those people who were identified as having low mood after completing their baseline assessments were invited to the second part of the study which is a randomised controlled trial for low mood in aphasic stroke patients (*CALM-Communication & Low Mood study*)

For all participants background and demographic information was recorded from hospital medical notes. Information such as date of birth, date of stroke, Bamford stroke classification (i.e., PACS, TACS, LACS and POCS), side of lesion and side of weakness were also documented using information from medical notes. It was also recorded whether that participant had suffered a previous stroke or had any other relevant medical history. The medical notes were also checked to confirm the presence of aphasia as a result of stroke and whether the patient had a previous history of psychological/psychiatric problems. If living arrangements, employment and marital status were not recorded in their medical notes then this information was obtained by asking the patient and/or their carer/relative.



All assessments at baseline were completed within a month after recruitment with the researcher either at the hospital or at their own home. Baseline assessments were completed over 2 to 3 one-hour sessions depending on their communication abilities. The researcher tried to complete all baseline assessments within a month after recruitment unless the participants' circumstances did not make this possible such as if they were unwell or unavailable.

All participants were screened for communication problems using the Sheffield Test for Acquired Disorders (SST) (Syder et al, 1993). Those patients who scored below 5 on the language screening test were most likely not able to complete some of the self-report questionnaires or the comprehensive language battery. All other participants also completed the Comprehensive Aphasia Test (Swinburn, Porter & Howard, 2004). For most participants this was the most difficult and time-consuming assessment and it was completed over 1 to 2 one-hour sessions. The Barthel Index (Collin et al, 1988) was also administered to assess the level of disability. For those people who completed assessments in the hospital this scale was completed by a nurse and for those who were at home either by themselves or by their relative/carer. They were also assessed on two self-report mood measures, the Visual Analogue Mood Scales-Revised version (Stern, 1997) and the Visual Analogue Self-Esteem Scale (Brumfitt & Sheeran, 1999b). The hospital version of the Stroke Aphasic Depression Questionnaire (SADQ-21) (Lincoln et al., 2000) was included as an observer-rated measure of mood and was completed again from a nurse for in-patient participants and from a relative/carer for out-patient participants. Other questionnaires related to activity level were also completed with the participants or with some help from carers/relatives for those patients with severe communication problems.

The Nottingham Extended Activities of Daily living Scale (N-EADL) (Nouri & Lincoln, 1987) was included to assess level of independence in a range of everyday activities. In addition, the shortened version of the Nottingham Leisure Questionnaire (N-LQ) was also administered to assess the frequency and type of leisure activities.

All participants were asked to complete follow-up assessments at 6 months after completing baseline assessments. They were contacted either by telephone or in writing to arrange their follow-up assessment. Those participants who were still taking part in the study and who agreed to be re-assessed were visited by the researcher at their place of residence. At follow-up assessments participants were assessed on some of the tests used at baseline. Their carers/relatives were also asked to complete some additional questionnaires. Carers were asked to complete again the SADQ-21 and an additional questionnaire assessing caregiver burden, the Caregiver Strain Index (CSI; Robinson, 1983). Both participants and their carers/relatives were asked to complete a Satisfaction with Care Scale (SWC) as an index of satisfaction with support they received since their stroke. Copies of the baseline and follow-up assessments can be found in Appendix C.

The Results chapter begins with a plan of analysis for the data collected and a description of participants' background and demographic information followed by the data analysis of the study's assessments. Findings are presented in three sections: 1) Analysis of baseline data, 2) Analysis of follow-up data, and 3) Analysis of baseline data predicting mood at follow-up.

## **4. CHAPTER FOUR: RESULTS**

### **4.1 Chapter outline**

This chapter is divided into three parts which are the following: 1) Data analysis for baseline assessments, 2) Data analysis for follow-up assessments, and 3) Baseline factors predicting mood at follow-up. At the beginning of this chapter the plan of analysis is briefly described and the choice of parametric versus non-parametric statistics is justified. Demographic and stroke-related information are also presented in order to describe the study sample. The first part includes description of all assessments conducted at baseline including a more detailed battery of assessments for those participants with better language ability. It also identifies factors associated with low mood at recruitment and more specifically it presents a model for the prediction of mood scores using baseline data. The second part covers description of the follow-up sample and description of follow-up assessments. The last part of this chapter describes factors at baseline predicting depression at follow-up.

### **4.2 Plan of analysis**

The main aim of the statistical analysis was to determine which factors that were assessed were significantly related to low mood at baseline and at follow-up, but also to investigate which baseline factors were predictors of low mood at follow-up.

Demographic and background information were described using means for continuous data and frequencies and/or percentages for categorical data. It is rare in research, particularly with human beings, to obtain a complete data set from every participant (Pallant, 2007). In stroke research there are several reasons why a variable or a participant may have a significant number of missing data.



In this study there were a few missing data and this was taken into consideration not only when conducting statistical analyses but also when discussing results in the following chapter of this thesis. The 'exclude cases pairwise' option was used in SPSS, which excludes the case only if it is missing the data required for the specific analysis, but the case was included in all other analyses. Another option was to use the 'exclude cases listwise', in which the case is excluded from all analyses. This alternative was not chosen as it would have significantly decreased the sample size and it should only be used when referring to a subset of cases that provided a full data set. The 'replace with mean' option could have been used to replace missing values, but this could have possibly biased the results of our analysis as it does not lead to proper estimates of measures of association or regression coefficients. Moreover, missing values for follow-up data were not replaced with baseline values (last observation carried forward method). Although more missing data further decreased the sample size for follow up analyses, this method could seriously distort the means and covariance structure for longitudinal data analyses and this is possible even if the mechanism that causes the data to be missing is completely random. Normality for all data was assessed by obtaining skewness and kurtosis values and specific statistical tests used to assess normal distribution such as the Kolmogorow-Smirnov test.

Data were analysed using the Statistical Package for Social Sciences (SPSS) for Windows version 15 and 16. Descriptive statistics (mean and standard deviation) were used to describe data, which was normally distributed, but also for the purpose of general data exploration. Parametric statistics, including t-tests, Pearson correlations, ANOVAs and multiple linear regressions were calculated for data that were normally distributed.

Although most of the questionnaires and rating scales of the study provide ordinal data, most variables did not significantly differ from the normal distribution using either the Kolmogorov-Smirnov test or by considering the distributions of variables (z scores). Further justification for the use of parametric statistics versus non-parametric statistics was also discussed in the next section prior to reporting the results of the data analyses. Correlations were used to assess univariate associations between scores on mood measures and scores on other measures in order to identify the most important variables that were significantly related to mood of aphasic stroke patients. Independent samples t-tests were used to compare means for continuous variables with two groups, one-way ANOVAs for continuous variables with more than two groups and  $\chi^2$  test for categorical variables. Multivariate regression analyses were also conducted to develop cross-sectional and longitudinal prediction models of low mood in aphasic stroke patients.

To examine which factors were significantly related to emotional distress three main analyses were conducted. The statistical analyses conducted are briefly described here:

- 1) Predictors of low mood at baseline: to identify factors associated with low mood at baseline, mood scores were compared with bio-psycho-social variables (e.g. age, gender, stroke classification, cognition, communication, disability, leisure activities).
- 2) Predictors of low mood at follow-up: all the analyses for baseline data were repeated for follow-up data
- 3) Baseline predictors of distress at follow-up: all the analyses described in analysis 1 were repeated with baseline variables and follow-up variables

### *Justification for the use of parametric statistics versus non-parametric statistics*

The distinction between types of scales is important to determine which type of statistical analysis is appropriate. Interval or ratio scales require the use of parametric statistics, while ordinal scales require the use of non-parametric statistics. For nominal and categorical data some of the non-parametric statistics such as chi-square can also be used.

The majority of assessments used in clinical and specifically in psychological research are ordinal, Likert-type scales, in which items can be placed into rank order but differences between values may not be equal. Ordinal scale data do not often meet the assumption of normality due to their restrictive range (Nanna & Sawilowsky, 1998). Many scales in social sciences have positively or negatively skewed scores and this does not necessarily suggest a problem with the nature of the construct being assessed rather than a problem with the measure used. Due to the underlying nature of mood measures, they are often skewed and in clinical psychology research normally distributed data is rare (Pallant, 2007).

Non-parametric statistics, such as Mann-Whitney, Wilcoxon, Kruskal-Wallis and Spearman's rho should be used for data that are not normally distributed, as these tests do not make assumptions about the distribution of the data. Samples from a population in which the true distribution is normal may not necessarily look normal if the sample size is relatively small, as normality is largely dependent on sample size (Altman & Bland, 1995). Parametric analyses were also used based on evidence that parametric tests are robust to Type I and Type II error even when data are not normally distributed if the sample size is reasonably large and tests used are two-tailed (Sawilowsky & Blair, 1992).



Previous studies have also used the parametric analysis of multiple regression to explore factors associated with post-stroke depression (Thomas & Lincoln, 2008; Berg et al, 2003; Dennis et al, 2000; Hermann et al, 1998; Spencer et al, 1995), therefore making it possible to make more meaningful comparisons with previous relevant research in the area of stroke.

Distribution of scores was examined using both normality plots (Normal Q-Q plots) and normality tests such as the Kolmogorov-Smirnov test (suitable for  $N > 50$ ). Skewed data were not transformed to normalise distribution as the severity of skew was not considered too significant (small frequencies towards the extremes and/or normality tests not violating the assumption of normality) but also in order to avoid losing or making more difficult the interpretation of the original data. In some cases, histograms and boxplots were checked for outliers as many statistical techniques are sensitive to extreme values and if necessary cases with values well above or well below the majority of other cases were removed from the data files. It is often advised to transform skewed data but this may not be necessary in clinical studies with a reasonable sample size (Altman & Bland, 1995). However, no other technique of data transformation was used, such as square root, log or inverse transformation, as altering the relative distances between data points-which is how these transformations improve normality-raises issues in the interpretation of the data (Osborn, 2002).

Data collected were treated as interval because if they were treated as ordinal this would limit the analyses that could have been conducted (Miles & Shelvin, 2001). The present study also investigated depression as a continuous rather than a categorical variable, therefore the mood variable was not dichotomised.

Dichotomising mood variables is common in clinical research as it simplifies the statistical analysis and easy interpretation of results (Altman & Royston, 2006). However, dichotomisation violates the linearity assumption of multiple regressions, leads to loss of information, and therefore reduces statistical power to detect relationships between variables (Altman & Royston, 2006; MacCallum et al., 2002).

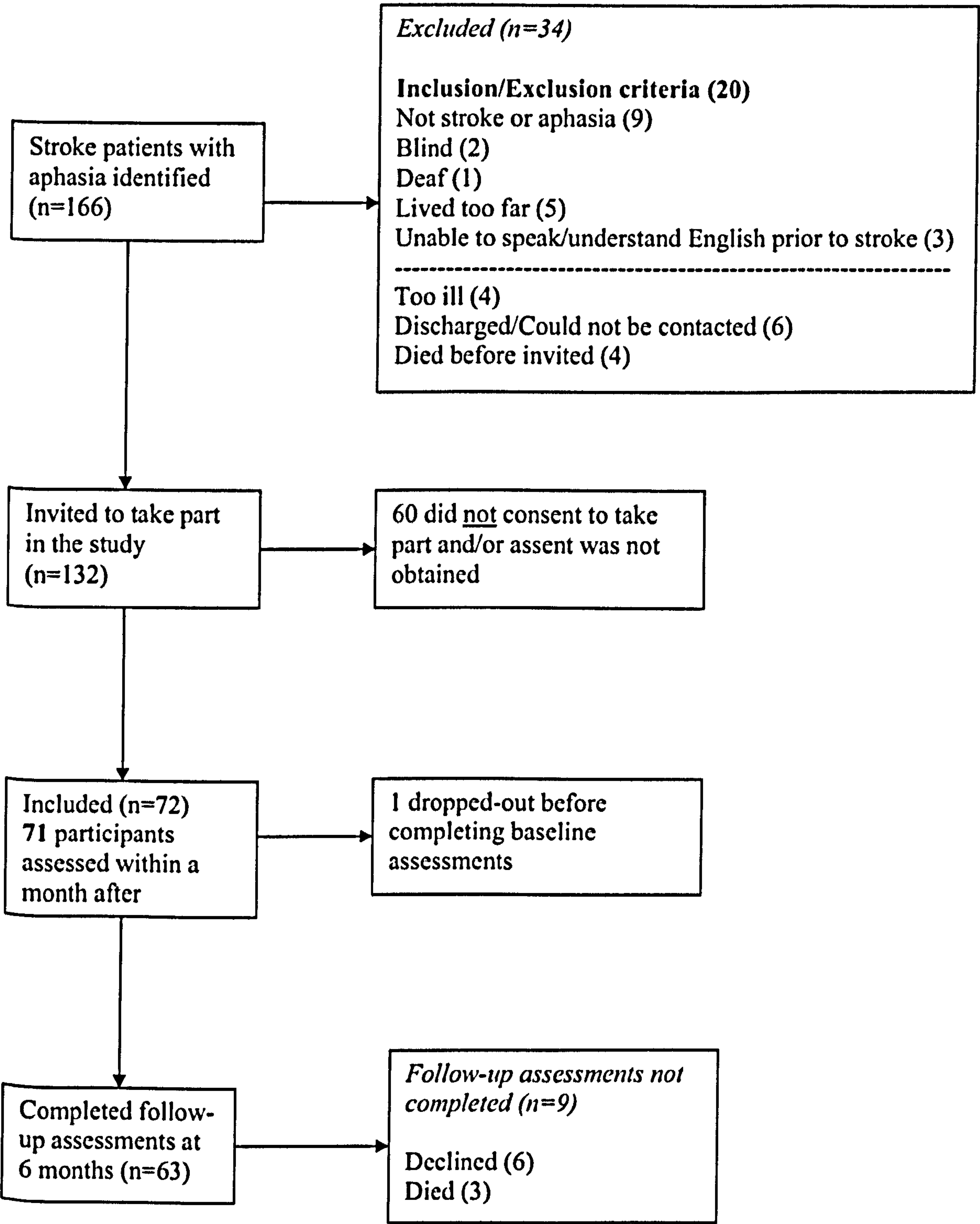
### **4.3 Patient recruitment**

Recruitment to the study took place for two years and during this period 166 patients were identified both in hospitals and in the community and were considered for inclusion in the study. Figure 4.1 describes the flow of study participants and the reasons why people were not included in the study. Of the 166 patients, 34 were not invited to take part in the study due to a number of reasons. Overall, twenty people (12.05%) were not able to take part based on the study's inclusion/exclusion criteria. Of the thirty four stroke patients who were not included, fourteen patients (8.43%) met the inclusion criteria but the researcher was not able to invite them to the study either because they were discharged early from hospital, too ill or died before being approached. Sixty patients (36.14%) thought the study was not appropriate for them at the time they were approached, so they decided not to take part or they agreed to invite them again in the future. All participants who met the inclusion/exclusion criteria, who signed a Consent Form or an Assent Form was signed by their relative or carer were included in the study.

Seventy two participants (43.37%) who met the inclusion criteria and agreed to take part were recruited into the study. Twenty four patients were recruited from the Nottingham University Hospitals (QMC & City Hospital) and forty eight from various community settings (SLT referrals, community stroke team, stroke databases, stroke clubs). Of the seventy two stroke patients who agreed to participate, one of them recruited in the community did not complete any of the baseline assessments as he decided to drop out from the study immediately after agreeing to take part due to ill health.



Figure 4.1: Flow chart diagram of study

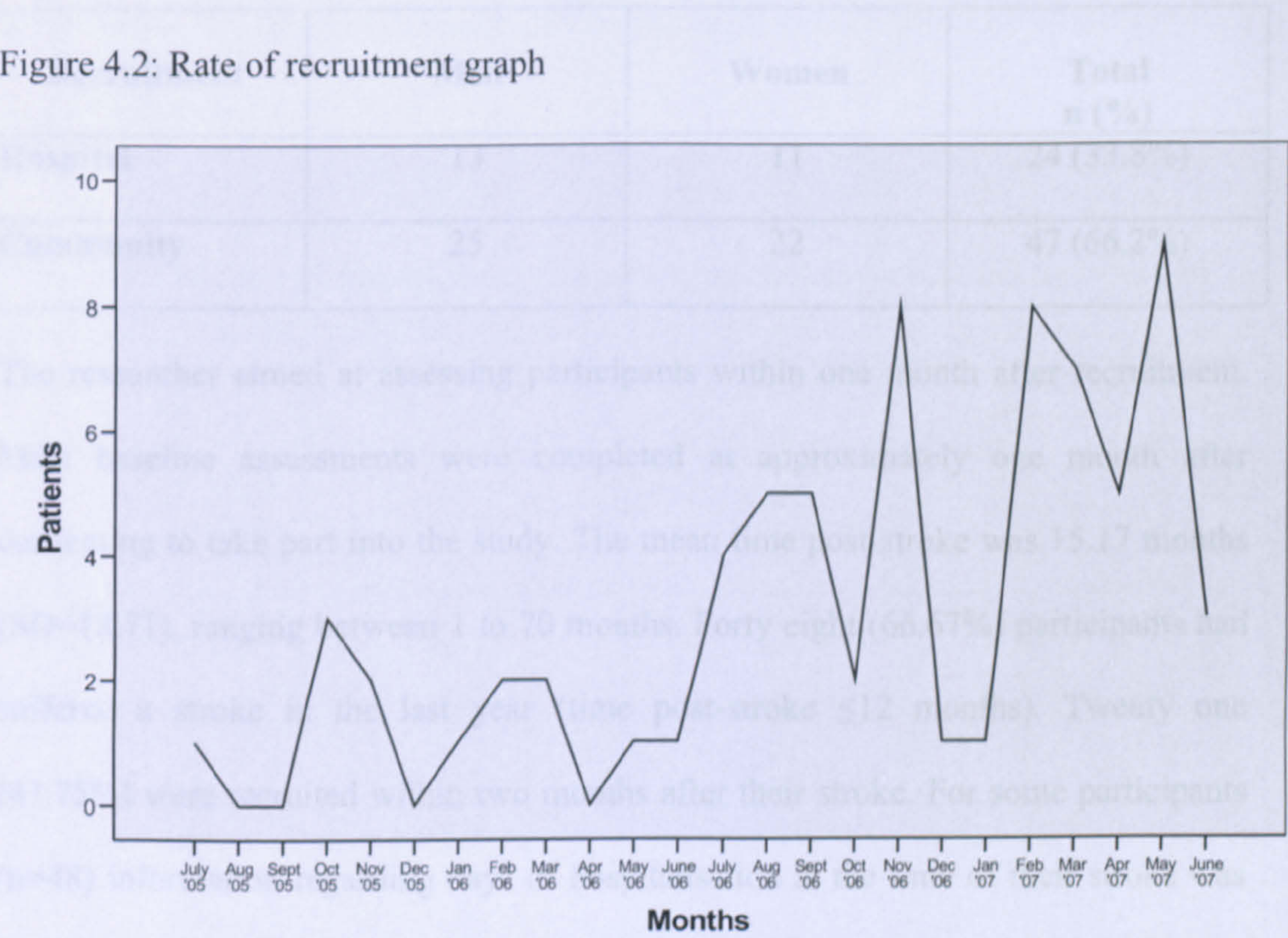




Recruitment of participants took place for almost two years, and between 1<sup>st</sup> July 2005 and 30<sup>th</sup> June 2007. The majority of participants were recruited during the second year of recruitment with November 2006 (n=8), February 2007 (n=8) and May 2007 (n=9) being the months with the highest recruitment numbers. Hospital recruitment rate was slower because most potential participants couldn't take part because of their medical status at the time, but permission was requested by their relatives/carers to contact and invite them to the study at a later stage.

The rate of recruitment per month is shown in Figure 4.2.

Figure 4.2: Rate of recruitment graph





**4.4 Patient characteristics**

Of the 71 aphasic stroke patients recruited who completed baseline assessments 38 (53.52%) were men. Stroke patients with aphasia were recruited both from hospital and community settings. The majority of participants agreeing to take part in this study were recruited from the community (n=47, 66%). Gender and source of recruitment are presented in Table 4.1. The mean age of patients was 69.31 years (SD=12.33), with age ranging between 34-91 years.

Table 4.1: Source of recruitment and gender

Recruitment	Men	Women	Total n (%)
Hospital	13	11	24 (33.8%)
Community	25	22	47 (66.2%)

The researcher aimed at assessing participants within one month after recruitment. Most baseline assessments were completed at approximately one month after consenting to take part into the study. The mean time post-stroke was 15.17 months (SD=18.71), ranging between 1 to 70 months. Forty eight (66.67%) participants had suffered a stroke in the last year (time post-stroke  $\leq$ 12 months). Twenty one (43.75%) were recruited within two months after their stroke. For some participants (n=48) information regarding days of hospitalisation at the time of their stroke was also recorded (for the remaining participants information was not available on the hospital stroke databases). Participants stayed at a hospital ward between 4 and 453 days post-stroke, with a mean of 73.14 (SD=78.13) days of hospitalisation. Therefore, most participants were at the hospital just over two months after their stroke.



The gender and age of those participants who decided not to take part in the study was recorded. No other additional information was collected on those stroke patients who did not consent to take part in the study. Chi-square test  $\chi^2$  was calculated to compare the gender of stroke patients recruited to the study and those who did not consent to take part. An independent sample t-test was also used to compare age between those people who decided to take part in the study and those who declined participation. The results are shown in Table 4.2. There was no significant difference between people who decided not to take part in the study and those who did. There was also no significant difference in the gender of people who did or did not take part in the study.

Table 4.2: Gender and age of participants recruited and those who did not take part

	Participants recruited (n=71)	Participants who declined to take part (n=60)	Comparison p value
<b>Gender</b>			
Male	38	30	.688
Female	33	30	
<b>Age</b>			
Mean	69.31	71.57	.274
Standard Deviation	12.33	10.92	

The demographic characteristics of the stroke patients included in the study are presented in Table 4.3. Almost half of the participants were men who were married (n=26) and retired (n=31). Forty one participants were married (57.75%) and thirty one were living with their spouse (43.66%). Thirty seven participants were living with their partner or spouse (52.11%), twenty were living on their own (28.17%) and fourteen with somebody else (19.72%) such as a relatives or professional carers. The majority of them were also retired (n=61) at the time of their stroke.

Male participants were more likely to be married and living with their spouse, while female participants were less likely to be married and more likely to be widowed. Men were much younger (mean=66.33 years, SD=11.79) than women (mean=73.00, SD=11.99) and this difference was found to be significant ( $t_{70}=-2.37, p=.02$ ).

Table 4.3: Demographic characteristics of the sample

Demographic Characteristics	Total n (%)	Men n	Women n
<b>Marital Status</b>			
Married	41 (57.7%)	26	15
Divorced	5 (7.1%)	3	2
Widowed	17 (23.9%)	5	12
Single	6 (8.5%)	2	4
Unknown	2 (2.8%)	2	0
<b>Living arrangements</b>			
With spouse	37 (52.1%)	24	13
With others	14 (28.2%)	5	9
Alone	20 (19.7%)	9	11
<b>Employment Status</b>			
Employed	7 (9.9%)	5	2
Retired	61 (85.9%)	31	30
Unemployed	3 (4.2%)	2	1

Information on relevant medical history as documented in their medical notes for participants recruited in the hospital and as discussed with participants and/or their carers for community participants is summarised in Table 4.4. The prescription of antidepressant medication was not very common among the study's participants as it was only documented for nine stroke patients (12.7%). Eighteen participants (25.4%) had suffered a previous stroke and thirty nine participants (54.9%) had a relevant medical condition such as heart disease and/or hypertension.

Table 4.4: Relevant medical history of the sample

Medical history	n (%)
<b>Previous stroke</b>	
Yes	18 (25.4%)
No	49 (69%)
Unknown	4 (5.6%)
<b>Other relevant medical condition</b>	
Yes	39 (54.9%)
No	28 (39.5%)
Unknown	4 (5.6%)
<b>Prescribed antidepressant at time of baseline assessment</b>	
Yes	9 (12.7%)
No	58 (81.7%)
Unknown	4 (5.6%)



### **Stroke characteristics**

Stroke characteristics were described using the Bamford classification, side of weakness and side of lesion. These are summarised in Table 4.5. The Bamford classification was difficult to document for some patients, especially those recruited in the community. Therefore, it was not documented for twenty-five patients because access to hospital medical notes was not possible at the time of recruitment for participants recruited in the community and limited information was available from the stroke database. The majority of participants were classified as TACS (31.9%) and PACS (29.2%) while POCS (2.8%) was the least common classification. Left hemisphere lesions were more common than right. Lesion side was unknown for three patients.

Table 4.5: Stroke characteristics

Stroke characteristics	n (%)
<b>Bamford classification</b>	
TACS	23 (31.9%)
PACS	21(29.2%)
POCS	2 (2.8%)
LACS	5 (6.9%)
Unknown	20 (29.2%)
<b>Side of weakness</b>	
Left	8 (11.3%)
Right	53 (74.6%)
Bilateral	0
No weakness	6 (8.5%)
Unknown	4 (5.6%)
<b>Side of lesion</b>	
Left hemisphere	55 (77.4%)
Right hemisphere	13 (18.3%)
Unknown	3 (4.3%)

## **PART 1: Analysis of baseline data**

### **4.5 Description of baseline assessments**

The distribution of baseline assessments was investigated by calculating the z skew values for each total score. The z skew values are calculated for each scale using the formula  $z_{\text{skewness}} = (S-0) / \text{SE skewness}$  (where S stands for skewness and SE skewness for the standard error of skewness). Values greater than 1.96 at  $p < .05$  are significantly different from the normal distribution (Field, 2005). The z skew values for all baseline assessments are shown in Table 4.6.

Table 4.6: z skewness scores for baseline assessments

Baseline Assessments	z skewness
Sheffield Screening Test	-1.76
Barthel Index	-1.69
Pre-stroke Barthel Index	-8.66
N-Extended Activities Daily Living	1.35
N-Leisure Questionnaire	5.01

Skewness scores for Sheffield Screening Test and N-Extended Activities of Daily Living scale were not significant ( $p \leq .05$ ). Outliers were identified and were removed for those scales with skewness scores were higher than 1.96, but still this did not make any significant difference in the distribution of scores. Therefore, Kolmogorov-Smirnov tests (normality tests comparing the sample scores to a normally distributed set of scores with the same mean and standard deviation) were performed for scores on the pre-stroke and post-stroke Barthel and N-Leisure Questionnaire and were all not significantly different from the normal distribution ( $p \leq .05$ ).



As outlined at the beginning of this chapter, it was considered appropriate to use methods of analysis that make assumptions about normality such as correlation, regression, t-tests and analysis of variance. Skewed data were not transformed and parametric statistics were used as they are reasonably robust for non-normal distributions (Sawilosky & Blair, 1992). Data transformation was also not considered appropriate as it means that variables would be different from the ones originally measured and this has obvious implications for interpreting those data (Field, 2005).

The descriptive statistics for some baseline assessments (SST, BI, N-EADL, N-LQ) are summarised in Table 4.7. All 71 participants completed a short language screening questionnaire (Sheffield Screening Test) to confirm the diagnosis of communication problems such as aphasia. Language measures were not available to compare the level of communication impairments of those people who did not consent to take part in the study with those who completed baseline assessments. Figure 4.3 shows the distribution of scores on the Sheffield Screening Test at baseline. Most participants ( $n=44$ ) scored between 11 and 20 (maximum score=20) on the Sheffield Screening Test, which indicated a 'mild/moderate' level of communication impairment. Seventeen participants (24%) scored  $\leq 5$  on the Sheffield Screening Test. The mean of Barthel scores was 13.38 ( $SD=6.15$ ), indicating moderate disability. Eleven participants had very low Barthel total scores ( $\leq 5$ ), indicating severe disability and fifteen participants were independent in personal care after their stroke as they obtained the maximum score of 20. Almost all participants were independent in personal self-care prior to their stroke and there was a ceiling effect for the pre-stroke Barthel Index scores as the mean score approached the maximum of 20 and the standard deviation was small (mean=19.32,  $SD=1.33$ ).

The mean score of the Nottingham Extended Activities of Daily Living (EADL) Index was 9.01 (SD=8.01). Most participants scored relatively low on the EADL Index Domestic subscale. Nottingham Leisure Questionnaire (N-LQ) scores were also generally low suggesting that most participants were not engaging in many leisure activities after their stroke.

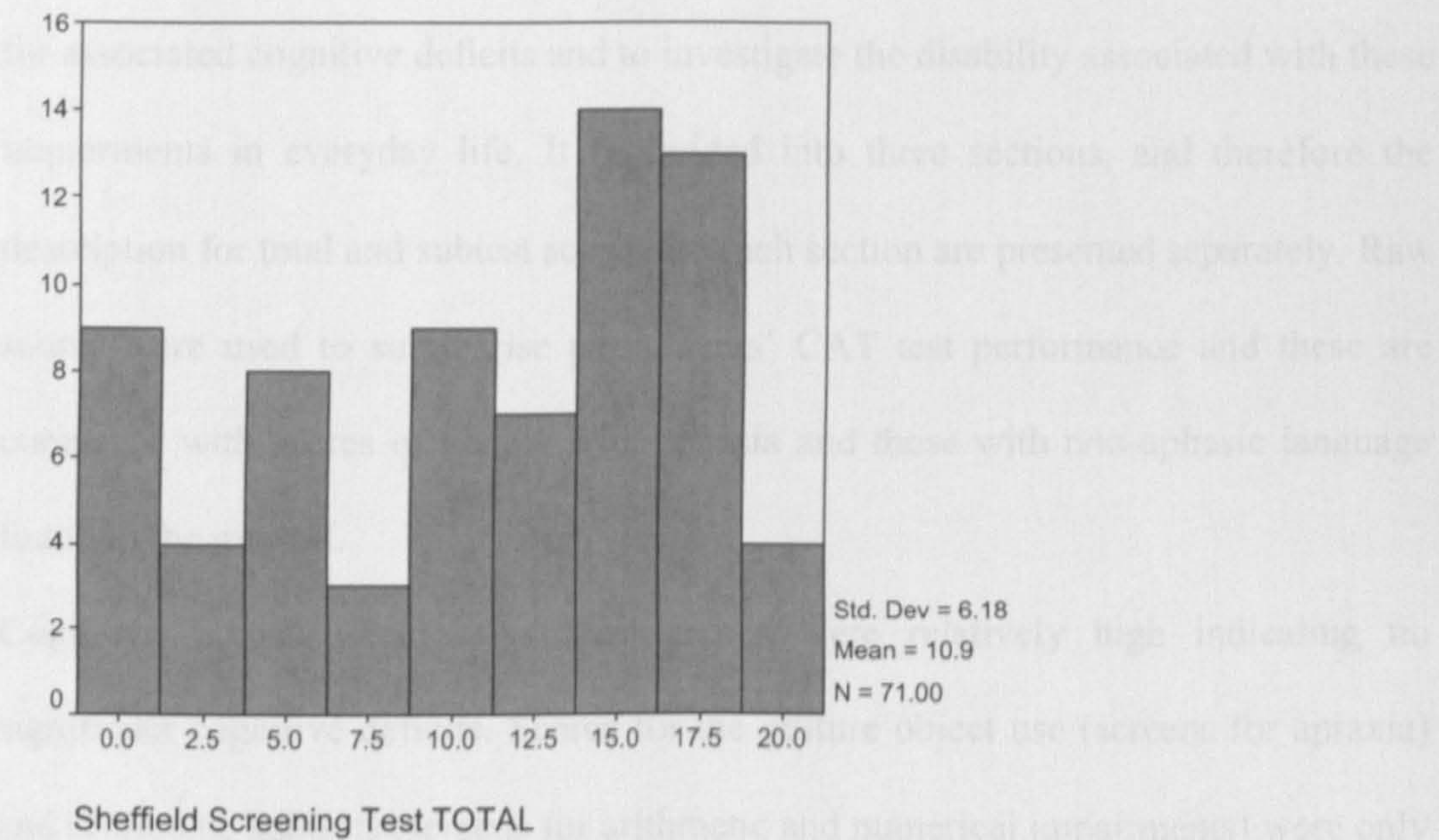
Table 4.7: Description of baseline assessment scores

Measures	n	Range of possible scores	Range	Mean	SD
Sheffield Screening Test Total	71	0-20	0-20	10.89	6.18
-Receptive	71	0-9	0-9	4.80	2.71
-Expressive	71	0-11	0-11	6.08	3.81
Barthel Index	71	0-20	1-20	13.38	6.15
Pre-stroke Barthel	71	0-20	14-20	19.32	1.33
N-EADL Total	71	0-22	0-22	9.01	8.01
-Mobility	71	0-6	0-6	2.48	2.57
-Kitchen	71	0-5	0-5	2.76	2.04
-Domestic	71	0-5	0-5	1.69	2.08
-Leisure	71	0-6	0-6	2.08	1.92
N-LQ Total	71	0-60	0-29	6.32	7.79

N-EADL: Nottingham Extended Activities of Daily Living  
N-LQ: Nottingham Leisure Questionnaire



Figure 4.3: Distribution of scores (histogram) on the Sheffield Screening Test at baseline



4.6 Description of Comprehensive Aphasia Test scores at baseline

Seventeen participants (23.94%) had very low total scores on the Sheffield Screening Test ( $\leq 5$ ) and were not invited to complete the Comprehensive Aphasia Test. Four participants (5.63%) decided to drop out from the study and three participants (4.23%) died before completing this more detailed language battery. Of the 71 participants, forty five (66.20%) were assessed using the Comprehensive Aphasia Test. However, two participants only completed the Cognitive Screen section and some subtests from the Language Battery and then decided that they did not want to complete the Language Battery and Disability Questionnaire as they said it was either a difficult or very stressful task for them at the time. Both those participants did not have low mood based either on their self-report or observer-rated mood score but they both had the same level of language ability based on the Sheffield Screening Test (SST=13).



Tables 4.8-4.10 show the descriptive statistics for all sections of the Comprehensive Aphasia Test (CAT). The CAT is designed to assess language performance, to screen for associated cognitive deficits and to investigate the disability associated with these impairments in everyday life. It is divided into three sections, and therefore the description for total and subtest scores for each section are presented separately. Raw scores were used to summarise participants' CAT test performance and these are compared with scores of people with aphasia and those with non-aphasic language found in the manual.

Cognitive Screen total and subtest scores were relatively high indicating no significant cognitive deficits. Scores for the gesture object use (screens for apraxia) and arithmetic subtests (screens for arithmetic and numerical impairments) were only lower, but within the expected range for aphasic patients. For the line bisection subtest most participants scored within the normal range (-2.5 to +2.5) and only four people deviated from the normal range indicating some impairment with spatial perception that might have also affected their performance into subsequent subtests of the CAT.

Table 4.8: Descriptive statistics for Comprehensive Aphasia Test (*Cognitive Screen*)

Comprehensive Aphasia Test	N	Range of possible scores	Range	Mean	SD
<i>Cognitive Screen Total Score</i>	47	0-38	18-38	29.96	5.53
-Line bisection	47	0 to +/-6	0 to +/-5	0.62	1.09
-Semantic memory	47	0-10	1-10	8.60	1.81
-Word fluency (animals & "S" words)	47	18*	0-37	12.51	10.58
-Recognition memory	47	0-10	0-10	7.94	2.63
-Gesture object use	47	0-12	2-12	3.89	1.71
-Arithmetic	47	0-6	0-6	3.89	1.710

SD=Standard Deviation

\*= average verbal fluency score for normal range performance

Note: Higher scores better cognitive ability

Table 4.9 shows the descriptive statistics for the Language Battery section of the Comprehensive Aphasia Test. Language Battery total raw scores were high but still within the aphasic range. Mean scores for the comprehension of spoken subtest (Mean=43.57, SD=10.10) and written language subtest (Mean=43.96, SD=12.25) were almost similar suggesting that participants had both comprehension and expression communication impairments. Repetition and Reading subtest scores were relatively low and again within the expected range for people with aphasia. Participants scored much lower on the copying picture names task than the copying task of the Writing section, but above the expected mean for people with aphasia.

Table 4.9: Descriptive statistics for Comprehensive Aphasia Test  
(Language Battery)

Comprehensive Aphasia Test	n	Range of possible scores	Range	Mean	SD
<b>Comprehension</b>					
-spoken words	47	0-30	11-30	22.28	4.86
-spoken sentences	46	0-32	7-32	21.17	6.05
<i>-spoken language total</i>	46	0-62	18-59	43.57	10.10
-written words	47	0-30	9-30	24.43	5.09
-written sentences	46	0-32	0-31	19.09	8.10
<i>-written language total</i>	46	0-62	14-62	43.96	12.25
<b>Repetition words</b>	45	0-32	0-32	21.69	10.94
<b>Reading</b>					
-words	45	0-48	0-48	35.10	16.29
-function words	45	0-6	0-6	4.73	2.16
<i>-reading total</i>	45	0-54	0-54	39.73	18.15
<b>Writing</b>					
-copying	45	0-27	0-27	25.27	5.61
-picture names	45	0-21	0-21	13.67	7.52
<i>-writing total</i>	45	0-48	0-48	38.93	11.19
<b>Language Battery Total</b>	45	0-306	62-296	222.16	66.21

SD=Standard Deviation  
 Note: Higher scores better language ability



Descriptive statistics for the Disability Questionnaire of the Comprehensive Aphasia Test at baseline are summarised in Table 4.10. The Disability Questionnaire total scores are clustered around the middle of the range (Mean=48.42, SD=20.47) suggesting that for most participants aphasia was associated with a moderate level of disability.

Table 4.10: Descriptive statistics for Comprehensive Aphasia Test  
(Disability Questionnaire)

Comprehensive Aphasia Test	N	Range of possible scores	Range	Mean	SD
<i>Disability Questionnaire Total Score</i>	45	0-124	6-87	48.42	20.47
<i>Disability Total</i>		0-64	3-48	25.24	11.02
-Talking	45	0-16	0-14	7.31	3.85
-Understanding		0-16	0-16	6.18	3.66
-Reading		0-16	0-11	3.31	2.80
-Writing		0-16	0-16	8.47	4.33
<i>Impact Total</i>		0-60	3-46	23.22	11.51
-Intrusion	45	0-16	0-14	5.91	2.76
-Self-image		0-16	0-16	7.24	4.15
-Emotional consequences		0-28	2-24	10.20	6.59

Note: Higher scores indicate more disability and significant impact  
SD=Standard Deviation

**4.7 Mood assessments at baseline**

The Kolmogorov-Smirnov test for normality was calculated for all mood measures. The VAMS-R total score ( $z=.067$ ,  $p=.200$ ) and the VASES total score with and without the depressed item ( $z=.78$ ,  $p=.200$  and  $z=.93$ ,  $p= 200$ ) did not significantly differ from the normal distribution. However, the SADQ-21 total score ( $z=. 234$ ,  $p=.010$ ) was significantly different from the normal distribution

The distribution of mood scores was further investigated by calculating the  $z$  skew values for each scale. The  $z$  skew values for all the mood scales are shown in Table 4.11. The  $z$  skew values are calculated for each scale using the formula  $z_{skewness} = (S - 0) / SE\ skewness$  (where  $S$  stands for skewness and  $SE\ skewness$  for the standard error of skewness). Values greater than 1.96 at  $p<.05$  are significantly different from the normal distribution (Field, 2005).

Table 4.11:  $z$  skew for mood scales

Mood Scale	$z$ skewness
VASES+D total	-1.01
VASES-D total	-1.05
VASES depressed item	-.98
VAMS-R total	-.08
VAMS-R sad item	.77
SADQ-21 total	1.81

The z skewness values for all mood scores were not significantly different ( $p < .05$ ) from the normal distribution as they were all above the recommended absolute value of 1.96. Therefore, all mood scores were used in further data analyses exploring variables associated with low mood and it was considered appropriate to use parametric statistics as all mood scales were not significantly skewed.

Not all mood assessments were completed for each stroke patients recruited in the present study. For those whose communication impairment was so severe that they could not complete the picture-based self-report mood measures such as the VAMS-R and the VASES and information was only available from their relatives/carers on the observer-rated measure (SADQ-21). However, for some participants recruited, especially those living in the community, it was not possible to identify a carer/relative to complete the SADQ-21 or some of them did not return the questionnaires to the researcher. Descriptive statistics for the mood measures are shown in Table 4.12.

Table 4.12: Descriptive statistics for mood measures at baseline

Mood Measure	n	Range of possible scores	Range	Mean	SD
VASES-T*	64	10-50	14-49	32.50	7.92
VASES-T (D)*	64	11-55	15-54	35.81	8.80
VASES (D)*	64	1-5	1-5	3.31	1.15
VAMS-R total**	66	0-800	7-656	348.85	149.51
VAMS-R sad**	66	0-100	1-97	43.55	29.08
SADQ-21 total**	59	0-63	1-45	17.54	9.93

VASES-T (D): VASES total including depressed item

VASES (D): VASES depressed item

SD=Standard Deviation

\*Higher scores indicate better mood, \*\*Higher scores indicate lower mood



The VASES total mean score was slightly higher than the half-way score suggesting that scores were distributed towards fewer mood problems. Scores on the VAMS-R were lower than the half-way score indicating better mood, although the standard deviation was large. The mean score on the SADQ-21 were just above the cut-off point indicating low mood, but with a relatively high standard deviation.

Table 4.13 shows the number of nurses, partners/spouses and relatives who completed baseline SADQ-21 scores. Overall, response return rate for the SADQ-21 questionnaires was much higher (83%) than the expected rate for postal questionnaires in social sciences and clinical research (>40%). An equivalent number of SADQ-21 questionnaires were completed by nurses (n=27, 45.8%) and by spouses/partners (n=26, 44.1%). Only six questionnaires (10.2%) were completed by other relatives.

Table 4.13: SADQ-21 completion at baseline

SADQ completed by (n=59) :	n (%)
-nurse	27 (45.8%)
-partner/spouse	26 (44.1%)
-relative	6 (10.2 %)

### *Classification of 'depression' at baseline*

- VAMS-R

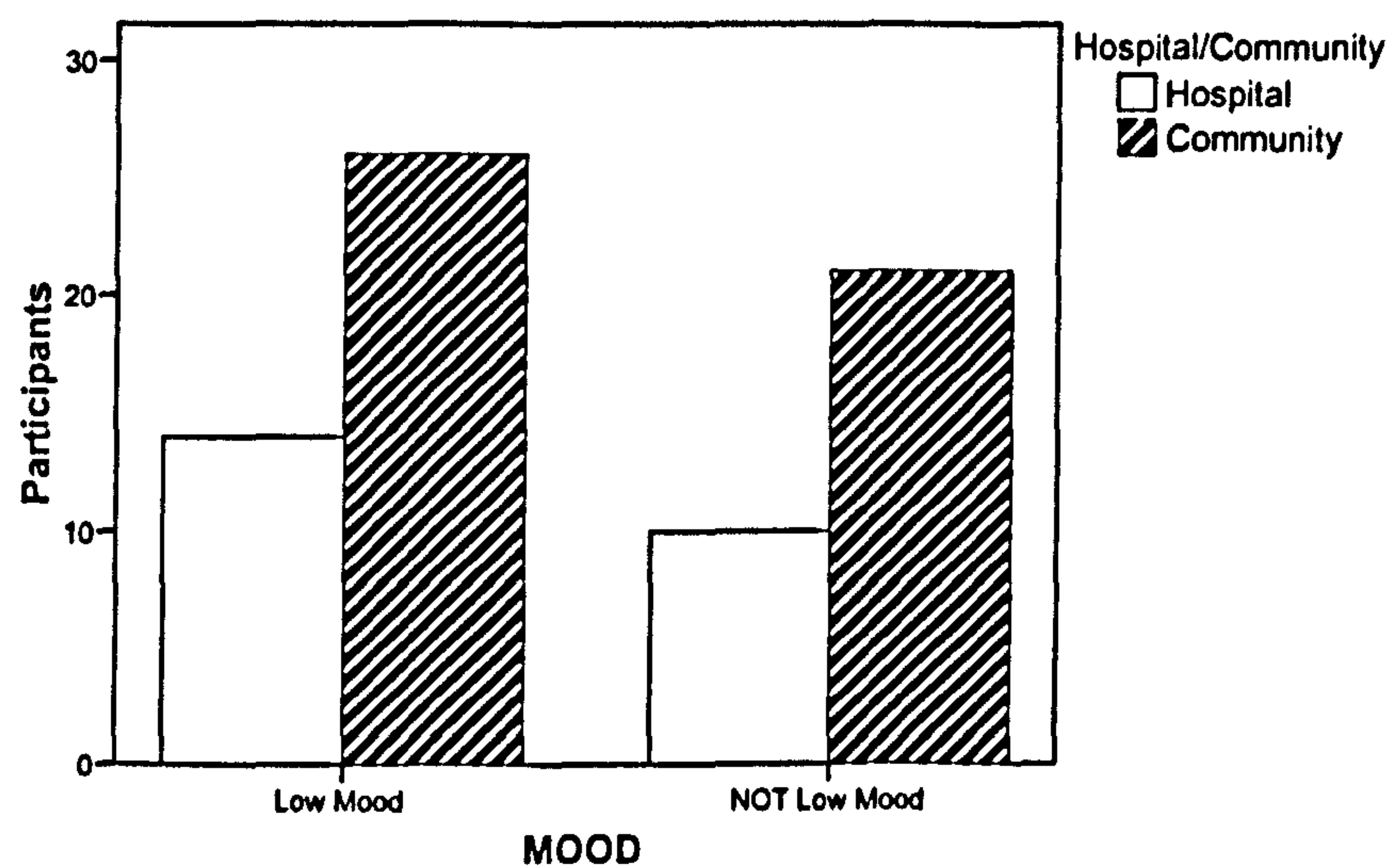
VAMS-R scores were available for 66 of the 71 patients who completed baseline assessments. A cut-off of  $\geq 50$  was used to categorise stroke patients as having 'low mood' based on the cut-off point recommended in the published manual of the VAMS (Stern, 1998). Twenty six of the 65 participants (40%) who completed the VAMS-R were classified as being 'depressed'.

- SADQ-21

SADQ scores were available for 59 of the 71 patients who completed baseline assessments. A cut-off of 17/18 was used on the SADQ to classify participants as depressed (Bennett et al., 2006). Twenty eight of the 59 participants (47%) for whom the SADQ-21 were completed and/or returned to the researcher were classified as being 'depressed'.

Of the seventy one participants who completed mood assessments at baseline, thirty nine (55%) were classified as 'depressed' either using the VAMS-R sad subscale cut-off scores or the SADQ-21 scores. Fifteen (21%) participants were found to have low mood using both the VAMS-R and SADQ-21 scores. Figure 4.5 shows the number of participants with low mood recruited in the hospital and in the community based on the VAMS 'sad' subscale or the total SADQ-21 cut-off scores.

Figure 4.4: Number of participants with low mood based on VAMS-R or SADQ-21



4.8 Correlations between mood measures at baseline

Pearson’s correlations (two-tailed) were calculated between mood measures to identify whether there was any relationship between self-report visual analogue scales items and the observer-rated measure. Correlations were also calculated between the sad and depressed items of the VAMS-R and VASES self-report measures respectively. Information about multicollinearity was also provided as correlations above 0.80 and/or 0.90 suggest multicollinearity between measures (Field, 2005). Effect sizes for Pearson’s correlation coefficients were based on  $r=.10$  (low effect),  $r=.30$  (moderate effect) and  $r=.50$  (large effect) (Field, 2005). Pearson’s correlations were calculated between all mood measures and are summarised in Table 4.14.



The VAMS-R scores were significantly correlated with the VASES ( $r=-.715$ ) and moderately correlated with the observer-rated measure SADQ-21 ( $r=.440$ ). VASES and VASES+D total scores were also significantly correlated with the SADQ-21 total scores. SADQ-21 total score was significantly associated with the VAMS-R Sad item, but not significantly associated with the VASES Depressed item. Correlations between different measures were assessed for multicollinearity and were all below the recommended value of 0.80. Significant correlations between self-report measures and the observer-rated measure provide further evidence for the concurrent validity of the scales used in this study as measures of mood.



Table 4.14: Correlations between mood measures at baseline

	1. VAMS-R	2. VAMS-R Sad item	3. VASES	4. VASES+D	5. VASES Depressed item	6. SADQ
1. VAMS-R		r .615*** p <.001	-.715*** <.001	-.720*** <.001	-.516*** <.001	.440*** .001
2. VAMS-R Sad item			r -.432*** p <.001	-.443*** <.001	-.420*** .001	.319* .019
3. VASES				r .996*** p <.001	.649*** <.001	-.323* .018
4. VASES+D					r .709*** p <.001	-.320* .019
5. VASES Depressed item						r -.154 p .266
6. SADQ						

r = Pearson's correlation coefficient, p = Probability level

\* Correlation is significant at the 0.05 level (two-tailed)

\*\* Correlation is significant at the 0.01 level (two-tailed)

\*\*\* Correlation is significant at the 0.001 level (two-tailed)



**4.9 Associations with low mood at baseline**

Statistical tests were performed on only one of the self-report measures in order to decrease the number of statistical tests and therefore the probability of Type I errors. Both VAMS-R and VASES were normally distributed so the choice of the visual analogue scale included in the analysis was based on evidence of internal consistency in this study. Therefore, the VASES+D (total score with depression item) was chosen as its internal consistency was higher ( $\alpha=.85$ ) than the VAMS-R ( $\alpha=.80$ ). This finding is also supported by a study assessing the validity and reliability of those measures in stroke patients which showed that the internal consistency of the VASES ( $\alpha=.85$ ) was increased when the ‘depression’ item was included and was higher than the VAMS ( $\alpha=.71$ ) (Bennett et al., 2006). The SADQ-21 was included as an observer-rated measure. Internal consistency values ( $\alpha$ ) for all mood measures are summarized in Table 4.15.

**Table 4.15: Internal consistency ( $\alpha$ ) for mood measures at baseline**

Mood Measure	Internal Consistency ( $\alpha$ )
VAMS-R	.80
VASES+D	.85
SADQ	.86



Independent sample t-tests were carried out for categorical variables comparing two groups such as gender, previous stroke, other relevant medical condition and side of lesion on the mood measures at baseline. One-way ANOVAs were used to identify whether there were any differences between categorical variables on the VASES+D and SADQ for those variables with more than two groups such as marital status, living arrangements and employment status. Levene's test for equality of variances was not violated for any of the comparisons. Comparisons between VASES+D and SADQ scores for categorical variables are summarised in Table 4.16. For all other continuous variables Pearson's correlations were performed.

Table 4.16: Comparison between categorical variables on VASES+D and SADQ-21

Categorical Variables	VASES+D				SADQ-21			
	n	Mean	SD	p	n	Mean	SD	P
<b>Gender</b>								
Male	37	37.84	8.03	<.01**	32	17.91	9.71	.76
Female	28	33.21	9.05		27	17.11	10.36	
<b>Marital status</b>								
Single	6	35.00	7.35	.13	2	14.00	12.73	.21
Married	37	34.30	8.87		40	19.72	9.58	
Divorced	5	44.00	8.16		4	13.50	10.25	
Widowed	15	36.73	2.16		11	13.64	9.98	
<b>Living arrangements</b>								
With spouse	33	34.88	8.90	.35	36	19.61	9.36	.08
With others	12	34.58	10.60		14	15.93	11.66	
Alone	20	38.20	7.06		9	11.78	7.10	
<b>Employment status</b>								
Employed	7	36.71	12.05	.42	6	16.50	5.68	.38
Retired	55	36.09	8.19		50	17.20	9.98	
Unemployed	3	29.33	11.01		3	25.33	15.57	
<b>Previous stroke</b>								
Yes	15	34.07	9.73	.40	16	21.06	10.47	.10
No	46	36.35	8.77		40	16.15	9.81	
<b>Other medical history</b>								
Yes	36	34.61	7.74	.17	34	18.56	9.12	.27
No	24	37.83	10.31		21	15.43	11.65	
<b>Side of lesion</b>								
Left	49	36.35	8.72	.42	48	17.15	10.55	.68
Right	12	34.00	10.10		7	18.86	7.45	
<b>Bamford classification</b>								
TACS	18	38.56	8.63	.01**	22	17.23	12.37	.32
PACS	21	35.19	8.46		17	18.18	8.93	
POCS	2	20.00	7.07		2	26.50	12.03	
LACS	5	42.20	5.59		4	9.75	.96	

p= Level of probability, SD=Standard deviation, \*\*p≤.01

Mood scores on the VASES+D were significantly different between male and female participants ( $p=.003$ ), but not significantly different between male and female participants on the SADQ-21. Marital status, living arrangements and employment status prior to stroke were not significantly different both for VASES+D and SADQ-21 scores.

Also, VASES+D and SADQ-21 totals scores were not significantly different between patients who had a previous stroke with those who had not had a previous stroke. Other related medical history was also not significantly different either on the self-report or observer-rated mood measures.

Most participants had left side of lesion but VASES+D and SADQ-21 scores did not significantly differ between participants with a right side lesion and participants with left sided lesion. VASES+D scores were lower for stroke patients who were classified as POCS compared to TACS, PACS and LACS. However, only two participants were classified as POCS, so it is important to also note that VASES+D scores were lower for stroke patients who were classified as PACS ( $n=21$ ) compared to TACS ( $n=18$ ) and LACS ( $n=5$ ). Tukey's post hoc test showed significant difference in VASES+D scores between POCS and TACS ( $p=.022$ ) and between POCS with LACS ( $p=.013$ ). However, this finding might be attributed to chance only as only two participants were classified as POCS.



Correlations between continuous variables and all mood measures (VAMS-R, VASES+D and SADQ-21) are summarised in Table 4.17. Age was not significantly correlated with self-report mood scores. Sheffield Screening test total scores were not significantly related to mood on either of the self-report measures. Pre-stroke, post-stroke Barthel scores and scores on ADL and leisure activities were not significantly related to VAMS-R or VASES+D total scores.

Age was not significantly correlated with SADQ-21 scores. Participants who scored higher on the SADQ (indicating more distress) had lower scores on the Sheffield Screening Test total and receptive subscale (indicating greater communication impairment). Level of independence on the Barthel index pre- and post-stroke was not significantly related to mood as measured by the SADQ. Activities of daily living (EADL scores) and leisure activities (LQ scores) were also not significantly correlated with mood.

Table 4.17: Correlations with VAMS-R, VASES+D & SADQ-21 scores

	VAMS-R		VASES+D	SADQ-21
Age	r	.04	.08	-.12
	p	.74	.48	.38
Sheffield Screening Test total	r	-.07	-.13	-.28*
	p	.57	.28	.03
Barthel Index	r	-.02	-.12	-.18
	p	.85	.31	.18
Pre-stroke Barthel Index	r	-.09	-.03	-.06
	p	.44	.78	.64
N-Extended Activities Daily Living	r	-.01	-.04	-.05
	p	.97	.74	.73
N-Leisure Questionnaire	r	-.03	.04	-.03
	p	.81	.75	.81

r = Pearson's correlation, p = Probability level, \*p≤.05

4.10 Relations between mood scores and language assessment

Correlations between mood measures and language screening test (SST)

Correlations between mood measures and the Sheffield Screening Test (SST) are summarised in Table 4.18. VASES total and ‘depressed’ item scores as well as VAMS-R total and ‘sad’ item scores were not significantly related with communication impairments as measured on the language screening test. Only the SADQ-21 was significantly related to overall and receptive, but not expressive communication impairment. Patients who had higher SADQ-21 scores (indicating lower mood) had lower scores on the SST (indicating greater communication impairment).

Table 4.18: Correlations between mood measures and Sheffield Screening Test

	SST total score		SST receptive subtest	SST expressive subtest
VAMS-R	r	-.07	-.09	-.04
	p	.57	.43	.73
VAMS-R Sad item	r	.04	.06	.02
	p	.72	.61	.83
VASES+D	r	-.13	-.11	-.13
	p	.28	.35	.29
VASES	r	-.15	-.14	-.14
	p	.20	.24	.23
VASES Depressed item	r	.12	.16	.09
	p	.31	.20	.47
SADQ-21	r	-.28*	-.34**	-.20
	p	.03	.01	.12

r = Pearson’s correlation coefficient, p = Probability level

\* Correlation is significant at the 0.05 level (two-tailed)

\*\*Correlation is significant at the 0.01 level (two-tailed)

### **Correlations between mood scores and cognitive screen (CAT battery)**

Correlations were calculated for all mood scores and the cognitive screen subtests. The cognitive screen total score was not significantly related to mood. There were also no significant correlations between any of the mood measures and any of the individual subtests of the cognitive screen. Therefore, associated cognitive deficits as measured with the cognitive screen section of the CAT were unrelated to mood as measured either with self-report or observer-rated questionnaires. Table 4.19 shows correlations between mood measures and cognitive screen subtests.

### **Correlations between mood scores and language battery (CAT battery)**

Correlations were also calculated for all mood measures and the language battery subtests. Table 4.20 summarises correlations between mood measures and language battery subtests.

Language battery total scores were not significantly correlated with mood. None of the spoken and written language subtests were significantly correlated with mood scores. Participants who scored higher on the writing section of the language battery (indicating better writing skills) had higher scores on the VASES (indicating better mood) with and without the depressed item. VAMS-R was also significantly correlated with the writing total scores. Participants who scored lower on the VAMS-R (indicating better mood) had also higher scores on the writing section. Both self-report mood measures were significantly correlated with the writing total score but the observer-rated measure (SADQ-21) was unrelated with writing skills. Correlations between writing section subtests and mood measures are summarised in Table 4.21.



Table 4.19: Correlations between mood measures and the Cognitive Screen (CS)

	Cognitive Screen Total Score	Semantic Memory Total Score	Word Fluency Total Score	Recognition Memory Total Score	Gesture Object Use Total Score	Arithmetic Total Score
VAMS-R	r	-.18	-.18	-.14	-.18	-.06
	p	.24	.23	.34	.22	.67
Sad	r	.07	-.01	.21	-.09	.09
	p	.65	.96	.17	.56	.55
VASES	r	.07	.09	-.07	.24	.10
	p	.66	.53	.66	.11	.50
VASES+D	r	.06	.10	-.08	.22	.10
	p	.69	.49	.62	.13	.50
Depressed	r	.01	.16	-.08	.11	-.02
	p	.94	.30	.58	.48	.89
SADQ-21	r	-.01	-.05	-.08	-.25	.20
	p	.98	.78	.63	.13	.24

r = Pearson's correlation coefficient, p = Probability level

\* Correlation is significant at the 0.05 level (two-tailed)

\*\*Correlation is significant at the 0.01 level (two-tailed)

Table 4.20: Correlations between mood measures and the Language Battery (LB)

	Language Battery Total Score	Spoken Language Total Score	Written Language Total Score	Repetition Total Score	Naming Total Score	Reading Total Score	Writing Total Score
VAMS-R	r	-.18	-.18	-.12	-.08	-.13	-.09
	p	.24	.23	.42	.60	.41	.55
Sad	r	-.04	.07	-.06	.09	.01	-.38**
	p	.81	.66	.72	.52	.94	.01
VASES	r	.10	.13	.06	-.03	-.01	.36**
	p	.50	.40	.69	.84	.93	.01
VASES+D	r	.12	.13	.07	-.02	.01	.38**
	p	.43	.40	.65	.88	.95	.01
Depressed	r	.19	.10	.13	.10	.18	.23
	p	.22	.50	.39	.50	.24	.12
SADQ-21	r	-.07	-.16	-.07	.04	.02	-.33
	p	.67	.37	.69	.83	.90	.06

r = Pearson's correlation coefficient, p = Probability level

\* Correlation is significant at the 0.05 level (two-tailed)

\*\*Correlation is significant at the 0.01 level (two-tailed)

Table 4.21: Correlations between writing section of the language battery and mood measures

Comprehensive Aphasia Test (CAT)	Writing Total	Writing: Copying	Writing: Picture Names
VAMS-R	r -.41** p .01	-.30* .04	.38** .01
VASES+D	r .38** p .01	.32* .03	.33* .03
SADQ-21	r -.33 p .06	-.37* .03	-.20 .25

r = Pearson’s correlation coefficient, p = Probability level  
 \* Correlation is significant at the 0.05 level (two-tailed)  
 \*\*Correlation is significant at the 0.01 level (two-tailed)

**Correlations between mood scores and disability questionnaire (CAT battery)**

The relationship between all mood measures and the disability questionnaire was also investigated. Table 4.22 shows correlations between mood measures and baseline Disability Questionnaire (DQ). Scores on the VAMS-R, VASES+D and SADQ-21 were significantly related with the Disability Questionnaire total, disability subscale and impact subscale ( $p \leq .001$ ). VAMS-R Sad item and VASES Depressed item were not significantly associated with the Disability Questionnaire total and disability subscale, but were significantly associated with the impact subscale.



Table 4.22: Correlations between mood measures and the Disability Questionnaire (DQ) at baseline

	DQ Total Score	Disability: Total Score	Disability: Talking	Disability: Understanding	Disability: Reading	Disability: Writing	Impact: Total Score	Impact: Intrusion	Impact: Self-image	Impact: Emotional
VAMS-R	r .577***	.386**	.341*	.129	.137	.250	.661***	.402**	.471***	.695***
	p <.001	.009	.022	.404	.376	.101	<.001	.006	.001	<.001
Sad	r .401	.294	.338*	.129	.137	.250	.426**	.310*	.251	.457**
	p .007	.053	.025	.404	.376	.101	.004	.041	.100	.002
VASES	r -.606***	.381**	-.287	-.510***	-.251	-.116	-.717***	.389**	-.530***	-.779***
	p <.001	.010	.056	<.001	.096	.448	<.001	.008	<.001	<.001
VASES+D	r -.609***	-.377*	-.286	-.499***	-.237	-.126	-.725***	-.384**	-.542***	-.788***
	p <.001	.011	.056	<.001	.117	.408	<.001	.009	<.001	<.001
Depressed	r -.430**	-.236	-.324*	-.196	-.030	-.129	-.541***	-.158	-.476***	-.607***
	p .003	.011	.030	.196	.845	.400	<.001	.299	.001	<.001
SADQ-21	r .520***	.419*	.105	.431**	.480**	.278	.498**	.442**	.374*	.422*
	p .001	.012	.548	.010	.004	.106	.002	.008	.027	.012

r = Pearson's correlation coefficient, p = Probability level

\* Correlation is significant at the 0.05 level (two-tailed)

\*\* Correlation is significant at the 0.01 level (two-tailed)

\*\*\* Correlation is significant at the 0.001 level (two-tailed)

**Correlations between Language Battery and Disability Questionnaire scores (CAT battery)**

The relationship between the Disability Questionnaire total and subscales scores and the Language Battery total scores was also investigated and the results are summarised in Table 4.23. Higher Language Battery total scores (indicating greater communication impairment) were significantly related with lower scores on Disability Questionnaire total, disability subscale and impact subscale (indicating less disability and impact of aphasia) ( $p \leq .01$ ). These significant correlations suggest that there are not any significant discrepancies between the level of communication impairment and the disability and impact associated with it.

Table 4.23: Correlations between Language Battery and Disability Questionnaire scores at baseline

	Language Battery Total scores	
	r	p
Disability Questionnaire Total scores	-.597	<.001***
-Disability: Total	-.658	<.001***
-Impact: Total	-.437	.003***

r = Pearson's correlation coefficient, p = Probability level  
\*\*\* Correlation is significant at the 0.001 level (two-tailed)

**4.11 Comparison between depressed and non-depressed patients on language measures at baseline**

Of the 71 participants who completed baseline mood measures thirty nine (55%) were classified as ‘depressed’ using either the VAMS ‘sad’ subscale or the SADQ-21 total scores cut-off criteria. Table 4.24 shows Sheffield Screening Test and Language Battery (CAT) total scores for those participants classified as ‘depressed’ and those classified as ‘non-depressed’. Scores between the two groups were compared using independent samples t-tests. Sheffield Screening Test and Language Battery total scores did not significantly differ between those classified with or without depressive symptoms.

Table 4.24: Comparison between depressed and non-depressed participants for language scores

LANGUAGE MEASURES	Depressed		Non-depressed		Comparison p Value
	Mean	SD	Mean	SD	
Sheffield Screening Test Total scores	9.49 (n=39)	6.30	12.59 (n=32)	5.67	.262
Language Battery (CAT) total scores	205.09 (n=23)	68.55	240.00 (n=22)	60.09	.380

SD=Standard Deviation



## 4.12 Factors predicting mood at baseline

### Multiple regression assumptions

Multiple regression refers to using more than one independent variable to predict the dependent variable. Multiple regression analysis makes a number of assumptions about the data and it should not be used on small samples or when the distribution of scores is very skewed (Pallant, 2007). In the literature, there are several methods for the sample size calculation required for the calculation of regression analysis.

Tabachnick & Fidell (2007) suggested a way for calculating sample size requirements by taking into account the number of independent variables ( $N > 50 + 8m$  where  $m$ =number of independent variables). Other authors recommend between 10 and 15 cases per independent variable (Field, 2005).

Based on this information, for the sample size of the present study ( $n=71$ ), between 4 and 7 predictor variables can be included in the multiple regression analysis. The criterion/dependent should be measured on a continuous scale and the predictor variables should be measured on a ratio, interval or ordinal scale. However, multiple regression analyses are only possible for those participants for whom data relating to each variable are complete. Therefore, for certain study variables (for instance Comprehensive Aphasia Test scores were available for 45 participants) included in the regression fewer participants are likely to be available for the analysis.

The data were also checked again for outliers as multiple regression is a statistical procedure that is very sensitive to very high or low scores for either the dependent or/and independent variables included for the analysis. The baseline data database was also checked for any extreme values due to data entry errors. Data were also checked for multicollinearity as this increases the chance for Type II error and limit the size of R due to shared variance between predictor variables (Field, 2005).

Correlation coefficients were examined for collinearity between predictor variables. None of the independent variables were found to be highly correlated ( $\geq .90$  and above). Total scores of scales instead of subscale scores were included in the multiple regression analysis to avoid singularity which occurs when one independent variable is actually a combination of other independent variables (Pallant, 2007).

There are different regression methods to be used Enter, Stepwise, Forward, Backward and Remove. Stepwise is the most frequently used method and Enter is the default in the SPSS statistical program. Stepwise method enters variable one at a time depending on whether they meet statistical criteria. The independent variable with the highest standardised beta (that is the predictor that has the highest simple correlation with the outcome) is first added or removed from the equation to see whether it is significant and the process continues until no further variables are significant.

In the Simultaneous/Enter method, all the available independent variables are entered in the equation directly. The Stepwise multiple regression approach is a combination of Forward selection and Backward deletion. Despite the appeal of this approach, it is not entirely satisfactory as the addition of another independent variable can completely change the contributions of the other predictors to the variance of scores on the dependent variable (Kinnear & Gray, 2008). It is also recommended that if there is no theoretical basis for the regression model or/and you have a relatively moderate number of cases then it is safer to use simultaneous multiple regression (Enter method) (Dancey & Reidy, 2007).

Regression methods using statistical procedures such as the Stepwise, Forward and Backward methods should be used with caution and are more preferable when you have a larger set of independent variables and you want to indentify the minimum number of independent variables predicting the criterion/dependent variable (Brace, Kemp, & Snelgar, 2006). Therefore, it was considered more appropriate for the purpose of all initial multiple regression analyses.



4.13 Predictors of low mood at baseline

- Regression model for baseline VASES+D scores

Multiple linear regression analysis was used to develop a model for the prediction of VASES scores at baseline. The results of the regression are shown in Table 4.25. The variables significantly correlated with VASES+D scores were the Language Battery writing scores and the Disability Questionnaire scores. VASES+D scores were also significantly associated with gender and Bamford stroke classification. Most participants had either a TACS or PACS stroke classification, therefore the Bamford stroke classification was not entered as an independent variable in the regression model as the significant difference was in relation to POCS stroke classification and only two participants were classified with POCS. Writing and Disability Questionnaire total scores were entered rather the subscale scores to limit the number of predictors used in this regression analysis. These three variables (gender, writing total scores and disability questionnaire total scores) were entered into the regression as independent variables using the Enter method.

Table 4.25: Regression model for baseline VASES+D scores

	B (95% CI)	SE	Standardised B	t	T significance	PC
Gender	-3.064 (-7.380 to 1.252)	2.137	-.179	-1.43	.159	-.218
Writing Total	.067 (-.150 to .285)	.108	.087	.62	.536	.097
Disability Questionnaire Total	-.218 (-.339 to -.097)	.060	-.519	-3.65	.001***	-.495

B=Beta Coefficients, CI=Confidence Interval, SE=Standard Error, PC=Partial Correlation

\*\*\*p≤.001

Disability Questionnaire total scores were the only significant predictor of VASES+D. Gender and Writing total scores were not significant predictors and did not account for the variance in VASES+D total scores at baseline. This model including only the Disability Questionnaire scores was found to be highly significant ( $F_{3, 41}=9.39, p<.001$ ). Disability Questionnaire has a regression coefficient of  $-.218$ . Thus, as Disability Questionnaire scores increase by one unit (more disability), VASES+D scores decrease by  $.218$  (more distress). The adjusted  $R^2$  for the model was  $.364$  which indicates that this model accounted for more than a third of the variance in VASES+D scores.

- Regression model for baseline SADQ-21 scores

Simultaneous (Enter method) linear regression was also carried out to test a model predicting SADQ-21 scores. The results of the regression analysis are shown in Table 4.26. Both Sheffield Screening Test (SST) total scores and receptive subscale scores were significantly associated with baseline SADQ-21 scores. Sheffield Screening Test total scores were only entered in the model as it was of interest to look whether the overall communication impairment was a predictor of low mood as measured on the SADQ-21 scores. The Copying subtest scores from the Writing section of the Language Battery were also found to be a significant factor associated with SADQ-21 scores. The Copying subtest scores and Disability Questionnaire total scores were entered as predictor variables as these were all shown to have significant relationships with SADQ-21 scores.

Table 4.26: Regression model for baseline SADQ-21 scores

	B (95% CI)	SE	Standardised B	t	t significance	PC
Writing: copying	-.289 (-.736 to .159)	.219	.175	-1.32	.198	-.230
Sheffield Screening Test Total	.370 (-.388 to 1.127)	.371	.175	.996	.327	.176
Disability Questionnaire Total	.247 (.078 to .417)	.083	.550	2.98	.006**	.471

B=Beta Coefficients, CI=Confidence Interval, SE=Standard Error, PC=Partial Correlation

\*\*p≤0.01

Disability Questionnaire total scores were a significant predictor of SADQ-21 scores at baseline. The Copying subset scores and Sheffield Screening Test total scores were not found to be significant predictors of SADQ-21. The regression model was found to be significant ( $F_{3, 31}=5.32, p=.004$ ). For one unit increase in Disability Questionnaire scores (more disability) there was a .247 increase in SADQ scores (more distress). The Adjusted  $R^2$  for the model was .276, suggesting that Disability Questionnaire scores only accounted for a quarter (27.6%) of the variance in SADQ-21 total scores.



## **PART 2: Analysis of follow-up data**

### **4.14 Description of follow-up sample**

Sixty three participants (89%) of the original sample (n=71) completed follow-up assessments at 6 months after recruitment to the study. By the time of their follow up assessment all participants had been discharged from the hospital. Participants completed follow up assessments at six months after recruitment  $\pm$  2 weeks. Of the eight participants (11%) who were not followed up, five declined and three had died. Aphasic stroke survivors who were reassessed were compared to those not reassessed on age, gender and baseline Barthel Index scores using Independent t-tests and chi-square for independence. Participants who were not followed up were not significantly different in age than those who were followed up ( $t_{69}=-1.745$ ,  $p=.085$ ). There was also no significant difference in gender among participants who were followed up or not at six months ( $\chi^2=.072$ ,  $p=.789$ ). Barthel Index scores showed that participants who completed follow up assessments were more independent at baseline, but still there was not a significant difference between the two groups ( $t_{69}=1.800$ ,  $p=.076$ ). Time post-stroke was greater for those people who were followed up and this difference was found to be significant ( $t_{69}=3.229$ ,  $p=.003$ ). Overall, the follow up group did not significantly differ from the group of participants who were not followed up in terms of age, gender, and level of independence as measured on the Barthel Index. However, time after stroke was significantly different between the two groups. These comparisons and descriptive statistics are shown in Table 4.27.

Table 4.27: Descriptive statistics and comparisons between participants who were followed up with those who were not followed up on baseline information

	Participants followed up (n=63)	Participants not followed up (n=8)	Comparison p value
<b>Age</b>			
Mean	68.41	76.38	.085
SD	12.36	10.17	
<b>Gender</b>			
Male (n)	35	3	.789
Female (n)	28	5	
<b>Barthel Index</b>			
Mean	13.84	9.75	.076
SD	6.05	6.07	
<b>Time Post- Stroke (months)</b>			
Mean	15.92	5.38	.003*
SD	19.19	6.21	

SD=Standard deviation, \*≤.01

An equal number of participants had suffered a TACS (n=18, 29%) and a PACS (n=18, 29%). Two participants (3%) were originally classified as POCS and 5 (8%) as LACS and the stroke classification for the remaining participants was unknown. Forty-eight (76%) participants had a left side lesion, eleven (18 %) a right side lesion and for four participants the side of lesion was not available. Of the 63 participants who were followed up thirty-four (54%) were living with their spouse, thirteen (21%) with other family members or/and relatives and sixteen (25%) on their own.

Independent samples t-tests were performed to check whether scores on the mood and activities of daily living measures at baseline were significantly different for participants who were followed up at six months compared with those who were not followed up. These findings are shown in Tables 4.28-4.29. Independent t-tests showed that none of the baseline mood scores were significantly different between participants who were reassessed at six months follow up and those who were not followed up. This suggests that patients who did not complete the six month follow up assessment did not have better or worse mood than the ones who did.

Table 4.28: Comparisons between participants followed up and those who were not followed up on mood measures

MEASURES	Participants followed up (n=63)	Participants not followed up (n=8)	Comparison p value
VAMS			
Mean	346.83	351.29	.941
SD	149.32	149.319	
VASES+D			
Mean	35.71	37.00	.714
SD	8.66	9.98	
SADQ-21			
Mean	17.72	16.00	.692
SD	9.26	15.82	

SD=Standard deviation



Independent t-tests also showed that baseline leisure activities scores were significantly different between participants who were reassessed at six months follow up and those who were not followed up. This suggests that people in the follow up group were involved in more leisure activities than those in the group who did not complete follow up assessments. The follow up sample did not differ significantly from the non-follow up sample in extended activities of daily living total scores.

Table 4.29: Comparisons between participants followed up and those who were not followed up on activities of daily living (ADL) measures

MEASURES	Participants followed up (n=63)	Participants not followed up (n=8)	Comparison p value
N-EADL			
Mean	17.08	12.62	.145
SD	12.98	20.49	
N-LQ			
Mean	6.81	2.50	.002**
SD	8.11	2.27	

N-EADL: Nottingham-Extended Activities of daily Living Index

N-LQ: Nottingham-Leisure Questionnaire

SD=Standard deviation, p=probability, \*\*p=≤.01

**4.15 Follow-up assessments**

**4.15.1 Mood measures at follow up**

The same mood measures were used at follow up (VAMS-R, VASES and SADQ-21) and this allows comparison with baseline data. Descriptive statistics for mood measures at follow up are summarised in Table 4.30. Paired sample t-tests were performed to compare baseline mood scores with follow up mood scores. VAMS-R total scores were significantly lower (indicating worse mood) at follow up compared with baseline scores ( $p<.05$ ). All other mood scores were not significantly different.

Table 4.30: Descriptive statistics and comparisons for mood measures at follow up

	n	Range of possible scores	Range	Follow up Mean (SD)	Baseline Mean (SD)	Comparison p value
VAMS-R	59	0-800	29-673	299.34 (136.61)	348.85 (149.51)	.026*
VASES+D	59	11-55	18-55	37.81 (9.51)	35.81 (8.80)	.183
SADQ-21	49	0-63	3-35	18.88 (8.53)	17.54 (9.93)	.331

SD=Standard deviation, p=probability, \* $p\leq.05$

All forty nine SADQ-21 questionnaires at follow up were completed by a spouse/partner or close relative living with participants. The remaining questionnaires were either not returned to the researcher or a relative/carer was not available to complete this.

### *Classification of 'depression' at follow up*

- VAMS-R

VAMS-R scores were obtained for 59 of the 63 participants who were reassessed at six months follow up. The remaining four participants were not able to complete the VAMS-R at follow up. Using a cut-off of  $\geq 50$  on the VAMS-R sad subscale, 11 (19%) of the 59 participants who completed the VAMS-R at follow up were classified as having low mood. VAMS-R 'sad' subscale scores for those who had low mood at follow up ranged between 56 and 95 (mean 73.91, SD=13.68). This is lower than the 40% prevalence of 'depressed' participants completing VAMS-R at baseline. McNemar symmetry chi-square test was carried out to identify any change in depression classification between baseline and follow up assessment. A significant difference was found between the classification of participants at baseline and at follow up ( $p=.021$ ). This means that proportion classified as 'depressed' based on the VAMS-R 'sad' subscale cut-off point changed significantly over the six month period.

- SADQ-21

SADQ-21 questionnaires were completed by a spouse, relative or carer for 49 participants. A total of fifteen questionnaires were not returned to the researcher for those participants who were completed assessments at six months follow up. Using a cut-off of 17/18, 25 of the 49 participants (51%) were classified as having 'low mood'. This is slightly higher than the 47% that was found for the SADQ-21 at baseline assessment. The SADQ-21 total scores for those depressed participants was between 17 and 35 (mean=25.60, SD=5.91).



McNemar test was performed to see whether the same proportion of participants was classified as 'depressed' at baseline and at follow up. This showed that there was no significant difference in participants' classification based on the SADQ-21 cut-off scores at baseline and at follow up ( $p=.791$ ).

Of the 63 participants who completed mood assessments at six month follow up twenty eight participants (44%) were classified as being 'depressed' using either the VAMS-R sad subscale or SADQ-21 cut-off scores. This is slightly lower than the prevalence rate of 55% found at baseline. When using both VAMS-R sad subscale and SADQ-21 cut-off criteria only seven participants (11%) were found to be 'depressed'.

#### **4.15.2 Activities of daily living (ADL) assessments at follow up**

Participants were reassessed on the Nottingham Extended Activities of Daily Living Index (EADL) and Nottingham Leisure Questionnaire (N-LQ) at six months. Table 4.31 presents descriptive statistics of ADL scores at follow up. Paired t-tests were calculated to compare baseline and follow up scores on each of the ADL assessments. Total scores both N-EADL and N-LQ were significantly higher (indicating less disability and more activity participation) at follow up compared with those at baseline. All baseline subscales of the N-EADL were also significantly different from those at follow up ( $p<.001$ ).

Table 4.31: Descriptive statistics and comparison of ADL scores at follow up

	n	Range of possible scores	Range	Follow up Mean (SD)	Baseline Mean (SD)	Comparison p value
N-EADL	62	0-22	0-22	9.89 (7.74)	9.01 (8.01)	<.001***
-mobility		0-6	0-6	2.61 (2.53)	2.48 (2.57)	
-kitchen		0-5	0-6	3.06 (1.97)	2.76 (2.04)	
-domestic		0-5	0-5	1.97 (2.09)	1.69 (2.08)	
-leisure		0-7	0-7	2.23(1.96)	2.08 (1.92)	
N-LQ	62	0-60	0-37	15.82 (8.96)	6.32 (7.79)	.002***

N-EADL: Nottingham-Extended Activities of daily Living Index, N-LQ:

Nottingham-Leisure Questionnaire (higher scores are positive)

SD=Standard deviation, p=probability, \*\*\*p≤.001

**Comparison of depressed and non depressed participants at follow up**

Twenty eight (44%) of the 63 participants followed up were classified as ‘depressed’ and thirty five (56%) as ‘not depressed’ either using the VAMS-R and/or the SADQ-21 cut-off scores. Table 4.32 shows depressed versus non depressed participants on the follow up Activities of Daily Living (ADL) assessments and the Disability Questionnaire. Independent sample t-tests were used to compare scores for depressed and non depressed aphasic stroke participants. Mean ADL scores both on the EADL and N-LQ were higher for non depressed participants but this difference was not significant ( $t_{60}=1.847$ ,  $p=.070$  and  $t_{60}=1.408$ ,  $p=.164$ ). Disability Questionnaire scores were significantly higher for depressed participants at follow up compared with those who were not depressed ( $t_{52}=-2.579$ ,  $p=.013$ )

Table 4.32: Comparison of depressed and non depressed participants at follow up on ADL and Disability Questionnaire scores

Follow up Assessments	Depressed (n=28) Mean (SD)	Not depressed (n=35) Mean (SD)	Comparison p value
N-EADL	7.96 (6.66)	11.47 (8.29)	.070
N-LQ	14.07 (9.99)	17.26 (7.88)	.164
Disability Questionnaire	51.09 (22.57)	35.75 (20.71)	.013*

SD= Standard Deviation, p= probability, \*p< .05



**4.15.3 Language assessments at follow-up**

At follow up participants were reassessed on the Disability Questionnaire of the Comprehensive Aphasia Test (CAT). No other language assessments were repeated at six months follow up. Table 4.33 shows descriptive statistics of Disability Questionnaire scores at follow up. Paired t-tests were calculated to compared baseline and follow up scores on each section of the Disability Questionnaire. The baseline total scores were significantly higher than those at follow up, indicating less disability and impact associated with aphasia at six months after recruitment. All other subscales scores of the Disability Questionnaires were not significantly different.

Table 4.33: Descriptive statistics and comparisons on the Disability Questionnaire scores at follow up.

	Range of possible scores	Range	Follow up Mean (SD)	Baseline Mean (SD)	Comparison p value
Disability Questionnaire Total Score (n=54)	0-124	0-102	42.00 ( 22.60)	48.42 (20.47)	.012*
-Disability Total	0-64	0-54	22.62 (12.98)	25. 24 (11.02)	.140
-Impact Total	0-60	0-49	19.25 (12.03)	23.22 (11.51)	.182

Note: Higher scores indicate more disability and significant impact  
SD=Standard Deviation, p=Probability, \*≤.05

4.15.4 Satisfaction with Care & Carer Strain Index scores at follow up

Two additional assessments were completed at six months follow up. Forty four carers completed the Carer Strain Index at follow up (the remaining questionnaires were not returned to the researcher). Seventeen carers scored above the cut-off point ( $\geq 7$ ) indicating that they experienced strain while caring for someone after stroke. Almost one third of participants (27%) who completed follow up assessments completed the Satisfaction with Care scale (the remaining participants were not able to complete this due to the severity of their aphasia). Fifty carers completed the Satisfaction with Care scale and scored slightly lower (less satisfaction with support and services) but still above average than participants themselves.

Table 4.34: Descriptive statistics for the Carer Strain Index and Satisfaction with Care scales at follow up.

	n	Range of possible scores	Range	Mean	SD
<b>Carer Strain Index Total</b>	44	0-13	0-13	5.73	4.11
<b>Satisfaction with Care-Participant Total</b>	19	0-300	0-300	207.26	96.41
-Emotional support		0-100	0-100	65.53	34.82
-Help with aphasia		0-100	0-100	65.68	37.38
-Hospital & community services		0-100	0-100	75.58	30.74
<b>Satisfaction with Care-Carer Total</b>	50	0-300	0-298	185.14	77.95
-Emotional support		0-100	0-98	56.02	33.14
-Help with aphasia		0-100	0-100	61.00	33.48
-Hospital & community services		0-100	0-100	68.37	25.81
-CSI: total scores $\geq 7$ indicate strain, -SWC: higher scores indicate higher satisfaction SD=Standard Deviation					



4.16 Correlations between mood measures at follow up

Correlations were conducted between mood measures to identify whether there was a significant association between self-report measures (VAMS-R and VASES) and the observer-rated measure at follow up. These correlations are presented in Table 4.35.

The total scores and ‘depression’ items of self-report measures were all significantly correlated, with the exception of the observer-rated measure (SADQ-21) not correlating with any of the self-report measures.

Table 4.35: Correlations between mood measures at follow up

	1. VAMS-R	2. VAMS-R Sad item	3. VASES	4. VASES+D	5. VASES Depressed item	6. SADQ- 21
1. VAMS-R		r .565** p <.001	-.651** <.001	-.662** <.001	-.515** <.001	.207 .173
2. VAMS-R Sad item			r -.28* p .04	-.31* .02	-.37** .01	.293 .050
3. VASES				r .982*** p <.001	.631*** <.001	-.253 .098
4. VASES+D					r .705*** p <.001	-.256 .093
5. VASES Depressed item						r -.252 p .100
6. SADQ						

r = Pearson’s correlation coefficient, p = Probability level  
\* Correlation is significant at the 0.05 level (two-tailed)  
\*\* Correlation is significant at the 0.01 level (two-tailed)  
\*\*\* Correlation is significant at the 0.001 level (two-tailed)



**4.17 Association with low mood at follow-up**

Preliminary statistical analyses were also performed to identify which variables that were assessed at follow up were associated to mood at follow up. The same mood measures were used at follow up (VASES+D and SADQ-21) to allow comparison to baseline findings. VASES+D scores were obtained for 59 participants who were reassessed (five participants were not able to complete self-report mood measures) and SADQ-21 scores were available for 49 participants (the remaining questionnaires were not returned to the researcher). Independent sample t-tests were used for categorical variables with two groups (gender) and one-way ANOVAs for categorical variables with more than two groups. These findings are presented in Table 4.36. Pearson correlations were also used to identify any relationship between mood and other continuous variables assessed at follow up. Age, ADL scores, Carer Strain Index, Satisfaction with Care and Disability Questionnaire scores are the additional continuous variables which were also assessed at follow up. Table 4.37 presents the correlations between continuous variables at follow up and the VAMS-R, VASES+D, SADQ-21 total scores at follow up

Table 4.36: Comparison between VASES+D and SADQ-21 scores for categorical variables

Variable	VASES+D				SADQ-21			
	n	Mean	SD	p	n	Mean	SD	P
Gender								
Male	34	38.00	10.36	.86	25	20.48	8.11	.18
Female	24	37.54	8.32		24	17.21	8.80	
Marital status								
Single	6	32.67	7.20	.55	2	20.50	14.85	.81
Married	36	38.36	10.08		34	18.15	7.96	
Divorced	5	39.40	5.90		4	22.25	7.14	
Widowed	9	38.44	8.17		8	18.00	10.18	
Living arrangements								
With spouse	32	38.06	10.01	.89	30	18.10	7.63	.65
With others	11	38.45	8.60		12	20.83	9.08	
Alone	15	36.80	9.40		7	18.86	11.80	

p= Level of probability, SD=Standard deviation

VASES+D and SADQ-21 total scores at follow up assessment did not significantly differ between men and women and this finding is similar to baseline. There was also no significant difference in VASES+D and SADQ-21 total scores for participants' marital status and this replicates baseline findings. The majority of participants were married. VASES+D scores were compared for those who were married (Mean=38.36, SD=10.08) and those who were single (Mean=32.67, SD=7.20), divorced (Mean=39.40, SD=5.90) or widowed (Mean=38.44, SD=8.17) but no significant difference was found ( $F_{3, 52}=.717, p=.546$ ).

SADQ-21 scores did not significantly differ between participants who were married (Mean=18.15, SD=7.96) compared to those who were single (Mean=20.50, SD=14.85), divorced (Mean=22.25, SD=7.14), or widowed (Mean=18.00, SD=10.18) ( $F_{2,46}=.430, p=.653$ ).

VASES+D scores were slightly lower for participants living alone (Mean=36.80, SD=9.40) compared to those living with their spouse (Mean=38.06, SD=10.01) or with others (Mean=38, 45, SD=8.60) but the overall difference was not significant ( $F_{2,55}=.117, p=.890$ ). Similarly, SADQ-21 scores were not significantly different for participants who were living alone (Mean=18.86, SD=11.80) compared to those who were living with their spouse (Mean=18.10, SD=7.63) or others (Mean=20.83, SD=9.08) ( $F_{3,44}=.323, p=.808$ ). This finding is also similar with baseline findings.

Table 4.37: Correlations with continuous variables and mood scores at follow up

	VAMS-R		VASES+D		SADQ	
	r	p	r	p	r	p
Age	.05	.69	-.04	.74	-.09	.51
N-EADL total	-.26	.04*	.16	.21	-.07	.59
N-Leisure Questionnaire	-.24	.06	.28	.03*	-.20	.16
Carer Strain Index total	-.01	.96	-.10	.51	.37	.01**
Satisfaction with Care total						
-Participant	-.39	.09	.33	.16	.24	.46
-Carer	.09	.52	-.05	.73	-.12	.42

r = Pearson’s correlation, p = Probability level  
 \* Correlation is significant at the 0.05 level (two-tailed)  
 \*\*Correlation is significant at the 0.01 level (two-tailed)



Age was not significantly correlated with self-report mood measures (VAMS-R and VASES+D) or the observer-rated measure (SADQ-21) and this confirmed baseline findings. Participants who scored lower on the N-Extended Activities of Daily Living total, mobility ( $r=-.28$ ,  $p=.03$ ) and leisure ( $r=-.30$ ,  $p=.02$ ) subscales had significantly higher scores on the VAMS-R, indicating lower mood. This differs from baseline where N-EADL total and subscale scores were not significantly related to mood on VAMS-R. N-EADL total scores and subscale scores at follow up were not significantly related with either the VASES+D or the SADQ scores and this was also found at baseline.

There was a significant positive correlation between N-Leisure Questionnaire total scores and VASES+D scores at follow up, indicating that greater participation in leisure activities was associated with better mood on the VASES+D self-report measure. This finding was different to baseline where N-LQ total scores were not significantly related to VASES+D. However, with regard to VAMS-R and SADQ-21 scores at follow up, N-EADL total scores and subscale scores were not significantly correlated either with self-report mood ratings on the VAMS-R or observer mood ratings on the SADQ-21. This finding is similar to baseline.

Satisfaction with Care total scores completed both by participants and carers was not significantly related with any of the mood measures. Satisfaction with Care scores on individual items were not significantly correlated with VASES+D or SADQ-21. However, VAMS-R scores were moderately correlated with participants' satisfaction with emotional support ( $r=.42$ ,  $p=.02$ ), support with communication problems ( $r=.42$ ,  $p=.02$ ) and overall hospital and community services ( $r=.42$ ,  $p=.02$ ). These correlations suggested that participants with lower mood were more satisfied with care provided by different healthcare services after their stroke.

Correlations between all mood measures and the disability questionnaire at follow up were also calculated. Table 4.38 shows the associations between mood measures and the Disability Questionnaire of the Comprehensive Aphasia Test at follow up. Disability Questionnaire total scores were significantly correlated with all mood measures. Lower mood scores were significantly related with greater disability and impact from living with aphasia. The Disability subscale was not significantly related with the VAMS-R 'sad' item and the Impact subscale was not significantly related with the SADQ-21 total scores. All other correlations between these subscales and mood measures were found to be significant.

Table 4.38: Correlations between mood measures and the Disability Questionnaire (DQ) at follow up

	DQ Total Score	Disability: Total Score	Disability: Talking	Disability: Understanding	Disability: Reading	Disability: Writing	Impact: Total Score	Impact: Intrusion	Impact: Self-image	Impact: Emotional
VAMIS-R	r .544***	.441***	.237	.357**	.347*	.508***	.554***	.379**	.538***	.467***
	p <.001	.001	.088	.009	.011	<.001	<.001	.005	<.001	<.001
Sad	r .326*	.260	.194	.150	.259	.256	.334*	.126	.333*	.335*
	p .016	.060	.164	.285	.062	.065	.015	.370	.015	.014
VASES	r -.717***	-.592***	-.437***	-.526***	-.466***	-.538***	-.729***	-.619***	-.667***	-.575***
	p <.001	<.001	.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
VASES+D	r -.718***	-.573***	-.407**	-.533***	-.459***	-.509***	-.718***	-.605***	-.652***	-.571***
	p <.001	<.001	.003	<.001	.001	<.001	<.001	<.001	<.001	<.001
Depressed	r -.473***	-.362**	-.199	-.345*	-.266	-.388**	-.503***	-.471***	-.429***	-.394**
	p <.001	.008	.153	.011	.054	.004	<.001	<.001	.001	.003
SADQ-21	r .325*	.331*	.276	.279	.252	.258	.263	.171	.184	.274
	p .041	.040	.089	.085	.121	.113	.106	.298	.261	.091

r = Pearson's correlation coefficient, p = Probability level

\* Correlation is significant at the 0.05 level (two-tailed)

\*\* Correlation is significant at the 0.01 level (two-tailed)

\*\*\* Correlation is significant at the 0.001 level (two-tailed)



4.18 Factors predicting mood at follow-up

- Regression model for VASES+D at follow-up

Multiple linear regression was used to evaluate a model for the prediction of low mood on the VASES+D at six months using assessment scores collected at follow-up. The variables that were found to be significantly related with mood at six months follow-up were greater participation in leisure activities on the N-Leisure Questionnaire and greater disability on the Disability Questionnaire of the Comprehensive Aphasia Battery. Both these two variables were entered into the regression model and simultaneous (Enter method) regression was calculated in the same way as at baseline. The results of the regression model are shown in Table 4.39.

Table 4.39: Regression model for follow up VASES+D using follow up variables

	B (95% CI)	SE	Standardised B	t	t significance	PC
Disability Questionnaire total	-.318 (-.418 to -.218)	.050	-.750	-6.398	<.001***	-.671
N-Leisure Questionnaire total	-.111 (-.383 to .162)	.136	-.096	-.817	.418	-.115

B: Beta Coefficients, CI: Confidence Interval, SE: Standard Error, PC: Partial Correlation  
\*\*\*p≤ .001

Disability Questionnaire total scores were a significant predictor of follow up VASES+D scores. N-Leisure Questionnaire was not a significant predictor of mood scores on the VASES+D. Disability Questionnaire total scores increase by one unit (greater disability), mood scores on the VASES+D decrease by .318 (lower mood).

The model including Disability Questionnaire total scores was significant ( $F_{2,50}=24.774, p<.001$ ). The adjusted  $R^2$  for the model was .478, meaning that it accounted for almost half of the variance (47.8%) in follow up VASES+D scores. This was greater than the  $R^2$  of .364 found at the baseline regression model for VASES+D.

- Regression model for SADQ-21 at follow-up

Multiple linear regression was also carried out to test a model for the prediction of SADQ-21 scores at six months using scores collected at follow-up. The Disability Questionnaire total scores and Disability subscale scores were associated with SADQ021 scores. The Disability Questionnaire total scores were entered into the regression to find out whether both disability and impact associated with communication impairment were predictive of follow up SADQ-21 scores. Care Strain Index total scores were also significantly associated with SADQ-21 scores and was also entered into the regression model. Simultaneous regression was performed and the results are shown in Table 4.40.

Table 4.40: Regression model for follow up SADQ-21 scores using follow up variables

	B (95% CI)	SE	Standardised B	t	T significance	Partial Correlation
Disability Questionnaire Total	.118 (.004-.232)	.056	.317	2.108	.042*	.336
Carer Strain Index total	.712 (.083-1.341)	.310	.346	2.299	.028*	.362

B: Beta Coefficients, CI: Confidence Interval, SE: Standard Error  
 \*p≤.05

Both Disability Questionnaire total scores and Carer Strain Index total scores were significant predictors of SADQ-21 scores at six months follow up assessment. The regression model was significant ( $F_{2, 35}=7.217, p=.002$ ). The  $R^2$  for the model was .252, indicating that together DQ and CSI accounted for a quarter (25.2%) of the variance in follow up SADQ-21 scores. This finding is similar to the regression model at baseline in which Disability Questionnaire scores were again a significant predictor and accounted for a quarter (27.6%) of the variance in baseline SADQ-21 scores. However, the standardised (Beta) regression coefficients show that Carer Strain Index total score (.346) was a stronger predictor than Disability Questionnaire total score (.317).



## **PART 3: Baseline factors predicting mood at follow-up**

### **4.19 Associations between baseline assessments and mood at follow-up**

Baseline assessments and other information collected at baseline were used to identify any significant associations in order to develop a regression model to predict mood scores after six months. Independent t-tests were used for categorical variables with two categories and one-way ANOVAs were used for categorical variables with more than two categories. The results of these analyses are shown in Table 4.41. Gender, previous stroke, other relevant medical history and side of lesion were not found to be significantly associated with mood either using the VASES+D as a self-report measure or the SADQ-21 as an observer-rated measure. VASES+D scores were lower (indicating worse mood) for patients classified as POCS compared with TACS, PACS, and LACS. This finding is similar to baseline, but again stroke classification groups were unequal in numbers therefore Type I error levels are not guaranteed for the significance found between POCS and all other stroke classifications on VASES+D scores at follow up.

Table 4.41: Comparison between VASES+D and SADQ-21 scores for categorical variables at baseline

Baseline information	VASES+D				SADQ-21			
	n	Mean	SD	P	n	Mean	SD	P
Gender								
Male	34	38.00	10.36	.09	25	20.48	8.11	.75
Female	24	37.54	8.38		24	17.21	8.80	
Previous stroke								
Yes	13	36.31	9.46	.51	14	19.43	7.02	.79
No	41	38.34	9.66		32	18.69	9.11	
Other medical history								
Yes	32	36.84	9.89	.27	27	19.74	8.50	.27
No	21	39.81	8.60		18	16.83	8.73	
Side of lesion								
Left	46	38.67	9.29	.21	38	18.58	8.78	.91
Right	8	34.00	11.07		7	19.00	8.72	
Bamford classification								
TACS	16	39.00	8.73	<.01**	15	18.60	9.16	.71
PACS	17	36.41	8.64		14	19.86	8.07	
POCS	2	18.50	.71		2	23.00	11.31	
LACS	5	44.20	8.23		3	14.67	3.22	

p= Probability, SD=standard deviation, \*\*p≤.01

Pearson's correlations were carried out between baseline Barthel Index, Sheffield Screening Test, mood and activity of daily living scores, and follow up mood scores on the VASES+D and SADQ-21. The results are shown in Table 4.42. Age, independence in basic ADL pre- and post-stroke, and communication impairment at baseline were not significantly correlated with follow up scores on the VASES+D and SADQ-21. Lower mood as measured by both the self-report and observer-rated mood measures at baseline was significantly associated with lower mood on the same measures at six months. Greater participation in leisure activities (N-LQ) was associated with better mood measured on the SADQ-21, but not on the VASES+D at six months.



Table 4.42: Correlations between baseline and follow up scores on the VASES+D and SADQ-21

Baseline Assessments	VASES+D (follow-up)		SADQ-21 (follow-up)	
	r	p	r	p
Age	-.043	.747	-.095	.516
Pre-stroke Barthel Index	-.124	.354	.133	.364
Barthel Index	-.027	.839	-.161	.268
Sheffield Screening Test total	-.069	.605	-.227	.117
-receptive total	.008	.953	-.203	.162
-expressive total	-.119	.372	-.225	.121
VAMS-R	-.432***	.001	.295*	.040
VASES+D	.455***	<.001	-.304*	.036
SADQ-21	-.311*	.040	.464***	.001
N-EADL	-.040	.768	-.167	.252
N-Leisure Questionnaire	.090	.502	-.322*	.024

r= Pearson’s correlation, p= Probability  
 \* Correlation is significant at the 0.05 level (two-tailed)  
 \*\* Correlation is significant at the 0.01 level (two-tailed)  
 \*\*\* Correlation is significant at the 0.001 level (two-tailed)

Pearson's correlations were calculated between subtests of the Comprehensive Aphasia Battery (CAT) at baseline and follow up scores on the VASES+D and SADQ-21 scores. These are shown in Table 4.43. Better cognitive performance at baseline was significantly related to lower SADQ-21 total scores (indicating better mood). Higher Writing subtest total scores (indicating better writing skills) were significantly related with higher VASES+D scores and lower SADQ-21 scores (indicating better mood). Lower observer-rated mood (SADQ-21) at follow up was also associated with better scores on Language Battery subtests of spoken and written comprehension. Disability Questionnaire total and subtest scores were significantly related with both mood measures.

Table 4.43: Correlations between baseline Comprehensive Aphasia Battery (CAT) and scores on the VASES+D and SADQ-21 at follow up

Comprehensive Aphasia Test (baseline)	VASES+D (follow-up)		SADQ-21 (follow-up)	
	r	p	r	p
Cognitive Screen total	.281	.061	-.416*	.014
Language Battery total	.176	.252	-.368*	.032
-Spoken comprehension	.222	.147	-.402*	.018
-Written comprehension	.176	.253	-.390*	.023
-Repetition	.053	.733	-.255	.146
-Naming	.101	.513	-.261	.136
-Reading	.061	.696	-.188	.286
-Writing	.358*	.017	-.456**	.007
Disability Questionnaire total	-.656***	<.001	.538***	.001
-Disability	-.465***	.001	.466**	.006
-Impact	-.729***	<.001	.498**	.003

r= Pearson’s correlation, p= Probability  
 \* Correlation is significant at the 0.05 level (two-tailed)  
 \*\* Correlation is significant at the 0.01 level (two-tailed)  
 \*\*\* Correlation is significant at the 0.001 level (two-tailed)



#### **4.20 Baseline factors predicting mood at follow up**

- Regression model for VASES+D scores at follow up using baseline assessments

Multiple regression was carried out to evaluate a model for the prediction of VASES+D scores at six months follow up using baseline assessment scores. Based on the number of participants who completed baseline and follow up assessments, the number of predictor variables that could be added in this VASES+D regression model was between 4 and 6 (an acceptable ratio is 10:1).

Participants who were classified as POCS had lower mood than those who were classified as TACS, PACS or LACS. However, the Bamford classification variables was not included in the regression analysis as only two participants suffered a POCS and the significant association of stroke classification with VASES+D mood scores may be due to chance. All baseline mood scores were entered into the regression as they were significantly correlated with VASES+D at six months. Baseline VASES+D scores were also included in the analysis to find out whether mood at baseline was predictive of mood at six months using the same self-report measure. This approach was also suggested in another study of post-stroke depression which used multiple regression (Berg et al., 2003). The Writing subscale from the Language Battery and the Disability Questionnaire (both from the Comprehensive Aphasia Test) were also significantly associated with self-report mood at follow up using the VASES+D. All other baseline variables were not significantly related with VASES+D scores at follow up and were not included in the regression. Simultaneous regression (Enter method) was carried out and the results are shown in Table 4.44.

Table 4.44: Regression model predicting follow-up VASES+D scores using baseline assessments

Baseline variables	B (95% CI)	SE	Standardised B	t	t significance	PC
VAMS-R total	-.006 (-.034 to .022)	.014	-.094	-.421	.677	-.079
VASES+D total	.286 (-.228 to .801)	.251	.258	1.141	.263	.211
SADQ-21 total	-.200 (-.544 to .144)	.168	-.181	-1.192	.243	-.220
Writing total	.018 (-.234 to .271)	.123	.022	.148	.883	.028
Disability Questionnaire total	-.178 (-.353 to -.003)	.086	-.365	-2.082	.047*	-.366

B: Beta Coefficients, CI: Confidence Interval, SE: Standard Error, PC: Partial Correlation  
 \*p≤.05

Less disability associated with aphasia at baseline was a significant predictor of less emotional distress on the VASES+D at follow up assessment. All other variables included in the regression model were not found to be significant. This model including only the Disability Questionnaire was significant ( $F_{5,28}=7.000, p\leq.001$ ) and it accounted for 47.6% of the variance in follow up VASES+D scores (adjusted  $R^2=.476$ ).

To check out whether the exclusion of all other variables except the Disability Questionnaire total scores was correct, the regression model was repeated using the Stepwise method. The second regression was performed to ensure that variables are entered into the model in an order determined by the strength of their correlation with the dependent variables (VASES+D).

This method is more sophisticated and preferable when you have a larger set of independent variables and it ensures that the smallest possible set of predictors are included in the model and that variables that do not add up to its success are not included (Brace, Kemp, & Snelgar, 2006).

The regression was repeated with all variables entered in the previous regression model. Disability Questionnaire total scores at baseline met the criteria for inclusion and were entered in the first step and VASES+D scores in the second step. No other variables met the retention criteria of this regression method. The results are shown in Table 4.45. In this second model, baseline VASES+D scores were also a significant predictor of follow up VASES+D total scores. The standardised Beta coefficients show that Disability Questionnaire total scores is a stronger predictor than baseline VASES+D total scores. The model was significant ( $F_{2, 31}=48.351$ ,  $p<.001$ ). The value of Adjusted  $R^2$  was slightly higher (.494) than the value (.476) provided by the first regression model using the Enter method. There was a .08 increment in  $R^2$  with the inclusion of baseline VASES+D scores.



Table 4.45: Regression model for predicting follow up VASES+D scores using baseline assessments (Stepwise method)

Baseline variables	B (95% CI)	SE	Standardised B	t	t significance	PC
Disability Questionnaire total	-.277 (-.375 to -.080)	.072	-.466	-3.145	.004**	-.492
VASES+D total	.394 (.059 to .730)	.164	.355	2.399	.023*	.396
VAMS-R total	-.153°			-.704	.487	-.127
SADQ-21 total	-.197°			-1.365	.182	-.242
Writing Total	.046°			.305	.763	.056

B: Beta Coefficients, CI: Confidence Interval, SE: Standard Error, PC: Partial Correlation  
 ° : Beta In coefficients that would result if the variable was entered into the model  
 \*p≤.05, \*\*p≤.01

- Regression model for SADQ-21 scores at follow up using baseline assessments

Multiple regression was performed to evaluate a model for the prediction of follow up SADQ-21 scores using baseline assessments. All baseline mood scores on the VAMS-R, VASES+D and SADQ-21 were significantly correlated with SADQ-21 scores at follow up and were entered in the model. N-Leisure Questionnaire total scores were also significantly associated with the observer-rated measure at follow up and were also entered into the regression. Baseline Language Battery total scores and subscales of Spoken comprehension, Written comprehension and Writing were all significantly correlated with SADQ-21 scores at six months. However, only the Language Battery total scores were included in this regression analysis in order to limit the number of independent variables entered in the regression model and avoid multicollinearity. The results are shown in Table 4.46. Baseline SADQ-21 total scores were the only significant predictors of follow up SADQ-21 scores. The model was significant ( $F_{6, 24}=4.968$ ,  $p=.002$ ). Adjusted  $R^2$  was .442 and it accounted for almost half of the variance (44.2%) in SADQ-21 at six months.

Table 4.46: Regression model predicting follow-up VASES+D scores using baseline assessments

Baseline Variables	B (95% CI)	SE	Standardised B	t	t significance	PC
VAMS-R total	.005 (-.021 to .032)	.013	.112	.419	.679	.085
VASES+D total	.026 (-.457 to .508)	.234	.030	.111	.912	.023
SADQ-21 total	.566 (.246 to .887)	.155	.649	3.648	.001***	.597
N-Leisure Questionnaire total	-.187 (-.523 to .149)	.163	-.177	-.1.148	.718	-.228
Language Battery total	-.028 (-.077 to .022)	.024	-.243	-1.158	.262	-.230
Disability Questionnaire Total	-.037 (-.246 to .172)	.101	-.090	-.365	.258	-.074

B: Beta Coefficients, CI: Confidence Interval, SE: Standard Error, PC: Partial Correlation

\*\*\*p≤.001

Since follow up SADQ-21 scores were significantly correlated with a number of independent variables the regression analysis was repeated using hierarchical multiple regression (Stepwise method), whereby predictors are added or subtracted from the equation one at a time. The second regression was performed to ensure that variables are entered into the model in an order determined by the strength of their correlation with the dependent variables (SADQ-21).



Language Battery and SADQ-21 total scores at baseline were identified as significant predictors of SADQ-21 total scores at follow up. Lower mood on the baseline SADQ-21 total scores and greater communication impairment on the Language Battery total scores were predictive of lower mood at six months. The model was significant ( $F_{2, 28}=31.560, p<.001$ ). The value of Adjusted  $R^2$  of this model was slightly higher (.520) than the value (.442) provided by the first regression model using the Enter method. There was a .08 increment in  $R^2$  with the inclusion of baseline Language Battery total scores.

Table 4.47: Regression model for predicting follow up SADQ-21 scores using baseline assessments (Stepwise method)

Baseline Variables	B (95% CI)	SE	Standardised B	t	t significance	PC
SADQ-21 total	.565 (.330 to .799)	.114	.647	4.937	<.001***	.682
Language Battery total	-.032 (-.062 to -.002)	.015	-.282	-2.154	.040*	-.377
VAMS-R Total	.051°			.338	.738	.065
VASES+D total	-.010°			-.074	.942	-.014
Disability Questionnaire total	-.085°			-.423	.675	-.081
N-Leisure Questionnaire total	-.185°			-1.279	.212	-.239

B: Beta Coefficients, CI: Confidence Interval, SE: Standard Error, PC: Partial Correlation

° : Beta In coefficients that would result if the variable was entered into the model

\* $p\leq.05$ , \*\*\* $p\leq.001$

## **5. CHAPTER FIVE: DISCUSSION**

### **5.1 Chapter outline**

This chapter summarises the key findings of the present study and it discusses these in relation to previous findings in the area of post-stroke depression in aphasia. Results are also discussed in relation to literature in post-stroke depression in general as few studies have included people with aphasia or those studies which have investigated this phenomenon are from the same group of researchers (Robinson group) or only focus on biological factors which affects their generalisability. Methodological issues are also considered as well as this study's strengths and limitations. The last part of this chapter includes suggested implications both for clinical and research practice, but it also outlines future recommendations for psychological interventions to address mood problems in the area of post-stroke depression and aphasia.

### **5.2 Summary of the study findings**

Based on previous study findings in the area of post-stroke depression, this study aimed at developing and testing a theoretical model for depression in aphasic stroke patients. Biological, psychological and social factors were evaluated in a sample of 71 aphasic stroke patients who were recruited both from hospital and community setting any time after their stroke and completed assessment at recruitment and six months follow up. This section will summarise the overall study findings and present them in relation to the theoretical framework proposed for investigation in this thesis (see Chapter 1-Figure 1.1, p.89).

Figure 5.1 presents the theoretical model of post-stroke depression in aphasia based on the study findings. The factors highlighted in the model are those that were found predictive of low mood at baseline and/or six months follow-up.



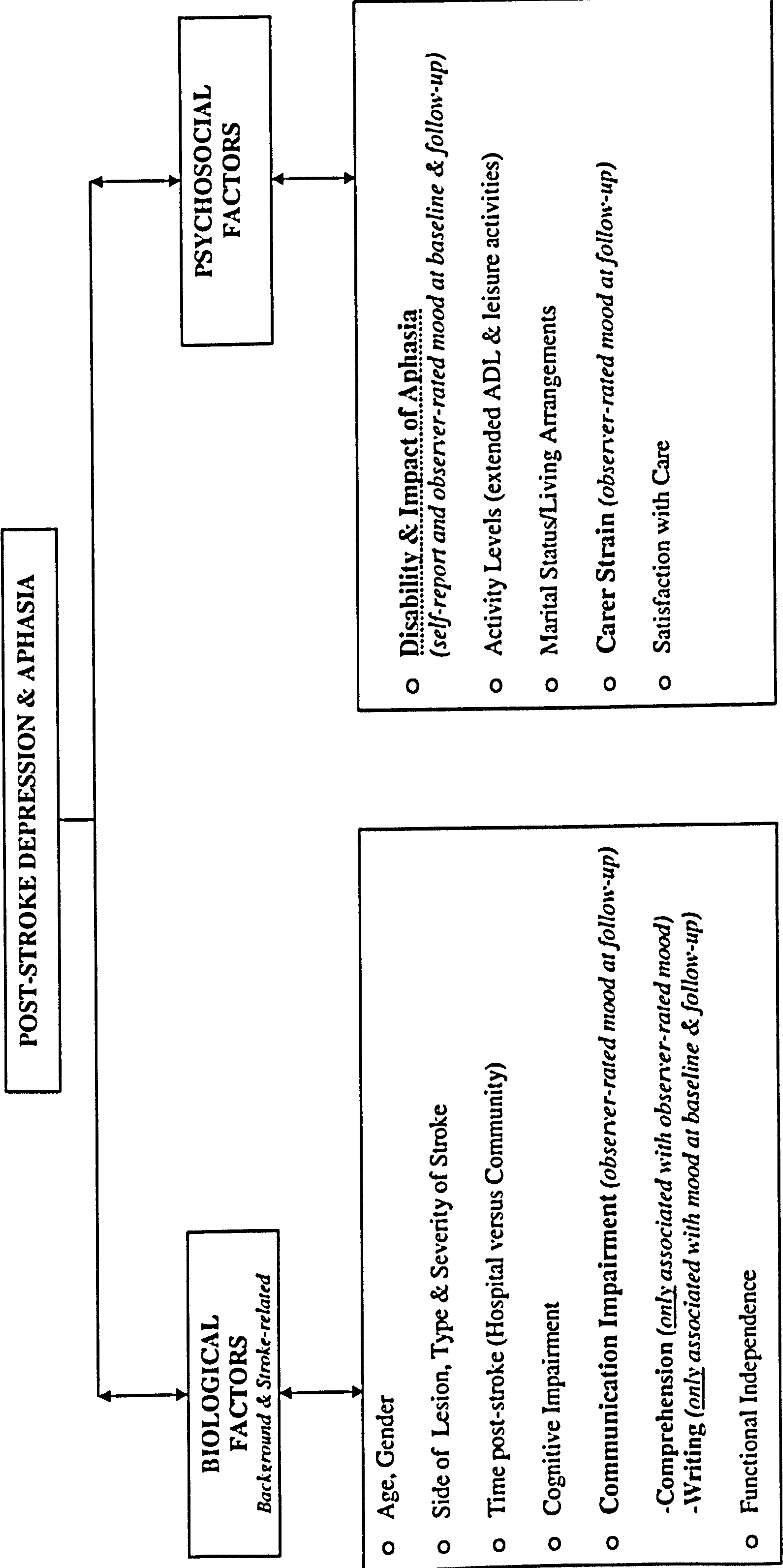
Biological factors such as demographic variables (e.g., age and gender) and stroke characteristics (e.g., side of lesion, type of stroke) were not found to be predictive of low mood either at baseline or at six months follow-up. Receptive communication impairment using a brief language screening test (SST) was significantly associated with the observer-rated mood measure scores (SADQ-21), but was not predictive of mood outcomes at recruitment or at six months follow up. The Writing section of the Language Battery (CAT) was only significantly associated with baseline mood scores. Overall communication impairment as measured using the Language Battery was predictive of follow up SADQ-21 mood scores.

Disability and impact of aphasia was highlighted and underlined as it was found to be the strongest predictor of low mood at both end points. Carer Strain was also a significant predictor of mood on the observer-rated measure at six months. The study was exploratory and was mainly based on theory from previous literature in post-stroke depression. The sample size did not allow investigating factors that might contribute to the development of depression at the acute versus the more chronic stages following a stroke. Therefore, it is important to understand and interpret its findings as a preliminary step into developing a comprehensive theoretical model for post-stroke depression in aphasia.

The following section will present and discuss the main findings of the study and in particular factors that contribute to low mood in post-stroke depression and aphasia. Factors significantly associated with depression at recruitment and at six month follow up are presented, but also factors identified at recruitment to predict depression after six months.



Figure 5.1: Theoretical model of post-stroke depression in aphasia based on study findings



## **5.3 Discussion of Main Study Findings**

### **5.3.1 Frequency of depression**

The frequency of depressive symptoms in the present study will be firstly discussed. More than half of the aphasic participants recruited in this study (55%) were classified as 'depressed' at baseline using either the VAMS-R 'Sad' subscale or SADQ-21 total cut-off scores and a similar rate of participants were classified as 'depressed' at six months follow up (44%). Estimates of the prevalence of post-stroke depression (PSD) range from 25% to 79% (Kneebone & Dunmore, 2000), with a wide variability in estimates due to the heterogeneity in methodologies used such as timing of assessments, screening measures, and patient selection criteria. Still, depression is a common and distressing consequence of stroke, estimated by a recent systematic review of observational studies to affect almost one third (33%) of stroke patients (Hackett et al., 2005). For instance, the rate of depression using traditional questionnaires such as the Hospital Anxiety and Depression Scale and Beck Depression Inventory has been reported between 29% (Berg et al., 2003) and 33% (Spencer et al., 1995) within the first month following a stroke. Prevalence of post-stroke depression has been widely studied but information on depression in aphasic stroke patients has not been studied as such patients are often excluded from stroke studies. Overall, the findings from the present study support previous literature reporting that low mood was a common problem in people with aphasia (Thomas & Lincoln, 2006; Kauhanen et al., 2000a/2000b; Astrom et al., 1993).

Astrom et al. (1993) found that aphasia was associated with a high risk for depression in the first week following a stroke, and the present study extended this finding for longer periods of time post-stroke. Participants in this study were recruited at different times after their stroke. The average time post-stroke was 15

months. More than half of the participants were recruited to this study within a year following their stroke and almost a third within two months post-stroke.

Major and minor post-stroke depression may have different time courses with the course of major depression to be less than one year post-stroke while minor depression to be more persistent (Robinson, 2006). Kauhanen et al. (2000a/2000b) assessed aphasic stroke patients and reported high rates of depression both at 3 and 12 months. These studies also made a distinction between minor and major depression, with minor depression being much higher at 3 months than at one year post-stroke and major depression being higher at one year than at 3 months.

In the context of the present study a distinction was not made for the severity of depressive symptoms and these were not classified as minor or major based on classification criteria. Mood measures used did not allow for the classification of minor or major depression. It also did not investigate depression in aphasia in the acute and more chronic stages following a stroke separately, but instead it treated the sample of participants as a whole. This is acknowledged and is taken into consideration because it is possible that those recruited from hospital stroke units one month following their stroke may be more optimistic about their recovery therefore significantly affecting their mood scores in any direction. Later onset depression in aphasia may be explained by early denial and then the realisation of this functional loss as awareness of psychosocial consequences of aphasia takes place after hospital discharge (Hermann & Wallesch, 1993). Moreover, selection bias is a possibility as aphasic stroke patients with low mood were more likely to decline participating in a research study and the number of patients not agreeing to take part in this study may justify this assumption. If this is true then the rate of depression reported in this study was lower than expected if a more representative sample of participants was



recruited. However, information on the emotional status of non-participants was not collected, so it is not possible to know whether they were depressed or not and whether their participation in this study could significantly affect its results.

The frequency of mood problems in this study was estimated using both self-report, picture-based mood measures developed for people with communication problems (VAMS-R and VASES) as well as an observer-rated mood measure (SADQ-21). Carers or relatives completed an observer-rated mood measure using the SADQ-21, which was informative for those participants with severe communication problems and could not complete any of the self-report mood measures. It is important to note that this study focused on assessing low mood and related psychological outcomes rather than 'clinical depression' assessed using more traditional self-report questionnaires or structured diagnostic interviews with limited use in people with moderate to severe communication problems. Measures selected could be used as screening measures to identify those patients who have low mood and who are at greater risk of developing more severe symptoms of clinical depression.

It is important to briefly discuss the choice and use of mood measures used in this study before reporting in more detail the frequency of low mood. There were significant correlations between the picture-based self-report measures and the observer-rated measure, which provided some evidence of concurrent validity. All mood measures showed high internal consistency both at baseline and at six months follow up. A revised version of the Visual Analogue Mood Scales (VAMS-R) was also developed as part of this thesis. The internal consistency of the VAMS was significantly improved by revising the positive items, '*Happy*' and '*Energetic*' and it was also significantly correlated with the Hospital Anxiety and Depression Scale total as well as with the anxiety and depression subscales in a sample of healthy older

people recruited in the community (see Chapter 2-Development and Validation of Visual Analogue Mood Scales-Revised). The internal consistency of the revised version of the VAMS was also validated in the main study and it was also found to be high.

The SADQ-21 is a useful and practical measure in clinical practice that identifies those stroke patients with aphasia who require a more detailed assessment of mood or to obtain some information for those who are not able to complete self-report mood measures (Sutcliffe, 1997). However, the assistance of proxies (relatives and/or nursing staff) may increase the feasibility of mood assessment and decrease its validity (Laska et al., 2007).

More than half of aphasic stroke patients (55%) recruited in this study experienced symptoms of low mood at the time of completing baseline assessments. Nearly half of the participants (40%) who completed the VAMS-R were found to have low mood using the cut-off point for the '*Sad*' item as recommended in the published manual. Based on the SADQ-21 cut-off point half of the participants (47%) were also found to have low mood. Both measures indicated an almost similar and interestingly high prevalence of low mood among stroke patients with aphasia recruited both at the acute and chronic stages following their stroke. Almost a quarter of them had low mood at baseline using both these measures indicating some agreement between the self-report and the observer-rated measure.

There are two possible explanations for those participants who were not found to experience low mood on both measures. Firstly, both of these two measures assess mood, but they are using different perspectives so it is possible that issues that were significant and the cause of lower mood for participants themselves were not equally important for their relatives/carers and vice versa. Secondly, SADQ-21 at baseline



was completed by nursing staff for participants recruited in the hospital and by spouses/partners for those recruited in the community, so it is possible that this disagreement was attributed to how well different observers were able to answer the questions included.

Low mood still remained common for many participants at six months after recruitment, but it was slightly lower (44%) than the prevalence rate of 55% found at baseline using either the VAMS-R or the SADQ-21 cut-off criteria. At six months follow up, none of the participants assessed were at the acute phase post-stroke which may explain this improvement in mood scores.

A much lower but still clinically significant prevalence rate (19%) was found at follow up using the VAMS-R compared to that found at baseline (40%). The proportion of participants classified as 'depressed' on follow up SADQ-21 scores (51%) was similar to that reported at baseline (47%). Only seven participants (11%) were found to be 'depressed' using both of these measures indicating less agreement between stroke patients perception of mood problems and their relatives/carers compared to baseline. This may be due to almost half of the baseline SADQ-21 scores completed by nurses rather than relatives as compared to follow SADQ-21 scores that they were all completed by a family member. It is possible that relatives report more frequently observed behaviours indicative of low mood than nursing staff. It has been suggested that the caregivers own mood may affect how they assess the mood of a patient with whom they have a very close relationship (Berg et al., 2009). However, the SADQ-21 questionnaire has been validated in hospitalised stroke patients and responses were found to correspond well with patient experience (Lincoln et al., 2000). The SADQ-21 is the original hospital version of this questionnaire assessing subjective mood and it may be more appropriate to be



completed by nursing staff than relatives. There is also the short 10-item carer version, which may be more suitable for use in participants recruited in the community for whom it will be completed by a close relative (Sutcliffe, 1997).

Overall, the frequency of depressive symptoms both at recruitment and six months follow up were relatively high. This finding is higher than the rate reported in previous studies in post-stroke depression and might be explained due to the fact that this study included stroke patients with aphasia at the acute and chronic stages following their stroke with different degrees of communication impairment. Damecour & Caplan (2001) reported low rates (15%) when using self-report mood measures in a sample of acute and more chronic aphasic stroke patients. Laska et al., (2007) reported a slightly higher rate (24%) using diagnostic criteria and clinical interview to assess depression in aphasia. Kauhanen et al. (2000b) found that 70% of aphasic patients fulfilled the DSM criteria for depression at 3 months and 62% at 12 months after stroke. High rates of low mood in this study may also be attributable to the study's broad inclusion criteria with participants recruited from both from hospital and community settings, to the inclusion of aphasic patients with mild to severe aphasia, or to the choice of the study's mood measures. It is also likely that the recruitment methods (i.e., self-referral, referral from therapists to the RCT part of the study) biased the sample towards including more participants with mood problems.

These findings on the frequency of depression in aphasic stroke patients suggest that this phenomenon might be common in stroke patients with aphasia, and therefore such patients should not be excluded from research in post-stroke depression. Healthcare professionals working with stroke patients with aphasia should be aware that they are likely to develop depressive symptoms any time following their stroke.

### **5.3.2 Post-stroke aphasia**

Aphasia affects 20% to 38% of stroke patients (Laska et al., 2001; Warlow et al., 2000; Pedersen et al., 1995). Since previous literature has suggested that a third of stroke patients have aphasia, their exclusion from research in post-stroke depression affects the generalisability of findings. The emotional impact of acquired aphasia has been investigated and several negative emotional states such as depression, anxiety, emotional lability and apathy have been identified (Code et al., 1999). Depression is the most common phenomenon with most research on it, but still findings are inconclusive for aphasic stroke patients. According to recent reviews of studies in post-stroke depression, almost 71% of them (92 studies in total) reported some exclusion of people with aphasia (Townend et al., 2007a/2007b) and only three out of 20 studies included aphasia as a potential risk factor for the development of depression (Hackett et al., 2005).

Spencer et al. (1997) has also reported that aphasia is not frequently assessed with objective and standardized measures. Most studies that have included people with aphasia have not assessed aphasia severity (Astrom et al., 1993) or they have only used brief screening measures (Thomas & Lincoln, 2006/2008).

Some aphasia types such as non-fluent, expressive aphasia (also known as Broca's aphasia) have been linked with greater depression (Thomas & Lincoln, 2008; Kauhanen et al., 2000a/2000b; Robinson & Benson, 1981). Since aphasic stroke patients are usually excluded from studies of post-stroke depression this makes comparison of current findings with previous literature difficult and more limited to post-stroke depression in general which may have a different aetiology.

Stroke patients with different level of language deficits in expression and/or comprehension with a documented aphasia diagnosis were included in the present



study. Language impairments were assessed within one month after recruitment using a screening language test (Sheffield Screening Test) and a more detailed language battery (Comprehensive Aphasia Test) and further justification for the choice of these assessments is presented in the Method chapter. Both language measures have been used only at baseline assessment and were not repeated at six months follow up assessment. The screening measure briefly assessed aspects of expressive and receptive language and was complemented with the recently published language section of the Comprehensive Aphasia Test (Swinburn, Porter, & Howard, 2004), which assessed several areas of language such as comprehension of spoken and written language, repetition, naming, reading, and writing.

Almost a quarter of participants scored very low on the Sheffield Screening Test (total score  $\leq 5$ ) and they were not able to complete the more detailed language battery, which suggested that some participants had severe communication problems. Sheffield Screening Test scores were clustered around the middle for the remaining participants indicating moderate level of communication impairment. Previous studies have mostly included people with milder communication impairments (Thomas & Lincoln, 2008, Thomas & Lincoln, 2006), or they have not consistently assessed the severity of aphasia (Townend et al., 2007a/2000b). The relationship between general as well as specific aspects of communication impairment and mood were investigated in the present study in a group of aphasic stroke patients with different levels of severity.

In theory, communication impairment can affect mood indirectly by less participation in social and leisure activities. Aphasia has a significant negative impact in multiple areas of everyday life (Code, 2003; Code et al., 1999). The association between communication impairment and activity levels was not



investigated in the present study as a mediating factor for the development of depression, but only the direct association between mood and activity levels. The findings of the relationship between aphasia and mood as measured in this study are presented and explained in more detail later on in this chapter.

### **5.3.3 Comparison between baseline and follow up assessments**

There was no significant difference in mood scores of participants followed up and those who did not complete follow up assessments at six months. This suggests that those participants who were not followed up (8 participants) did not have lower mood than those who were able to complete follow up assessments. However, the three participants who died before completing follow up assessments had low mood at baseline. Previous studies have indicated that post-stroke depression is associated with increased mortality rates (Morris et al., 1993). There was a significant decrease in leisure activities of participants not followed up which may explain the reason why some of them declined to complete their six months follow up assessments. There was a significant increase in extended ADL and leisure activities at six months follow up. This finding was expected especially for those participants recruited in the community as most recovery of ADL and social function takes place in the first six months following a stroke (Mercier et al., 2001).

There were also changes in VAMS-R mood scores at six months indicating a significant improvement in mood as measured on that scale. However, there were no differences between baseline and follow up scores on the VASES+D and SADQ-21. It is likely that the VAMS-R is a more sensitive mood measure that can identify even slight improvements and it may be a more suitable outcome mood measure to be used for assessing the effectiveness of an intervention. It is also possible that the VASES+D and SADQ-21 have better test-retest reliability than the VAMS-R and

therefore is less reliable when used for as a follow up assessment. VAMS-R items may be related to aspects that change significantly over time such as the items '*Energetic*' and '*Tired*'.

Forty-five participants completed all sections of the Comprehensive Aphasia Test. Two people completed the Cognitive Screen section and then decided that they did not want to complete the Language Battery and Disability Questionnaire. Both those participants did not have low mood based either on their self-report or observer-rated mood scores, but they both had the same moderate level of language ability based on the Sheffield Screening Test. One reason why these two participants decided not to be assessed further with the CAT may be that they both scored relatively low on most subtests of the Cognitive Screen and this negatively affected their motivation to complete the remaining sections.

Disability Questionnaire total scores were significantly better at six months follow up compared to baseline. This may be either because there was some improvement in their language abilities causing less disability and impact on their everyday life or because they were able to adjust and cope better with their communication impairments. However, this finding was not replicated for the two subtests of this questionnaire assessing level of disability and impact associated with aphasia. Comparison of language abilities between baseline and follow up was not possible as baseline language assessments were not repeated at follow up.

#### **5.3.4 Discussion of factors related to low mood**

Several inter-relationships between study variables were identified, but most of them were not found to be predictive of mood of aphasic patients at different times following their stroke.



Overall, disability and associated impact of aphasia using the Disability Questionnaire of the Comprehensive Aphasia Test were the most consistent predictors of mood at baseline and at six month follow up, but did not account for all the variance in mood scores. Baseline mood scores were predictive of follow up mood scores on the VASES+D and SADQ-21 at six months after recruitment to this study. Carer Strain Index was also a significant predictor of mood on the observer-rated measure at six months along with the follow up Disability Questionnaire scores. Language Battery total scores (communication impairment in several language modalities) were predictive of follow up SADQ-21 mood scores.

#### **Regression models at baseline and follow up**

This study used multiple regression models to analyse data gathered at recruitment and at six months follow up in order to investigate the predictive inter-relationships between variables. Different factors were shown to be predictive of mood scores at baseline and at six months follow up. Multiple regression analyses were also performed using baseline factors that could be predictive of follow up mood scores six months after recruitment to this study.

The variables entered in the regression models were estimated based on the sample size and the number of participants completing measures assessing the independent variables. Two out of the three mood measures were selected as dependent variables on the regression models, one of the self-report measures and the observer-rated measure. The choice of the VASES+D mood measures over the VAMS-R was based on its higher internal consistency and previous literature using this as a suitable measure to assess mood states in people with aphasia (Bennett et al., 2006; Vickery et al., 2006). The proportion of variance in mood scores accounted for by the models in the present study is not comparable to regression models in the literature which



accounted between 11% (Hermann et al., 1998), 24% (Thomas & Lincoln, 2008) and 60% (Wade et al., 1986) of the variance in mood scores in the first year after stroke. There was some similarity in the factors that were predictive of mood at baseline and at follow up which suggests that low mood at earlier and later stages may not be two distinct conditions with different onset and aetiology.

Baseline regression models (VASES+D and/or SADQ-21) included the following variables: gender, Sheffield Screening Test total scores, writing total or copying scores and Disability Questionnaire total scores. Both models suggested a single predictor of mood at baseline and this was the Disability Questionnaire. Adjusted  $R^2$  was higher for the baseline VASES+D scores (36.4%) than the baseline SADQ-21 scores (27.6%). Questions included in this questionnaire included how difficult it is to perform everyday activities that require communication as well as the impact and emotional consequences of aphasia. It is possible that the Disability Questionnaire is also measuring aspects of mood but it is not clear whether greater disability and impact associated with living with aphasia made participants more depressed or their experience of aphasia is worse because they are depressed.

It is difficult to compare this study's findings in terms of the disability and associated impact of communication impairment because this measure has not been used in other studies of depression in aphasic stroke patients and comparison with this study's findings is limited.

VASES+D follow up regression model included the Disability Questionnaire total scores and the N-Leisure Questionnaire, but only the Disability Questionnaire was identified as a significant predictor accounting for almost half of the variance in mood scores. Some aspects of leisure activity are reflected in the Disability Questionnaire and difficulties in communication also may reduce leisure activities

such as reading, writing, or going out socially. This questionnaire was also included in the SADQ-21 model with the addition of the Carer Strain Index and both of them were significant predictors of follow-up SADQ-21 scores. The regression model used identified caregiver stress as a stronger predictor than the disability and impact of aphasia for the observer-rated measure and this was expected as both the Carer Strain Index and SADQ-21 were completed by the same carer for each participant. One third of stroke caregivers have been found to be depressed themselves (Berg et al., 2005) and this was also true for some carers in the present study. This may affect their objectivity while completing the SADQ-21 or their high scores (indicating more stress) may be the indirect result of participants' low mood. Berg et al. (2009) reported that although there is often some correlation between caregiver and patient ratings, caregivers tended to rate patients as more depressive than did the patients themselves.

All mood scores at baseline were found to be significantly related to follow up mood scores, so they were all entered in both regression models predicting mood at follow up using baseline factors. Therefore, many factors met the criteria for inclusion in these models. Initially, VASES+D scores at follow up were only predicted by baseline Disability Questionnaire scores at baseline, but when the model was repeated using another regression method for a large number of independent variables, the baseline VASES+D scores were also identified as a predictor of follow up VASES+D scores. The same procedure was followed for the SADQ-21 model in which baseline SADQ-21 scores were the only significant predictors of SADQ-21 scores at six months follow up accounting for almost of the variance, but when the model was repeated Language Battery total scores were also found predictive and



accounted for almost 7% of the variance. The following section will discuss each of the factors that were found to be predictive based on the models described.

#### **5.3.4.1 Disability and impact of aphasia**

The Disability Questionnaire section of the Comprehensive Aphasia Test was used both at recruitment and at follow up to assess how aphasic stroke patients feel about different aspects of their communication and how things feel since their stroke as well as how things that they find difficult may get in the way in their everyday life. Ratings in this questionnaire were from participants themselves rather than their carers. It has been shown that there is increasing need to address the views and perceptions of people with aphasia and incorporate them in the planning of their rehabilitation (Le Dorze & Brassard, 1995; Parr et al., 1995). Negative emotional consequences as a result of living with aphasia have been previously been reported (Herrman & Wallesch, 1989; Le Dorze & Brassard, 1995).

Baseline Disability Questionnaire scores were slightly higher than those at follow up indicating greater disability and emotional distress. Initially, this change may be attributable to some degree of aphasia recovery at least for those participants recruited in the study one month after their stroke.

This questionnaire was predictive of mood at baseline and at follow up indicating that disability and impact associated with living with aphasia is an important factor related to mood at any stage in post-stroke aphasia. The use of compensatory strategies to overcome communication barriers or other coping strategies to deal effectively with any difficulties associated with their communication impairment in their everyday life may play a significant role that explains why this questionnaire was related to mood scores both at baseline and at follow up.



Comparison between the Language Battery and Disability Questionnaire total scores were useful in order to examine whether participants who scored well on the language battery rated themselves more positively in the disability questionnaire or there were discrepancies between these ratings. No discrepancies were found between language performance and disability associated with aphasia, which indicated that people with greater communication impairments experienced a greater level of disability while living with aphasia.

The Disability Questionnaire section of the Comprehensive Aphasia Test has been further developed by the same authors as a separated assessment to investigate the impact of aphasia on someone's life regardless of their spoken or written language abilities so it is a suitable tool that can be used in future research (The Communication Disability Profile by Swinburn & Byng, 2006). Qualitative data could also be gathered in the context of this questionnaire to allow a more in depth analysis of the experiences of people with aphasia.

#### **5.3.4.2 Mood assessments**

Baseline mood VASES and SADQ-21 scores were predictive of mood at six month follow up. Higher VASES+D mood scores (indicating better mood) at recruitment were predictive of higher mood scores at six months follow up on the same measure. A similar direction was also true for SADQ-21, where negative SADQ-21 scores at baseline could predict worse scores on the same measure at six months follow up.

Assessing aphasic stroke patients for low mood at any stage following their stroke could be predictive of their mood scores later on. Therefore, it is useful to assess all aphasic stroke patients using the VASES+D or the SADQ-21 early after their stroke or at any stage during their rehabilitation to monitor and predict future outcome. This

study supports previous findings that people with aphasia can be included in depression diagnosis (Townend et al., 2007a/2007b).

The use of mood measures is not only useful in identifying mood problems, but also in predicting mood outcomes six months later on. It has been reported that depression early after stroke is predictive of depression at six months after stroke (Spencer et al., 1995), 12 and 18 months after stroke (Berg et al., 2003), or even two years after stroke (King et al., 2002). The prediction of emotional status can help clinicians plan rehabilitation of aphasic stroke patients accordingly and be alert to possible symptoms of low mood.

#### **5.3.4.3 Language assessments**

Information from language tests was only collected at baseline assessment. The detailed language battery was not repeated at six months as it was felt that it could be difficult and time-consuming for most participants to be re-assessed within six months for the purpose of this research. Many local Speech and Language Therapists used this battery while working with many of the participants in the community and re-assessment for the purpose of this research would increase practice effects or be too tiresome for them. The screening test of aphasia used at baseline was also not repeated and may have been useful to have some information on language at follow up to compare with findings at baseline. However, the Sheffield Screening Test may not be sensitive enough to pick up any changes in communication impairment within six months. It is mostly a measure used to screen for the presence of communication impairment rather than monitoring recovery and measuring language outcomes.

Type of aphasia was not assessed in this study and this also influenced the choice of the language assessments used, which did not classify participants as having Broca's (nonfluent), Wernicke's (fluent), global, anomic, conduction or other aphasia types.



This study focused on the effect of communication impairment on different language modalities rather than rigid classification criteria. Also, classifying the different subtypes of aphasia is difficult and has led to disagreements among experts with only 60% of patients reported to fit in a classification scheme (Spreen & Risser, 2003). It has been suggested that the classic aphasia categorization simply refers to different syndromes, which consist of associated deficits that reflect damage or dysfunction of neural networks that are essential for certain language functions (Hillis, 2007).

Self-report mood scores (VAMS-R, VASES) were not significantly related with the screening test total, receptive or expressive subtest scores. SADQ-21 scores were found to be significantly related with the Sheffield Screening Test total scores and its receptive subtest scores. Patients who had higher SADQ-21 scores (indicating lower mood) had lower scores on the SST (indicating greater communication impairment).

This finding contradicts previous literature reporting higher frequency and severity of depression in stroke patients with expressive communication impairment (non-fluent aphasia) versus receptive communication impairment (fluent aphasia) (Thomas & Lincoln, 2008; Kauhanen et al., 2000a/2000b; Herman et al., 1993; Robinson & Benson, 1981).

The range of the Sheffield Screening test scores were quite wide in this sample as many participants scored much lower than the cut-off with some of them receiving even a total score of zero. Receptive subtest scores were lower than expressive subtest scores, therefore possibly explaining the relationship between receptive communication impairment and mood scores. SADQ-21 is an observer-rated measure, so this finding may reflect the importance of comprehension skills for carers rather than patients themselves. Furthermore, receptive communication was



associated with mood as rated by carers because they may have greater awareness of the impact of aphasia and stroke than participants themselves.

Subtests of the language battery assessing comprehension of spoken and written language, reading, repetition, and naming were not significantly related to any of the mood scores. The Writing section of the Language Battery was only significantly correlated to baseline self-report mood scores, with SADQ-21 scores only related with the copying task and not the task of writing single word to dictation from a picture. Performance in the writing domain was only briefly screened in this battery of assessments. The value and meaning of certain language tasks may be more important than others (Starkein & Robinson, 1988). Writing can be of less concern to certain people with aphasia than difficulties in other modalities (Swinburn, Porter & Howard, 2004). But this was not consistent with this study's findings, which suggests that any significant impairment associated with this language modality may negatively affect the emotional status of people with aphasia. Writing abilities are also highly influenced by educational background and physical impairment (hemiparesis) and this may be reflected in the scores. Information on participants' educational background and/or socio-economic status was not collected in this study, but it is possible that the sample included more participants for whom writing was an essential aspect of their everyday life or a pre-requisite for their social activities prior to stroke than other language functions such as reading.

Baseline Language Battery total scores were significantly associated with SADQ-21 scores, but not VASES+D scores at six months follow up. Specifically, subtests of spoken and written comprehension were related to follow-up mood scores on the observer-rated measure. Language Battery total scores were included in the SADQ-21 regression model using baseline factors to predict low mood at six months follow

up and were found to be a significant predictor accounting for almost 7% of the variance in mood scores. Writing total scores at follow-up were related both with VASES+D and SADQ-21 follow up scores, but were not predictive of low mood. The most important predictor of recovery in communication is the extent of the initial loss (Wade et al., 1986), so it is possible that greater communication impairment at baseline may be related to low mood at six months due to no further improvements in communication, especially for those participants recruited in hospitals. Although some long-term follow up studies have shown some recovery even after many years, most research on aphasia recovery suggests that the greatest degree of language recovery occurs in the first three months following a stroke (Lazar et al., 2008; Laska et al., 2001).

### **5.3.5 Factors not related to mood**

#### **5.3.5.1 Demographic characteristics**

Findings in the literature are inconclusive regarding demographic factors. In this study demographic characteristics (age, living arrangements, marital status and employment status) were not significantly associated with low mood at recruitment or at six months follow up. These findings are consistent with some of the previous literature. Gender was found to be associated with one of the self-report mood measures (VASES+D) at baseline. Male participants had higher mood scores than female participants. This contradicts most studies in the literature review which found that gender was not related to mood after stroke (Cassidy et al., 2004; Kauhanen et al., 1999; Kellermann et al., 1999; Astrom et al., 1993). Specifically, gender was not significantly related with measures of psychological status in aphasia (Kuroda & Kuroda, 2005). In the present study female participants were younger than male participants and this may explain the significant difference in their mood



scores. Demographic factors are not amenable to intervention, so it was positive that they were not found to be significantly related to mood.

#### **5.3.5.2 Medical history and stroke characteristics**

Depression following brain damage such as a stroke may be related to lesion location or other biological/medical factors (Williams & Evans, 2003). Relevant medical history and stroke characteristics were not significantly related with mood at baseline and follow up. Side of stroke lesion recorded either from the CT or MRI scans was not significantly related to mood either at baseline or follow up. This supports similar findings from recent reviews about the relationship between side of lesion and depression (Carson et al, 2000; Singh et al, 1998), although most participants had a left side lesion as this is associated with the presence of aphasia. It has been found that lesion location is an important factor in post-stroke depression only in the acute stage post-stroke (Herrmann & Wallesch, 1993). Left hemisphere damage has been found to predict greater severity of depression, which may be associated with the presence of aphasia (Ford & Adams, 2008). However, other psychosocial factors may be responsible for the development of depression for people with cognitive impairments such as aphasia as they become aware of their losses and their implications in their everyday life (Williams & Evans, 2003). This finding was expected as almost all participants had left hemisphere lesions, and this is inevitable when recruiting stroke patients with aphasia. This relationship could not be explored any further as no other measure of lesion location was included.

Type of stroke, based on Bamford stroke classification, was found to be related to mood on the VASES self-report measure at baseline but this finding was attributed to chance as the number of cases within some groups (i.e. POCS=2, LACS=5) was small with most participants having anterior circulation strokes (TACS or PACS).



Therefore, it was not possible to assess whether type of stroke was related to mood. However, most participants are expected to have TACS or PACS as one criterion is the presence of cognitive impairment, including aphasia. Lesion volume was also not assessed in the present study but TACS and PACS stroke classifications tend to be larger than LACS or POCS (Mead et al, 2000). An association was also found between the severity of depressive symptoms and anterior circulation lesions (TACS and PACS), but not with the volume of lesions in acute stroke patients with aphasia (Hermann, Bartels, & Wallesch, 1993).

#### **5.3.5.3 Cognitive and language impairment**

##### **Cognition**

Cognitive impairment was assessed in this study using the Cognitive Screen section of the Comprehensive Aphasia Battery. Not all aspects of cognition are assessed in the CAT cognitive screen since it is only a brief screening measure (e.g. attention or dysexecutive problems are not assessed). Some researchers have reported a significant relationship between Mini Mental Status Examination (MMSE) and depressive mood (Robinson et al, 1986; House et al, 1990) and others no significant relationship (Pohjasvaara et al., 1998; Burvill et al., 1997; Ng et al., 1995; Eastwood et al., 1989; Parikh et al., 1987). Previous research that found no association between mood and cognitive impairments is also supported by findings from the present study as the cognitive screen total and subtest scores were not significantly related to mood. Cognitive impairment has been found to be associated with the ability to perform activities of daily living (ADL) (Mercier et al., 2001). Neither ADL activities nor cognitive impairment were related with mood in the present study.

In the current study, some of the participants did not complete the Cognitive Screen or/and the Language Battery of the Comprehensive Aphasia Test. Missing data on

these two assessments were either because participants decided to withdraw from the study prior completing them (n=6) or because their scores on the Sheffield Screening test were very low (n=17) indicating they were unlikely to be able to complete most of the subtests included in this test. Therefore, people with more severe communication problems were excluded from this analysis.

### **Language**

Thomas & Lincoln (2008) showed that mild communication impairment was the strongest predictor of depression severity and prognosis. However, this study recruited hospital-based participants early after their stroke and included an atypical sample of aphasic stroke patients with an average Sheffield Screening Test total score of 17 out of 20. A small-scale exploratory study concluded that the relationship between aphasia and psychological status is not straightforward and most importantly that the severity of the communication problems in aphasic people does not relate to psychological distress (Kuroda & Kuroda, 2005). In this study communication impairment was not related to mood at recruitment using the self-report measures. The observer-rated measure (SADQ-21) was only significantly related to overall and receptive communication impairment using the Sheffield Screening Test, but this finding was not replicated using subtests of the more detailed Language Battery section of the CAT. Participants with greater communication problems, particularly in comprehension, were perceived as being related to mood by carers completing the SADQ-21. Carers' perceptions of mood problems after stroke may be attributed to limitations in communication problems, while stroke patients may have different perceptions. Furthermore, low mood in stroke patients with more severe communication problems may be different in aetiology to those with mild communication impairment.



#### **5.3.5.4 Activities of daily living and leisure activities**

It has been suggested that low mood may be a reaction to a greater difficulty in performing some activities following a stroke (Hosking et al, 1996). In this study, independence in basic ADL and self-care abilities as measured using the Barthel Index, was not significantly related to mood at baseline and follow up. This finding contradicts previous literature that has suggested that severity of disability in everyday activities is associated with mood (Morris et al., 1992; Parikh et al., 1987; Sinyor et al., 1986). Post-stroke depression is associated with impaired recovery of activities of daily living, but it is unclear whether EADL activities are predictive of mood outcome (Chemerinski, Robinson, & Kosier, 2001).

In addition to basic ADL activities, this study also assessed extended ADL activities using the Nottingham Extended Activities of Daily Living (N-EADL) and this was also considered more appropriate for those participants living in the community. Language impairments are highly correlated with social withdrawal and reduced activity levels (Potkins et al, 2003). Specifically, patients with aphasia tend to spend less time involved in leisure activities (Bouchard-Lamothe et al, 1999). This study also assessed leisure activity using the Shortened version of the Nottingham Leisure Questionnaire (N-LQ). Stroke patients with aphasia did not engage in many leisure activities on a frequent basis, but this was not significantly related to their mood at baseline. Leisure activities were only associated with mood on the VASES+D at six months follow up but, not a significant predictor of follow up VASES+D scores as shown in the subsequent multiple regression model. One possible explanation of these findings with regard to ADL and leisure activities might be that stroke patients with aphasia perceived their level of disability more in relation to their communication impairments rather than limitations in functional independence.



### **5.3.5.5 Caregiver variables**

At six months follow up this study also assessed caregiver stress using the Carer Strain Index (CSI). Stress of informal caregivers is common regardless of disease-specific experiences (Thornton & Travis, 2003). Negative outcomes are common among carers of stroke patients (Blake, 2001). The relationship between aphasic stroke patients' mood and objective or subjective elements of caregiver strain was briefly investigated in this study. People with aphasia often require great support with their communication because their communication impairments often affect many areas of social functioning. Aphasia is also related with increased disability due to physical or other cognitive impairments so it would be expected to increase carers' strain. Previous literature (Franzen-Dahlin et al., 2008; Bakas et al., 2006) has reported that caregivers of stroke patients perceive greater difficulty with tasks and had rated communication with people with aphasia more upsetting and challenging. Communication difficulties following a stroke have been found particularly stressful to caregivers (Draper et al., 2007).

In this study, most caregivers did not experience high levels of strain as average Carer Strain Index scores were below the cut-off score. Seventeen out of fifty caregivers who completed this scale scored above that recommended cut-off point which indicates that the caregiving for aphasic stroke patients can be a stressful experience. Several protective factors may explain why some carers who have completed this questionnaire were experiencing less stress than others, thus not affecting participants' mood negatively. Findings from the present study suggested that perceived caregiver burden was a problem for 34% of carers and this may be related to the level of support they receive for stroke services. Strain experienced by caregivers was related to participants' mood at six months follow up on the observer-

rated mood measure, but not on any of the self-report mood measures. Caregiver strain was entered in the regression model at follow up and was a more significant and stronger predictor of mood than the Disability Questionnaire which assesses disability and impact associated with aphasia. More participants were found to have low mood at follow up on SADQ-21 mood scores and this may be explained by the stress experienced by carers completing this questionnaire.

Carers' Satisfaction with Care (SWC) was also assessed using a 3-item questionnaire referring to satisfaction with emotional support, help for their communication problems and the overall hospital and community services the patients for whom they cared for have received since their stroke. Satisfaction with care was rated higher by participants than their carers, with individual items about emotional support, help with aphasia and overall hospital and community services rated slightly above the half-way score of 50. It is possible that carers' views of services provided are more or less accurate than that of their relatives depending on how much they are involved in their everyday long-term care and what level of support they provide them in order to access stroke services. Carer Satisfaction with the amount of emotional, aphasia-related and overall support received was not related to mood scores at six months follow up. This finding was also consistent for the version completed by some participants if their carer was not available to complete their own version. On the contrary, previous studies have reported that satisfaction with support is significantly related with mood (King et al., 2002; Spencer et al., 1995; Morris et al., 1993). This brief questionnaire was simple to complete and it was considered appropriate for the purpose of this study, but it did not assess aspects of practical and social support which were previously found to be related with emotional distress (O'Rourke, 1993).



## **5.4 Methodological limitations**

The methodologies used in the present study will be considered in this section as these may affect the generalisability of the findings. Previous studies in post-stroke depression have reported several practical and methodological issues; therefore it is considered important to discuss these in the context of this study's findings. For instance, poor attention and concentration, memory problems and fatigue are common problems following a stroke which often makes difficult to complete assessments and therefore they often need to be assessed over several sessions. This is particularly common for individuals with communication impairments such as aphasia and this factor was taken into account when choosing the type and number of assessment that could be administered at baseline and six months follow up. The nature of aphasia-communication impairment presents a number of methodological difficulties since it interferes with some methods used in clinical research such as interviews and self-report questionnaires (Wahrborg, 1991).

### **5.4.1 Methods used**

Both self-report measures and an observer-rated measure were used to assess low mood and justification for the choice of these assessments was described in the Method chapter. Previous research has suggested that the self-report mood measures used are significantly correlated with other more traditional mood measures such as the Hospital and Anxiety Depression Scale (HADS) (Bennett et al, 2006). This finding was also replicated in this thesis in a group of healthy older adults living in the community. Structured interviews using either International Classification of Diseases (ICD-10) or Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) diagnostic criteria were not used as a method of depression diagnosis in the present study. It was considered that clinical interviews would not be feasible for the



purpose of a longitudinal research study. However, a study by Laska et al. (2007) concluded that 67% of acute aphasic stroke patients could be reliably assessed using DSM-IV criteria as long as a reliable 'yes/no' response to some questions can be established. However, this method was considered more time-consuming and less appropriate for use with stroke patients with communication problems and it was also not routinely used as a method of assessment both in hospital and community settings from which participants were recruited. The aim of this thesis was to provide additional knowledge on the validity and reliability of mood measures for use with aphasic stroke patients by a range of healthcare professionals rather than just those with the knowledge and expertise to conduct psychiatric interviews. Visual analogue self-report mood measures and an observer-rated measure were selected and used for the purpose of this study, although their limitations are acknowledged.

Demographic and medical information was obtained from medical notes, therefore it was obtained by different members of staff, not always recorded accurately using non-standardised methods for participants recruited in the hospital and also for some participants recruited in the community for whom the researcher accessed their hospital notes. However, for some participants it was not possible to gather the medical information required for the purpose of this study, either because that information was not available in their hospital notes or because the researcher could not obtain access for them through the R&D hospital departments or stroke databases during the time frame of this study.

#### **5.4.2 Assessments used**

Several questionnaires but also more detailed batteries of assessments, such as the Comprehensive Aphasia Battery were used in this study. Most measures selected have been used and validated in previous stroke research to allow wherever possible

comparison with previous studies in post-stroke depression. Evidence of their validity and reliability were also carefully considered (see Method chapter). This study included a screening measure of communication impairment but also a more detailed battery of language tests that was recently designed to be used in stroke studies including people with aphasia. Mood was assessed using both self-report and an observer-rated measure in order to increase the validity of data gathered from a population with communication problems. One of the self-report measures used to assess mood was the VASES, which was originally designed to assess self-esteem in people with communication impairments. The VASES was used to assess mood indirectly in aphasic stroke patients as it has been suggested that low self-esteem has been associated with a range of mental health difficulties including depression (Richmond & Matthews, 2008). Low self-esteem was ranked as the best predictor of emotional and behavioural problems (Rigby & Waite, 2006). Depression in aphasia has a direct impact on self-esteem and low self-esteem can lead to depressive symptoms (Barrett & Gonzalez-Rothi, 1998). The VASES has also been used in previous stroke studies and it has been found to be a reliable and valid mood measure to assess mood problems following a stroke. The VASES+D (including the example depressed item) was used for this study as the scale was found to have higher internal consistency and higher correlation with the other mood measures when this item was added.

Price et al. (1999) argued that stroke patients are often not able to complete scales with a visual analogue format, but this conclusion was not based on picture-based analogue scales such as the VAMS and the VASES. Visual analogue scales have been found useful in providing information about the mood of people with communication problems in a simple and reliable way (Bennett et al., 2006).



### 5.4.3 Recruitment and sample size

At the beginning of this study participants were recruited in two hospitals in Nottingham (Queens Medical Centre and Nottingham City Hospital). At this time the two hospitals were planning to merge and become one acute trust currently known as Nottingham University Hospitals NHS Trust. Stroke services were transferred to one site and this did not allow recruitment to take place as required for a few months.

This was one reason why recruitment rate was low at the start of this study, therefore ethical approval was obtained to recruit from stroke databases as well as community settings. By inviting aphasic stroke patients from various community sources, such as stroke registers and stroke clubs recruitment was possible from a larger population and therefore maximized the possibility for a good sample size. This aimed to be a single centre study, but ethical approval was multi-centre so that if recruitment numbers very low, recruitment could also take place from additional local hospitals such as Mansfield Community Hospital and Derbyshire Royal Infirmary. In the present study participants were recruited from one centre, but recruitment from multiple centres may have led to greater generalizability of findings.

The small sample size was also due to patients in the hospital declining to take part in the study as they or their families felt that this was a major commitment for them and would prefer to be contacted at a later stage. For example, they made comments such as 'too ill to think about this too', 'too difficult to do and/or understand', 'have too many things to worry about now' or just 'not interested'. Few stroke patients (n=34) who were invited to take part did not meet the study's criteria. Participants were only recruited into the study if they were able to give informed consent or assent was obtained from a relative.



Participation or non-participation to the study could have introduced selection bias and this is a common phenomenon that may affect the findings of any type of clinical research. It is possible the patients with lower mood or greater communication difficulties declined to participate. Depression is associated with lack of interest and low motivation to participate in activities, such as a research study. The study was a survey and not an intervention study, so patients may have felt that there was no direct benefit from taking part. However, it is also possible that participants with lower mood decided to take part in this study as if they were found to have low mood they would be invited to take part in a randomized controlled trial for the behavioural treatment of low mood in aphasic stroke patients. The study's sample could therefore be biased towards participants with more or less mood problems, but no information was available to compare the mood or language of people declined with those who decided to take part. It has been suggested that older adults with symptoms of psychological distress are less likely to participate in research (Thompson, Heller, & Rody, 1994). Macniven et al. (2005) reported audit results from one of the stroke units from which recruitment in this study took place (Queen's Medical Centre) and found that many participants refused to take part or complete assessments and those were the ones thought by nursing staff to have low mood.

Seventy one participants were assessed at baseline and sixty three were reassessed at six months follow up. The attrition rate was low with almost 90% of participants followed up at six months. Attrition is a significant problem in any study in which participants are reassessed and the longer the time frame of the study, the more difficult it is to retain participants (Kendall, Butcher & Holmbeck, 1999).

The researcher tried to contact and re-assess participants at their own home and complete most questionnaires with relatives/carers face to face rather than by post.

Most missing data were due to participants' not been able to respond to some of the assessments and to appropriately complete them even with the guidance of the researcher.

This study's sample size was higher than that of other stroke studies in the literature including people with aphasia (Townend et al., 2007a/2007b). For example, previous studies have included a sample of  $\leq 50$  participants (Thomas & Lincoln, 2008  $n=21$ ; Benaim et al., 2004  $n=29$ ; Berg et al., 2003  $n=14$ ; Astrom et al., 1993  $n=20$ ). However, sample size was not sufficient to investigate post-stroke depression separately in the acute (hospital) and later (community) stages after a stroke as the proportion of participants recruited in the community was much higher than those recruited in the hospital. This issue also limited the validity and generisability of the data presented on the frequency of low mood in aphasia stroke patients.

Statistical analyses such as multiple regression models require a relatively large study sample. Although the sample size requirements were estimated before including independent variables in each regression model, a greater sample size would have allowed the inclusion of a greater number of independent variables. If more variables could be entered, then further variance could be accounted for and therefore provide more detailed information on factors predicting mood in post-stroke depression and aphasia.

This study did not recruit participants for a control group. This would have allowed identifying whether stroke patients with aphasia experience more difficulties than other stroke patients or age matched controls, but also whether their mood is different to that of patients with other neuropsychological impairments. It has been suggested that it is difficult to recruit hospital or community based controls, so this possibility was not considered as part of this study (Ward et al., 2004).



#### **5.4.4 Timing of baseline and follow up assessments**

This study was a longitudinal design including assessments at two time points. All participants completed baseline assessments within a month after recruitment and follow up assessments six months after completing baseline assessments  $\pm$  2 weeks. Some participants were in hospital and some living in the community at the time of completing baseline assessments, but by the time of their follow up assessments all participants were discharged from hospital.

Participants were recruited and completed assessments at different times following their stroke. Follow up assessment at six months was considered a reasonable end point to repeat some of the initial assessments and to be able to identify any changes in mood scores. The follow up assessment was also used to test a model of depression and aphasia following a stroke using baseline factors to predict mood outcomes six months later on. The time constraints conducting a PhD research did not allow for a longer or an additional follow assessment. A longer duration of follow up or another follow up assessment would be informative to ascertain whether there was remission in depression in those participants who had remained depressed at six months because cases of severe depression may be more persistent or require specific treatment.

Moreover, the fact that the participants were recruited at different stages following their stroke did not allow identifying different factors that may be related to low mood at the early or later stages after stroke. Ideally, a larger number of participants would have allowed the separate analysis for participants recruited in the hospital and for those recruited from the community. This was not possible in this study as community participants were almost double in numbers than hospital participants.



#### 5.4.5 Statistical analyses

Data gathered in this study were analysed by the researcher using SPSS (most recent version depending on availability), which is a widely available statistical program for performing statistical analyses in social sciences. The justification of statistical techniques employed in the present study was also described in more detail in the Results chapter. Parametric statistics were used to test differences between groups on assessments using independent t-tests and for Pearson's correlations for evaluating relationships between variables. The use of MANOVA was considered to test independent variables with more than two groups to address the likelihood of Type I errors, but instead a series of ANOVAs were performed as the study was only looking at a single dependent variable using two different mood measures.

The use of correlations to examine the inter-relationships between variables is not sufficient as they just confirm that a relationship exists between variables and do not provide an explanation for the causal relationship between them. Methodologically preferable is the use of multiple linear regression analysis because this statistical technique states the amount of variance that independent variables explain in the dependent variable. Therefore, multiple regressions were also calculated to investigate the predictive relationships between variables and low mood in aphasic stroke patients both for baseline and follow-up assessments. Reliability and factor analysis was also employed in Chapter 2 to further explore the relationship between the revised version of the VAMS and the HADS.

Data on some measures used in this study were slightly skewed as observed in normality plots, but were not shown to be significantly different from the normal distribution when using normality tests such as the Kolmogorov-Smirnov test.

Multiple regression analyses are only possible for those participants for whom data relating to each variable are complete, therefore for variables related to the Comprehensive Aphasia Test fewer participants were available for these analyses. Few studies have used multiple regressions according to the accepted criteria of this method (Counsell & Dennis, 2001). Some stroke studies have used multiple regression methods to explore factors related to mood after stroke (Thomas & Lincoln, 2008; Nys et al., 2006a; Dennis et al., 2000; Hosking et al., 2000; Berg et al., 2003).

Factors mediating or moderating the relationship between the criterion/dependent variables and the independent variables were not investigated using partial correlations. Partial correlation is more common when there is only one control variable and it is sometimes used even when there are two or three.

Other statistical techniques would have been employed to allow multiple comparisons among variables were path analysis or Structural Equation Modelling (SEM). SEM may be used as a more powerful alternative to multiple regression as it is a statistical technique for testing and estimating causal relationships using a combination of statistical data and qualitative causal assumptions. However, it is a complex technique that requires a larger sample size and it is more appropriate for confirmatory rather than exploratory modelling and it is strictly restrictive to theory testing rather than theory development, which was the purpose of this thesis.

If future research aims to study the multiple relationships between factors identified in the present study and a larger sample could be obtained then SEM could be considered as an alternative technique to multiple regression to test the theoretical framework proposed. Path analysis is also used for larger multi-factor models where there are data from multiple measures for each of the constructs and they require



other statistical software packages that were not used for the development of this model predicting factors associated with post-stroke depression and aphasia.

#### **5.4.6 Factors not considered in this study**

Baseline and follow up regression models were significant, however they did not account for all the variance in mood. For some of the regression analyses calculated considerable proportions of the variance in the outcome mood variables remained unexplained. This study did not measure every factor identified by previous literature that may be related with mood in stroke patients with aphasia. Stroke patients and especially those with communication impairments are difficult to be assessed with a great number of questionnaires. The number and type of assessments were selected in this study taking into consideration this limitation. Variables assessed were based on previous literature in the area of post-stroke depression, but also more specific to those stroke patients with aphasia. This section will briefly refer to those factors that were not included in the presented study and could be important to be investigated in future stroke research in post-stroke depression in aphasia.

Previous literature has suggested that physical, cognitive, emotional and social aspects of stroke survivors' quality of life are significantly impaired (Hopman & Verner, 2003). Quality of life has been found to be affected in people with aphasia in the first post-stroke year (Taylor-Sarno, 1997), but the relationship between mood and quality of life was not assessed in the present study. Stroke affects various quality of life dimensions and depression is an important determinant for poor quality of life (Kauhanen, 1999). Generic quality of life outcomes measures such as the SF-36 and the EuroQoL have become increasing popular as outcome measures in stroke clinical trials (Williams et al., 1999), but not appropriate for aphasic stroke patients. Previous research has developed and validated stroke-specific quality of life



questionnaires (Williams, 1998), but also more specific for use in stroke patient with aphasia (Stroke and Aphasia Quality of Life Scale: Hilari & Byng, 2001; Hilari et al., 2003).

There is some evidence to suggest that coping strategies on stressful life events such as suffering a stroke are related to depression in the general population. Stressful events such as coping with additional medical problems, death of a spouse/partner are very common in stroke patients and may affect their mood. The process of coping with acquired brain injury such as a stroke is complex and difficult due to the psychological adaptation to a number of challenges associated with the direct consequences of brain injury (Finset & Andersson, 2000). Coping styles and resources have been previously found to be associated with depression in aphasia (Code et al., 1999; Hemsley & Code, 1996).

Personality traits have also been studied and this could be another factor that could be interesting to study in people with aphasia. Inherent personality characteristics may be responsible for some people being more prone to develop depression than others. Changes in personality have been documented following a stroke (Haga et al., 2004). It has been found that neuroticism at one month post-stroke was related to depression at one year (Aben et al., 2002). Research investigating personality traits in people with aphasia could be challenging as most assessments are lengthy and not developed for people with communication problems.

Functional communication deficits associated with aphasia could also be addressed. This refers to how language is used in everyday communication contexts rather than focusing on the communication impairment itself. People with aphasia have varying degrees of non-verbal communication that should be assessment separately (Worrall & Frattali, 2000). The Communication Outcome after Stroke (COAST) (Long et al.,

2008) is a recently developed practical and reliable measure that can be used to assess everyday communication effectiveness for people with communication problems. There are a number of other functional communication measures such as the Edinburgh Functional Communication Profile (Skinner et al., 1984) and the Communication of Activities of Daily Life (Holland, Frattali, & Fromm, 1999) can be considered in future research. The functional communication deficits resulting from aphasia were investigated and aspects of depression such as anger and sadness were found to be associated as with functional communication measures (Fucetola et al., 2006).

#### **5.4.7 Ethical considerations**

Stroke patients and especially those with communication difficulties raise ethical concerns in terms of consenting and participating in clinical research (Braunack-Mayer & Hersh, 2001; Kagan & Kimelman, 1995). This study invited all stroke patients who met the inclusion/exclusion criteria with any degree of communication impairment due to their aphasia (i.e., mild to severe).

For participants who were not able to complete and sign and consent form, a relative or carer completed an assent form on their behalf (BPS code of ethics and conduct, 2009). However, it was still considered important to included participants who were able to understand the research process and the aim of the present study even if they were not able to sign a consent form. Some aphasic stroke patients were interested to take part in this study, but due to the severity of their aphasia they were not able to complete and sign the consent form and the researcher could not identify a close relative or carer to seek assent so they could not participate in the study. This study considered an important part of the recruitment process participants' ability to understand the aim of the study and what is required for them to do while taking part.



This was often very time-consuming due to their communication impairments and was also a reason why it was not possible to recruit a greater number of participants (Ward et al., 2004).

Several strategies have been recommended for making the recruitment process more inclusive for people with aphasia (Parr, 2004). For each potential participant the researcher introduced the study and its aims using accessible materials in order to support face to face communication. This study did not develop accessible picture-based study information and consent materials, but the standard materials were used according to ethics guidelines. However, the purpose of the project and what was required was presented in clear and simple terms with short sentences and whenever possible key points emphasized. ‘Communication support’ such as extra time, pictures, gestures and short-spoken phrases were also used. At the initial stages the study was also presented for comments and suggestions at a stroke advisory group including stroke patients and carers, which provide recommendations and support for stroke research taking place within the University of Nottingham. The study received some positive and useful recommendations by the group members about the presentation of study information and support materials which were taken into consideration wherever possible by the researcher.

## **5.5 Strengths and limitations**

### **Strengths**

The design and method used in this study aimed at addressing gaps in post-stroke depression literature as most studies have excluded people with aphasia. There are inherent difficulties in clinical research on the emotional and psychosocial consequences of stroke in people with aphasia (Wahrborg, 1991). This study addressed this issue by focusing on post-stroke depression in this population



neglected by research to date and tried to overcome methodological issues involved in the process. Moreover, this is a prospective longitudinal study with two time points; one at recruitment and one at six months follow up. Other studies have only assessed participants either in the first month following their stroke or in much later stages.

This study assessed not only the presence of aphasia using a screening test, but also the severity of communication impairment in many language modalities including comprehension, expression, reading, and writing using a detailed language battery specifically designed for people with aphasia. Cognitive and language abilities were assessed in more than half of the participants (63%) using the Cognitive Screen and Language Battery sections of the Comprehensive Aphasia Battery. The Disability Questionnaire of the Comprehensive Aphasia Test allowed the researcher to also collect information about the social consequences of acquired aphasia. This questionnaire assesses the disability and emotional sequelae of communication impairment which is an important issue often addressed by clinicians but not yet investigated in the literature.

Two self-report mood measures and an observer-rated measure were used to assess mood at baseline and at six month follow up. Obtaining information from multiple sources provides a measure of confidence and limits Type I and II errors (i.e. false positives or false negatives).

So far, few stroke studies have assessed activity levels beyond basic ADL and self-care abilities. The present study included three measures for assessing activity level: basic self-care, extended ADL and leisure activities. The activity levels of the study's sample were assessed on a range of activities that are suitable both for participants recruited in the hospital and in the community. Moreover, information on pre-stroke

basic self-care activities using the Barthel Index was also obtained in order to have an indicator of activity levels prior to stroke. Therefore, the extent to which pre-stroke activity levels were disrupted was also assessed.

Overall, this study used questionnaires or assessments that were previously used in stroke research and there have sufficient evidence for their validity and reliability in the population under study. It aimed to be as inclusive as possible to all levels of aphasia severity and recruited a reasonable number of participants given the scope and timescale of a PhD study in post-stroke depression in aphasia while taking into account previous challenges and methodological limitations.

### **Limitations**

There are also several limitations to be noted. Firstly, given the exploratory nature of the study, as not many studies in post-stroke depression have included people with aphasia, the findings require replication ideally with a larger sample of stroke patients. The Information Sheet for Participants and Carers only included the intended sample size for the randomised controlled trial (i.e., n=180). The present study was limited by practical time considerations and resources, so it was not expected to result in a fully powered study, which in turn could have affected its findings. Therefore, it is possible that the study was underpowered, as the sample size required was not confirmed using a power calculation analysis. The lack of statistical power could have increased the likelihood of Type II errors and could have also limited the robustness of statistical analyses reported.

Secondly, participants in this study were recruited from a variety of sources such as hospital stroke units, stroke databases, self-help groups, stroke clubs and also via referrals from Speech and Language Therapists in the community. Although recruitment from various sources both in hospital and the community increased the



study's sample size and therefore its power for subsequent statistical analyses it does not provide us with a model for depression in a homogeneous group of stroke patients with aphasia. The generalizability of the results should be considered also in the context of stroke services in Nottingham as all participants were recruited from a single centre.

Moreover, this study was also the first part of a randomised controlled trial for the treatment of low mood in aphasic stroke patients and it is possible that patients who were interested to take part were motivated by the possibility to be randomly allocated to the treatment group of the trial. Stroke patients with aphasia were invited to take part in this study without prior knowledge of their mood status at the time of recruitment. Although the referral form used for recruitment clearly stated that all stroke patients with aphasia could participate in the first part of the study it is still possible that patients with lower mood that could benefit from the treatment trial were referred to the researcher. However, in order to ensure that the study's sample was not highly selected the researcher obtained separate ethical approval for this survey and potential participants were provided with an information sheet and consent form that explained the aim of this part of the study.

Information on communication impairments of participants was only obtained at baseline and neither the screening language test nor the more detailed language battery was repeated at follow up. This did not allow for further investigation of the relationship between mood and language deficits in expression and/or comprehension following a stroke cross-sectionally at a later time point.

This study did not assess 'clinical' depression as described by DSM-IV or/and ICD-10 diagnostic criteria. Scores on the measures used to assess mood in this study's population were previously found to be related with more traditional mood measures



and they were used to classify participants as having low mood. Severity of emotional distress was also not assessed and no distinction was made between minor or major depressive symptoms as previously reported in the literature of post-stroke depression in general.

It is acknowledged that when a large number of comparisons are conducted on a set of data it is likely that statistically significant results may occur by chance (Type I errors). Because of the extent of data collected, many statistical tests were performed in order to explore individual subtests and items of each measure to generate hypotheses for future studies.

## **5.6 Clinical implications and recommendations**

This section discusses the implications of this study for clinical practice and future research in post-stroke depression. One third of stroke patients have communication impairments, but they are often excluded from research in post-stroke depression due to difficulties associated with recruitment and consent procedures to a research study and completing the required assessments (O'Rourke, 1996). Although in clinical practice it is widely acknowledged that aphasic stroke patients might be at greater risk of depression, these patients are still excluded from research in post-stroke depression.

The present study considered the use of non-verbal, picture-based self-report mood measures and aimed to include stroke patients with mild to severe communication impairments due to their aphasia. This suggests that many stroke patients with moderate to severe aphasia can still complete self-report mood measures or other assessments. Previous findings indicating that even mild communication problems can affect mood are also supported here (Thomas & Lincoln, 2006).

Post-stroke depression is a common and debilitating phenomenon that may slow rehabilitation and produce a negative influence on recovery (Burvill et al., 1995). Early screening and identification of mood problems is important so that effective interventions become available to stroke patients any time following their stroke. According to the British Psychological Society's briefing paper in psychological services for stroke survivors and their families all stroke patients may require emotional support and some may even require treatment by staff trained in specific psychological approaches (BPS, 2002).

The National Clinical Guidelines for Stroke (RCP, 2008; 2004) recommend that all patients should be screened for anxiety and/or depression within the first month following their stroke and their mood to be kept under review. This study's findings also support this, as low mood was also observed at six months follow up. Moreover, mood problems may be more common than reported here as many aphasic stroke patients with low mood may have declined to take part in this research study. Despite the publication of these guidelines, Bowen et al (2005) reported a 50% compliance rate in hospital stroke services for depression screening and a median of 54% review for mood following hospital discharge. Care pathways for the management of depression following stroke have their weakness in part due to the lack of suitable measures for assessing patients with communication deficits (Hassan et al., 2002). Therefore, it is increasingly important both for clinicians and researchers to possess reliable and valid methods of identifying mood problems after stroke for people with communication problems.

All mood assessments used in the present study were found to be suitable for aphasic stroke patients. Significant correlations between self-report measures (VAMS-R, VASES) and the observer-rated measure (SADQ-21) provided further evidence for



the concurrent validity of the scales used in this study as measures of mood. On the basis of these results, it is recommended that these measures may be used as screening measures to identify aphasic stroke patients who require further assessment of their mood. The VASES including the example depressed item had high internal consistency, but also the revised version of the VAMS, which was developed and validated as part of this thesis. VAMS-R was found to be a valid and reliable mood measure in a group of older adults living in the community. The observer-rated measure SADQ-21 has been developed from previous research (Sutcliffe & Lincoln, 1998) in order to gather information about those stroke patients with severe communication impairments who cannot even complete non-verbal, pictured-based mood measures such as the VAMS and the VASES. These measures could be readily available for use in hospital stroke units and community settings in order to alert healthcare professionals that aphasic stroke patients are vulnerable to depression, so this should be considered and closely monitored as part of their rehabilitation. The validation of existing mood measures to screen for emotional distress in stroke patients with aphasia or other stroke-related cognitive impairment is recommended by several guidelines (RCP, 2008; NICE, 2004; BPS, 2002).

Randomised controlled trials for the treatment of low mood in stroke patients in general but also those with aphasia which aim to influence psychological outcomes require reliable self-report and observer-rated measures as well as knowledge of both sensitivity and specificity for power calculation and the choice of cut-off points.

Results indicate the need to be alert to the possibility of low mood and even the development of clinical depression at any stage following a stroke in people with aphasia. Negative emotions in aphasia may not be directly related to the presence or the severity of the communication impairment itself, but they are frequent and could



interfere with recovery (Brumfitt, 1993; Starkein & Robinson, 1988). Negative emotional consequences in aphasic stroke patients should be further investigated and their unique role in the development of symptoms of low mood.

In order to identify aphasic stroke patients at risk of low mood and develop interventions to alleviate that phenomenon, it is important to gain an understanding of the factors, which may cause or exacerbate low mood. Future interventions for the management and of low mood in stroke patients with aphasia should target the factors identified in the present study to reduce mood problems both at the early and more chronic stages following a stroke. This is important as there is emerging evidence that treatment of depression improves functional outcome (Hassan et al., 2002). The existence of a theoretical framework can facilitate early recognition of mood problems and clinicians would be in a better position to offer appropriate interventions (Wahrborg, 1991).

This study was part of a randomised controlled trial evaluating the effectiveness of behaviour therapy for the treatment of low mood in stroke patients. This trial was based on previous findings in a sample of aphasic stroke patients with mild communication impairments in which activity level was related to low mood at baseline and at six months. The aim of behaviour therapy is to increase activity levels in order to improve mood. Findings from this study will inform this intervention and may identify future directions for the effective treatment of mood problems in people with aphasia.

Interventions such as cognitive behaviour therapy (CBT) aim at restructuring maladaptive thoughts and behaviours so may not be appropriate for patients who have cognitive or communication problems without further modification. For instance, adaptations using more frequent and shorter sessions while also involving a

close family member have been proposed (Kahn-Bourne & Brown, 2003). Further modification for use in aphasic stroke patients can include memory aids, non-verbal and pictorial information to support interaction and communication. Any modifications should be documented and tested by researchers in order to allow replication and the development of a manual-based intervention.

Other interventions could focus on practical help and support to increase patients and their families' abilities to cope better with the disability and impact of aphasia in their everyday lives. A variety of support programmes have been previously developed for use in stroke patients focusing on social support, information provision and satisfaction with care (O'Rourke, 1996). However, these were targeting different aspects and were not specifically designed for those with aphasia.

Future interventions should also consider helping people with aphasia to identify and express the emotional consequences of becoming aphasic and how this has affected their everyday life as this may be a beneficial outcome in itself (Swinburn, Porter, & Howard, 2004). Family therapy, educational interventions and other forms of supportive or innovative therapies encouraging creativity have been recommended to alleviate depressive symptoms in people with aphasia (Barrett & Gonzalez-Rothi, 1998).

The most consistent and important predictor identified as part of this study at baseline and at follow up was the disability and associated impact of aphasia in the everyday life of people with aphasia. Mood questionnaires were not specifically focused on negative emotions in relation to communication impairment, but the disability questionnaire specifically investigated emotional consequences due to aphasia and this was predictive of overall mood scores. Information gathered using the disability questionnaire can be used to guide health and social care providers



when offering services to people with aphasia to support decision-making and goal-setting. Views on how aphasia following a stroke impacts their everyday life may be amenable to intervention. Previous research is not available for interventions aiming at modifying coping strategies in order to view the impact of aphasia less negatively. Further research is still required to test factors that are causally linked to low mood in post-stroke aphasia with a larger sample size recruited from multiple sites providing stroke services both in hospital and in the community. All the factors included in the biopsychosocial model proposed in this study did not explain all the variance in mood scores both at baseline and at six months follow up after recruitment.

#### **Future directions for the present study**

This study may help clinicians and researchers to identify mood problems in stroke patients with aphasia. The VAMS-R and VASES+D can be used as screening self-report mood measures and the SADQ-21 can be used as an observer-rated measure for those aphasic stroke patients with severe aphasia. Certain aspects of their validity (construct and concurrent validity) and reliability (internal consistency) were established for the purpose of this study, but further work is required on other psychometric properties of these scales such as test-retest reliability, inter-rater reliability and responsiveness to clinical change in a sample of hospital and community stroke patients.

Important knowledge was also gained on the process of informed consent when including people with communication impairments or other related cognitive deficits following a stroke. Practical information can be put together for publication in order to facilitate the inclusion of more people with aphasia in stroke research. The standard informed consent forms approved by research ethics committees can be supported with user-friendly, picture-based information to increase the accessibility



of the informed consent process (Kagan & Kimelman, 1995). Aphasic stroke patients recruited in this study were allowed sufficient time for the informed consent process and information was presented in more than one modality if this was considered necessary (Braunack-Mayer & Hersh, 2001). It is also recommended that for people with severe communication problems their carers and/or relatives can play an active role in the process of consent by providing an assent form.

This study may be replicated using a larger sample of participants to test the models identified for consistency before identifying additional risk factors that play a role in the development of low mood in aphasia. A larger sample with participants recruited both from hospital and community settings would allow the investigation of depression and aphasia in the acute versus more chronic stages after a stroke in those participants with mild versus severe communication impairments.

This study's findings are specific to stroke patients with aphasia although some interesting similarities and/or differences could be found in groups of people with communication impairments due to other neurological conditions. The present study did not include a comparison/control group of age-matched individuals with comparable communication impairments and disabilities. It would be of interest to make comparisons with other similar patient groups, but this is often difficult and not always appropriate as different assessments need to be used for different patient groups.

## 6. CHAPTER SIX: CONCLUSIONS

### 6.1 Overview

This thesis presented the findings of two studies, which were designed to explore post-stroke depression in aphasia. The first study was conducted in order to revise and validate an existing self-report mood measure for use in people with communication problems following a stroke. The main study was designed to explore factors relating to low mood in aphasic stroke patients recruited both in hospital and community settings any time after their stroke. This thesis also included a review of the literature in post-stroke depression to identify factors that may be related to this phenomenon in people with aphasia. A theoretical model was proposed which was developed from previous studies in the area of post-stroke depression in general as few studies have included stroke patients with communication problems. The theoretical framework developed was used to guide the design and assessments of this research study. This research is an important contribution as it provided information about the mood of stroke patients with aphasia, which were previously excluded from most studies in post-stroke depression. It has been based on previous findings and has considered a range of biopsychosocial factors as previous literature has focused mainly on biological factors, such as lesion location or demographic characteristics, such as age and gender.

This thesis included six chapters that will be briefly summarised:

-*Chapter 1* reviewed available literature in post-stroke depression in general, but also in post-stroke depression and aphasia. Information about stroke was also reviewed and available assessments to measure outcomes in stroke research were presented. A theoretical model was proposed which included risks factors that may be associated



with depression and aphasia after a stroke and that this study aimed to assess some of these in a sample of aphasic stroke patients recruited from hospital and community settings.

*-Chapter 2* presented the development and validation of a revised version of the Visual Analogue Mood Scales (VAMS-R). The positive mood items of this scale were slightly modified based on findings from previous research suggesting that their format is problematic and if excluded the internal consistency of the scale increases. The revised version was validated using a domiciliary sample and it was found to have good construct validity, internal consistency and test-retest reliability. Results from the main study also supported that this revised version is significantly related to other mood measures and has good internal consistency.

*-Chapter 3* reported the methods used in this study including information on study design, recruitment, consent/assent procedures, inclusion/exclusion criteria and rationale for choice of assessments for the main study of this thesis.

*-Chapter 4* included the results from the main study evaluating risk factors for the study of mood in stroke patients with communication problems such as aphasia. It provided justification for the use of statistical tests used and it also presented statistical analyses performed for data collected at recruitment and at six months follow-up.

*-Chapter 5* includes the discussion of findings in relation to previous research in post-stroke depression in general and whenever possible in aphasia as few published stroke studies have included people with aphasia. Factors identified as important predictors of mood in post-stroke aphasia are presented and possible explanations are provided for those factors which were not found to be significant. Methods used and the study's main strengths and limitations are critically discussed.



The following section will briefly summarise the key findings from the studies presented in this thesis and their implications for future clinical practice and research. Stroke patients often have high levels of emotional distress, but little is known about the levels of distress of stroke patients with communication problems such as aphasia as well as about the contributing factors. The aim of this study was to examine predictors of low mood in stroke patients and to develop a model of factors relating to post-stroke depression in aphasia based on previous literature.

A sample of 71 individuals from hospital and community settings with a documented stroke and aphasia diagnosis participated in this study and they completed assessments at recruitment and at six months follow up. The majority of participants were able to complete self-report assessments face to face with communication support from the researcher. Specifically, participants were assessed on measures of mood, language, disability, activities of daily living and leisure activities, and various demographic and stroke characteristics were also recorded. Carers completed an observer-rated mood measure at recruitment and at follow up. At six months follow up carers also completed measures assessing carer strain and carer satisfaction with care.

This study has illustrated the relevance and practicality of using both self-report and observer-rated measures for the assessment of low mood in post-stroke aphasia. This study also briefly examined the reliability and validity of some of these measures. Patients with aphasia recruited in this study at various times following their stroke reported many psychosocial difficulties and in particular high rates of low mood using three different mood measures. The severity of communication impairment and its relationship with mood was also investigated using a screening measure, but also a more detailed language assessment.

The study also tested for non-linguistic cognitive abilities and emotional consequences of aphasia using a single and newly published battery of assessments such as the Comprehensive Aphasia Test (Swinburn, Porter, & Howard, 2004).

## **6.2 Key study findings**

The key findings of this study that can be used to design future research in post-stroke depression for people with aphasia and that can influence clinical practice and stroke guidelines across stroke services are the following:

- Stroke patients with aphasia can be included in research studies in the area of post-stroke depression.
- Non-verbal and picture-based mood measures (VAMS-R and VASES) previously developed for use in neurologically impaired people with communication problems are also valid and reliable mood measures for use with aphasic stroke patients.
- Both self-report mood and observer-rated measures can be used to assess low mood for those patients with severe aphasia.
- The frequency of low mood in aphasia after a stroke in this study is higher than the pooled estimates from previous observational studies and is consistent with similar findings suggesting that post-stroke depression may be more common in stroke patients with aphasia than those without.
- Almost half of participants had low mood both at baseline and at follow up. The majority of participants were between 1 and 12 months post-stroke. This suggests that low mood is possible at any time in stroke patients with aphasia.
- Demographic factors and medical information were not predictive of depression at baseline or follow up. Physical impairment, ADL activities and leisure activities were also not predictive of mood scores at both end points.



- Writing abilities were significantly associated with mood at baseline and at six months follow up, but were not found predictive of the mood outcome at any time point. Overall language impairment using the screening test was only associated with the observer-rated measure at baseline and using the more detailed language battery with the observer-rated measure at follow up. Baseline scores on the language battery were predictive of SADQ-21 mood scores at follow up.
- Disability and emotional consequences living with aphasia were significantly associated with low mood both at recruitment and at six month follow up. This was the strongest predictor of mood scores identified in this study.
- Baseline mood scores on the VASES+D were predictive of follow-up mood scores on the same measure, as well as baseline mood scores on the SADQ-21 were predictive of follow up scores on the same measure too.
- Carer strain was also identified as a significant predictor of SADQ-21 scores at follow up.

Time after stroke was not related to any of the mood measures both at baseline and at follow up. Several factors were found to be associated with low mood at baseline and at follow up, but in most cases a single variable was found to account for all the variance in mood scores both at baseline and follow up models. This indicates that association between variables does not necessarily ensure that they can predict mood scores or that these models should be replicated in a larger sample size to ensure their validity and reliability.

All factors identified in this study were psychosocial in nature and therefore are amenable to intervention. This partly supports the proposed model of depression in aphasia outlined at the beginning of this thesis.



The negative impact of communication impairment was also supported for the observer-rated measure at follow up indicating that at the later stages it affects observed behaviours associated with mood. The role of activity level and everyday activities in the development of mood problems in stroke patients with aphasia is not supported by present findings. Consequently, support in everyday leisure and social activities may be beneficial for stroke patients with aphasia but not directly related to aspects of their mood. Future directions should focus on how people with aphasia perceive aspects of their communication impairments to affect their life negatively and in what way. The factors assessed in this thesis were based on a theoretical model. The number and nature of assessments that aphasic stroke patients can reliably complete is limited, so the present study focused on those psychosocial variables argued to be associated with mood in aphasia and which could be addressed by psychological interventions.

### **6.3 Conclusions**

This study overcame some of the methodological limitations involved in the inclusion of people with aphasia in post-stroke depression research and included more participants with aphasia than most studies had previously reported. It considered the role not only of biological, but also of psychosocial risk factors, which are often neglected. The predictors of depression that the models of this study provided might be useful in the context of clinical practice both in hospital and community stroke services. Information could be taken into consideration when developing targets and planning rehabilitation both at the acute and post-acute stages in order to optimise functional recovery for stroke patients with aphasia.

Low mood was reported in almost half of participants and it remained persistent at six month follow up. The risk factors for post-stroke depression in aphasia are likely

to be multi-factorial as it was also suggested for depression in all stroke patients (Whyte & Mulsant, 2002). The adjusted  $R^2$  for baseline and follow up models did not account for all the variance in mood scores and they were low to moderate. This implies that additional factors should be considered by future research.

The contribution of psychosocial factors requires the further systematic investigation in a larger and more homogeneous sample of aphasic stroke patients recruited early after stroke (one month) and later on (12 months). The relationship between communication impairments and mood should be further investigated, but other factors should be also considered that can explain low mood in stroke patients with aphasia such as social adjustment, quality of life, coping strategies or disability awareness.

This study concludes that it is possible to verify the presence or absence of low mood using both self-report and observer-rated measures. The reluctance of previous studies to include people with aphasia in post-stroke depression research may be attributed to the lack of knowledge in the feasibility of recruitment and the psychometric properties of available assessments. In post-stroke depression research the inclusion of people with aphasia is of great importance both in observational studies and clinical trials in accordance with recent published guidelines.

The results of this thesis can be used to inform clinical guidelines and to make useful recommendations for evaluating the effectiveness of current and future interventions to treat or prevent low mood in stroke patients with aphasia. Interventions based on the cognitive and/or behavioural models of depression may be appropriate to target the psychosocial consequences of aphasia in everyday life. Other treatment approaches may include practical support and help to improve coping abilities with the disability and impact of communication impairments. Aphasic stroke patients and

their families are often not sufficiently informed about communication impairment, its consequences and prognosis and this may be counterproductive in the adjustment process (Warhrborg, 1991).

In conclusion, I hope that this study has further elucidated the problem of low mood in stroke patients with communications problems such as aphasia to allow more effective identification of low mood and therefore contribute in some way to the development of interventions for the alleviation of such symptoms. The results of this study may provide a starting point to include more stroke patients with aphasia in studies of post-stroke depression in order to establish more precisely which factors are relevant and responsible for this common and distressing phenomenon.



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## **APPENDIX A**

### **VISUAL ANALOGUE MOOD SCALES- REVISED (VAMS-R)**

**Due to copyright restrictions the HADS and VAMS cannot be reproduced and only the two revised items of the VAMS are included in the Appendix.**



**Institute of Work, Health & Organisations**  
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**Director**  
Professor Tom Cox CBE AcSS FBPSS  
Hon FFOM (Dublin) Hon FErgS FRSH FRSA

## INFORMATION FOR PARTICIPANTS

### The Development of a Modified Version of the Visual Analog Mood Scales (VAMS)

Investigators: Prof N. B. Lincoln, Dr. M. Walker, & E. Kontou

You are being invited to take part in a research study. Before you decide if you want to take part in the study it is important for you to understand its purpose and what your participation will involve.

The aim of the study is to find out whether a modified version of the *Visual Analog Mood Scales* is more suitable and effective in the assessment of mood states, and how it is related with to a traditional and widely used measure as the *Hospital & Anxiety Depression Scale*. Your participation will involve the completion of two questionnaires, which are evaluating mood, and it will take about 10-15 minutes to complete them. You will be also asked to provide some demographic details.

Although this research will not be of direct benefit to you, your participation will provide us with information to improve the assessment of mood in individuals over the age of 55, and in stroke patients.

If you decide to take part in this study, all the information provided by you will be used for the purpose of the research study, and will remain confidential and anonymous. Participation is voluntary and if at any point you decide that you do not want to continue to take part in the study, you are free to withdraw and without giving a reason.

Thank you for taking part in this study.

If you agree to take part, please sign, and return the consent form provided with your questionnaires.





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**Director**  
Professor Tom Cox CBE AcSS FBPsS  
Hon FFOM (Dublin) Hon FErgS FRSH FRSA

**CONSENT FORM**

The Development of a Modified Version of the Visual Analog Mood Scales (VAMS)

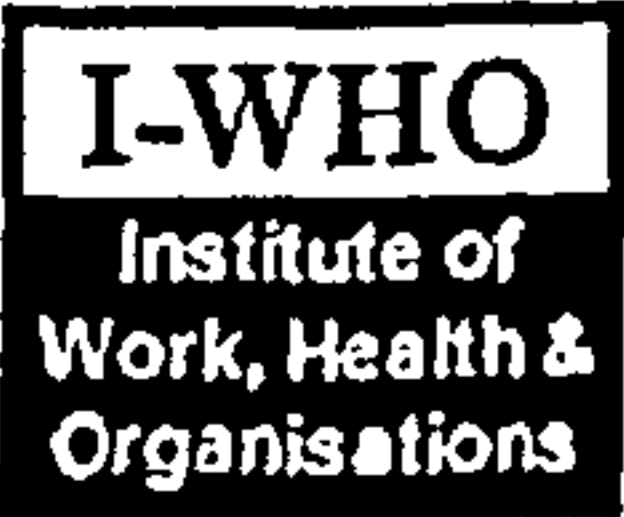
Investigators: Prof N. B. Lincoln, Dr M. Walker, & Miss Eirini Kontou

- Have you read & understood the information sheet? YES NO
- Have you had the opportunity to ask questions & discuss the study? YES NO
- Have you received enough information about the study? YES NO
- Do you understand that you can withdraw from the study at any time? YES NO
- Do you agree to take part in the study? YES NO

Signature (Participant) :.....

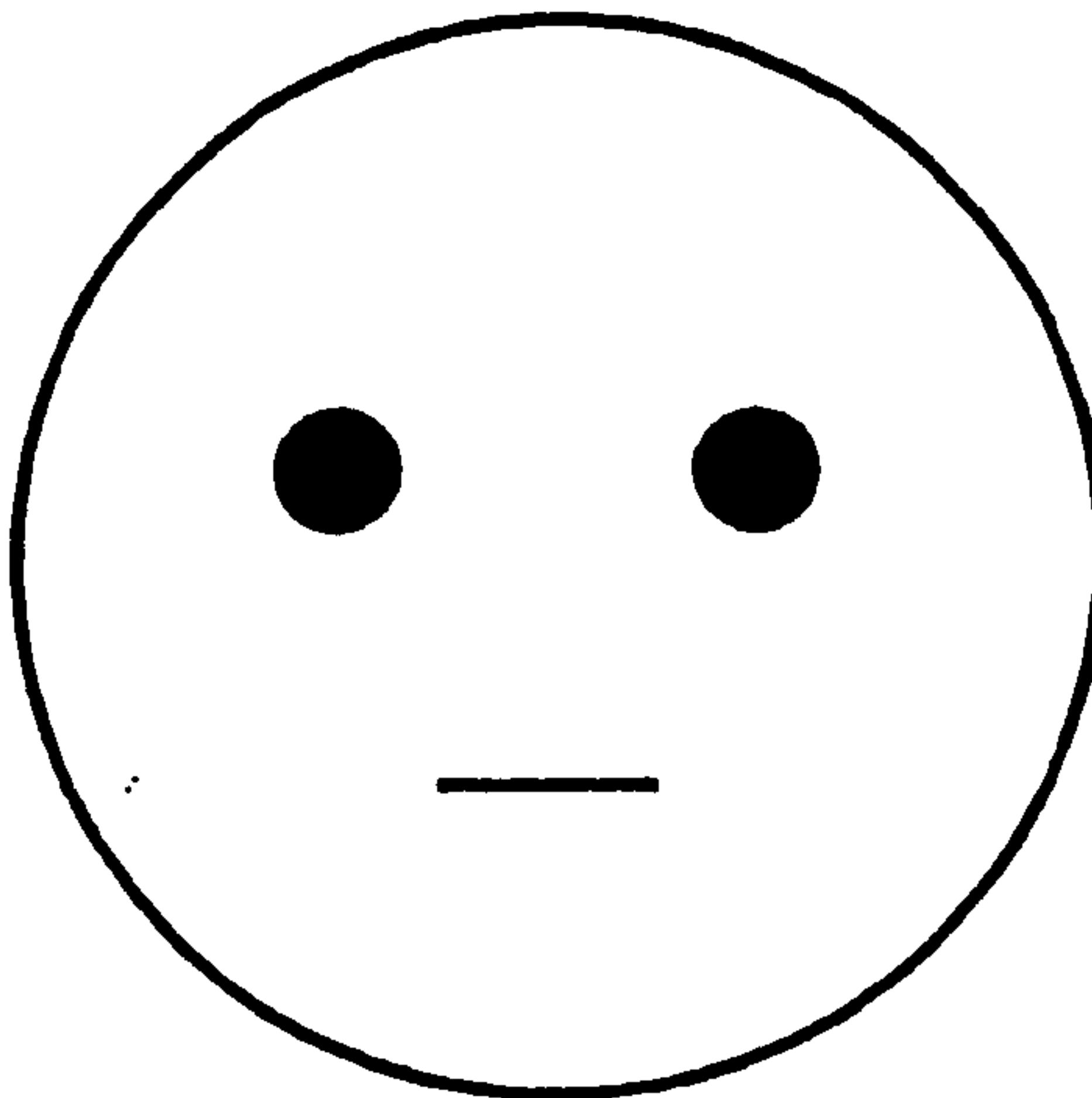
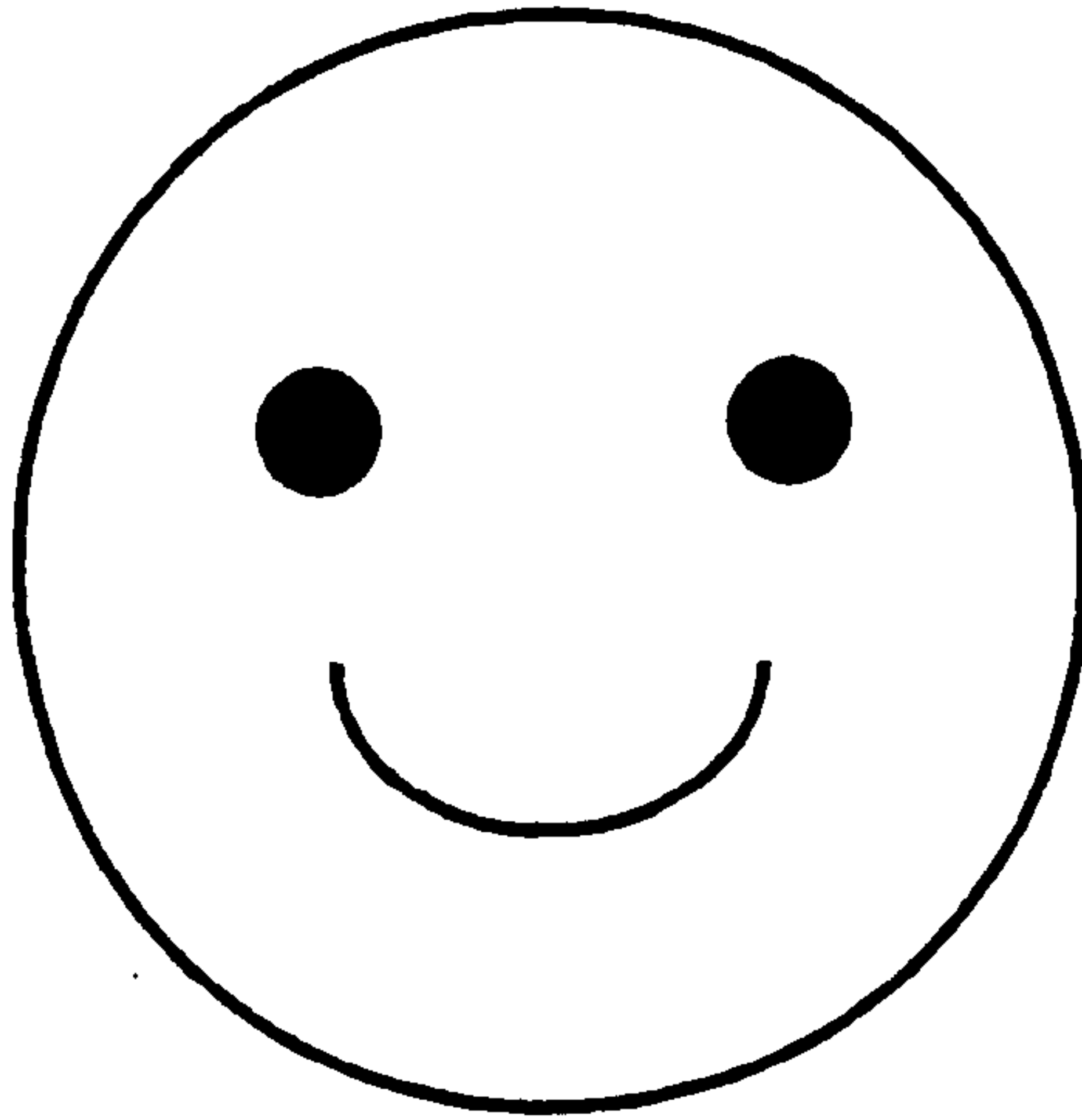
Name (In BLOCK CAPITALS):.....

Date:.....



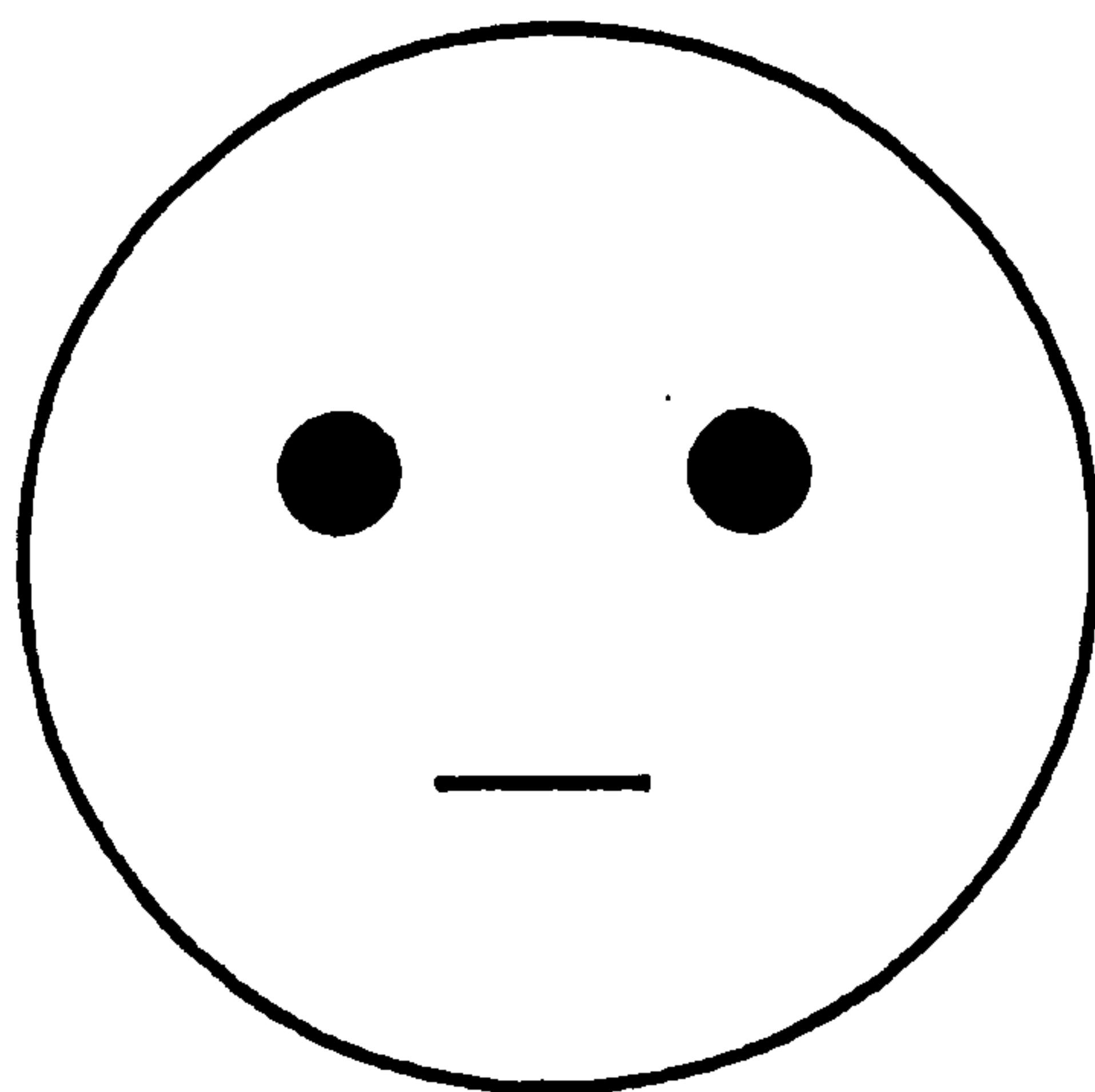
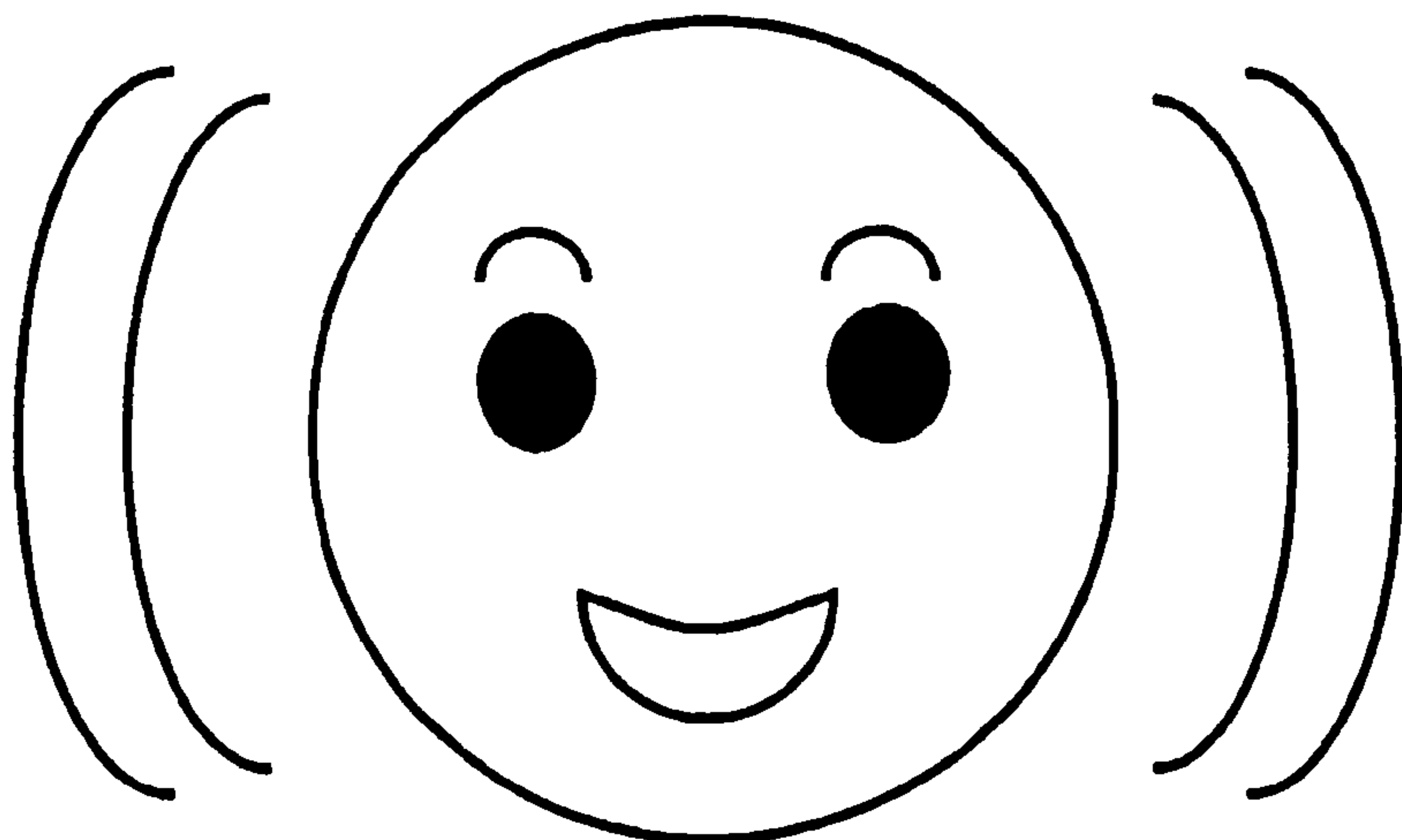


**Happy**



**Neutral**

**Energetic**



**Neutral**

**APPENDIX B**

**ETHICS INFORMATION**



# Nottingham Research Ethics Committee 1

1 Standard Court  
Park Row  
Nottingham  
NG1 6GN

Telephone: 0115 912 3344 ext 49435  
Facsimile: 0115 9123300

3<sup>rd</sup> January 2006

Miss S Thomas  
Division of Rehabilitation and Ageing  
B Floor, Medical School  
University of Nottingham  
Queen's Medical Centre  
Nottingham  
NG7 2UH

Dear Miss Thomas

**Study title:** Psychological treatments for depression in aphasic stroke patients: a randomised controlled trial  
**REC reference:** 04/Q2403/148  
**Protocol number:** 3

**Amendment number:** 1  
**Amendment date:** 28/11/2005

The above amendment was reviewed at the meeting of the Sub-Committee of the Research Ethics Committee held on 13<sup>th</sup> December 2005.

## Ethical opinion

The Committee requested confirmation that the Initial approach to patient's will be made through a known contact at SALT.

The members of the Committee present gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

## Approved documents

The documents reviewed and approved at the meeting were:

- Email dated 22/12/2005  
Response to the Committee's request for further information.
- Notice of Substantial Amendment  
Dated 28/11/2005
- Protocol  
Version 3  
Dated 28/11/2005

- Participant Information Sheet Part 1  
Version 3  
Dated 28/11/2005
- Carer Information Sheet Part 1  
Version 3  
Dated 28/11/2005
- Consent Form Part 1  
Version 3  
Dated 28/11/2005
- Assent Form Part 1  
Version 3  
Dated 28/11/2005
- Participant Information Sheet Part 2  
Version 3  
Dated 28/11/2005
- Carer Information Sheet Part 2  
Version 3  
Dated 28/11/2005
- Consent Form Part 2  
Version 3  
Dated 28/11/2005
- Assent Form Part 2  
Version 3  
November 2005

### **Membership of the Committee**

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.

### **Research governance approval**

All investigators and research collaborators in the NHS should notify the R&D Department for the relevant NHS care organisation of this amendment and check whether it affects research governance approval of the research.

### **Statement of compliance**

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

# Central Office for Research Ethics Committees (COREC)

## NOTICE OF SUBSTANTIAL AMENDMENT

*For use in the case of all research other than clinical trials of investigational medicinal products (CTIMPs). For substantial amendments to CTIMPs, please use the EU-approved notice of amendment form (Annex 2 to ENTR/CT1) at <http://eudract.emea.eu.int/document.html#guidance>.*

*To be completed in typescript by the Chief Investigator in language comprehensible to a lay person and submitted to the Research Ethics Committee that gave a favourable opinion of the research ("the main REC"). In the case of multi-site studies, there is no need to send copies to other RECs unless specifically required by the main REC.*

*Further guidance is available at <http://www.corec.org.uk/applicants/apply/amendments.htm>.*

<b>Details of Chief Investigator:</b>	
<b>Name:</b>	Miss Shirley Thomas
<b>Address:</b>	Division of Rehabilitation & Ageing, B Floor Medical School, Queens Medical Centre, University of Nottingham, NG7 2UH
<b>Telephone:</b>	0115 9249924 Ext. 43982 From 19 <sup>th</sup> December my telephone number changes to: 0115 8230227
<b>E-mail:</b>	shirley.thomas@nottingham.ac.uk
<b>Fax:</b>	0115 9423618 From 19 <sup>th</sup> December this changes to: 0115 8230231

Full title of study:	Psychological treatments for depression in aphasic stroke patients: a randomised controlled trial
Name of main REC:	Nottingham Research Ethics Committee (1)
REC reference number:	04/Q2403/148
Date study commenced:	January 2005
Protocol reference (if applicable), current version and date:	Version 3 November 2005
Amendment number and date:	Amendment 1; November 2005



**Type of amendment (indicate all that apply in bold)**

*(a) Amendment to information previously given on the REC application form*

**Yes**      **No**

*If yes, please refer to relevant sections of the REC application in the "summary of changes" below.*

*(b) Amendment to the protocol*

**Yes**      **No**

*If yes, please submit either the revised protocol with a new version number and date, highlighting changes in bold, or a document listing the changes and giving both the previous and revised text.*

*(c) Amendment to the information sheet(s) and consent form(s) for participants, or to any other supporting documentation for the study*

**Yes**      **No**

*If yes, please submit all revised documents with new version numbers and dates, highlighting new text in bold.*

**Is this a modified version of an amendment previously notified to the REC and given an unfavourable opinion?**

**Yes**      **No**

**Summary of changes**

*Briefly summarise the main changes proposed in this amendment using language comprehensible to a lay person. Explain the purpose of the changes and their significance for the study. In the case of a modified amendment, highlight the modifications that have been made.*

*If the amendment significantly alters the research design or methodology, or could otherwise affect the scientific value of the study, supporting scientific information should be given (or enclosed separately). Indicate whether or not additional scientific critique has been obtained.*

- We would like to use the information collected from patients at the time of recruitment to investigate which factors are related to low mood in patients with aphasia, for example, disability and severity of aphasia. These findings will provide useful clinical information to help identify patients who are at risk of having low mood and will inform the development of interventions for low mood in this population. As noted in the protocol, there is evidence that depression is common in stroke patients with communication impairment (Robinson & Benson, 1981; Kauhanen et al, 2000; Thomas & Lincoln, in press). However, little is known about which factors are related to patients having low mood.

- In order to obtain a broader and more representative sample of patients and increase the sample size for the study (and therefore the statistical power) we plan to also recruit patients from existing stroke databases, in addition to the current method of identifying patients through speech and language therapists (this is relevant to section A10 and A20 of the REC application form). Information about the study will be sent to the patient by the person responsible for managing the database.
- It is necessary to amend the Information for Participants sheet and Information for Carers sheet to inform potential participants that we would like to use the baseline data to examine factors relating to mood in people with aphasia. Some patients who are recruited will not have low mood and will not be eligible for the treatment study.

We therefore propose a two-stage recruitment process:

Part 1: All patients with aphasia who meet the inclusion criteria will be invited to take part in a study to identify what factors affect the mood of stroke patients with aphasia. An amended information sheet is enclosed for Part 1 of the study (Version 3, November 2005).

Part 2: Only those patients who are identified as having low mood will be invited to take part in the randomised controlled trial of behaviour therapy to treat low mood. An amended information sheet is enclosed for Part 2 of the study (Version 3, November 2005).

The advantage of dividing recruitment into two stages is that it allows patients the opportunity to take part in only the first part of the study and not the treatment study. Secondly, not all patients who are assessed will meet the inclusion criteria for the treatment study and it is therefore unnecessary to provide them with information about this.

- The Comprehensive Aphasia Test (CAT) will be added as a baseline assessment of language. This will provide useful information about cognitive problems and language ability. This data will be used to examine whether the severity and nature of language impairment is associated with mood and will also provide useful information to the psychologist conducting the behaviour therapy intervention. This assessment takes about 1 hour to complete and is usually completed with the patient over 2 sessions.
- The Stroke and Aphasia Quality of Life Scale (SAQOL) will be added as an outcome measure. It is important not only to examine the effectiveness of the intervention on mood but also whether the quality of life of the patient has improved. The SAQOL is a measure developed and validated for patients with aphasia.
- Two investigators have been added to the study team – Miss Eirini Kontou and Dr Jamie Macniven. Miss Eirini Kontou is a PhD student in the Institute of Work, Health & Organisations at the University of Nottingham. She is a research psychologist funded by a bursary from the Stroke Association and holds an honorary NHS contract. Part 1 of the study will form part of Eirini's PhD thesis and this is supervised by Prof Nadina Lincoln and Dr Marion Walker. Dr Jamie Macniven is a clinical psychologist employed by QMC and will be involved in supervising Eirini Kontou.

### Information for Participants

**Title: Psychological treatments for low mood in stroke patients with communication problems: Part 1**

**Investigators: Dr Shirley Thomas, Prof Nadina Lincoln, Dr Marion Walker, Ms Eirini Kontou, Dr Jamie Macniven, Dr John Gladman & Ms Helen Haworth**

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and discuss it with relatives, friends or your G.P. if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

#### What is the purpose of the study?

We would like to find out what factors affect the mood of stroke patients who have communication problems. The study will be conducted between November 2004 and November 2007.

#### Why have I been chosen?

We are asking 180 people with communication problems following their stroke to take part in this study which involves completing some assessments of communication and mood. If you have low mood you may also be invited to take part in a treatment programme.

#### Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form which you will be given a copy of also. If you decide to take part you are still free to withdraw at any time and without giving a reason. This will not affect the standard of care you receive.

#### What do I have to do?

We will complete some questionnaires with you to assess your communication and your mood. A trained researcher will complete the assessments with you over two or three one-hour sessions. We will also ask your relative/carer to complete some questionnaires. At three months and six months the researcher will visit you to repeat some of the assessments of communication and mood with you.



**You will receive all other care and treatment as usual.**

**What are the possible disadvantages and risks of taking part?**

There are no particular risks involved in taking part in the study.

**What are the possible benefits of taking part?**

Although this research may be of no direct benefit to you, we expect it will enable us to understand more about the factors that affect the mood of stroke patients with communication problems so that we can improve services in the future.

**What if something goes wrong?**

If you wish to complain about any aspect of the way you have been approached or treated during the course of the study, the normal National Health Service complaints mechanisms may be available to you.

**Will my taking part in this study be kept confidential?**

If you consent to take part any part of your medical records may be inspected by the researcher for the purposes of gathering data and analysing the results. All information that is collected about you during the course of the research will be kept strictly confidential, although with your permission we can share clinically important information with other health professionals involved in your overall care.

Any information about you that leaves the hospital will have your name and address removed so that you cannot be identified from it. We will send a letter to your G.P. to inform them that you are taking part in the study. The researcher in this study is not diagnosing clinical depression. However, if the researcher becomes concerned about your mood during the study then they will ask your permission to contact your G.P.

**What will happen to the results of the research study?**

We plan to publish the results of this study in a scientific journal. You will not be identified in any report/publication. If you would like to receive the published results, please tell the researcher.

**Who is organising and funding the research?**

The research is being conducted by Eirini Kontou and Shirley Thomas as part of a therapy research training programme. This research is being funded by the Stroke Association.

**Who has reviewed the study?**

Nottingham Research Ethics Committee has reviewed the study.

### **Further information**

If you have any questions about this study you may contact:

Eirini Kontou

Institute of Work, Health, & Organisations

William Lee Buildings 5-6, Science & Technology Park

University Boulevard, Nottingham, NG7 2RQ

Tel: 0115 8467616

Thank you for taking the time to read this.

### Information for Carers

**Title: Psychological treatments for low mood in stroke patients with communication problems: Part 1**

**Investigators: Dr Shirley Thomas, Prof. Nadina Lincoln, Dr Marion Walker, Ms Eirini Kontou, Dr Jamie Macniven, Dr John Gladman & Ms Helen Haworth**

Your relative is being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and discuss it with relatives, friends or your G.P. if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

#### What is the purpose of the study?

We would like to find out what factors affect the mood of stroke patients who have communication problems. The study will be conducted between November 2004 and November 2007.

#### Why has my relative been chosen?

We are asking 180 people with communication problems following their stroke who low mood to take part in this study which involves completing some assessments of communication and mood. If your relative has low mood they may may also be invited to take part in a treatment programme.

#### Does my relative have to take part?

It is up to you to decide whether or not your relative will take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign an assent form which you will be given a copy of also. If you decide for your relative to take part then he/she is still free to withdraw at any time and without giving a reason. This will not affect the standard of care he/she receives.

#### What do I have to do?

We will complete some questionnaires with your relative to assess their communication and their mood. A trained researcher will complete the assessments with your relative over two or three one hour sessions. We will also ask you to complete some questionnaires about your relative. At three months and six months the researcher will visit your relative to repeat some of the the assessments of communication and mood with him/her.



**Your relative will receive all other care and treatment as usual.**

**What are the possible disadvantages and risks of taking part?**

There are no particular risks involved in taking part in the study.

**What are the possible benefits of taking part?**

Although this research may be of no direct benefit for your relative, we expect it will enable us to understand more about the factors that affect the mood of stroke patients with communication problems moods that we can improve services in the future.

**What if something goes wrong?**

If you or your relative wish to complain about any aspect of the way you have been approached or treated during the course of the study, the normal National Health Service complaints mechanisms may be available to you.

**Will my relative taking part in this study be kept confidential?**

If you consent for your relative to take part any part of their medical records may be inspected by the researcher for the purposes of gathering data and analysing the results. All information that is collected about your relative during the course of the research will be kept strictly confidential, although with your permission we can share clinically important information with other health professionals involved in your relative's overall care. Any information about your relative that leaves the hospital will have his/her name and address removed so that they cannot be identified from it.

We will send a letter to your relative's G.P. to inform them that your relative is taking part in the study. The researcher in this study is not diagnosing clinical depression. However, if the researcher becomes concerned about your relative's mood during the study then they will ask their permission to contact your relative's G.P.

**What will happen to the results of the research study?**

We plan to publish the results of this study in a scientific journal. Your relative will not be identified in any report/publication. If you would like to receive the published results, please tell the researcher.

**Who is organising and funding the research?**

The research is being conducted by Eirini Kontou and Shirley Thomas as part of a therapy research training programme. This research is being funded by the Stroke Association.

**Who has reviewed the study?**

Nottingham Research Ethics Committee has reviewed the study.

**Further information**

If you have any questions about this study you may contact:

Eirini Kontou

Institute of Work, Health & Organisations

William Lee Buildings 5-6, Science & Technology Park

University Boulevard, Nottingham. NG7 2RQ

Tel: 0115 8467616

Thank you for taking the time to read this.

CONSENT FORM

Psychological treatments for low mood in stroke patients with communication problems: Part 1

Investigators: Dr Shirley Thomas, Dr Marion Walker, Prof Nadina Lincoln, Ms Eirini Kontou, Dr Jamie Macniven, Dr John Gladman & Helen Haworth

The patient should complete the whole of this sheet himself/herself.  
Please cross out as necessary

- Have you read & understood the patient information sheet YES/NO
- Have you had opportunity to ask questions & discuss the study YES/NO
- Have all the questions been answered satisfactorily YES/NO
- Have you received enough information about the study YES/NO
- Who have you spoken to Dr/Mrs/Ms .....
- Do you understand that you are free to withdraw from the study
  - at any time YES/NO
  - without having to give a reason YES/NO
  - without affecting your future medical care YES/NO
- Do you agree to take part in the study YES/NO

Signature (Patient)

Date

Name (In block capitals)

I have explained the study to the above patient and he/she has indicated his/her willingness to take part.

Signature (Researcher)

Date

Name (In block capitals)



Assent Form

Psychological treatments for low mood in stroke patients with communication problems: Part 1

Investigators: Dr Shirley Thomas, Dr Marion Walker, Prof Nadina Lincoln, Ms Eirini Kontou, Dr Jamie Macniven Dr John Gladman & Helen Haworth

The partner/relative/carer should complete the whole of this sheet himself/herself.

Please cross out as necessary

- Have you read & understood the patient information sheet YES/NO
- Have you had opportunity to ask questions & discuss the study YES/NO
- Have all the questions been answered satisfactorily YES/NO
- Have you received enough information about the study YES/NO
- Who have you spoken to Dr/Mrs/Ms .....
- Do you understand that the patient is free to withdraw from the study
  - at any time YES/NO
  - without having to give a reason YES/NO
  - without affecting their future medical care YES/NO
- Do you agree that the patient can take part in the study YES/NO

Signature (Partner/carer/relative)

Date

Name (In block capitals)  
I have explained the study to the above partner/carer/relative and he/she has indicated his/her willingness to take part.

Signature (Researcher)

Date

Name (In block capitals)

## **APPENDIX C**

### **COPIES OF ASSESSMENTS**

**Due to copyright restrictions the CAT battery and all items of the VAMS and VASES cannot be reproduced and so they are not included in the Appendix.**

## Data Collection Form

Patient ID

### Demographic Details

Source: Berman 2 ☐ Beeston ☐ Newell ☐ SLT community ☐

Date of recruitment:

Hospital number:

Patient address:

Patient telephone:

Date of birth:

Age:

Male / Female

Carer name:

Carer address:

Carer telephone:

Relationship to patient:

GP name:

GP address:

GP telephone:

Nationality/ethnic group:

Marital status: Married ☐ Widowed ☐ Divorced/separated ☐ Single ☐

Employment status: Employed ☐ Retired ☐ Unemployed ☐

Current occupation (or most recent if retired/unemployed):

Place of residence: Independent housing ☐ Residential home ☐ Nursing home ☐

Living arrangements: Alone ☐ With spouse ☐ With relatives ☐ Other \_\_\_\_\_



**Stroke Details**

Date of stroke:

Time since stroke:

Date of admission:

Date of discharge:

Stroke classification: TACS ☐ PACS ☐ POCS ☐ LACS ☐

Side of lesion: Left ☐ Right ☐ Bilateral ☐

Side of weakness: Left ☐ Right ☐ Bilateral ☐

Date of scan:

CT / MRI

Scan details:

Co-existing medical conditions:

Treatments for low mood/depression/anxiety:

Other relevant treatments received:

**Medical History**

Details of previous stroke (e.g. date, severity, residual impairment:

Pre-stroke functional status (inc pre-stroke Barthel if available):

History of psychological/psychiatric problems:

Other relevant medical history:

Other comments:

## BASELINE ASSESSMENTS

- Sheffield Screening Test for Acquired Language Disorders (SST)
- Visual Analogue Mood Scales-Revised (VAMS-R)
- Visual Analogue Self-Esteem Scales (VASES)
- Stroke Aphasic Depression Questionnaire-Hospital version (SADQ-21)
- Barthel Index (BI)
- Nottingham-Extended Activities of Daily Living (N-EADL)
- Nottingham-Leisure Questionnaire (N-LQ)
- Comprehensive Aphasia Test (CAT)

## **FOLLOW-UP ASSESSMENTS (6 months)**

- Visual Analogue Mood Scales-R (VAMS-R)
- Visual Analogue Self-Esteem Scales (VASES)
- Stroke Aphasic Depression Questionnaire-Hospital version (SADQ-21)
- Nottingham-Extended Activities of Daily Living (N-EADL)
- Nottingham-Leisure Questionnaire (N-LQ)
- Disability Questionnaire (CAT)
- Carer Strain Index (CSI)
- Satisfaction With Care-Participant and/or Carer version (SWC)



# Sheffield Screening Test for Acquired Language Disorders

Diana Syder, Richard Body, Mark Parker, Margaret Boddy

## Score Sheet

Client's Name.....

Date of birth .....

Tester's Name.....

Date of test.....

Full instructions for administration and scoring are contained in the Manual

### Receptive Skills (Section 2)

#### 1. Verbal Comprehension of Single Words

Score

I'm going to ask you to point to some of the things in the room.

door \_\_\_\_ light \_\_\_\_ chair \_\_\_\_ ceiling \_\_\_\_ corner \_\_\_\_

☐

#### 2. Comprehension of Sequential Command

a) Point to the window and then the door

☐

b) Before pointing to the ceiling, touch the chair

☐

#### 3. Comprehension of a Complex Command

Tap the chair twice with a clenched fist, whilst looking at the ceiling

☐

#### 4. Recognition of Differences in Meaning Between Words

I'm going to read you a list of words and I want you to tell me which is the odd one out:

a) chicken, duck, apple, turkey

☐

b) run, drink, walk, sprint

☐

c) small, large, massive, huge

☐

#### 5. Comprehension of a Narrative

a) I'm going to read you a short paragraph and then ask you a question about it.  
John went to the shop to buy a pen. When he got there he found that he  
had forgotten his wallet, so he came home and made himself a cup of tea.

What should he have taken with him?

☐

b) I'm going to read you another paragraph

Mrs Smith visited several shops. She bought a newspaper, a cauliflower  
a stamp and some sausages.

What was the second shop she visited?

☐

Receptive Skills: Total Score

☐

Sheffield Screening Test for Acquired Language Disorder  
Expressive Skills (Section 3)

6. **Word Finding**  
Tell me the names of three well-known places  
in *the client's home town*.

Score  
☐

*Score one mark if three names are given correctly*

7. **Abstract Word Finding**  
Tell me another word that means the same as:

- a) beautiful;
- b) angry;
- c) ridiculous.

☐  
☐  
☐

8. **Sequencing**  
Describe how you would make a cup of tea.

☐

*A correct answer contains two or more appropriate stages in the right order*

9. **Definitions**  
Describe what the following words mean:

- a) home;
- b) search;
- c) ambitious.

☐  
☐  
☐

10. **Verbal Reasoning**  
I'd like you to tell me:

- a) why you would use an umbrella;
- b) why people go on holiday;
- c) what would you do if you were locked out of the house.

☐  
☐  
☐

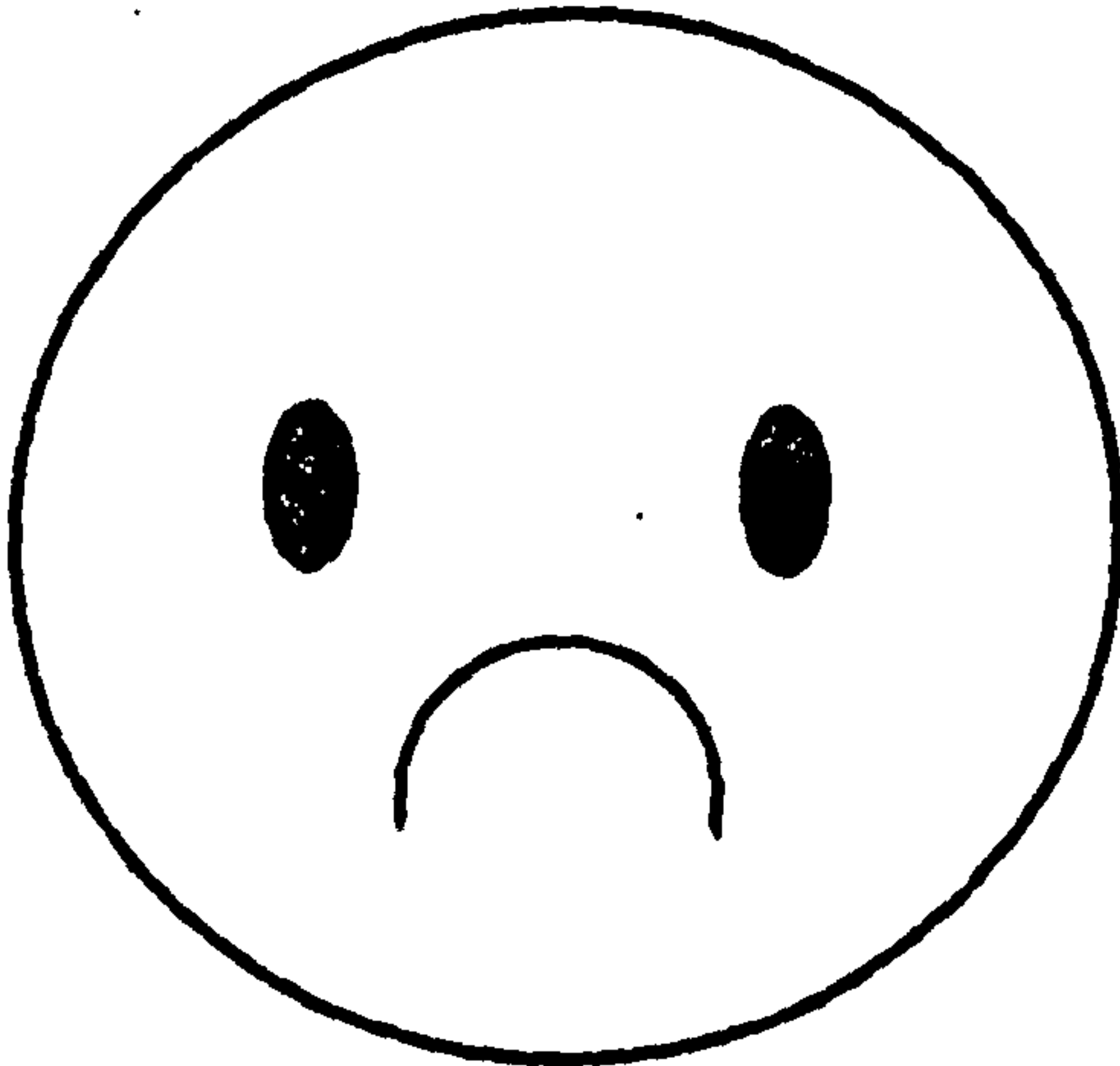
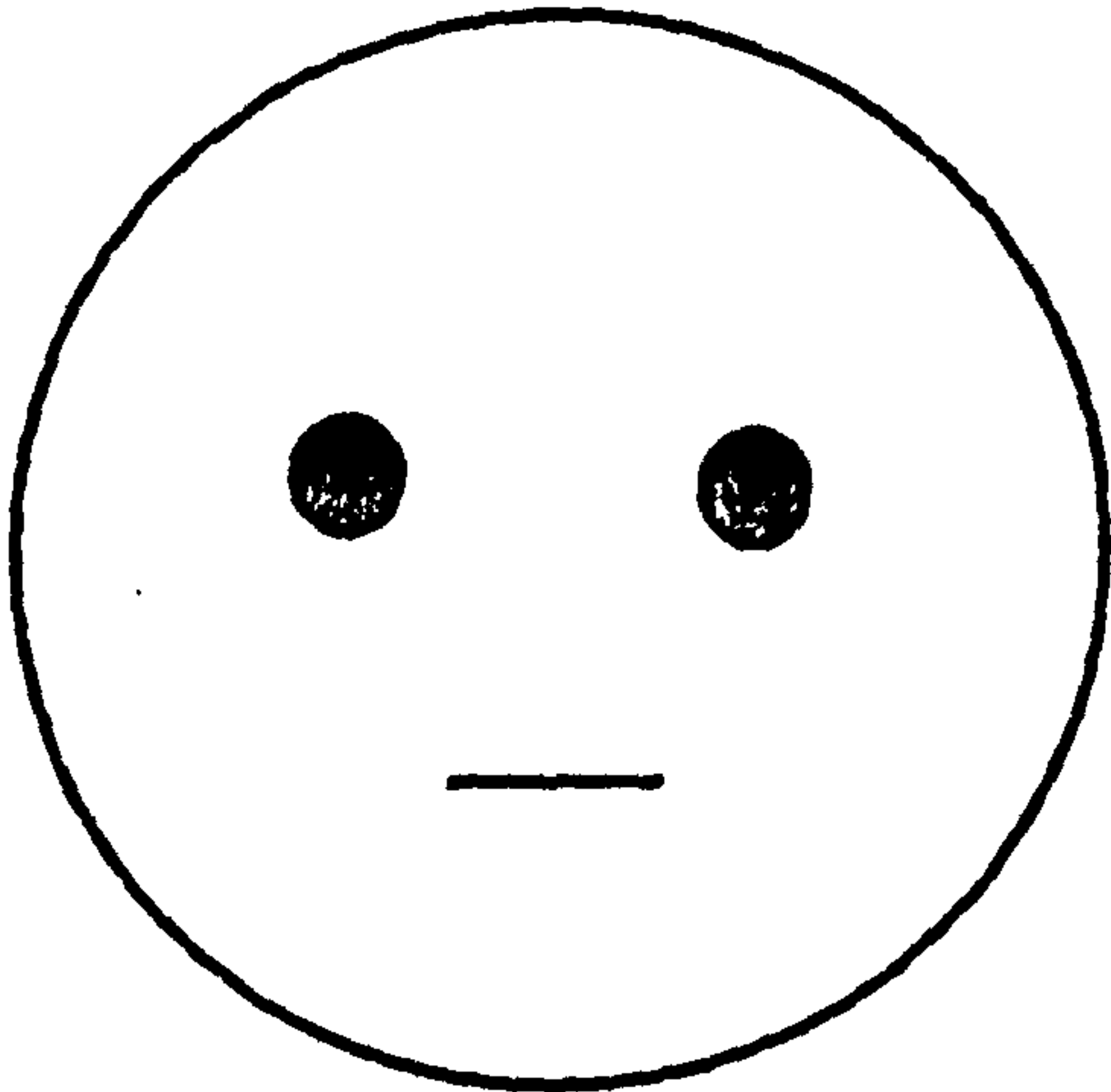
Expressive Skills: Total Score

☐

Receptive and Expressive Skills: Total Score

☐

Neutral



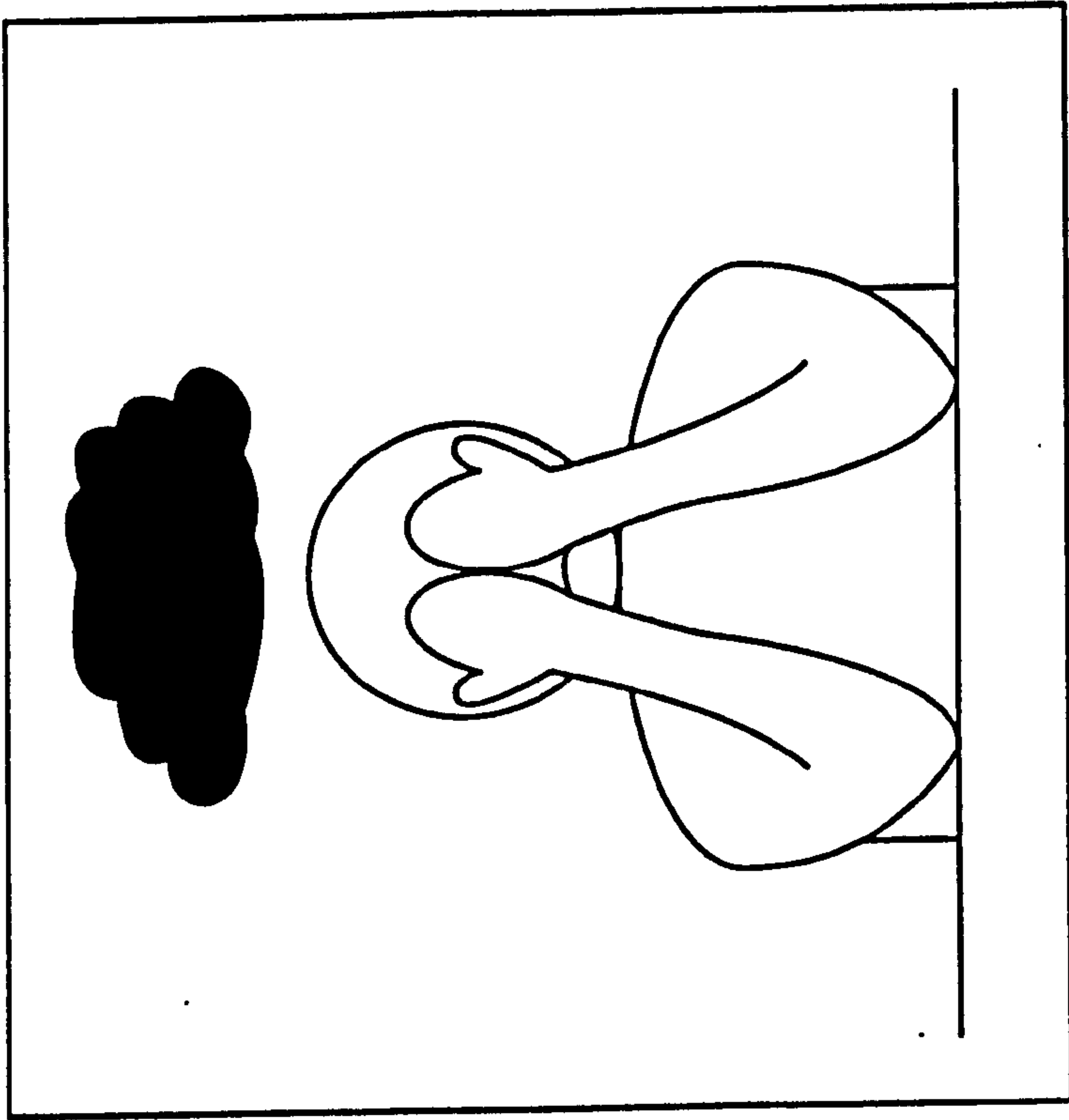
Sad



# VASES

On the following pages you will find the ten pairs of pictures which form the VASES. Below you will find a practice task that you can do with your client. Look at these two pictures with the client and explain what each one represents. Show the client the rating scale beneath the pictures and explain

**depressed**



++

Very true of me

+

True of me

0

In between

+

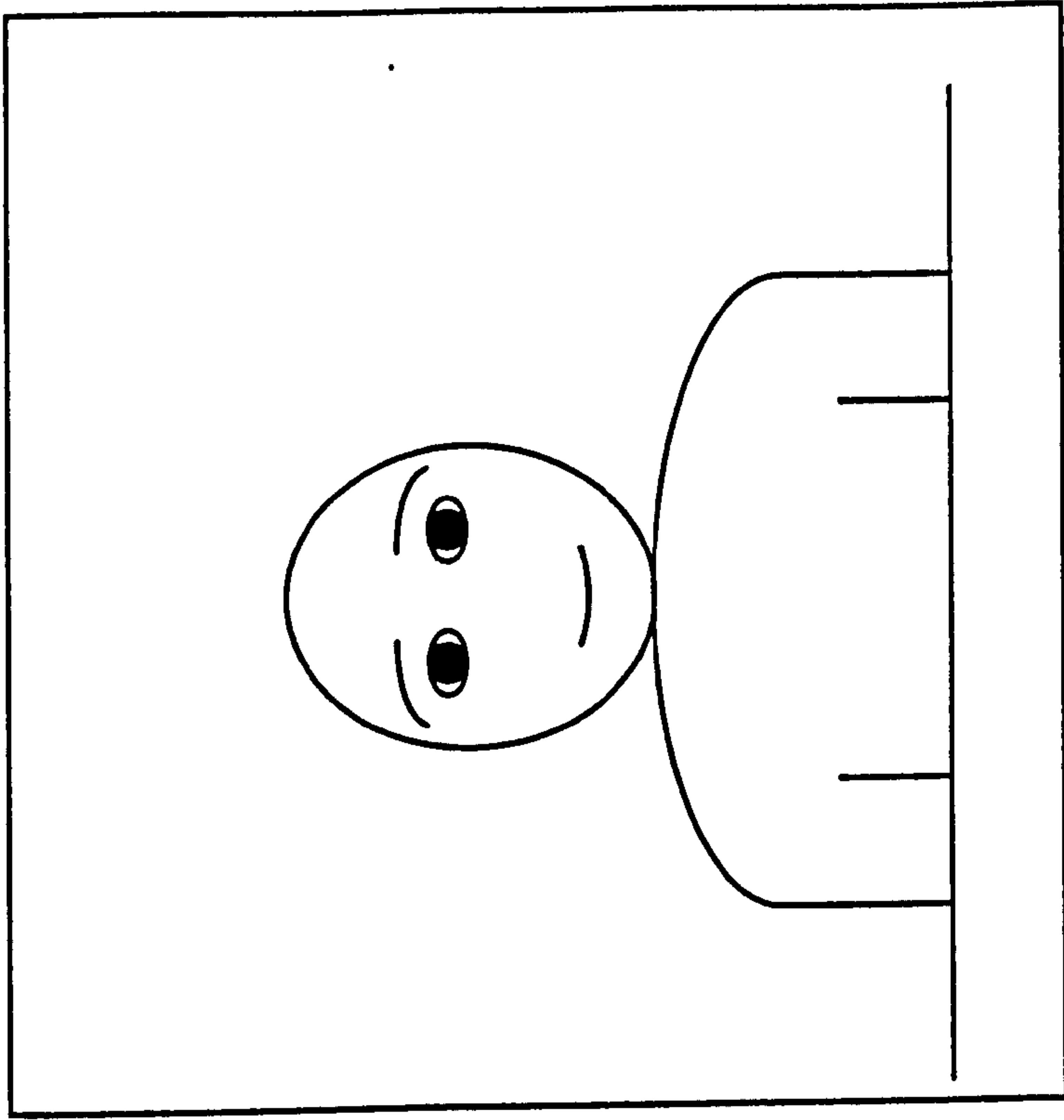
True of me

++

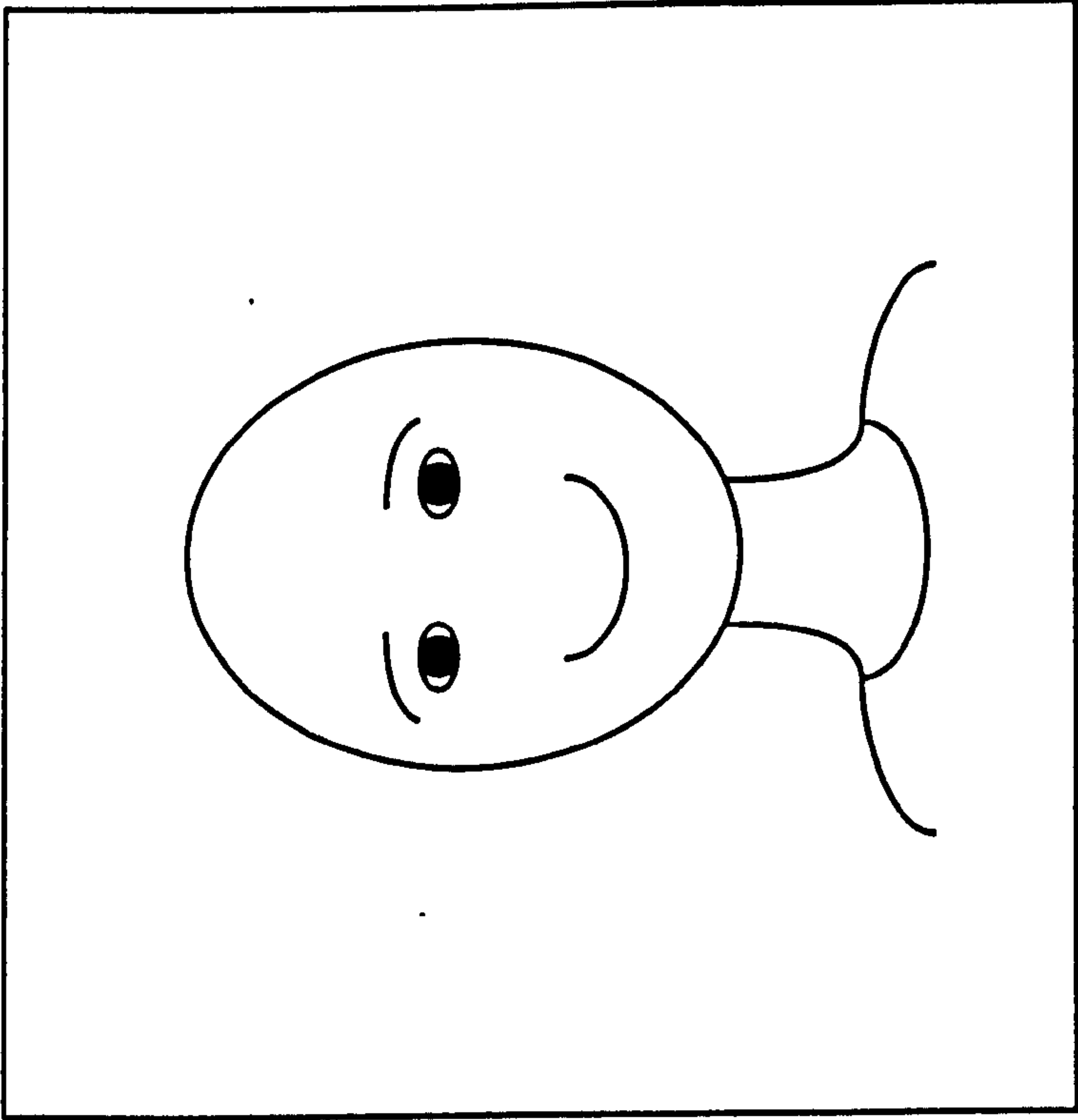
Very true of me

what each symbol means. Ask the client to look again at the two pictures and consider which of the two pictures is most true of them. When the client has decided which picture is most like them, ask them to look at the rating scale. Explain it again and ask the client for their answer.

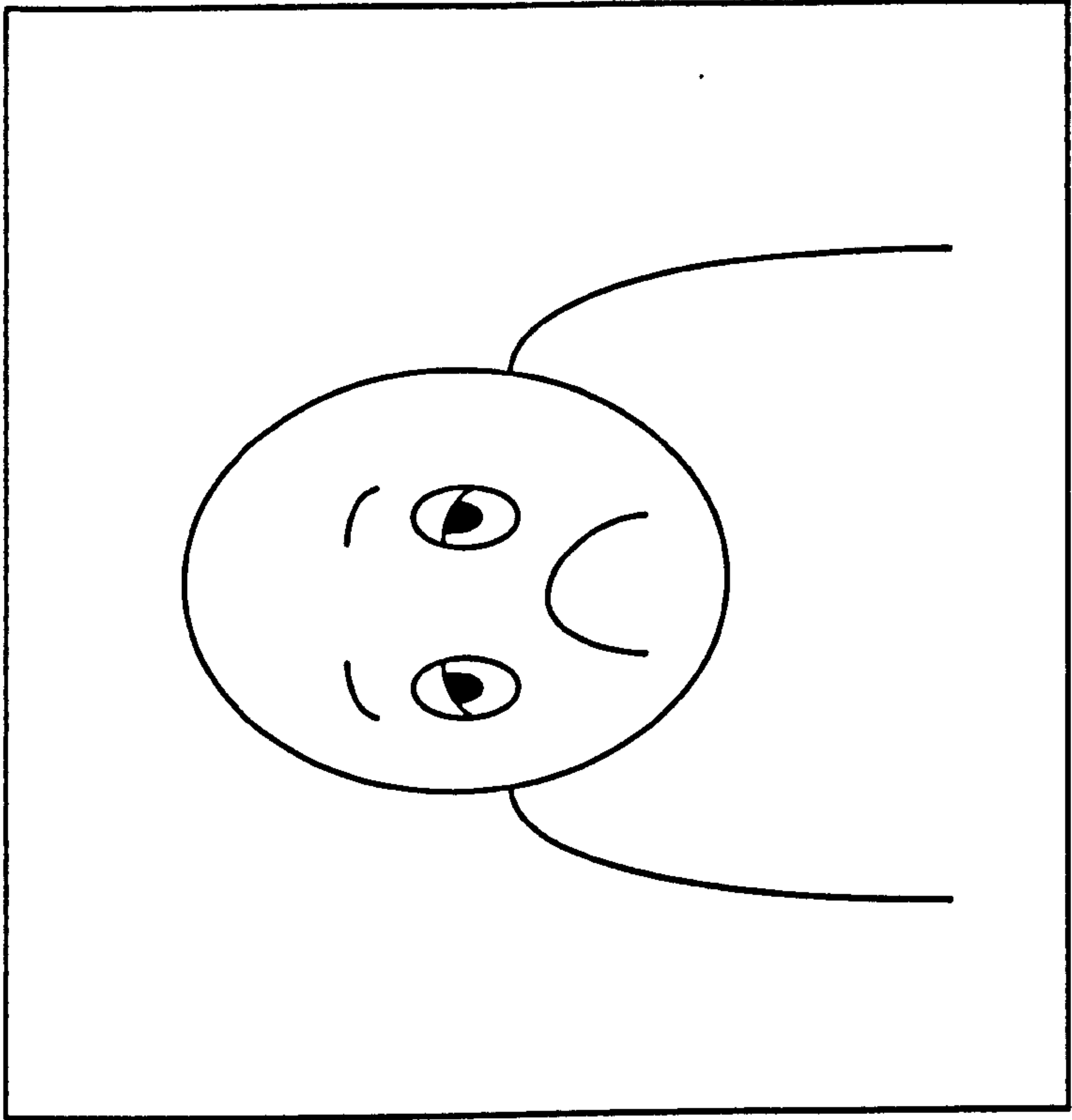
**not depressed**



**cheerful**



**not cheerful**



++

+

0

+

++

## THE STROKE APHASIC DEPRESSION QUESTIONNAIRE II (HOSPITAL VERSION)

Please indicate on how many days out of the last 7 the patient has shown the following behaviours:

**1. Did his/her waking cause a disturbance in sleep patterns?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------

**2. Did he/she have weeping spells?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------

**3. Did he/she have restless disturbed nights?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------

**4. Did he/she initiate activities?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------

**5. Did he/she avoid eye contact when you spoke to him/her?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------

**6. Did he/she burst into tears?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------

**7. Did he/she smile when you spoke to him/her?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
------------------------	--------------------------	---------------------------	-------------------------



**8. Did he/she indicate suffering from aches and pains?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**9. Did he/she refuse to eat meals?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**10. Did he/she get angry?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**11. Did he/she refuse to participate in social activities?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**12. Did he/she laugh at a joke?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**13. Did he/she get restless and fidgety?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**14. Did he/she sit without doing anything?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**15. Did he/she concentrate on activities?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**16. Did he/she take care of his/her appearance to the extent of his/her physical ability?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**17. Did he/she seem to enjoy social activities or outings?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**18. Did he/she keep him/herself occupied during the day?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**19. Did he/she take sleeping tablets?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**20. Did he/she take interest in events around him/her?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

**21. Did he/she look at you when you approached him/her?**

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week
---------------------	-----------------------	------------------------	----------------------

BARTHEL ADL INDEX (Collin et al, 1988)

ACTIVITY	ABILITY	SCORE OPTION	SCORE
BOWELS	Incontinent (or needs to be given enema)	0	
	Occasional accident (once per week)	1	
	Continent	2	
BLADDER	Incontinent or catheterised and unable to manage	0	
	Occasional accident (max once per 24 hours)	1	
	Continent (for over 7 days)	2	
GROOMING	Needs help with personal care	0	
	Independent face/hair/teeth/shaving (implements provided)	1	
TOILET USE	Dependent	0	
	Needs some help but can do something alone	1	
	Independent (on and off, dressing, wiping)	2	
FEEDING	Unable	0	
	Needs help cutting, spreading butter etc.	1	
	Independent (food provided in reach)	2	
TRANSFER	Unable - no sitting balance	0	
	Major help (one or two people, physical) can sit	1	
	Minor help (verbal or physical)	2	
	Independent	3	
MOBILITY	Immobile	0	
	Wheelchair independent including corners etc.	1	
	Walks with help of one person (verbal or physical)	2	
	Independent (but may use any aid e.g. stick)	3	
DRESSING	Dependent	0	
	Needs help but can do about half unaided	1	
	Independent (including buttons, zips, laces etc.)	2	
STAIRS	Unable	0	
	Needs help (verbal, physical, carrying aid)	1	
	Independent up and down	2	
BATHING	Dependent	0	
	Independent (or in shower)	1	
	TOTAL	/ 20	



NOTTINGHAM EXTENDED  
ACTIVITIES OF DAILY LIVING  
(EADL) INDEX

PATIENT'S NAME:

HOSPITAL NUMBER:

0 = Not at all  
1 = With help  
2 = Alone with difficulty  
3 = Alone easily

DO YOU.....

Date

MOBILITY

- walk around outside?
- climb stairs?
- get in and out of the car?
- walk over uneven ground?
- cross roads?
- travel on public transport?

TOTAL

IN THE KITCHEN

- manage to feed yourself?
- make yourself a hot drink?
- take hot drinks from one room to another?
- do the washing up?
- make yourself a hot snack?

TOTAL

DOMESTIC TASKS

- manage your own money when out?
- wash small items of clothing?
- do your own shopping?
- do a full clothes wash?

TOTAL

LEISURE ACTIVITIES

- read newspapers and books?
- use the telephone?
- write letters?
- go out socially?
- manage your own garden?
- drive a car?

TOTAL

GRAND TOTAL

Comments

## Shortened version of the Nottingham Leisure Questionnaire

The next set of questions is about things you may do in your free time. Please record how often you have done each activity IN THE LAST FEW WEEKS. You should put a tick in ONE box for EACH activity.

<i>tick one box for each activity</i>			
How often do you do the following?	regularly 2	occasionally 1	never 0
Watching TV .....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listening to radio / music .....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visiting family / friends.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading books.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Singing.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gardening.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crafts e.g. knitting / sewing.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attending sports events.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collecting things.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shopping for pleasure.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooking for pleasure.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading newspapers / magazines.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walking.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volunteer work.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indoor games / cards / bingo / dominoes...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dancing.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*tick one box for each activity*

**How often do you do**

**the following?**

**regularly**

**occasionally**

**never**

2

1

0

Looking after / exercising pets .....

☐

☐

☐

Eating out .....

☐

☐

☐

Going to pubs.....

☐

☐

☐

Going to plays / museums / cinema.....

☐

☐

☐

Photography.....

☐

☐

☐

Exercise / fitness.....

☐

☐

☐

Attendance at day centres and clubs.....

☐

☐

☐

Going to parties.....

☐

☐

☐

Entertaining at home.....

☐

☐

☐

Church activities.....

☐

☐

☐

Driving.....

☐

☐

☐

DIY.....

☐

☐

☐

Sporting activities.....

☐

☐

☐

eg tennis / bowling / bicycling/  
fishing / swimming

Holidays.....

☐

☐

☐

Any other activities not already mentioned:

please specify

1.....

☐

☐

☐

2.....

☐

☐

☐



I am going to present you with a list of situations which may relate to your experience of looking after\_\_\_\_\_. They may apply to you either: never, rarely, sometimes or often.

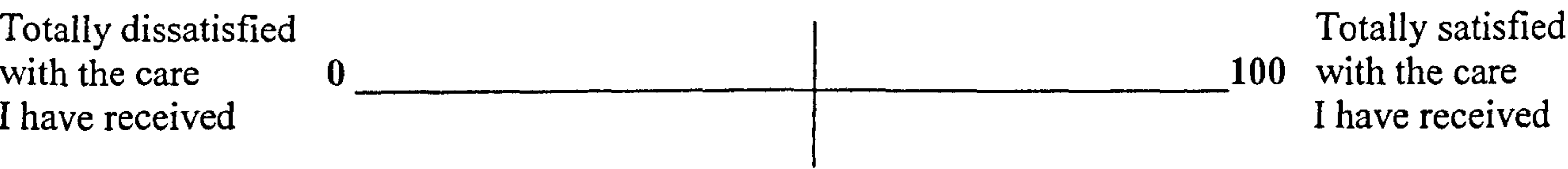
Please tick the box which best fits your description.

	Never	rarely	sometimes	often
Sleep is disturbed (eg. because my partner needs help to go to the toilet)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is inconvenient (eg. because helping takes so much time)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is a physical strain (eg. because of lifting in and out of bed)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is confining (eg. helping restricts my free time)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There have been family changes (eg. because helping has disrupted routine/there has been no privacy)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There have been changes in personal plans (eg. could not go on holiday)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There have been other demands on my time (eg. from other family members)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There have been emotional adjustments (eg. because of severe arguments)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Some behaviour is upsetting (eg. incontinence/trouble remembering things)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is upsetting to find my partner has changed so much from his/her former self (eg. seems like a different person)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There have been work adjustments (eg. having to take time off)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is a financial strain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling completely overwhelmed (eg. worrying/ concerns about how you will manage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**SATISFACTION WITH CARE (SWC)-Participant**

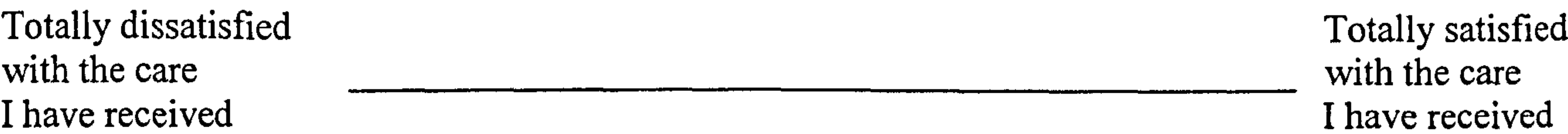
Please put a mark on the line below at the place which shows HOW SATISFIED YOU ARE WITH THE SERVICES YOU HAVE RECEIVED.

Example: WHERE SOMEONE WAS AS EQUALLY SATISFIED AS DISSATISFIED WITH CARE.

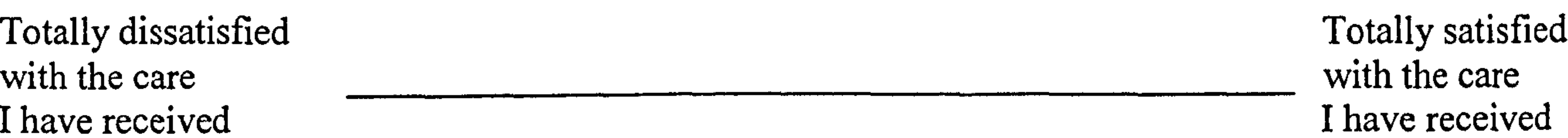


The following questions/statements relate to your satisfaction with aspects of care you have received since your stroke.

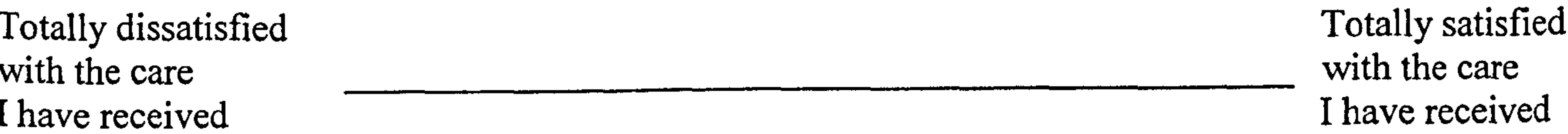
1) Are you satisfied with the emotional support you have received since your stroke?



2) Are you satisfied with the help that you have received for your communication problems since your stroke?



3) Overall how satisfied are you with the hospital and community services that you have received?



### **SATISFACTION WITH CARE (SWC)-Carer**

Please put a mark on the line below at the place which shows HOW SATISFIED YOU ARE WITH THE SERVICES THE PERSON FOR WHOM YOU CARE HAS RECEIVED.

Example: WHERE SOMEONE WAS AS EQUALLY SATISFIED AS DISSATISFIED WITH CARE.

Totally dissatisfied  
with the care  
I have received      0      100      Totally satisfied  
with the care  
I have received

The following questions/statements relate to your satisfaction with different services that the person for whom you care has received since their stroke.

**1) Are you satisfied with the emotional support that the person for whom you care for has received since they had their stroke?**

Totally dissatisfied  
with the care  
I have received

---

Totally satisfied  
with the care  
I have received

**2) Are you satisfied with the help for communication problems that the person for whom you care for has received since they had their stroke?**

Totally dissatisfied  
with the care  
I have received

---

Totally satisfied  
with the care  
I have received

**3) Overall how satisfied are you with the hospital and community services that the person for whom you care has received?**

Totally dissatisfied  
with the care  
I have received

---

Totally satisfied  
with the care  
I have received