RECOVERY OF DRESSING ABILITY AFTER STROKE

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ABSTRACT

The research programme was designed to coincide with a separate phase II randomised controlled trial (RCT) of a Neuropsychological approach to dressing rehabilitation after stroke entitled 'Dressing Rehabilitation Evaluation Stroke Study' (DRESS). This research programme incorporated the cohort of participants from the DRESS study. It was an original piece of work that involved three separate but related research studies.

The first project involved an inter-rater reliability study of the Nottingham Stroke Dressing Assessment (NSDA) and accompanying error analysis form which is the primary outcome measure used in the DRESS RCT. The inter-rater reliability study measured agreement between three raters' dressing assessments on twenty patients. Of the 44 items on the NSDA that could be tested, there was excellent agreement (k >0.75) on 29 items, good agreement (k >0.6) on 8 items, fair agreement (k >0.4) on 5 items, and poor agreement (k <0.4) on 2 items. The intra-class correlation coefficient between the three raters' final percentage score was 0.988, representing excellent agreement between raters. For the error analysis form there was excellent agreement (k >0.75) on 2 items, good agreement (k >0.6) on 4 items, and fair agreement (k >0.4) on 1 items.

The aim of the second study was to explore to what extent upper limb hemiparesis affects dressing performance in the presence of cognitive impairment. Using a cohort of 70 participants from the 'DRESS study', this study explored the dressing performance of cognitively impaired stroke survivors who had bilateral hand function as compared with unilateral hand function. A Chi-square test for independence indicated a strong association between dressing method and dressing success, χ^2 (1, n=70) = 12.79,

$p<0.001$, phi=0.47. Of those who were unsuccessful at dressing at baseline, a Mann-Whitney U test revealed a significant difference in NSDA scores between the bi-manual group (median=78) and the uni-manual group (median=29). U=118, Z=-4.045, $p<0.001$, r=0.6. The results indicated that the ability to use both hands in the presence of cognitive impairment had a positive effect on dressing performance.

The final study was an acceptability study which was carried out to survey the participants on the DRESS study. An acceptability questionnaire was devised and used to conduct structured interviews with the DRESS study participants during their final outcome assessment. The aim was to explore patients' experiences of being a participant on the DRESS study phase II randomised controlled trial and to ascertain their opinion on the importance of independent dressing, the usefulness and efficacy of the different dressing treatments, the frequency and duration of dressing treatment sessions, and their perceptions of the success of the DRESS study treatment approaches. The majority of participants felt that it was "very important" (n=34) or "quite important" (n=10) to be able to dress on their own without help. Similarly, the majority of participants (n=44) felt that dressing was an important part of their recovery from stroke. All aspects of the DRESS study were considered to be acceptable and there was no significant difference in participants' responses between the two treatment groups.

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LIST OF ABBREVIATIONS

ADL.....Activities of Daily Living

AF.....Atrial Fibrillation

BI.....Barthel Index

DRESS.....Dressing Rehabilitation Evaluation Stroke Study

EADLs.....Extended Activities of Daily Living

FIM.....Functional Independence Measure

IADLs.....Instrumental Activities of Daily Living

ICC.....Intra-class Correlation Coefficient

mRS.....Modified Rankin Scale

NSDA.....Nottingham Stroke Dressing Assessment

PADLs.....Personal Activities of Daily Living

RA.....Research Assistant

RCT.....Randomised Controlled Trial

TIA.....Transient ischemic attack

USN.....Unilateral Spatial Neglect

VOSP.....Visual Object Spatial Perception

CHAPTER 1

AN INTRODUCTION TO STROKE

1.1 CHAPTER OVERVIEW

This chapter will provide an introduction to stroke. The central theme of this thesis is the recovery of dressing ability after stroke. It is therefore useful to have background knowledge of stroke in order to place subsequent chapters in context. The chapter will begin by defining type and sub-types of stroke, and the various known risk factors, before going on to describe the incidence, prevalence and economic impact of stroke. The chapter will conclude with an overview of rehabilitation and recovery from stroke.

1.2 DEFINITION OF STROKE

Stroke is defined as 'a clinical syndrome, of presumed vascular origin, typified by rapidly developing signs of focal or global disturbance of cerebral functions lasting more than 24 hours or leading to death' (World Health Organisation 1978). A stroke is caused by an interruption of the blood supply to the brain, usually due to a ruptured blood vessel or a blockage caused by a clot (WHO 2008). This causes an inadequate supply of oxygen and nutrients to reach vital parts and results in damage to the brain tissue. A stroke can occur in the cerebral hemispheres, the cerebellum, or the brainstem.

1.3 TYPE OF STROKE

Stroke is either ischemic or haemorrhagic in nature. Ischemic stroke is the most common (69%) and is caused by a clot which narrows or blocks the blood vessels preventing blood from reaching all areas of the brain (Wolfe et al 2002). Damage is caused to the brain cells as a result of this deprivation**.** Haemorrhagic stroke occurs when a blood vessel ruptures and bleeds into the brain. Haemorrhagic strokes account for 31% of strokes, of which, 13% are due to primary haemorrhage, 6% to subarachnoid haemorrhage (SAH), and 12% are of uncertain type (Wolfe et al 2002).

About half of those with SAH die in the first few hours and the overall survival rate is approximately 40%, half of whom will have residual disability and most of whom will experience long-term symptoms, especially fatigue and cognitive impairment (Van Gijn and Rinkel 2001).

1.4 TRANSIENT ISCHAEMIC ATTACK (TIA)

Transient ischaemic attack (TIA) is traditionally defined as an acute loss of focal cerebral or ocular function with symptoms lasting less than 24 hours. TIA is thought to be due to inadequate cerebral or ocular blood supply as a result of low blood flow, thrombosis, or embolism associated with diseases of the blood vessels, heart, or blood (Hankey and Warlow 1994). TIAs have similar symptoms to those of a stroke but differ in that all symptoms resolve within 24 hours.

The risk of recurrent stroke during the first few days after a TIA or minor stroke is much higher than was previously estimated (Rothwell et al 2006). Within two days of a TIA the risk of stroke is 3.1% and within seven days

of TIA the risk of stroke rises to 5.2% (Giles & Rothwell 2007). Recently, several published studies have supported the notion that TIA needs to be treated as a medical emergency (Goldstein & Rothwell 2008), as rapid assessment and treatment of TIA and minor stroke can prevent up to 80% of recurrent events (Pendlebury & Rothwell 2008). TIAs affect 35 people per 100,000 of the population each year and are associated with a very high risk of stroke in the first month of the event and up to one year afterwards (Rothwell et al 2007).

The recommendation in the National Clinical Guidelines for Stroke (Intercollegiate Stroke Working Party 2008) for people who have had a suspected TIA and are considered to be at high risk of stroke, is that they should commence immediately on 300mg of daily aspirin; undergo specialist assessment and investigation within 24 hours of onset of symptoms; and have measures for secondary prevention introduced as soon as the diagnosis has been confirmed. Approximately 15-20% of stroke patients have a preceding transient ischaemic attack (Rothwell & Warlow 2005).

1.5 RISK FACTORS FOR STROKE

The major known risk factor for haemorrhagic stroke is hypertension (raised blood pressure) (Khaw 2000). Normalisation of hypertension can reduce the risk of stroke by at least 40% (Ringelstein & Nabavi 2000). Cardiovascular disorders are a significant cause of ischaemic strokes, particularly atrial fibrillation (AF) (Ringelstein & Nabavi 2000; Rothwell et al 2004), which is associated with a 5-fold increase in stroke risk (Wolf et al 1991). According to the National Clinical Guidelines for Stroke (Intercollegiate Stroke Working Party 2008), 25% of strokes are in patients

with AF. Acute thrombosis has been found to be central to the pathogenesis of ischemic stroke (Wilhelmsen et al 1984). Prior stroke or TIA, increasing age, a history of hypertension, and diabetes mellitus are the strongest, most consistent independent predictors of stroke' (Goldstein & Rothwell 2008). 'Moderate alcohol intake, normalization of body weight and regular physical activity can all contribute considerably to prevention of stroke' (Ringelstein & Nabavi 2000).

1.6 INCIDENCE AND PREVALENCE OF STROKE

Stroke presents a major world-wide health challenge and is known to be the third most common cause of death in the United Kingdom (Wolfe 2000), with 5.5 million people dying from stroke each year (WHO 2003). Statistics from the Department of Health (2005) demonstrate the impact of stroke in England, with a reported 110,000 people having a stroke each year. This equates to between 176 and 216 people per 100,000 of the population in the UK (Mant et al 2004) with 10-20% of strokes being fatal (Rothwell 2005). Twenty-five per cent of strokes occur in those aged under 65 years (Department of Health 2005).

However, in recent years, improved risk factor management has attributed to a decline in stroke incidence and subsequent mortality (Rothwell et al 2004). The risk of recurrent stroke within five years of first stroke is between 30% and 43% (Mant et al 2004). It is therefore important for patients to commence preventative treatment following initial stroke to minimise the risk of recurrent events.

1.7 THE ECONOMIC IMPACT OF STROKE

Rothwell (2005) suggests that the main burden of stroke is survival with disability, dementia, depression, epilepsy, falls, and other such complications. Stroke can have a devastating impact on the lives of individuals and their families, and is the single largest cause of adult disability (Department of Health 2005). Stroke has a marked impact on an individual's ability to return to work (Radford & Walker 2008). This lack of re-employment of stroke survivors results in an estimated £689 million each year being consumed in benefits (Omer Saka et al 2005). Besides the significant impact of stroke on the individual and their family, stroke also places a significant burden on the NHS and the economy. The cost of stroke is estimated to be between 2% and 4% of all health care expenditure (Evers et al 2004; Omer Saka et al 2005). Over £2.8 billion is spent by the NHS on stroke care every year (Department of Health 2008a). Omer Saka et al (2005) have estimated the combined healthcare and lost productivity costs of stroke survivors to be in excess of £7 billion per year in the UK. Rehabilitation is therefore not only important at an individual level but also in terms of reducing the economic burden that stroke places on health and social care services.

1.8 STROKE CARE - REHABILITATION AND RECOVERY

Stroke care has changed over the last decade to involve more of a collaborative effort with treatment being provided by a multidisciplinary team consisting of doctors, nurses, therapists and social services (Intercollegiate Stroke Working Party 2004). Stroke medicine is now a recognised speciality and the Department of Health has advised that every hospital should have a dedicated stroke unit. There is robust evidence to

show that stroke patients benefit from access to a specialist stroke service (Stroke Unit Trialists Collaboration 2004; Langhorne et al 2004; Shepperd & Iliffe 2004; Outpatient Service Trialists 2004; Logan et al 1997; and Walker et al 1999) as opposed to general medical care. The Stroke Unit Trialists Collaboration (2007) state that acute stroke patients are more likely to survive, return home and regain independence if they receive organised inpatient (stroke unit) care. This is typically provided by a co-ordinated multidisciplinary team operating within a discrete stroke ward, which can offer a substantial period of rehabilitation if required.

Bogousslavsky commented in Cappa et al (2008) that "it is striking how little stroke specialists still know about cognition and behaviour, while neuropsychologists commonly have only a vague understanding of the pathophysiology and mechanisms of stroke". This comment illustrates the importance of stroke units in unifying expertise in the area of stroke management and rehabilitation. Organised stroke unit care involves providing inpatient care by a multidisciplinary team who specialise in looking after stroke patients and work together as a co-ordinated team (Stroke Unit Trialists Collaboration 2007).

Published research data on the pattern of stroke recovery suggests that most recovery of functional abilities is expected to occur within the first six months (Tilling et al 2001). Recovery may continue for some time afterward but the rate of improvement is likely to slow down significantly over time (Wade & Langton-Hewer 1987). Due to the potential for individuals to improve over time, there is currently a focus on providing long term care and community rehabilitation services.

At an individual level, the ability to learn is central to rehabilitation and his or her ultimate performance outcome (Zoltan 2007). Rehabilitation is largely a learning process (US Department of Health and Human Services 1995), as the person re-learns lost skills or adapts to compensate for certain impairments. Factors such as medication, mood, anxiety, and stress can also affect an individual's learning potential (Fuhrer & Keith 1998). Also important in the recovery and rehabilitation of the stroke patient are the multiple factors involved, such as the physical, cognitive, and psychological functions that are all intertwined and interrelated. Motivation and ability are both considered important attributes of learning readiness for rehabilitation (Vanetzian 1997).

CHAPTER 2

THE IMPACT OF STROKE ON FUNCTION AND ACTIVITY

2.1 CHAPTER OVERVIEW

This chapter will build on the previous introductory chapter on stroke by providing an explanation of the functional impairments that can result from stroke. These impairments can lead to disability and an inability or difficulty in performing everyday activities of daily living such as dressing. As the brain is the body's control centre, when its structure is damaged as a result of stroke it can result in impairment to any of the body's functions. This chapter will begin by introducing the International Classification of Function, Disability and Health (ICF) and will go on to describe the physical impairments resulting from stroke and will go on to explain the various cognitive, communication and psychological components that may be affected. The chapter will then progress by describing how these impairments can impact on the ability to perform activities of daily living and the outcome measures that are commonly used to assess independence in such activities.

2.2 THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH (ICF)

It is important to have an understanding of function and disability after stroke in order to select the most appropriate rehabilitation assessments and interventions (Weimer et al 2002). The World Health Organisation (WHO) (2001), through international collaboration, developed 'The International Classification of Functioning, Disability and Health (ICF) as a

system of classifying health and health related aspects of human life. Whilst the ICF does not guide clinicians in how best to treat patients it does provide an international unified language for the definition and classification of all aspects of health. The ICF provides the most recent and comprehensive model of functioning and disability (Stucki et al 2007) and offers an international common language of concepts, definitions and terms for examining and describing an individual's ability to function, their disability and their health (Moriello et al 2008). This common language should aid communication between professionals, agencies, service users and the public and help eliminate disparity. The terminology and themes contained in the ICF can be used in stroke care and rehabilitation to analyze and subsequently describe the impact of an individual's stroke.

This chapter has provided an overview of stroke. The focus of this thesis is on the recovery of dressing ability following stroke. Dressing ability is dependent upon numerous factors including physical and cognitive functions, all of which can be affected by stroke. Impairment of these functions can, without effective rehabilitation, result in dressing disability in the individual. The following chapter will examine the impact of stroke on function and activity by exploring the impairments that a stroke may cause in an individual.

2.3 PHYSICAL IMPAIRMENT RESULTING FROM STROKE

Stroke can affect all bodily functions, however, motor deficit is the most common impairment resulting from stroke (Warlow et al 1996), presenting in 88% of patients (Bonita & Beaglehole 1988). Perhaps the most easily recognisable symptom of stroke is the physical weakness (impaired motor control) to one side of the body (hemiparesis) that affects 89% of patients

(Bonita & Beaglehole 1988). Hemiparesis may involve the upper limb (arm and hand), the lower limb (leg, ankle and foot), the face, or a combination of all of these.

A systematic review by Hendricks et al (2002) of the literature available on motor recovery after stroke provided evidence to suggest that approximately 65% of hospitalised stroke survivors with initial lower limb motor deficits demonstrated some degree of motor recovery. Approximately 50-80% of patients regain walking ability within a year following stroke (Skilbeck et al 1983). At three weeks post stroke, 40% of people are unable to walk independently (Wade & Langton-Hewer 1987) and at three months post stroke 20% of patients remain wheelchair dependent (Jorgensen et al 1995a). Those who regain unrestricted walking ability account for only 18% of stroke patients (Lord et al 2004). In those with initial paralysis, less than 15% of patients make a complete motor recovery (Hendricks et al 2002).

The initial severity of paresis is the most important predictor of subsequent motor recovery (Kwakkel et al 1996). Approximately 70% of stroke patients will experience altered arm function, and 40% are left with a non-functional arm accompanied by pain and spasticity (Hirako 2001; Winstein et al 2004; Wolf et al 2006; Stewart et al 2006).

Problems affecting the upper limb post stroke are both persistent and disabling (Coupar et al 2007). However, prospective epidemiological studies are lacking, and findings of longitudinal studies report varying percentages of hemiparetic arm recovery six months post stroke (Kwakkel et al 2003). Heller et al (1987) report that the paretic arm remains without function in 30% of hemiplegic stroke patients, compared with 52%

as reported by Olsen (1990), and 66% as reported in studies by Wade et al (1983) and Sunderland et al (1989). Severe paralysis is associated with poor outcome (Kwakkel et al 1996), with the optimal prediction of outcome being possible at 4-5 weeks post stroke (Heller et al 1987; Wade et al 1983; Sunderland et al 1989 & Duncan et al 1992). If at this time a measureable grip function is not present, this would likely indicate a poor functional recovery of the arm (Heller et al 1987; Wade et al 1983 & Sunderland et al 1989). This information is of clinical importance to therapists when assessing patients' upper limb weakness and planning treatment to restore functional ability in carrying out daily living activities such as dressing. For example, if an individual has a dense upper limb weakness with no movement present, the therapist may choose to focus interventions on adaptive or compensatory approaches using the non affected limb to compensate for the loss of function in the affected side. However, if an individual shows signs of active movement in the affected limb with reduced strength but some degree of motor control present, the therapist may focus treatment on restoring function in the affected limb through a "neurodevelopmental"[1] or "motor relearning"[2] approach.

Improving upper limb function after stroke is often a core element of rehabilitation in order to maximise patient outcomes and reduce disability (Langhorne & Legg 2003). A systematic review by Langhorne et al (2009) demonstrated that constraint induced movement therapy, electromyographic biofeedback, mental practice with motor imagery, and robotics could all potentially be used to improve arm function.

[1] The neurodevelopmental approach is based on principles of motor control, neuromuscular facilitation and sensory integration and has a strong developmental base (Hagedorn 1997).
[2] The motor relearning approach involves goal oriented, active repetitive movement training of a paretic limb to promote the recovery of previously learned motor skills (Chae and Sheffler 2009).

Although there have been numerous studies on the efficacy of treatments for motor recovery, they have tended to be small scale with methodological limitations, rendering it difficult for professionals to draw firm conclusions on the benefits of such therapies in clinical practice (Kalra 2010).

Other physical impairments resulting from stroke include altered sensation, which is likely to be present in at least 60% of people (Carey 1995), and loss of static or dynamic balance and trunk control. All of which may affect the individual's ability to carry out daily living tasks and pose a potential risk of injury or accident. Indeed, any of the body's muscles and reflexes can be affected by stroke, causing problems with swallowing (dysphagia), speech (dysarthria), eye movements (ocular motor control) and continence.

2.4 COGNITIVE IMPAIRMENT RESULTING FROM STROKE

The brain performs an array of high level functions, all of which can be damaged as a result of stroke. Cognition is the collective term for all the mental processes in the brain concerned with the acquisition and use of knowledge (Grieve & Gnanasekaran 2008). Cognition refers to the mental functions of attention; memory; higher executive functions such as planning, prioritising, and problem solving; perception; and praxis (Malia & Brannagan 1997). Cognitive decline occurs in approximately 30% of stroke patients (del Ser et al 2005).

The assessment and subsequent treatment of cognitive impairments is complex and involves the use of both functional tasks and standardised assessments. It is important to assess for cognitive impairment as problems such as decreased attention and memory will cause an individual

difficulty in learning and following directions during rehabilitation interventions (Kong, Chua & Tow 1998).

2.5 ATTENTION

Attention can be divided into five subtypes: focused, sustained, selective, alternating, and divided. Although people may commonly think of attention as seeing and perceiving, it is far more than that; acting early on in cognitive processing, attention selects the important features in the environment whilst ignoring all the others (Grieve & Gnanasekaran 2008). Attention is the brain's ability to select from moment to moment what to listen to and what to look at. Attention processing can be viewed as a hierarchy, with the basic level being arousal, our state of readiness for action. The ability to focus attention on a task or activity is a basic form of attention. Sustained attention refers to the ability to focus on a particular task such as dressing for a prolonged period of time. The next level is selective attention, whereby the individual is able to attend to one task of high priority whilst not being distracted by background noise or activity. For example getting dressed in a ward environment and focusing on the stages involved in dressing whilst being able to ignore background noise from patients, staff or the ward radio from elsewhere on the ward. Selective attention is also important in the visual world when searching for information relevant to a particular task. For example when dressing, the individual may need to search for a particular colour garment in a wardrobe. Alternating attention is the brain's ability to shift the focus of attention in line with the task in hand and the features of the environment (Grieve & Gnanasekaran 2008). The highest level of attention is divided attention. This form of attention allows individuals to do two or more things at once. The term 'multi-tasking' is often used in everyday living

and is made possible by dividing attention between two or more activities that are competing, for example getting dressed whilst also listening to the radio.

Deficits in attention affect all other cognitive functions. Without attention, perception is impaired, as is our memory, decision making ability, and ability to problem solve (Grieve & Gnanasekaran 2008).

2.6 MEMORY

In general terms memory is the ability to keep things in mind and then to recall them at a future time. There are different aspects of memory and an individual may have deficits in some functions of memory whilst other aspects remain intact. Memory is a system that organizes and stores vast amounts of information of different types. Some impairment of memory is likely to occur in most stroke patients however global amnesia is very rare (Grieve & Gnanasekaran 2008).

Short-term memory has a limited capacity and retains information over a period of seconds or minutes. It is short-term memory that allows an individual to recall a telephone number when dialling the number very soon after being verbally given the series of numbers. Working memory deals with two sources of information; that from sensory memory and that from long-term memory. Working memory acts like a workbench, where verbal, visual and spatial information of both new and old memories are manipulated and integrated over a short period of time before passing on to long-term memory and to other cognitive systems (Grieve & Gnanasekaran 2008). Long-term memory, unlike short-term memory, has unlimited capacity and is able to process a large variety of information

which is constantly being updated. Procedural memory is the stored knowledge related to the acquisition of learned skilled activity, such as the ability to perform the habitual daily activities of dressing and undressing. All the learnt motor and language skills that have been developed through repetition and practice are part of this implicit procedural memory. Stored memories of procedures evolve into routines that are retrieved automatically in response to specific stimuli. Most people with memory loss will retain their procedural memory (Grieve and Gnanasekaran 2008). Semantic memory relates to knowledge of the world, without reference to how or when information was learnt. Semantic memories are organised by concept and associations into a complex knowledge base and are retrieved without context (Grieve & Gnanasekaren 2008). Prospective memory forms a large part of everyday memory and is concerned with remembering what to do and when to do it. This type of memory is what enables stored plans for action to be activated at the appropriate time. Prospective memory therefore requires the ability to monitor time and to keep track of ongoing activities. Compensatory strategies such as diaries, calendars, alarm clocks, and electronic organizers can all help prompt prospective memory.

Visual memory is more likely to be impaired in right hemisphere brain damaged people (Grieve & Gnanasekaran 2008). The visual-spatial sketchpad acts as a temporary store of both visual and spatial information from the eyes to the brain. This is sometimes referred to as the 'inner eye', as it is the component of memory that holds information that cannot be rehearsed verbally, and is used to inspect and manipulate visual images entering the working memory from long-term memory. Visual memory may for example enable a person to remember where they placed their slippers. Verbal memory is more likely to be impaired in left hemisphere

brain damage. Verbal memory refers to the memory of words and verbal information.

Memory impairment can lead to loss of identity and independence, and can make social interaction with friends and family difficult. It can affect an individual's ability to carry out daily activities such as being able to remember the stages involved in getting dressed, the order in which items are put on, and the movements required to don the items.

2.7 HIGHER EXECUTIVE FUNCTIONS

Executive functions are crucial to everyday success (Zoltan 2007). They are the high-level abilities that influence more basic abilities such as attention, memory and motor skills. Executive functions are necessary for goal-directed behaviour and include the ability to initiate actions, monitor and change behaviour appropriately, plan and prioritise tasks, anticipate outcomes, and adapt to change and challenging situations. Impairment of executive functions may compromise an individual's ability to participate fully in society (Baum et al 2009). In terms of dressing, executive functions such as planning and problem solving are required when attempting to dress with a hemiparesis of the upper limb. Rather than relying on procedural memory, the individual needs to adapt to a new method of upper body dressing in order to compensate for the lack of function in the affected arm and the loss of bilateral movement.

2.8 PERCEPTION

The word perception comes from the Latin word percepio, meaning 'receiving, collecting, and action of taking possession or apprehension with

the mind or senses' (Oxford English Dictionary online 2008). Perception can be defined as 'the process by which information about the world, as received by the senses, is analysed and made meaningful' (Oxford Medical Dictionary 2007), in other words, 'making sense of the senses' (Grieve & Gnanasekaran 2008). Sensory information is received through the five senses of sight, touch, hearing, smell, and taste.

Siev and Freishtat (1976) describe the main perceptual deficit areas as being body image and body scheme; spatial relations; and agnosia. Individuals with a body image deficit will lack a visual and mental image of their body. Body scheme deficits cause the individual difficulty in perceiving the position of the body and its parts. This in turn causes difficulty with activities such as dressing. Body scheme disorders include somatognosia (lack of awareness of the body structure); anosognosia (lack of recognition of paralysis or its severity); unilateral neglect (neglect of one side of the body or the environment); and right/left discrimination deficit (difficulty understanding the difference between left and right).

An intact body scheme is important as it allows the individual to know and understand their body's orientation in space, which is crucial for them to be able to interact with the environment (Zoltan 2007). A patient with unilateral body neglect (sometimes referred to as unilateral inattention) will ignore one half of their body causing problems such as forgetting to dress one side of their body.

Problems with visual perceptual skills have been shown to have a negative impact on an individual's ability to perform activities of daily living (Cockburn et al 1990 & Edmans et al 1991). The individual may have unilateral body neglect and unilateral spatial neglect. Unilateral spatial

neglect (USN) has an estimated prevalence of 40% or greater (Paolucci et al 2001). It is characterised by an inability or difficulty in attending or responding to stimuli appearing on the side contra-lateral to the brain lesion (Bowen & Lincoln 2007; Menon-Nair et al 2007) despite the presence of a specific sensory deficit (Zoltan 2007). Visual inattention is most often associated with and more severe in right hemisphere lesions (Zoltan 2007) and can be apparent in varying forms and severity (Robertson 1998). As USN is a condition which reduces a person's ability to look, listen or make movements in one half of their environment, it can affect their ability to carry out many everyday tasks such as dressing (Bowen & Lincoln 2007). In dressing, the individual may have difficulty finding garments that are located to their neglectful side. The rate of recovery from neglect is reported to be greatest within the first month after stroke (Cassidy et al 1998). Specific interventions used to treat symptoms of USN include visual scanning training, video feedback training, and prism therapy (Luaute et al 2006), yet a study by Menon-Nair et al (2007) found that less than one quarter of clinicians provided scanning training, and even fewer clinicians provided other treatments for USN.

Spatial relations deficits include a number of impairments relating to the inability to perceive the position of two or more objects in relation to each other or oneself. These impairments include figure-ground deficit (difficulty in distinguishing an object from its background); form constancy deficit (difficulty differentiating between objects that have subtle variations in form, e.g. a drinking glass and a flower vase); position in space deficit (difficulty understanding the differences between in/out, under/over, in front/behind); topographical disorientation (difficulty finding one's way somewhere); and depth and distance deficit (inability to judge depth or distance) (Edmans et al 2005).

Agnosia is the inability to recognise familiar objects perceived by the senses. Again, this deficit can be broken down into various forms: visual, tactile, proprioceptive, auditory, and body scheme (Edmans et al 2005). For example, visual object agnosia is the difficulty in recognising objects, whereas visual spatial agnosia is the inability to perceive spatial relationships between objects (Edmans et al 2005). Astereognosis is the difficulty in recognising objects through touch, even though sensory function may be intact. Data is lacking on the prevalence of such deficits amongst stroke survivors.

2.9 APRAXIA

Apraxia is a cognitive disorder that can occur after stroke and prevents individuals from being able to execute learned skilled movement (Buxbaum 2001; West et al 2008). Individuals with apraxia are unable to undertake voluntary complex movements in the presence of normal motor and sensory functioning (Wade 1992). The cause is not due to muscle weakness or sensory loss but due to a disturbance of the conceptual ability to organise actions to achieve a goal (West et al 2008). People with apraxia often have difficulty in performing activities of daily living. In dressing the difficulty may be in selecting the correct item of clothing at the right time or the individual may have difficulty in using the item of clothing correctly and may struggle and present as being "clumsy" with fastenings.

There are two forms of apraxia: ideational apraxia, and ideomotor apraxia. Patients with ideational apraxia show loss of action concepts by making inappropriate movements (content errors), whereas ideomotor apraxics will show movements that are appropriate but spatially or temporally

inaccurate (accuracy errors) (Hanna-Pladdy et al 2003). Impairment in imitation or pantomime is the defining feature of ideomotor apraxia (Sunderland & Shinner 2007). Patients with ideomotor apraxia do not appear significantly impaired when handling real objects or when attempting naturalistic action (Sunderland & Shinner 2007). According to West et al (2008), the reported prevalence of motor apraxia after stroke is inconsistent. However, there is evidence to suggest it affects both left and right sided strokes, whilst being most prevalent in left brain damage (Rothi & Heilman 1997). In many cases (75%), patients with ideational apraxia will also have ideomotor apraxia evident (De Renzi & Lucchelli 1988). Various interventions are used to treat apraxia, yet there is a lack of evidence to prove their benefit (West et al 2008).

2.10 COMMUNICATION IMPAIRMENT FOLLOWING STROKE

Communication is a complex skill that can be divided into two separate processes: comprehension (getting the message in); and expression (getting the message out). Stroke causes communication disability (impaired language comprehension and expressive abilities) known as aphasia, in approximately one third of patients (Enderby 2000, Townend et al 2007). However, the characteristics of communication difficulties vary between individuals. Aphasia is apparent in the first week after stroke in approximately one quarter of stroke survivors, with spontaneous recovery occurring over the first month in half of those affected (Greener et al 1999). About 12% of stroke survivors are still aphasic at six months (Wade et al 1986).

Aphasia occurs when the communication centres of the brain are damaged (Swinburn et al 2007). It is usually caused by damage to the left

hemisphere of the brain 'within the distribution of the middle cerebral artery, surrounding the sylvian fissure on the lateral surface of the hemisphere and incorporating portions of the frontal, parietal, and temporal lobes' (Cherney and Small 2009). However, arguments are still ongoing about the cortical location of components which contribute to communication and language, and the actual mechanisms disrupted by a stroke (Goldberg 1990). Therefore any patient with left hemisphere cerebral damage should be screened for aphasia (Intercollegiate Stroke Working Party 2008).

Aphasia is an acquired impairment of the cognitive system for comprehending and formulating language but does not affect intelligence (Davis 1993). It is an impairment of language skills, causing problems in verbal expression, auditory comprehension, reading, writing and numerical skills (Dalemans et al 2008; Townend et al 2007). The severity of aphasia varies from person to person with some sufferers being unable to speak at all, some being unable to understand others, and some no longer able to read, write, or use numbers (Swinburn et al 2007). The greatest degree of spontaneous recovery from aphasia appears to occur within the first three months post-stroke (Demeurisse et al 1980; Laska et al 2001; Berthier 2005; Lazar et al 2007), however recovery can continue for many years (Mohr et al 1973; Heiss et al 2003). It is difficult to predict the extent of recovery from aphasia in the early stages after stroke (Lazar et al 2007). However the factors thought to determine recovery include the initial syndrome severity and size of lesion (Lendrem et al 1985; Lazar et al 2007).

2.11 IMPAIRMENT OF MOOD RESULTING FROM STROKE

It is common for patients who have had a stroke to experience feelings of depression, anxiety, frustration, anger and despair (Hackett et al 2004). Mood disturbance, emotionalism and depression may be a result of disruption to the electrical activity of the brain which generates and controls emotions and thoughts, or depression could result from a patient having to cope with an underlying problem such as chronic pain. Mood disorders occur in at least 25% of stroke patients during the first year post stroke (Burvill et al 1995a; Burvill et al 1995b; Johnson 1991). The severity of mood disturbance is associated with severity of cognitive and motor impairment and with the severity of activity limitation (Watkins et al 2007).

According to The Stroke Association (2008), depression is one of the most common problems after stroke with an estimated prevalence of 25% to 79% (Kneebone and Dunmore 2000). It commonly occurs when the initial recovery has slowed down and the patient realises how their future will be affected. However, controversy exists over whether the cause of post stroke depression is predominantly physical (e.g. due to lesion location) or caused by the patients' psychological response to their stroke (Carson et al 2000).

Depression after stroke can last for a few months with the patient recovering spontaneously. However up to one third of patients continue to suffer more severely for a year or longer (Astrom 1996). Although post stroke depression is common it often remits as the patient's recovery progresses (Hacket et al 2005). However, the negative thinking and loss of motivation associated with depression can have detrimental effects on

rehabilitation potential. Whilst milder depressed mood is more likely to resolve over time (Thomas & Lincoln 2006), depression in stroke survivors has been found to have an independent negative effect on the long-term recovery of physical and cognitive functions (Morris et al 1992). Astrom (1996) found that those patients with more severe symptoms at presentation were less responsive to treatment and showed a worse long-term prognosis.

2.12 THE IMPACT OF STROKE ON ACTIVITIES OF DAILY LIVING (ADL)

Motor, sensory, cognitive, communication and mood components can all be affected by stroke (Mayo et al 1999), and deficits in these areas can profoundly affect an individual's occupational performance in activities of daily living (ADL) (Legg et al 2006). Activities of daily living include all activities that a person normally chooses to engage in and can be considered to fall into the categories of self care, productivity and leisure.

Self care activities are often referred to as personal activities of daily living (PADLs). These PADLs include all activities that are necessary for survival and maintaining personal care. In the area of self care, the stroke patient will commonly experience some difficulty in the routine and habitual tasks of eating, dressing, grooming, and toileting. All of which are fundamental to a person's sense of dignity and independence.

In terms of productivity, many problems depend on whether the left or right side is affected (Reed 2001) but the patient could potentially have difficulty in managing work related tasks and domestic activities necessary for maintaining the home such as managing the laundry, cleaning and meal

preparation. These productive activities come under the term instrumental or extended activities of daily living (IADL or EADL).

Leisure activities include all the things that individuals choose to participate in during their free time. Recreational pursuits such as swimming or playing golf, together with hobbies such as painting, reading or watching television can all become difficult when motor or sensory problems, cognitive deficits, altered mood or reduced motivation are experienced. These activities are sometimes referred to as discretionary activities (Legg et al 2006).

Stroke is the most common cause of dependency in ADLs among the elderly population (Stineman et al 1997). Dennis and Warlow (1987) estimated that a third of stroke survivors will remain dependent on others for care and assistance in ADLs.

Outcomes of rehabilitation, particularly occupational therapy intervention, are commonly measured in terms of the patient's independence in ADLs. Wade (1992) states that 'while it is true that achieving independence in basic ADLs, such as dressing and mobility, is not equivalent to complete success in rehabilitation, without this independence further progress is difficult'. For this reason rehabilitation goals tend to focus on increasing functional mobility and increasing ability and independence in self care activities (Tyson & Turner 2000).

Since humans are largely occupational beings, spending the majority of daily life engaged in various activities, it is considered important to enable patients to be as independent as possible in ADLs. In terms of an individual's comfort, safety and dignity, performance of certain PADLs will

be required for discharge home without carers. For example, if following stroke a person can no longer manage independent toileting, transfers, feeding, washing and dressing, then a package of care will need to be arranged for the person to be able to manage outside of the supportive hospital environment. Whilst some patients may be content with being discharged to a care home environment, the majority of people wish to return to their own homes and to have as much of their former life restored as possible. For this reason, much of the focus of stroke rehabilitation is on promoting and restoring independence in ADLs.

The focus of this Master of Philosophy Research programme and subsequent thesis chapters will be on the self care ADL of dressing.

2.13 OUTCOME MEASURES OF INDEPENDENCE IN ACTIVITIES OF DAILY LIVING (ADL) FOLLOWING STROKE

The most frequent measure of recovery is the degree of functional independence the individual has achieved in activities of daily living (ADLs) (Reed 2001). In measuring occupational performance in ADLs a rating of 'independent' means that the individual can perform a task without any assistance from another person. Patients are permitted to use assistive equipment so a score of 'dependent' implies that the person is unable to perform the task or activity without the assistance of another person.

The multidisciplinary team will use profession specific outcome measures individually, but also collectively as a team they may use rating scales and outcome measures such as the Barthel Index (BI) (Mahoney and Barthel 1965; Wade and Collin 1988), the Modified Rankin Scale (mRS) (Farrell et al 1991) or the Functional Independence Measure (FIM) (Linacre et al

1994). Indeed, several assessments have been developed for the assessment of functioning and disability but in clinical trials the most widely used are the BI and the mRS (Sulter et al 1999; Roberts & Counsell 1998).

The BI and the mRS are commonly used scales that measure the patient's disability or dependency in activities of daily living (Sulter et al 1999). Basic self-care ADL status can be measured on the Modified Barthel ADL Index (BI), an instrument which can be used to measure the individual's performance in ten activities including personal hygiene, bathing, feeding, toileting, bladder and bowel control, dressing, ambulation/wheelchair management, stair climbing and chair/bed transfers (Wade and Collin 1988). Each item is weighted to give a score of the individual's level of independence in basic ADLs. However, the BI is a global measure that gives a general overview of ability in basic ADLs, it does not enable specific detailed analysis of the reasons for lack of independence in any of the ten ADLs listed. 'Comprehensive assessment of acute impairments and disability after stroke is the starting point for providing good quality care appropriate to a patient's requirements' (Lawrence et al 2001). Wood-Dauphinee et al (1990) used the coefficient of variation (SD/Mean) to show that the BI was the most sensitive measure for assessing morbidity after stroke.

Clinicians need to be sure of the reliability and validity of the assessment instruments used in clinical practice, in order to be confident in the results obtained. Outcome measures aim to accurately capture the amount of change in an individual resulting from recovery and rehabilitation. They chart an individual's progress to ascertain whether treatments have been successful and improvements gained. They therefore need to be sensitive

enough to detect change. Outcome measures of functional ability are often used as part of the goal setting process in rehabilitation and in the evaluation of a patient's recovery.

CHAPTER 3

OCCUPATIONAL THERAPY AND STROKE REHABILITATION

3.1 CHAPTER OVERVIEW

The previous chapter explained the many functions of the human mind and body that may be affected as a result of stroke. The impact on an individual's ability to perform daily living activities was also explored. This chapter will introduce the role of the occupational therapist in the rehabilitation of stroke survivors. This will lead into the subchapter on dressing assessment and practice and concludes the introductory chapters of this thesis.

3.2 THE ROLE OF THE OCCUPATIONAL THERAPIST IN STROKE REHABILITATION

The World Federation of Occupational Therapists (2004) defines occupational therapy as:

'a profession concerned with promoting health and well being through occupation. The primary goal of occupational therapy is to enable people to participate in the activities of everyday life. Occupational therapists achieve this outcome by enabling people to do things that will enhance their ability to participate or by modifying their environment to better support participation.'

In general terms, the occupational therapist is concerned with an individual's ability to develop or maintain performance in "occupations" or

ADLs. The intervention provided by the occupational therapist is considered to be an essential element in the rehabilitation of the stroke patient (Langhorne & Pollock 2002). Occupational therapy practice includes 'skilled observation; the use of standardised and non-standardised assessments of the biological, psychiatric, social, and environmental determinants of health; clarification of the problem; and formulation of individualised problem solving interventions' (Legg et al 2007).

The occupational therapist's role in stroke rehabilitation includes the assessment of the stroke survivor's previous and present performance in the areas of self-care, productivity and leisure; contact with the family and carers; the negotiation of agreed time-related goals of occupational therapy for each individual patient; the documentation of an intervention plan appropriate to the patient's individual goals; and involvement in multidisciplinary teamwork such as ward rounds, case conferences and discharge planning (Intercollegiate Stroke Working Party 2008). The distinct focus of occupational therapy is on everyday functional performance and participation (Baum et al 2009). Much of occupational therapy assessment involves direct observation of the individual.

Functional assessment is required in order to assess the individual's level of independence in ADLs. Much of this will be through the use of observation and activity analysis. Direct observation of naturalistic tasks is commonly used to discover how the individual is affected by cognitive impairment (Sunderland et al 2006). The comprehensive assessment carried out in the early stages will inform occupational therapy intervention and act as a baseline for treatment. Continual assessment will indicate the individual's areas of improvement as well as the areas of specific difficulty on which further intervention might focus.

In the acute stages of stroke rehabilitation there is a role for occupational therapists to play in preventing deformity, reducing spasticity and promoting normal movement, maximizing independence in self care activities such as turning in bed, sitting up, transferring, toileting, eating and drinking, washing and dressing. Later in the rehabilitation process, the treatment can progress to focus on maximizing independence in the home ready for discharge. This will include the domestic activities that are a priority for the individual such as meal preparation, shopping, laundry and cleaning. Recommendations will be given for any alterations or adaptations required to the home and any equipment that may be needed to enable the safe and independent performance of activities within the home environment.

There are a variety of treatment approaches available to the occupational therapist working with stroke patients. These include neurodevelopmental and normal movement approaches such as the 'Bobath' approach (Bobath 1990) which aim to facilitate normal movement whilst inhibiting abnormal movement patterns and muscle tone; the 'functional' or 'compensatory' approach which aims to improve patients' independence in ADLs through the use of aids and equipment and incorporation of the unaffected limb in activities; movement science approaches such as the motor relearning program (Carr and Shephard 1987) and the cognitive approach. The therapist's knowledge, skills, experience, clinical reasoning and rehabilitation unit policy will determine which approaches are adopted in the treatment of specific problems. Although there is potential for occupational therapy to include a diverse range of treatment approaches and interventions, what should happen in theory is not always what happens in practice.

De Wit et al (2006) published a study that was part of the Collaborative Evaluation of Rehabilitation in Stroke across Europe (CERISE). This study involved four stroke units from Hospitals in Leuven, Belgium; Nottingham, United Kingdom; Zurzach, Switzerland; and Herzogenaurach, Germany. The aim was to examine what the key components of occupational therapy and physiotherapy were in stroke rehabilitation. In the occupational therapy sessions, exercises and balance in sitting, ADL and ambulatory exercises were the most practiced categories. Sensory perceptual training and cognition and domestic activities were found to be typical occupational therapy activities. Physiotherapists focused more on mobility activities whereas the occupational therapists focused on ADL and domestic training. There were few significant differences between the centres. A further CERISE study by Putman et al (2006), sought to compare the time allocated to therapeutic activities and non-therapeutic activities of physiotherapists and occupational therapists in stroke rehabilitation units in four European countries. The average proportion of therapeutic activity per day ranged between 32.9% and 66.1% and was higher for physiotherapists than for occupational therapists in each unit (Putman et al 2006). There was a significant difference in the time occupational therapists allocated to therapeutic activity compared to non therapeutic activity such as administration and attendance at meetings. Of the four European countries, the British occupational therapists were found to spend significantly less time on therapeutic activities. Specifically, 67.1% of the British occupational therapists time was spent in non-therapeutic activities. Although neuropsychological training was significantly more likely to be organized by occupational therapists than physiotherapists, when the four individual European stroke rehabilitation units were compared, neuropsychological training and other training was significantly less likely to be given in the British stoke unit. The British occupational therapists

were observed to spend much more time on ward rounds compared to the other centres. Additionally, the occupational therapists in the British stroke unit appeared to place far greater importance on spending time on administration than compared to the other centres. It is disappointing to note that despite the fact that the British stroke rehabilitation unit had higher staffing levels, patients spent significantly less time in therapy sessions. This is especially disappointing in light of the available evidence documented in the National Stroke Strategy that rehabilitation after stroke is effective, should start early after stroke and be provided with sufficient intensity (Department of Health 2007). Indeed, the third edition of the National Clinical Guidelines for Stroke (Intercollegiate Stroke Working Party 2008) reiterates that patients should receive a minimum of 45 minutes daily of each therapy that is required.

If the reality is that occupational therapists are limited in their time available to engage in therapeutic activities, it is imperative that the adopted therapeutic approaches and chosen interventions are evidence based. A research culture has not always existed in the occupational therapy profession (Walker et al 2004). Therefore the available evidence is relatively sparse. However, in recent years, some important advances have been made in the evidence base for occupational therapy and stroke rehabilitation.

Legg et al (2007) carried out a systematic review of randomised controlled trials involving occupational therapy for patients with problems in personal ADLs after stroke. They found that occupational therapy focused on improving personal ADL after stroke improved performance and reduced the risk of deterioration in these abilities. Legg et al (2007) concluded that stroke patients who receive occupational therapy intervention focused on

personal ADL, as opposed to no routine occupational therapy, are more likely to be independent in those activities. They therefore recommend that focused occupational therapy should be available to everyone who has had a stroke.

Walker et al (2004) conducted an individual patient data meta-analysis of randomised controlled trials of community occupational therapy for stroke patients. This study included 8 single-blind randomised controlled trials incorporating 1143 patients. The results demonstrated that occupational therapy can significantly improve personal and extended ADLs and leisure activity in patients with stroke (Walker et al 2004). The study also reinforced the findings by Legg et al (2007) that specific targeted interventions result in better patient outcomes.

3.3 DRESSING ASSESSMENT AND PRACTICE

One of the key criteria used by occupational therapists when assessing whether or not a patient is safe for discharge home is their ability to manage the personal ADL of dressing. Dressing is an activity common to all individuals and as such is a relevant activity in which to engage patients at an early stage in their rehabilitation. A study by Edmans and Lincoln (1987) found that two years post stroke 36% of people were dependent on assistance to dress. Improving and maintaining an individual's ability to dress independently is important in restoring their sense of dignity and independence. Yet for more than half a century, therapists and researchers have debated which underlying deficits are important determinants of a stroke survivor's ability to dress (Suzuki et al 2006, Walker et al 2003, Walker and Walker 2001, Walker and Lincoln 1991,

Titus et al 1991, Walker and Lincoln 1990, Bjorney and Reinvang 1985, Tasi et al 1983, Warren 1981, Williams 1967, and Brain 1941).

The occupational therapist may use the complex task of dressing to assess a wide range of functions both physical and psychological. Yet there is currently no published score-able assessment to accurately record the individual dressing components of performance (Walker and Lincoln 1991). Occupational Therapists tend to develop their own in-house assessment forms to record patients performance in this activity. These cannot be considered to be standardised and the validity of such assessments will vary considerably.

Clinically, occupational therapists often use direct observation of patients during dressing to make their analysis as to the reason behind any difficulties witnessed in the donning and doffing of garments. In a UK survey of occupational therapy practice after stroke only 43% of therapists reported using standardised assessments when determining and treating dressing problems (Walker et al 2003). The majority of therapists believed cognitive impairment to be a major reason for dressing difficulties in stroke patients (Walker et al 2003). The survey and current evidence base for dressing practice will be discussed in more detail in the following chapter.

CHAPTER 4

LITERATURE REVIEW AND AIMS OF THE MPHIL RESEARCH PROGRAMME

4.1 CHAPTER OVERVIEW

The previous chapters have provided a broad overview of stroke, its aetiology, prevalence and economic burden on society, and also the devastating affects stroke can have at an individual level in terms of the stroke survivors ability to function, their impairments, and the disability such impairments can cause. The previous chapter explained the role of the occupational therapist in stroke rehabilitation and in particular, the role of the occupational therapist in the assessment and treatment of dressing difficulties after stroke. This chapter will now focus on the evidence for occupational therapy stroke dressing rehabilitation. The literature review will lead into the background to the chosen research topic and the rationale for conducting a programme of stroke dressing rehabilitation research.

4.2 THE EVIDENCE FOR DRESSING INTERVENTIONS

In order to explore the advances already made in stroke dressing rehabilitation, a literature search was carried out using the Ovid, AMED, EMBASE, MEDLINE, the Cochrane Library and the National Library for Health databases. A search was performed to find English language journal papers containing the key words 'stroke' or 'cerebrovascular accident' and 'dressing'. The search returned nine relevant results, all of which were obtained for review.

4.3 THE DEVELOPMENT OF THE NOTTINGHAM STROKE DRESSING ASSESSMENT

Before 1990, no standardised dressing assessment existed which divided dressing into its 'component parts' or the actions and skills required to complete the dressing process (Walker and Lincoln 1990). Walker and Lincoln recognised this and embarked on a research study that aimed to develop a detailed dressing assessment that could identify the possible problems that occur in relearning to dress. Their first dressing study also aimed to ascertain whether certain aspects of the total dressing process caused more difficulties than others for patients who had suffered a stroke. Sixty consecutive patients admitted to the Nottingham Stroke Unit were recruited to participate in the study to develop the Nottingham Stroke Dressing Assessment (NSDA). Initially the most common items of clothing were listed and then all items were subdivided into the various stages of movement required to complete the dressing process. Two different versions of the NSDA were compiled, one for males and one for females, to account for the variation in clothes worn between the genders. One occupational therapist documented the dressing abilities of all sixty patients. A numerical coding system was used to score each patient's observed level of independence. A score of 0 was given for a dressing stage if the individual was completely dependent. A score of 1 was given if verbal prompts were required, and a score of 2 if the patient was completely independent with a required dressing action. It was found that men and women encountered similar difficulties in relearning to dress after a stroke (Walker and Lincoln, 1990). A limitation of Walker and Lincoln's (1990) study was that it was conducted in one stroke unit geographically located in the East Midlands which may not be wholly representative of the multi cultural society living in London and larger cities with a larger

presence of ethnic minorities. The traditional African dress or religious garments such as the burhka, sari and turbans were not accounted for on the NSDA dressing assessment.

4.4 VALIDATION OF THE NOTTINGHAM STROKE DRESSING ASSESSMENT AND INVESTIGATION OF THE FACTORS WHICH INFLUENCE DRESSING PERFORMANCE

Following the development of the NSDA, Walker and Lincoln (1991) went on to validate the assessment and to investigate the factors which influence dressing performance following a stroke. In order to do this, sixty patients were assessed on the NSDA within a week of admission to the Nottingham Stroke Unit and also on ten physical and cognitive assessments including standardised assessments where available. The ten assessments used were the Rivermead Assessment of Motor Function (Lincoln and Leadbitter 1979); the Rivermead ADL Scale (self care section) (Whiting and Lincoln 1980); the Rivermead Perceptual Assessment Battery (Whiting et al 1985); the Frenchay Aphasia Screening Test (Enderby et al 1987); the logical memory test from the Wechsler Memory Scale (Wechsler 1945); NART; the Nottingham Sensory Assessment (Stolk-Hornsveld et al 2008); the Western Aphasia Battery (Kertesz 1982); the What's in a square? board game (Arnold Limited); and the Pursuit Rotor Test.

The percentage score of dressing independence was correlated with the physical and cognitive assessment results using a Spearman rank correlation coefficient. Of the sixteen abilities assessed, nine were significantly correlated with dressing ability (Walker and Lincoln 1991). When the spearman rank correlation coefficient was used to correlate the stages of dressing with the physical and cognitive assessments that had

significant correlation with dressing ability, it was discovered that the items of clothing worn on the lower half of the body were significantly correlated with the physical assessments, and the items of clothing worn on the upper half of the body were significantly correlated with the cognitive assessments. This means that following a stroke, physical impairments are likely to affect an individual's ability to dress their lower body, and cognitive impairments will cause difficulty in managing upper body dressing.

Dressing ability was most strongly associated with performance on tasks requiring visual matching and spatial abilities and a cancellation task to measure visual inattention (Walker & Lincoln 1991). It is worth noting that whilst Walker and Lincoln (1991) found kinaesthetic sensation to be related to dressing ability, it seemed more important in dressing for patients to know where their limbs were in space than their ability to feel the garments. This could mean that sensory perception and the ability to feel garments is not vital to dressing as vision can compensate for loss of touch, whereas proprioceptive ability is fundamental to donning garments and cannot be compensated for.

Walker and Lincoln (1991) demonstrated that perceptual skills as well as physical are important determinants of dressing ability. They discussed the common trend of therapists treating perceptual problems in the hope of improving functional abilities, and suggest it may be more appropriate to treat the functional problems directly. They cite studies by Edmans and Lincoln (1989) and Robertson et al (1990) which looked at treating perceptual problems with the aim of improving functional abilities. Both studies failed to show any beneficial effect of practice on perceptual tasks (Walker & Lincoln 1991). This could be due to the fact that the treatments

for perceptual problems were not representative enough of the naturalistic functional skills required to perform the ADL activities and therefore improvements on a synthetic treatment task will not necessarily be transferrable to a real life situation. Indeed, the National Clinical Guidelines for Stroke recommend that task-specific training should be used to improve activities of daily living (Intercollegiate Stroke Working Party 2008).

4.5 THE EVIDENCE FOR THE EFFECTIVENESS OF OCCUPATIONAL THERAPY DRESSING PRACTICE FOLLOWING STROKE

In 1996, Walker, Drummond and Lincoln carried out a study to determine whether giving dressing practice to patients at home with unresolved dressing problems following stroke reduced their problems. This was a crossover randomised controlled trial, in which no intervention was given for three months, followed by three months treatment to one group, whilst the other group received the reverse. Participants were included if they had persistent dressing difficulties at six months post stroke and were seen in their own home by a senior occupational therapist. Participants undertook regular dressing practice with their families with specific techniques (such as practicing one handed button fastening) depending upon the individual's dressing difficulties. Thirty participants were included in total with equal numbers in both groups. The outcome measures used in this study were the NSDA, Rivermead ADL (self care section), and the Nottingham Health Profile, all of which were administered by an independent assessor prior to randomisation, and at three months and six months post randomisation.

The results of the study showed that both groups of patients 'showed statistically significant improvement during the treatment phase' (Walker et al 1996). Neither group showed any change during the non-treatment phase. Whilst it is encouraging to see that the patients who received treatment in the first three months maintained their improvement (Walker et al 1996), the sample size was small and the follow-up period of three months was a relatively short duration post treatment. Walker et al (1996) concluded that dressing practice given at home to patients who have residual problems in dressing six months after acute stroke leads to a sustained reduction in their problems. It would be interesting to see whether patients maintained their dressing performance six months to a year post intervention.

4.6 THE INFLUENCE OF COGNITIVE AND PHYSICAL SKILLS ON RELEARNING TO DRESS AFTER STROKE

The literature search found that following on from the Walker et al study in 1996 the next dressing study wasn't published until five years later in 2001. Walker and Walker (2001) undertook a review of stroke dressing literature in order to answer the question: 'can we identify the influence of cognitive and physical skills on a person's inability to relearn to dress?' Articles were included if they investigated the relationship in dressing ability between physical and cognitive skills. Following a search using CINAHL, Medline, BIDS-Ingenta, AMED, and the Cochrane Library, forty articles were reviewed, of which only nine fulfilled the inclusion/exclusion criteria.

Walker and Walker (2001) reviewed Bjorneby and Reinvang's (1985) study which concluded that the assessments that correlate highly with dressing

ability are the grooved peg test with the non-affected hand, copying a cross, and imitation of nonsense hand positions. These assessments test for impairments of attention and dexterity, visual attention and apraxia. Walker and Walker (2001) also reviewed an article by Lorenze et al (1962) who discovered a strong relationship between severity of visual perception deficit and dressing performance. When performing activities such as dressing, individuals rely heavily on visual information to select garments, to orientate them correctly, and to locate the correct garment openings such as sleeves and hems. With a loss of visual information, the individual is required to compensate by using their sense of touch to feel for labels and fastenings. The results from the dressing studies by Bjorneby and Reinvang (1985) and Lorenze et al (1962) follow the logical hypotheses that the presence of attentional problems, loss of dexterity, visual perceptual impairment and apraxia may all negatively affect the ability to perform the complex activity of dressing.

Whilst undertaking the literature review, Walker and Walker (2001) also found several studies (McFie et al 1950; McFie and Zangwill 1960; Williams 1967; and Bach et al 1971) that demonstrated a positive correlation between drawing tasks or copying ability and the ability to dress independently. Again drawing tasks and copying ability are linked to visual information processing and visual perception. The presence of apraxia could affect drawing and copying ability.

Warren (1981) looked at the impact of multiple cognitive difficulties and hemispheric differences on dressing and reported that statistically significant correlations were found between the drawing, body scheme and dressing scores for the sample as a whole. Warren (1981) reported that the body scheme tests were the most significant predictors of dressing

ability, and also that there was no significant correlation between the different tests and hemisphere of the brain in which the stroke had occurred. Walker and Walker (2001) noted however that 'Warren used parametric statistical analysis for ordinal data rather than non-parametric.' In contrast Walker and Walker found a study by Tsai et al (1983) that reported 'there being a greater number of right hemisphere subjects who remained dependent for dressing on discharge'. The reason put forward is that 'visuospatial skills are more prominent in right hemisphere subjects and influence recovery' (Tsai et al 1983). Walker and Walker (2001) noted that although the study by Tsai et al was one of the few studies that specifically assessed dressing ability, the reliability of the 4-point scale used to assess performance was not reported. This reiterates the importance of using valid and reliable outcome measures in research as without proven psychometric properties, the assessment will invariably affect the reliability of the research and call into question the clinical utility and application of the research findings.

Walker and Walker (2001) then went on to review literature on the influence of motor difficulties upon dressing ability. They looked at the study by Bernspang et al (1987) which was one of the first to measure the influence of cognitive and motor difficulties on a person's ability to relearn to dress. At the time of this work, no other study had addressed both motor impairment and cognition in relation to functional outcome (Walker & Walker 2001). Few studies have measured the influence of motor deficits on the ability to relearn to dress (Bernspang et al 1987; Walker & Lincoln 1990, 1991; and Walker & Walker 2001).

In discussing the studies explored in the review, Walker and Walker (2001) were of the opinion that most were so poorly conducted in terms of

scientific rigour and research methodology that they could not be considered to have any real clinical value. They did find that most articles demonstrated the relationship between physical ability, cognition and dressing performance. A correlation is clear between the results of the neuropsychological tests and functional outcome at discharge. Walker and Walker (2001) were unable to determine from the available literature which deficit might have the greatest influence on relearning to dress. It was noted from the study by Heir and Edelstein (1991) that other prognostic indicators, such as stroke severity and incontinence, correlate with functional recovery (Walker & Walker 2001).

Walker and Walker (2001) conclude their review by stating that 'there is still no conclusive evidence on the influence of underlying impairments on a person's ability to relearn to dress'. Walker and Walker (2001) reiterated the benefits of psychometric tests to identify impairments that may affect function. Poor performance on such tests does not however confirm an inability to perform in functional tasks (Van Heugten et al 1999). Another interesting and important insight was the slight trend towards right hemisphere subjects remaining dependent for dressing (Walker and Walker 2001). These insights could be further tested in larger scale dressing rehabilitation randomised controlled trials in the future, such as the phase two Dressing Rehabilitation Evaluation Stroke Study (DRESS) RCT, in order to determine if there are definitive predictors of dressing recovery following stroke.

4.7 AN OBSERVATIONAL STUDY OF NURSING DRESSING INTERVENTIONS WITH STROKE PATIENTS COMPARED WITH OCCUPATIONAL THERAPIST INTERVENTIONS

Booth et al (2001) conducted a non participant structured observational study with the objective of comparing the interventions of qualified nurses with those of occupational therapists during morning care (including dressing) with the same sample of 10 stroke patients. A research physiotherapist observed all the patient-nurse and patient-occupational therapist interactions and recorded the patient activity at the end of every 20 second time interval. The interactions were coded and the data from each morning care session were recorded and analysed according to the frequency of each interaction. The most frequently observed style of interaction for both professionals was supervision. Occupational therapists utilised prompting/instructing and facilitating movement to a greater extent than the nursing staff. However the findings of this study cannot be generalised as the study was on too small a scale, in one hospital with only 10 patients. It therefore included too few therapists and nurses to be able to generalise their interventions as being representative of the rest of the nursing and occupational therapy professions.

4.8 DRESSING AFTER A STROKE: A SURVEY OF OCCUPATIONAL THERAPY PRACTICE IN ENGLAND

Following on from Walker and Walker's (2001) literature review, Walker et al (2003) carried out a survey of what was currently happening in occupational therapy practice in relation to dressing rehabilitation in England. The aim of the study was to determine the occupational therapists' beliefs about the influence of cognitive impairment on dressing

difficulties and to ascertain current practice when treating dressing problems (Walker et al 2003). One hundred and thirty seven questionnaires were posted out to occupational therapists from all stroke units known to the Stroke Association to ensure a representative sample. Seventy-six (55.5%) occupational therapists completed and returned the questionnaire and the frequency of dressing practice ranged from two to four times a week.

The results found that less than half (43%) of the therapists used standardised assessments. The most common assessment used was the Rivermead Perceptual Assessment Battery. The therapists were questioned about what factors they believed influenced a patient's ability to dress. Seventy six per cent reported apraxia, 71% neglect, 63% stated memory problems, 76% reported orientating clothing and relating it to body parts, sequencing was reported by 56% and 34% of occupational therapists believed that failing to dress the affected side influenced dressing ability.

When asked about treatment of dressing difficulties, '98% of therapists spent time providing the practice of specific functional skills on a repetitive basis; and 60% continued to use table-top tasks aimed at targeting a particular cognitive impairment'. In conclusion, Walker et al (2003) report that 'most therapists felt cognitive impairment was a major factor in dressing ability of stroke patients, with over half of therapists treating this impairment with the use of table-top tasks, and all but one using repetitive dressing practice to treat dressing difficulties'. Walker et al (2003) pointed out that the actual evidence to support these types of treatment remains 'controversial'.

4.9 THE IMPACT OF COGNITIVE IMPAIRMENT ON UPPER BODY DRESSING AFTER STROKE

With a lack of certainty over which impairments most affect a person's dressing performance following stroke, Walker et al (2004) set out to investigate whether the nature of cognitive impairment influences ability to relearn to dress. The study concentrated on difficulties with upper body dressing and used video analysis of thirty stroke patients putting on a standard polo shirt. All participants were assessed on dressing ability at the sub-acute stage and three months later, using standardised cognitive and physical tests and video analysis. Following completion of a series of cognitive and physical tests, the patients' dressing ability was assessed using the NSDA. Following this, video analysis was carried out of the patients attempting to put on a polo shirt. The therapist held the shirt at the neck and handed it to the patient with no verbal or physical assistance being given. The assessment lasted until the patient succeeded in the task or until no further progress had been made by three minutes. Two raters then viewed the video recordings and independently recorded each step in detail. Following comprehensive analysis of each patient's performance on all the tests, dressing rehabilitation using the functional approach and normal movement approach was given twice weekly by the same ward occupational therapist.

The results of the assessments found that thirteen patients had preserved power in both arms and were able to use them to put the shirt on independently despite some individuals having visuospatial impairment or apraxia. The remaining seventeen patients all had a degree of arm paresis, out of whom, twelve were unable to put on the shirt. The five patients who were found to be independent with upper body dressing,

performed significantly better on the tests for apraxia and visuospatial perception, showing fewer cases of cognitive impairment. 'Video analysis confirmed the importance of cognitive problems such as neglect or apraxia' (Walker et al 2004). These results provide evidence that cognitive impairment affects the ability to relearn to dress with one hand, but does not affect ability to dress in those patients who are able to use both hands (Walker et al 2004). Walker et al (2004) suggest that 'the influence of cognition on a person's ability to learn compensatory strategies has implications for the design of rehabilitation therapies'.

When analysing the results of the study it was found that 'the pattern of errors observed during dressing was related to the nature of cognitive impairment' (Walker et al 2004). The findings demonstrated that those with right hemisphere damage had problems in selecting the correct sleeve, self-monitoring their left side or covering the paretic shoulder, suggesting a deficit in visuospatial perception or neglect. Those with left hemisphere damage had problems with dressing the non-paretic arm first or showed a disorganised dressing strategy, suggesting impaired action control due to apraxia (Walker et al 2004). Amongst the patients with arm paresis, over two thirds were initially unable to don the t-shirt. However, by three months these patients had learnt a one-handed technique to do so. The patients were able to learn a new compensatory technique. The clinical implications of this mean that in dressing rehabilitation, for those with upper limb paresis the focus of treatment should be on teaching compensatory strategies (Walker et al 2004). Walker et al (2004) correlated the results of the NSDA at initial assessment and follow up assessment with the results of the polo shirt assessment and found that the polo shirt assessment can be considered a valid indicator of dressing

ability. This gave researchers a further functional dressing assessment to be used in future dressing research.

4.10 THE USE OF AN ECOLOGICAL APPROACH TO NEUROPSYCHOLOGICAL DRESSING ASSESSMENT AND INTERVENTION

Sunderland et al (2006) used the evidence from the previous stroke dressing studies to inform the design of a further investigation into action errors and dressing disability after stroke. The aim of the study was to discover if a blending of naturalistic observation and neuropsychological intervention would facilitate more effective intervention for dressing disability (Sunderland et al 2006). A sample size of eight patients was used for the study. Participants were recruited from two stroke units and included if they: were within six weeks of stroke; displayed persistent dressing difficulties; and were impaired on one or more cognitive screening tests. Patients were excluded if they had a history of dementia, were unable to sit for fifteen minutes or had a pre-stroke modified Rankin score (mRS) of more than three.

An AB randomised multiple-baseline across subjects design was used (Sunderland et al 2006). Participants received conventional dressing practice in the A (baseline) phase for a randomly determined period between five and fifteen days. This was followed by a neuropsychologically informed therapy in the B (intervention) phase. In both phases, dressing practice was given four times weekly. Time series data on the participants dressing ability was collected by the use of video recordings every three days as they tried to put on a t-shirt independently.

Following the baseline phase of conventional dressing practice, a hypothesis was formulated over the cognitive barriers to independent dressing. This then enabled suggestions for therapy. The categorisation of errors was carried out by two raters, who viewed the video independently. Inter-rater agreement was found to be 78% (Sunderland et al 2006). A standard assessment battery consisting of the line crossing test or star cancellation, the 10-hole peg test, object decision, and Kimura Box was used for the initial cognitive screen. Participants were included if they failed one or more of these tests. Three further assessments, the Motricity Index, Token Test and Nottingham Stroke Dressing Assessment were used and additional assessments were used in individual cases. These were the Elevator Counting test, Delayed Story Recall, Cube Analysis, Fluff Test, and Action Imitation Test.

The results of the study found that failure to dress the paretic arm first was common in participants with left cortical damage and in association with ideomotor apraxia. Those with right hemisphere damage and visuospatial deficits commonly had difficulty in finding the correct openings for hands or head. Three of the right hemisphere damaged individuals also had problems in attending to the task (Sunderland et al 2006).

The ratings were summed for each assessment point and were scored on a scale of one to six. 'An extended scale for dressing ability was therefore derived by ranking performance for each patient across the 25 assessment points from lowest rating to fastest correct performance' (Sunderland et al 2006). The trend was in the direction of improved performance at dressing (Sunderland et al 2006).

Sunderland et al (2006) discuss the use of a combination of detailed observation of dressing performance and the use of neuropsychological tests with the right hemisphere and left hemisphere patients to inform dressing treatment. They found that whilst it was useful with the right hemisphere cases and the 'randomised baseline design demonstrated that there were advantages of this approach over conventional dressing practice, three cases with left hemisphere or bilateral damage did not show evidence of treatment effect' (Sunderland et al 2006). Sunderland et al (2006) concluded their study by stating that it had 'shown that an ecological approach to dressing difficulties can be effective but further research is needed into theoretical, methodological and clinical aspects'. A sample size of eight patients is too small to be able to generalise the results and therefore a larger scale randomised controlled trial would be needed to fully evaluate the effectiveness of an ecological approach to dressing rehabilitation.

4.11 A PROSPECTIVE COHORT STUDY TO PREDICT UPPER BODY DRESSING RECOVERY

In the same year, Suzuki et al (2006) conducted a prospective cohort study entitled, 'Predicting recovery of upper-body dressing ability after stroke'. In this study, 51 patients underwent 15 days of dressing training based on the time-delay method, which is a technique that was used in the 1970s to increase the language use and facilitate generalization in children with learning difficulties (Halle et al 1979). Suzuki et al (2006) provide no justification or explanation as to why the length of treatment was 15 days. The study looked at upper body dressing only with no justification for the exclusion of lower body dressing ability. All participants regardless of gender were assessed on their ability to don a shirt. There was no mention

of whether patients usually wore this item of clothing or other garments such as a bra, vest, t-shirt or dress. For the purpose of the study, upper body dressing was viewed as involving 10 separate stages and dressing cues were given at set time intervals after 10 seconds had elapsed. The cues were given in four levels (verbal cues, gestures, tapping, and physical assistance). The study used eight outcome measures of physical and cognitive abilities and upper body dressing ability was assessed according to the FIM instrument dressing item. Participants were assessed on all outcome measures at the start of treatment, however they were only assessed using the FIM after training and not on the assessments of physical or cognitive function at outcome. Following the 15 days of dressing treatment, patients were assessed on the FIM dressing item and then grouped according to whether they had achieved independence in upper body dressing ability or not. Suzuki et al (2006) reported that upper body dressing ability and visual attention prior to dressing treatment were significantly better in patients who achieved independence in dressing at outcome than in those who remained dependent. They go on to claim that their analysis indicates that the FIM upper body dressing score can serve as a valuable predictor of the ability to dress the upper body independently after stroke (Suzuki et al 2006). However, the FIM instrument does not distinguish the component actions of dressing and cannot be used to evaluate the specific dressing impairments of the individual. Suzuki et al (2006) also gave cues during the outcome dressing assessment therefore the results do not give an accurate indication of how the patients may have performed without the assistive presence of the therapist during the dressing assessment. The findings cannot be generalised as the provision of 15 days of time-delay dressing treatment is not common practice in all stroke rehabilitation units. The effect of dressing treatment based on this particular method is not clear due to patients not being assessed on all

outcome measures at the point of dressing evaluation. The effect of natural recovery cannot therefore be excluded.

4.12 CURRENT DRESSING PRACTICE - THE FUNCTIONAL APPROACH

It is clear that advances have been made in the area of stroke and dressing rehabilitation. However, the studies have been relatively small scale and have not provided conclusive evidence to be able to influence current occupational therapy practice. The guidance in relation to dressing rehabilitation contained in the latest version of the National Clinical Guidelines for Stroke is based on consensus and simply advises that 'any person who has limitations on any aspect of personal activities should be referred to an occupational therapist with experience in neurological disability (Intercollegiate Working Party for Stroke 2008). In the absence of conclusive evidence, occupational therapists will continue to use a functional pragmatic problem-solving approach to dressing rehabilitation, whilst researchers will continue to strive for answers to dressing difficulties following stroke.

At present, occupational therapists commonly use the functional approach in dressing practice (Walker et al 2003). The functional approach, also referred to as the 'compensatory' approach, aims to improve the patient's level of independence in activities of daily living, through the use of aids and equipment or the use of the non-affected limbs (Walker et al 2000). Although the aim is to promote independence, the functional approach may encourage one-sidedness in the patient (Hagedorn 1992). The focus is to minimise dependency by aiming to restore function, but is not concerned with analysis of the impairment. The focus is at the activity level rather

than the impairment level. Because of this, the functional approach doesn't seek to analyse and treat the root cause of the problem, rather it compensates for the deficit by finding alternative methods of performing tasks.

In terms of dressing practice, the functional approach would involve teaching the stroke patient how to dress independently using the unaffected upper limb to dress the paretic side of the body first using a one handed technique (Edmans et al 2005). The use of problem solving is also integral to this approach.

4.13 BACKGROUND TO THE MPHIL STUDY

This research programme was carried out alongside a phase II randomised controlled trial (RCT) of a neuropsychological approach to dressing rehabilitation. The Dressing Rehabilitation Evaluation Stroke Study (DRESS) was a two year feasibility study funded by the Stroke Association and carried out in Nottingham. The DRESS study was conducted prior to a definitive phase three RCT being undertaken. As such, there was potential to explore a number of unanswered questions. Feasibility studies enable researchers to "test the waters" and "iron out any kinks" in the research protocol prior to embarking on a much larger multi-centre RCT. The author, as a research therapist on the DRESS study, was able to foresee a number of additional dressing research questions that could be linked to and/or potentially answered by the DRESS study. The MPhil programme is therefore embedded within the DRESS study and used the same cohort of study participants.

4.14 THE DRESSING REHABILITATION EVALUATION STROKE STUDY (DRESS)

The Dressing Rehabilitation Evaluation Stroke Study (DRESS) aimed to investigate the feasibility of a neuropsychologically informed dressing therapy. The DRESS study is in the final write up phase and compares a neuropsychological (cognitive) approach (n=35) to dressing, with the conventional "functional" approach (n=35) commonly used by occupational therapists in the UK (Walker 2007).

The study was conducted in two parts. Part one involved the compilation of a treatment manual for the most common cognitive impairments known to affect dressing ability. These cognitive impairments were discussed previously in chapter two. Findings from previous dressing studies directly informed the contents of the cognitive treatment manual together with an up to date review of the neuropsychological literature (Walker 2007). A large influence on the contents of the cognitive treatment manual was the previous study by Sunderland et al (2006) involving single case study designs to investigate an ecological approach to the treatment of dressing problems. The functional treatment manual was compiled based on the dressing strategies published in the College of Occupational Therapists Specialist Section for Neurological Practice book entitled 'Occupational Therapy and Stroke' (Edmans et al 2005). The functional approach to dressing was previously explained on page 66. This initial stage of the DRESS project was completed in a six month period.

The second part of the DRESS study involved a randomised controlled trial. Two research therapists based in the Stroke Unit at Nottingham City Hospital were referred patients with persistent dressing difficulties at two

weeks post stroke. The research occupational therapists excluded those patients who met the exclusion criteria. Patients were excluded if they were: unable to tolerate sitting for 15 minutes, unable to speak fluent English; had a known history of dementia or depression, a known pre-morbid disability (pre-stroke modified Rankin score >3); or lived more than fifteen miles from the hospital. Patients gave written consent to participate in the study and were then assessed using a cognitive screening test involving line crossing (Wilson et al 1987); 10-hole peg test (Annett 1992); object decision (Warrington & James 1991); and gesture imitation (Kimura & Archibald 1974). Patients were considered to have a cognitive impairment that may affect dressing ability if they failed on one or more of these cognitive tests. Only patients with a confirmed cognitive impairment were included in the study. At the point of inclusion, patients were then assessed on dressing performance using the Nottingham Stroke Dressing Assessment (NSDA). Patients were assessed at their bedside whilst seated in a standard arm chair or wheelchair depending on their seating and mobility requirements.

Following this functional baseline assessment the patients were randomised into one of two groups; the functional group or the cognitive group. The Research Assistant (RA) randomised patients using a computerised randomisation programme. Those patients randomised to the functional group received conventional dressing practice with no attempt to formally assess their impairments and treat accordingly. The cognitive group received the neuropsychological approach which entailed a further functional dressing assessment, the t-shirt test (Walker et al 2004) and further detailed standardised cognitive assessments to determine the specific cognitive impairment(s) causing the dressing difficulties. The treatment approach was then formulated following discussion between the

two treating research therapists and the RA in conjunction with the guidance contained in the cognitive treatment manual.

Both groups received dressing practice from a research occupational therapist three times a week for six weeks. Following the treatment phase patients were assessed on the primary outcome measure (NSDA) and cognitive screening tests used at baseline (10 hole peg test, line cancellation test, Action Imitation Test and the Object recognition test) by an assessor who was blinded to treatment group allocation.

4.15 AIMS AND OBJECTIVES OF THE CURRENT MPHIL STUDY

Research aims/question(s):

1. To investigate the reliability of the Nottingham Stroke Dressing Assessment (NSDA) as an outcome measure for use in research and clinical practice.

2. To determine to what extent hemiparesis of the upper limb affects dressing performance, and whether there is a direct correlation between, one handed or two handed dressing and degree of dressing dependency.

3. To determine the acceptability of the treatment approaches used in the DRESS study.

CHAPTER 5

A STUDY OF THE INTER-RATER RELIABILITY OF THE NOTTINGHAM STROKE DRESSING ASSESSMENT (NSDA)

5.1 CHAPTER OVERVIEW

This chapter will present the first of the three research studies that made up the research programme. This first study was a study of the inter-rater reliability of the Nottingham Stroke Dressing Assessment. The chapter is subdivided into sections containing an introduction, methods, results and the discussion. The introduction will provide an explanation of the need for such a study. The methods will explain how the study was carried out and this will be followed by the results in which the findings will be presented. The discussion will explain the findings and the potential impact of the results of the study.

5.2 INTRODUCTION

Measurement is a key process both in research and in clinical practice (Polgar and Thomas 1995). In practice, 'measurement' refers to both the process of discovering the extent of a phenomenon and also to the result obtained (Wade 1992). The words 'assessment' and 'measurement' are often interchanged in practice. Wade (1992) explains that measures are used to determine whether or not an impairment or problem is present, whereas assessments are used to determine the extent of a problem. Researchers and clinicians need to have confidence in the reliability and validity of the measurement instruments used in clinical research in order to be confident in the results obtained. Outcome measures aim to

accurately capture the amount of change in an individual resulting from recovery and rehabilitation. They chart an individual's progress to ascertain whether treatments have been successful and improvements gained. If the measurement instrument in a study lacks rigorous psychometric properties then the internal and external validity of the findings, and hence the usefulness of the study, will be severely limited.

In the DRESS study, the measure used to capture the functional level of independence in dressing prior to treatment (at baseline) and after the treatment period was completed (at outcome), was the Nottingham Stroke Dressing Assessment (NSDA) (Appendix A).

The Nottingham Stroke Dressing Assessment (NSDA) (Walker & Lincoln 1990) comes in two formats; each gender specific. Each version comprises a list of the various garments of clothing that may be worn. The garments are then broken down into the actions required to put on each item of clothing. For example, the tee-shirt is broken down into four dressing actions. These are:

(1) Selecting correct hole with affected arm;
(2) Selecting correct hole with non-affected arm;
(3) Pulling over head; and
(4) Pulling down.

Each action or task in completing the activity of getting dressed is assessed and given a rating based on a simple scoring system. If the individual is completely independent a score of two will be given, if verbal prompts are required they are given a score of one, and if they are dependent on physical assistance a score of zero is given. Patients are permitted to use

dressing aids and if these enable independent dressing a score of two would be given to reflect independence. The total possible score for each individual will vary due to differences in the garments worn by that person, and to account for this the scoring system allows a percentage score of independence to be recorded.

The male and female versions of the NSDA are accompanied by an 'Error Analysis Form' (Appendix B). This form lists the possible errors in dressing that might be observed during the NSDA assessment. For example, failing to initiate, or failing to dress the paretic side first. The purpose of this form is to record the possible reasons why a person might not be independent in dressing and to account for scores of zero or one on particular actions. The assessor simply ticks the relevant boxes that describe the errors observed. If no errors have been observed this is also noted. The error analysis form is used in the DRESS study to determine which cognitive impairments may be causing the patient to have difficulty with dressing and informs the Research Therapist and Research Assistant which further standardised tests the patient should be assessed with if randomised to the cognitive group. By conducting the NSDA at baseline and at outcome, the amount of improvement in dressing ability can be calculated.

During assessment, the validity of subsequent diagnoses and treatment decisions can be compromised by inadequate measurement. Validity refers to the accuracy of findings, whereas reliability is concerned with whether the findings are replicable (Bailey 1997, p. 70). Psychometric testing may be used to assess the reliability of such assessment measures (Bailey 1997, p.69). The validity of the NSDA has already been established by Walker (1992) as part of her Master of Philosophy thesis on dressing after

stroke. The NSDA was considered to have a high degree of face and content validity (Walker 1992).

Reliability is also referred to as 'consistency or agreement' (Jadad & Enkin 2007). A common issue in clinical assessment is the extent to which clinicians agree with each other in their assessments of patients. Inter-rater reliability refers to the measure of the level of agreement between different assessors and as such is often referred to as inter-observer agreement or inter-assessor agreement. Inter-rater reliability is important in both the clinical and research setting as it ensures that a change in score is due to a change in the individual's performance and not variations in scoring between different assessors. In the hospital setting it is likely that more than one therapist will be involved in the assessment and treatment of the patient. A high level of inter-rater reliability is therefore required to enable the results to be considered generally representative of the patient's ability, regardless of which therapist administered the assessment.

Some preliminary work has already been conducted on the intra and inter-rater reliability of the NSDA (Walker 1992) but this had some limitations and was not formally published. The work was carried out as part of the author of the NSDA's MPhil study and involved just two raters who were both research therapists. The purpose of this present study was to investigate the inter-rater reliability of the NSDA between three raters and between a mixture of clinical and research therapists. This study will also examine the inter-rater reliability of the accompanying error analysis form.

When testing inter-rater agreement, the percentage of agreement is sometimes used. However, it is not the most psychometrically sound method to determine inter-rater agreement as it is unable to take into

account the effect of a chance finding (Watkins and Pacheco 2000). The percentage of agreement simply represents total agreement between raters without considering the possibility of chance. Cohen's (1960) kappa test fully adjusts for chance in its calculation giving a score that more accurately reflects, with less ambiguity, the reliability of the data (Watkins and Pacheco 2000). Kappa (k) is a comparison of how well raters or tests agree, and is typically used to examine how accurately a test can be repeated (Harris and Taylor 2008). Kappa is used with ordinal data. The scoring categories used in the NSDA are 0=dependent on physical assistance, 1=dependent on verbal assistance, and 2=independent. The values 0, 1, 2, represent categories in order of level of dependency. The data from the NSDA can therefore be considered as ordinal data and a kappa test can be used to assess the level of agreement between each of the three assessors (raters) for each of the NSDA categories.

In summary, when inter-rater reliability studies involve ordinal data (ordered categories), the kappa (k) statistic can be used to examine the level of agreement (Cohen 1960). The kappa value can vary from zero to 1 with a k of zero indicating that there is no significant agreement, or specifically no more than would be expected by chance. A k of 1 indicates that there is perfect agreement.

Fleiss (1981) provided the following guidelines for interpreting the significance levels of kappa values:

Less than 0.40 = Poor agreement

0.40 – 0.59 = Fair agreement

0.60 – 0.74 = Good agreement

0.75 – 1.00 = Excellent agreement

5.3 METHOD

Two stroke research occupational therapists working on the 'DRESS' study, and one ward based clinical occupational therapist experienced in stroke rehabilitation acted as raters for the inter-rater reliability study. (This provided a mixture of both research and clinical therapists). They received two hours of training on the correct administration and scoring of the NSDA by its author prior to using the assessment. Difficult scenarios were used as vignettes to illicit discussion of valid scoring. Two practice sessions were then carried out in order for the three researchers to familiarise themselves with the assessment tool and the scoring system and to iron out further problems before proceeding with the study.

The study commenced in July 2008 with the three therapists independently completing the NSDA on 20 consecutive patients who had provided their written consent to participate in the DRESS study. A sample size of 20 was considered reflective of similar published studies of inter-rater reliability involving two or more raters (Pomeroy et al 2000; Edmans and Webster 1997; Sloan et al 1992; Lee et al 1989; Bohannon and Smith 1987). All three therapists observed each patient during the dressing process and independently completed the NSDA, and error analysis form whilst prohibited from speaking to each other. Before each assessment, one of the three raters agreed to act as the clinical therapist, enabling the patient to receive physical or verbal assistance from one therapist if required. The rater allocated as clinical therapist for the dressing session was usually the person who had obtained consent from the patient to join the study or who the patient was most familiar with. The rationale being that for a patient to be observed during the usually private activity of getting dressed by not just one therapist but three, may not be the most pleasant experience.

Therefore if embarrassment and self consciousness could be minimised through the use of an already established therapeutic relationship it was thought that this might enhance the assessment experience for the patient. The three therapists independently completed the NSDA and the error analysis form without discussion.

The patients were all consecutive participants who had consented to join the DRESS study, thus following the same inclusion and exclusion criteria as previously described (see page 69). Patients were recruited from three similar stroke wards that together form the Stroke Unit service at Nottingham City Hospital. Patients were assessed at their bedsides whilst seated in an armchair or wheelchair depending on their seating and mobility requirements.

Ethical approval was granted from the Nottingham Ethics Committee1 (07/H0403/130) as part of the DRESS study protocol for patients to be assessed using the NSDA at baseline and outcome assessments. The initial baseline NSDA assessment was used for the inter-rater reliability study as the outcome assessments on the DRESS study were carried out by an independent assessor who was blind to patient group allocation. As the two research occupational therapists involved in this study were also the treating therapists on DRESS they were excluded from involvement in the outcome assessments.

Data were collected on the 20 patient dressing assessments and error analysis forms from the three raters. Additional demographic data were also recorded such as sex, age, side of lesion, Barthel score, and motricity (motor) index score, hand dominance, and one or two handed dressing, in

order to be able to describe the sample of participants recruited to the study.

On completion of all 20 assessments, the demographic data and results from each rater (rater 1, rater 2 and rater 3) were initially entered onto a computer using the Statistical Package for the Social Sciences (SPSS) programme (SPSS for Windows 2007). Although the descriptive statistics for the sample could be analysed using SPSS, an alternative statistical package had to be used in order to carry out a kappa test on multiple raters. The data was transposed into the STATA (StataCorp 2007) computer package. This enabled a kappa test to be used for the scores obtained by the three raters on each of the measures (individual components of the NSDA) assessed.

If there is limited data available for a classification this may affect the computation of kappa. For this reason it is recommended that there should be at least 10 cases in each cell to ensure maximum accuracy (StataCorp 2007).

5.4 RESULTS

Six men and 14 women were assessed for this inter-rater reliability study. Ages ranged from 49 to 96 years (median age 79 years). Time since onset of stroke ranged from 12 days to 44 days (median time since stroke 21 days). The Barthel Index scores for each patient ranged from 2 to 17 (median score of 7). Six patients (30%) had suffered a left sided brain lesion and 14 patients (70%) had a right sided lesion. The upper limb Motricity Index score for the 20 patients ranged from a score 0 to 99 with a

median score of 59. The side of weakness (combined upper and lower limb Motricity Index score) ranged from 7 to 99 with a median score of 65.

Although there is no statistical reason why the demographic data of the study sample should affect the inter-rater reliability of the NSDA, the demographics are useful in describing the characteristics of the patient sample used in the study.

The Kappa coefficients for each dressing stage are shown in Table 1. There was excellent agreement ($k > 0.75$) on 29 items, good agreement ($k > 0.6$) on 8 items, fair agreement ($k > 0.4$) on 5 items, and poor agreement ($k < 0.4$) on 2 items. There were 5 items that could not be tested due to missing data (no patients wearing the related garments). This was the case with press stud and bow fastenings and the three dressing stages involved in putting a skirt on over the feet and pulling up to the waist. There were 13 items that could not be tested due to there being too few variables (not enough patients wearing the related garments) to be able to calculate a meaningful test statistic. This was the case with round buttons and buckle fastenings, putting on a bra, putting a skirt on using the over the head method, and lacing shoes.

Table 1: Kappa coefficients for each NSDA dressing item.

Measure	NSDA dressing action	Kappa	Level of agreement
1	Cross affected leg over non affected leg	0.83	Excellent
2	Cross non affected leg over affected leg	0.84	Excellent
3	Reach affected foot	0.79	Excellent
4	Reach non affected foot	0.88	Excellent
5	Standing – static	0.86	Excellent
6	Standing – dynamic	0.93	Excellent
7	Zip fastening	0.80	Excellent
8	Large button fastening	0.80	Excellent
9	Small button fastening	0.71	Good
10	Round button fastening	n/a	Too few variables
11	Velcro fastening	1	Excellent
12	Hook & eye fastening	0.79	Excellent
13	Press stud fastening	n/a	All missing values
14	Bow fastening	n/a	All missing values
15	Buckle fastening	n/a	Too few variables
16	Trouser clip fastening	1	Excellent
17	Bra - selecting correct hole with affected arm	n/a	Too few variables
18	Bra - selecting correct hole with non affected arm	n/a	Too few variables
19	Bra - Pulling over head	n/a	Too few variables
20	Bra - Pulling down	n/a	Too few variables
21	Bra - Pulling up to shoulders	n/a	Too few variables
22	Vest/slip - Selecting correct hole with affected arm	1	Excellent
23	Vest/slip - Selecting correct hole with non affected arm	0.78	Excellent
24	Vest/slip - Pulling over head	0.32	Poor
25	Vest/slip - Pulling down	0.66	Good
26	Dress - Selecting correct hole with affected arm	0.55	Fair
27	Dress - Selecting correct hole with non affected arm	0.55	Fair
28	Dress - Pulling over head	0.55	Fair
29	Dress - Pulling down	1	Excellent
30	Shirt - Selecting correct hole with affected arm	0.77	Excellent
31	Shirt - Selecting correct hole with non affected arm	0.77	Excellent
32	Shirt - Pulling around back/over head	0.64	Good
33	Shirt - Pulling down	0.77	Excellent
34	Cardigan - Selecting correct hole with affected arm	0.7	Good
35	Cardigan - Selecting correct hole with non affected arm	0.26	Poor
36	Cardigan - Pulling around back/over head	0.54	Fair
37	Cardigan - Pulling down	0.7	Good
38	Jumper/T-shirt - Selecting correct hole with affected arm	0.73	Good

39	Jumper/T-shirt - Selecting correct hole with non affected arm	0.44	Fair
40	Jumper/T-shirt - Pulling over head	1	Excellent
41	Jumper/T-shirt - Pulling down	0.71	Good
42	Skirt (a) Putting affected leg through waist	n/a	All missing values
43	Skirt (a) Putting non affected leg through waist	n/a	All missing values
44	Skirt (a) Pulling up	n/a	All missing values
45	Skirt (b) Putting affected arm through skirt	n/a	Too few variables
46	Skirt (b) Putting non affected arm through skirt	n/a	Too few variables
47	Skirt (b) Putting over head	n/a	Too few variables
48	Skirt (b) Pulling down	n/a	Too few variables
49	Pants - Selecting correct hole with affected leg	0.89	Excellent
50	Pants - Selecting correct hole with non affected leg	0.89	Excellent
51	Pants - Pulling up	1	Excellent
52	Trousers - Selecting correct hole with affected leg	0.92	Excellent
53	Trousers - Selecting correct hole with non affected leg	0.92	Excellent
54	Trousers - Pulling up	0.92	Excellent
55	Stockings/tights/socks - Pulling up over affected toes	1	Excellent
56	Stockings/tights/socks - Pulling up over non affected toes	1	Excellent
57	Stockings/tights/socks - Pulling up affected leg	0.67	Good
58	Stockings/tights/socks - Pulling up non affected leg	0.83	Excellent
59	Shoes - Putting shoe on affected foot	0.93	Excellent
60	Shoes - Putting shoe on non affected foot	1	Excellent
61	Shoes - Lacing shoe on affected foot	n/a	Too few variables
62	Shoes - Lacing shoe on non affected foot	n/a	Too few variables

The three raters' dressing percentage scores for each of the 20 patients and the rater that acted as clinician during the assessment are shown in table 2. The intra-class correlation coefficient (ICC) was examined for final percentage scores on the NSDA between the three raters using SPSS. The intra-class correlation coefficient between raters was 0.988. This represents excellent agreement between the three raters, when scoring patients' final percentage score on the NSDA.

Table 2: The raters' final percentage score for each participant.

Patient ID	Rater 1's final % score	Rater 2's final % score	Rater 3's final % score	Rater acting as clinician
1	18%	16%	16%	Rater 1
2	81%	65%	72%	Rater 1
3	60%	60%	60%	Rater 1
4	50%	45%	42%	Rater 1
5	87%	87%	89%	Rater 3
6	21%	21%	21%	Rater 3
7	40%	46%	46%	Rater 1
8	88%	88%	88%	Rater 1
9	16%	21%	21%	Rater 1
10	20%	20%	30%	Rater 3
11	76%	78%	76%	Rater 2
12	100%	100%	100%	Rater 1
13	42%	42%	42%	Rater 2
14	84%	73%	82%	Rater 2
15	100%	98%	100%	Rater 2
16	46%	46%	48%	Rater 3
17	58%	60%	57%	Rater 2
18	87%	83%	83%	Rater 1
19	30%	26%	22%	Rater 1
20	93%	93%	93%	Rater 1

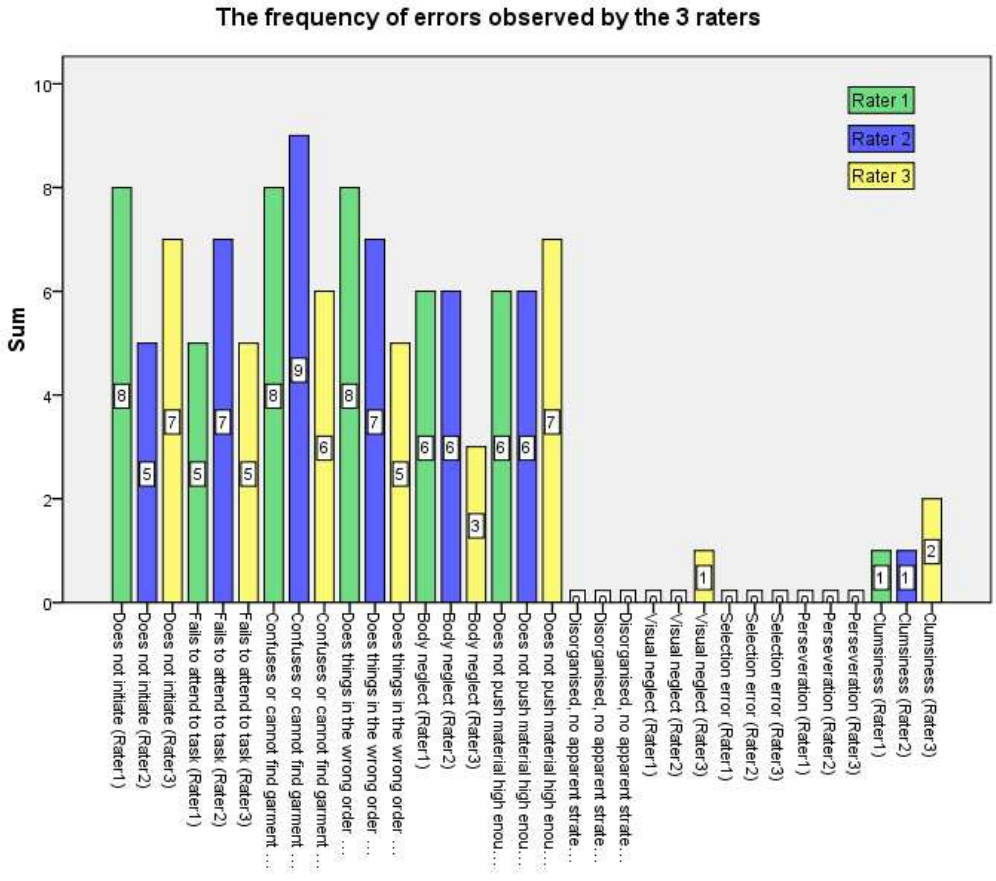
Data in green = cases where all 3 raters scored exactly the same on NSDA final % score.
Data in blue = cases where 2 raters observing dressing scored exactly the same but rater acting as clinician scored differently.

The percentage score on 6 out of 20 occasions (30%) was identical for all 3 raters. On 9 out of 20 occasions (45%) the 2 raters acting as observers had matching scores while the rater acting as designated clinician had a different but similar score. It was observed that in 6 cases (67%) the rater acting as clinician scored higher, and in 3 (33%) cases the rater acting as clinician scored lower than the 2 observing raters. The difference in scores between the two observer raters' identical scores and the clinician rater's score varied from 2% to 10%. The average difference in score was 3.6%. On 5 occasions (25%) all 3 raters scored the patients' final NSDA scores differently. The difference in scores varied from being exactly the same to

differing by 16%. The average difference in scores between the lowest and highest for each patient was 3.9%.

Finally the data from the accompanying 'Error Analysis' forms were analysed to determine the level of agreement between the three raters when assessing the nature of specific errors or impairments observed during the dressing assessment. Initially the frequencies of each dressing error were explored (figure 1).

Figure 1: Frequencies of each error item observed.



There were 3 items that had "all missing variables" and 1 item that had "too few variables" to be able to calculate a meaningful kappa statistic. Of the remaining dressing error items there was excellent agreement (k >0.75) on 2 items, good agreement (k >0.6) on 4 items, and fair

agreement (k >0.4) on 1 item. The four dressing errors (G, H, I & J) that had too few variables present to be able to calculate a kappa score were: G – Disorganised, no apparent strategy; H – Visual neglect; I – Selection error; and J - Perseveration. The kappa coefficients for each dressing error are shown is table 3.

Table 3: Kappa coefficients for each dressing error.

Measure	NSDA Error Analysis dressing error	Kappa	Level of agreement
1	(Error A)	0.70	Good
2	(Error B)	0.67	Good
3	(Error C)	0.79	Excellent
4	(Error D)	0.63	Good
5	(Error E)	0.56	Fair
6	(Error F)	0.77	Excellent
7	(Error G)	-	Too few variables
8	(Error H)	-	Too few variables
9	(Error I)	-	Too few variables
10	(Error J)	-	Too few variables
11	(Error K)	0.73	Good

5.5 DISCUSSION

The study of the inter-rater reliability of the Nottingham Stroke Dressing Assessment (NSDA) was carried out on one Regional Stroke Unit for reasons of practicality. The unit does not have any selection criteria for admission to the wards and therefore patients are admitted with a range of stroke severity and a mixture of pre and post stroke abilities. The patients used for the study can therefore be considered a representative sample of the UK stroke population. The aim of the study was to assess the reliability of the NSDA assessment and therefore patient demographics are unlikely to affect this. However, the population used enabled conclusions to be

made on the reliability of the NSDA regardless of severity of dressing problems observed. The study sample involved 20 patients which although is representative of other inter rater reliability studies (Roy et al 1988; Collin et al 1988), resulted in not all the items of clothing being assessed. Some items were assessed but on too few participants to be able to infer significantly meaningful test results. The study did however involve the use of three raters which significantly added to the robustness of the methodology employed.

The results of the kappa tests on the individual dressing stages demonstrated that, of the stages of dressing that could be tested, 37 had good or excellent agreement whilst only 7 had fair or poor agreement. The items that had fair and poor agreement were the bra (pulling up to shoulders and pulling down), cardigan (selecting correct hole with non affected arm) and the stages for putting on a dress. Those items that had fair or poor agreement were also the items least commonly worn by the 20 patients. For example only 3 patients put on a dress. Having only 3 patients to compare scores for the dressing stages involved in putting on a dress, may have negatively affected the kappa results. Had the same dressing stage been completed by a larger number of patients the level of agreement may have increased. For this reason it may have been favourable to have used a larger sample size in order to ensure that a greater number of patients could be assessed on each of the dressing items and stages.

There is always room for human error in such an assessment. For example, if the rater acting as clinician was required to give physical assistance frequently throughout the dressing assessment, they may have completed the NSDA form after completion of the dressing process and

would therefore be relying on memory. This could result in an inaccurate NSDA score. If this occurred in the case of an item that was only assessed on 2 patients, the likelihood is that a low kappa would be obtained. However, if this happened on an item that was assessed on 10 patients and on 9 occasions the NSDA was completed accurately at the time of dressing observation, the kappa level of agreement is more likely to be higher.

The intra-class correlation coefficient for the three raters' final percentage scores demonstrated excellent agreement between raters. The data was explored for patterns of significance. In almost 50% of cases the observing raters had identical scores whilst the score of the rater acting as clinician varied. This was the case regardless of which rater was acting as clinician. There was no meaningful difference between the three raters as the phenomenon was observed to occur with all three raters. The role of clinician was not shared equally however. Rater one acted as clinician 11 times, rater two acted as clinician five times and rater three took on this role four times.

The NSDA final percentage scores of raters one and two matched nine times, raters one and three matched eight times, and raters two and three matched ten times. This demonstrates that there is no meaningful difference between the three raters scoring. The average difference in score between the raters was marginal.

The error analysis form also proved to have inter-rater reliability of an acceptable level for those error items with sufficient data present. This means that although the scoring is dependent upon human judgement, the error categories are described in sufficient detail as to enable accurate observations to be made.

The limitations of this study were its small sample size in terms of certain individual garments being worn by too few individuals. A solution might have been to assess all 20 participants' ability to don all items of clothing listed on the NSDA assessment, however this would not be deemed to be good clinical practice. Occupational Therapists aim to ensure client centred practice and if a patient is assessed wearing garments of clothing they would not normally choose to wear this would be of no benefit to the rehabilitation of that individual. In allowing the participants to select their own preference of clothing perhaps the results are more reflective of the popularity of garments worn by stroke survivors in the initial weeks post stroke when treated in an acute hospital setting (i.e. slippers in preference to lace-up shoes).

In summary, the NSDA and accompanying Error Analysis form can be considered to have psychometrically proven inter-rater reliability. Clinicians and researchers can be confident in the results obtained. The NSDA provides occupational therapists with a reliable standardised outcome measure for use in the assessment of patients' post stroke dressing ability. The Error analysis form can also be used to assist in determining possible differential diagnosis for the cognitive impairments affecting dressing performance.

Overall, the Nottingham Stroke Dressing Assessment can be considered a standardised functional assessment of dressing ability with psychometrically proven inter-rater reliability.

CHAPTER 6

A STUDY TO DETERMINE TO WHAT EXTENT UPPER LIMB HEMIPARESIS AFFECTS DRESSING PERFORMANCE IN THE PRESENCE OF COGNITIVE IMPAIRMENT

6.1 CHAPTER OVERVIEW

This chapter will describe and discuss a study that was conducted to determine to what extent upper limb hemiparesis affects dressing performance in the presence of cognitive impairment. The chapter will begin by considering bilateral and unilateral hand use in the performance of daily activities. It will then go on to introduce the potential impact that a hemiparetic upper limb due to stroke can have on an individual's ability to perform bimanual tasks. The introduction will then proceed with a discussion on the recovery and rehabilitation of the hemiparetic upper limb before going on to highlight previous studies which have documented the importance of bilateral hand use in dressing. The aims of the study will then be outlined followed by the methods employed and the results obtained. Finally this chapter will conclude with a discussion of the research findings and their relation to previous research into the effects of cognitive impairment and hemiparesis on dressing ability.

6.2 INTRODUCTION

In everyday life individuals may use a range of bilateral (both arms) and unilateral (one arm) skills when carrying out daily activities. Kilbreath and Heard (2005) studied the frequency of hand use in healthy older adults and demonstrated that this older population, showed an increase in the

frequency of bilateral hand use to perform everyday activities. The more complex unilateral actions were typically performed by the dominant arm. For simpler skills either arm was used although the dominant hand was more likely to perform the action with greater speed and accuracy (Kilbreath and Heard 2005).

When an individual suffers a stroke resulting in upper limb paresis it is likely to have a significant impact on their ability to use the affected hand in daily activities. Upper limb paresis leaves many individuals unable to perform bimanual tasks (Dean & Mackey 1992). Not surprisingly then, it has been reported that arm hemiparesis is the dominant functional impairment in as many as 80% of patients with acute stroke (Jorgensen et al 1995b). Improving upper limb function is therefore often a core element of stroke rehabilitation in order to reduce disability for the patient (Langhorne & Legg 2003).

When an individual's stroke results in hemiparesis of their dominant arm, their therapist will seek to re-train the accomplished skills that this arm performed prior to stroke. If arm recovery proves unlikely, the therapist may then aim to train the individual to use their non-dominant arm to perform complex unilateral skills (Waller & Whitall 2008). The ideal rehabilitation outcome would be to restore function to the affected upper limb thereby promoting bilateral upper limb activity, however depending on the severity of initial paresis, restoration is not always possible. In cases where there is severe hemiparesis in the affected upper limb with no signs of muscle activity or recovery, the focus of rehabilitation will likely shift from restoration of function in that affected limb, to compensation strategies using the other non affected limb. Whilst recovery from stroke is difficult to predict with absolute certainty, there is evidence to suggest

that the majority of recovery occurs within the first three to six months (Skilbeck et al 1983; Andrews et al 1981). Sensory recovery of the hand and upper limb has been reported many years after stroke (Carey et al 1993; Dannenbaum & Dykes 1983; Yekutiel & Guttmann 1993). However, only 20% (Parker et al 1986) to 56% (Nakayama et al 1994) of patients regain useful upper limb function after three months post stroke. By one year post stroke, no significant improvement is likely to occur (Sunderland et al 1994; Duncan et al 2000).

It is important to note that there is evidence to support the theory that the arm ipsilateral to the stroke lesion may also be affected after stroke (Sunderland 2000; Sunderland et al 1999; Jebsen et al 1971; Desrosiers et al 1996). Although clinicians commonly refer to this arm as "unaffected", studies have reported impairments such as reduced speed of movement and strength (Desrosiers et al 1996; Jones et al 1989), and difficulties associated with apraxia (Sunderland 2000). Although present, these ipsilateral impairments are reported to be subtle compared with the gross sensorimotor damage on the contra lateral side and the impact on function is relatively small (Sunderland 2000). A study by Sunderland et al (1999) demonstrated that within a month of an infarct involving the parietal and/or posterior frontal lobe, the majority of left hemisphere patients and a smaller proportion of right hemisphere patients have impaired dexterity of the ipsilateral hand. The results indicated that dexterity problems were probably due to cognitive deficits affecting perception and the control of action and the impairment was not sufficient to prevent the completion of everyday activities (Sunderland et al 1999).

Previous studies have discussed the importance of being able to use both hands for the specific activity of dressing. Walker and Lincoln (1991) found

that severity of hemiparesis was the strongest correlate of dressing ability. Later, in a study by Walker et al (2004) involving the video analysis of 30 cognitively impaired stroke patients putting on a polo shirt; those patients with upper limb paresis were less successful in donning the item of clothing than those with bilateral arm use. All patients with preserved power in the upper limb (n=13) used both arms and were successful in donning the garment despite having similar cognitive impairment. In comparison, only 5 out of 17 patients with single hand use were successful in the same dressing task. The authors suggested that patients with preserved use of both arms were able to overcome cognitive impairment to dress the upper body, due to the habitual routine nature of the dressing task. They hypothesised that those with a hemiparetic upper limb found it difficult to adopt a new one-handed strategy which involved learning a new method of donning upper body garments.

The study by Walker et al (2004) involved a relatively small sample size (n=20) and the very specific dressing task of putting on a polo shirt. The hypothesis that bilateral arm use was an important factor in the dressing success of cognitively impaired stroke patients therefore required further testing on a larger sample size to ascertain its validity.

As previously described in chapter four, the aim of the DRESS study was to investigate whether a definitive treatment manual could be compiled to address the cognitive impairments which most commonly affect dressing performance. This study examining the effect of upper limb hemiparesis and cognitive impairment on dressing ability, used the same cognitively impaired cohort of DRESS participants (n=70) to explore the importance of bilateral arm use when dressing in the presence of cognitive impairment.

6.3 AIMS OF THE UPPER LIMB STUDY

The primary aim of this upper limb study was to investigate whether one or two-handed use was important in upper body dressing where cognitive impairment was present; by comparing those patients who used a unilateral dressing method with those who used a bilateral method. Of those patients that were not successful in upper body dressing (as determined by an upper body NSDA score of less than 100%), the study sought to explore which group (one-handed or two-handed) showed greater improvement (% improvement in NSDA score) in dressing performance. In addition, the study also sought to explore whether the treatment group (cognitive or functional) had an effect on their dressing performance at outcome NSDA dressing assessment. Finally, the study sought to explore trends in the cognitive assessment scores of those patients who failed to attain successful dressing and whether factors such as hand dominance and side of paresis affected dressing success.

This study will seek to answer the following questions:

(1) Do cognitively impaired stroke survivors perform better at dressing when they have bilateral hand function as compared with unilateral hand function?

(2) Do those with bilateral hand use show greater improvement in dressing ability following an intensive six week rehabilitative dressing treatment?

(3) Do those in the cognitive treatment group reach higher levels of dressing independence than those in the functional treatment group?

(4) Is hand dominance and side of paresis an important factor in dressing ability?

6.4 METHOD

Seventy participants recruited to the DRESS study were assessed at baseline on four cognitive and perceptual tests: the Line Cancellation test (Wilson et al 1987) (Appendix C) to assess visual inattention/neglect; the object decision subtest from the visual object spatial perception (VOSP) assessment (Warrington & James 1991) (Appendix D) to assess spatial perception; the Action Imitation test (Kimura and Archibald 1974) (Appendix E) of apraxia, and the 10-Hole Peg Test (Annett 1992) (Appendix F) using the non-paretic hand was used as a test of attention. The 10-Hole Peg Test can also give an indication of an individual's hand dexterity. Following completion of the cognitive tests, participants' motor performance was assessed using the Motricity Index (Collin & Wade 1990; Wade 1992), to assess upper and lower limb paresis (Appendix G).

The Motricity Index can be used to assess motor impairment in individuals who have had a stroke. Only the upper limb scores were used for this upper limb dressing study. The upper limb section comprises of three tests for each arm:

(1) Pinch grip, using a 2.5cm cube between the thumb and forefinger;

(2) Elbow flexion from 90^{o} so that the arm touches the shoulder;

(3) Shoulder abduction moving the flexed elbow from off the chest.

A scoring system is used to categorise participants' upper limb motor function:

Test 1 (Pinch grip):

0 = No movement

11 = Beginnings of prehension

19 = Grips cube but unable to hold against gravity

22 = Grips cube, held against gravity but not against weak pull

26 = Grips cube against pull but weaker than other side.

33 = Normal pinch grip

Tests 2 & 3:

0 = No movement

9 = palpable contraction in muscle but no movement

14 = Movement seen but not full range/not against gravity

19 = Full range against gravity, not against resistance

25 = Movement against resistance but weaker than other side

33 = Normal power

The scores from the three tests give an indication of the participant's pinch grip, elbow flexion, and shoulder abduction and can be added together to provide an overall score for the arm. These upper limb scores were recorded along with the patient's hand dominance prior to stroke and their side of weakness.

In addition, the participants' level of independence in self care tasks at the time of recruitment was scored using the Barthel ADL Index (Collin et al 1988). This information provided an indication of general functional ability in daily living tasks.

The primary outcome measure used to assess dressing performance was the NSDA (Walker & Lincoln 1990) (Appendix A). The dressing assessment procedure followed has been previously explained (page 69). The patient's

dressing ability was assessed at the baseline assessment period and a percentage score was obtained from the NSDA assessment and rec+orded along with the dressing method used; either using one hand or both hands. For the purpose of this investigation, only the upper body dressing score was calculated. The reason for observation of the upper limb relates to the findings from work by Walker and Lincoln (1991) who found that upper body dressing performance correlated with cognitive ability, whilst lower body dressing performance correlated with physical impairment.

This present study was concerned with cognitive impairment and the affect of upper limb paresis on dressing performance. The lower body dressing scores were not included in this study as difficulties with lower body dressing are likely to be influenced by physical disability. Therefore unsuccessful lower body dressing could be due to an inability to manage independent standing and dynamic standing balance, rather than being a result of cognitive impairment. To eliminate the possibility of dexterity affecting success rather than cognition, the upper body NSDA scores were obtained without including the scores for fastenings e.g. zips, buttons, Velcro, laces, and press studs which are usually scored as part of the NSDA assessment.

As this upper limb dressing study was nested within the DRESS study, following completion of the baseline assessments, participants were randomised to one of two treatment groups; either to the functional approach group or to the cognitive approach group. (These have previously been described on page 70). Participants then received dressing treatment three times a week for six weeks from a DRESS study research therapist according to the prescribed treatment manual as determined by randomisation. The NSDA was repeated again approximately two months

later by a blinded assessor, following the six week period of prescribed dressing rehabilitation. These outcome NSDA assessments were used as the dressing performance outcome scores for the upper limb dressing study. Again the upper body score without fastenings was calculated for each participant.

In order to determine whether there was an association between unilateral (one-handed) or bilateral (two-handed) dressing method and success in upper body dressing, patients were grouped according to dressing method and success or failure in NSDA score. A 2x2 table of performance (success/failure) by treatment group (cognitive/functional) was formulated. The association between dressing method and upper body dressing performance was explored using the Chi-square test for independence.

For those participants who failed dressing at baseline, the percentage improvement was examined between baseline NSDA and outcome NSDA scores and a Mann-Whitney U test was used to explore whether the unilateral or bilateral group showed most improvement in NSDA score.

A chi-squared test was used to explore whether treatment group or hand dominance and side of weakness had a significant effect on the success or failure of those in the unilateral dressing group.

6.5 RESULTS

6.5.1 PARTICIPANT CHARACTERISTICS

The characteristics of the 70 patients recruited to the study are shown in table 4. Seventy acute stroke patients (42 women:28 men) were recruited to the upper limb study with 42 patients having left arm paresis, and 28

having right arm paresis. Of the 70 participants, 68 (97%) were previously right hand dominant, whilst only 2 (3%) were left hand dominant. Among the 42 cases with left arm paresis, 26 used a one handed dressing method, and 16 used a two handed method. Of the 28 cases with right arm paresis, 8 used a one handed dressing method, while 20 used both hands to dress.

Table 4: Participant characteristics

	Left paresis (n=42)	**Right paresis (n=28)**
Age in years Mean (SD) Range	 77 (11) 47-93	 76 (13) 41–96
Sex Men:Women	 12:30	 16:12
Days since stroke onset Median (IQR) Range	 27 (20,51) 12-99	 26 (20,33) 13–139
Hand dominance Right:Left	 41:1	 27:1
Barthel Score on recruitment Median (IQR) Range	 5 (3,8) 1–16	 7 (4,12) 0–17
Number of dressing treatments Median (IQR) Range	 13 (9,16) 0–18	 9 (4,14) 0-18
Dressing method One handed:two handed	 26:16	 8:20
Motricity Index Total Arm Score Median (IQR) Range	 28 (7,61) 0-99	 68 (39,97) 0-99

6.5.2 THE RELATIONSHIP BETWEEN DRESSING METHOD AND SUCCESS OR FAILURE IN UPPER BODY DRESSING.

(Question 1: Do cognitively impaired stroke survivors perform better at dressing when they have bilateral hand function, as compared with unilateral hand function?)

The chi-square test for independence was used to generate a 2 by 2 table exploring the relationship between the two categorical variables of dressing method and success or failure at upper body dressing. Table 5 groups the participants according to dressing method (one or two handed dressing) and success (100% NSDA score) or failure (NSDA<100%) in upper body dressing at initial assessment.

Table 5: 2x2 table of dressing method & success/failure at upper body dressing at initial NSDA assessment.

		Failure	Success	Total
One handed dressing	Count	34	0	34
	% of Total	49%	0%	49%
Two handed dressing	Count	23	13	36
	% of Total	32%	19%	51%
Total	Count	57	13	70
	% of Total	81%	19%	100%

All 34 participants who used a one handed dressing method failed upper body dressing. There were 36 participants who were able to use both hands for dressing. Of these, 23 (63.9%) failed upper body dressing and 13 (36.1%) were successful. These results suggest that the ability to use both hands for dressing may have a positive effect on dressing performance.

A Chi-square test for independence (with Yates Continuity Correction) indicated a significant association between dressing method and dressing success, χ^2 (1, n=70)=12.79, p<0.001, phi=0.47. Therefore the Chi-square test demonstrates a significant result. The dressing success of the one handed group is significantly different from the two handed group. With no cases of successful dressing in the one handed dressing group. These results indicate that there is an association between dressing method (one handed or two handed) and dressing success (Score of 100% on the NSDA) in the presence of cognitive impairment.

Table 6 shows the comparison of groups, defined by dressing method and success or failure at dressing at the initial baseline assessments. Table 6 shows that at the initial baseline dressing assessment, 57/70 (81%) patients were unable to dress their upper body independently. The median NSDA score for the 57 patients upper body dressing ability was 38% (range = 0%-96%). Following randomisation to one of the two dressing treatment groups, 65 participants completed the prescribed dressing intervention (cognitive group = 34 patients; functional group = 31 patients) and outcome assessments.

Table 6: Initial assessment: comparison of groups, defined by use of one or both hands and success or failure in dressing.

	Both hands, Successful	Both hands, Failure	One hand, Failure
Number of cases	13	23	34
Side of paresis Left:right	 4:9	 11:12	 26:8
Hand dominance Left:right	 2:11	 0:23	 0:34
NSDA % Median (SD) Range	 100 100	 75 (29) 6-96	 28 (24) 0–75
Barthel Score Median (SD) Range	 4 (4) 1-17	 8 (5) 1-17	 5 (3) 0–10
Motricity Index, arm Median (SD) Range	 85 (17) 42–99	 70 (21) 39-99	 9 (16) 0–50
Dexterity/Concentration, non-paretic hand, 5 trials of 10 pegs Median (SD) time (sec) Range N impaired**	 N=13 19 (6) 14-39 12	 N=22 28 (11) 16–50 18	 N=34 19 (14) 10–50 24
Line Cancellation Correct/36 Median (SD) Range N impaired (<34)*	N=13 36 (7) 12-36 3	N=22 35 (12) 0-36 9	N=34 26 (12) 4–36 24
Object Decision Correct/20 Median (SD) Range N impaired (<14)*	N=13 14 (4) 7-18 3	N=22 11 (3) 6-18 13	N=34 10 (4) 3–20 21
Action imitation Median (SD) Range N impaired (<15 on demonstration)*	N=13 19 (2) 12-20 1	N=23 17 (5) 4-20 8	N=34 19 (5) 2-20 5

*<5th percentile for normal elderly people. (Wilson et al 1987; Warrington & James 1991) **2SD above the poorest scores reported by Turton (Turton & Butler 2004; Turton & Fraser 1986).

Table 7 shows the comparison of groups, defined by dressing method and success or failure in dressing at the final outcome assessments.

Table 7: Outcome assessment: comparison of groups, defined by use of one or both hands and success or failure in dressing.

	Both hands, Successful (N=25)		Both hands, Failure (N=9)		One hand, Success (N=7)		One hand, Failure (N=24)	
Treatment group	Cog	Func	Cog	Func	Cog	Func	Cog	Func
Number of cases	12	13	6	3	5	2	11	13
Side of paresis Left:right	4:8	6:7	4:2	2:1	4:1	1:1	7:4	11:2
Hand dominance Left:right	1:11	0:13	1:5	0:3	0:5	0:2	0:11	0:13
Outcome NSDA final % score Median (SD) Range	100 100	100 100	82(33) 6-94	88(11) 75-96	100 100	100 100	63(31) 0-88	56(23) 6-88
Motricity Index, arm (baseline) Median (SD) Range	87(19) 49-99	88(18) 42-99	59(16) 39-88	47(20) 39-77	28(19) 0-50	9(13) 0-18	0(6) 0-18	9(15) 0-39
Dexterity/Concentration non-paretic hand, 5 trials of 10 pegs Median (SD) time (sec) Range N impaired**	18(13) 0-50 1	18(7) 13-40 0	20(13) 14-50 0	18(6) 17-29 0	12(6) 9-24 0	11(1) 10-12 0	16(14) 11-50 0	16(13) 12-50 1
Barthel Score Median (SD) Range	9(4) 3-16	7(5) 1-17	4(1) 3-6	16(9) 1-17	6(2) 2-8	6(6) 2-10	5(3) 0-9	5(2) 2-8
Line Cancellation Correct/36 Median (SD) Range N impaired (<34)*	36(13) 0-36 2	36(14) 0-36 4	36(12) 7-36 1	25(7) 22-36 2	36(1) 33-36 1	36(0) 36 0	35(11) 9-36 4	33(12) 5-36 6
Object Decision Correct/20 Median Range N impaired (<14)*	16(6) 0-17 4	15(6) 0-19 4	16(6) 3-19 2	16(8) 4-18 1	18(2) 14-19 0	17(4) 14-20 0	12(6) 0-20 5	13(5) 6-19 6
Action imitation Median Range N impaired (<15 on demonstration)*	19(6) 0-20 1	19(3) 7-20 1	19(1) 18-20 0	17(6) 9-20 1	19(1) 18-20 0	17(5) 13-20 1	19(7) 1-20 2	19(1) 15-20 0

*<5th percentile for normal elderly people. (Wilson et al 1987; Warrington & James 1991) **2SD above the poorest scores reported by Turton (Turton & Butler 2004; Turton & Fraser 1986).

At outcome assessment, 33/65 (51%) participants were unable to dress their upper body independently. At initial assessment 13 participants were independent in upper body dressing with an NSDA score of 100%. By outcome assessment the number of successful cases had increased by 19, resulting in 32 participants being independent in upper body dressing (NSDA score of 100%).

A 2 by 2 table was generated to explore the relationship between the two categorical variables of dressing method and success or failure at upper body dressing for the outcome data. Table 8 groups the participants according to dressing method (one or two handed dressing) and success (100% NSDA score) or failure (NSDA<100%) in upper body dressing at final outcome assessment following a six week period of dressing rehabilitation.

Table 8: 2x2 table of dressing method & success/failure at upper body dressing at outcome NSDA assessment.

		Failure	Success	Total
One handed dressing	Count	24	7	31
	% of Total	37%	11%	48%
Two handed dressing	Count	9	25	34
	% of Total	14%	38%	52%
Total	Count	33	32	65
	% of Total	51%	49%	100%

At NSDA outcome assessment, of the 31 participants who used a unilateral (one handed) dressing method, 7 had achieved a successful outcome (100% NSDA score) compared to initial NSDA assessment where 0 participants were successful with upper body dressing. The number of participants achieving a successful (100%) upper body dressing NSDA

score in the bilateral (two handed) dressing group, had increased from 13 to 25 participants.

A Chi-square test for independence (with Yates Continuity Correction) was performed for the outcome assessment NSDA data to test the significance of being able to use both hands when performing upper body dressing. The Chi-square test again indicated a significant association between dressing method and dressing success, χ^2 (1, n=65) = 14.86, p<0.001, phi=0.5. Therefore the Chi-Square test demonstrates a significant result. The dressing success of the one handed group was significantly different from the two handed group. This reaffirms the association found in the analysis of the baseline data between dressing method (one handed or two handed) and dressing success (Score of 100% on the NSDA).

6.5.3 IMPROVEMENT IN DRESSING BETWEEN THE ONE HANDED AND TWO HANDED DRESSING GROUPS.

(Question 2: Do those with bilateral hand use show greater improvement in dressing ability following rehabilitative dressing treatment?)

At initial NSDA baseline assessment 13/70 (19%) participants achieved independence in upper body dressing (NSDA of 100%). Of the 57 participants who were dependent for upper body dressing (NSDA<100%), NSDA score ranged from 0 – 96% with a median score of 38 (SD 32).

Of the 57 participants who were dependent for upper body dressing at initial baseline assessment, 53 completed the DRESS study dressing treatment and outcome assessments. The median NSDA score for these

53 participants at baseline assessment was 50% (SD 32), with a minimum score of 0% and a maximum score of 96%. The median NSDA score for the same 53 participants at outcome assessment was 88% (SD 29), with a minimum score of 0% and a maximum score of 100%.

Of these 53 participants, their improvement in dressing performance was examined by comparing their baseline NSDA final percentage score with their outcome NSDA final percentage score. The participants were grouped according to dressing method (one handed or two handed) and the improvement in percentage score was examined between the two NSDA scores to explore whether the unilateral or bilateral group showed greater improvement in dressing ability. A Mann-Whitney U Test was performed for this purpose.

Of those participants who did not achieve successful independent dressing (NSDA score of 100%) at initial baseline assessment and went on to complete the study (n=53), a Mann-Whitney U test revealed a significant difference in the dressing performance (NSDA % score) of the two handed group (Median = 78, n =22) and the one handed group (Median = 29, n =31). U = 118, z=-4.045, p=<0.001, r=0.6.

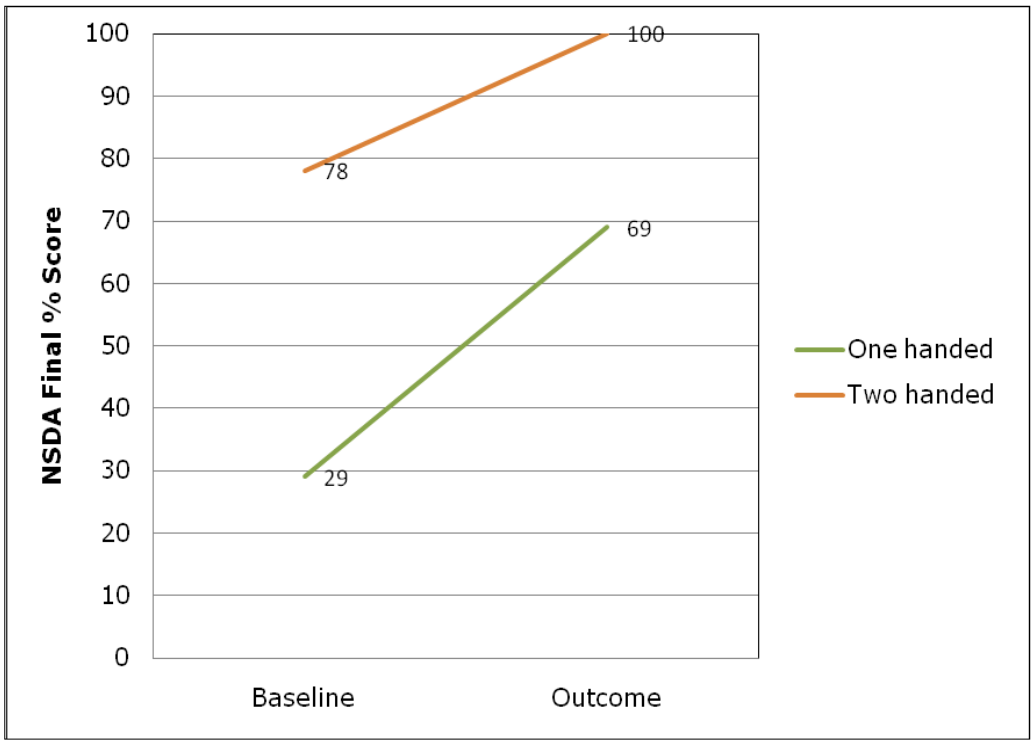
The approximate r value is obtained by calculating the formula: r = z / square root of N where N = total number of cases (Pallant 2007). The r value is 0.6. This would be considered a large effect size using Cohen (1988) criteria of 0.1=small effect, 0.3=medium effect, 0.5=large effect.

The Mann-Whitney U test was repeated for the outcome NSDA scores of the same 53 participants who were unsuccessful at dressing (NSDA scores<100%) at baseline. Of those participants who did not achieve

successful independent dressing (NSDA score of 100%) at outcome assessment, a Mann-Whitney U test revealed a significant difference in the dressing performance (NSDA % score) of the two handed group (Median = 100, n =22) and the one handed group (Median = 69, n =31). U = 136, z=-3.846, p<0.001, r=0.5. These results demonstrate that bilateral hand use positively affects dressing performance post stroke as compared with a one handed dressing method, where cognitive impairment is also present.

The % improvement in final NSDA % scores of the 53 participants who were initially dependent for upper body dressing was examined between the groups on two layers; one or two handed dressing, and treatment group allocation. Figure 2 shows the amount of improvement in the dressing ability of the 53 participants who were not independent at baseline NSDA assessment. The participants have been grouped according to dressing method used (one or two handed) and the group median scores have been plotted for the baseline NSDA final % score, and the outcome NSDA final % score. A Mann-Whitney U test revealed a significant difference in the NSDA change scores of the one handed group (Md = 37, n =31) and two handed group (Md = 16, n =22), U = 264, Z = -1.39, p=.16, r=.19. From the graph it is clear that although there has been marked improvement in the median NSDA scores of both groups, the two handed group has a median score of 100% at the outcome assessment period which represents independent dressing; compared with the one handed group whose median dressing score was only 69%.

Figure 2: A line graph showing improvement in dressing ability (group median NSDA scores) according to dressing method used.



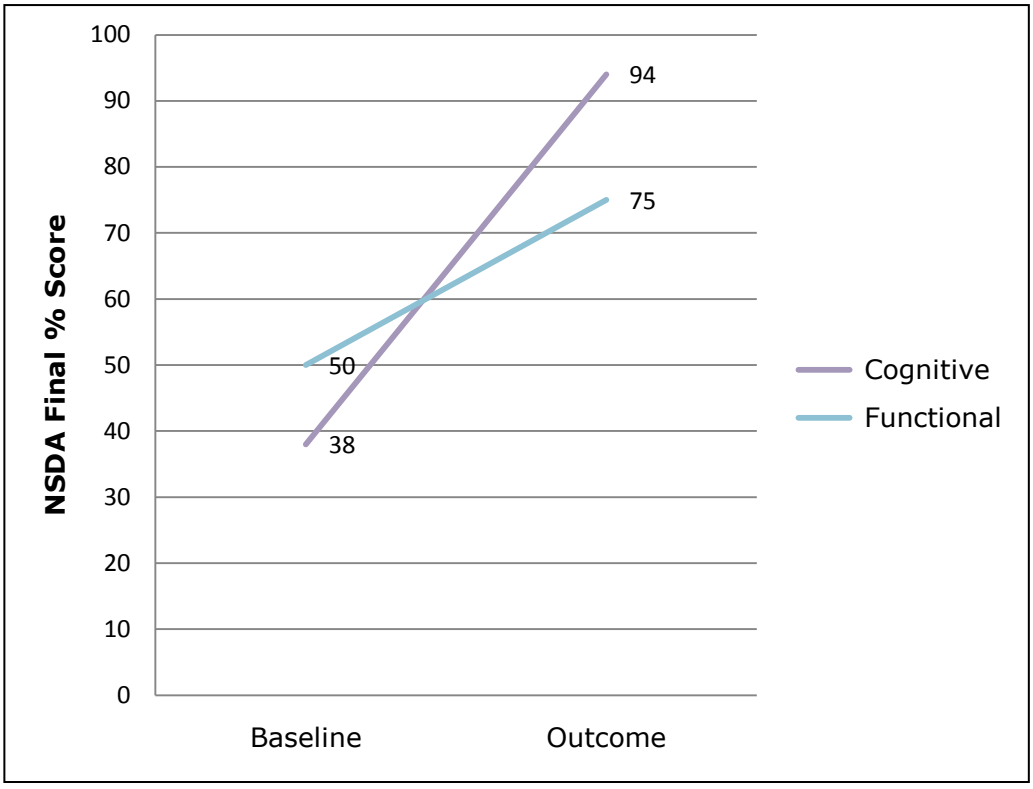
6.5.4 IMPROVEMENT IN DRESSING BETWEEN THE COGNITIVE AND FUNCTIONAL TREATMENT GROUPS.

(Question 3: Do those in the cognitive treatment group reach higher levels of dressing independence than those in the functional treatment group?)

Having explored the change in scores of participants grouped according to dressing method (one or two handed dressing), the data was then explored according to treatment group (cognitive or functional). Figure 3 shows the change in median group NSDA score (improvement in dressing performance) between baseline assessment and outcome assessment for

participants grouped according to treatment randomisation group (cognitive or functional). A Mann-Whitney U test revealed a statistically significant difference in the NSDA change scores of the cognitive group (Md = 12, n=29) and the functional group (Md = 19, n=24), U = 316, z=-.58, p=.5, r=.08. The graph illustrates that the cognitive treatment group showed greater improvement in median NSDA scores between the baseline and outcome assessment periods.

Figure 3: A line graph showing improvement in dressing ability (group median NSDA scores) according to treatment group.



6.5.5 IMPROVEMENT IN UPPER BODY DRESSING WHEN GROUPED ACCORDING TO DRESSING METHOD AND TREATMENT GROUP.

(Question 4: When participants are grouped according to dressing method and treatment group, which group will achieve most improvement in dressing ability?)

The participants were then grouped into four separate groups according to dressing method and treatment group (one handed & cognitive, one handed & functional, two handed & cognitive, two handed & functional). The group median scores were then plotted for the two assessment periods (baseline and outcome). Figure 4 shows the results of this analysis. The change scores for the four groups were as follows: one handed, cognitive group median = 50, n=16; one handed, functional group median = 25, n=15; two handed, cognitive group median = 12, n=13; two handed, functional group median = 19, n=9.

Figure 4: A line graph showing improvement in dressing ability (group median NSDA scores) according to dressing method and treatment group.

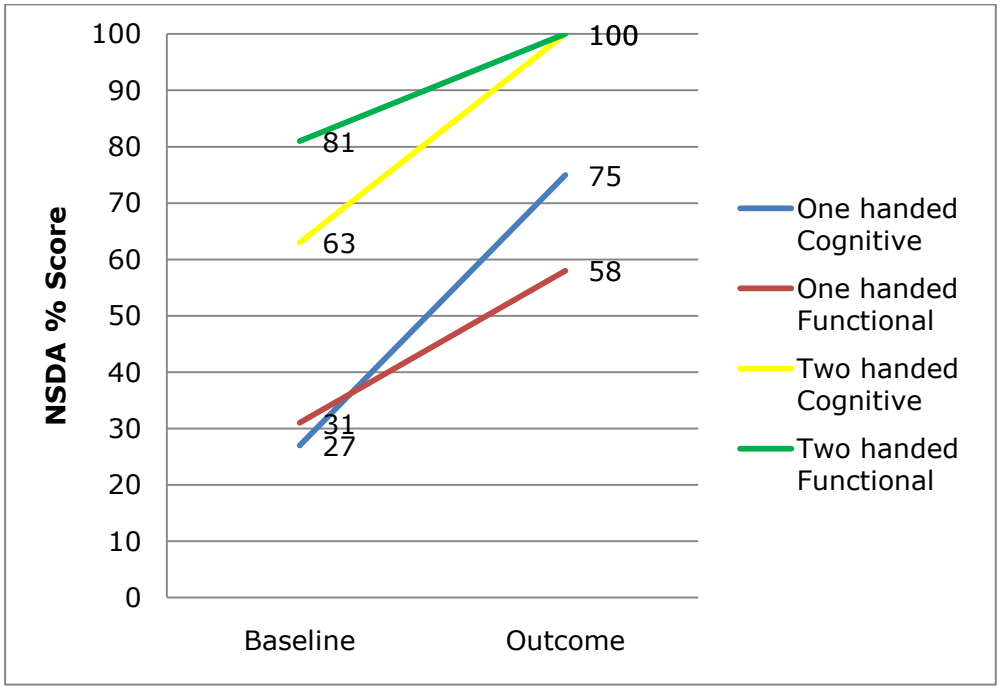


Figure 4 shows that the median NSDA scores for both of the two handed groups were higher at baseline than both of the one handed groups. By the outcome assessment period both the two handed groups had a median score of 100%. This is the highest score possible on the NSDA and therefore there is a ceiling effect.

6.5.6 THE RELATIONSHIP BETWEEN HAND DOMINANCE AND HEMIPARESIS AND DRESSING PERFORMANCE

(Question 5: Is hand dominance and side of paresis an important factor in dressing ability?)

It was not possible to explore whether there was a relationship between hand dominance being the same side as upper limb paresis and dressing performance (NSDA score) due to groups not being evenly matched for hand dominance, with only one left hand dominant participant.

6.6 DISCUSSION

6.6.1 PARTICIPANT CHARACTERISTICS

The study included 70 patients with cognitive impairment (as assessed on four baseline tests) and known dressing difficulties as a result of stroke. There were more female than male patients recruited to the study and there were more participants with left sided paresis than with right hemiparesis (42:28). Although the groups were equally matched in terms of mean age, time since stroke onset, hand dominance, and Barthel score.

The majority (97%) of participants were previously right hand dominant with only two being left handed. Therefore most participants "unaffected", non paretic arm was the same as their usually dominant hand. Of those with left arm weakness, the majority used a one handed dressing method, making use of their preferred dominant hand. In contrast, of those who had right arm paresis, the majority used both hands to dress. One rationale for this could be that when the dominant hand is unaffected by stroke, the individual prefers to adopt a uni-manual approach to tasks as

they have more finely tuned dexterity established in this hand. In contrast, if the dominant hand is affected, the non dominant hand may lack the dexterity to perform tasks alone and therefore the individual has more motivation to involve their affected hand in tasks.

From the sample of participants, the upper limb Motricity Index scores were examined and it was observed that all those with preserved power in the upper limb used both arms when dressing. This would suggest that those using a one handed method were doing so due to a complete lack of function in the affected hand rather than reduced strength and movement only.

6.6.2 THE RELATIONSHIP BETWEEN DRESSING METHOD AND SUCCESS OR FAILURE IN UPPER BODY DRESSING.

(Question 1: Do cognitively impaired stroke survivors perform better at dressing when they have bilateral hand function, as compared with unilateral hand function?)

At the baseline assessment period, prior to the commencement of dressing treatment, the participants were grouped according to dressing method (one or two handed dressing) and the numbers of participants in each group were closely matched. All the participants who used a one handed dressing method failed upper body dressing. All participants in the one handed group were right hand dominant and more than three quarters of this group had a left side paresis and therefore had the use of their usually dominant hand. Of the participants able to use both hands when dressing, approximately a third of the group were successful in upper body dressing and were considered to be independent on the NSDA for the upper body at

baseline assessment. At this baseline assessment period none of the participants had received any dressing treatment from the DRESS study therapists and therefore those unable to use their usual bimanual dressing method would not have received advice and repetitive practice using a one handed dressing method.

There were 65 participants who completed the study and of the one handed group (who had all failed at upper body dressing at baseline) seven achieved a successful independent dressing outcome following a six week period of dressing rehabilitation on the DRESS study. Of those able to use both hands, there was a greater success rate with the number of participants becoming independent almost doubling. Three times as many participants achieved successful independent dressing at outcome compared with the successful participants in the one handed group. The results of this aspect of the study found the dressing success of the one handed group to be significantly different from the two handed group.

These results would suggest that stroke survivors who have cognitive impairment but remain able to use both hands are more likely to achieve independent dressing than those who have a hemiparesis preventing bilateral function. These results are not in keeping with the suggestion by Walker et al (2004) who stated that 'routine manual tasks are robust in the face of cognitive deficit'. It would seem that routine manual tasks involving bilateral upper limb activity such as dressing can pose a difficulty to those with a hemiparesis and cognitive impairment due to the need to problem solve and re-learn a one handed strategy.

An important factor to note is that the two handed group who failed upper body dressing, had a lower group median score for the arm score on the

Motricity Index than the two handed group who were successful. The two handed failure group had a group median score of 70 in comparison to the two handed successful group whose group median score was 85. Similarly the results of the 10-hole peg test demonstrate that of the two groups of participants able to use both hands for dressing, the successful group had more active range of movement in their affected upper limb and more dexterity in the affected hand. The scores on the three cognitive tests for visual neglect, visual spatial perception, and apraxia were more closely matched for the two groups able to use both hands for dressing. This supports the notion proposed by Walker and Lincoln (1991) that hemiparesis is the strongest correlate of dressing ability.

6.6.3 IMPROVEMENT IN DRESSING BETWEEN THE ONE HANDED AND TWO HANDED DRESSING GROUPS.

(Question 2: Do those with bilateral hand use show greater improvement in dressing ability following rehabilitative dressing treatment?)

The participants who were initially unsuccessful with dressing at baseline NSDA assessment were compared by group according to dressing method (one or two handed). The NSDA scores for the baseline and outcome Assessments were explored. The results of the Mann-Whitney U test demonstrated a significant difference in the dressing performance of the two groups. This demonstrated that bilateral hand use positively affects dressing performance post stroke as compared with a one handed method. The functional approach involves teaching patients how to dress using a one handed technique. Yet those able to use both hands and a two handed technique were more successful in dressing their upper body.

The percentage improvement in final NSDA scores of the participants who were initially dependent for upper body dressing was examined according to dressing method. When grouped according to dressing method, although there was marked improvement in the median NSDA scores of both groups, the bilateral dressing group scored significantly higher at both assessment points. By outcome the bilateral group had achieved a group median NSDA score of 100% compared with 69% for the unilateral group.

The results suggest that those with bilateral hand use are more likely to achieve a higher level of independence in dressing following a rehabilitative dressing treatment. These results reaffirm the previous findings of Walker and Lincoln (1991) and Walker et al (2004).

6.6.4 IMPROVEMENT IN DRESSING BETWEEN THE COGNITIVE AND FUNCTIONAL TREATMENT GROUPS.

(Question 3: Do those in the cognitive treatment group reach higher levels of dressing independence than those in the functional treatment group?)

When participants were grouped according to treatment group (cognitive or functional), the cognitive group, although starting from a lower baseline group median NSDA score, showed greater improvement in dressing ability. This was suggestive of those participants assigned to the cognitive treatment group achieving more successful outcomes than those receiving the functional dressing approach.

These results would suggest that those in the cognitive group did reach higher levels of dressing independence. The main DRESS RCT will report

the final results of the two dressing approaches on full body dressing performance but early analysis of results confirm similar findings to the present study. From this upper limb study, the results suggest that the cognitive dressing approach is more effective than the functional approach in enabling cognitively impaired stroke survivors to reach a successful dressing outcome in upper body dressing without the inclusion of fastenings.

6.6.5 IMPROVEMENT IN DRESSING WHEN GROUPED ACCORDING TO DRESSING METHOD AND TREATMENT GROUP.

(When participants are grouped according to dressing method and treatment group, which group will achieve most improvement in dressing ability?)

To explore the level of improvement in NSDA scores further, the participants were then grouped into four separate groups according to dressing method and treatment group (one handed and cognitive, one handed and functional, two handed and cognitive, two handed and functional). Both two handed groups achieved greater independence in dressing than the one handed groups. Although in figure 4, the gradients of the two lines representing both of the one handed groups are steeper than those representing the two handed groups, suggesting a greater amount of improvement, it would be incorrect to draw that conclusion due to the ceiling effect of the two handed groups median outcome NSDA scores. Rather, the graph illustrates that all four groups showed improvement between baseline and outcome median NSDA scores, but whereas both the two handed groups reached an outcome median NSDA score of 100%, representing complete dressing independence, the one

handed groups at both assessment periods were lower. Of both the one handed groups, those participants using a one handed dressing method and receiving the cognitive treatment showed greater improvement than those in the one handed group receiving the functional treatment.

However, when the participants are grouped into four groups, the numbers in each group are not large enough to draw conclusions as to the significance of the treatment group on dressing outcome. The effect of the two treatment groups are being explored separately in the main DRESS RCT.

This study has demonstrated that there is a strong association between dressing method (one or two handed) and dressing success, in the presence of cognitive impairment. These results are consistent with findings of a similar smaller study by Walker et al (2004).

As the sample size and the characteristics of the participants did not permit the analysis of the affect of hand dominance and side of upper limb weakness on dressing performance; future research involving a larger cohort of participants is needed to explore this question further.

CHAPTER 7

A SURVEY TO EXPLORE THE ACCEPTABILITY OF THE TREATMENT APPROACHES USED IN THE DRESS STUDY

7.1 CHAPTER OVERVIEW

This acceptability study concluded the three part programme of dressing research. The purpose of this final study was to explore the acceptability of the treatment approaches used in the DRESS study to the participants who received them. This chapter will begin with an introduction to explain what is meant by the term 'acceptability' and why it may be considered important to ensure that treatments are acceptable to patients. It will provide a brief history of the change in attitude to involving patients and consumers in research and treatment evaluation. The introduction will go on to discuss different potential methods of evaluating acceptability of treatment, before going on to describe the methods used in this acceptability study. The results of the acceptability study will be given, followed by a discussion of the possible implications for a further phase III DRESS research study and future dressing practice.

7.2 INTRODUCTION

This study aimed to explore the acceptability of the treatment approaches used in the DRESS study. The term "acceptability" in this instance refers to whether the treatments were satisfactory and agreeable to the study participants. The Department of Health (2008b) requires healthcare research to be based on evidence of need and what has been proven to be most effective in meeting those needs. However, whilst patients'

rehabilitation requirements and effectiveness of treatment are important, it is also important to explore the acceptability of treatment methods to those receiving them. Ley (1990, p1) states that patients' satisfaction with the care they receive is an important determinant of patients' compliance. There is little merit in attempting to implement research evidence for a particular treatment approach if patients do not believe the treatment to be relevant, and are therefore non-compliant with the treatment thus rendering it ineffective. An evaluation of the research participants' experience of the research intervention should therefore be considered an integral part of the overall research process.

Historically, patients were not typically consulted on their treatment or the research process. Many treatments administered to patients were not useful, potentially harmful or unproven (Consumers in NHS Research 1999). Evaluation of acceptable treatments traditionally relied almost exclusively on outcome measures of patient change. However in the late 1970s, investigators began discussing the need for broader criteria to evaluate treatment, in addition to measures of efficacy (Garfield 1978; Kazdin & Wilson 1978; Strupp & Hadley 1977; Wolf 1978; Kazdin 1980). Wolf (1978) proposed that an important dimension to assess was the acceptability of treatment.

Acceptability refers to the 'judgements about the treatment procedures by non-professionals, lay persons, patients, clients, and other potential consumers of treatment' (Kazdin 1980). According to Kazdin (1980) judgements of acceptability are likely to embrace evaluation of whether treatment is appropriate for the problem, whether treatment is fair, reasonable, intrusive, and whether treatment meets with conventional

notions about what treatment should be. In general, acceptability refers to the overall evaluation of the procedures (Kazdin 1980).

In 1996 the Department of Health's Director of Research and Development established a subgroup of the Central Research and Development Committee known as 'Consumers in NHS Research'. One of the primary objectives of Consumers in NHS Research was 'to monitor and evaluate the effects of consumer involvement in NHS research and development' (Buckland & Gorin – Consumers in NHS Research Support Unit 2001). The involvement of consumers in the research process leads to research that is more relevant to the needs of consumers (and therefore to the NHS as a whole), more reliable, and more likely to be used. Therefore if research reflects the needs and views of consumers, it is likely to produce results that can be used to improve practice (Buckland & Gorin – Consumers in NHS Research Support Unit 2001).

In 1997 the Government published a white paper, 'The New NHS: Modern Dependable', which announced new measures aimed at helping to ensure that research played a greater role in changing the way the NHS was run (Department of Health 1997). Two years later Consumers in NHS Research held a conference entitled 'Research: Who's Learning' at Kensington Town Hall in January 2000. At this conference Lord Hunt spoke (in his capacity as Parliamentary Under Secretary of State for Health) about 'the difficulty of convincing some professionals that patients and the public should be involved in healthcare decisions', and stated that 'the different and various views of users are needed in order to develop a service that truly reflects their needs' (Consumers in NHS Research 2000). Lord Hunt stated that the government was working towards greater public involvement by producing such guidelines as the 'Patient and Public involvement in the new

NHS' paper (Department of Health 1999). Patient and public involvement in the new NHS was a document produced to re-state the aims and benefits of patient and public involvement, identify key areas for action, and offer examples of good practice (Department of Health 1999). Its purpose was 'to stimulate further action to involve patients, users, carers and the public in health and health services, highlighting the opportunities which the Government's NHS reforms offered to develop effective patient and public partnership' (Department of Health 1999).

The white paper 'The NHS – Modern and Dependable' (Department of Health 1997) had already been produced to advise that the progress of healthcare services should be measured from the patient's perspective. This white paper focussed on the progress and improvement of clinical practice rather than patient involvement in health related research.

'Consumers in NHS Research' was renamed 'INVOLVE' in 2003, but its purpose, to act as a national advisory group on patient involvement in research, largely remained the same. INVOLVE continues to provide support in ensuring that people's involvement in research 'improves the way that research is prioritised, commissioned, undertaken and disseminated' (Involve 2004). It encourages members of the public to get involved in research 'through consultation, collaboration and user-led or user-controlled research' (Tarpey & Royle 2006). When patients are involved in the research process, it is believed that the research is more relevant to patients and more likely to reflect their needs and views (Involve 2004). Indeed, certain commissioners of research projects, such as The Big Lottery, will not fund projects without user involvement (Tarpey & Royle 2006). User involvement is required to evaluate acceptability of treatments used in research and practice. Without a thorough evaluation

of acceptability, treatment may be efficacious but have little impact if it is not implemented and followed (Symons et al 2006). Acceptability may therefore directly affect compliance and ultimately the success of a treatment approach. There is also an ethical and legal responsibility to ensure that treatments are acceptable to patients and consumers (Kazdin 1980). Acceptability surveys allow healthcare research to be evaluated by the subjects of the research and are a positive way of ensuring consumer involvement in the research process. Listening to patients' views is essential to providing a patient-centred health service. It is pleasing that in many areas of medicine and rehabilitation, the criteria used to evaluate treatment interventions and outcomes is changing from efficacy only toward a more complete analysis of treatment goals, procedures, outcomes, and resources required to achieve those outcomes and improve overall quality of care (McCarthy et al 2005).

7.3 AIMS OF THE ACCEPTABILITY STUDY

With reference to the DRESS study, the researcher was interested in conducting a survey to explore patients' views on the specific dressing treatment approaches used in the DRESS study. The cognitive treatment approaches used in the DRESS study are new and novel techniques not previously used as part of dressing rehabilitation treatment. The researcher was therefore keen to answer a number of questions related to the acceptability of these DRESS study treatment approaches and the research methods employed on the DRESS study.

The aims of this current acceptability study were to establish patients' views on:

a) the importance of independent dressing ability,

the acceptability of:

b) the different dressing treatment approaches,

c) the frequency of treatment sessions,

d) the duration of treatment sessions,

and:

e) the success of the dressing treatment sessions.

The Researcher also wanted to compare the responses to the survey questions between the two treatment groups (cognitive group and functional group) to explore whether participants viewed their experience on the DRESS study differently depending on the treatment group they had been randomised to.

As a third of stroke patients are known to have aphasia it was considered important not to exclude these patients. Aphasic patients were included in the DRESS study in order to ensure the study sample was representative of the stroke population. If aphasic patients were excluded from this acceptability study then the study sample would not be representative of the stroke population involved in the DRESS study. People with aphasia can and have been included in assessments (Townend et al 2007) and should therefore also be included in evaluative surveys. It may be that the participants with aphasia had different views and opinions on the DRESS study treatment approaches to the participants who did not have communication impairment and therefore it was important that this possibility was addressed. There are a number of supportive techniques, often referred to as 'communication ramps', for supporting communication

in people with aphasia. These may include using written key phrases and pictures, simplifying verbal communication as much as possible to enable yes/no responses, and observation of gestures (Worral et al 2005). There was therefore no valid reason to exclude aphasic patients and communication ramps were utilised to aid their participation in the survey. In order to make the questions accessible to those patients with communication impairment, the author devised one main questionnaire, a second 'aphasia friendly' version with simplified sentences and pictures and symbols to aid communication and a third much shorter and simplified version for the severely communication impaired patients.

This decision was reached following a review of the stroke rehabilitation literature, discussions with research colleagues, and in consultation with experts in the practice of speech therapy and the Nottingham Stroke Consumer Group (NSPCG). The NSCG is a group made up of stroke survivors of various backgrounds (including business, university lecturing, the civil service, nursing, manufacturing and IT) who meet four times a year with senior academics and researchers from the University of Nottingham to discuss and evaluate stroke research proposals and grant applications. The group's aim is to improve and develop treatment for stroke by focusing research more closely on the needs of stroke survivors.

7.4 METHOD

The views of the DRESS study participants were to be surveyed. Surveys are a common method of collating individuals' views and evaluating treatments and services. Most surveys are carried out for descriptive purposes (Robson 1993). Robson (1993) advises that surveys work best

with standardised questions where there is confidence that the questions mean the same thing to different respondents, although he also recognises that this is a condition which is difficult to satisfy when the purpose is exploratory. There are advantages and disadvantages to both postal and self-administered surveys and interview surveys. Whilst postal and self-administered surveys can be disadvantaged by things such as low response rates and ambiguities in, and misunderstandings of the survey question not being detected; interviews also have their disadvantages. It is possible for interview data to be affected by interviewer bias and also for respondents to feel their answers are not anonymous which may result in them being less open and truthful with their responses. However, an advantage of using an interview survey strategy is that the interviewer can clarify questions and this is particularly useful when interviewing patients with communication and/or cognitive impairment.

An alternative method to meet the aims of this acceptability study may have been to use focus groups. However this option was not favoured for a number of reasons. Focus group sessions would have had additional time and cost implications for both the researcher and the participants involved. There would be less anonymity and therefore an increased risk of interviewer bias. If focus groups had been chosen as the survey method for this study there would have been an increased possibility of introducing bias as for reasons of practicality the most articulate and able DRESS participants may have been selected to participate in the focus group sessions. It would have been impractical to involve all 70 DRESS study participants in a focus group but by opting to instead add a survey questionnaire to the outcome assessments, all DRESS study participants could potentially be involved in the evaluation of the DRESS study.

Initially, the questions that might ascertain how the DRESS participants felt about the treatment approaches they received were listed by the researcher who had been the research occupational therapist on the DRESS study. It was essential that the questions were relevant for all participants regardless of which treatment group (cognitive or functional) they had been randomised to. Following the compilation of the list of survey questions the researcher sought feedback from three research colleagues on the DRESS study steering group. Their opinion was sought because they had first-hand knowledge of the treatment approaches used in the study together with an understanding of the assessment process the DRESS study participants had undergone. The wording of the questions was altered slightly and an extra question was added. Appropriate wording of the questions was an important factor in ensuring the survey was accessible to the whole spectrum of participants included in the study.

A questionnaire was created that was simple and clear to follow with a tick box system for responses. This questionnaire was then to be used as an interview tool by the masked therapist conducting the DRESS study outcome assessments, rather than a questionnaire that would require patients to self complete. This solved the potential problem of any patients who may be unable to read, self-complete, and return the questionnaire form. Having the survey administered immediately following completion of the treatment period, during the outcome assessment visit, meant that the DRESS treatment experience was more likely to still be fresh in the mind of the participants. It also increased the likely response rate as participants were not required to self complete and post the forms back to the researcher. The therapist involved in administering the questions was masked as to which treatment each participant had received. Also, because this therapist had not been involved in any of the DRESS study

dressing treatment sessions, it was likely that participants might be more open and honest with their responses than if the treating therapist was to conduct the survey questionnaire.

The questionnaire tool (appendix H) was compiled for use in a structured interview with patients at their final outcome visit. For those able to follow and understand verbal information, the researcher would read out the questions and record the responses on the form. In order to be more inclusive to those patients with communication impairment, the same questionnaire was adapted to be used as a communication aid with pictures and symbols to help explain the questions and a visual scale for respondents to point to their response. This was the aphasia-friendly version (appendix I). A third version (appendix J) was prepared for the most severely communication impaired patients. This third version was based on the 'Satisfaction with Care' survey (Lincoln et al 2004), which was a simple survey design that asked patients to rate their satisfaction with emotional support, practical help and overall satisfaction with services on a line from 0 to 100. This short two question version of the acceptability survey was intended for use only with the most severely aphasic participants with receptive and comprehension difficulties.

Before using the questionnaires in the survey, the researcher sent copies of all three versions to an expert clinical research speech and language therapist experienced in stroke research and asked for her professional opinion and feedback.

Final alterations were made before the therapist sought the opinion of the Nottingham Stroke Consumer Group. The therapist asked for their comments and suggested alterations to the content of the questionnaire

and also the format of the two aphasia friendly versions. The group were supportive of the proposed acceptability study and the inclusion of the two aphasia friendly versions of the survey questionnaire. They suggested that a further question was added to enquire about the use of dressing aids/equipment to aid dressing.

The questionnaire was then to be administered by the masked outcome assessor on the DRESS study to the participants on the DRESS study during their outcome assessment visit. In order to maintain confidentiality, only the participants' randomisation number was used on the survey response form and not their name or any other distinguishing personal demographic data. The randomisation number was used by the researcher to check whether the participant was from the cognitive or the functional treatment group following completion of the DRESS study outcome assessments and the acceptability survey to enable 'between group' analysis.

The quantitative responses from the closed questions were taken from the completed questionnaires and entered into an SPSS database for statistical analysis. The data from each question was used to create frequency tables of participants' responses.

The responses to the open questions were listed under the heading of each question. Each response was preceded by the participants ID number from the questionnaire, and their assigned treatment group (cognitive or functional). The responses to each question were to be coded into categories according to themes that emerged from the data. This data, organised into themes, could then be analysed in a similar way to the data

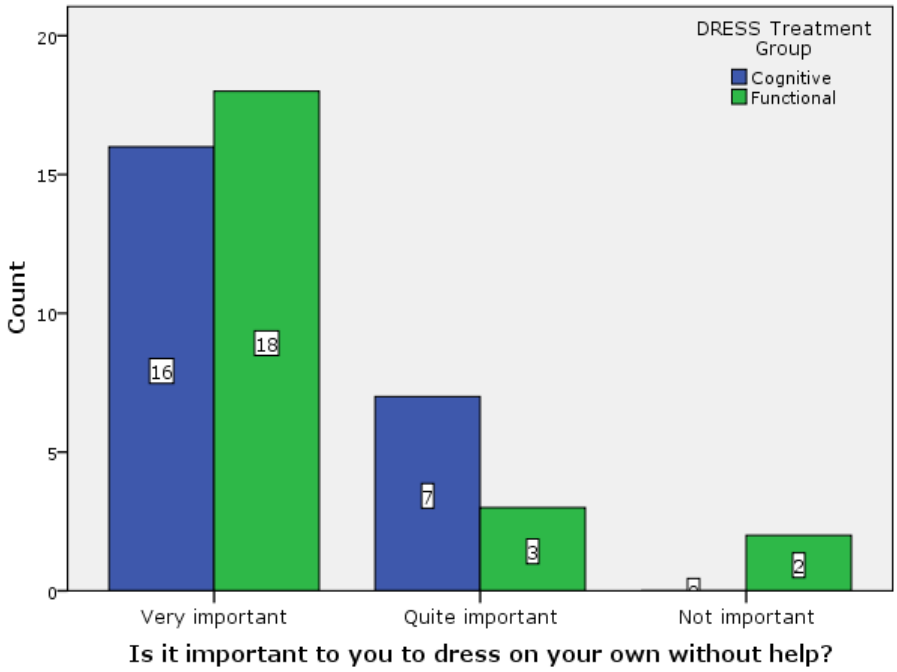
from the closed questions and used to create frequency tables of responses.

7.5 RESULTS

There were 70 participants in the main DRESS study, however this acceptability study did not commence until after the first 16 participants had completed the DRESS study. The acceptability survey was therefore to include the final participants on the DRESS study (n=54). Of these final 54 participants, 2 participants died before completing the trial, and 4 withdrew prior to completion due to deterioration in their medical condition and no longer meeting the study inclusion criteria. Of the remaining 48 participants, 2 were so severely aphasic with additional visual impairment that they were unable to complete any format of the acceptability survey. This resulted in 46 participants completing the acceptability survey. The majority of participants (N=41) were able to complete the main survey; 4 participants used the aphasia version, and 1 participant used the severe aphasia version.

Participants were asked whether they considered it important to be able to dress independently. More than two thirds (74%) of participants stated that independent dressing was "very important". The responses from the two treatment randomisation groups were closely matched. A small proportion of participants (4%), who were all from the functional group, stated that independent dressing ability was "not important" to them. The results are shown in bar chart, figure 5.

Figure 5: Bar chart of participants' responses to question 1 "Is it important to you to be able to dress on your own without help?"



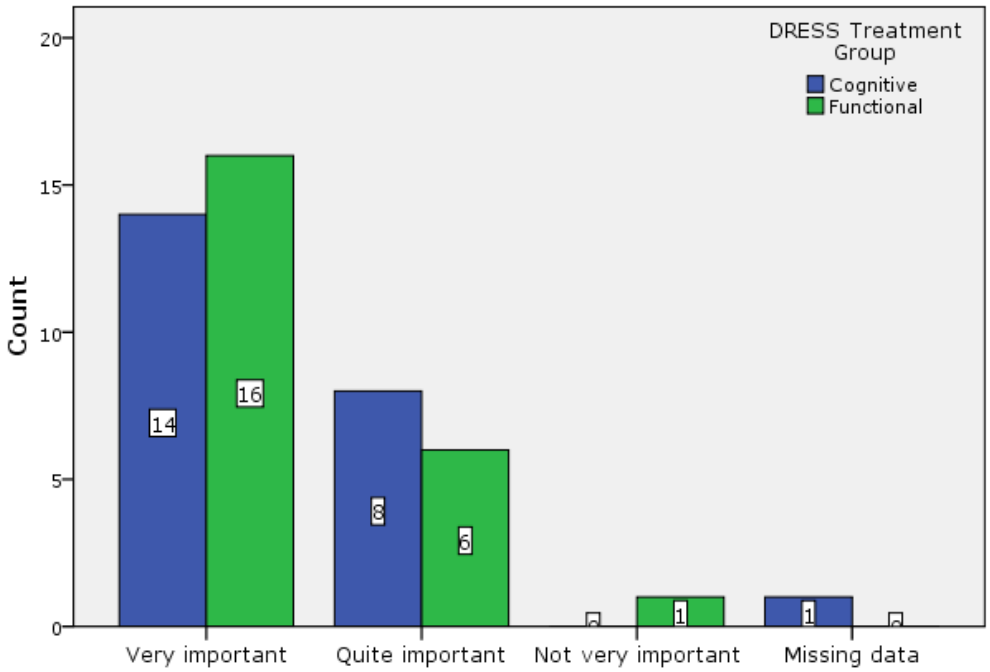
The participants' comments to question one were recorded. A frequent theme that emerged was that participants wanted to remain independent and did not want to have to rely on others for help. Participant R17 stated "I was always independent. When this was taken away it was horrible". Participant R23 stated "I want to be independent as my wife won't be able to do it". Participant R37 stated "I live on my own and don't want to rely on family. I want to do it myself". Similar comments were made by participant R45 who stated "I need to do it myself"; participant R49 who stated "I'm left overnight on my own"; participant R50 who stated "I have no-one to help me"; and participant R54 who said "I live alone". Participant R25 stated "[it's] important so that I can get out – Independence". Participant R21 stated "I live on my own and go out a lot". Three participants in contrast stated "[I'm] happy to have help, I'm not

bothered" (R29); "I don't mind people helping me" (R44); and "There's someone at home to help" (R67).

Participants were then asked whether they felt that being able to dress independently was an important part of stroke recovery. The results are shown in the bar graph below (figure 6). Responses from the two treatment groups were equally matched. Thirty participants felt that independent dressing was a "very important" part of stroke recovery, and 14 participants felt it was "quite important". One participant felt that independent dressing was "not very important".

Figure 6: Bar chart of responses to question 2.

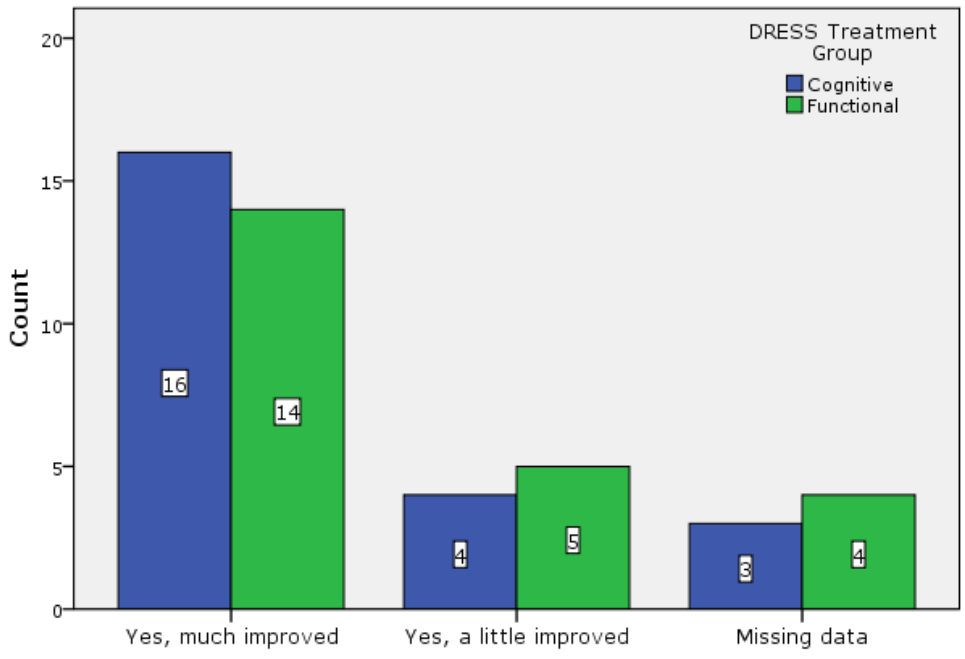
"Do you feel that being able to dress on your own is an important part of your recovery from stroke?"



Participants' additional comments in response to question two were recorded. The common theme that emerged was that participants wanted to regain independence. They made comments such as "I am very determined – I've always been independent" (R35); "I am a bit independent and feel bad when I can't do it" (R44); and "I couldn't be dressed by someone else" (R58).

Participants were then asked whether their dressing ability had improved since they started dressing practice. The results are displayed in figure 7 and again the responses from the two treatment groups are evenly matched. Thirty participants stated "yes, much improved", and nine participants stated "yes, a little improved".

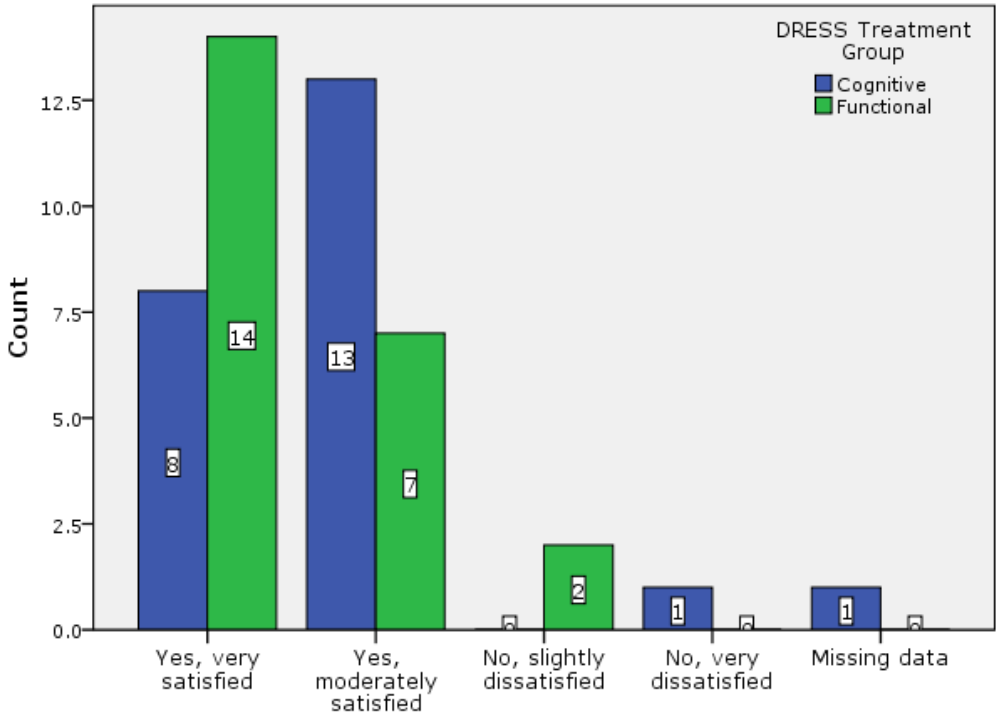
Figure 7: Bar chart of participants' responses to question 3. "Do you feel that your dressing ability has improved since you started dressing practice?"



Participant R22 commented "I couldn't do it before at all. I hadn't a clue how to start"; and participant R51 stated "I wouldn't have done anything for myself before they came, nurses would have done it for me". Four participants' comments reflected possible memory impairment. They made comments such as "not sure I had dressing practice" (R40), "can't remember" (R45), "not sure" (R57), and "can't really remember" (R70).

The next question that participants were asked was whether they were satisfied with their current ability to dress. The responses from the two treatment groups varied for this question. Fourteen of the functional group compared with eight of the cognitive group were "very satisfied" with their current dressing ability. Thirteen participants from the cognitive group were "moderately satisfied" compared with seven in the functional group. Three participants reported being dissatisfied; two from the functional group were "slightly dissatisfied" and one participant from the cognitive group was "very dissatisfied". The results are shown in the bar chart, figure 8.

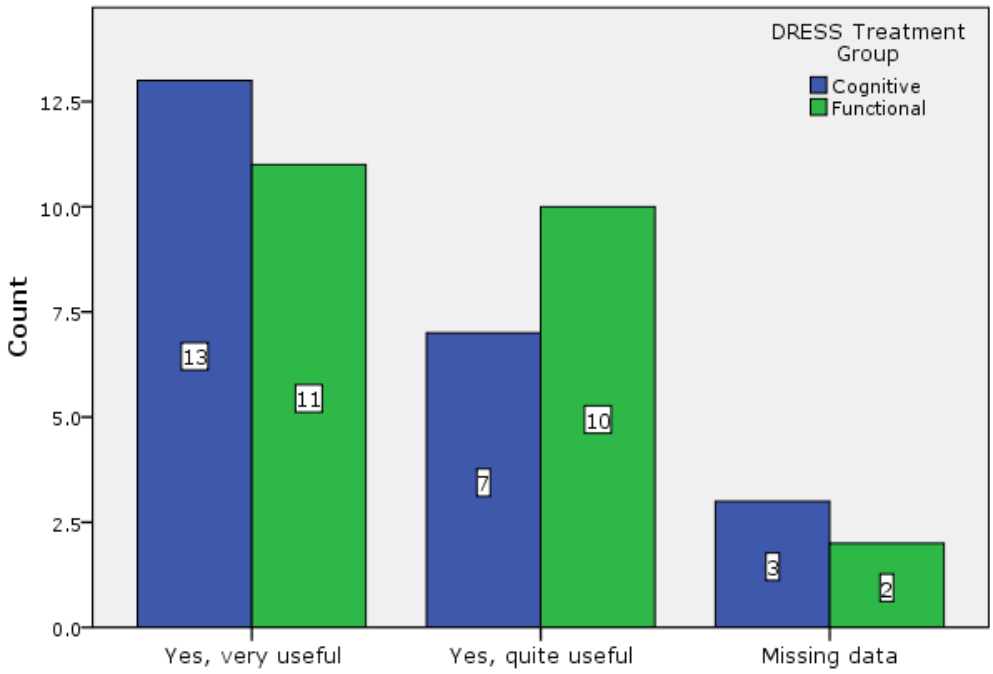
Figure 8: Bar chart of participants' responses to question 4: "Are you satisfied with your current ability to dress?"



Participants were asked whether they felt the DRESS study methods that had been shown to them by the research therapists were helpful. All participants felt that they were useful; 24 participants stated "yes, very useful" and 17 participants said "yes, quite useful". No participants stated that they were not useful. Three participants commented that they could not remember. The results from question five are displayed in a bar chart in figure 9.

Figure 9: Bar chart of responses to question 5

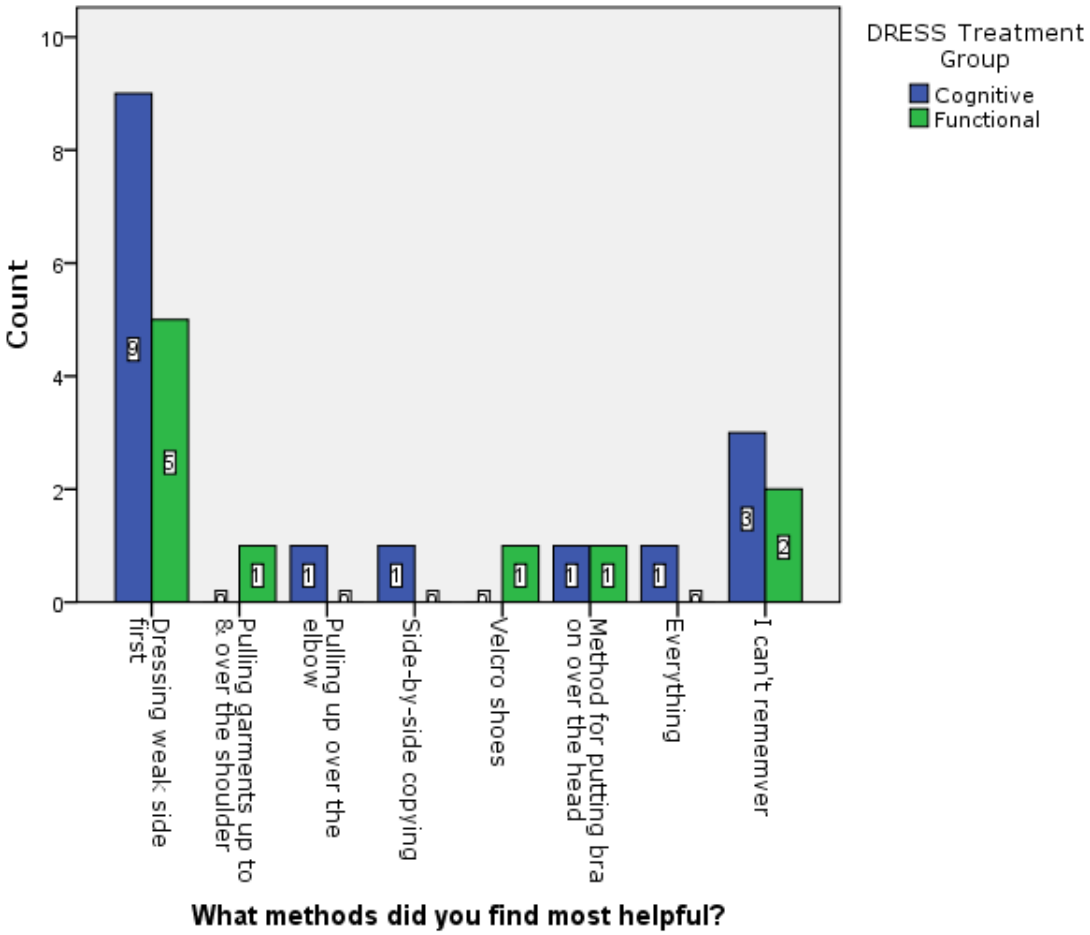
"Do you think that the methods the Research Occupational Therapist showed you to use for dressing were helpful?"



Question six was an open question and asked the DRESS study participants to describe what dressing methods they found to be most helpful. The responses were put into themes and the frequency of each response was calculated. The results are displayed in a bar chart in figure 10. The most frequent response given by 14 of the participants was "dressing the weaker side first".

Figure 10: Bar chart of responses to question 6

"What methods did you find most helpful?"

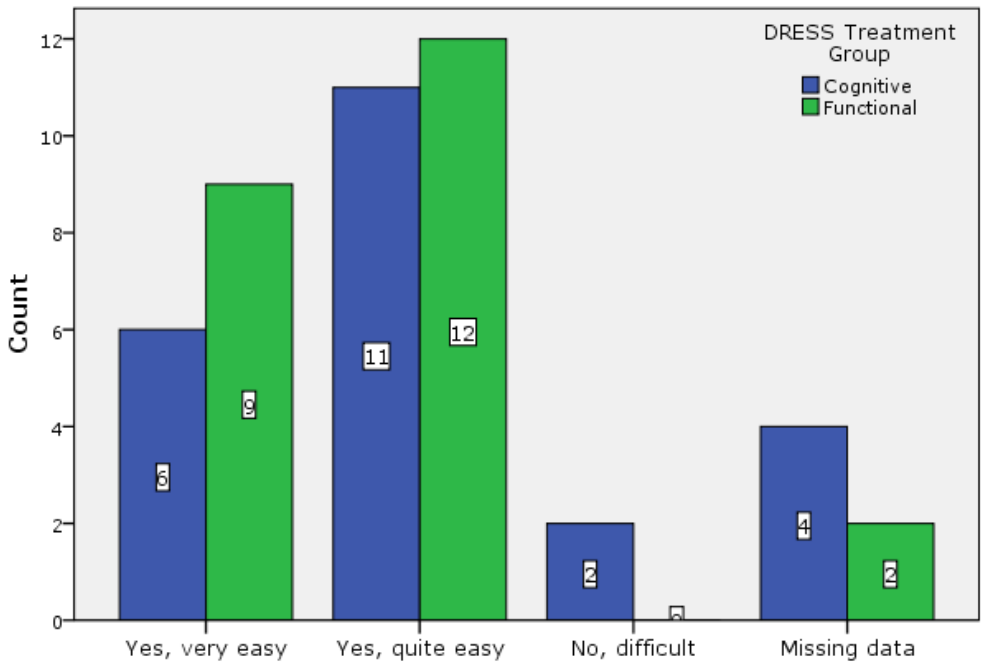


Participants were then asked about what methods they found to be least helpful. Again this was an open question. One participant (R51) gave the response "printed instructions, I couldn't see all the words". No other dressing methods were identified as being unhelpful.

Next participants were asked whether the dressing methods shown to them by the DRESS study research therapists were easy to learn. Fifteen participants stated "yes, very easy", 23 participants stated "yes, quite easy" and 2 participants (both from the cognitive group) stated "no, [they were] difficult". The results from this question are shown in the bar chart in figure 11.

Figure 11: Bar chart of responses to question 8

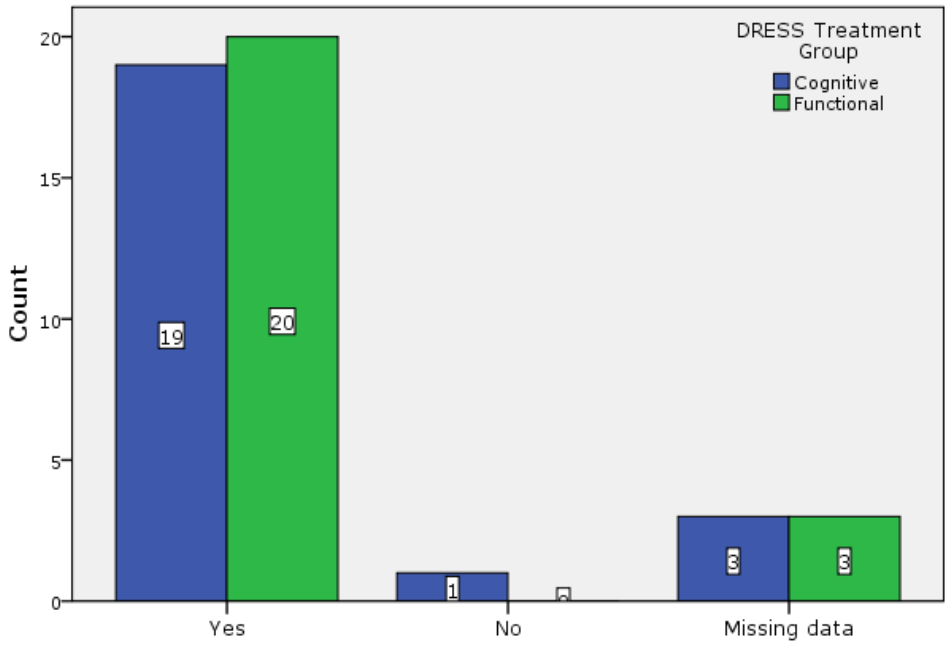
"Were the dressing methods shown to you by the Research Occupational Therapist easy to learn?"



Participants were then asked whether they could continue to use the DRESS study dressing methods without the research therapist being present. Of the 40 participants who responded to this question, 39 participants stated "yes" and 1 participant stated "no". The responses to this question from the two treatment groups are shown in the bar chart in figure 12.

Figure 12: Responses to question 9

"Could you continue to use the dressing methods shown to you without the Research Occupational Therapist being present?"

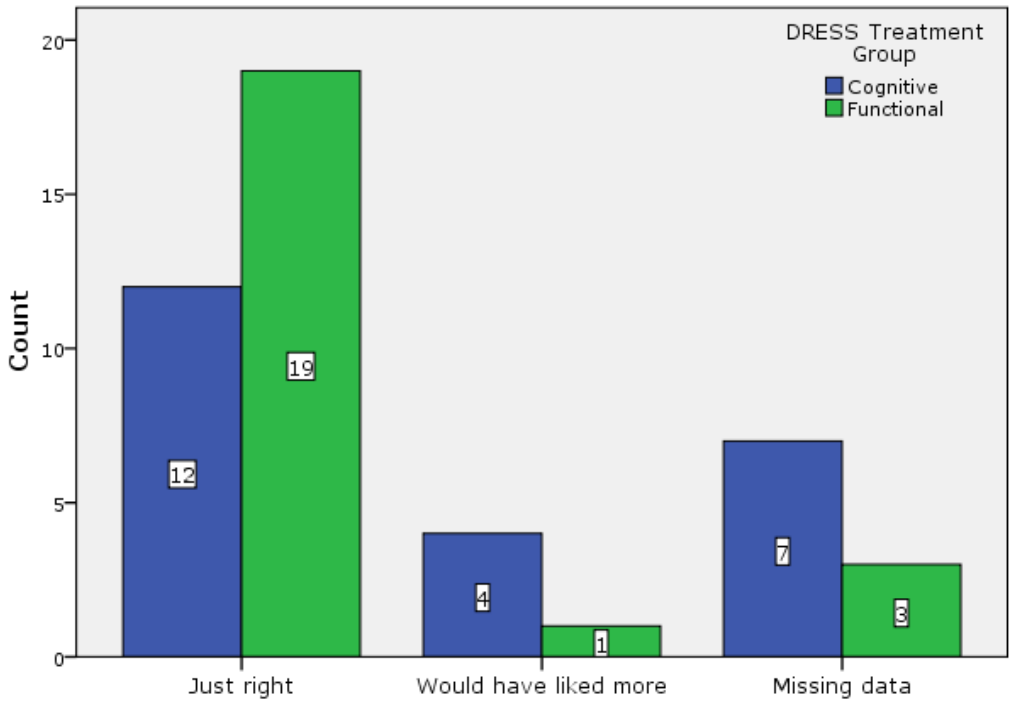


The participant who stated "no" they could not continue to use the dressing methods without the research therapist being present, was then asked the question, "If you could not use the dressing methods without the Research OT being present, why was this?" The participant (R63) replied, "[I] couldn't say".

Participants were asked about the number of dressing sessions they received each week (3 sessions per week) and whether they felt this was appropriate, too little, or too much. The responses to this question are given in the bar chart in figure 13. There were 31 participants who stated "just right", and 5 participants who "would have liked more".

Figure 13: Responses to question 10

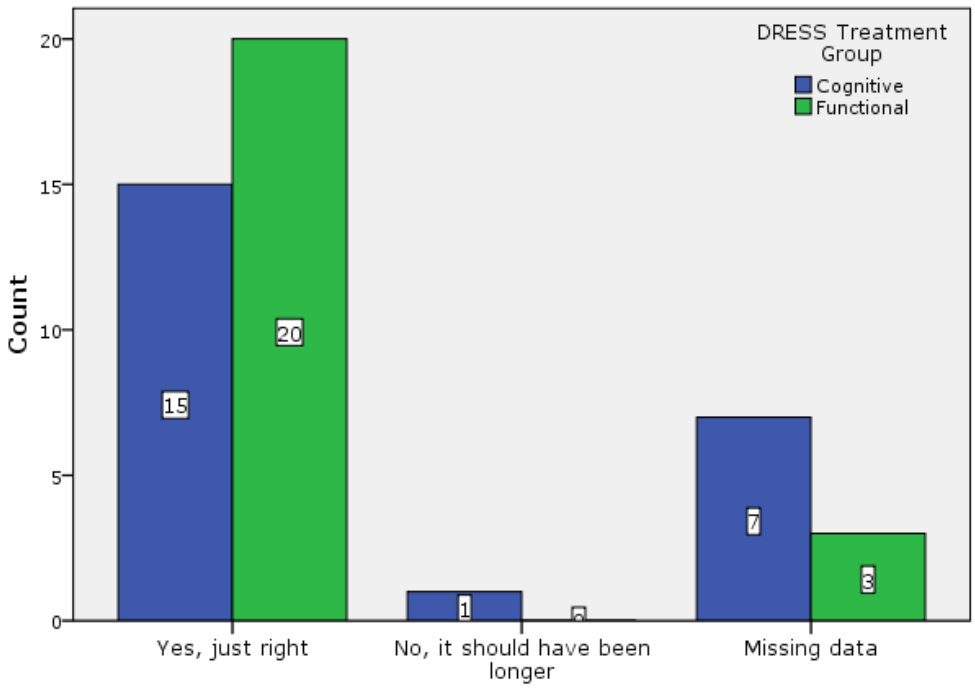
"Was the number of dressing treatment sessions per week with the Research Occupational Therapist...just right, not enough, or too much?"



Participants were asked whether the length of each treatment session was appropriate. Figure 14 displays the results of this question in a bar chart. In responses to this question, 35 participants stated "yes, just right", one participant stated "no, it should have been longer".

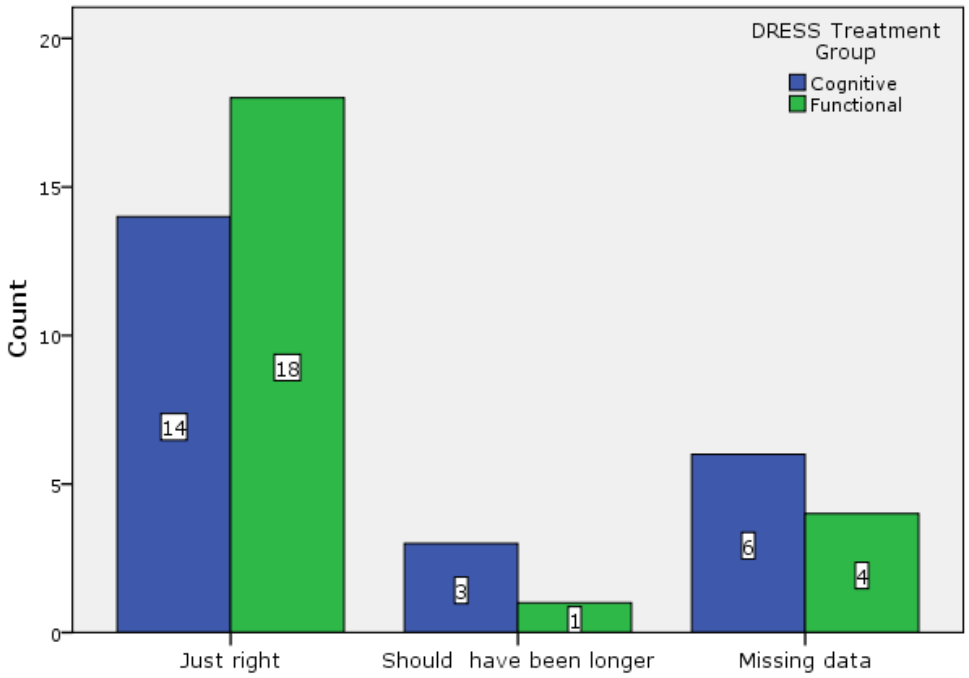
Figure 14: Responses to question 11

"Was the length of each treatment session appropriate?"



The participants were then asked about the duration (6 weeks) of the DRESS study treatment period. In response to this question 32 participants stated that the duration was "just right" and 4 participants stated "[it] should have been longer". The results of this question are displayed in a bar chart in figure 15.

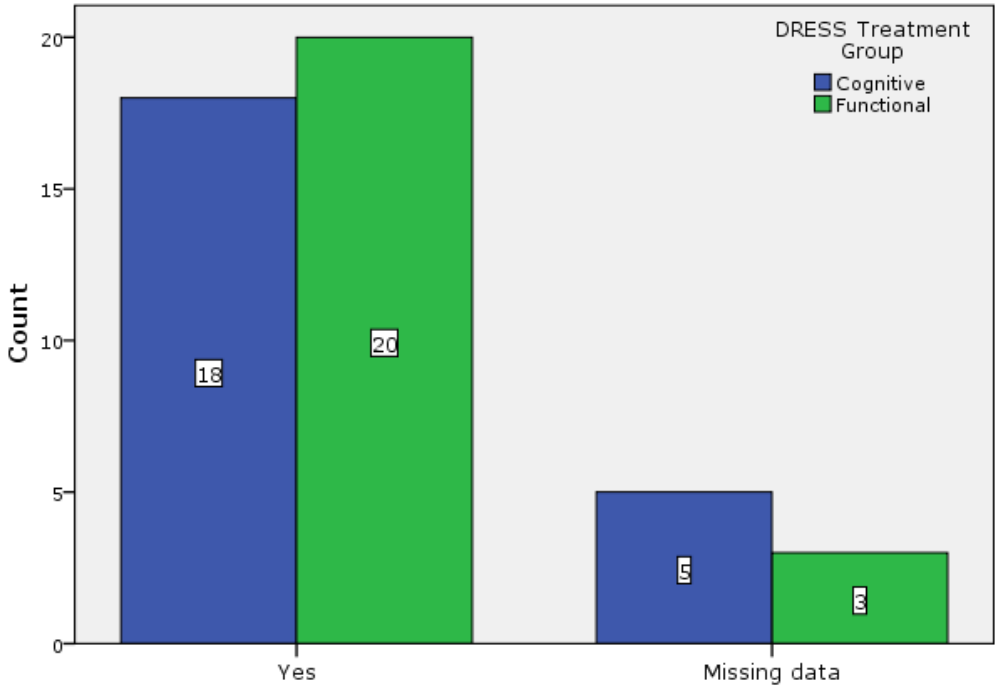
Figure 15: A bar chart to show responses to question 12 "Was the duration (6 weeks) of the treatment period...just right, too short, or too long?"



Participants were asked whether they enjoyed the dressing treatment sessions on the DRESS study. All 38 participants responded sating "yes" they had enjoyed the dressing treatment sessions. The results are displayed in the bar chart in figure 16. The participants' additional comments to this question were recorded. Participants frequently commented that they liked having the therapeutic relationship with the DRESS study occupational therapists. For example the participants commented that "She was a nice lady" (R20), [a] "Nice girl [who] Spent a lot of time with me to show me how to do it" (R54), "She was very good she was" (R56), [and they liked] "Getting to know someone and the conversation" (R19). Participant R31 said "She was always a pleasant person", and participant R32 said [she was a] "Nice girl [who] spent a lot of time with me to show me how to do it". Similar comments about the research occupational therapists were made by participants R33, R35, R36 and R37. Participant R51 said of his experience on the DRESS study that "[it was a] good laugh. They helped make light of my problems and that was helpful to me. When I put on my ted stockings we called it the cross dressing club!" Participant 21 thought it was "Nice to have someone to talk to" and similarly participant R68 stated "I liked the exchange of words". Participant R24 talked about repetition stating that she liked the "Continuation of help. [They] helped me with same things over and over again".

Figure 16: A bar chart of responses to question 13

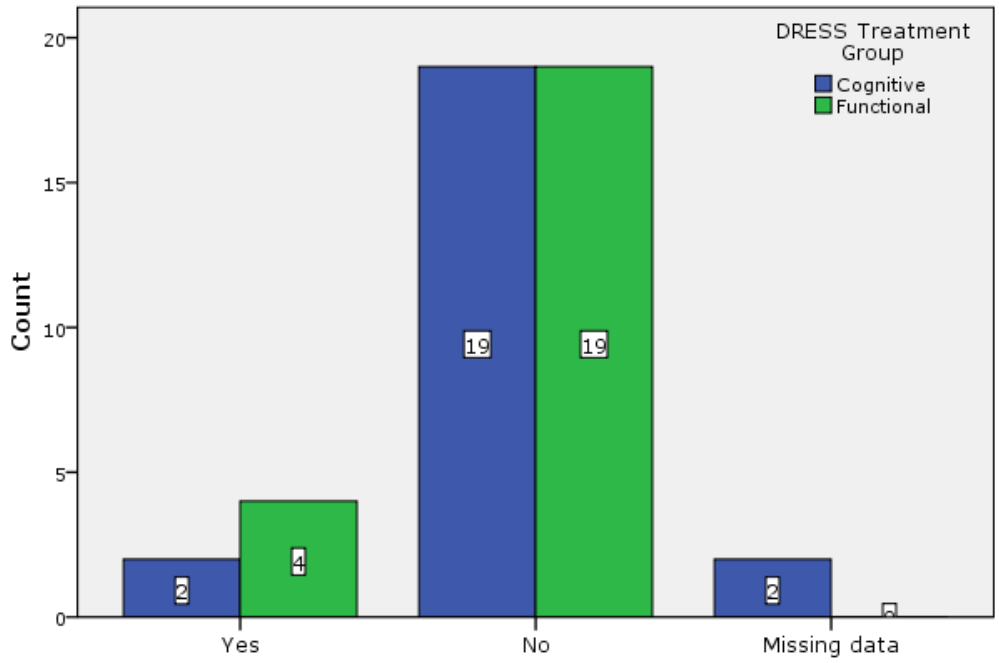
"Did you enjoy the dressing treatment sessions with the Research Occupational Therapist?"



Participants were asked whether they had used any dressing aids or equipment to help them to dress independently following their stroke. The results to this question are displayed in the bar chart in figure 17. Six participants said "yes" while 38 participants said "no". The participants listed the dressing aids and equipment they used as being the "rotunda" stand aid (R51, R64, R65), a "Long handled shoehorn" (R35, R69), a stocking putter-on-erer, button hook" (R69) and a "walking stick to push lower garments off such as shoes" (R45).

Figure 17: A bar chart of responses to question 14

"Since your stroke, have you used any dressing aids or equipment to help you dress independently?"



Finally participants were asked if they had any additional comments to make about their experience on the DRESS study. Participant R68 replied "I liked it very much. I think its wonderful, I really do. You can test

yourself; how far you can go and learn about your abilities". Participant 51 stated "[it] would be better when I have sitting balance, then I can dress while sitting on the edge of the bed".

The five question themes of the survey will now be answered in turn.

a) The importance of independent dressing ability:

The majority (n=44) of participants felt that it was "very important" (n=34) or "quite important" (n=10) to be able to dress on their own without help. Only 2 participants stated that independent dressing was "not important" to them. Similarly, the majority of participants (n=44) felt that dressing was an important part of their recovery from stroke. Again, only 1 participant did not consider dressing to be an important part of stroke recovery.

Participant R37 commented that they were "very determined", and had "always been independent". Participant R44 gave a similar comment "I am a bit independent and feel bad when I can't do it". Participant R58 went on to give the explanation "I couldn't be dressed by someone else", which was in stark contrast to participant R54 who stated "it doesn't worry me". These conflicting views illustrate that whilst independent dressing ability was important for many stroke survivors, for a small minority it was not such an important factor in their stroke recovery and rehabilitation.

b) The acceptability of the different dressing treatment approaches:

All participants stated that they enjoyed the dressing treatment sessions. A frequent theme in the comments that were made in response to the question of whether participants had enjoyed the DRESS treatment sessions was that participants enjoyed the interaction with the Research Occupational Therapist. There was no significant difference between the treatment groups in their responses to questions relating to acceptability of treatment.

There was however, a difference between the groups in their view of how easy the treatment strategies were to learn. The participants from the functional group found it easier to learn the dressing methods than those in the cognitive group according to their responses to question 8, although only two participants in the cognitive group reported finding the dressing methods difficult to learn. All participants, regardless of their treatment group, felt that the dressing methods they were shown by the DRESS OT were useful (24 = "very useful", 17 = "quite useful").

All but one participant reported being able to continue using the dressing methods without the research occupational therapist being present.

c) The acceptability of the frequency of DRESS treatment sessions:

With regards to the number of dressing sessions per week, no participants stated that there were too many treatment sessions. Of the 36 participants who responded to the question about the frequency of DRESS

treatment sessions, 31 replied that three sessions a week was "just right" while the remaining 5 participants stated that they would have liked more.

d) The acceptability of the duration of DRESS treatment sessions:

A similar set of responses was obtained for the question concerning the duration of each treatment session. Similarly, all but one participant felt that the length of each treatment session was appropriate. These 35 participants felt that the length of each treatment session was "just right" but one participant wanted the sessions to be longer.

The majority (32) of participants felt that the duration (6 weeks) of the treatment period was "just right". Four participants would have liked the duration of treatment to have been longer.

e) The success of the DRESS treatment sessions:

All of the participants (39) who responded to the question on dressing improvement stated that their dressing ability had improved since they started on the DRESS study. Of these, 30 participants felt that their performance was "much improved" and 9 felt it was "a little improved". There was no significant difference in responses between the two treatment groups.

All but three participants were satisfied (either "very" or "moderately") with their current dressing ability.

Participants reported that they found the dressing methods shown by the research therapist useful. When asked specifically what dressing methods

they found most helpful, the most frequently given response was the advice from the functional method of dressing the weak side first. This response was given more frequently by the cognitive group, although this is a strategy that was classed as a functional treatment. Five participants (19%) stated they could not remember.

When asked what methods the participants found least helpful, the only method mentioned was the use of printed step-by-step instructions as the participant (R51) stated that they could not read all the words.

In the main, participants stated that they were able to learn the dressing methods taught to them by the Research OT. The functional group found it slightly easier to learn the treatment techniques. Two participants from the cognitive group replied that the dressing methods were difficult to learn. All but one participant (who was from the cognitive group), believed that they would be able to continue to use the dressing methods without the Research OT being present.

These responses suggest that participants on the whole viewed the DRESS treatment sessions as successful.

7.6 DISCUSSION

The author did not embark on this final study until after the DRESS RCT had already commenced and for this reason not all of the 70 DRESS participants were included in the survey. The aims of the acceptability survey were to establish the views of the DRESS study participants on five themes relating to their opinions and experience as a research participant on this phase II feasibility RCT. The responses cannot be generalised for

the whole population of stroke survivors, however they give an indication of the acceptability of the DRESS treatment approaches used in the study carried out in Nottingham and could potentially inform any necessary alterations to the delivery of the DRESS study were it to progress onto a phase III study. For example, if there had been an assessment or dressing treatment used in the DRESS study that participants found distressing, it would have highlighted this and a suitable alternative could have been identified.

The results of the five question themes will now be discussed in turn.

a) The importance of independent dressing ability:

It was considered necessary to first establish whether independent dressing ability was actually of importance to the participants on the DRESS study. Whilst their involvement may imply that dressing independence was considered important, an alternative reason for accepting dressing rehabilitation could have been that patients viewed it as a means to accelerating their discharge home. The views of the DRESS study participants reflected the anecdotal evidence from the stroke survivors on the Nottingham Stroke Consumer Group reviewing panel who had reviewed the proposal and survey questionnaires for this study. They all spoke about the importance of dressing in relation to restoring and maintaining independence, self esteem and dignity. It is known that two years post stroke, 36% of people are dependent on assistance to dress (Edmans and Lincoln 1987). Given the magnitude of the problem and the importance to stroke survivors, dressing rehabilitation should form an important aspect of occupational therapy stroke rehabilitation.

b) The acceptability of the different dressing treatment approaches:

The acceptability of the dressing treatment approaches administered to participants on the DRESS study was considered crucial to future compliance of the treatments should a further phase III multi-centre RCT prove certain dressing treatments to be affective. As previously discussed in the introduction of this chapter, acceptability and patient satisfaction with treatment is likely to affect compliance. This acceptability study added an extra dimension to the overall evaluation of the DRESS study as it involved the study participants in the evaluation process.

There was a possibility that treatments from one of the two treatment group manuals applied on the DRESS study would be found to show greater improvement in the participants' dressing performance whilst not actually being considered acceptable treatments in terms of comfort and tolerance from the participants' point of view. For this reason the analysis of the results was intended to involve a comparison of the responses given between the two DRESS study treatment groups (cognitive approach group and functional approach group). There was no significant difference between the two treatment groups regarding the acceptability of the treatments. All participants stated that they enjoyed the dressing treatment sessions. It was noted that a frequent theme in the comments that were made was that participants enjoyed the interaction with the Research Occupational Therapist (ROT). Suggesting that the acceptability of the DRESS treatment sessions was in part due to the two research therapists involved in delivering the treatment approaches and not simply due to the treatments administered.

The participants from the functional group found it easier to learn the dressing methods than those in the cognitive group, although only two participants in the cognitive group reported finding the dressing methods difficult to learn. This could be due to the individual characteristics of the participants or it could be that the new and novel treatments used in the cognitive approach to dressing rehabilitation are more complicated and therefore difficult to learn.

It is interesting that all but one participant reported being able to continue using the dressing methods without the ROT being present, in light of the dressing success/failure results in the previous chapter. It suggests that whilst participants' perceptions were that they were able to continue using the same dressing methods shown to them without the therapist present, this did not necessarily equate to them being successful in their actual dressing performance.

c) The acceptability of the frequency of DRESS treatment sessions:

In answer to this question, five participants stated that they would have wanted more than three DRESS study dressing treatment sessions each week. There is a possibility that this could be due to the social interaction and not simply because participants felt they actually needed more than three sessions a week.

d) The acceptability of the duration of DRESS treatment sessions:

The duration of each individual DRESS treatment session and the duration of the DRESS treatment programme (6 weeks) were deemed to be acceptable to the majority of participants. The DRESS study protocol did

not dictate that treatment sessions should be of a fixed duration of time and therefore the length of each treatment session was determined by each patient's own individual needs. The responses gained from this question indicate that the research occupational therapists were able to accurately judge the required pace of each treatment session. With regard to the duration (6 weeks) of the treatment period four participants would have liked the duration of treatment to have been longer. The DRESS study protocol stated that treatment would be given for a fixed duration of six weeks as this was the length of treatment that was found to have an effect in the previous single case design study conducted by Sunderland et al (2006).

e) The success of the DRESS treatment sessions:

It was noted that the frequently used strategies for unilateral body neglect and unilateral spatial neglect were not mentioned. A disadvantage of using surveys in general is that data can be affected by the characteristics of the respondents (Robson 1993). A characteristic of stroke patients is that they commonly suffer from memory impairment. Therefore if a participant on the DRESS study had severe memory loss it could have impeded their ability to recall the details of their experience and prevented them from giving accurate responses. As previously discussed in chapter two, memory is commonly impaired as a result of stroke and this could be the reason for few participants listing the cognitive strategies as being helpful. An alternative reason for this could be that they simply did not think the cognitive strategies were helpful or that they lacked sufficient insight into the extent of their dressing impairments. The results of this question will therefore inform the interpretation of results from the main DRESS study RCT. It will be interesting for the results of the success of the two DRESS

treatment approaches to be compared to the results of this and other questions on the acceptability survey. It may be that while participants did not view certain strategies as beneficial, the results of the DRESS study show that they did have an impact on improving dressing performance.

The researcher suggests that patients were likely to be unable to recall all the strategies they had used, rather than patients not finding them useful, as the participants were later asked about what methods they found least helpful and only one participant (R51) was able to produce a response. Participant R51 stated that the printed (step by step) instructions were not helpful as he could not see all of the words. The rest of the participants gave responses such as "nothing", "none", or "can't remember".

CHAPTER 8

CONCLUSION

8.1 CONCLUSION

In conclusion, this MPhil study successfully met its objectives. The three separate but inter-related studies explored the inter-rater reliability of the Nottingham Stroke Dressing Assessment (NSDA); the effect of hemiparesis of the upper limb on dressing performance in the presence of cognitive impairment; and the acceptability of the DRESS study treatment approaches.

This chapter will conclude by summarising the contribution of this research to the evidence base and suggest future directions for dressing research. It will also summarize the possible clinical implications of this MPhil study.

8.2 THE CONTRIBUTION OF THIS MPHIL STUDY TO THE EVIDENCE BASE AND FUTURE DIRECTIONS FOR DRESSING RESEARCH

The increasing amount of research conducted over the last two decades provides occupational therapists with the reassurance that advances are being made in the area of stroke dressing rehabilitation.

This MPhil programme was linked to the DRESS study, a phase II RCT that aimed to pilot the feasibility of further exploring an ecological approach to dressing using a neurologically informed dressing treatment approach. The first phase of this MPhil programme of research (chapter 5) following a

review of the stroke dressing literature (chapter 4) was to investigate the inter-rater reliability of the NSDA which was the primary outcome measure used in the DRESS study and previous dressing research.

The inter-rater reliability study involved three raters (a mixture of both clinical and research therapists) and was carried out on 20 patients. In conclusion the Nottingham Stroke Dressing Assessment (NSDA) and accompanying Error Analysis form can be considered a robust, valid and reliable standardised assessment of dressing ability post stroke. The NSDA and Error Analysis form have psychometrically proven inter-rater reliability. Clinicians and researchers can therefore be confident in the results obtained. The NSDA provides occupational therapists with a reliable standardised outcome measure for use in the assessment of patients' post stroke dressing ability. The Error Analysis form can also be used in determining possible differential diagnosis for the cognitive impairments affecting dressing performance.

This study has added significantly to the evidence base for occupational therapy and stroke dressing rehabilitation and a paper on the reliability of the NSDA has been accepted for publication in the British Journal of Occupational Therapy. As a result the NSDA and Error Analysis form will be available to researchers and therapists for use in further dressing research and in clinical practice.

There is substantial evidence that cognitive impairment as well as physical limitations can affect the ability to dress independently. Walker et al (2004) provided preliminary evidence that cognitive impairment affect the ability to relearn to dress with one hand, but does not affect dressing ability in those able to use both hands for dressing. One of the aims of this

MPhil study (chapter 6) was to conduct a larger scale study than that previously carried out by Walker et al (2004), to determine to what extent hemiparesis affects dressing performance. In this study, all patients with a hemiparesis preventing bilateral upper limb functional movement were unable to dress using a one handed technique at initial assessment. Following a six week period of dressing treatment there was a marked improvement in the dressing ability of patients using one hand (unilateral group) for dressing and of patients using both hands (bilateral group) for dressing. However the bilateral group achieved better results overall than those in the unilateral group. This study has therefore confirmed the findings by Walker et al (2004) that there is a strong association between dressing method (one or two handed) and dressing success, in the presence of cognitive impairment. The ability to use both hands for dressing significantly improves the upper body dressing performance of cognitively impaired stroke patients. More research involving a larger sample size is required in order to determine which specific cognitive impairments might be useful predictors of dressing ability.

Sunderland et al (2006) studied an ecological approach to dressing difficulties in which detailed observation of dressing performance was combined with standardised cognitive testing to inform treatment of dressing problems. This study noted that whilst it was useful with right hemisphere cases, the left hemisphere or bilateral cases did not show evidence of treatment effect (Sunderland et al 2006). It was concluded that while an ecological approach could be effective, further research on a larger scale was required.

The final phase of this MPhil programme (Chapter 7) was an acceptability study of the treatment approaches used in the DRESS study. The findings

of this survey could potentially inform any necessary alterations to the delivery of a phase III dressing study that may be carried out to build on the evidence from the current phase II DRESS RCT. The results of the acceptability study did not show any significant difference in participant acceptability between the two dressing treatment groups. There were no treatments that were considered unacceptable although it was noted that written step by step instructions are not necessarily helpful to those participants with visual neglect.

The length of each treatment session, frequency of dressing treatment sessions and duration of the treatment period were considered satisfactory to the majority of DRESS study participants who took part in the acceptability survey. Therefore a further phase III trial following a similar protocol for treatment dosage may be considered ethical and acceptable.

8.3 CLINICAL IMPLICATIONS OF THIS MPHIL STUDY

The main clinical implication of this MPhil study is the publication of the Nottingham Stroke Dressing Assessment and accompanying Error Analysis form. The literature review uncovered a survey of occupational therapy practice in the UK which highlighted the fact that therapists do not always use standardised assessments and that therapy departments tend to develop their own in-house dressing assessments. The reliability and validity of such assessments cannot be guaranteed. The inter-rater reliability study of the NSDA and Error Analysis form and its subsequent publication, will provide occupational therapy clinicians with a reliable and standardised assessment of dressing ability that can be incorporated into the assessment and treatment of stroke patients. The NSDA and error analysis can be used by clinicians to help inform targeted clinical

interventions. This is especially important in the current economic climate when working with the pressures of time constraints and limited resources. Clinicians need to ensure that they are providing assessments and treatments that are based on evidence of effectiveness.

The results of the upper limb study can be applied to assist in predicting dressing outcome. Therapists can be confident that when patients have cognitive impairment that causes difficulty in dressing, those with bilateral upper limb function are likely to show most improvement in dressing performance. Those with a severe hemiparesis preventing the functional use of both upper limbs are likely to require significantly more time and training in upper body dressing techniques.

The clinical implications of the acceptability study are that clinicians can be confident that the DRESS treatment interventions will not cause undue stress or concern to patients. In the event of a successful phase III DRESS RCT the effective dressing treatment methods can be applied to clinical practice and occupational therapists can be confident that the treatments are likely to be considered acceptable to patients.

Also the acceptability study highlighted that patients liked one to one contact and found this to be beneficial. This suggests that the majority of stroke survivors want to engage in therapy and value one to one contact time with therapists and clinicians. This is important in light of the recommendations in the National Clinical Guidelines for Stroke regarding the amount of each individual therapy that patients should receive following stroke. The Guidelines recommend that stroke patients 'should receive a minimum of 45 minutes daily of each therapy that is required' (Intercollegiate Stroke Working Party 2008).

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APPENDICES

APPENDIX A – The Nottingham Stroke Dressing Assessment (NSDA)

General Instructions

NOTTINGHAM STROKE DRESSING ASSESSMENT

General instructions

1. Position the patient in an upright chair which has arms.
2. Place clothes randomly within the patient's field of vision and within easy reach.
3. Aids that are familiar to the patient may be used.
4. Only score what the patient does, not what you think they are capable of.
5. The patient's final attempt is scored.
6. If the patient is still having difficulty after five minutes or is visibly distressed and required help – score 0 (dependent).
7. If verbal encouragement is required – score 1 (independent with verbal assistance).
8. If facilitation of a movement is required to complete the task – score 0.
9. If medical problems prevent the patient from completing the task- score 9 (not applicable).

Specific instructions

1. Cross leg over - must be able to lift one leg off the floor and cross over other leg. May cross at knee or ankles.
2. Reach foot – may cross leg over to reach foot. Must be able to touch toes.
3. Standing- must be able to sit to stand independently. **Static** – stand for ten seconds unaided, **Dynamic** – reach down and pull up lower garments whilst standing.

Garments worn on the upper half of the body

1. Selecting the correct hole with arm - must be able to feed sleeve onto appropriate limb.
2. Pulling over head - if unable to pull over head due to garment not pushed over elbow, score 0
3. Pull around back - garment must be in a suitable position to put in second arm. May be pulled around waist.
4. Pulling down - must be able to push garments over shoulders and pull down to encircle the waist.

Garments worn on the lower half of the body

1. Selecting correct hole with leg – must be able to feed trouser leg onto appropriate limb.
2. Pulling up – must be able to sit to stand independently and be able to pull garment up fully to cover bottom.
3. Shoes- foot must fit snugly in shoe.
4. Lacing shoes- may include one-handed method, toggle and elastic lace aids.

APPENDIX A – The Nottingham Stroke Dressing Assessment (NSDA)

NSDA Male Version

NOTTINGHAM STROKE DRESSING ASSESSMENT - MALE

Patient Study No: .....

Date of Assessment: ..... Assessment: Initial / Outcome

0 Dependent
1 Dependent on verbal assistance only
2 Independent
n/a Not applicable

	Score	Comment and aids used
Cross affected leg over non-affected leg		
Cross non-affected leg over affected leg		
Reach affected foot		
Reach non-affected foot		
Standing – static		
Standing – dynamic		
Fastenings		
Zip		
Large button		
Small button		
Round button		
Velcro		
Hook and eye		
Press stud		
Bow		
Buckle		
Trouser clip		
Vest		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling over head		
Pulling down		
Shirt / cardigan		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling around back / over head		
Pulling down		

	Score	Comment and aids used
Jumper		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling over head		
Pulling down		
Pants		
Selecting correct hole with affected leg		
Selecting correct hole with non-affected leg		
Pulling up		
Trousers		
Selecting correct hole with affected leg		
Selecting correct hole with non-affected leg		
Pulling up		
Socks		
Pulling up over affected toes		
Pulling up over non-affected toes		
Pulling up affected leg		
Pulling up non-effected leg		
Shoes		
Putting shoe on affected foot		
Putting shoe on non-affected foot		
Lacing shoe on affected foot		
Lacing shoe on non-affected foot		
TOTAL (actual score divided by possible total score i.e. excluding not applicable stages)	**/**	**%**

Adjustment of clothing

a) Does not make any attempt
b) Makes minimal attempt
c) Adjusts clothes as far as physically possible
d) Adjusts clothes independently

Sequencing

a) Aware of sequencing difficulties
b) Unaware of sequencing difficulties
c) No problem

APPENDIX A – The Nottingham Stroke Dressing Assessment (NSDA)

NSDA Female Version

NOTTINGHAM STROKE DRESSING ASSESSMENT - FEMALE

Patient Study No: .....

Date of Assessment: ..... Assessment: Initial / Outcome

0 Dependent
1 Dependent on verbal assistance only
2 Independent n/a Not applicable

	Score	Comment and aids used
Cross affected leg over non-affected leg		
Cross non-affected leg over affected leg		
Reach affected foot		
Reach non-affected foot		
Standing – static		
Standing – dynamic		
Fastenings		
Zip		
Large button		
Small button		
Round button		
Velcro		
Hook and eye		
Press stud		
Bow		
Buckle		
Trouser clip		
Bra		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling over head		
Pulling down		
Pulling up to shoulders		
Vest/slip		
Selecting correct hole with affected arm		
Selecting correct hole non-affected arm		
Pulling over head		
Pulling down		
Dress		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling over head		
Pulling down		

	Score	Comment and aids used
Shirt / cardigan		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling around back / over head		
Pulling down		
Jumper		
Selecting correct hole with affected arm		
Selecting correct hole with non-affected arm		
Pulling over head		
Pulling down		
Skirt / Waist Slip		
a) Putting affected leg through waist		
Putting non-affected leg through waist band		
Pulling up		
Or b) Putting affected arm through skirt		
Putting non-affected arm through skirt		
Pulling over head		
Pulling down		
Pants		
Selecting correct hole with affected leg		
Selecting correct hole with non-affected leg		
Pulling up		
Trousers		
Selecting correct hole with affected leg		
Selecting correct hole with non-affected leg		
Pulling up		
Stockings / Tights / Socks		
Pulling up over affected toes		
Pulling up over non-affected toes		
Pulling up affected leg		
Pulling up non-affected leg		
Shoes		
Putting shoe on affected foot		
Putting shoe on non-affected foot		
Lacing shoe on affected foot		
Lacing shoe on non-affected foot		
TOTAL (actual score divided by possible total score i.e. excluding not applicable stages)	**/**	**%**

Adjustment of clothing

a) Does not make any attempt
b) Makes minimal attempt
c) Adjusts clothes as far as physically possible
d) Adjusts clothes independent

Sequencing

a) Aware of sequencing difficulties
b) Unaware of sequencing difficulties
c) No problem

APPENDIX B – NSDA Error Analysis Form

Nottingham Stroke Dressing Assessment – Error Analysis Form

Patient ID Date

Tick each box where an error of that type is observed.

A. Does not initiate.
Does not spontaneously begin dressing or a stage. ☐

B. Fails to attend to task.
Score only if there is more than a sentence of talk that is not commentary about progress in dressing, or if there is more than 3 seconds of looking away. ☐

C. **Confuses or cannot find garment openings.**
Cannot identify correct garment openings or puts things on back-to-front. Do not include protracted searching if it leads to finding the correct opening. ☐

D. Does things in the wrong order.
For example, shoes before socks or non-paretic arm first into upper garments. ☐

E. Body Neglect.
Does not complete dressing of the left (right) side of the body. ☐

F. Does not push material high enough up paretic arm.
Score only if the hand was threaded (at least partially) through the correct sleeve but falls out later. ☐

G. Disorganised, no apparent strategy.
Gives unmistakable signs of not knowing what to do with an item of clothing (e.g. fumbles at a shirt without seeming to know what to do with it). ☐

H. Visual Neglect
Cannot find items of clothing scattered to the left (right) or parts of garments to that side. ☐

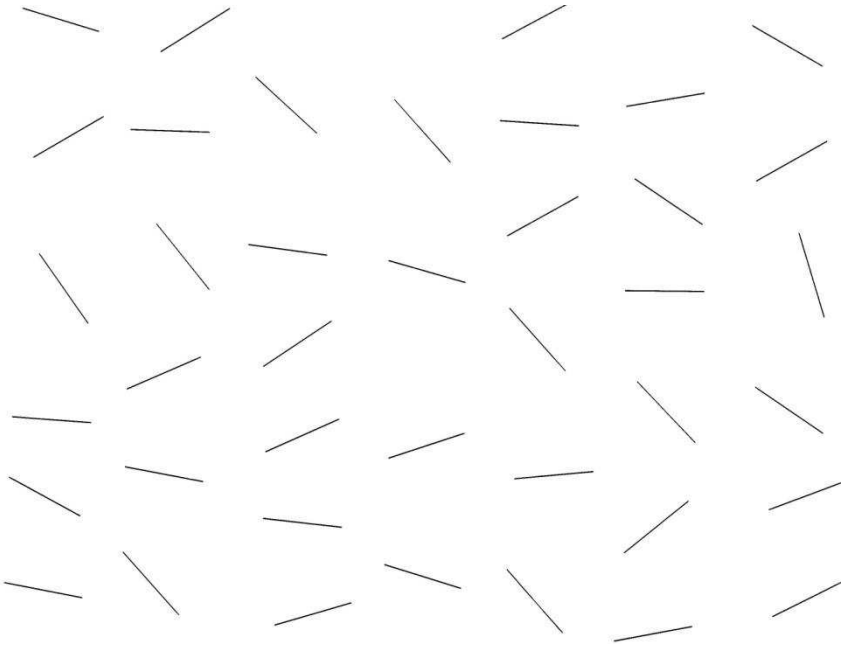
I. Selection Error
Selects the wrong item of clothing ☐

J. **Perseveration**
Attempts to repeat a stage already completed. ☐

K. Clumsiness
Difficulty picking up items or cannot do-up fasteners. ☐

APPENDIX C – Line Cancellation Test

BEHAVIOURAL INATTENTION TEST – LINE CROSSING



Instructions

'On this page we have many lines pointing in different directions. Follow my pen as I indicate these lines' (Move pen right to left, top to bottom over all the lines on the page). 'Now with this pen, I want you to cross out all the lines which you can see on the page like this'. (Illustrate by crossing out two of the four central lines).

Some patients may initially cross out only those lines which appear to correspond to the orientation of the example. In such cases the patient should be instructed to cross out *all* the lines irrespective of orientation.

Scoring

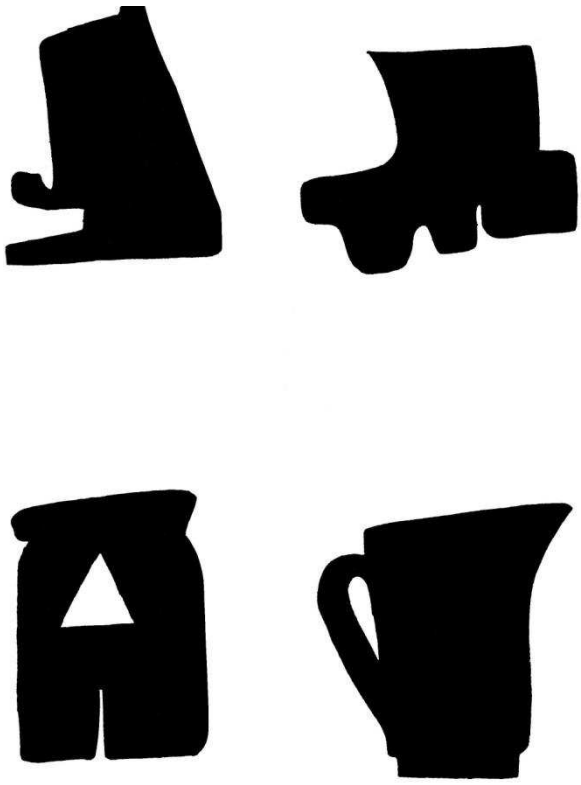
The total number of lines crossed is noted. The maximum is 36 (18 left, 18 right). The four lines of the central column are not scored.

Analysis

Cut-off score = 34

APPENDIX D – Object Decision Test

VISUAL OBJECT AND SPACE PERCEPTION TEST (Object decision test)



Object Decision

Instructions

"One of these four shapes is a silhouette drawing of a real object, the others are all nonsense shapes. I want you to point to the real object"

Subjects who are uncertain are urged to guess.

Scoring

Score one point for each correct answer (maximum = 20)

APPENDIX E – Action Imitation Test

Action Imitation Test

Patient ID Date
Hand Assessed: R L

Each action is tested in turn using the following graded procedure:-

Verbal command: ***"With your left (right) hand show me how you would …"***
Elaborate as necessary to help the patient understand that they have to pantomime the action without any object present, e.g. "Just pretend you are holding it."

A demonstration is given using the assessor's other hand (mirror image imitation) while the verbal command is repeated. For items 1-6 the examiner holds the real object but the patient has to pantomime without the object.

For Items 1-6, give the patient the object repeat the verbal command. The assessor offers the object to the participant in a neutral orientation on an open palm.

Score 2 = perfect; 1 = possible error; 0 = definite error

	Verbal command	**Demonstration**	**Given Object**
1. Drink from a cup	☐	☐	☐
2. Use a key	☐	☐	☐
3. Throw a ball	☐	☐	☐
4. Use a pencil	☐	☐	☐
5. Brush your teeth	☐	☐	☐
6. Use a hammer	☐	☐	☐
7. Salute	☐	☐	
8. Threaten with a fist	☐	☐	
9. Wave goodbye	☐	☐	
10. "Do this"*		☐	

*Correct = back of hand towards you and thumb touching the lips.

Total Scores ……. ……. ……..

A score of less than 15 on demonstration is strongly indicative of apraxia.

APPENDIX F – 10 Hole Peg Test

10 HOLE PEG TEST

PROCEDURE

The board is placed horizontally at the patient's midline.
Start with the non-paretic hand then alternate for 5 trials for each hand.
The task is to move the pegs one by one from the further to the nearer row.
The right hand picks up pegs starting at the right end of the row.
The left hand picks up pegs starting at the left end of the row.
A trial is re-started if a peg is dropped or significant distraction occurs.

SCORING

The time taken is from touching the first peg to releasing the last.
Incomplete performance is scored as the number of pegs moved in 50 sec.

Reference

Annett M. (1992) Five tests of hand skill. Cortex, 28, 583-600.

APPENDIX G – Motricity Index

MOTRICITY INDEX

AND

TRUNK CONTROL TEST

PATIENT'S NAME:

HOSPITAL NUMBER:

Date										
Side tested										
ARM TO BE CONDUCTED IN SITTING POSITION										*TEST 1 (Pinch grip)* *0 = No movement* *11 = Beginnings of prehension* *19 = Grips cube but unable to hold against gravity.* *22 = Grips cube, held against gravity but not against weak pull.* *26 = Grips cube against pull but weaker than other/normal side.* *33 = Normal pinch grip.*
1. Pinch grip *2.5cm cube between thumb and forefinger.*										
2. Elbow flexion *from 90°, voluntary contraction/movement.*										
3. Shoulder abduction *from against chest*										*TESTS 2 - 6* *0 = No movement* *9 = Palpable contraction in muscle but no movement.* *14 = Movement seen but not full range/not against gravity.* *19 = Full range against gravity, not against resistance.* *25 = Movement against resistance but weaker than other side.* *33 = Normal power*
LEG TO BE CONDUCTED IN SITTING POSITION										
4. Ankle dorsiflexion *from plantar flexed position.*										
5. Knee extension *from 90°, voluntary contraction/movement.*										
6. Hip flexion *usually from 90°*										
ARM SCORE (1+2+3)										
LEG SCORE (4+5+6)										
SIDE SCORE (Arm + leg)/2										
TRUNK CONTROL TEST ON THE BED										*TRUNK CONTROL TEST* *0 = Unable to do on own.* *12 = Able to do but only with non-muscular help (pulling on bedclothes,using arms to steady self when sitting, pulling up on monkey pole etc).* *25 = Normal*
7. Rolling to weak side										
8. Rolling to strong side										
9. Sitting up from lying down										
10. Balance in sitting position *On side of bed.*										
TRUNK SCORE (7+8+9+10)										

APPENDIX H – Acceptability survey questionnaire

Dressing Rehabilitation Evaluation Stroke Study

Patient Survey

I would like to ask you some questions on how you feel about your ability to dress yourself. I would also like to ask about the dressing treatments you received during the last 6 weeks. It would be really helpful if you could give us your honest opinion on the dressing treatments and how we might improve them.

Patient ID number:
Date:
Assessor:

1. Is it important to you to dress on your own without help?

Very important	
Quite important	
Not important	

Comments:

2. Do you feel that being able to dress on your own is an important part of your recovery from stroke?

Very important	
Quite important	
Not very important	
Not at all important	

Comments:

3. Do you feel your dressing ability has improved since you started dressing practice with Jo/Katherine?

Yes, much improved	
Yes, a little improved	
No, not improved	
No, it has got worse	

Comments:

4. Are you satisfied with your current ability to dress?

Yes, very satisfied	
Yes, moderately satisfied	
No, slightly dissatisfied	
No, very dissatisfied	

Comments:

5. Do you think that the methods Jo/Katherine showed you to use for dressing were useful?

Yes, very useful	
Yes, quite useful	
No, not useful	
No, they were no help at all	

Comments:

6. What methods did you find **most** helpful?

_____
_____
_____

7. What methods did you find **least** helpful?

_____
_____
_____

8. Were the dressing methods shown to you by Jo/Katherine easy to learn?

Yes, very easy	
Yes, quite easy	
No, difficult	
No, very difficult	

Comments:

9. Could you continue to use the dressing methods without Jo/Katherine being present?

Yes		No	

If no, why not?

_____
_____
_____
_____

10. Was the number of dressing sessions (3 times a week) with Jo/Katherine…….

Just right	
I would have liked more	
I would have liked less	

Comments:

11. Was the length of each DRESS treatment session appropriate?

Yes, just right	
No, it should have been longer	
No, it should have been shorter	

Comments:

12. Was the duration of the treatment period (6 weeks)…….

Just right	
Should have been longer	
Should have been shorter	

Comments:

13. Did you enjoy the dressing sessions with Jo/Katherine?

Yes		No	

Can you tell us why?

_____
_____

14. Since your stroke, have you used any dressing aids or equipment to help you dress independently?

Yes		No	

If yes, did you find these helpful?

_____
_____
_____
_____

15. Do you have any other comments to make about the DRESS study?

_____
_____
_____

I would like to thank you for your valued participation in the 'DRESS' study, and for taking the time to answer these questions about the dressing practice you received.

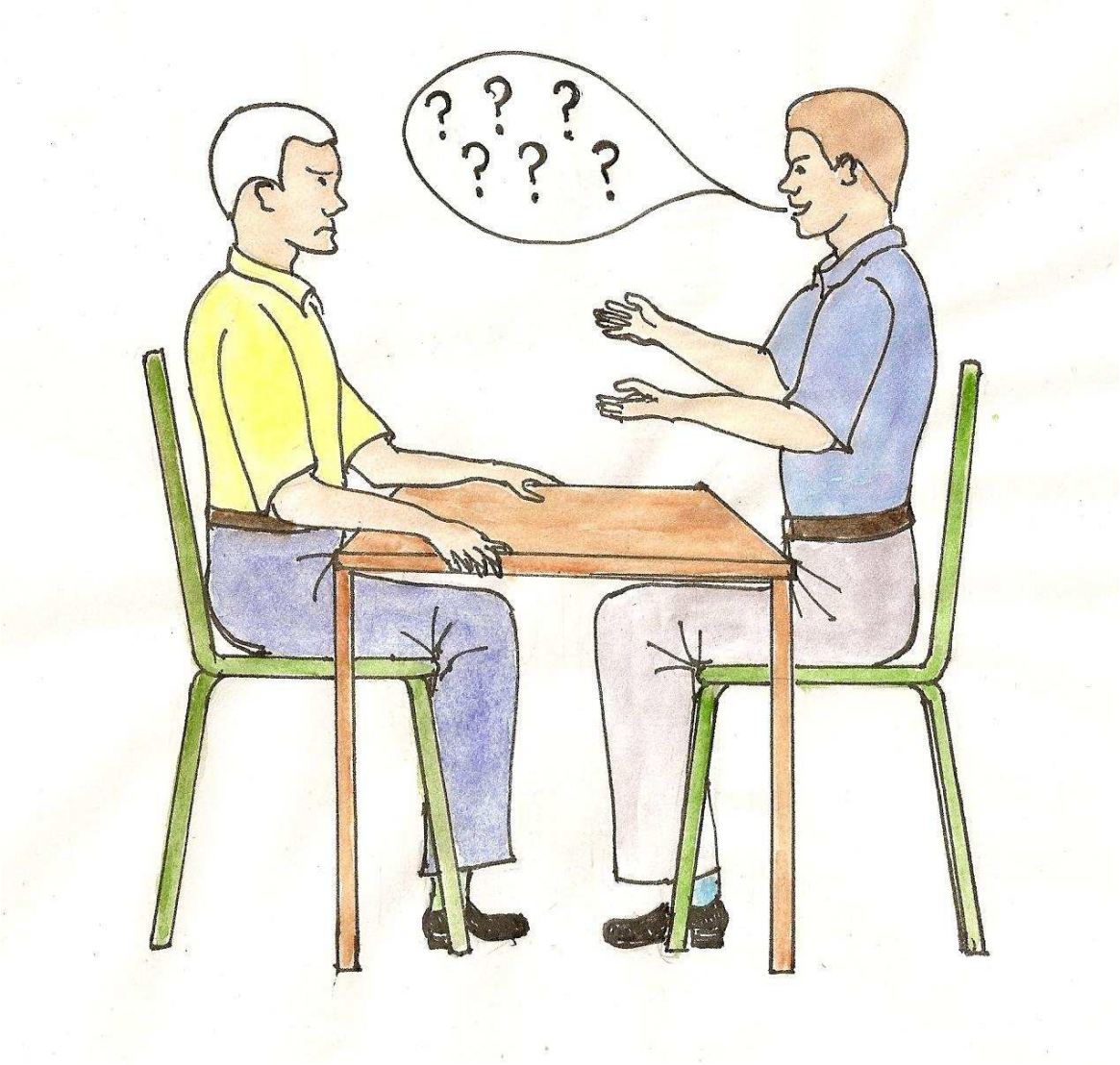
APPENDIX I – Acceptability survey questionnaire

(aphasia friendly version)

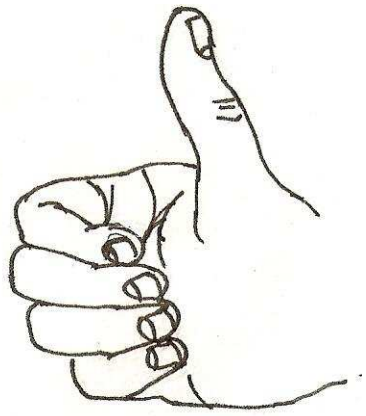
Dressing Rehabilitation Evaluation Stroke Study

Patient Survey

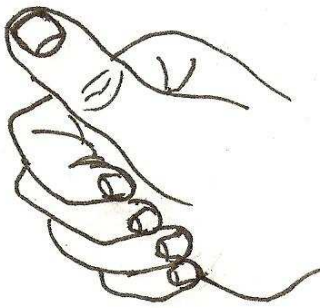
I would like to **ask** you some **questions**



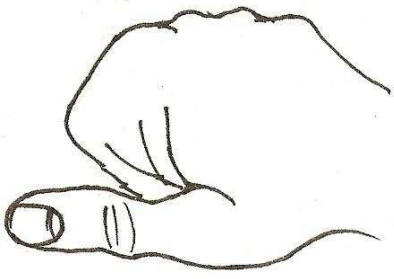
1. Is it **important** to **you** to be able to **dress on your own?**



Very important

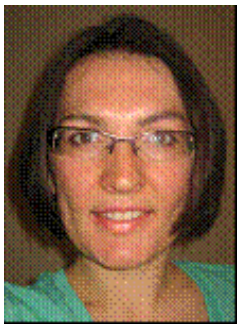


Quite important

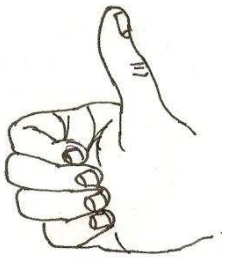


Not important

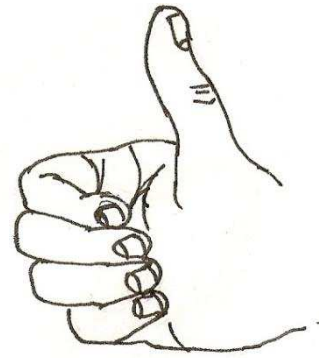
2. **Has your dressing ability improved** since you started dressing practice with Jo and Katherine?



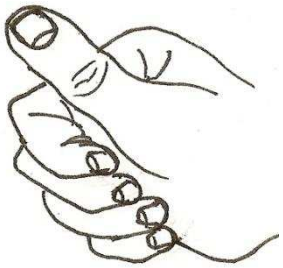
Jo Katherine



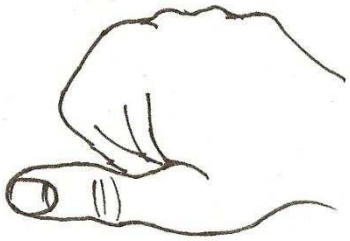
Dressing improved ?



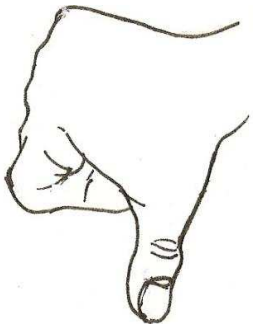
Yes,
much improved



Yes,
a little improved

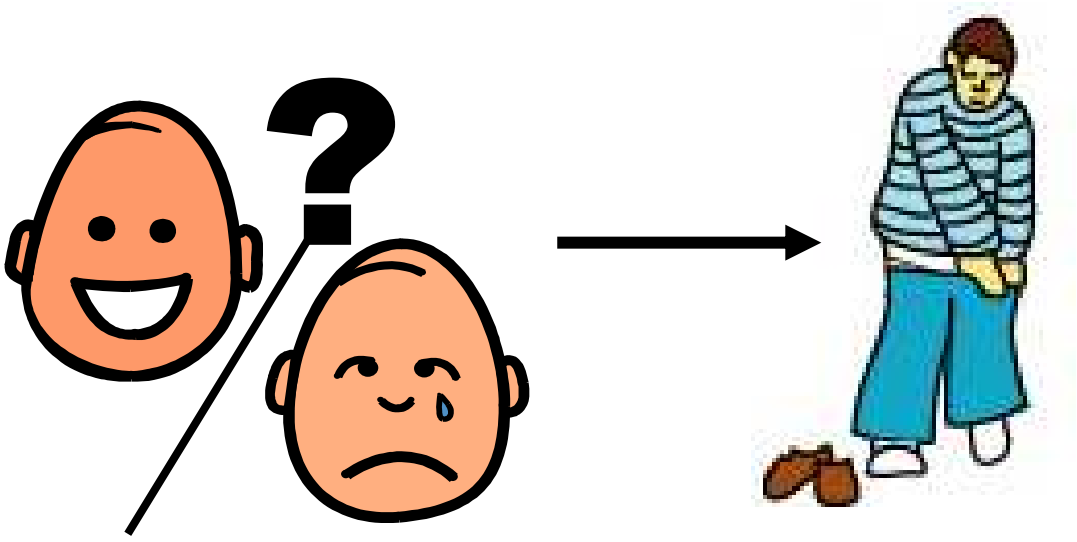


No, not improved

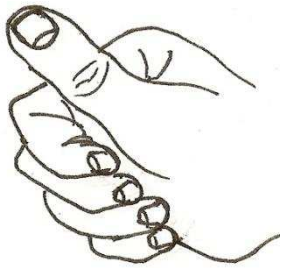


No, it has got worse

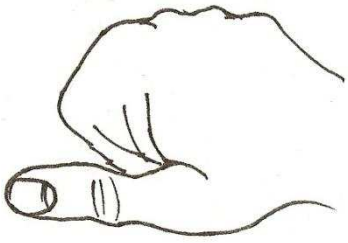
3. Are you **satisfied** with your **current ability** to **dress?**



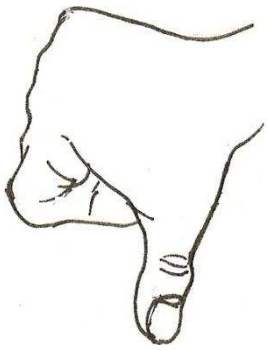
Yes,
very satisfied



Yes,
moderately satisfied

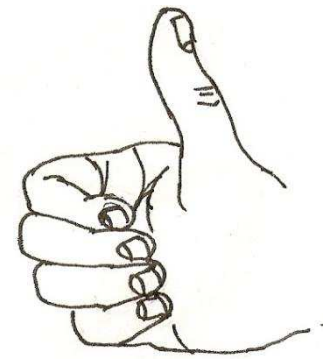


No, slightly dissatisfied

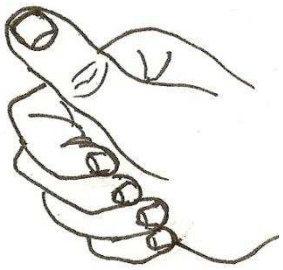


No, very dissatisfied

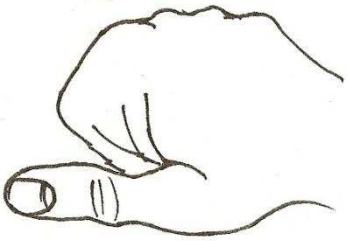
4.**Were** the **dressing methods** Jo/Katherine showed you **helpful?**



Yes, very useful



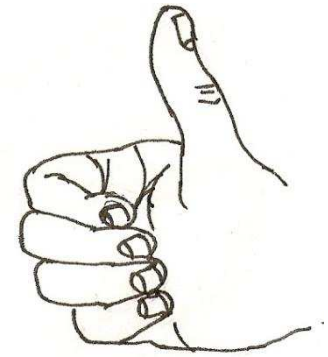
Yes, quite useful



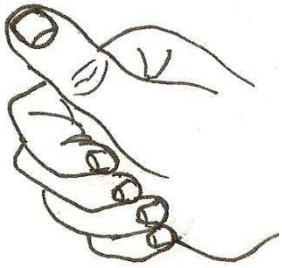
No, not useful

No, no help at all

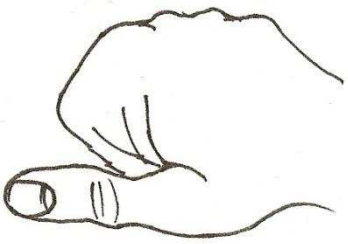
5.**Were** the **dressing methods easy to learn?**



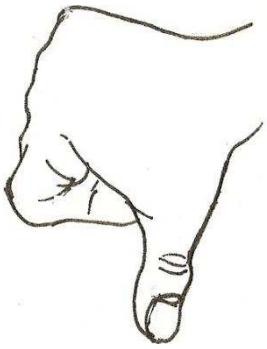
Yes, very easy



Yes, quite easy

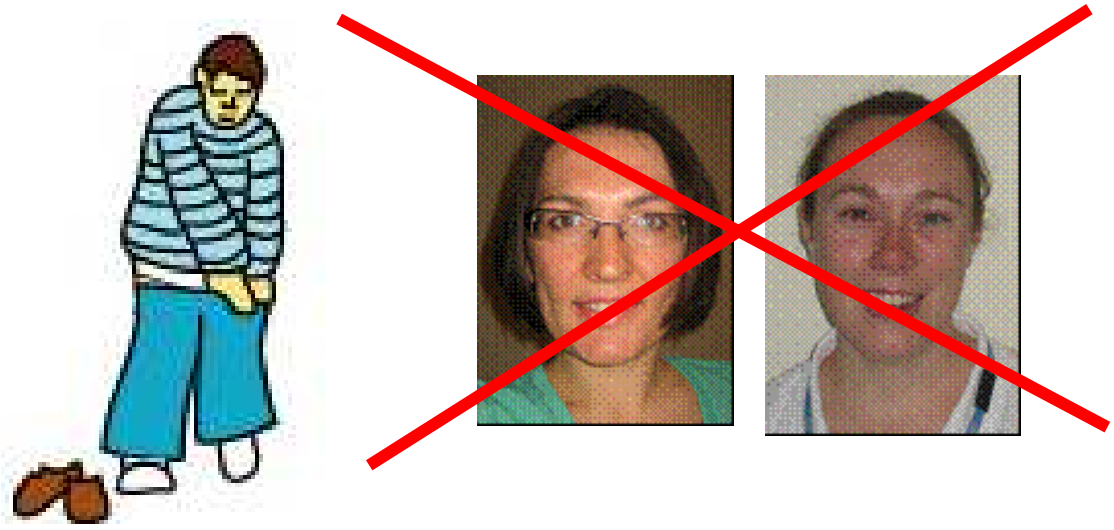


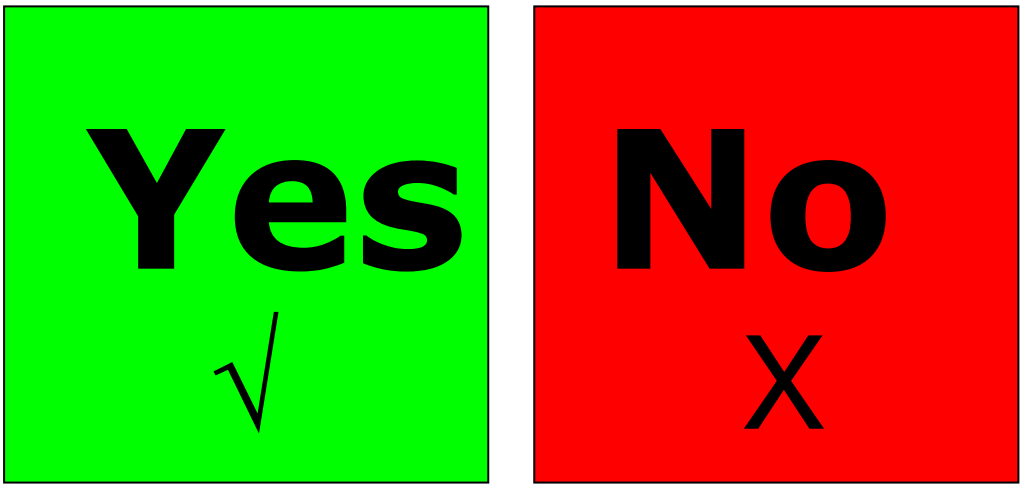
No, difficult



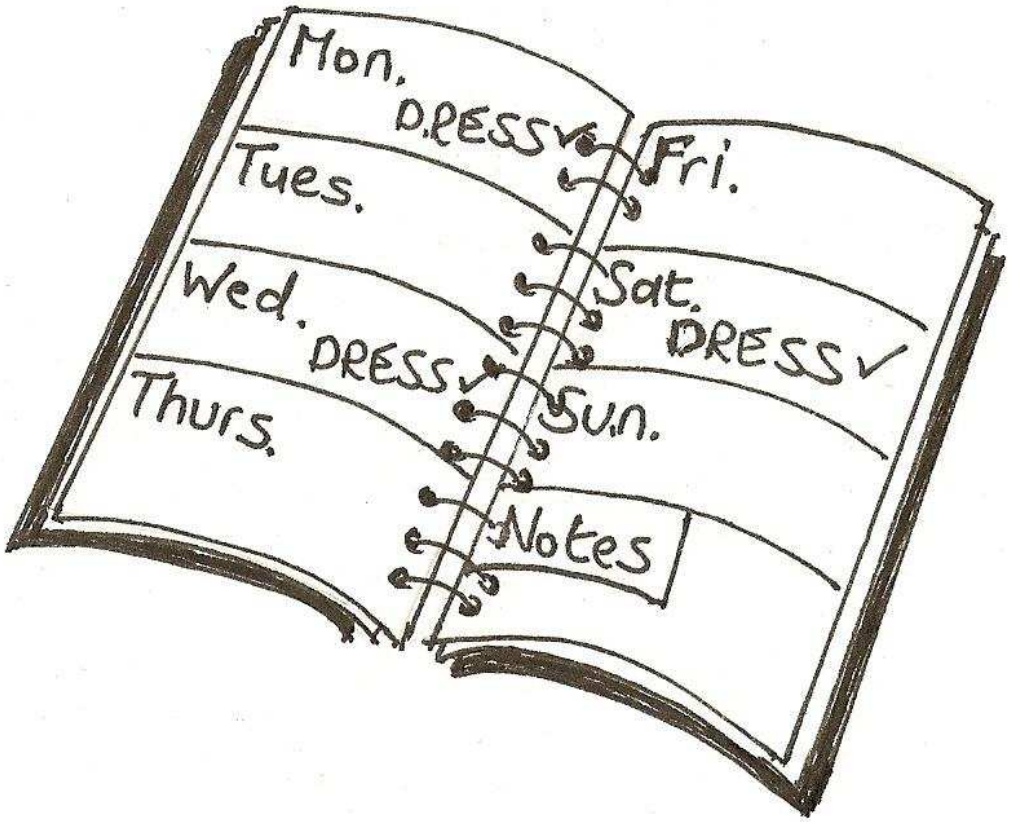
No, very difficult

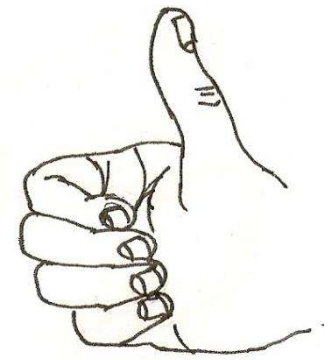
6. **Could you use** the **dressing methods** on your **own?**




Yes
√
No
X

7.**Was** the **number** of **dressing sessions** (3 times a week)…….





Just right

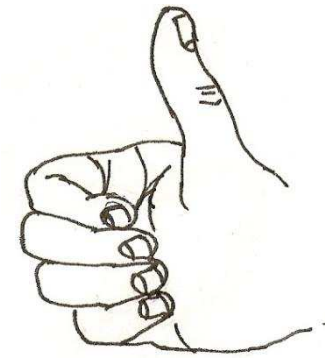
+

I would have liked more

−

I would have liked less

8. **Was** the **length** of **each DRESS treatment session** appropriate?



Just right

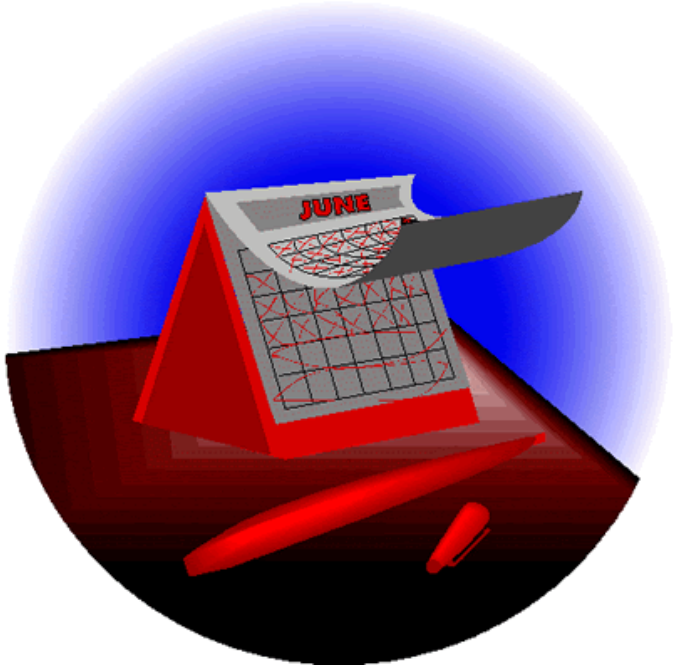
+

Should have been longer

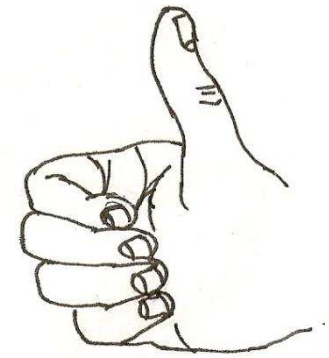
−

Should have been shorter

9.**Was** the **duration** of the **DRESS treatment period** (6 weeks)……



6 weeks



Just right

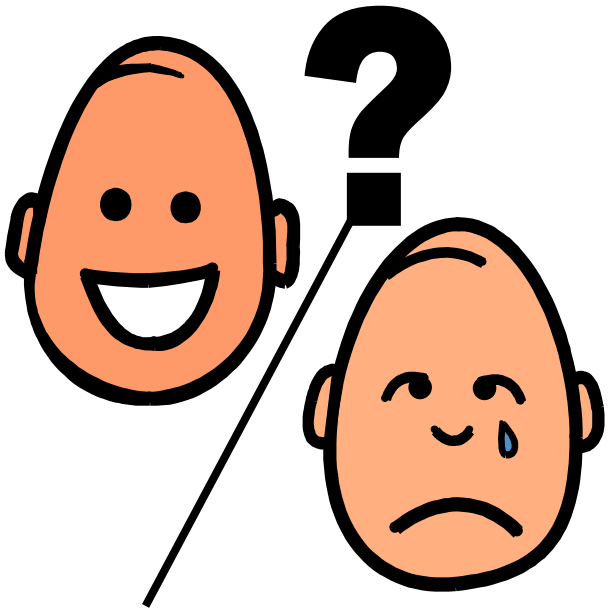
+

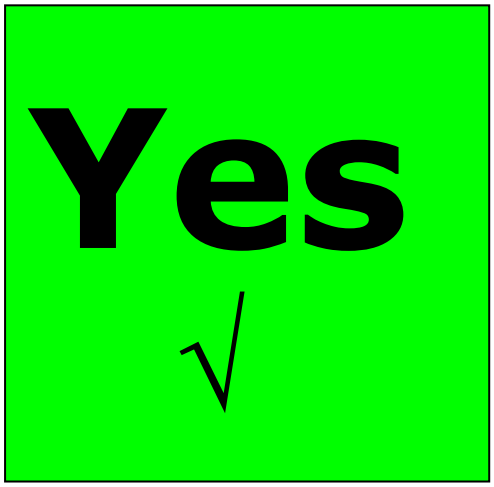
Should have been longer

−

Should have been shorter

10. **Did you enjoy** the **dressing sessions** with Jo/Katherine?



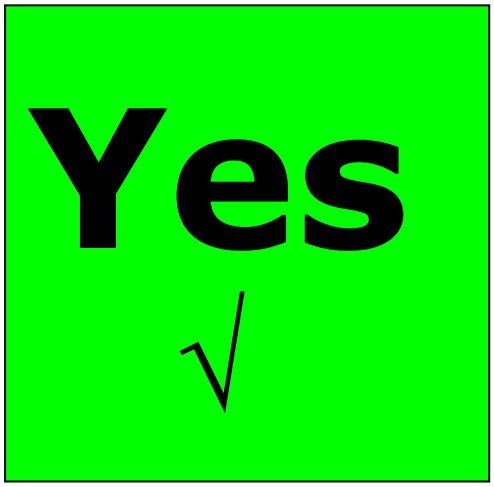

Yes
√


No
X

11. Since your stroke have you **used** any **dressing aids?**



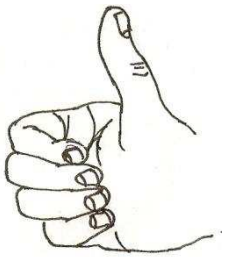


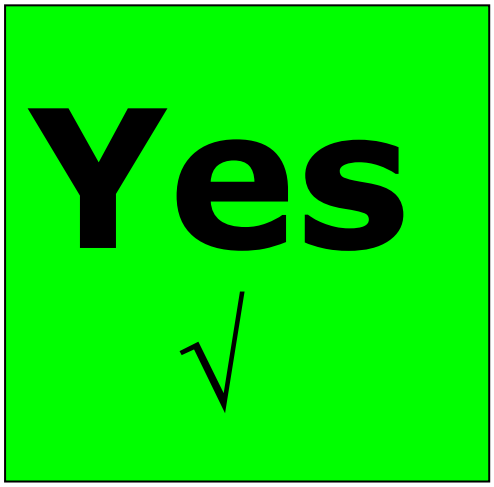

Yes
√


No
X

If yes,

Were the **dressing aids helpful?**




Yes
√


No
X

Thank you

APPENDIX J – Acceptability survey questionnaire

(Aphasia friendly version response form)

Dressing Rehabilitation Evaluation Stroke Study

Aphasia-friendly Patient Survey Response Form

This is the response form that accompanies the Aphasia-friendly version of the acceptability patient survey

Patient ID number:
Date:
Assessor:

1. Is it important to you to be able to dress on your own?

Very important	
Quite important	
Not important	

2. Do you feel your dressing ability has improved since you started dressing practice with Jo/Katherine?

Yes, much improved	
Yes, a little improved	
No, not improved	
No, it has got worse	

3. Are you satisfied with your current ability to dress?

Yes, very satisfied	
Yes, moderately satisfied	
No, slightly dissatisfied	
No, very dissatisfied	

4. Were the dressing methods Jo/Katherine showed you helpful?

Yes, very useful	
Yes, quite useful	
No, not useful	
No, no help at all	

5. Where the dressing methods easy to learn?

Yes, very easy	
Yes, quite easy	
No, difficult	
No, very difficult	

6. Could you use the dressing methods on your own?

Yes		No	

7. Was the number of dressing sessions (3 times a week)

Just right	
I would have liked more	
I would have liked less	

8. Was the length of each DRESS treatment session appropriate?

Yes, just right	
Should have been longer	
Should have been shorter	

9. Was the duration of the treatment period (6 weeks)…….

Just right	
Should have been longer	
Should have been shorter	

10. Did you enjoy the dressing sessions with Jo/Katherine?

Yes		No	

11. Since your stroke, have you used any dressing aids?

Yes		No	

If yes, were the dressing aids helpful?

Yes		No	

APPENDIX K – Acceptability survey questionnaire

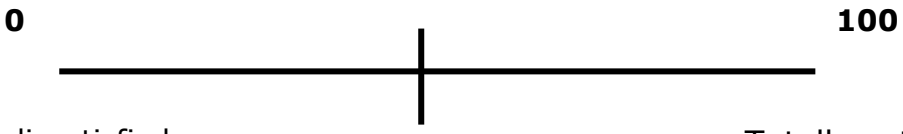
(severe aphasia version)

Participant ID

DRESS Survey

Please put a mark on the line below at the place which shows HOW SATISFIED YOU ARE WITH THE STROKE SERVICES YOU HAVE RECEIVED.

Example: WHERE SOMEONE WAS AS EQUALLY AS SATISFIED AS DISSATISFIED WITH CARE.



Totally dissatisfied with the care I have received

Totally satisfied with the care I have received

The following questions/statements relate to your satisfaction with aspects of the dressing practice you took part in since your stroke.

1) Are you satisfied with your ability to get dressed on your own?

Totally dissatisfied Totally satisfied

2) Overall how helpful was your dressing practice with Jo/Katherine?

Very helpful Not helpful

Publications arising from this thesis

Fletcher-Smith, J.C., Walker, M.F., Sunderland, A., Garvey, K., Wan, A., Turner, H. (2010) An Inter-Rater Reliability Study of the Nottingham Stroke Dressing Assessment (NSDA). *British Journal of Occupational Therapy. 73(12),* 570-578.