THE TRAINING AND PRACTICE IN NEUROLOGICAL REHABILITATION THEORIES IN THE OCCUPATIONAL THERAPY MANAGEMENT OF STROKE PATIENTS IN SOUTH AFRICA

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Master of Science in Occupational Therapy

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DECLARATION

I, Juliana Dorothea Freeme, declare that this thesis is my own work. It is being submitted for the degree of Master of Science in Occupational Therapy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

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To my husband, David Freeme,

For believing that I could do it.

PUBLICATIONS AND PRESENTATIONS ARISING FROM THE STUDY

Occupational Therapy Association of South Africa. Practical application of the new findings in neurological rehabilitation in the treatment of stroke patients. National Congress, Port Elisabeth, 2009.

South African Association of Health Educationalists. Neurological Rehabilitation Occupational Therapy Curricula in South Africa. Third national congress, Johannesburg, 2010.

Wits Faculty of Health Sciences. The Neurological Rehabilitation protocols of Occupational Therapists in South Africa. Research day and postgraduate expo, Johannesburg, 2010.

ABSTRACT

Recent studies to determine appropriate theories of adult neurological rehabilitation for South African Occupational Therapy (OT) curricula are non-existing. Seven OT training centres in South Africa participated in a survey to determine the content of the OT neurological rehabilitation curricula. The results showed that there are no specific requirements for the assessment and treatment of stroke patients in the OT curricula and standardized assessments are not commonly taught at an undergraduate level. A second survey was conducted by means of a questionnaire to OT clinicians in the field of neurological rehabilitation. The sample consisted of 29 subjects. The questionnaire surveyed the current settings where stroke patients are receiving OT, the subjects' treatment protocols with stroke patients, and their use evidence based practice (EBP). The most commonly use theory was neurodevelopmental therapy (NDT) and the majority of subjects received training in this theory. Standardized assessments were not used to measure the effectiveness of treatment, therefore OTs were unsure of the effect of their interventions. OTs also had difficulty explaining their reasons for choice of theories and their theoretical justification was not based on scientific evidence. Only 51.85% of the sample usually uses EBP, and the subjects' own experience had the greatest effect on their use of EBP. Two factors, the lack of time and lack of knowledge impeded the subjects' use of EBP the most. There is however a lack of sufficient evidence regarding which neurological rehabilitation theories are the most effective and therefore more research in the South African and OT contexts is needed.

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LIST OF ABBREVIATIONS

ADL:	Activities of daily living
AMPS:	Assessment of motor and process skills
BR:	Brunnström
CAM:	Cognitive assessment of Minnesota
CNS:	Central nervous system
COPM:	Canadian occupational performance measure
COTNAB:	Chessington occupational therapy neurological assessment battery
CVA:	Cerebrovascular accident
EBP:	Evidence based practice
FES:	Functional electrical stimulation
FIM/FAM:	Functional independence measure/functional assessment measure
HPCSA:	Health professions council of South Africa
IADL:	Instrumental activities of daily living
ICF:	International classification of function
MAS:	Motor assessment scale
MDT:	Multi disciplinary team
MMSE:	Mini mental state examination
MRT:	Motor re-learning theory
NDT:	Neurodevelopmental therapy
NR:	Neurological rehabilitation
OT:	Occupational therapy or occupational therapist
OTASA:	Occupational therapy association of South Africa
OTPF II:	Occupational therapy practice framework, second edition
PG:	Postgraduate
PHC:	Primary health care
PNF:	Proprioceptive neuromuscular facilitation

R:	Rood
RBMA:	Rivermead behavioural memory assessment
RCT:	Randomised controlled trials
RLAS:	Ranchos Los Amigos scale
ROM:	Range of motion
RPAB:	Rivermead perceptual assessment battery
SI:	Sensory integration
UCT:	University of Cape Town
UFS:	University of the Free State
UG:	Undergraduate
UK:	United Kingdom
UKZN:	University of Kwa-Zulu Natal
UL:	University of Limpopo
UP:	University of Pretoria
US:	University of Stellenbosch
UWC:	University of Western Cape
Wits:	University of the Witwatersrand

CHAPTER 1: INTRODUCTION

1.1 Introduction to the study

The prime objective of universities offering occupational therapy (OT) training programmes is to generate competent, autonomous, and knowledgeable occupational therapists (OTs). They achieve this by providing a professional education that teaches the fundamental theoretical and clinical skills through academic and practical study (1). The challenges are to identify the fundamental theoretical and clinical skills, to ascertain whether the future OTs are taught what they really need to equip them to be efficient in decreasing the consequences of stroke in daily functioning of these patients.

One of the fields of practice in OT is neurological rehabilitation, and the management of stroke patients forms part of this. The majority of an OT's workload in a general practice with physically dysfunctional patients is comprised of the treatment of stroke patients (2) (3). OTs treat stroke patients by facilitating and improving motor control and hand function in the hemiplegic upper limb, maximising the patient's ability to perform occupational performance tasks, helping the patient manage cognitive, perceptual and behavioural changes due to the stroke, and preparing the patient for their return to home and work environments (4). OTs aim to facilitate task performance by improving relevant performance components or through teaching compensatory techniques to overcome the loss of functional skills (5). The burden of care of stroke survivors is also placed on caregivers and family members. Therefore, decreasing the burden of care as well as improving the quality of life of stroke survivors and their caregivers, is an essential role to be fulfilled by OTs (5).

The prevalence of stroke in South Africa is three hundred people out of a hundred thousand (6) and it has been identified as the most important cause of death and disability for people over 50 years old in South Africa (7). Sixty eight percent of stroke survivors will have permanent functional motor impairments of the upper limb, which in turn affect a person's quality of life and functional independence. Upper limb function is crucial for functional independence in occupational performance (8). The result is that two hundred out of a hundred thousand stroke survivors will need help in at least one activity of daily living (6). Therefore, due to the high incidence of morbidity of stroke survivors in South Africa, OTs play an essential role in the neurological rehabilitation of stroke patients.

There is some evidence for the benefits of OT after stroke, but uncertainty is evident among OTs about the actual content and effectiveness of the therapy they provide (9), and the effectiveness of adult neurological rehabilitation theories used in the rehabilitation of stroke patients (5). There is a multitude of neurological rehabilitation theories, and each one is different in terms of the intervention utilised to address deficits in motor functioning (8). The theories most commonly used in OT practice in neurological rehabilitation in South Africa are the Neurodevelopmental therapy (NDT) theory developed by Bobath, and published in 1974 and 1990 (10) (11), the Rood Theory developed by Rood between 1954 and 1962 (12) (13) (14), the Brunnström Theory developed by Brunnström and published in 1966 and 1970 (15) (16) and the Motor re-learning theory(MRT) developed by Carr and Shepherd from 1980 to 2003 (17) (18) (19) (20) (21). And lastly, the Proprioceptive Neuromuscular Facilitation (PNF) is an approach developed by Knott and Voss, published in 1968 and 1985 (22).

The practical application of these theories in OT treatment will cause significant differences in the way stroke patients are treated, because they place different emphasis on the vast causes of dysfunction in movement after stroke. The theoretical basis for each neurological rehabilitation theory is different, therefore, the treatment techniques would focus on different areas of impairment. There is however, a lack of evidence in research suggesting one theory is superior to another in improving independence in functioning in all areas of occupation after the effects of stroke (3). These theories are also mainly developed by Physiotherapists and within westernised countries and their suitability for OT and within the South African context can be questioned.

With the controversy occurring in clinical practice, there is also limited guidance provided on which theories should be taught in neurological rehabilitation and which theories OTs should use in terms of current best practice. Previous research states that “given the broad range of therapy approaches, educators and researchers must obtain data on which stroke rehabilitation methods are actually being used by clinicians” (23:842). The curriculum design and content of university courses should be guided by the work the entry level OTs perform (2). However, it is not clear which theories the OTs are using in the field and whether these theories are useful in the South African context. There has been a long standing disparity between OT education and practice, and one way to close the gap is to align curriculum content to clinical practice (24). Due to the fact that the OT curricula are already over extended, there is insufficient time to cover neurological rehabilitation theories in depth, and it is worrying that the curriculum may not adequately prepare OTs to manage stroke patients. It is therefore important that the limited

time that is available in the curriculum be dedicated to the knowledge and skills essential for practice in this field. The study will therefore explore the training and current practice of neurological rehabilitation theories in the OT management of stroke patients in South Africa.

It is noted that the terms theories and approaches, programmes and techniques are used interchangeably in different contexts and from different sources. To prevent confusion, the term theory will be used in this study.

1.2 Statement of the problem

No recent studies are available regarding which theories of adult neurological rehabilitation are included in the curricula at each of the eight OT training centres in South Africa. It is also not clear what practical training the students receive in applying these theories in practice to ascertain whether the current training is adequate in preparing the OTs for competence in neurological rehabilitation.

Qualified OTs specialising in adult neurological rehabilitation do not justify the use of certain treatment techniques with sound theoretical knowledge, but their choice of intervention is dependent on the clinical setting and influences from other multidisciplinary team members (25), initial training and experience, and not necessarily evidence based practice (EBP).

Besides NDT courses, there is a lack in postgraduate training in the remaining neurological rehabilitation theories, and therefore OTs are not exposed to more theories in South Africa. As many of the OTs have undergone postgraduate training in NDT, they are also the role models to younger and less experienced OTs. Therefore, OTs are also exposed more to the NDT techniques in clinical practice than other neurological rehabilitation theories. There is thus inadequate exposure to a variety of neurological rehabilitation theories, and therefore limited numbers of OTs that can provide evidence for the effectiveness of all theories.

OTs do not sufficiently use theoretical frameworks. This may be due to inadequate undergraduate teaching or the inappropriateness of neurological rehabilitation theories taught for the South African context.

OTs do not use standardised assessments to measure the effectiveness of their treatment of stroke patients. It is therefore difficult to conclude whether the current techniques are effective in practice (9). There is a lack of standardised assessments appropriate for the South African

context, and therefore OTs find it challenging to use the currently available resources to measure the effectiveness of their therapy.

1.3 Purpose of the Study

The purpose of the study was to determine the current training and practice of neurological rehabilitation theories in the OT management of stroke patients in South Africa. The study determined whether OTs are using neurological rehabilitation theories effectively in practice and the training that impacted their knowledge and skills. The results of this study were used to compile a suggested framework of a process to be followed to ensure OTs in South Africa manage stroke patients effectively. The training needs were identified from the information gathered on which neurological rehabilitation theories OTs use in practice, and a framework for effective OT training in neurological rehabilitation was recommended.

1.4 Aims and objectives of the study

1.4.1 Aim 1

The study aimed to determine what is being taught at an undergraduate level at the eight training centres in South Africa.

1.4.1.1 Objectives for aim 1

The study was conducted to determine the following:

- The neurological rehabilitation theories taught.
- The evaluation methods taught.
- The content of the different neurological rehabilitation courses in South Africa.

1.4.2 Aim 2

The study aimed to determine the application of skills and knowledge of neurological rehabilitation theories in clinical practice of OTs in South Africa.

1.4.2.1 Objectives for aim 2

The study was conducted to determine the following:

- The neurological rehabilitation theories the OTs have been trained in.
- The OTs' familiarity with the different neurological rehabilitation theories.
- The training that affected the OTs' familiarity with the neurological rehabilitation theories.

- The neurological rehabilitation theories the OTs were using in their practice.
- The training that affected the OTs' use of neurological rehabilitation theories.
- The ranking of the OTs' choices of neurological rehabilitation theories they use.
- The reasons for their choice in using the different neurological rehabilitation theories.

1.4.3 Aim 3

The study aimed to investigate whether OTs are effective in their therapy, and what they aimed to achieve in their management of acute stroke patients in South Africa.

1.4.3.1 Objectives for aim 3

The study was conducted to determine the following:

- The standarised and/or non-standardised assessments used to measure the effectiveness of the treatment techniques the OTs use.
- The tools used to measure the effectiveness of the therapy OTs use.
- The aims OTs set to achieve in their management of acute stroke patients.
- The theoretical justification the OTs gave for their treatment choices.

1.4.4 Aim 4

The study aimed to investigate whether OTs in the field of neurological rehabilitation are using EBP in their management of acute stroke patients in South Africa.

1.4.4.1 Objectives for aim 4

The study was conducted to determine the following:

- Whether OTs in the field of neurological rehabilitation knew what EBP is.
- The frequency of use of EBP and the different sources used.
- The factors providing the information OTs base their knowledge of treatment on.
- What influenced their ability to use EBP.

1.5 Justification of the study

An OT practicing in the field of physical dysfunction treats stroke patients as the majority of their workload, as the number of patients surviving stroke and left with chronic disability is significant (6). As neurological rehabilitation is such an important part of the OT's daily practice, it is essential to have sound theoretical knowledge and skills to assess and treat the stroke patients

competently. This research was required in the field of neurological rehabilitation as it is an important area of practice in OT.

To keep up with the new research and developments in neurological rehabilitation, training centers, as well as OT clinicians should stay updated by using EBP. There is a lack of evidence relevant to the South African context. The study was therefore important in order to raise awareness of the different neurological rehabilitation theories and the evidence for their effectiveness, how these theories were used in South Africa, and whether training centers were equipping the future OTs with the latest and most effective skills and knowledge to practice competently in the field of neurological rehabilitation.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Introduction to the review of literature

The review of literature will start with a brief description of stroke and its relevance to OTs in practice. The role of the OT in the management of stroke will be discussed, with an overview of the assessment and treatment of the factors causing disability after a stroke, and the most important aims of therapy as set by an OT. The theories used to manage stroke will be briefly described, and each theory's viability will be examined using previous research and evidence. The training of competent OTs in this field will be investigated, with a view of the difficulties of designing a neurological rehabilitation curriculum. Lastly, a review will be done regarding the importance of using EBP to keep up to date with the latest developments when designing the curriculum and managing stroke patients in daily practice.

2.2 Introduction to stroke

Stroke is also known as cerebrovascular accident (CVA). It is the description given when a sudden loss of blood flow due to vascular injury causes a decrease in oxygen supply to brain tissue, which in turn causes brain tissue death or infarction (26). The majority of strokes occur in the anterior and posterior circulation of the cerebrum and this will lead to hemispheric dysfunction (26). The most typical manifestation of a stroke is hemiparesis or hemiplegia. Hemiplegia is defined as paralysis on the one side of the body, and therefore no movement (26). Hemiparesis is the weakness or partial paralysis of one side of the body, which may only cause mild impairment in movement (26).

A stroke in either hemisphere will cause contralateral hemiplegia with a stroke on the left more commonly presenting with aphasia and other communication deficits, and motor planning deficits (26). A stroke on the right will result in poor insight and judgement, and impulsive behavior (26). Other dysfunctions could be sensory disturbances, perceptual dysfunction and spatial neglect, visual disturbances and visual field deficits, personality and intellectual changes, and a complex range of speech and associated language deficits (27).

The burden of stroke is not just high mortality, but the high morbidity, which leaves 50% of survivors chronically disabled (6). Due to the advances in medicine and the increased longevity of the geriatric population, there is an increase in the number of physically disabled persons in

our society (5). The prevalence of stroke in South Africa is three hundred people out of a hundred thousand and the prevalence of stroke survivors needing help in at least one activity of daily living was found to be two hundred people out of a hundred thousand (6), and only 25% of survivors will return to the level of everyday participation in activities of daily life (28). Strokes remain the major source of functional disabilities worldwide due to the frequencies and long term consequences (29). As independence in activities of daily living (ADL) is the core philosophy of OT, management of the dysfunctions caused by stroke is the major concern of the OT. Therefore, due to the high morbidity rate after stroke, many stroke survivors will need intervention by an OT.

Not all patients recover fully after the stroke. According to research, improvement can occur, but this varies according to the nature and severity of the stroke (28), as well as the time of recovery (26). There are usually already signs of recovery during the acute stages of the stroke, due to pathological processes resolving and neurotransmission resuming. Later on, some improvement in function will occur due to structural and functional reorganisation within the brain (26). This is called neuroplasticity (26). It has been found that neuroplasticity includes greater excitability and recruitment of intact neurons in both hemispheres of the brain in response to stimulation, participation, training, and experience (26). A patient will recover function in two ways. Firstly, there will be an amount of neurological repair, which will allow for movement returning in a hemiplegic limb. Then, secondly, the patient will regain the ability to perform meaningful activities, tasks and roles, even if full neurological function has not been restored (26). This often occurs when patients start using their unaffected limbs to compensate for the loss of function in the hemiplegic limbs (26). Neurological rehabilitation is designed to promote possible function, through either promoting the neurological repair, or through the teaching of compensatory methods, and this should occur as soon as the patient is medically stable to prevent secondary complications (26).

Research has been done to determine the prognosis of stroke survivors, and it was found that poor outcomes can be expected if the lower limb does not regain movement after two weeks, and the upper limb after four weeks (28). Other prognostic factors with a negative influence on the recovery of stroke patients include advanced age, urinary incontinence, cognitive impairments, delirium, functional deficits present at admission and level of social support (5). Other factors affecting the functional outcomes of stroke patients are the presence and severity of co-existing disease, poor sitting balance, prior stroke, visual perceptual deficits, depression, severe aphasia, and limb and hand in daily activities six months after altered level of

consciousness. Only 14% of stroke survivors have been found to regain full motor function (26). Approximately 35% of stroke survivors with initial lower limb paralysis do not regain useful function, and 20 -25% of all survivors are unable to walk without complete assistance (26). Research also stated that 65% of stroke survivors are unable to use their affected upper the stroke (28). The OT uses clinical reasoning to weigh up factors predicting a good prognosis or a poor prognosis. In the case where improvement is likely, the OT needs to use the most suitable and effective methods of therapy to ensure movement returns, and the patient can recover to their full extent.

2.3 Content of OT neurological rehabilitation

Defining the content of an OT treatment session with a stroke patient is difficult due to the complex nature and variability of the intervention (30) (31). Due to the lack of certainty of OTs regarding the interventions in neurological rehabilitation, several researchers have aimed to define the content (5). Literature states that it is uncertain which elements of OT intervention are essential to the improvement of performance (32).

OTs most often treat stroke patients after their admission to hospital. Inpatient rehabilitation is most suitable for stroke patients who are unable to return home due to their residual disabilities, but who have the necessary cognitive skills and endurance to participate in therapy for approximately three hours per day (28). These patients typically need ongoing assistance and supervision by the hospital staff, and they have the necessary social support at home in order for the assistance and supervision to continue once they return home (28).

The conventional processes and methods of assessment and treatment in OT intervention with stroke patients will now be discussed to provide insight into the content of the curricula.

2.4 Assessment

2.4.1 Standardised assessment

OTs use standardised and non-standardised assessments to evaluate function in areas of occupation and body structures and function. Standardised testing enables the OT to measure the level of independence, and therefore the levels of care needed by the stroke patient, in order to ensure the patient's safe return to home, and in order to set realistic goals for therapy (4). Factors influencing the choice of using a standardised method may include the level and pattern of motor control of the patient, the clinical setting, the time available to administer the

test, the resources available, and the intended use of the results (4). OTs are encouraged to use standardised assessments to enrich their general observations (4) (26), as an unstructured assessment process will lead to vague and non-specific treatment goals (33). A study done on Physiotherapists in the United Kingdom (UK) revealed therapists also did not use published measures that are tested for validity and reliability (34). The researchers also stated that this is a worrying trend, as this is in essence a waste of time and resources. They argue that changes noted in therapy could be due to measurement error and not necessarily due to true clinical change (34).

Measurements should be made at several points in time, which could be, for example, at admission to ascertain the abilities of the patient and to set goals for therapy, and throughout therapy to evaluate the effectiveness of the methods of intervention the OT chose. The OT should perform these assessments regularly to note the patient's progress and their suitability for discharge from hospital.

The setting of standards in quality of health care is an international concern, as seen in the publication by the United States Department of Health: Post stroke rehabilitation clinical practice guideline (26). This guideline recommends that practitioners "use well-validated standardised measures throughout acute care and rehabilitation, to achieve consistency of treatment decisions, facilitate team communication, and monitor progress for each survivor" (26:1011). Pressure has also been placed on OTs in the health care systems in Australia and the UK to provide quality and evidence based techniques at the lowest possible cost (35). The best way to indicate the effectiveness of therapy is to provide quantifiable measures to indicate the improvement in stroke patients' functioning. This is not just important in terms of fiscal constraints, but also due to the importance of providing the best quality rehabilitation to patients (35). Obtaining a measurement of the effectiveness of a therapy method is becoming critical due to the controversies surrounding the effectiveness of the neurological rehabilitation theories (36) as well as proving the value of OT in neurological rehabilitation (35).

It is clear why OTs need to use standardised assessments, but a major concern is that the standardised assessments have been validated in countries other than South Africa, and local OTs may argue that these assessments are not appropriate to measure function in their unique context and resulting in invalid results (37).

2.4.2 Areas of occupation

The OT assessment of a stroke patient includes the analysis of the effect of the deficits occurring after stroke on the patient's ability to function normally in all areas of occupation. According to the Occupational Therapy Practice Framework, second edition (OTPF II), the areas of occupation includes ADL, instrumental activities of daily living (IADLs), rest and sleep, education, work, play, leisure and social participation (38). The activities included in ADL are bathing or showering, bowel and bladder management, dressing, eating and feeding, functional mobility (such as transferring from bed to chair, ambulation and wheelchair use), personal device care (such as caring for hearing aids), personal hygiene and grooming, sexual activity and toilet hygiene. Activities included in IADL are care of others, care of pets, child rearing, communication management, community mobility, financial management, health management, home establishment, meal preparation, religious observance, safety and emergency maintenance and shopping (38). The patient's ability to engage in areas of occupation depends on the various pathological conditions resulting in stroke and the location of the lesion in the brain (27). OTs consider the integrity of the bodily structures and functions which will allow clients to perform diverse tasks and activities that comprise role performance (39). According to the OTPF II client factors are the specific abilities, characteristics, or beliefs the client has and makes the person unique. Client factors involve the values, beliefs, spirituality, body functions and structures, and these factors influence a person's ability to function optimally in areas of occupation (38). The specific client factors affected by stroke will be discussed later.

As stroke is a complex condition, the OT will commence with assessment of ADLs, as these skills are orientated to taking care of one's own body. These activities are fundamental for functioning in other areas of occupation, and enable survival and well-being (38). The OT also performs a thorough assessment of the stroke patients' environment, i.e. their physical, social, and cultural environment, to determine their level of independence in performing all tasks necessary to enable quality of life (4), which is determined by their level of functioning in all areas of occupation (28).

The OT will complete a comprehensive assessment of the stroke patient's abilities to fulfill their life or occupational roles, and whether the patients can reintegrate into the community. Motor deficits, somatosensory deficits and cognitive and perceptual deficits have been proven to affect performance in ADL (29), and the OT needs to ascertain which client factors affect performance in areas of occupation to ensure that these deficits are addressed first. Commonly affected client factors to be described first are body functions. Body functions affected are mental

functions (such as memory and emotional functions), sensory functions (such as vision) and pain, neuromusculoskeletal and movement related functions (such as joint mobility and muscle tone), and cardiovascular, haematological, immunological and respiratory function (such as cardiovascular system function) (26) (27). Secondly, body structures affected by stroke are structures of the nervous system. Then, lastly, the stroke patient's ability to meet activity demands is limited. They may be mobile only through the use of a wheelchair and typical environments in South Africa, such as informal settlements, cannot be maneuvered easily on the un-tarred roads. Their body functions and structures are also affected, as they often only have the use of one upper limb due to hemiplegia, their memory and attention is affected and they are unable to function independently. They may also suffer secondary complications such as contractures which limit their joint mobility (38).

OTs also make use of standardised assessments to determine limitations and restrictions in occupational performance. Examples of standardised measures for assessment of areas of occupation include the Functional independence measure (FIM) (40), Barthel index (41) and the assessment of motor and process skills (AMPS) (42).

The specific mental functions, sensory functions and pain, neuromusculoskeletal and movement related functions and cardiovascular, haematological, immunological and respiratory functions will now be discussed.

2.4.3 Mental functions

2.4.3.1 Perception functions

The screening of primary visual skills (sensory function), including acuity, visual fields, and visual tracking, is done by the OT before the assessment of visual perceptual skills. This assessment is crucial before the assessment of other client factors, as research has shown that these skills are prerequisites for functional independence, although motor abilities are more important (29). Several standardised assessments are available to OTs, and a commonly used one is the Rivermead perceptual assessment battery (RPAB) (43). Some of the common visual perceptual disorders seen in stroke patients are agnosia, figure-ground, depth perception and body scheme disorders, and unilateral neglect (26) (27). These disorders affect the ability of the patient to move normally in order to perform tasks in all areas of occupation.

2.4.3.2 Specific mental functions

The OT will also assess the stroke patient's specific mental functions such as judgement, insight, decision making, attention and memory (38). These skills are crucial to enable independent living, and should be considered by the OT before commencing a treatment program (29). Stroke patients with these deficits will have difficulty initiating daily tasks, planning simple tasks, remembering appointments and to take medication. They may also be impulsive and have other safety risks, and therefore all these factors influence the patient's ability to improve in therapy and to function normally at home (4). Standardised measures useful in the OT practice for assessment of cognitive, memory and executive functioning are the Mini mental state examination (MMSE) (44), the Cognitive assessment of Minnesota (CAM) (45), the Rivermead behavioural memory assessment (RBMA) (46) and the AMPS (4).

2.4.3.3 Emotional functions

Many stroke patients have an emotional response to their stroke, which includes denial, anxiety, anger and depression (26) (27). Depression is a widely associated symptom of stroke, with 25-40% of stroke patients suffering from this condition (26) (27). Depression occurs due to the structural changes in the brain, as well as over time as the stroke patient becomes more familiar with their residual disabilities. Patients may also deny the consequences of their stroke, and this may have a significant effect on their willingness to participate in rehabilitation (26). Emotional lability, which is a disproportionate emotional response to the actual event, is also common among stroke survivors. The combination of dysfunctional emotional reactions and disturbances in cognitive processes could lead to a stroke patient experiencing high levels of frustration, anger, impatience, impulsivity, irritability, insensitivity, and rigid thinking (26). Therefore, these changes, with the motor changes must be considered in the rehabilitation process, and the patients' return to home or work.

2.4.4 Neuromusculoskeletal and movement related functions

Stroke has devastating effects on a person's motor and sensory functioning. OTs are skilled in assessment of these functions, and traditionally the assessment places emphasis on the upper limb of the stroke patient. The specific client factors assessed by the OT include muscle tone, muscle strength, muscle endurance, selective control of movement, postural control, joint mobility, somatosensory functions and pain, and cardiac system functions (4) (26) (27) (38).

2.4.4.1 Muscle tone

Muscle tone may present as abnormal in two extremities. One extremity is increased muscle tone, or spasticity. Spasticity has been defined as a motor disorder characterised by a velocity dependent increase in tonic stretch reflexes with exaggerated tendon jerks resulting from the hyperexcitability of the stretch reflex (47). The other extremity is decreased muscle tone, or hypotonia. A complete absence of muscle tone and tendon reflexes is flaccidity, which implies an absence in innervations from the cerebral cortex due to severe brain damage. Abnormalities in muscle tone can interfere with movements and function of the hemiplegic limbs and hand. The therapist must ensure that they distinguish between a muscle contracture, shortening, stiffness and myofascial tension and spasticity. Hypertonicity has been defined as a resistance to passive movement, which also involves stiffness both neural (spasticity) and mechanical (soft tissue stiffness) factors causing it. This is tested by slowly moving a joint. The most commonly used assessment to test for an increase in muscle tone is the Modified Ashworth scale (4), although the most effective way of evaluating spasticity is through quantifying the electromyographic activity in a laboratory (47). Therefore, dysfunction in muscle tone where tone is increased due to neural factors will be referred to as spasticity, and hypertonicity due to the dysfunction of mechanical factors will be discussed under the section regarding secondary impairments.

2.4.4.2 Muscle strength (power)

Muscle weakness dysfunction can range from complete inability to activate muscles to just slight impairment in strength, and is a major factor contributing to disability after stroke (48). Muscle strength has been a highly controversial client factor in neurological rehabilitation, due to the uncertainty of the effect of spasticity on movement, rather than the effect of strength on movement. The NDT theory is also cautious to use resistance in a hemiplegic muscle due to the belief that resistance increases already abnormal spasticity (10) (11). Some studies have shown the benefits of strengthening muscles in appropriate patients (47). Crucial studies have been performed to find the correlation between spasticity and hypertonicity and disability, and the effect of spasticity and weakness on function. The conclusion is that the major contribution to disability after stroke is not because of spasticity, but rather weakness (47). This client factor can be evaluated using standardised tests and methods, for example manual muscle testing, grip and pinch strengths (4).

2.4.4.3 Muscle endurance

The strength of the muscle to perform movements is also affected by the muscle's ability to sustain the movement and activity for practical amounts of time. This is called the endurance of the muscle, and can be affected by the patient's physical and mental fatigue (26).

2.4.4.4 Selective control of movement of the limbs

The OTPF II names this client factor "control of voluntary movement", but to ensure theoretical correctness, the term will be used as "selective control of movement" in this study. Determining the amount of active movement in the limbs is one of the initial assessments the OT must perform (26). The OT should critically evaluate the return of movement in the limbs to ascertain the effectiveness of the rehabilitation program and the capacity of the patient to improve, always considering the patient's prognosis. Assessments commonly used to evaluate the return of movement in the limbs and hand is the Fugl-Meyer assessment of motor recovery after stroke (4) (36) and the Motor assessment scale (49). The Fugl-Meyer assessment of motor recovery after stroke is based on the stages of return of movement according to Brunnström (15) (16). At first, the patient can perform reflexive but not voluntary movement. After this stage, voluntary movement returns, but movements can only occur within a synergistic pattern. Movements become more practical and precise, and isolated joint movements are used (15) (16) (26). The major challenge in treatment of hemiplegia is the patient's use of synergistic movements. This is defined as the inability to isolate and control single muscle groups, as movement initiated in one joint result in the automatic contraction of other muscles linked to the synergy. These synergistic movements are seen as dysfunctional by the OT, as they are inaccurate, inflexible and energy consuming. The OT should not consider the return of movement and sensory function in isolation, but it must always be interpreted in terms of the effect these deficits have on the patient's ability to perform functional activities. There is no single upper limb assessment method that is universally accepted (4) therefore results of assessments recording the patient's ability to move must be correlated with the patient's ability to perform functional activities.

2.4.4.5 Selective control of movement of the trunk (postural control)

Postural control refers to the individual's ongoing ability to remain upright against gravity for stability and with the change from one position to another, therefore the selective control of movement of the trunk (27). Postural control is an important client factor to treat in stroke patients, as it has a significant effect on the patient's ability to perform ADL and IADL (26) (27). A stroke patient with hemiplegia typically has difficulty with postural control due to their poor trunk control, poor bilateral integration, and impaired automatic postural control. The patient

exerts a significant amount of energy in attempting to stay upright, they are therefore unable to focus on purposeful activities, and they may not have the residual energy to perform activities independently. They will also use their upper and lower limbs to assist with external support when moving between positions, and their limbs are therefore not being used in functional movements. Postural control is an important client factor to treat in the acute stages after a stroke, as impairments in this client factor will cause dysfunctional limb control, increased risk of falls, contracture and deformity, diminished sitting and standing endurance, decreased visual feedback from the environment as they will be looking down, and poor ability to swallow (26) (27). Postural control is a predictor of gait recovery, sitting balance, FIM scores and Barthel index scores (27).

2.4.4.6 Range of movement, joint malalignment and secondary impairments (joint mobility)

Another category believed to cause the dysfunction in movement after a stroke is adaptive features, also known as secondary impairments, which occur when muscles are immobilised in their shortened position and this causes physiological changes to the muscle fibres (50). Muscles are immobilised due to weakness and spasticity. These features are discussed in detail under the MRT (17). It is essential to prevent shortening and stiffness in the acute phase of rehabilitation through active and passive mobilisation. Another type of malalignment, called subluxation, causes shoulder dysfunction. This is the malalignment of the shoulder joint due to the weight of the arm pulling down the humerus when supraspinatus and deltoid muscles are weak (26).

2.4.5 Sensory functions and pain

2.4.5.1 Somatosensory functions

Somatosensory disturbances after stroke may affect touch, temperature and pressure, proprioceptive and pain functions. The dysfunctions often accompany motor deficits after stroke, as the motor and somatosensory cortices are closely linked in their anatomical location, and therefore a severe stroke may affect both areas (51). Testing may be difficult in the case where a stroke patient has the inability to respond, if they are confused and in case of other cognitive deficits. Somatosensory deficits can range from a complete loss of all sensory modalities, to patients with mild impairment and only dysfunction in discriminatory sensation such as two-point discrimination (26). Somatosensory function affects movement, as sensory input from the environment transfers information to the somatosensory cortex regarding the

movement required, for example the size, shape and weight of an object will relay information to ensure the correct shaping of the hand to hold the object (51). Studies have also found a significant link between somatosensory deficits and the person's ability to function in ADL (29).

2.4.5.2 Pain

Stroke patients may have had certain dysfunction present before the occurrence of the stroke. Due to the majority of stroke survivors being elderly, there are many co-morbid conditions present. Stroke patients often experience pain due to arthritis and previous injury (28). Stereotyped positioning of joints will cause shortening and contractures of tendons, muscles, and ligaments, and therefore increased pain upon movement. Shoulder pain may also occur due to adhesions, tendinitis, and bursitis (26). Pain can severely affect the stroke patient's ability and motivation to move. Pain syndromes could include central pain syndrome and painful impingement syndrome, while overstretching and shortening of muscles, joint and soft tissue injury also cause pain (27). One of the commonly used subjective pain assessments is the visual analogue scale (52). This assessment is subjective, and research has shown that stroke patients are unable to use this scale successfully (53).

2.4.6 Haematological, immunological and respiratory functions

2.4.6.1 Cardiac system functions

Another factor to consider is the likelihood of many stroke survivors having a pre-morbid cardiac condition, which is a cardiovascular system function. Oedema may also be present due to immobility and the co-morbid cardiac conditions (26). Oedema also pools under the extensor tendons in the low tone stage of the stroke when there is no active movement (27). This swelling prevents active and passive flexion of the fingers and thumb (27). Oedema is quantified through circumferential or volumetric measurements (54).

2.5 Treatment

The OT will compile a report of the above assessments, and make recommendations for treatment and start treatment planning. The OT focuses on the return of function with the use of purposeful activities (55). OT treatment includes individually selected and graded tasks and activities, which involves the retraining of areas of occupation and the underlying client factors (4).

Family education is extremely important throughout the treatment programme. Family members are better equipped with their loved one's disability when they are informed and educated about

stroke and its implications (26) (27). Education of the patients and their families is crucial, as this enables cooperation and participation in identifying goals for therapy, to highlight available strengths, and for successful carry over to the home environment (26). Therefore, over and above individual sessions, the OT should be counselled, trained and included in the therapy sessions.

2.5.1 Areas of occupation

The patient should be encouraged during the acute stages of hospitalisation to perform self care activities such as rolling in bed, sitting on the side of the bed, transferring to a wheelchair, commode or chair, and attempting some independence in grooming and dressing. This will help with the patient's motivation and self efficacy (26).

OTs are encouraged to only teach the patient compensation techniques for daily tasks by using the less affected arm and hand when the affected upper limb is resistant to rehabilitation techniques to improve movement (4) (26). Adaptive devices should only be issued if all active methods of performing the tasks are not available or the skill cannot be learned (26). The patient and caregivers should be adequately trained in the use of the device, and only reliable and safe equipment should be considered (26). Some tasks require precision movements, which are safer if performed by the less affected upper limb, as the return of movement may still be clumsy and poorly controlled (28).

Areas of occupation should be performed using a balance of therapeutic and remedial techniques. For example, the patient may be taught an adapted way of dressing, but the dressing is not performed completely through the use of one hand only. The activity should be performed with the use of the residual muscle activity, moving through the full range possible to reduce stiffness and shortening, abducting the shoulder and extending the elbow of the hemiplegic upper limb and using both hands for buttoning, noting the texture of the shirt for somatosensory input, shifting weight during the activity to promote postural control by placing the shirt out of reach, orientating the shirt into the correct starting position, and lastly, keeping the patient focused and motivated throughout the task (26) (27).

2.5.2 Mental functions

2.5.2.1 Perception, specific mental and emotional functions

The treatment of visual and perceptual impairments is a complex process, with several studies being done to identify effective treatment strategies (56). The OT retrains specific skills,

teaches compensation techniques, substitute impaired skills with unimpaired skills, or assists with the adaptation of the tasks and environment. The OT teaches the patient techniques such as visual scanning of the environment when hemianopia and hemineglect are present, in order for the patient to find items in their environment easily. The OT will teach the patient safety techniques, such as holding on to a handrail when descending stairs, in the case of depth perception problems (4). The OT will use cognitive therapy to help the patient compensate for the loss of cognitive skills. The patient is taught to write important information in a diary, set alarms for reminders, and uses their cellphones for daily organisation if their memory and executive functioning is not adequate for independence. Grabrails are often installed into homes of stroke patients to ensure safety around stairs and in the bathroom, and assistive devices such as a walker with a tray can be used to transport meals safely (4).

The OT must recognise signs and symptoms of depression, and refer the patient to the appropriate team members. The OT must educate the family on how to handle the patient's lability and anxiety. The patient can also be taught deep breathing and redirection of attention when anxious (26). It is important for the stroke patient to stay active and mobile, and to socialise with others, as well as go on community outings to ensure that they do not become isolated and depressed.

2.5.3 Neuromusculoskeletal and movement related functions

All the tasks and activities performed in treatment should occur within the context of the patient's functional activities (4) and preferably in a context that is known by the patient (32). This also includes providing patients with the opportunities for practice of patient chosen activities and provision of necessary adaptations and training in the use of the adaptations (32).

A synthesis concluded on 29 studies on the effects of OT in treatment of stroke, that best evidence for certain components of OT intervention has been found. These are: (1) practicing of movements to accomplish specific goals is effective in increasing active movement, and this should be done with two hands simultaneously (2) written and illustrated home programmes of exercise and methods of doing activities will help patients continue to develop active movement (3) imagery of performing the actual movements in functional activities, and (4) use actual objects within a functional goal (39).

2.5.3.1 Muscle tone

Reducing spasticity has been proven ineffective in automatically improving performance, and there is little correlation between a reduction in spasticity and an improvement in function.

Although the presence of spasticity is acknowledged, the emphasis in therapy has been questioned (47) (57). The reduction of spasticity is traditionally treated using the NDT (10) (11) and Rood theories (14) (34) which will be discussed later. Severe spasticity may affect the limb and hand movement, and therefore secondary impairments develop. With the shortening of soft tissue, there may be masking of available selective control of movement (27). The patient may have regained selective control of movement, but due to the secondary impairments, the patient will be unable to move. Several studies have been conducted since 1970 to ascertain the link between reducing spasticity and the return of function. Carr and Shepherd in 1982 noted that while it is possible to reduce spasticity temporarily, this did not necessarily improve function (47).

A controversial method of managing the extremes in tone dysfunction is splinting. Splinting is used in low tone for maintaining joint alignment, protecting the tissues from shortening or overstretching, preventing injury to the limb and hand and reducing oedema (28). A specially designed splint, such as the anti-spasticity splint, is used to maintain soft tissue length. Prolonged stretching is believed to reduce spasticity, placing both groups of muscles at their resting lengths, and attempts at distal relaxation by promoting proximal alignment (27). A synthesis of research found that there is no conclusive evidence for the effectiveness of splinting (39), and another study found that overnight splinting could possibly maintain wrist and finger extension but does not necessarily improve range of motion or reduce pain in the hemiplegic hand (58).

Therefore, reducing spasticity as an isolated client factor will not be practicing according to the philosophy of OT as it does not have a functional outcome.

2.5.3.2 Muscle strength (power) and endurance

Several studies have found that strength can be improved without the increase in spasticity (47). There seems to be a correlation between the increase in muscle strength and the decreased level of disability (17) (47) (59). Muscle strengthening can be achieved by focusing training in the mid-range where muscles are the strongest, decreasing the effect of gravity, decreasing friction and decreasing the lever of the arm. Mental practice has also been proven to be successful, when use in stroke patients who are not able to move initially (47). Some evidence exists that progressive resistance strength training programmes reduce impairments after stroke (48), and research results show that strength training can significantly improve strength after stroke which results in modest improvement in functional abilities (60).

The American Heart Association has recommended that stroke survivors be involved in exercise groups, strength training, flexibility exercise, coordination and balance training. Carefully selected resistive tasks have been shown to improve performance. If the patient has poor mental and physical endurance, the OT should use a graded program and gradually build up their ability to perform tasks. This can be done in terms of the length of sessions, energy requirements and length and amount of rest breaks (26). As depression, anxiety and low energy levels are common after stroke, research has shown that muscle strength training also has an impact on the patient's psychological factors as the patient's feel healthy and energised due to exercising (48).

2.5.3.3 Selective control of movement of the limbs

The return of movement can be treated by an OT using one or more of the neurological rehabilitation theories, which will be discussed later. In the case where a patient has any ability to move, they must be encouraged to use the limbs and hand in functional tasks. Poor selective control of movement has been proven to be the most likely motor impairment, rather than spasticity (26). The patient is also trained to avoid movements that reinforce synergistic movements (4). Initially, the OT aims at eliciting small voluntary or reflexive movements, and once the limb can overcome gravity the training of functional movements can start (28).

An increased amount of research is surfacing regarding the effectiveness of goal directed and task orientated activities being more effective in assisting the return of movement than pure exercises to strengthen muscles. Intensive task related training has shown significantly greater results in improvement of movement than general rehabilitation which includes a wide spread of activities (28). Based on this premise, several techniques have emerged, for instance constraint induced movement therapy, progressive resistive exercise and sensory related therapy. Treatment of movement is most beneficial with patients who have moderate disability, as functional return of movement in those with greatest disability levels is unlikely (28).

2.5.3.4 Selective control of movement of the trunk (postural control)

The aim of improving postural control will lead to the patient's ability to perform ADL requiring balance and changes in body position. Postural control is a prerequisite for successful performance of occupational tasks. Postural control is treated through maintaining the full range of motion in the trunk, differentiating different segments in the trunk from another, holding movements during tasks to improve active control, affecting postural tone to enhance stability and to move in all directions to ensure activation of all groups of trunk muscles (26). Similar to

the improvement in selective control of movement in the limbs, treatment should be task orientated and goal directed for neuroplasticity to occur, and for movement to become functional (26).

2.5.3.5 Range of motion, joint malalignment and secondary impairments (joint mobility)

Treatment should minimise the secondary complications (32) which includes methods aimed at maintaining or improving soft tissue properties of the limbs and hand. These secondary changes have become more important than the primary features of stroke, such as reducing spasticity. There must be consideration for the education and support of the patients, their caregivers regarding the stretching and positioning of the affected limb. It is also important to prevent deformities and further loss of function due to contractures and pain (4).

As therapy is becoming more task related, patients are also encouraged to perform certain tasks at home, instead of passive stretch or traditional strengthening exercises (4). Treatment prescribed for contractures include functional electrical stimulation (FES) (4) (28) and serial casting. Some controversy also exists regarding the effectiveness of shoulder support for the prevention of subluxation in the form of slings (26), as there is no conclusive evidence from research. The risk factors for developing contractures are muscle paralysis, spasticity, and muscle imbalances (26).

The OT must use a preventative approach by educating the patient on a program for proper positioning, and soft tissue and joint mobilization (26). Splinting, as discussed before, has been suggested to maintain the length of muscles during the period of paralysis, but active movement must be encouraged if the patient has any mobility. Controlled and frequent mobility is still the most effective method of preventing contractures (26), therefore using the principles of treatment for selective control of movement and muscle strengthening.

2.5.4 Sensory functions and pain

2.5.4.1 Somatosensory functions

The treatment of loss of sensation is twofold. Firstly, the re-education will entail presenting the patient with tactile stimuli with feedback from the patient. Secondly, the patient will be taught compensatory strategies to ensure safety while sensation is diminished. Tactile stimulation will also occur when the patient actively uses the affected limbs in activity, whereas the non-use of a limb does not expose the limb to any tactile experiences. Weight bearing has also been found

to increase sensory input (26), but again, techniques used in isolation, and not as normal goal orientated tasks, would not promote neuroplasticity.

2.5.4.2 Pain

Pain occurs due to stiffness and shortening of muscles and other soft tissues, and these secondary impairments should be prevented, as discussed in the aforementioned section. The OT must consider all possible avenues for pain management, including referral to specialists in treatment of pain. Pain and oedema can lead to the increased non-use of a hemiplegic limb, and could prevent the active use of the limbs in functional activity (26). It is therefore an important client factor to treat in the acute stages of stroke.

2.6 The role of the OT in neurological rehabilitation

In most clinical settings in South Africa, a person who has suffered a stroke will receive treatment from a variety of medical professionals, including the OT. Neurological rehabilitation is a distinct field of practice in OT and training is required as part of the undergraduate degree in the specific management of stroke patients. The heterogeneity of functional and health problems occurring after a person has suffered a stroke, as seen above, makes the comprehensive treatment challenging, and it increases the number of outcomes for rehabilitation significantly. There is evidence that a multidisciplinary approach in the treatment of stroke will decrease mortality and length of hospital stay, while improving quality of life significantly in the stroke survivors (5).

In summary, according to literature (4) (5) (26), the following aims should be achieved in the management of stroke patients, with reference to the above descriptions of assessment and treatment:

- The patient will gain competence in valued and necessary **basic ADL and instrumental ADL** in order to perform at the highest level of independence possible in the desired post-discharge setting.
- The patient will improve **postural control** in order to perform daily living tasks requiring balance and change in body position.
- The patient will have the necessary **control of movement** of the involved upper limb in order to use the involved upper extremity spontaneously during the performance of ADL.
- The patient will have the necessary **strength and endurance** involved upper limb in order to use the involved upper limb spontaneously during the performance of ADL

- The patient and/or caregiver will demonstrate appropriate management techniques for the hemiplegic upper limb to prevent **pain and other secondary mechanical or physiological movement restrictions**. This includes a home programme or the provision of splints for the reduction of malalignment and not for the reduction of spasticity. Static splinting will not be considered if it impedes active movement of the upper limb and hand.
- The patient will gain **visual function** or will employ compensatory strategies in order to resume previously performed ADL safely.
- The patient will gain increased **somatosensory perception** and/or will employ compensatory strategies in order to perform ADL safely.
- The **caregiver** will demonstrate appropriate methods and problem solving strategies for assisting the patient with ADL and with home activities to improve component skills.
- The patient and/or caregiver will demonstrate appropriate strategies for improving or compensating for **cognitive deficits** during the performance of ADL.
- The patient and/or caregiver will demonstrate appropriate strategies for improving or compensating for **perceptual deficits** during the performance of ADL.
- The patient and/or caregiver will be able to verbalise the reality and impact of **emotional reactions** to stroke and identify coping strategies or resources to help adjust to living with stroke.
- The patient will gain competence in tasks and activities necessary to resume valued roles or to assume new **meaningful roles in the community**, which includes return to home and work.
- The family and caregivers will be educated throughout the assessment and treatment process, but the OT will spend specific time with the appropriate persons in preparation of the patient's discharge.

Literature stated that another aim that should be fulfilled is that the patient will improve **motor planning** ability in order to relearn old methods or learn new methods of performing ADL (26). According to the latest research, the improvement of motor planning should be the underpinning of all treatment to improve movement in the limbs and trunk (17). It will therefore be more suitable to state this as an underlying principle in all treatment, and not a specific aim to achieve in isolation.

Research has been done to determine the effectiveness of OT in reaching the above aims in neurological rehabilitation. One study found some evidence for the benefits of OT after stroke,

but there is uncertainty among OTs about the actual content and effectiveness of the therapy they provided. No evidence was found in a systematic review on the efficacy of training of sensory-motor function on ADL, and IADL, social participation, and arm and hand function (9). This systematic review also stressed the urgent need for more high-methodological-quality efficacy trials to support the effectiveness of OT interventions (5). Their study indicated positive results for comprehensive OT on the improvement of ADL performance and social participation in stroke patients. The lack of evidence regarding the specific OT interventions in the management of stroke patients was a clear conclusion in their review (5). Research has shown that after completion of rehabilitation, 46% of the subjects in a study were independent in self-care, and 64% of the sample could return to their own homes (26), but again the OTs were unsure of the actual content of their intervention. Previous research syntheses found the following: "We conclude that OT effectively improves participation and activity after stroke and recommend that therapists use structured instruction in specific, client-centred activities, appropriate adaptations to enable performance, practice within a familiar context, and feedback to improve client performance. Empirical research to verify these findings and to characterise the key therapeutic mechanisms associated with desired outcomes is needed" (32:250).

Thus, the role of the OT in neurological rehabilitation is well understood, but the current controversy exists regarding the most effective methods to be used to reach each of the above mentioned aims. This study will focus specifically on neurological rehabilitation theories applicable to the return of movement. It is acknowledged that all aims are important to achieve and should be considered in the holistic treatment of the patient. The most effective treatment techniques to be used have become a popular focus of several randomised controlled studies, but very little conclusive evidence exists to prove the efficacy of these different interventions (5). The different methods used to retrain sensory-motor function in patients after a stroke is therefore a highly debatable topic in neurological rehabilitation.

The conclusion to the debate is therefore that dysfunctions in areas of occupation and in client factors are treatable by OTs in many ways, but if not performed in the ecological and contextual familiarity of the patient, designation of goal activities by the patient, meaningfulness of activity to the patient, in a structured and goal specific teaching of activity skills and practice to the patient (32), the return of function will not occur successfully.

2.7 Theories of neurological rehabilitation

It was explored how stroke survivors are affected by the consequences of their condition, and how these impairments should be treated. A review of the available techniques as prescribed by the different neurological rehabilitation theories will now be done, with a brief reference to the use of the latest principles shown by research.

The treatment of sensory motor dysfunction in the upper limb, hand, trunk, and lower limb is treated traditionally using the theories of several neurological rehabilitation specialists (61). The theories most commonly used in OT practice in neurological rehabilitation in South Africa are the NDT theory developed by Bobath, and published in 1974 and 1990 (10) (11), the Rood Theory developed by Rood between 1954 and 1962 (12) (13) (14) and the Brunnström Theory developed by Brunnström and published in 1966 and 1970 (15) (16). Another theory taught was the PNF approach developed by Knott and Voss, published in 1968 and 1985 (22). These theories are traditionally based on the neurophysiological principles (also called sensorimotor approaches) primarily involving the therapist moving the patient through patterns of movement and the therapist acting as problem solver and decision maker, and the patient being the passive recipient (62). In contrast to these theories, the MRT was developed by Carr and Shepherd from 1980 to 2003 (17) (18) (19) (20) (21). The emphasis in this theory is on motor learning and the therapist acting as the coach and the patient the active participator in treatment.

The question has been asked: "While acknowledging the outstanding contributions of these pioneering therapists, is it now time to leave the named treatment approaches in the past?" (63:369). The author states that there is a need to move away from labelled theories, and that therapists should see the common components of potentially successful interventions. A systematic review found that it does not matter which theory is chosen, as any of the neurological rehabilitation theories will improve a patient's functional status, and the deciding factor for success is rather the intensity of the treatment and as long as the treatment is directly training task specific ADL activities (61).

However, it is very important for therapists to identify the theoretical assumptions of different treatment techniques (34) (63). Therapists should understand the behaviour of people following central nervous system (CNS) damage, and the actions required of therapists in clinical practice. Understanding what the theory of assessment and treatment is based on is the first step in clinical practice, the therapist should have evidence that the theory has been researched

and the data supports or rejects the theoretical assumptions. But, unfortunately there is no fully comprehensive and experimentally proven neurophysiological basis for the traditionally used neurological rehabilitation theories (64). A major problem exists in clinical practice, that although therapists claim to practice under a certain theoretical framework, different therapists will practice differently according to their knowledge, experience, clinical skills, and patient interaction skills (63).

A brief description of each of the commonly usedneurological rehabilitation theories will follow. It is out of the scope of this research study to determine the exact content of each theory, as the study only focuses on which theories OTs use in their intervention with stroke patients. Therefore, each theory will be discussed briefly.

2.7.1 The Rood theory

Facilitation and inhibition techniques were primarily developed by Rood in 1954 to 1962. Facilitation techniques are used to facilitate muscle activation, and therefore contraction of the muscle and this includes tactile, thermal, proprioceptive and special senses. The techniques may also be combined for a greater response. An OT trained in the Rood theory will use facilitation techniques to elicit muscle activity, and inhibitory techniques are used for the treatment of hypertonicity (65). Some of the techniques address the neural component of hypertonicity (spasticity), and others are effective in treating the visco-elastic components (hypertonicity and secondary impairments).

These facilitation and inhibition techniques must be used in conjunction with goal directed action for the purpose of developing movement related abilities (65). Rood's sequence of movement development is useful in selecting appropriate activities in therapy. At first, movement first appears as phasic reciprocal shortening and lengthening contractions of the muscles which cause protective responses. Movement becomes more goal directed, and tonic holding contractions develop. Thereafter co-contraction develops, which is followed by the last stage, when functional movements are initiated (65).

OTs currently use selected principles from Rood's work as adjunctive or preliminary interventions to prepare the patient for engagement in purposeful activities during a treatment session, but used in its original format, it does not comply with the task orientated or functional approaches (65).

2.7.2 The Brunnström theory

Brunnström, a physical therapist, developed the theory and published the principles of this movement therapy in 1962 (14). The assumptions underlying this theory are that purposeful movement becomes modified with the development of higher centres. She believed that after CNS damage, patients revert to reflexive and primitive movement patterns, and that reflexes and primitive movements must be used in a developmental sequence in therapy to facilitate the return of normal voluntary movement. She developed a sequence which she found that stroke patients move through as they recover. This sequence typically occurs from mass stereotyped flexor and extensor movement patterns, to movements that combine the features of two patterns, and the finally near normal movement that presents as discreet voluntary movements of each joint. An OT trained in the Brunnström theory will conform to specific treatment guidelines (66).

This theory encourages treatment that progresses developmentally from evocation of reflex responses to willed control of voluntary movement, to automatic, functional movements (66). When no movement is elicited, the therapist uses reflexes, associated reactions, proprioceptive facilitation and/or exteroceptive facilitation, which will develop tension in muscles in preparation for voluntary movement. The therapist combines the patient's attempt to move with associated reactions and reflexes, and this allows for the patient to receive sensory feedback. Exteroceptive and proprioceptive feedback is used to assist in eliciting movement, and when the patient can move voluntarily, they hold the contraction independently. The theory supports the decrease in facilitation as soon as the patient has voluntary control (66). Emphasis is placed on the importance of voluntary willed movements, and a patient will be more successful with familiar movements with a goal object, and repetition of the correct movement is essential for motor learning.

Brunnström developed guidelines for the treatment of the upper limb, hand and wrist and lower limb. This theory is also limited in terms of an absence in encouraging muscle strengthening. This theory is also presented in a hierarchical organisation (67), which has been outdated since the development of the dynamical systems theory (59). The theory also does not consider the needs and motivation of the patient, and activities are selected according to the movement required, and these are not always the activities the patient chose to perform. It would therefore not conform to treatment found to be effective (39) (61).

2.7.3 The NDT theory

The NDT theory is a popular approach used by OTs worldwide, as well as all the members of the neurological rehabilitation multidisciplinary team (9) (23) (34) (68). The original NDT theory developed by Bobath and Bobath in the 1940's included the use of manual techniques to eliminate spasticity and dysfunctional movement patterns and to retrain normal patterns of coordination in the affected trunk, arm, and leg. The Bobaths have presented their methods and theories in two well known books published 1974 and 1990 (10) (11). This theory was mainly used by physiotherapists, but was soon closely incorporated into the OT treatment regime (9). According to the authors, the NDT theory is described by the occupational functioning model as a preparatory technique as it establishes sensorimotor performance components that are prerequisites for functioning (69). The original theory represented a theoretical framework in a reflex-hierarchical theory (68), but later updates of the theory claim that it has been superseded by the system-orientated approach (70).

The Bobath concept was defined using the Delphi technique. Through the use of this research technique, the experts stated that NDT is misunderstood if it is considered as the inhibition of spasticity and the facilitation of normal movement. The study also stated that NDT is based on current neurophysiology, muscle, and motor learning to promote specificity and individuality in assessment and treatment (71). The Neurodevelopmental Treatment Association made a statement on their website about NDT, and described it as a living concept, which is used for the management of movement dysfunction after CNS pathophysiology (72). The theory encourages interaction with the individuals, caregivers and members of the interdisciplinary team throughout the intervention process. The main goal for treatment is normal functioning, to minimise impairments and prevent disabilities. The therapist uses principles of movement science to address quality of movement, and this includes direct handling, including facilitation and inhibition, to optimise function (72).

NDT states that hemiplegia is associated with the loss of normal movement responses and the development of abnormal muscle tone and movement. Movement control problems after stroke were identified as the loss of postural control, the loss of selective movement control, and abnormal muscle tone (69). This theory states the reason for a stroke patient's inability to function in daily activities is purely due to the dysfunction in posture and movement. The theory advocates the improvement in the sensorimotor components, which would in turn have an effect on the improvement of functioning in ADL. It assumes that improvement in client factors will automatically carry over the skills into improved independence in functional tasks (69).

The management of spasticity remains a major focus of the NDT therapist, but some attention is given to the integrity of the musculoskeletal system, in others words, the secondary impairments defined by the MRT (23).

2.7.4 The MRT

Two Australian physiotherapists developed the MRT in the 1980's, namely Carr and Shepherd. They recognised the potential of neuropsychology and motor learning. Their theory suggests that active practice of context specific motor tasks with appropriate feedback would promote motor learning and motor recovery. The MRT is based on the dynamic systems theory of motor control, the neuroplasticity of the CNS, and the maladaptive biomechanical changes that occur after CNS injury (59).

Carr and Shepherd stated that three processes occur in the body after a stroke which cause dysfunction in movement. They classified the motor characteristics of CNS dysfunction as positive features, negative features and secondary impairments. Positive features include exaggerations of normal phenomena due to the loss of inhibitory control, resulting in spasticity and hyperreflexia. Negative features include weakness, fatigability, slowness and impaired dexterity, caused by the decrease in recruitment and firing rate modulation of motor neurons (59). Secondary impairments are defined as physiological, mechanical, and functional changes in muscle and other soft tissues that develop in response to immobility, disuse, and attempts to move within the constraints of weakness. Therefore, these impairments occur when muscles are immobilised in their shortened position, physiological changes occur such as a loss of sarcomeres and remodelling of connective tissue. As a result of this process, muscles change in their mechanisms, and become shortened and stiff.

Principles of motor learning guide the therapist in structuring the therapeutic environment to maximise the patient's recovery of motor function (59). The MRT is compatible with the task orientated approach in OT, but it is specifically based on the improvement of motor control. The emphasis is on training control of the muscles and preserving the integrity of the musculoskeletal system, as well as on promoting the learning of relevant actions (motor learning). Emphasis is on driving the reorganisation of the brain, ensuring flexibility of the musculoskeletal system and enabling active participation by the patient. This is achieved through exercise training and constraint induced therapy, also known as forced use. This technique is based on some of the latest research in neurological rehabilitation (73). The reorganisation of the CNS after cortical injury is a cornerstone described in this theory.

The MRT stipulates a detailed framework for the assessment and improvement of balance, walking, standing up and sitting down, and reaching and manipulation. OTs are guided in how to anticipate, prevent, and reduce mechanical constraints that are likely to interfere with functional movements. They are guided in understanding kinetics and kinematics to understand the typical performance of the musculoskeletal system in a normal and abnormal CNS. The OT also understands the postural adjustments needed for task performance, how to structure activities to provide a graded challenge and to ensure the patient is moving in a way that is sound, according to fundamental movement strategies. A crucial part of the theory is the knowledge on how to structure an activity so that patients develop task analysis and problem solving skills (59).

2.7.5 The difference between the NDT theory and the MRT

NDT advocates the facilitation of normal movement components and task-specific training, using specific manual guidance techniques, and MRT places emphasis on training motor control of muscles, promoting learning of relevant actions and tasks, and the preservation of muscle length. The main differences between the two approaches are the amount of time spent on task-specific activities, the incorporation of muscle strengthening, and the use of hands-on techniques during all types of activities. MRT focuses on strength training within the context of everyday life, and it rather encourages the therapist to be the coach than manually guiding the patient's movements. NDT has reservations about allowing the patient to practice outside of the therapy room, as well as the use of resisted exercises. Both theories support the use of task related training (63).

2.8 Research evidence for each neurological rehabilitation theory

The traditional sensorimotor theories (NDT, Rood and Brunnström) are commonly used, but their effectiveness is being challenged as OTs move towards practicing models of EBP. There is limited research to support the effectiveness of the sensorimotor theories (23), whereas theories that focus on the use of functional activities as the therapeutic agent show more positive results in a research and clinical perspective (27).

There is a paucity of research on the specific treatments in neurological rehabilitation, and there is a lack of information regarding the actual therapeutic procedures, i.e. the content of OT sessions in research on OT in neurological rehabilitation (32). The amount of research regarding the effectiveness of neurological rehabilitation theories is fast emerging, but results from these studies should not be accepted verbatim.

Neurological rehabilitation has received a boost by an increasing amount of literature from animal studies, neuroimaging investigations of post stroke recovery and an increase in clinical rehabilitation trials. Scientists and clinical researchers are converging new technology and rigorous clinical methodologies to provide increasing support for some of the basic underpinnings underlying the different treatment theories in neurological rehabilitation (74).

Several studies receive strong criticism regarding the methodology and content, and these studies of patients often have limitations. Studies on the effectiveness of neurological rehabilitation theories and methods are particularly difficult to perform. Finding a heterogeneous sample of disabilities and impairments is nearly impossible, and some researchers have attempted to set well-defined criteria for patient selection, which may improve statistical power and concomitant conclusion validity (61). Controlled interventions are difficult to define and control and, only small differences in treatment time and type is found. There is often a lack of randomisation and blinding, there are inadequate samples available, and, finally, there are no suitable sensitive outcomes measures available to gather the necessary information to show significant differences between methods (28). Clinical trials done on the effectiveness of OT in neurological rehabilitation are affected by the fact that characteristics of stroke patients vary significantly due to the different types of stroke, the varied acute treatments received, and that the rehabilitation programmes were very different (5).

Clear research stating that one of the above treatment theories is superior to the others is yet to emerge (34), but OTs use the NDT theory most commonly and also tend to combine various treatment theories in intervention with stroke patients. In a previous study done, it was stated that it is important that OTs are aware of the lack of evidence to support the effectiveness of the NDT theory, and that there is no clear research stating that the NDT theory is the best theory to use (9). It would therefore not be accurate to state that NDT must be effective if it is used so commonly.

According to a study done on the senior OTs in the Trent region, in the UK, the two most common theories used when treating patients with neurological deficits are the Functional Approach and the NDT Theory (5). OTs seemed pressurised, by their physiotherapy colleagues in particular, to adhere to the principles of the NDT theory, even though they were aware of the lack of evidence to support the NDT theory as superior to other treatment methods. OTs' choice of neurological rehabilitation theories seems to be based upon their clinical situations rather than their personal experience or education and training (9).

In another similar study done on physiotherapy with stroke patients, it was found that the most frequently used theory was also the NDT theory in the treatment of stroke patients. The NDT theory is used in physiotherapy in the treatment of stroke patients, and the aim is to improve the quality of movement and to prevent spasticity (9). The therapists were unable to give detail of the theoretical basis of their treatment, and they could not justify their choice of treatment methods. Although NDT is a popular choice for intervention, the therapists' justification or reasons for the use of the theory are unclear, and its effectiveness is not substantiated with evidence.

Another systematic review revealed little evidence to support the effectiveness of the NDT theory (75). The NDT theory was compared to other theories in terms of upper limb recovery following stroke, and the conclusion was that the theory is not superior to other theories (76). A randomised controlled study compared the NDT theory and the MRT. It was found that patients treated according to MRT had a shorter hospital stay than those treated according to the NDT theory (mean of 21 days vs. 34 days). Both groups improved on the Motor Assessment Scale and the Sodring Motor Evaluation Scale (SMES), but motor function was significantly better in the MRT group. Both groups had improved ADL according to the Barthel scores, but there was no significant difference between the two. The patients in the MRT group showed a significantly better score than the NDT group in terms of bowel and bladder function and independence in toileting, 12% less patients in the MRT group used wheelchairs than the NDT group and the women treated with MRT improved more in ADL than the women in the NDT group. It was concluded that physiotherapy treatment employing the MRT is preferable to the NDT theory in the acute rehabilitation stage (68).

This study was continued by the researchers, and after a three month follow up assessment found that the patients returned home and continued performing normal ADL. The conclusion was that MRT treatment is not necessarily better than the NDT treatment, but rather effective more rapidly. The patients in the MRT group were also mobilised more rapidly, which probably affected their pelvic floor muscles and stimulated their sphincter function to improve bowel and bladder control, as well as independence in toileting. The author also stated that the task-orientated strategies represented by MRT are preferable in physiotherapy to the facilitation and inhibition strategies of the NDT theory (68).

This study caused an expected feud among MRT and NDT followers. It was criticised regarding the perceived inaccuracies in the theoretical background of the NDT theory (77), errors in the

execution of the NDT theory (78), flaws in the methodology and accuracy of the results (70). As mentioned previously, there are several challenges in performing accurate and sound research in neurological rehabilitation, therefore no study has been without fault.

NDT has received a great deal of criticism, as the approach has changed over time. It is unclear how accurate the research on effectiveness of the treatment is, as many therapists practice under the theory in a variety of ways. There is also limited updated research published (62), and the fact that practicing in the NDT theory requires a very high level and skill and therefore postgraduate training (78) limits the expertise of OT with only a basic degree. OTs with limited training in NDT at an undergraduate level are not as skilled as OTs with postgraduate training in this theory, although OTs with a basic degree may practice in a neurological rehabilitation unit.

There is limited literature available regarding the effectiveness of the Brunnström theory. In one study comparing the Brunnström theory with the NDT theory, the only significantly different outcome was greater gait speed by one patient in the Brunnström group. The study was flawed in its execution as none of the subjects received a full programme of treatment, but rather short periods of the two different treatment techniques. The study also did not use a control group, therefore it cannot be concluded whether both treatment techniques were effective, or whether the patients all recovered spontaneously (66).

As new research emerges, the principle that the reduction of spasticity is essential before voluntary movement can be elicited is now seen as inaccurate (47). Reduction of spasticity is however still an important technique in rehabilitation, but, it must be used with one of the other neurological rehabilitation theories. The Rood theory is therefore often used in conjunction with the NDT theory and Brunnström theory, but there is currently limited research supporting the effectiveness of this theory (65). Application of these techniques alone is not effective in therapy (65).

The impact of stroke on functional independence and the role of the OT in the neurological rehabilitation process have been discussed, and an overview of the client factors and areas of occupation have been highlighted. The content of the different neurological rehabilitation theories was summarised and some of the current controversies regarding the effectiveness of the theories were presented. As presented in the first chapter of this study, the researcher aims to investigate from the presented information to give a framework on what should be included in

the training of OTs in the field of neurological rehabilitation in South Africa. The literature review will now consider the research and information available on neurological rehabilitation curricula.

2.9 Neurological rehabilitation in the context of OT

OTs may be losing their focus by over-analysing the exact components of movement of a hemiplegic limb to determine the quality of the movement, rather than focusing on the patient's values, interests, needs, and roles, as per the philosophy of OT (33). Some neurological rehabilitation theories, as seen in the literature, encourage the focus of correct movement patterns, as incorrect movement patterns are energy consuming, not refined and accurate, and not functional (15).

Focusing on the areas of occupation tasks that are the most meaningful to the patient, and focusing therapy on successful participation in these tasks, may well be an extension of the MRT. The MRT started by identifying the success of physiotherapists who use functional activities as opposed to routine exercise in the neurological rehabilitation of stroke patients, but the theory does not adequately cover the thorough consideration of a stroke patient as an occupational being, as it is based on the philosophy of physiotherapy. Analysis of activities performed by the patient cannot be performed in a haphazard, brief manner, but need the expert skills of an OT, as activity analysis is at the core of our profession. There is therefore a clear void in the area of thorough assessment and treatment of the stroke patient's occupational well-being, considering the vast and complex client factors and performance skills dysfunctions because of the CNS damage (31).

When OTs focus solely on the improvement of quality of movement to reach the outcome of improve the functional abilities of a stroke patient, the OT may run the risk of neglecting the actual treatment and practice of areas of occupation tasks. The only way to improve functional abilities is to practice areas of occupation tasks, and not to improve the components, i.e. client factors first (17). The MRT clearly states that the carryover of skills from isolated movement practice is very poor into areas of occupation tasks, and the actual tasks which are meaningful and goal directed have the greatest effect in the stroke patient's recovery (17).

2.10 Neurological rehabilitation in the context of South Africa

Neurological rehabilitation faces many challenges in South Africa. There is a lack of adequately trained neurologists to diagnose and treat stroke patients, and therefore inappropriately trained

medical professionals manage the care of these patients (7). The South African government has limited financial support for the care of stroke patients, due to the first priority of HIV/AIDS prevention and treatment (7). Only 10 – 20% of the population has access to acute stroke units and neurological rehabilitation facilities (7).

The South African stroke patient is very different to the British or Australian patient, as South Africa faces challenges such as extreme poverty, lack of basic resources such as running water and electricity and the effect of HIV/AIDS on the patient's presentation and prognosis to consider, apart from the typical presentation of stroke (7). Functional activities such as collecting water in a bucket 50 metres away from the South African patient's house, is a very different challenge to a stroke patient in England learning how to drive again. Patients are unable to attend out-patient therapy due to the lack of public transport for disabled persons, and due to the low socio-economic situation of disabled persons, private transport is not viable, and due to the vast distances patients have to travel to the nearest rehabilitation centres (79). The co-morbid conditions associated to poor nutrition, sanitation and overcrowding affects the recovery rate of stroke patients, and therefore requires more intensive therapy, which is not possible due to the restriction of access to therapy and due to the heavy load of patients (7) (37) (79).

2.11 Neurological rehabilitation curricula

It is clear that neurological rehabilitation is a complex field of practice due to the high level of morbidity and level of permanent disability in stroke patients. OT curriculum design and content should be guided by the work the entry-level OTs are performing (2), which is the complete management of stroke patients. Due to the new and exciting developments in the neurological rehabilitation field of practice, it is important to keep current OT curricula up to date with the latest research and procedures in clinical practice, to ensure that graduating OTs are well prepared and confident in their knowledge of managing a patient who has suffered a stroke.

The minimum requirements for obtaining an OT degree does provide a general guideline of what is required of an OT graduate in terms of assessing and evaluating patients with physical dysfunction (2). These requirements are however broad enough to give curriculum developers enough flexibility in terms of the content and emphasis of a neurological rehabilitation course. There is no requirement set for the neurological rehabilitation theories that should be taught, thus the choice is up to the curriculum developers' discretion. Often curricula are developed by

the academic based on their personal views or according to the structure of a prescribed textbook and not necessarily based on investigations into current healthcare trends or EBP (31).

A long standing disparity exists between OT education and practice, as academics highly value theory and ensure that they keep up to date with the latest techniques, but clinicians however, need to react to difficult and complex situations immediately and spontaneously, and theories they were taught might not always be applicable in the real situations (24). The ideal curriculum should therefore consider what the latest research has developed in terms of skills and knowledge, but it should be sensitive to, and incorporate, the needs and available resources of the OTs and patients who use the theories.

Information regarding the development and content of an OT neurology curriculum is sparse. In order to prepare students more effectively for the real world, academics need to seek the advice and views from clinicians in the field of neurology when designing a curriculum (31). Due to the specialised nature of neurological rehabilitation, many qualified OTs opt for further education in terms of postgraduate courses and degrees to improve their skills and knowledge in this complicated field of practice. New graduates feel that they specifically lack practical skills in their curricula, and therefore pursue several professional development courses once they are qualified to become more competent (1).

Developing a curriculum with the appropriate content to prepare OT students for entry level practice has been a challenge since the OT course was developed into a degree, rather than a diploma with apprentice-type teaching. In an article 20 years ago, it was concluded that there is a great diversity in content and emphasis across different universities' OT physical dysfunction curricula (2). There was a difference in the areas of medical conditions covered, general approaches to assessment and treatment of patients, specific evaluations, and specific treatment techniques and modalities (2).

The dilemma of aligning the content of a curriculum with the requirements of clinical practice has been continuing since a study in 1979 found discrepancies between the treatment activities therapists had been taught during their academic course and activities they were using in clinical practice (2). This study also found that stroke was the condition to which the curricula devoted most class time, as it was recognised as the single most common diagnosis among patients seen in therapy, and one of the most complex conditions to treat (2) (31). The study found that the greatest number of teaching hours was dedicated to the use of NDT, PNF, the Brunnström theory and the Rood theory (2).

An appropriate starting point for developing or revising a curriculum should be with the priorities of the neurological rehabilitation practices, what clinicians find works effectively, and then training should align with the health needs and available resources of the patient population. A study elaborated on this concept and investigated the components OTs feel neurological rehabilitation training should include. Four major themes were identified by OT clinicians practicing in the field of neurological rehabilitation. These are: (1) Integrated foundation studies; (2) The art of thorough assessment; (3) Treatment approaches in neurology; and (4) Building confidence. These themes will now be discussed:

Integrated foundation studies include the knowledge of neuroanatomy and neurophysiology, understanding the medical and surgical terms, and the conditions treated in neurology. The OT clinicians stated that these subjects were often taught by service departments, and the essential clinical application of neurology by an OT may be lost (31). The study also found that of all neurological conditions, it is essential to focus on the understanding and knowledge regarding stroke assessment and treatment. This understanding includes the neurophysiology, aetiology and clinical signs of stroke, including brainstem and cerebellar strokes (31). Neuroscience is essential in the curricula, but its influence has been mainly didactic and clinicians do not apply these theories well into clinical practice (73). This may be why several studies have found OTs to have poor theoretical justification for their chosen treatment techniques (9). A curriculum should lay the foundation of good practice in neurological rehabilitation, as an OT with sound theoretical justification can choose the best treatment modality based on their understanding of stroke and its effects and recovery pattern.

The **art of thorough assessment** includes a student's confidence in assessment through clinical observations as well as standardised assessments. The OT clinicians reinforced the importance of standardised functional assessments to enable an OT to set measurable and realistic outcomes for therapy (31). From previously stated reviews, it is clear how important standardised assessments are to show effectiveness of techniques and to show the value of OT, but if training OTs are not exposed to these protocols, it will be unlikely that they will practice in this manner once qualified. There should also be exposure to appropriate and relevant standardised assessments in the curriculum, where the lecturer should scrutinise assessments based on the areas OTs will practice in, the resources available and the population being assessed.

Another important focus of assessment according to the OT clinicians in the study was activity analysis, which entails the analysis of the patient's ability to perform functional activities. This analysis allows an OT to determine the dysfunctions in a patient's movement. They recommend the use of video material of stroke patients and actual patients to increase the amount of interaction with stroke patients (31).

The OT clinicians also identified that **appropriate neurological rehabilitation theories** should focus on motor retraining, particularly the upper limb (31). The OT clinicians identified PNF, the NDT theory, and the MRT as suitable theories to be included in the curriculum (31). The study showed that OT clinicians are of the opinion that a curriculum should not be split into the teaching of several theories, but rather a more intensive focus on a smaller number of theories. The saying "Jack of all trades, but master of none" may become true in OT if OTs are trained in multiple neurological rehabilitation theories. They run the risk of knowing a little of everything, and due to the usual time constraints in a very full curriculum, there is not enough time to adequately comprehend each theory that exists (31). Although previous studies have not included the MRT into the curricula, this study supported the inclusion of this new theory into the OT curriculum (31). OTs may also feel overwhelmed by the large number of theories, and due to poor justification of the use of certain theories, OTs will also have difficulty choosing the most appropriate theory to use with a patient based on their prognosis, the actual principles of the theories and the contraindications when using a mix of theories (31).

As the field of neurology is complex, it is a difficult area of practice in which OTs have to **build confidence** in. Therefore, this skill was identified as essential in assessment and treatment of patients with neurological dysfunction. In order to gain confidence, students should build sound theoretical base by ensuring that they read, understand and discuss current literature in neurology (31). It is essential that students gain knowledge and confidence through supervised practice of skills. Students need actual hands-on experience of handling patients with neurological dysfunction (31). It is crucial that students are supervised by OTs with sound foundational knowledge, good assessment and treatment skills, and excellent justification for their use of specific theories. Supervisors with sound EBP knowledge and skill and who are role models in their practice of neurological rehabilitation theories should be selected to be involved in student training.

As EBP is an integral part of the curriculum and the practical student training, this will now be discussed.

2.12 Evidence based practice in neurological rehabilitation

EBP is defined as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” (80:45). EBP also incorporates elements of research utilisation, professional judgement and knowledge of individual patient characteristics and it is preferable when professionals are making clinical decisions (81). OTs view EBP as both a personal and professional duty (81) to ensure that their intervention methods are based on sound and well established research and evidence (25).

There seems to be a major shift to evidence based healthcare, which makes clinicians more aware of the principles, skills and resources for EBP. The need to base OT intervention on the latest and most rigorous evidence cannot be disputed (81), but OTs are pressurised to provide the maximum quality of care while using limited resources (82). However, as in the case of neurological rehabilitation, the field is developing at an incredible rate, and it is often challenging to keep up with the latest findings (24). The latest research findings may also not be appropriate in the South African context (37). OTs consider professional training, client input, information from colleagues, continuing education workshops, and clinical experience as valid sources of information for EBP (81). Other surveys have found that health professionals use their undergraduate training, clinical experience and informal continuing education opportunities to support their clinical decision making (83). Sources of information have been classified according to a hierarchy. Meta-analysis of randomised controlled trials (RCTs) and RCTs are at the higher levels and case studies and expert opinion at a lower levels (25). Therapy choices must be based on the higher levels of evidence, if these sources of information are available.

In order to gather the best evidence to answer a clinical question, one must include clinical assessment findings, systematic reviews from literature and primary studies (84). The evidence must be evaluated in terms of its validity and clinical usefulness. An OT can only determine the effectiveness of techniques through sound assessment, therefore the use of standardised assessment is encouraged (84).

Recommended steps for sound EBP have been published widely (84) (85). A short summary will now follow: The first step is to write an answerable question. The therapists should use their daily practice and formulate a question they wish to answer regarding their interventions. Secondly, they should gather best evidence to answer the question, including assessment findings, systematic reviews from the literature, and primary studies. Thirdly they should critically appraise that evidence for its validity, impact and applicability, and use the intervention

in their daily practice. In the following step they should synthesise the findings by compiling all their results from the testing of the interventions to make conclusions. Once the OTs have used the interventions and tested the effectiveness, they should communicate with various stakeholders, including client and family, about evidence as it relates to assessment and treatment. The next step would be the use of the interventions that they found to be effective, apply the findings to practice. This is however not the final step. From here, therapists should monitor, evaluate, and document results continually, as interventions change and improve. The EBP process would then restart at the first step, and interventions are continually updated and improved and therapists should keep up to date with these developments.

The views of OT on EBP were studied in Canada (81). The OTs indicated a need to understand the latest findings in treatment options. According to the subjects, different ways of accessing information to assist in the decision making process are to use one's own clinical experience, to review current scientific literature, seeking knowledge from OT peers and other health care workers and working with the patient by using a client-centred approach in treatment (81). The perception exists that EBP is purely using formal research and measuring treatment efficacy through outcomes, but it is indeed a more complex process.

Clinicians felt that they value their **own clinical experience** and they review previous interventions in order to make a decision on the most effective way of treating a patient (81). They also valued continuing professional development and attending formal programs as part of their own learning experiences. They indicated that a score on a standardised assessment does not necessarily give the true indication of a patient's functional abilities, or evaluates the patient holistically, which is the reason why the clinician's prefer their own clinical observations. OTs have confidence in their own impression of a patient and their "gut feeling" (81). This is however debatable, as seen before on the argument for standardised testing and the need for measurable evidence in practice (4) (26) (35) (36).

The OTs found **scientific literature** useful in finding information to assist in choosing the correct intervention techniques (81). Some OTs, however find it difficult to base their intervention on pure science, and they struggle to balance the specific needs and wishes of the patient with that of the recommendations of research (81). Thus there is professional tension between being client centred and being scientifically orientated, as literature is not always relevant to the OT profession, not easily applied and not always relevant to the issues concerned. It would be preferred then to base the choice of intervention on consideration from

scientific literature, evidence from clinical experience, and feedback and observations from the specific client and past clients. But in clinical practice, there is a greater emphasis on gaining knowledge from clinical experience, clients, and consultation with colleagues than searching research literature (81). In the South Africa, the same preference would occur, due to the limited scientific literature available, as there are currently no studies done related to the South African context.

Seeking knowledge from **more experienced colleagues and experts in the field** was also identified as one of the sources of information (81). OTs find it easy to approach clinicians they trust and who they feel are competent in their treatment (81). The OT profession is unique in its desire to place the client at the centre of therapy. Intervention is therefore based on what is observed by the OT regarding **the client**, what is expressed by the client and what is decided in consultation with the client (81). The OT also considers the client's readiness for change (81).

It is the integration of the above factors that will lead to feelings of competency and a high level of job satisfaction. OTs are also not pressurised by their employers to use EBP, but rather to keep clients satisfied with the service (81). So, effective OT is rather measured by the satisfaction of the client and not the correctness of the treatment interventions used (81).

OTs feel that if they use research findings to substantiate their treatment choices, they are much more efficient, accountable, and responsible for the development of their profession (81). But, they however, feel incompetent in selecting relevant, trustworthy and good evidence from scientific literature (81). OTs state that it is their professional responsibility to provide the best treatment to clients, and they therefore feel guilty for not being involved in research and lacking research expertise (81). The solution to increasing OTs' abilities to find appropriate research information and to become more involved in research is to obtain help and support from persons with greater research experience and knowledge (81).

Barriers, perceived by OTs, in the use of EBP were identified (81) (86). These were the lack of time, lack of support and the perception that existing research knowledge was difficult to apply to individual clients. Added to this was professional isolation, limited searching skills, limited critical appraisal skills, the use of research evidence not being a priority, lack of evidence to support OT practice, and the large volume of published research (86).

In conclusion, OTs are becoming more aware of the urgency to use EBP in neurological rehabilitation. Due to the lack of evidence regarding which theories are the most effective to

use in the South African context and within the OT philosophy, a crisis has developed in that OTs are unable to use EBP in our context. Frameworks to improve the use of EBP have been proposed, which may be used successfully in South Africa (84) (85). The protocol use of standardised assessments to measure the effectiveness of techniques was identified as the first priority in the journey to EBP, and changing the mindset that relying on one's own experience and advice from experts is not enough to confidently say EBP is being used. Some barriers were identified to the use of EBP, and should be considered, and throughout the process these barriers must be addressed.

2.13 Conclusion to the review of literature

The morbidity rate of stroke patients is significant and the increase in the number of disabled stroke survivors make this condition a priority in the OT's practice. OTs currently practicing in this field should be updated with the latest research on the most effective intervention techniques, and the undergraduate curricula also need to reflect the most important aspects. Although the role of OT is clearly understood in neurological rehabilitation, information regarding the actual content of the treatment is uncertain, and empirical research is still needed to define the actual content.

A brief overview of the neurological rehabilitation theories were given, with some ideas on the latest research findings in each. Research has not shown one neurological rehabilitation theory as superior to the others, and none of the theories have conclusive evidence regarding their effectiveness. Research on neurological rehabilitation theories is challenging due to several factors such as finding a heterogeneous sample of disabilities and impairments, controlled interventions are difficult to define and control, there is often a lack of randomisation and blinding, there are inadequate samples available, and there are no suitable sensitive outcomes measures available to gather the necessary information to show significant differences between methods. The theories may not always appropriate in the South African context or compliant to the OT philosophy.

Designing a suitable and appropriate neurological rehabilitation curriculum includes integrated foundation studies to increase the theoretical justification of OT when choosing neurological rehabilitationtheories. It should also include the art of thorough assessment and the use of standardised assessments. The curriculum should contain only one or two well founded and researchedneurological rehabilitation theories, and training OTs should be allowed to build

confidence in this field by being exposed to sufficient practical opportunities and with the supervision of good role models.

The review concluded with a framework for the use of EBP, but before this process can occur, the mindset that EBP is only the review of scientific literature should change and OTs should be exposed to all the different sources. OTs should also realise that relying solely on one's own expertise and advice from others is not good enough to suffice as EBP. The journey to EBP in neurological rehabilitation is not without its barriers, and these should be considered along the way.

CHAPTER 3: METHODOLOGY

3.1 Introduction to the methodology

The first part of the study was conducted to determine what is taught at an undergraduate level in neurological rehabilitation.

The second part of the study was conducted to determine the skills and knowledge required for practice in neurological rehabilitation, how OTs determine their effectiveness of intervention and their use of EBP.

The methodology will therefore be presented in two parts, namely:

Part 1: A survey of the content of undergraduate neurological rehabilitation courses at the eight OT training centres in South Africa.

Part 2: A survey on the management of stroke patients by occupational therapists working in the field of neurological rehabilitation.

3.2 Part 1: A survey of the content of undergraduate neurological rehabilitation courses at the occupational therapy training centres in South Africa.

3.1.1 Study design

A cross sectional descriptive survey was used in Part 1 of the study. The information on the content of the curricula of the neurological rehabilitation theories of the OT training centres was collected from lecturers of the neurological rehabilitation courses at the training centres. Document collection and analysis was used to gather the information required for the curricula audit.

3.1.2 Study population and sample

Lecturers responsible for the teaching of neurological rehabilitation at all eight OT training centres were invited to participate in the study by providing the necessary information to the researcher regarding the content of the curricula at these centres. All eight training centres gave permission to participate in the study. The training centres that participated were:

- University of the Witwatersrand

- University of the Free State
- University of Pretoria
- University of the Western Cape
- University of Stellenbosch
- University of Kwa-Zulu Natal
- University of Cape Town

3.1.3 Research measurement

3.1.3.1 Measuring instrument

The curriculum audit was performed using an electronic, self-administered form developed by the researcher (Appendix A). Curricula structures were different at each university, therefore the researcher had to ask specific questions and request documentation in order to make a comparison between the courses. The curriculum audit form was purpose-designed for the study and no further information is available on its reliability and validity. The audit form was based on a questionnaire used in a previous study done (1), and was modified by the researcher for use in this survey. The original audit form was used to collect data in studies done on in the UK, Australia, New Zealand, Canada, and South Africa in paediatric curricula (1).

The audit form was sent in an electronic format via e-mail to the heads of departments at each of the eight training centres. The audit consisted of two sections where the researcher presented specific questions in the first part, and requested information regarding the content of the curricula in the second part.

The audit form included seven questions in the first section and one question in the second section. One question in the second section was open ended in order to include information over and above what the curriculum provided.

3.1.3.2 Content of the audit form for document collection and analysis

The following information regarding assessment and treatment in the OT curriculum was requested:

- Neurological rehabilitation theories taught during the four year undergraduate course. Four of the most commonly used theories were presented, namely: NDT (Bobath), MRT

(Carr and Shepherd), Neurotechniques (Rood), and Selective Control of Movement (Brunnström) and any other theories could be mentioned. The participant was requested to select the appropriate answers.

- Neurological assessments (standardised and non-standardised) taught to the students during the four year course. Ten non-standardised physical assessments, two non-standardised psychosocial assessments and ten standardised physical and psychosocial assessments were included in the list. The participant was requested to select the appropriate assessments.
- The following information was requested regarding the structure of the OT neurological rehabilitation course:
    - The overview of the neurological rehabilitation courses, i.e. the timing of the lectures, the number of credits, and the structure of the neurological rehabilitation course within major subjects and modules.
    - The estimated percentage of time spent on neurological rehabilitation lecturing in relation to the total subject or module.
    - The specific requirements to be fulfilled by the students regarding the number of patients with neurological dysfunction and the estimated number of patients with neurological dysfunction the students would assess and treat during the four year course.
    - The opportunities students have to practice practical skills in assessing and treating specifically with patients neurological dysfunctions during the four year course.

The second section of the audit form requested the participant to provide the researcher with the learning outcomes or objectives of the neurological rehabilitation course.

3.1.4 Research procedure

The researcher contacted heads of departments of the eight OT training centres via email. The email requested the Head of Department to complete the informed consent form (Appendix B) and fax or personally return the completed form back to the researcher. This gave permission for the researcher to use the information regarding the curriculum for the study. Attached to the e-mail was the information letter (Appendix C) which explained the purpose of the study and the questionnaire and how to complete and return the questionnaire. The heads of departments were asked to forward the audit form (Appendix A) to the lecturers responsible for the neurological rehabilitation courses. Participants returned the audit forms via e-mail or fax, and

the researcher completed the one audit form herself, as she is the neurological rehabilitation lecturer at the eighth training centre. The researcher collected all the completed questionnaires and contacted the respective lecturers of the training centres via telephone and e-mail for any extra information where the provided curricula did not contain all the necessary information required for data analysis.

3.1.5 Data analysis

Data were gathered and entered into Microsoft Excel. Descriptive analysis was done using the data collected from the content of the courses.

The researcher analysed the curricula to ascertain the content of the neurological rehabilitation curricula. A descriptive analysis was done in terms of the outcomes and learning objectives for the course, neurological rehabilitation theories taught, methods of teaching, hours/credits of teaching as a part of the total course, timing of lectures in the course, clinical practice obtained during the course and the number of stroke patients assessed and/or treated during training. The requirements of students to assess and treat a stroke patient during the time of the course were also requested.

The information was presented using descriptive tabular comparisons, and figures with ranges and percentages.

3.3 Part 2: A survey on the management of stroke patients by OTs working in the field of neurological rehabilitation.

3.3.1 Study design

A cross sectional descriptive survey was used in Part 2 of the study. The survey was performed once and the descriptions were done using tables and figures.

3.3.2 Study population

The population used in this study were South African OTs working in the field of neurological rehabilitation treating stroke patients in a clinical setting who have been qualified for two years or longer. It was not possible to estimate the size of the OT population working in the field of neurological rehabilitation in South Africa, as a register for specialists in OT does not exist. OTs are able to practice in any field with a basic undergraduate degree.

3.3.3 Study sample

The sample for this study was a cluster of OTs working in the field of neurological rehabilitation that are registered with the Health professions council of South Africa (HPCSA).

The researcher contacted the Occupational Therapy Association of South Africa (OTASA) to obtain the details of the OTs who indicated on their membership information that their field of interest or practice was in neurological rehabilitation. Hundred and seventy one prospective subjects were identified and the OTASA secretary forwarded the research information via e-mail to them. Not all prospective subjects complied with the inclusion criteria.

The eight training centres also provided details of clinical settings where stroke patients are treated in the areas. The researcher obtained contact telephone numbers from the training centres of OTs, contacted them, and requested their e-mail addresses. Subjects were identified, and a third party person forwarded the research information via e-mail or by hand to them.

Hospitals across South Africa were contacted to seek suitable subjects for the study. Suitable OTs were contacted, and information was sent using the electronic format of the questionnaire and the researcher or a third party hand delivered printed questionnaires. At the majority of the hospitals and settings contacted, only one or two OTs working in the field of neurological rehabilitation were identified, and most often they were employed as community service OTs, and therefore did not comply with the inclusion criteria of this study.

3.3.3.1 Inclusion criteria

OTs that met the following criteria were included in the sample:

- Practicing in South Africa and registered with the HPCSA.
- Qualified for at least two years.
- Currently working in the field of adult neurological rehabilitation and treating stroke patients in a clinical setting.
- OTs who qualified internationally were not excluded, as their experience was deemed valuable in the study.

3.3.3.2 Exclusion criteria

OTs were excluded from the study if they were:

- Qualified for less than two years, as these therapists are using techniques they were taught at an undergraduate level, and they might not have gained enough experience to elaborate on their clinical reasoning.

3.3.3.3 Selection procedure

The information letters stipulated the inclusion criteria for the study. OTs who chose to participate in the study completed and returned the questionnaire, which implied their consent to participate in the study. OTs who were personally contacted by the researcher across the country were briefly screened during the conversation, and the information letters as well as the electronic questionnaires were sent via email to appropriate possible subjects. The information letters and questionnaires were sent again after one month. The OTs who met the inclusion criteria were asked to complete the questionnaire and return it to a third party, to ensure their anonymity. The third party printed the completed questionnaires and sent it to the researcher without any form of identification of the subject who completed the questionnaire.

3.3.4 Research measurement

Email was the preferred method of the survey, as it has a fast turnaround time and it is inexpensive and was easy to administer. The questionnaire was generally completed electronically, and returned via the third party or in minimal instances, the researcher.

3.3.4.1 Measuring instrument

A questionnaire (Appendix D) was used to collect data from the subjects in the sample and was purpose-designed for the study; therefore, no further information is available on the reliability and validity of the questionnaire. The questionnaire was developed by the researcher, based on previous questionnaires used to collect data in studies in the UK (9) (25). The original questionnaire (9) was used to collect data on the current practice of OTs working with stroke patients, and the second questionnaire was used to collect data in a previous study (25) on the use of EBP by OTs who treat adult stroke patients. The former questionnaire was designed based on literature and two exploratory interviews with OTs who were considered experts in the field of neurological rehabilitation.

The questionnaire consisted of 3 sections:

3.3.4.1.1 Section A

This section contained information regarding the subject's demographic and background details. This included the subject's basic qualification, university of undergraduate qualification, year of undergraduate qualification and details regarding topics of all postgraduate degrees and/or

courses. The subjects had to state the number of years of experience as qualified OTs, as well as the number of years of clinical experience in neurological rehabilitation.

Information was also gathered regarding the description of the clinical setting the subject was working in, which included the type of clinical setting, the average length of time of an average treatment session with a stroke patient, and the average number of treatment sessions a stroke patient receives before discharge. The subjects had to provide information regarding the average length of hospitalisation of stroke patients in their clinical setting, and the average number of stroke patients seen by the subject per month. Lastly, the subjects were asked whether they treated inpatients or outpatients more regularly at the specific clinical setting.

3.3.4.1.2 Section B

This section gathered information regarding the subjects' knowledge and use of neurological rehabilitation theories, stroke treatment protocols, and knowledge and use of EBP.

3.3.4.1.2.1 Subjects' knowledge and use of neurological rehabilitation theories

Subjects had to identify which theories they received training in and whether this training occurred during their undergraduate and/or postgraduate courses and/or degrees. The subjects were also given the opportunity to state any other theories, not included in the choice options that they were trained in during their undergraduate and postgraduate courses and/or degrees. The subjects were asked to identify which theories they currently use as part of their stroke treatment protocols and their degree of familiarity with the four main neurological rehabilitation theories. A forced choice question was asked to ascertain the reasons for the choice of theories used in the subjects' stroke treatment protocols. The subjects were asked to rank in order of priority how often subjects use the four main neurological rehabilitation theories.

3.2.4.1.2.2 Stroke treatment protocols

The protocols were explored by identifying which assessments are used in therapy, general aims subjects wish to achieve with the treatment of stroke patients, the frequency of supplying assistive devices to acute stroke patients and neurotechniques most often used in treatment of stroke patients.

3.2.4.1.2.3 Knowledge and use of evidence based practice

Subjects were asked to indicate the degree of effect of factors they considered to influence their knowledge of stroke treatment protocols. The factors they had to rate were their knowledge from undergraduate training, reviewing literature and latest research, working with other

therapists, their own experience working with stroke patients and using techniques that seem to give good results, and attending postgraduate courses and/or attaining a postgraduate degree.

The subjects were asked to explain in their own words what they understood as EBP, to provide the researcher with proof that the subjects understand the meaning of EBP, and thereafter they had to rate how frequently they use EBP. Subjects were asked to select the evidence they base their choice of stroke treatment on and the frequency of use of the specific type of evidence. The type of evidence was based on the levels of EBP, namely research papers, published case studies as well as their own experiences with patients, experts' opinions on stroke treatment, textbooks and the setting's custom and practice, i.e. conventional treatment. Factors affecting the subjects' use of EBP were explored by subjects ranking the degree of importance of lack of time, high cost, little relevance to neurological rehabilitation, lack of knowledge of available resources/methods and lack of support to use EBP.

3.2.4.1.3 Section C

Subjects were presented with a case scenario and questions related to a patient and the stroke treatment protocol they would follow in their specific clinical setting were asked.

The case scenario included the gender, age, and personal background of the patient. The scenario included basic information regarding the medical history and the most important OT assessment findings. Details were given regarding the patient's high level of dependence on others for transferring and her inability to sit independently. Independence in sitting refers to a patient's level of postural control. The patient presented with a typical pattern of spasticity in her upper and lower limbs, and an unconsolidated flexor synergy in her affected arm and hand. She presented with occupational performance dysfunction in terms of difficulty with cutting up food and dressing herself. The case scenario included reference to the patient's possible perceptual problems, which has not yet been assessed or treated by the OT.

This part of the questionnaire ascertained how the subjects applied the techniques in practice that they identified in Section B of the questionnaire, and identified whether there were differences between their general protocols and their specific protocols with the patient in the case scenario.

The subjects were asked three open-ended questions.

1. To rate, in order of importance, the three aims they would wish to achieve with the patient in the case scenario.

2. To justify the theoretical basis for the choice of the treatment protocol for this specific patient.
3. The method of evaluation they would use to ascertain the effectiveness of the treatment protocol they decided to use to treat the patient.

3.2.4.2 Piloting of the questionnaire

A pilot study was completed once ethical clearance was obtained. The aim of piloting the questionnaire was to ensure that the questionnaire was clear and easy to understand and to complete. Field pretesting was used by pilot-testing the initial version of the questionnaire on six pilot subjects, including two OTs working in an academic institution, three OTs working in different clinical settings, and one research expert. The six pilot subjects were sent hard copies of the information letter and questionnaire to complete and return to the researcher, and these questionnaires were excluded from the main study.

The researcher did a follow-up interview with each pilot subject, once the questionnaire was completed. The interview aimed at discussing each question and the possible answers, any misunderstandings regarding the questions and answers, any misleading or inappropriate options of answers, and details and appropriateness of the case scenario.

The following changes were made to the initial questionnaire after piloting:

1. Options of the basic qualification was extended to include all terminology used at the eight training centres in South Africa.
2. Six options of types of clinical settings were added to the questionnaire.
3. The question regarding time spent in an average treatment session with a patient was specified in terms of minutes.
4. An extra question was added regarding the type of patient most commonly seen by the pilot subjects.
5. An extra column was added to the questions regarding training received in the four main theories to include “no training received”.
6. The sequence of the columns was changed for ease of completion by subjects and data capturing.
7. Variability was ensured by providing more rating points, and most answer columns were changed to avoid a neutral value comment in the middle.
8. The answers related to the question regarding the reasons for the subject’s choice of use of neurological rehabilitation theories were revised.

9. The options for assessments used in treatment of stroke patients were extended from options the pilot subjects added as these were commonly used assessments in the South African context. Assessments included in the actual questionnaire were the Lowenstein Occupational Therapy Cognitive Assessment (LOTCA), general observations and non-standardised assessments, and the FIM/FAM.
10. The question regarding the aims the subjects try to achieve generally when treating stroke patients was changed to specify the treatment of acute stroke patients.
11. The question regarding the evidence used upon which to base the subject's choice of stroke treatment was adapted as the option "custom and practice" was not well known.
12. The options for factors affecting the subject's use of EBP were revised.
13. The case scenario was revised to ensure that the patient's condition was easily understood and that subjects would be familiar with the descriptions, and to ensure that the relevant details were appropriate for the study.

3.2.5 Research procedure

Once ethical clearance was obtained, the questionnaires were sent to suitable subjects identified through contact with the researcher, and the OTs on the OTASA contact list. The following information was forwarded to the OTs:

- The actual e-mail content served as a covering letter providing information on the purpose of the study, as well as inviting the OTs to participate in the study. The e-mail contained instructions on how to complete the questionnaire, as well as instructions on how to return the questionnaire to the third party person, who forwarded the printed questionnaire to the researcher. The covering letter was also printed for hand delivery or faxing.
- An information letter (Appendix E) was attached with all the details of the study, the purpose of the questionnaire and details of completing and returning the questionnaire.
- The e-mail content also encouraged the subjects to contact the third party person in case of difficulty with the document. The third party person would organise an alternative method of sending the questionnaire to the subject.
- The questionnaire was attached (Appendix D). This was completed electronically by either selecting answers from a drop down list, by selecting an option by clicking with the mouse of the computer, or by typing an answer in a text box provided. Alternatively, the questionnaire was completed by hand.

The researcher collected all the completed questionnaires personally and from the third party. A reminder was sent once a month to the suitable subjects. Non-return of questionnaires was taken as refusal to participate, or that the possible subjects on the OTASA mailing list did not fit the criteria.

In the case where subjects did not have computer and/or internet access, they had the option of receiving the questionnaire via post or personal delivery, and returning the questionnaire via posting or faxing it to the third party. Subjects who had difficulty completing the questionnaire electronically printed the questionnaire, completed it by hand, and returned the completed questionnaire via fax or post.

The information was gathered over a period of seven months from 2009 to 2010.

3.2.6 Data analysis

Data were gathered and entered into Microsoft Excel. The researcher performed a descriptive analysis of the results from the questionnaires to ascertain the current training and practice of OTs in the field of neurological rehabilitation. This was done through compiling the results in descriptive tables and figures, and converting results into comparable frequencies and ranges.

3.2.7 Ethical considerations

Ethical clearance to proceed with the study was obtained from the Human Research Ethics Committee (medical), at the University of the Witwatersrand. The protocol number is M080523 (Appendix F). Specific ethical considerations included:

Part 1:

- Each institution was allocated a number and the training centre was not identified.
- Informed consent was obtained from the Head of the Department (Appendix B) prior to the data collection.
- Participant lecturers or training centres could withdraw the information provided at any stage and feedback would be provided, if requested.

Part 2:

- Subjects were invited to participate in the study via e-mail and post. An information letter as well as a covering letter (on the text of the e-mail) was attached with the questionnaire explaining the research.

- The researcher would have been able to identify the subject through the e-mail address of the sender, therefore questionnaires completed electronically by the subjects were returned via e-mail to a third party. The third party person printed the questionnaires, deleted the original e-mail, and sent the hard copy of the questionnaire to the researcher to ensure the subjects' anonymity.
- Subjects completed the questionnaire and returned it to the third party, and to the researcher, which indicated their consent to participate in the study.
- Each questionnaire was allocated a number for data capturing and analysis purposes, and in the case where the questionnaire was personally collected by the researcher, no identifying information was available on the questionnaire. The numbered questionnaires were filed and data were captured into Microsoft Excel.

CHAPTER 4: RESULTS

4.1 Introduction to the results

The results are presented in two parts. The first part presents the results of the survey of the content of neurological rehabilitation courses at the OT training centres in South Africa. The second part presents the results from the survey on how OTs working in the field manage acute stroke patients in the clinical setting. This part consisted of the demographics of the subjects, demographics of the clinical settings, the subjects' training on an undergraduate and postgraduate level, their treatment protocols of stroke patients, and the subjects' current EBP profiles.

4.2 Part 1: A survey of the content of undergraduate neurological rehabilitation courses at the occupational therapy training centres in South Africa.

4.2.1 Introduction

The results regarding the theories and the assessments taught in the courses, the structure of the neurological rehabilitation courses and lastly the learning outcomes will be presented. Seven of the eight centres returned the questionnaires, and therefore the return rate was 87.5%. No data were received from the eighth centre.

4.2.2 The neurological rehabilitation content of undergraduate OT courses

The typical route for qualifying in OT in South Africa is through a four year degree at any one of the eight training centres in South Africa that offers this programme. The degree is either a Bachelor of Science (OT) or a Bachelor (OT). Students are first educated on the theoretical aspects of management of stroke in the first, second and third year. The different training centres have differently structured programmes. Training in the management of stroke patients may either fall under the course for OT applied to physical dysfunction, or as part of the OT practical skills course. The students will have some exposure to patients in the first three years, but the final year of the course consists mainly of clinical practice under the supervision of qualified OTs. Students will only have exposure to stroke patients when they are in a setting for the treatment of patients with physical dysfunction. Patients are randomly allocated to students, and not necessarily according to different and specific diagnoses.

The vast differences in assessment and treatment requirements of stroke patients at the training centres are due to the different structures of the OT courses across the country. Neurological rehabilitation often focuses only on the management of stroke and traumatic brain injury patients; however, the course may also include spinal cord injuries. Some training centres teach clinical skills in OT applied to physical dysfunction, psychiatric dysfunction and applied to paediatrics in one course, and theoretical foundations in another. At other training centres, physical dysfunction, psychiatry, and paediatrics are taught theoretically and practically in different courses. Standardisation of the neurological rehabilitation courses is therefore difficult due to the differences in the set curricular structures.

None of the training centres indicated that there are stipulated requirements regarding the treatment of a specific number of stroke patients during the four year course. The lecturers noted that the number of stroke patients the students will assess and treat during the four year course depends on where the student is placed during fieldwork. All the centres reported that the students have the opportunity to practice assessment and/or treatment skills specifically with at least one stroke patient during the four years of training. Thus, an OT qualifying after four years may graduate after only assessing and/or treating one stroke patient during the course, and still meet the minimal requirements for training of OT. Once a student receives a qualification in OT, all qualified OTs should complete a compulsory year of service for the government, called community service. .

4.2.3 Theories taught at an undergraduate level at the training centres

According to table 4.2.1 the NDT theory is taught at all the centres in the sample (n=7/7). Only three centres are providing training to the students in the MRT and Brunnström theory. It is interesting to note that only two centres are using the Rood theory in their training.

Table 4.2.1: Summary of number of theories taught at each of the training centres (n=7)

	Total number taught	NDT	MRT	R	BR
Centre 1	1	X			
Centre 2	4	X	X	X	X
Centre 3	1	X			
Centre 4	4	X	X	X	X
Centre 5	1	X			
Centre 6	1	X			
Centre 7	3	X	X		X
Total		**7**	**3**	**2**	**3**

4.2.4 Non-standardised and standardised assessments taught at an undergraduate level

With reference to figure 4.2.1, all the training centres in the sample taught the assessment of the commonly affected client factors: balance, muscle tone, postural control, coordination and range of motion, as part of the undergraduate training. Commonly affected client factors such as cardiac and muscular endurance are only taught at four centres (57.14%), and selective control of movement is taught at only three centres (42.86%). At five centres, the muscle strength assessment is taught, although it was not determined if this is taught in relation to neurological conditions specifically, or in general (i.e. as part of the musculoskeletal conditions).

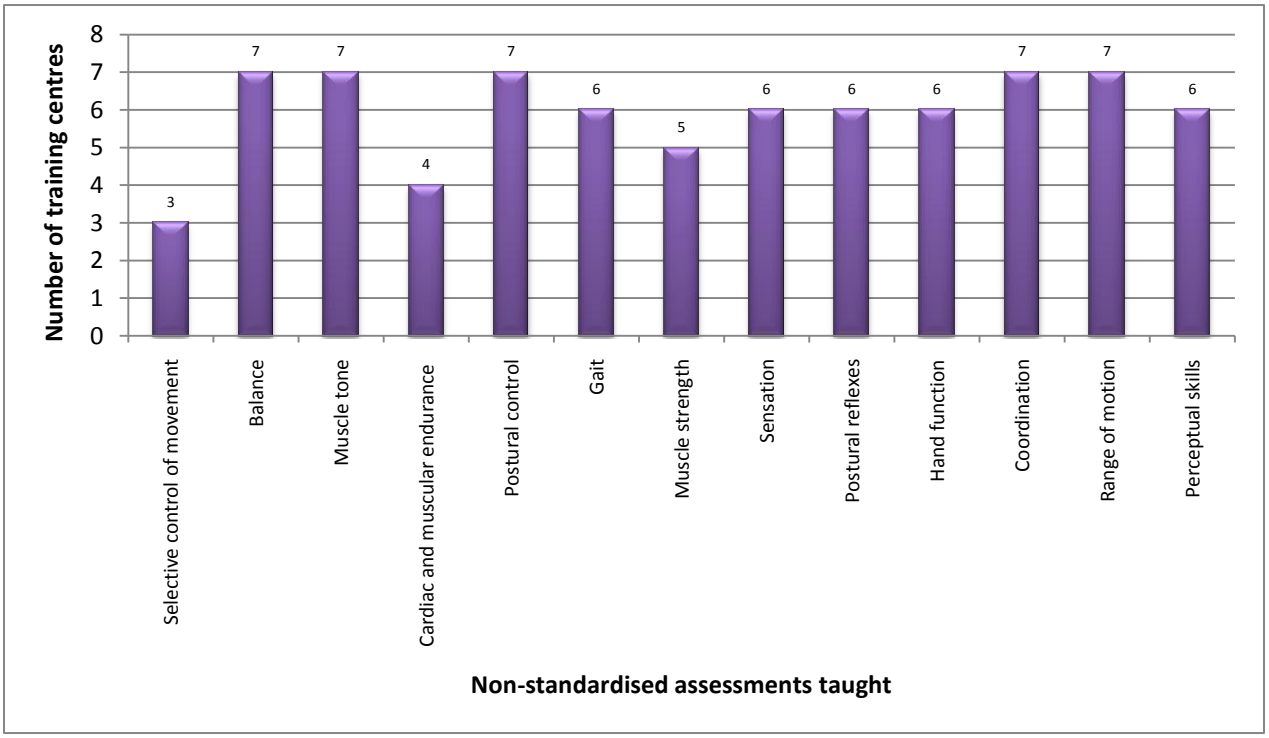


Figure 4.2.1: Non-standardised assessments taught at the training centres in the undergraduate degrees (n=7)

Figure 4.2.2 indicates the standardised assessments taught at the training centres in the sample. The RPAB (43) is taught at three centres (42.86%) and the Canadian occupational performance measure (COPM) (87) and the Chessington occupational therapy neurological assessment battery (COTNAB) (88) are taught at two centres (28.57%). The Arm motor ability test (AMAT) (89) and motor assessment scale (MAS) (49) are not taught at any of the centres. The AMPS (42) is not taught at any of the training centres.

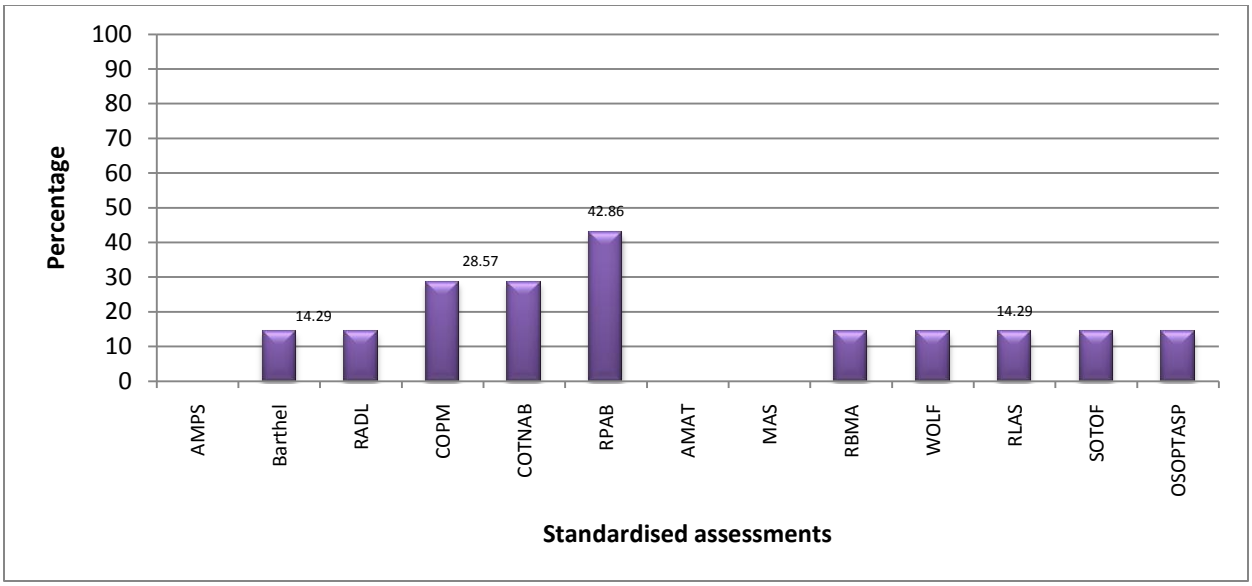


Figure 4.2.2: Standardised assessments taught at the training centres in the undergraduate degrees (n=7)

4.2.5 Conclusion of results of part one

The typical course of the OT degree in South Africa was described based on the information gathered from the curricula audit. It was clear that the training centres all have different curricula structures which made comparative results difficult to present.

The results regarding the content of the courses have shown that the NDT theory is most commonly taught at all the training centres, and the Rood theory is taught the least. Cardiac and muscular endurance, as well as selective control of movement assessments are not taught at all the training centres, although these are commonly affected client factors in stroke. Very few standardised assessments are taught at an undergraduate level at the training centres.

4.3 Part 2: A survey on the management of stroke patients by OTs working in the field of neurological rehabilitation.

4.3.1 Introduction

The researcher identified 37 potential subjects who met the inclusion criteria, which includes the anonymous questionnaires received from the OTASA mailing list. Three potential subjects refused participation in the study and five questionnaires were not returned. Twenty nine questionnaires were received and included in the study, which equates to a 78.4% response rate of the estimated population. The researcher also concluded that most of the hospitals and settings contacted only identified one or at most two OTs working in the field of neurological

rehabilitation, and most often they were working as community service OTs, and therefore did not comply with the inclusion criteria of this study.

Not all the subjects responded to all the questions, and some questions allowed for multiple answers. None of the received questionnaires was inappropriate and all data were used in the results. The results from the section regarding neurotechniques and assistive devices were eliminated, as the data did not add value to the research aims.

4.3.2 Demographics of subjects

4.3.2.1 Training centres where subjects received their undergraduate degrees

From figure 4.3.1, 37.93% of the subjects (n=11/29), obtained their undergraduate degrees from the University of the Witwatersrand (Wits) and a large number of subjects, 24.14% (n=7/29) obtained their degree from the University of the Free State.

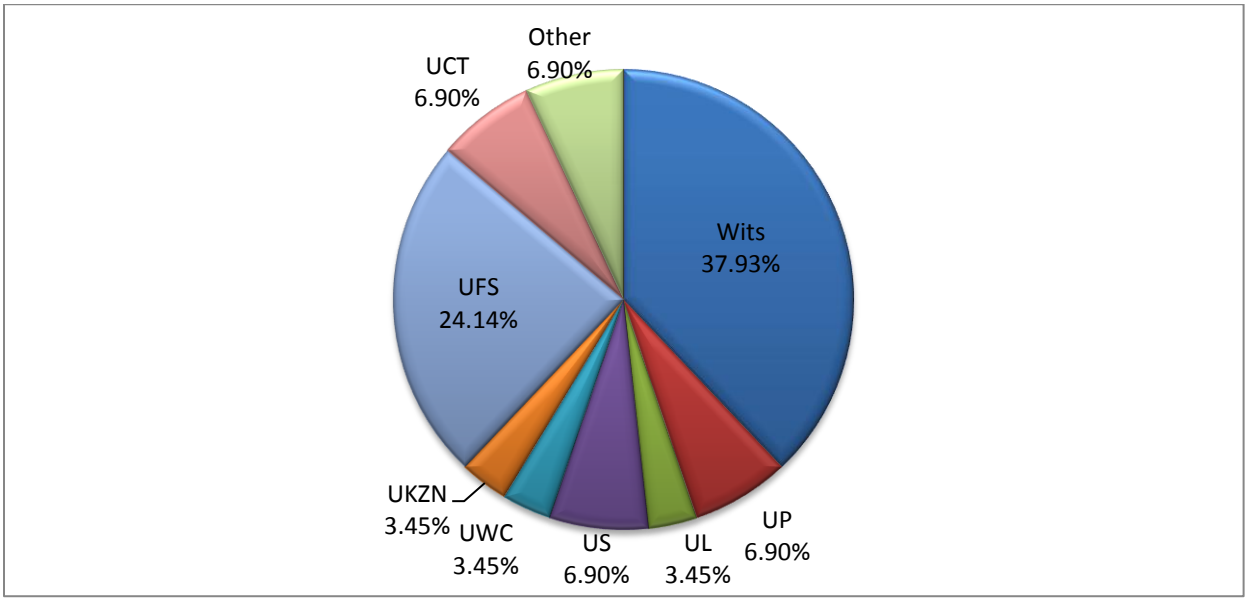


Figure 4.3.1: Universities where subjects obtained their undergraduate degrees (n=29)

4.3.2.2 Qualifications of subjects

The figure 4.3.2 below shows that most of the subjects had postgraduate training or obtained a postgraduate degree.

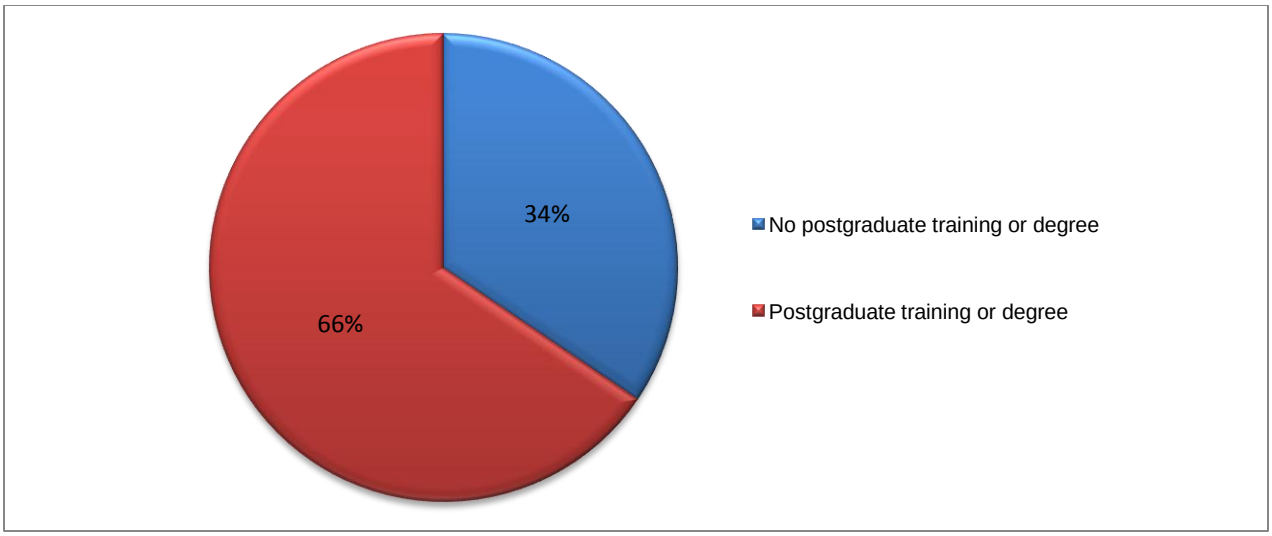


Figure 4.3.2: The distribution of subjects with or without postgraduate training or degrees (n=29)

The topics of the postgraduate courses and degrees are described in figure 4.3.3, an NDT and sensory integration qualification were at the highest frequencies.

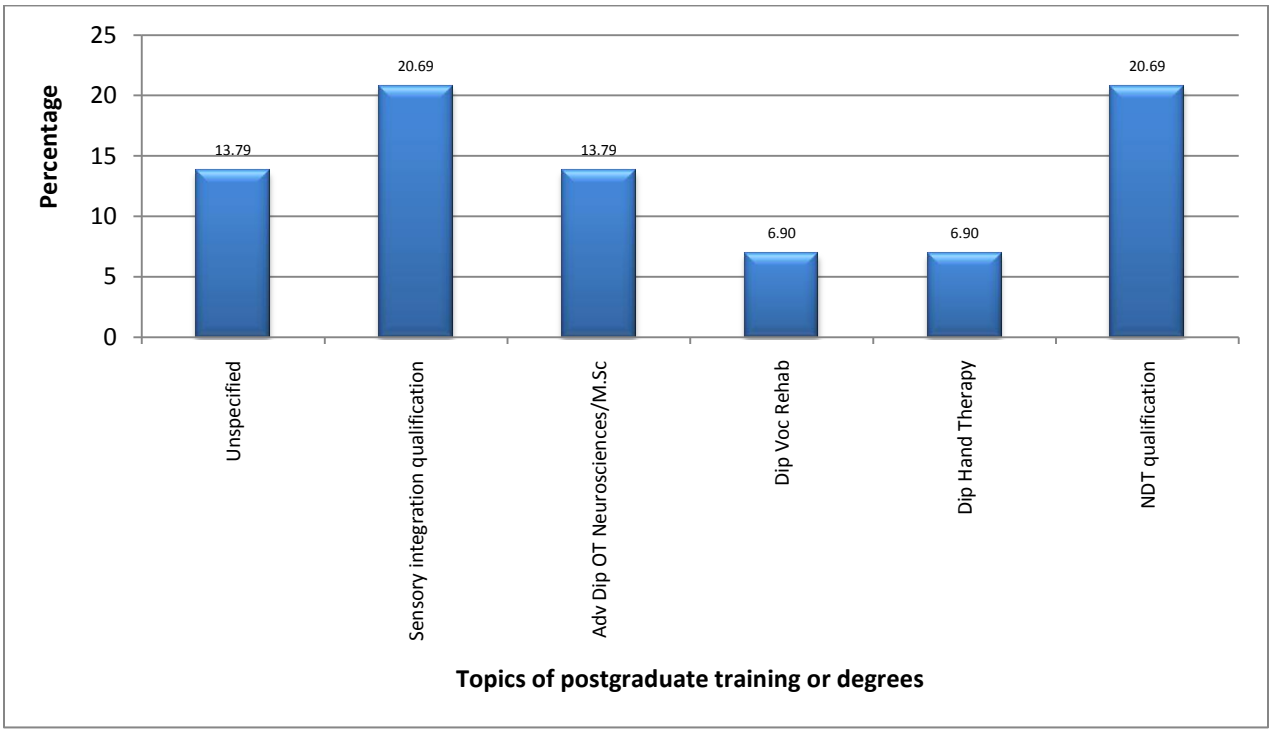


Figure 4.3.3: Topics of postgraduate training or degrees completed by subjects (n=29)

4.3.2.3 Experience of subjects

The subjects in the sample had been qualified for an average of 13 years, and the length of time the subjects have been qualified for, ranged from 2 years to 42 years. Overall, the subjects had mostly 2 - 5 years experience, but there were subjects in the sample with over 20 years of experience in OT and neurological rehabilitation.

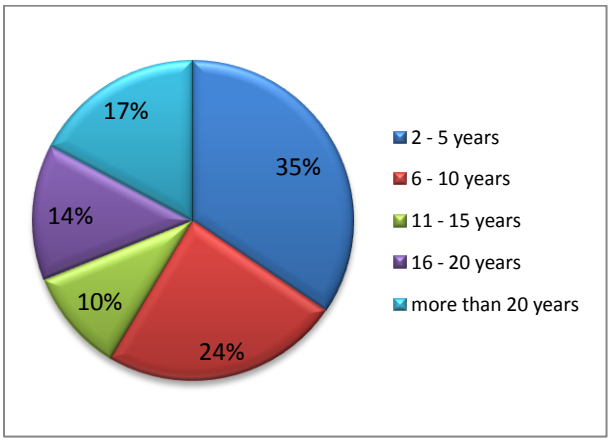


Figure 4.3.4: The number of years experience in OT (n=29)

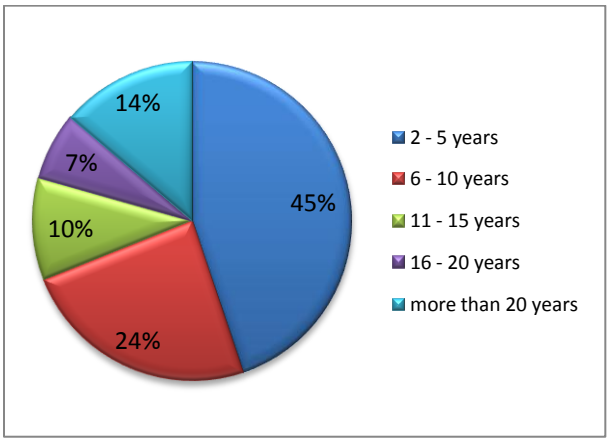


Figure 4.3.5: The number of years experience in neurological rehabilitation (n=29)

4.3.3 Demographics of clinical settings

4.3.3.1 Clinical settings of the subjects

With reference to figure 4.3.6, the most subjects at 51.72% (n=15/29) treat stroke patients in a government hospital, and 20.69% of the sample (n=6/29) in a private hospital. No subjects practiced in a primary health care (PHC) clinic.

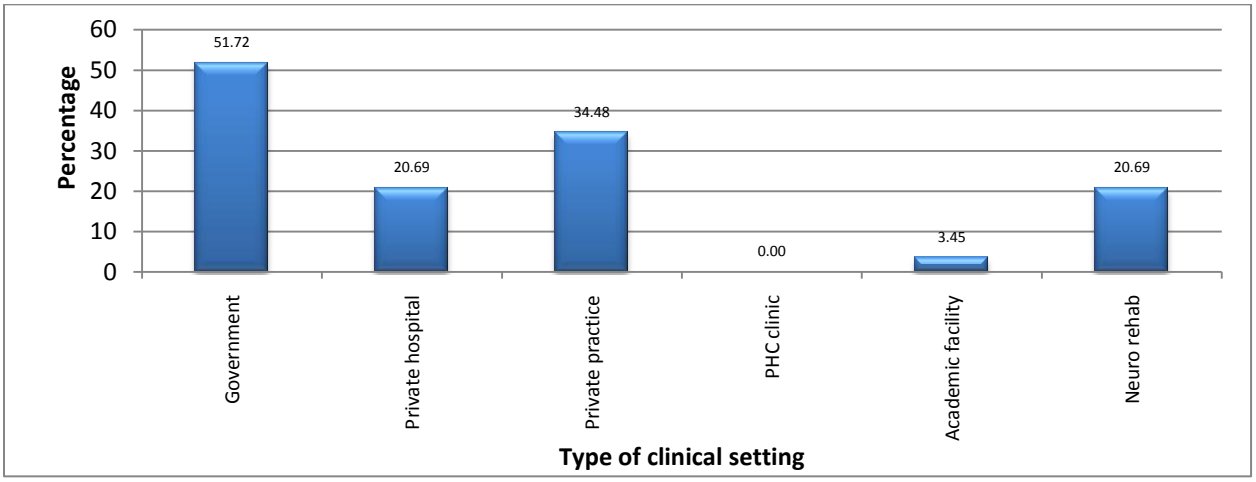


Figure 4.3.6: The distribution of subjects practicing in different types of clinical settings (n=29)

4.3.3.2 Treatment trends of subjects

Shown by figure 4.3.7, 48.28% of the subjects (n=14/29) reported that an average treatment session with a stroke patient was 46 to 60 minutes, and 41.38% of the subjects (n=12/29) reported an average treatment session of 31 to 45 minutes.

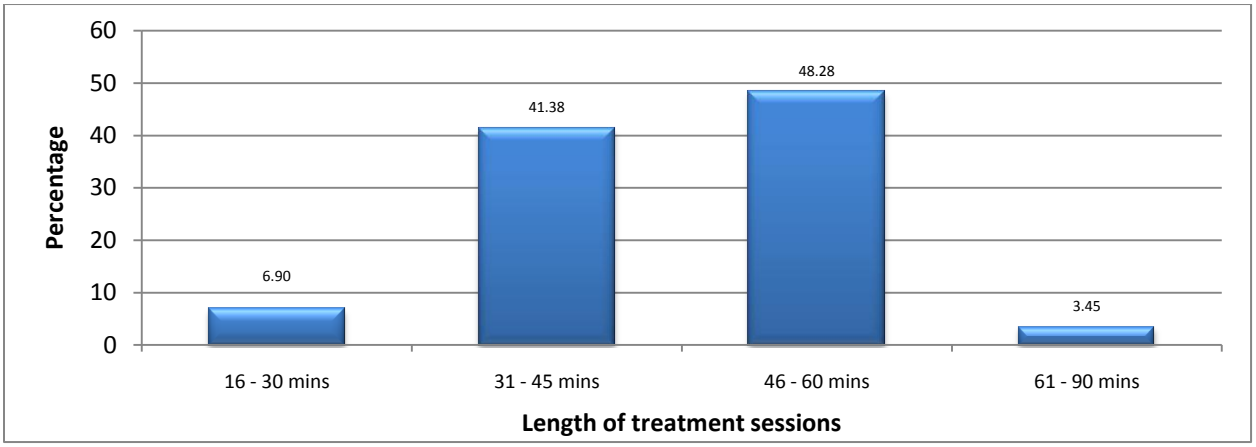


Figure 4.3.7: Average length of sessions of treatment of stroke patients (n=29)

According to figure 4.3.8, on average, stroke patients are not treated for a consistent number of sessions across the different clinical settings. The number of sessions of treatment during their stay in hospital or during rehabilitation, ranged from one to five sessions, to more than 30 sessions. The most frequent range, as indicated by 41.38% of the subjects (n=12/29), reported that stroke patients are treated for 21 – 30 sessions during their hospital stay. With reference to figure 4.3.9, the most frequent length of stay is 29 to 45 days, according to 37.93% of the subjects (n=11/29).

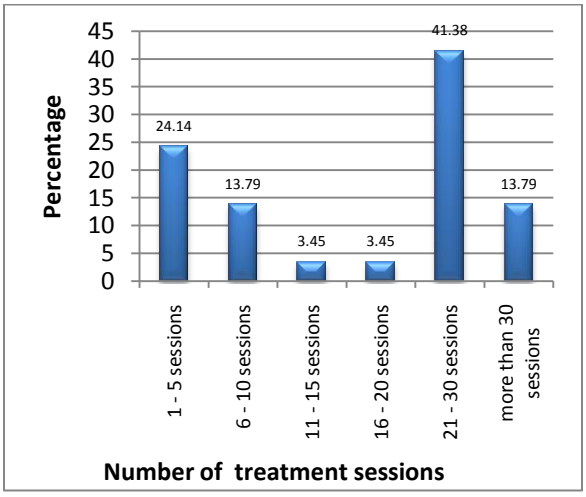


Figure 4.3.8: Average number of OT treatment sessions of stroke patients by subjects.

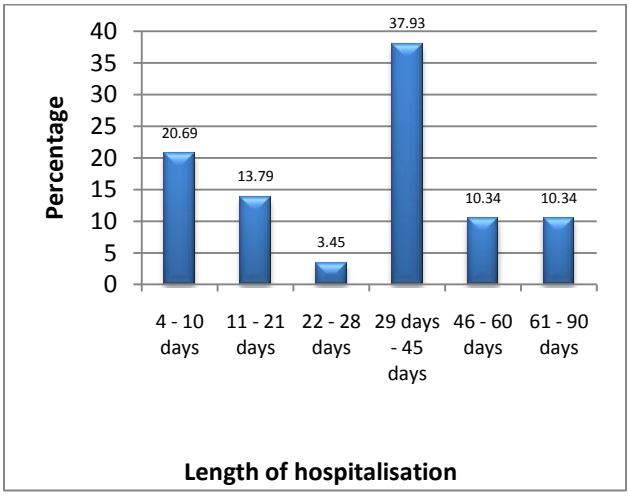


Figure 4.3.9: Average length of hospitalisation of stroke patients in different clinical settings where subjects work.

Shown by figure 4.3.10, 31.03% of the subjects (n=9/29), which is the most subjects, treat six to ten stroke patients per month as part of their total patient load. The remainder of the sample varied in their stroke patient load per month. The stroke patient load will also increase in the case where an OT works in a specialist neurological rehabilitation centre, which according to figure 4.3.6 is 20.6% of the subjects, and this is relational to the 17.24% of the subjects who treat 31 – 40 stroke patients per month. The majority of the subjects' patient loads were treated during their hospital stay as in patients, which comprised 75% of the subjects (n=22/29).

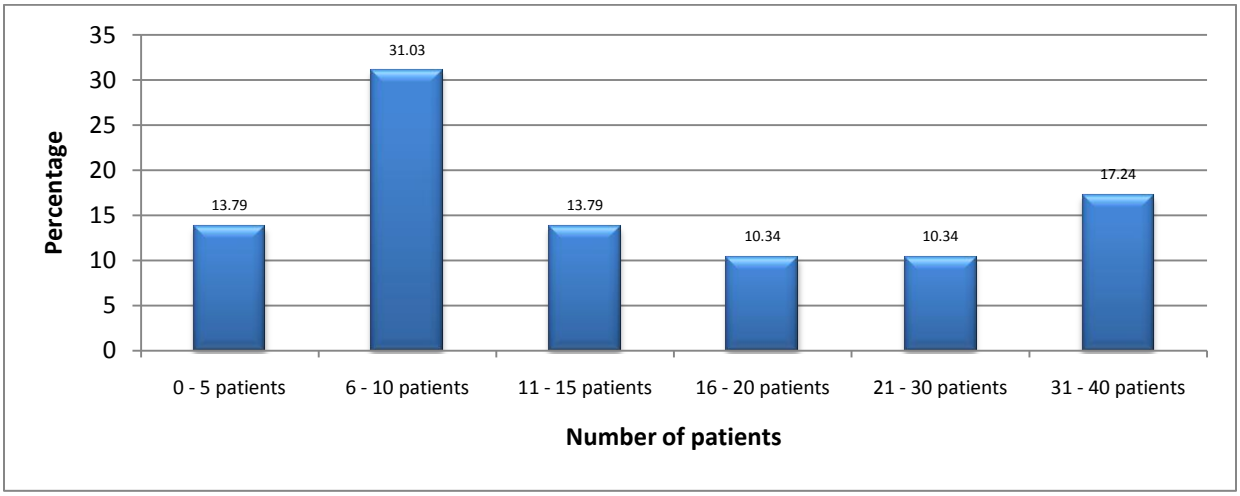


Figure 4.3.10: The average number of stroke patients treated by the subjects per month (n=29)

4.3.4 Treatment protocols of subjects

The next section of the questionnaire surveyed the subjects' treatment protocols of stroke patients. Not all subjects replied to all the questions, and some questions allowed for multiple answers.

4.3.4.1 Training subjects received in neurological rehabilitation theories

Subjects may have received training in the neurological rehabilitation theories in only their undergraduate degree, or only their postgraduate training or degree, while some may have received undergraduate and postgraduate training.

The following table 4.3.1 indicates the split between the subjects' undergraduate training only, postgraduate training only and undergraduate and undergraduate training received in the different neurological rehabilitation theories. The Brunnström theory was the highest frequency for undergraduate training only (68.97%) and MRT has the highest frequency for postgraduate training only (24.14%). NDT was the most common for undergraduate and postgraduate training (41.38%). MRT was the highest for no training received (31.01%).

Table 4.3.1: Summary of the training of subjects in different neurological rehabilitation theories (n=29)

	NDT		MRT		R		BR	
Sample size	n	%	n	%	n	%	n	%
Training in undergraduate only (n)	15	51.72	8	27.59	19	65.52	20	**68.97**
Training in postgraduate only (n)	1	3.45	7	**24.14**	0	0.00	3	10.34
Training in undergraduate and postgraduate (n)	12	**41.38**	4	13.79	6	20.69	4	13.79
No training (n)	1	3.45	9	**31.03**	3	10.34	2	6.90
Not answered (n)	0	0.00	1	3.45	1	3.45	0	0.00
TOTAL (n)	**29**	**100**	**29**	**100**	**29**	**100**	**29**	**100**

4.3.4.2 Familiarity of the subjects with neurological rehabilitation theories

Nearly half the subjects felt that they were familiar with all four neurological rehabilitation theories, and the NDT theory showed the highest frequency of subjects being very familiar with the theory, according to figure 4.3.11. This is reinforced by the fact that the highest number of subjects received training in their undergraduate and postgraduate courses and degrees, with reference to table 4.3.1.

One subject did not answer the question regarding the Rood theory.

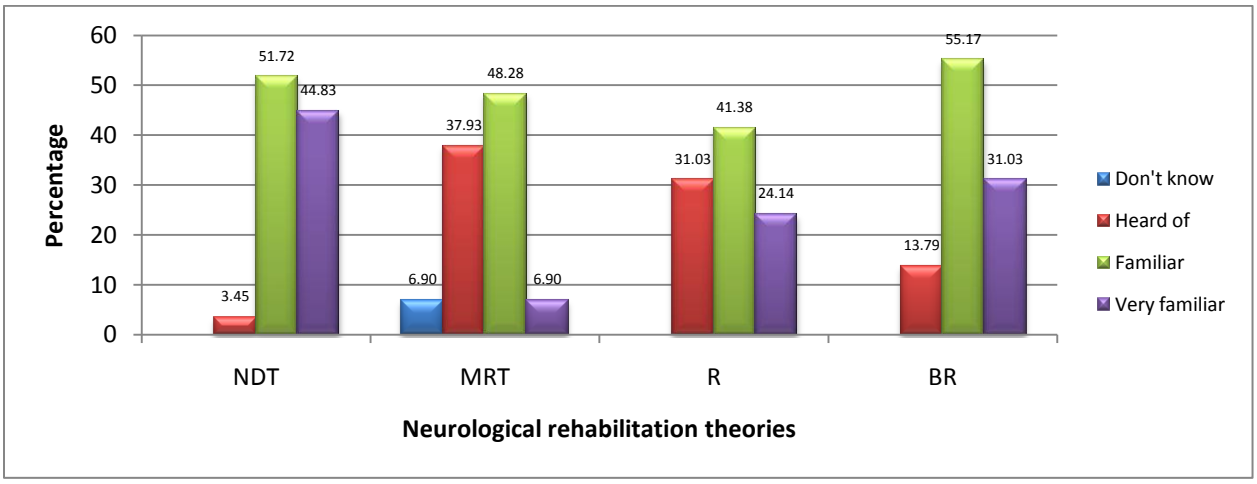


Figure 4.3.11: Subjects' familiarity with the different neurological rehabilitation theories (n=29)

4.3.4.3 The distribution of subjects' familiarity according to their training in neurological rehabilitation theories

In figure 4.3.12, the data regarding the familiarity of subjects with the different neurological rehabilitation theories were analysed in terms of the level of training the subjects received. In the figure below, the researcher used the filtering function on Microsoft Excel to summarise the information. The sample size for each level of training in each neurological rehabilitation theory in the figure is different (see table 4.3.1), and should be interpreted with the information from figure 4.3.11. The raw data is summarised in appendix G. The sample size for each theory consists of the number of subjects who indicated which training they received in the various theories, and not the percentage of the total sample (n=29). The data were converted to percentages to allow for comparisons, therefore the percentage of the sample who indicate their level of training in each theory, is only the percentage of the sample who stated their familiarity with that specific neurological rehabilitation theory (see table 4.3.1).

4.3.4.3.1 Familiarity with theories after undergraduate training only

Of all the subjects, 62.5% were trained in MRT in undergraduate only (n=5/8) heard of the theory, which is the highest frequency of all four theories. In the sample, 80% of the subjects who received only undergraduate training in NDT (n=12/15) felt they were familiar with the theory, which is the highest frequency. For the Rood and Brunnström theories, the subjects also indicated most frequently that they were familiar with the theories. Fifty percent of the subjects trained in undergraduate only (n=10/20) in the Brunnström theory felt familiar with the theory, which is the second highest frequency. About a third of the group felt very familiar with the theory (n=6/20), which is the highest for undergraduate training, but still a relatively low frequency. None of the theories were shown by the subjects to be very familiar, in terms of a significantly high frequency after undergraduate training.

4.3.4.3.2 Familiarity with theories after postgraduate training only

The one subject who received only postgraduate training in the NDT theory felt very familiar with it (100%). Of the subjects trained only in postgraduate MRT, 85.71% (n=6/7) felt familiar with the theory, which is the highest frequency for postgraduate training. The Brunnström and Rood theories showed low frequencies for subjects being very familiar with the theories after postgraduate training only. The highest frequency for this category is 75% of the subjects (n=9/12). These subjects with both undergraduate and postgraduate NDT theory training felt very familiar with the theory. Of the subjects who received undergraduate and postgraduate training in the Rood theory 66.67% (n=4/6) felt familiar with the theory, which is the highest

frequency. One subject, at 25% of the sample (n=1/4) with undergraduate and postgraduate training in MRT still feel that they have only heard of the theory.

4.3.4.3.3 Familiarity without any training

All of the subjects who did not receive training in the NDT (n=1/1) and Rood theories (n=3/3) have only heard of the theories. Just over half, at 55.56% of subjects, who have not received any training in the MRT (n=5/9), have only heard of the theory and interestingly, 33.33% of the subjects with no training (n=3/9) felt familiar with this theory. All the subjects who have not received any training in the Brunnström theory (n=2/2) felt they were familiar with it.

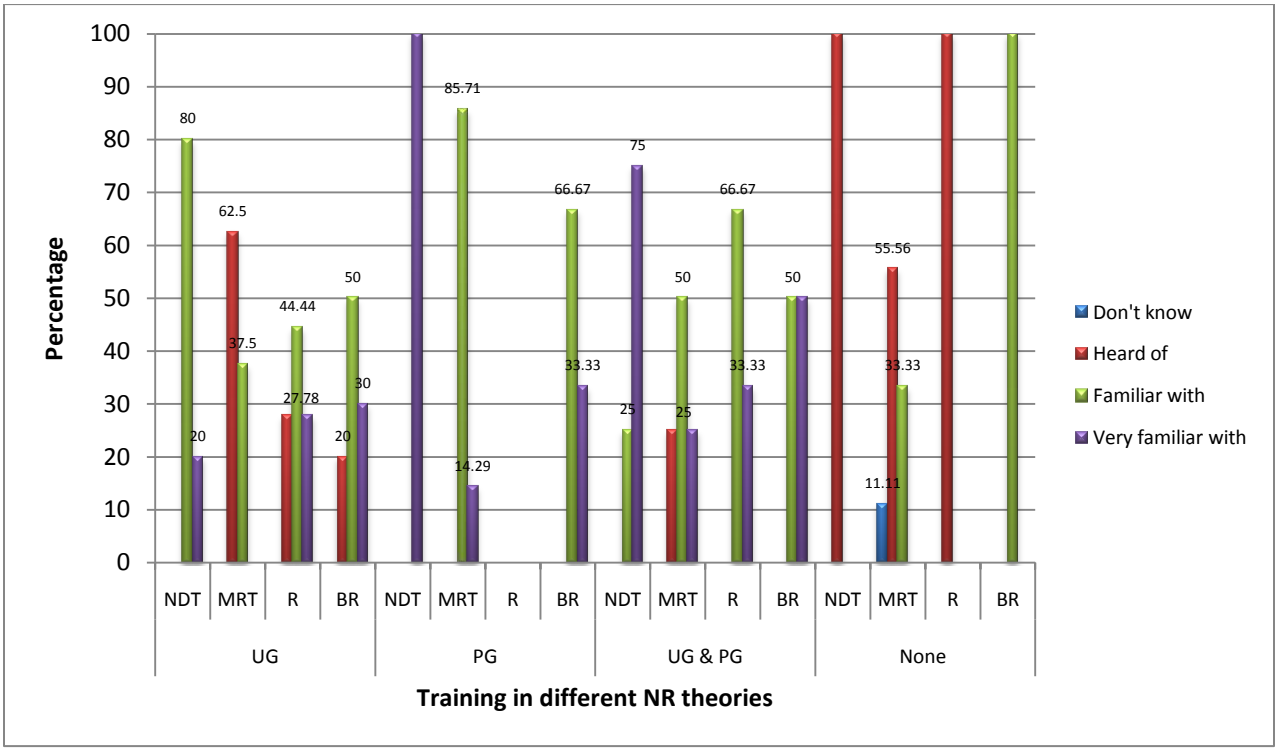


Figure 4.3.12: Familiarity of subjects with theories and the level of training received

4.3.4.4 Neurological rehabilitation theories used by subjects in current practice

In figure 4.3.13, the subjects reported on the theories they used in their current practice when treating stroke patients. The highest frequency of subjects used the NDT at 93.1% (n=27/29). The highest percentage of subjects (n=6/29), at 20.69%, did not use MRT, with Rood as second highest at 13.79% of the sample (n=4/29). Of the sample, 10.34% (n=3/29) was unsure whether they use the Brunnström theory in therapy, which is the highest frequency for this category. Of the sample 3.45% (n=1/29) reported using another theory in treatment as well, which is the PNF theory. Three subjects did not answer MRT and three subjects did not answer

Brunnström, which amounts to the difference of 10.34%, and 5 subjects did not answer Rood, which explains the 17.24% difference.

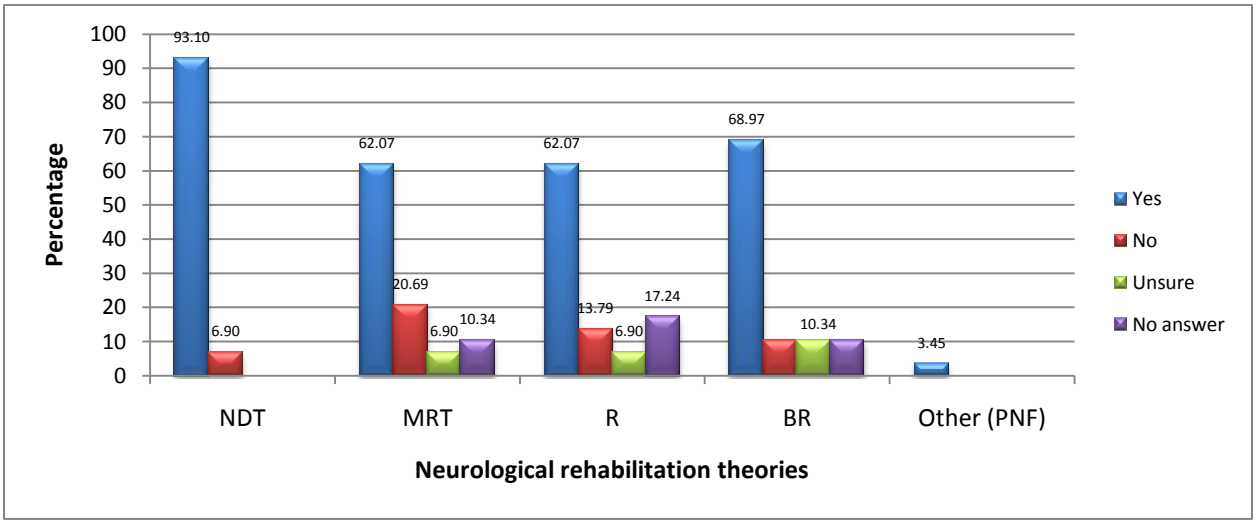


Figure 4.3.13: The distribution of subjects' current use of different neurological rehabilitation theories in their clinical practice (n=29)

4.3.4.5 Combinations of neurological rehabilitation theories used in practice

Figure 4.3.14 shows the frequencies for the different combinations of use of the four neurological rehabilitation theories. It seemed that subjects combined the neurological rehabilitation theories in very different ways, but the highest frequency was for the use of all four theories in practice, at 31.01% (n=9/29). The NDT was the only theory selected as being used only by 10.34% of the sample (n=3/29).

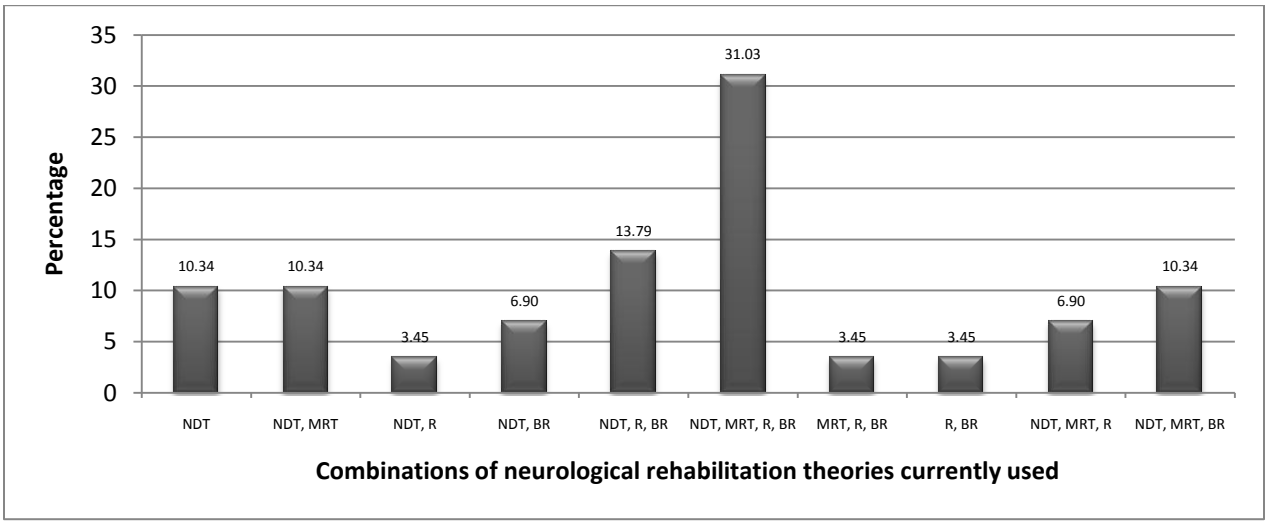


Figure 4.3.14: Combinations of neurological rehabilitation theories currently used by subjects (n=29)

4.3.4.6 The distribution of subjects' use of neurological rehabilitation theories according to the training received

In figure 4.3.15, the researcher described the distribution of the subjects' degree of use of the neurological rehabilitation theory according to their training in the theories. The researcher again used the filtering function on Microsoft Excel to produce this figure. The data were analysed, and shown below are the percentages of subjects who have indicated their training in each neurological rehabilitation theory, and whether they use the theory, do not use the theory or whether they are unsure. The sample sizes for training in each neurological rehabilitation theory was different, and therefore converted to percentages for comparisons. This figure must be interpreted with the combined information from table 4.3.1 and figure 4.3.13. The raw data were compiled in a table in appendix H.

4.3.4.6.1 Degree of use after undergraduate training

The highest frequency, 93.33% of the subjects, who have only received undergraduate training in NDT, use it in practice (n=14/15), and the Rood and Brunnström theories follow with 75% (n=12/16) and 72.22% (n=13/18) respectively. An equal number of subjects (50%) who received only undergraduate training in MRT use it and do not use it.

4.3.4.6.2 Degree of use after postgraduate training

All the subjects only trained in postgraduate in NDT (n=1/1) and in MRT (n=7/7) use the theories in practice. Of subjects 66.67% with postgraduate training only in the Brunnström theory (n=2/3) currently use the theory, and 33.33% do not (n=1/3).

4.3.4.6.3 Degree of use after undergraduate and postgraduate training

In the sample 100% of the subjects trained in NDT (n=12/12), MRT (n=4/4), Rood (n=5/5) and Brunnström (n=3/3) theories in undergraduate and postgraduate are using the theories.

4.3.4.6.4 Degree of use with no training

The one subject who did not receive any training in NDT also does not use this theory, which is indicated by the 100% bar on the figure. Subjects without training in the MRT, Rood and Brunnström theories are using it in practice.

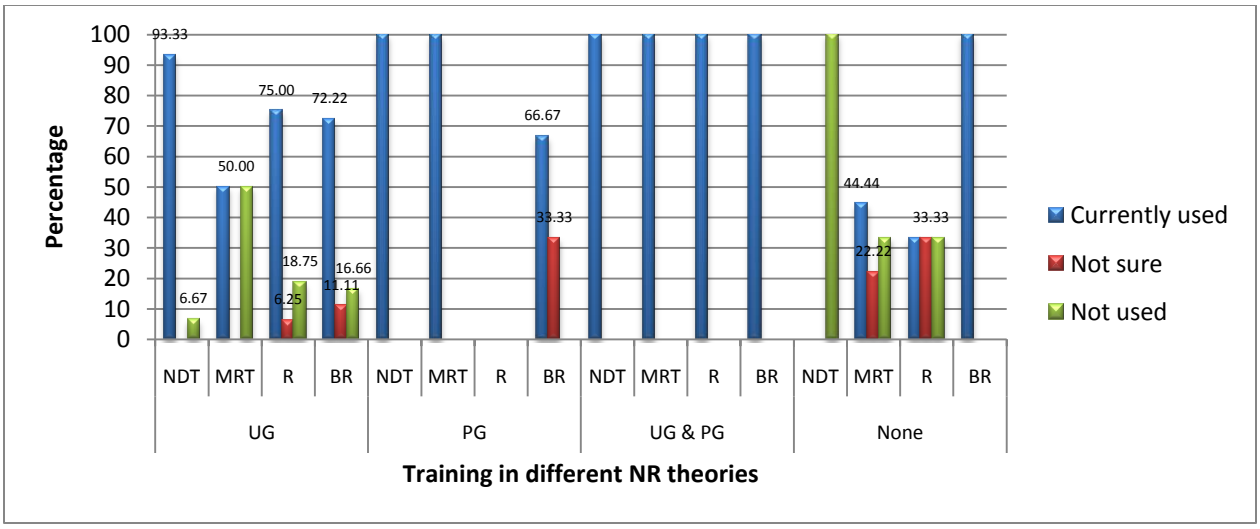


Figure 4.3.15: Training of subjects and the degree to which they are currently using the theories

4.3.4.7 Subjects' ranking of their choice of neurological rehabilitation theories

The subjects were asked to rank in order of priority which theories they are currently using in practice when managing stroke patients and this is shown in figure 4.3.16. NDT was the most frequently chosen as first choice in therapy, with 53.57% of the subjects (n=15/28). The Rood theory had the highest frequency for second choice, at 42.86% (n=12/28). MRT was the most frequently selected for third choice at 35.71% of the subjects (n=10/28). The Brunnström theory was not a significant choice of therapy, with a varied range between the highest frequency for third choice at 31.03% of the sample (n=9/28), and lower frequencies for first, second and fourth choice. NDT and MRT were equal in frequency of fourth choice, at 27.59% of the sample (n=8/28). One subject did not complete this question.

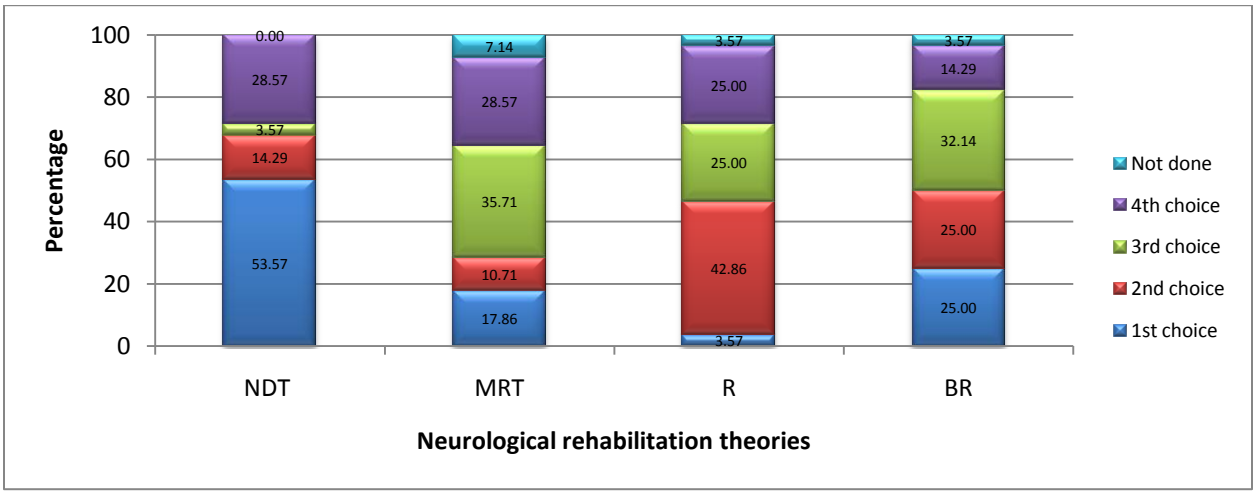


Figure 4.3.16: Subjects' ranking of choice of neurological rehabilitation theories in current practice (n=28)

Figures 4.3.17 and 4.3.18 show the distribution of training and familiarity and the ranking of choice of the theory. The information from table 4.3.1 and figures 4.3.11 and 4.3.16 were combined and the researcher used filtering in Microsoft Excel. Again, the sample sizes for each theory differed as only the subjects who indicated they were trained at the different levels, and familiarity at different levels were used, and this was converted to percentages to allow for comparisons. Refer to Appendix I and Appendix J for the detailed frequencies. There was some discrepancy between the responses in figures 4.3.13 and 4.3.16, and this may be due to some subjects indicating that they use a theory as their fourth choice, i.e. their last choice, rather than the more accurate answer of "not done". Therefore, only the first, second and third choices were mentioned.

4.3.4.8 The distribution of choice of neurological rehabilitation theory ranking according to training received

4.3.4.8.1 First choice

The majority of subjects, at 66.67% (n=10/15) with undergraduate and postgraduate training indicated NDT theory as their first choice. A nearly equal number of subjects at 30% and 33.3% (n=6/20 and n=1/3 respectively) of the sample with undergraduate only, and undergraduate and postgraduate training in the Brunnström theory, indicated this as their first choice. The highest frequency for MRT as first choice was for subjects with postgraduate training only, at 33.3% (n=2/6).

4.3.4.8.2 Second choice

The one subject with postgraduate training only chose NDT as their second choice. The highest frequency of subjects without any training in Brunnström at 50% chose it as their second choice, but this is only one subject. A higher frequency of subjects with undergraduate and postgraduate training, at 60% (n=3/5) indicated the Rood theory as their second choice than subjects with undergraduate training only, at 47.37% (n=9/19).

4.3.4.8.3 Third choice

It is interesting to note that a 100% of the subjects with undergraduate and postgraduate training chose MRT as their third choice (n=4/4). Subjects with no training in the Rood theory did indicate this as their third choice.

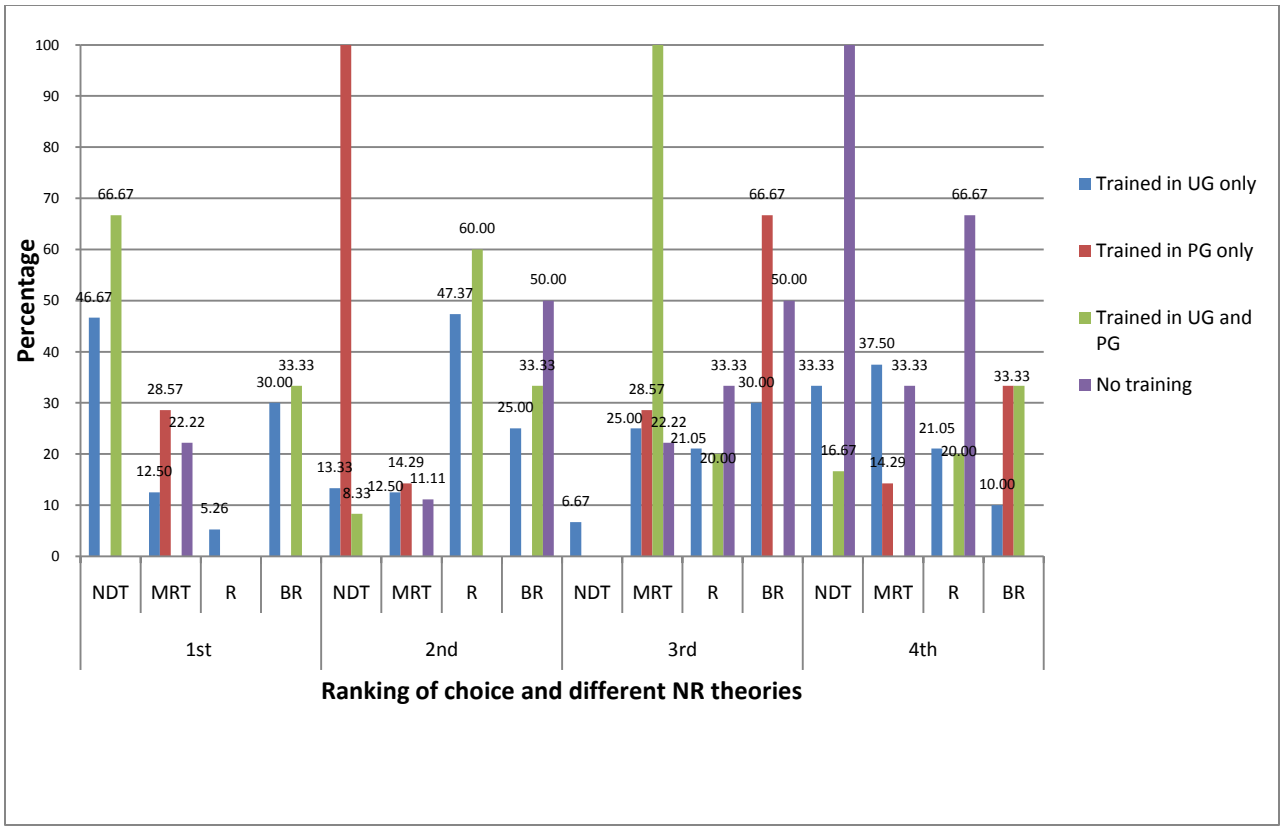


Figure 4.3.17: Subjects' ranking of their choice of neurological rehabilitation theory according to the training received

4.3.4.9 The distribution of choice neurological rehabilitation theory ranking according to familiarity

4.3.4.9.1 First choice

Only one subject chose the Rood theory as their first choice, and the subject is very familiar with it. Of the subjects who indicated NDT as their first choice, 67.67% were very familiar (n=10/15), but less were familiar. The highest frequency of subjects who chose the MRT theory as their first choice were familiar with it (n=3/5).

4.3.4.9.2 Second choice

The highest frequencies for the second choice of theory were for subjects who felt familiar with the theories, with MRT at 100% (n=3/3), 75% (n=3/4) for NDT, 71.43% (n=5/7) for the Brunnström theory and 66.67% (n=8/12) for the Rood theory.

4.3.4.9.3 Third choice

Only one subject chose NDT as their third choice, and they were familiar with it. The second highest frequency of subjects, at 55.56%, who chose the Brunnström theory as their third

option, are familiar with it (n=5/9).The highest number of subjects chose the MRT as their third choice, and most were familiar with it at 50% (n=5/10), and 40% had heard of it (n=4/10).

4.3.4.9.4 Fourth choice

Interestingly, 50% of subjects who were very familiar with the Brunnström theory (n=2/4), chose it as their last option for treatment. Sixty two and a half percent of subjects who were familiar with the NDT theory also placed it as their fourth choice.

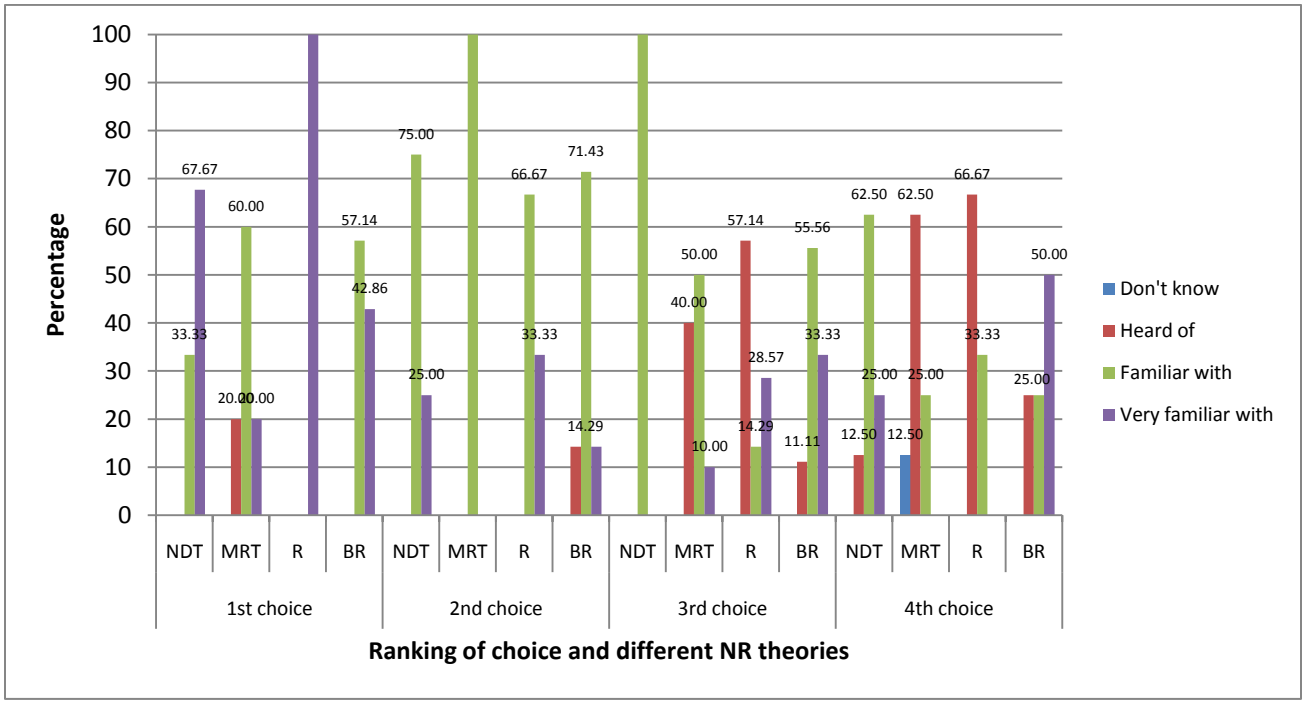


Figure 4.3.18: The distribution of choice of neurological rehabilitation theory ranking according to familiarity

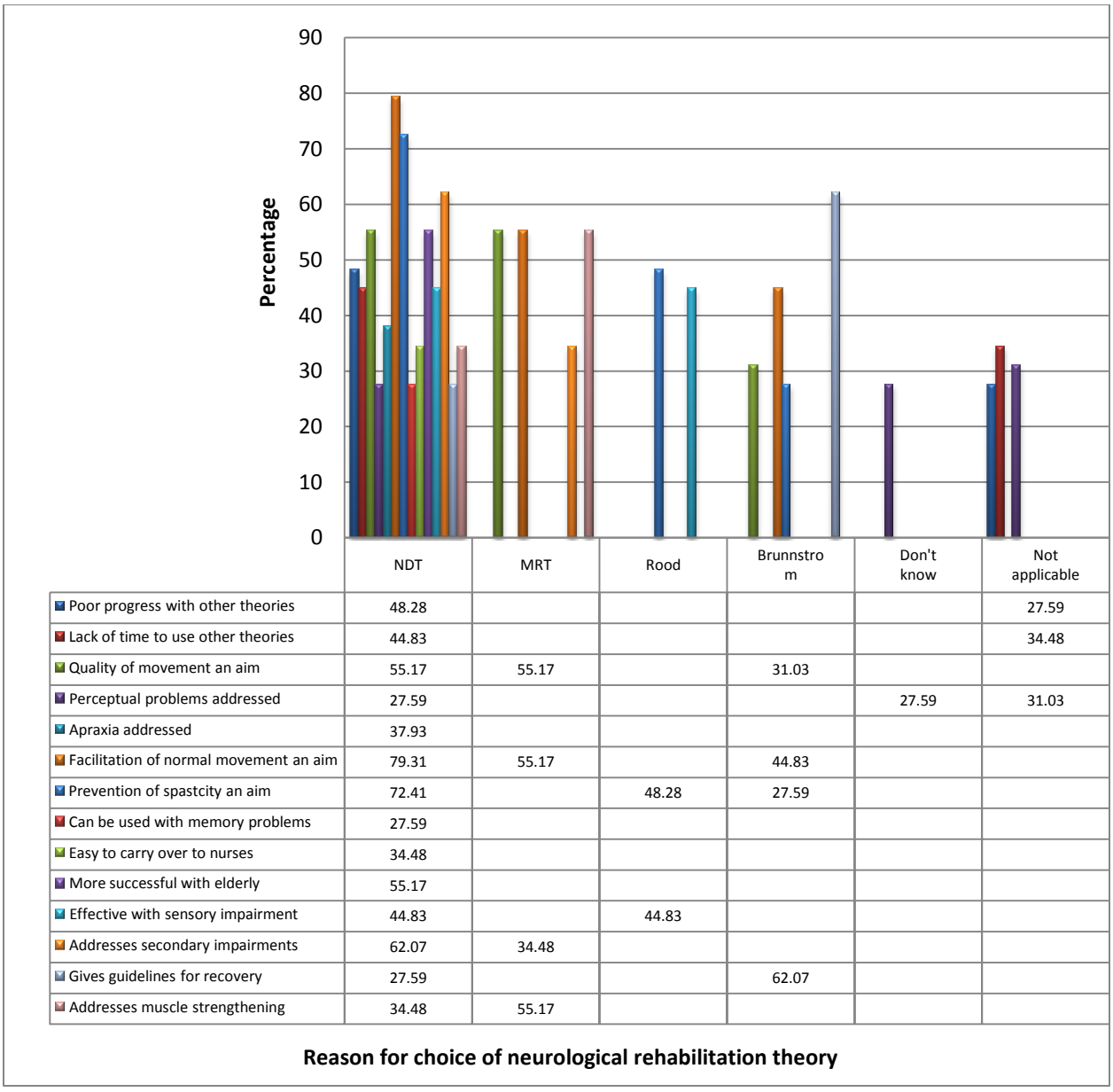
4.3.4.10 The reasons for choice of using neurological rehabilitation theory

The subjects were asked to select the reasons for their choice of theory when treating stroke patients, and results are shown in figure 4.3.19. Only reasons with a frequency of 25% and higher are shown. The complete results for this question as well as the actual number of subjects are tabulated in appendix K. The NDT theory was a selected choice of theory for each of the reasons. Two significantly high frequencies were found for the return of normal movement (79.31%, n=23/29) and prevention of spasticity (72.41%, n=21/29) as the main aims of therapy. The NDT theory was the most popular choice of theory for the following reasons, in order of frequency:

- This theory reduces secondary impairments (62.07%, n=18/29).
- The theory is successful in the use of the elderly (55.17%, n=15/29).

- There is poor progress with other theories (48.28%, n=14/29).
- Due to the short hospital admissions of stroke patients in certain settings, there is a need for early discharge and therefore not enough time to implement other theories (44.83%, n=13/29)).
- Easy to carry over to nurses (34.48%, n=10/29).
- Apraxia is addressed in this theory (37.93%, n=11/29).
- A patient with memory problems shows good progress with this theory (27.59%, n=11/29)

The NDT and MRT theories showed equal frequencies, at 55.17% (n=16/29), with the main aim of treatment being improvement of the quality of movement. The MRT was chosen most often for the reason that the theory improves muscle strengthening which improves functioning in patients (55.17%, n=16/29). The Rood theory was selected equally with NDT (44.83%, n=13/29) by the subjects for the reason that it works most effectively with patients with sensory impairments. The subjects (62.07%) selected the Brunnström theory for the reason that it is used in therapy as a clear guideline for recovery of patients (n=18/29). The subjects (31.03%) felt that none of the theories were applicable to use to address perceptual problems as part of treatment with stroke patients (n=9/29).



	NDT	MRT	Rood	Brunnstrom	Don't know	Not applicable
Poor progress with other theories	48.28					27.59
Lack of time to use other theories	44.83					34.48
Quality of movement an aim	55.17	55.17		31.03		
Perceptual problems addressed	27.59				27.59	31.03
Apraxia addressed	37.93					
Facilitation of normal movement an aim	79.31	55.17		44.83		
Prevention of spastcity an aim	72.41		48.28	27.59		
Can be used with memory problems	27.59					
Easy to carry over to nurses	34.48					
More successful with elderly	55.17					
Effective with sensory impairment	44.83		44.83			
Addresses secondary impairments	62.07	34.48				
Gives guidelines for recovery	27.59			62.07		
Addresses muscle strengthening	34.48	55.17				

Reason for choice of neurological rehabilitation theory

Figure 4.3.19: Subjects' reasons for use of neurological rehabilitation theories (only frequencies of 25% and above displayed)

4.3.4.11 Aims of treatment

The following sections summarise the responses of the subjects regarding their management in general of stroke patients, as well as their management of a stroke patient specifically presented to them in a case scenario. Priority aims the subjects wish to achieve in the management of stroke patients are presented in table 4.3.2, and aims not included in literature are presented in table 4.3.3.

The subjects in this study were asked to state in order of importance the three aims they wish to achieve generally in their treatment of stroke patients, and thereafter their priority aims for the patient in the case scenario.

4.3.4.11.1 General aims

The aim with the highest frequency indicated by the subjects was the improvement of the competence in ADL and IADL at 65.52%. Second most frequent was improvement of the patient's functional mobility, including transfers and bed mobility at 58.62%, but this was not an aim specified by literature. Just over half of the sample (51.72%) aimed at improving the control of movement of the upper limb. Less than half of the sample (41.38%), aimed at reducing secondary impairments, which includes reducing pain and maintaining range of motion. The remaining aims were only focused on by less than a third of the sample. Aims, as described by literature, that are not priority for any of the subjects are the return and education regarding sensory impairments, improving vision, and improving motor planning.

The subjects did indicate other priority aims of OT not indicated by literature. These were: managing abnormal tone and spasticity (20.69%), prescription of assistive devices before movement has returned, retraining dominance (10.34%), and referral to a suitable setting (3.45%).

4.3.4.11.2 Scenario aims

The results for the specific case scenario were slightly different, as the subjects could apply their knowledge and experience more clearly. The highest frequency remained the improvement of the competence in ADL and IADL at 55.17%, but this was lower than the general aims' frequency. Second highest was the improvement of the patient's functional mobility, including transfers and bed mobility at 48.28%. Third highest was the improvement of postural control to enable the patient to perform ADLs. Managing the patient's abnormal tone and spasticity was the fourth highest frequency of aims indicated, at 41.38% of the sample. The fifth aim that showed some significance, indicated by 27.59% of the sample, was the improvement of control of movement of the upper limb. The remaining aims were indicated by less than a third of the sample.

Table 4.3.2: Subjects' general and scenario treatment aims (n=29)

Aims of treatment according to literature	General n (%)	Scenario n (%)
The patient will gain competence in valued and necessary **basic ADL and instrumental ADL** in order to perform at the highest level of independence possible in the desired post-discharge setting.	19 (65.52%)	16 (55.17%)
The patient will have the necessary **control of movement** of the involved upper limb in order to use the involved upper extremity spontaneously during the performance of ADL	15 (51.72%)	8 (27.59%)
The patient and/or caregiver will demonstrate appropriate management techniques for the hemiplegic upper limb to prevent **pain and other secondary mechanical or physiological movement restrictions**. This includes a home programme.	12 (41.38%)	3 (10.34%)
The **caregiver** will demonstrate appropriate methods and problem solving strategies for assisting the patient with ADL and with home activities to improve component skills.	9 (31.03%)	6 (20.69%)
The patient and/or caregiver will demonstrate appropriate strategies for improving or compensating for **cognitive deficits** during the performance of ADL.	7 (24.14%)	1 (3.45%)
The patient will gain competence in tasks and activities necessary to resume valued roles or to assume new **meaningful roles in the community**.	6 (20.69%)	0 (0%)
The patient will improve **postural control** in order to perform daily living tasks requiring balance and change in body position.	5 (17.24%)	13 (44.83%)
The patient and/or caregiver will demonstrate appropriate strategies for improving or compensating for **perceptual deficits** during the performance of ADL.	5 (17.24%)	6 (20.69%)
The patient will have the necessary **strength and endurance** involved upper limb in order to use the involved upper limb spontaneously during the performance of ADL	1 (3.45%)	3 (10.34%)
The patient and/or caregiver will be able to verbalise the reality and impact of **emotional reactions** to stroke and identify coping strategies or resources to help adjust to living with stroke.	1 (3.45%)	2 (6.9%)
The patient will gain increased **somatosensory perception** and/or will employ compensatory strategies in order to perform ADL safely.	0 (0%)	0 (0%)
The patient will gain **visual function** or will employ compensatory strategies in order to resume previously performed ADL safely.	0 (0%)	0 (0%)
The patient will improve **motor planning** ability in order to relearn old methods or learn new methods of performing ADL.	0 (0%)	0 (0%)

Table 4.3.3: Subjects' general and scenario treatment aims not referred to by literature (n=29)

Aims according to subjects	General n (%)	Scenario n (%)
The patient's **functional mobility, including transfers and bed mobility**, will improve to enable improved performance in functional tasks, and this will decrease the physical burden of the caregiver.	17 (58.62%)	14 (48.28%)
The patient's **abnormal muscle tone or spasticity** in the upper limb will be managed to enable improved movement, and therefore functional independence. An example is splinting.	6 (20.69%)	12 (41.38%)
The patient's functional independence will improve with the prescription of **assistive devices**. This implies that movement will not necessarily improve in the affected limbs and hand. This includes **retraining of dominance**.	3 (10.34%)	4 (13.79%)
The current setting is unable to manage the patient effectively, and **referral** to a more suitable setting is done.	1 (3.45%)	0 (0%)

4.3.4.12 Theoretical justification for choice of treatment

The subjects were asked to give the theoretical justification for their choice of treatment for the patient in the case scenario. The subjects stated a wide variety of theoretical justification statements, as seen by the number of statements, and some subjects stated more than one justification. The statement with the highest frequency was the importance of improving postural control or sitting balance before upper limb selective control of movement can improve (31.03%). The second highest was the justification of treatment by basing the treatment on the NDT theory (24.14%). And thirdly, the statements were made that the patient's function is the most important, and that the OT will ensure that the patient can function as independently as possible before discharge, even though compensation and not necessarily through improved movement of the affected limb (20.69%). Table 4.3.4 summarises the results:

Table 4.3.4: Statement of theoretical justification for choice of aims

Statement	n=29	%
Improvement of postural control and balance affects independence in areas of occupation. Improvement of postural control also provides the proximal stability for improvement in upper limb movement.	9	31.03
Methods are based on the NDT theory.	7	24.14
Functional approach is used. The patient must be independent in functional activities, as they stay for such a short period in hospital, an OT cannot treat all client factors or expect normal movement to return first before function improves.	6	20.69
Treatment is based on experience, and the OT knows what works best.	5	17.24
If the patient becomes independent in daily tasks, the burden on the family will decrease.	5	17.24

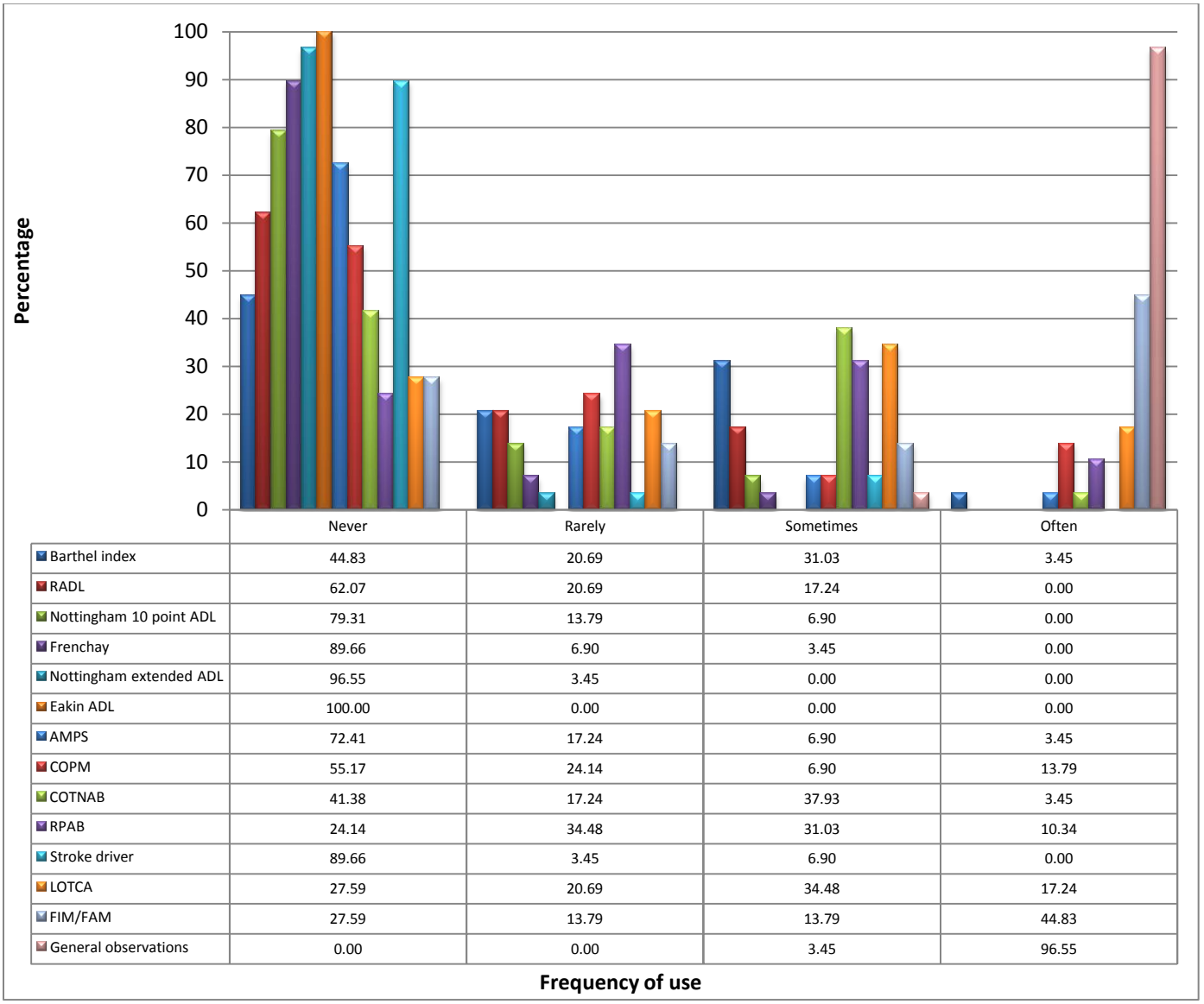
Statement	n=29	%
Perceptual and cognitive deficits should be addressed first, as these skills are prerequisite to improvement in motor tasks.	4	13.79
The patient is still in the acute phase of treatment, therefore, there is a window for improving selective control of movement, which will improve functioning in daily tasks.	4	13.79
The patient is still in the acute phase of treatment, therefore, there is a window for decreasing spasticity, which will improve functioning in daily tasks.	4	13.79
If the family is well educated on managing the upper limb with stretching and positioning, then there is less complications and disability.	3	10.34
Unclear justification.	3	10.34
Using the client centred approach, therefore treating what is most important to the patient.	2	6.9
Participation of patient is important to ensure success; therefore, by using simple functional tasks, the patient will be motivated to participate in therapy.	2	6.9
Using a mixture of theories determines the treatment.	2	6.9
Neurotechniques should be used to decrease spasticity and maintain ROM.	2	6.9
Preventing secondary complications is important, and this is done by reducing spasticity and improving active movement.	1	3.45
It is important to first treat client factors, which in turn will improve function in areas of occupation.	1	3.45
Unsure.	1	3.45
No answer.	1	3.45

4.3.4.13 The use of standardised and non-standardised assessments by the subjects

Further investigation was done into the subjects' treatment protocols, with a question on the assessments they use in therapy with stroke patients, and results are in figure 4.3.20. The complete results for this question as well as the actual number of subjects are tabulated in appendix L.

Most of the subjects, at 96.55% (n=28/29), indicated that they often use general observations to evaluate the patient initially and for reassessment. The second most often used assessment is the FIM/FAM, but only indicated by 44.83% of the sample (n=13/29). The highest frequencies of assessments the subjects use sometimes were the Barthel index (41) at 31.03% (n=9/29), the COTNAB (88) at 37.93% (n=11/29), the RPAB at 31.03% (n=9/29) and the Loewenstein occupational therapy cognitive assessment (LOTCA) (90) at 35.48% (n=10/29). Additional assessments mentioned by the subjects were the Visual motor integration, CAM, SI, RBMA, the

International classification of function (ICF), the MMSE and the Developmental test of visual perception for adults.



	Never	Rarely	Sometimes	Often
Barthel index	44.83	20.69	31.03	3.45
RADL	62.07	20.69	17.24	0.00
Nottingham 10 point ADL	79.31	13.79	6.90	0.00
Frenchay	89.66	6.90	3.45	0.00
Nottingham extended ADL	96.55	3.45	0.00	0.00
Eakin ADL	100.00	0.00	0.00	0.00
AMPS	72.41	17.24	6.90	3.45
COPM	55.17	24.14	6.90	13.79
COTNAB	41.38	17.24	37.93	3.45
RPAB	24.14	34.48	31.03	10.34
Stroke driver	89.66	3.45	6.90	0.00
LOTCA	27.59	20.69	34.48	17.24
FIM/FAM	27.59	13.79	13.79	44.83
General observations	0.00	0.00	3.45	96.55

Figure 4.3.20: The distribution of subjects' use of standardised and non-standardised assessments in measuring effectiveness of neurological rehabilitation (n=29)

4.3.4.14 Subjects' methods of evaluating the effectiveness of their therapy

The subjects were asked to state from the case scenario how they would evaluate the effectiveness of the treatment of the patient presented. Figure 4.3.21 illustrates the frequency of the different answers. In the sample, 37.93% of the subjects (n=11/29) would use the patients improvement in functional independence as an indication, but not one of these subjects indicated a specific measurement. It is seen that 24.14% of the sample (n=7/29) would use

feedback from collateral sources as an indication of improvement, and 20.69% of the sample (n=6/29) would use the FIM/FAM (40). Interestingly, 17.24% of the sample (n=5/29) would use either the decrease in spasticity or the return of movement respectively, but none of the subjects indicated a specific measurement they would use.

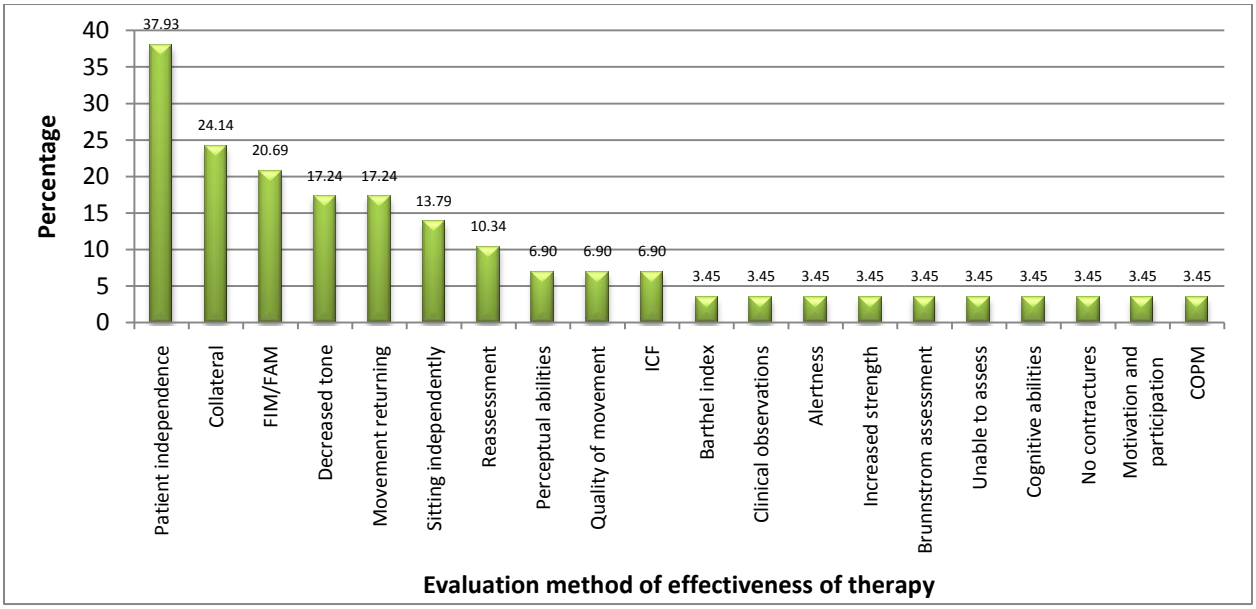


Figure 4.3.21: Method of evaluation of effectiveness of therapy (n=29)

4.3.5 The use of EBP

4.3.5.1 Definition of EBP

The subjects were asked to explain what EBP means in their own words. The following table 4.3.5 summarises the results:

Table 4.3.5: Definition of EBP according to subjects (n=27)

Definitions as stated by subjects	n (%)
Using treatment methods based what has been proven to work, therefore continually keeping up to date with formal research	18 (66.67%)
Using treatment methods that you've seen working in your own practice. You have to record results from your treatment sessions to prove that the techniques are effective. You have to use sound assessments to support the results you've found.	9 (33.33%)

4.3.5.2 Sources of knowledge used by subjects when managing stroke patients

The question explored the use of EBP to substantiate the information gathered from the subjects regarding their chosen treatment protocols, and results are presented in figure 4.2.22 below. The results show that the highest frequency of the sample, at 82.76% (n=24/29), learning from their own experience influenced their knowledge on stroke management. Two noteworthy factors affecting their knowledge are working with other therapists and postgraduate courses at 62.07% and 65.52% respectively of the sample (n=18/29 and n=19/29). Three subjects did not indicate their answer regarding postgraduate degrees, and one subject did not answer regarding postgraduate courses.

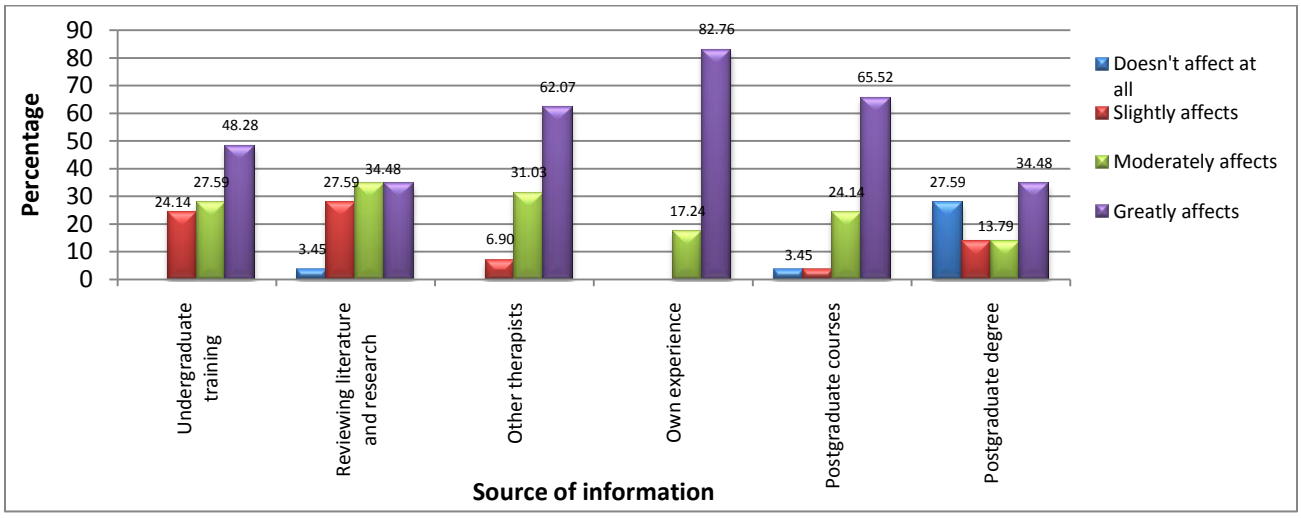


Figure 4.3.22: Source of knowledge used by subjects when managing stroke patients (n=29)

4.3.5.3 Frequency of use of EBP

Shown in figure 4.3.23, the finding was that 51.85% of the sample (n=14/27) usually, and only 14.81% (n=4/27) always used EBP. Two subjects did not complete this question.

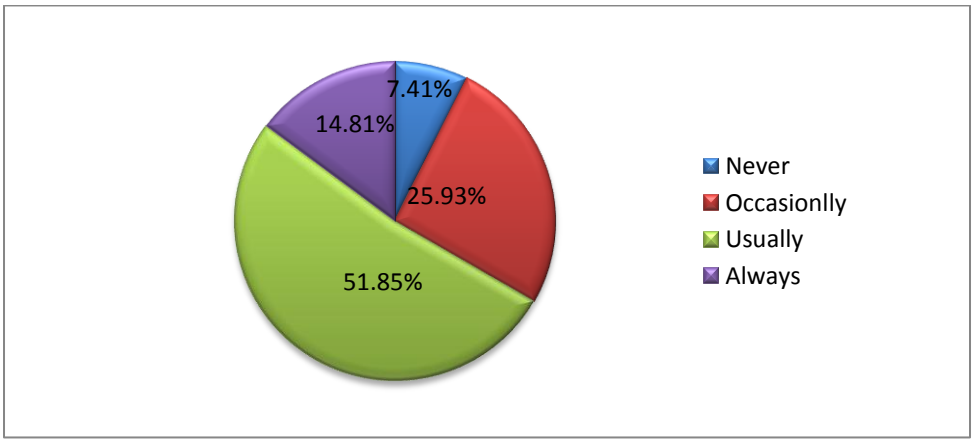


Figure 4.3.23: The frequency of use of EBP of the subjects (n=27)

4.3.5.4 Frequency of use of different EBP sources

The subjects were presented with examples of evidence, and they were asked to indicate how frequently they use the evidence in their therapy with stroke patients, which is depicted in figure 4.3.24. The type of evidence that was used mostly on a daily basis was custom and practice at 41.38% of the sample (n=12/29). The most frequent evidence used on a monthly basis by the subjects (n=8/28) was expert opinion at 27.59%. The most subjects, at 20.69% (n=6/29) never use published case studies as evidence for their treatment of stroke patients. One subject did not indicate their opinion regarding research papers, published case studies, and expert opinion.

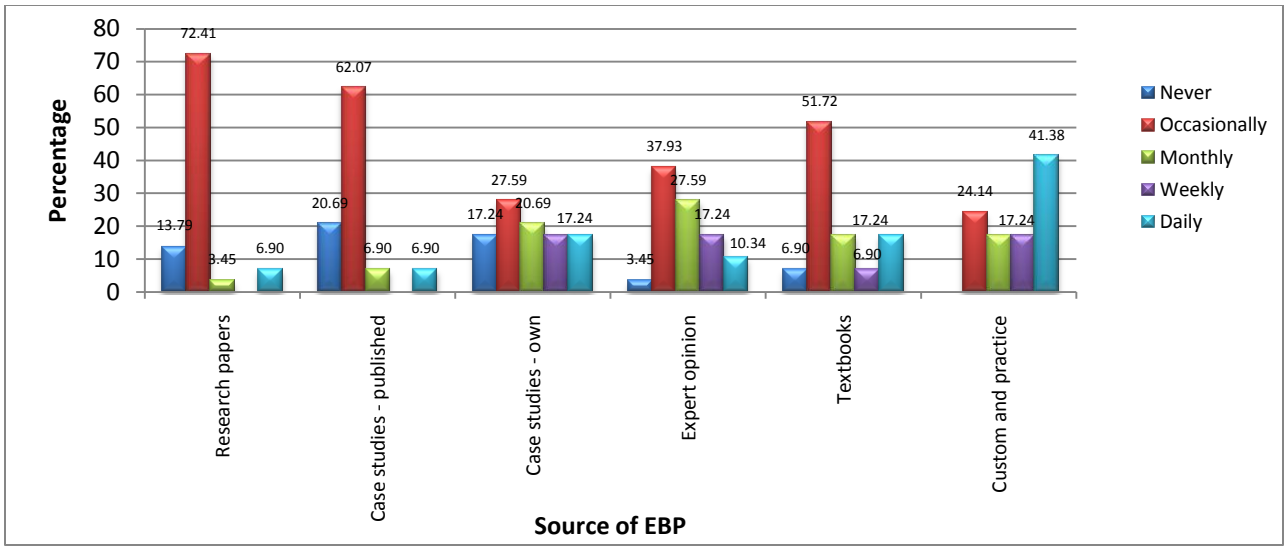


Figure 4.3.24: Frequency of use of EBP sources by subjects (n=29)

4.3.5.5 Factors that impeded subjects' use of EBP

As shown in figure 4.3.25, the subjects were asked to indicate the level of factors that impeded their ability to use EBP. As seen, 62.07% of the subjects (n=18/28) reported that a lack of time was a significant factor that impeded their ability to use EBP. Nearly half of the sample stated that factors with some important effect on their ability to use EBP are the high cost (42.28%), their lack of knowledge on what is available (51.72%) and the lack of support to use EBP (44.83%).

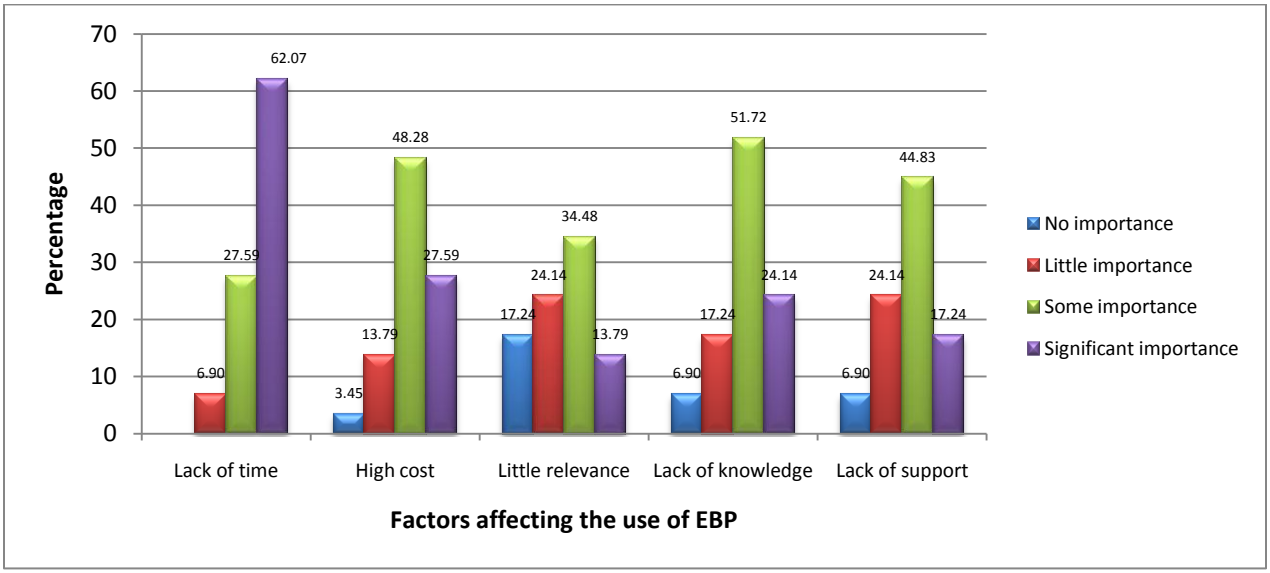


Figure 4.3.25: Subjects' degree of importance of factors affecting their ability to use EBP.

4.4 Conclusion to the results

The results from part one and part two of the study were presented in this chapter. A significant amount of data was produced by both surveys, and therefore only significant results were mentioned in detail. A discussion of these results will be presented in the next chapter.

CHAPTER 5: DISCUSSION

5.1 Introduction to discussion

The discussion will integrate the results by firstly identifying important characteristics of the sample of OT training centres in part one, and OT clinicians who completed the survey in part two of the study. The demographics of the clinical settings will also be described. This will provide a platform for the recommendations of how to improve the management of stroke patients in South Africa.

A cyclical framework will be presented for the improvement of the management of stroke patients in neurological rehabilitation. The results from part one and part two of the study will be discussed throughout this framework.

5.1.1 Sample demographics

The sample of the training centres included all but one centre of the population; therefore the results from the curricula audit are comprehensive. The sample from part two of the study was diverse. There was representation from OTs trained at all the training centres in South Africa, and from one international training centre (figure 4.3.1). The majority of the sample had postgraduate training (figure 4.3.2), but neurological rehabilitation related topics were not the most common in the sample (figure 4.3.3). The majority of the sample had only practiced as OTs and within the neurological rehabilitation field for two to five years (figures 4.3.4 and 4.3.5), and therefore the sample contained knowledgeable OTs in terms of their training, yet they were not extensively experienced. OTs may be excellent practitioners, with expertise developed from years of experience, and therefore they know what to do, but they are unable to justify their choice of techniques based on sound knowledge (24). Therefore, even if OTs have qualified recently, their strength lies in their current knowledge and training in the latest findings and research, but they may not have the experience with management of stroke patients to truly know which methods work effectively or not.

5.1.2 Clinical setting demographics

In order to understand the neurological rehabilitation clinical settings in South Africa, the demographics will now be discussed. The majority of subjects manage stroke patients in government hospitals, and the OTs are able to spend significant time with the patients. The patients remain in treatment for an adequate length of time, and the stated times are similar to

international standards in literature of 45 minute sessions and 16 days of hospitalisation (3) (28).

The international standards are not met by all the settings regarding the length of hospitalisation. This may be due to the fact that some of the subjects work in neurological rehabilitation settings or units (figure 4.3.6), where patients are admitted specifically for rehabilitation and not acute care. The therapists in these settings focus on the improvement of the patient's functional independence, and therefore much more time is needed to reach these goals (61). The comparatively short hospitalisation in government settings may be due to these hospitals being focused on acute care, and patients are discharged once they are medically stable and not necessarily independent in functional activities. It may be challenging to meet the international standards due to the small ratio of OTs to patients in South Africa, the fast discharge rate due to pressure on hospital bed occupancy and the lack of access to out-patient facilities (79).

Government hospitals do not offer rehabilitation services from OTs over weekends, but some private hospitals and private practices may operate over weekends. In the case where patients are treated daily while hospitalised, the data from figure 4.3.8 are realistic. Patients admitted for 4 – 10 days will receive 1 – 4 sessions of OT, and patients admitted for 29 – 45 days will then receive 21 – 30 sessions on average.

With the very short hospitalisations of 4 – 10 days, it becomes important for the OTs to have appropriate referral systems in place, therefore the stroke patient will receive therapy from settings closer to their homes on an out-patient basis, or from their nearest PHC clinic (79). The number of patients seen per month by the OTs in the sample varied. This is again affected by the specific setting the OT works in, as a general practice in physical dysfunction will consist of the majority of patients with stroke (25), whereas a neurological rehabilitation unit will consist of mainly stroke patients.

5.1.3 Introduction to the cyclical framework

The results will now be discussed in the form of a continuous cyclical framework. The continuous cyclical framework emerged from the various parts of the study, namely the different curricular structures, the training and skills of the subjects and the EBP information from the questionnaires. The cycle suggests a framework for using sound EBP to improve the neurological rehabilitation curricula at the training centres and management of stroke patients in clinical practice.

Figure 5.1.1: A cyclical framework to improve the curricula and management of stroke patients in neurological rehabilitation

Firstly, the need for the **development** of neurological rehabilitation theories and assessments suitable for the South African context will be highlighted. Secondly, a suggestion for a framework for the effective **training** of OTs in neurological rehabilitation will be presented. Thirdly, the importance of **maintaining** the current skills and knowledge of OTs in practice, to enable them to use effective intervention, as well as being good role models for the students at their facilities, will be discussed. Finally, the cycle will continue through development and ensuring what is trained and maintained will be up to date with the latest research findings. This cycle correlates well with the EBP process as recommended by literature (84) (85).

5.2 DEVELOPMENT

Figure 5.2.1: The first step, developing

5.2.1 The most effective neurological rehabilitation theory

Literature reinforces that theories should be used based on EBP, and not because they are traditionally accepted and thought to be effective (25). OTs should apply their EBP skills in choosing the best neurological rehabilitation theory.

NDT has historically been the most popular neurological rehabilitation theory to use amongst OTs and physiotherapists (9) (23) (34) (61) (71) (91). Often the decision to use NDT is based

on initial education and previous experience, and not necessarily on sound scientific evidence (9). NDT was indicated as the most commonly taught, in table 4.2.1, and used by most of the subjects, in figure 4.3.13, and it was indicated most frequently as the subjects' first choice, in figure 4.3.16. OTs also seem pressurised, particularly by their physiotherapy colleagues to adhere to the NDT theory, however, there is a lack of evidence to indicate that the NDT theory is the most effective (9). Therefore, South African OTs should reconsider the widespread use of NDT until it has been researched and indicated as the most effective theory to use (9) (34) in their context.

The second most frequently used theory by the subjects in this study was the Brunnström theory, and third in equal frequencies the MRT and Rood theory. These findings also correlate with previous studies (9) (23), as the MRT and Rood theory were also the least used. The Brunnström theory was not an option in previous studies, therefore results cannot be compared. The PNF theory was given as an option in the previous study, but the OTs indicated that they never or rarely used this technique (9), although OTs in Australia are encouraging the training of this theory (31). The highest frequency of theories the subjects did not use is for MRT, but this may be due to the fact that this is the only theory some subjects have only heard of (figure 4.3.11) and the highest frequency of subjects who were not trained in the theory (table 4.3.1).

The Rood theory was used most frequently as the second choice, which links with this theory being the second highest in undergraduate training received (table 4.3.1). This theory was rated low on familiarity (figure 4.3.11). Subjects are therefore using a theory with a low frequency for being familiar and very familiar as their second option, and very few subjects have postgraduate training in this theory (table 4.3.1), thus a low level of expertise. It is interesting to note that the use of the Rood theory is decreasing worldwide, due to the latest findings that a reduction of spasticity does not improve function (47) (92). Therefore, Rood theory techniques must be used in conjunction with functional movement; otherwise it will be ineffective (65). It is concerning that this theory is used as a second choice despite its effectiveness being questioned (23), and subjects had a low level of expertise and familiarity with it. There is sufficient evidence to show that this theory in isolation is not appropriate for intervention in OT. The ranking of use of this theory is also not congruent with the frequency of subjects using it (figure 4.3.13) as it was indicated as lower than the Brunnström theory, and Brunnström did not feature as a significant choice. This will be discussed next.

The Brunnström theory is most frequently used as an assessment tool, and the stages have been found useful to track the progress in motor functioning recovery after stroke, therefore the frequency of subjects currently using the Brunnström theory is inflated due to the use in assessment, and not necessarily in treatment (66). This assessment based on the Brunnström theory does not have a numerical value and is time consuming to administer. The Fugl-Meyer assessment of motor recovery after stroke (36), as mentioned before, has been developed and follows a similar sequence of recovery, and is easy to administer and measureable (36). The theory is not a popular treatment tool, as most of the theory is based on outdated and unfounded information. Only one effectiveness study has been done, without conclusive evidence and the theory has not been revised since 1970 (66). The Brunnström theory was not indicated by the subjects as a specific choice. It is used equally as a first and second choice, and most frequently as a third choice, and least frequently as a fourth choice. This is surprising, as this is the theory that subjects received the second most training in, after NDT (table 4.3.1). Also surprising is that more subjects are more familiar with this theory than the NDT theory, and second highest in frequency for being very familiar (figure 4.3.11). There was however a low level of postgraduate training in this theory (table 4.3.1). It is thus noted that although subjects had a high level of undergraduate training and are familiar and very familiar with this theory, it is not prioritised as a significant choice in therapy, and may be used by many subjects for assessment only. The Fugl-Meyer assessment of motor recovery after stroke should therefore be researched as a viable assessment tool, and the Brunnström theory should be researched as an effective treatment method in the OT and South African contexts.

OTs tend to develop an eclectic approach based on an assortment of models and theories (34), some developed for the OT profession and others not, or OTs develop their own theories and methods of treatment based on their own life experiences (55). The use of a combination of theories was also found in the current study, as seen in figure 4.3.14. Only the NDT theory is used in isolation by a few subjects. The highest frequency was for the combination of all four theories, which indicates that the subjects from South Africa also use an eclectic approach to therapy, as seen with previous studies (34). It will be difficult to compare treatment techniques of OTs who use eclectic approaches, as the content of their sessions will differ greatly. A study to investigate the content of therapy of OTs in South Africa would need to be done to ascertain the exact techniques used. Some literature does not encourage the use of an eclectic approach if training in all the theories was not sufficient, as discussed later in the training section. A single, sound, well researched theory is needed to guide OTs' intervention strategies in

neurological rehabilitation (23). Once OTs are using similar techniques the process can begin in refining and constructing what is the most effective approach to use in this field, as reinforced by previous studies (23), and the benefits of combining theories can be investigated.

Two related factors, the OT philosophy and the South African context, are fundamental points to consider during clinical reasoning and decision making in the treatment protocol of stroke patients, as highlighted in this research. No research has been done to provide evidence on the appropriateness of the neurological rehabilitation theories for the OT and South African contexts. A standardised assessment is also required to enable research into the appropriate theories. These factors, neurological rehabilitation related to the OT and South African contexts and the use of standardised assessments for the OT and South African contexts will now be discussed.

5.2.2 A neurological rehabilitation theory according to the OT philosophy

OTs are trained at an undergraduate level to analyse and assess functional activities, and not just the quality of movement (26). The concern with the neurological rehabilitation theories most commonly used in South Africa (figure 4.3.13), is that these theories are not based on the OT philosophy. A theory based on the OT philosophy will focus on the occupational health and well-being of a stroke patient by being able to perform all tasks in areas of occupation in a satisfactory way. The current theories are based on the premise that quality of movement will give quality of functional abilities. A significant number of the subjects indicated they would ascertain the effectiveness of their therapy through the reduction of spasticity and the return of movement (figure 4.3.21). It is therefore unclear how the philosophy of OT can fit into current neurological rehabilitation theories, as an OT's main aim of treatment should be the return of function, and this is not necessarily achieved through the return of movement, which the sensorimotor theories encourage. Therefore, the suitability of the NDT, Rood and Brunnström theories within the philosophy of OT should be investigated.

The MRT has some elements agreeing with the OT philosophy, due to the task orientated nature of the theory, but the main principles are not founded by OT experts. MRT was indicated most frequently as the third choice of therapy. This theory had the lowest frequency for undergraduate training, but the highest for postgraduate training, therefore some subjects are knowledgeable in it (table 4.3.1). The theory has the third highest frequency for subjects being familiar with it, but the lowest for subjects being very familiar with it (figure 4.3.11). This theory is therefore not the most popular choice as subjects are still unfamiliar with it. As this theory is a

newer theory, few OTs who have been practicing for longer than ten years have gained experience in using it (23). As a result, the newer qualified OTs lack the guidance of experts in this theory and role models to show them the way. Thus, with high levels of training, but with little experience and few role models, this theory is difficult to be used as a first choice. With the increased use of MRT, more research could be done on its effectiveness. The OTs should become more familiar with the theory, and strategies for this are discussed in the training section.

There is thus a need for an occupation based theory. This approach to therapy is much more resource intensive, as functional tasks require several objects, tools and equipment (59). An OT department should therefore be equipped with materials, tools and objects such as baking and cooking ingredients, cleaning materials, self care products such as shampoo and soap, leisure activities such as games, videos and reading material, as well as work related activities such as computer tasks, driving and managing paperwork (59). Continuous comments on the questionnaires completed by the clinicians in part two of the study raised the concern of there being very little financial support, and that the main portion of the budgets are put into the basic running of the department with essential resources acquired, leaving very little for the acquiring of more costly items such as those mentioned above. It is therefore crucial that OTs become more aware of the importance of resources for functional activities. Research has indicated that a functional approach is more successful (17) (59). OT managers will boost the success of the neurological rehabilitation departments by making it their priority to acquire these resources, and to progressively build up their inventory with sustainable and durable objects.

A final option regarding identifying a suitable OT neurological rehabilitation theory, is to investigate less familiar theories, such as PNF, and others used by OTs internationally, and piloting the feasibility of these theories, or to develop a new theory. It was however not in the scope of this research to investigate the less familiar theories.

5.2.3 A neurological rehabilitation theory in the South African context

The effectiveness of the four neurological rehabilitation theories researched can be questioned within this context of unique challenges in the health care system of South Africa (7) (79). A neurological rehabilitation theory suitable in the South African context would need to consider the challenges of stroke patients attending therapy, the lack of resources in the OT departments, especially in government and rural institutions, and in the stroke patients' environments and the co-morbid illnesses and disabilities brought on by poverty. There is

currently a lack of research to show the effectiveness of the commonly used neurological rehabilitation theories in South Africa. The current neurological rehabilitation theories should be investigated in the South African context, and if found suitable, OTs should use the most effective option. If research finds the theories unsuitable, new theories should be investigated.

As neurological rehabilitation theories cannot be compared without using a standardised assessment, this is a suggested starting point. Factors influencing the choice of using a standardised method may include the level and pattern of motor control of the patient, the clinical setting, the time available to administer the test, the resources available, and the intended use of the results (4). A major concern is that the standardised assessments have been validated in countries other than South Africa, and local OTs may argue that these assessments are not appropriate to measure function in our unique context (37). If these standardised assessments are at least used more often by the OTs, they can be applied to the specific contexts and problems with the assessments can be identified, but OTs do not often use appropriate standardised assessments, as will be discussed next.

5.2.4 Using standardised assessments within the OT and South African contexts

The following assessments, the Functional independence measure (FIM) (40), Barthel index (41) and the assessment of motor and process skills (AMPS) (42), are commonly used for the evaluation of a patient's ability to perform functional activities in areas of occupation. The remainders of the assessments surveyed are used for the assessment of specific client factors such as cognitive abilities and arm movement.

The LOTCA (90) and FIM/FAM (40), indicated in figure 4.3.20, are commonly used by the South African OTs. The LOTCA (90) is used sometimes and often by half the sample, but it was not mentioned as part of the training at any of the seven training centres (figure 4.2.2). This assessment should be considered to be included in the curriculum, as research supports this assessment as being valid and reliable (93). The research is however not based on a South African population, and therefore more research is needed to indicate whether this assessment is reliable and valid for use in South Africa.

The FIM/FAM (94) is used as part of the management of patients admitted to private hospitals in South Africa, and has been found to be reliable and valid (95), but this assessment has received critique as the research was not based on the South African context, and is outdated. As more than half of the subjects in the sample practice in private settings (figure 4.3.6), this may be the reason for the highest number of subjects using the FIM/FAM most often, as seen in figure

4.3.20. The third highest frequency of subjects also use the FIM/FAM to measure the effectiveness of their therapy (figure 4.3.21). The FIM/FAM is a costly licensed assessment tool, and requires specific training. The licenses are obtained by large corporate medical companies in South Africa, for the use by the therapists in the clinical setting for which they have a license. It is therefore not possible to include this measure in the undergraduate curriculum, but in order to prepare the students for the use of this tool they will need to be exposed to it during their undergraduate training.

The functional assessment which the subjects used the most frequently as "sometimes" in figure 4.3.20, is the Barthel index (41), which is similar to the results of a previous study (9). The Barthel index was developed as a scale to determine the level of disability, and therefore the amount of care a person would need when discharged from the hospital. The evaluation is suitable for the scope of nursing, and therefore a more specific OT measure is needed. The Barthel index is only taught at one of the seven training centres in the sample, and it may need to be considered as an assessment to be included in the curriculum, until a more OT orientated assessment is developed. The Barthel index seems to be a rigorous measure of neurological disability, although it has been criticised for being too restrictive and poorly responsive (96). The majority of subjects indicated that the patient's level of independence will indicate if therapy is effective (figure 4.3.21), although no specific measurements were given. It can be assumed that the Barthel index may be used as a measurement by the subjects to ascertain patients' level of functioning in areas of occupation.

Both the FIM/FAM and Barthel index were recommended by the "Post-stroke rehabilitation clinical practice guideline" to measure ADL functioning (26), but both have been criticised as not being sensitive enough to indicate change in functional abilities (28), and that they are limited in their ability to measure higher levels of function and quality of life (26). An assessment sensitive to change is crucial to indicate the effectiveness of treatment methods, and to set realistic rehabilitation goals, but the concern is that these assessments are not appropriate for the comprehensive evaluation of a stroke patient in OT, and other assessments should be explored or developed.

The results of this survey are similar to previous studies regarding the less frequently used assessments (9), as seen in figure 4.3.20, and this should be explored to identify the factors that make these assessments unpopular amongst the OTs.

Nearly all the subjects in the sample indicated that they often use general observations to assess stroke patients. A significantly high frequency of subjects indicated that they measure the effectiveness of their therapy through obtaining collateral information (figure 4.3.21), which is also a highly unreliable measure. Family and caregivers may inform the OT that the patient is progressing well, in fear of the therapy discontinuing if it is deemed ineffective. They may also inflate the problems the patient is experiencing in the hope of obtaining more help and assistance, and also in fear of therapy discontinuing if the patient is seen as coping well.

OTs have been scrutinised in previous studies regarding their wide-scaled use of non-standardised assessments in other fields of practice. OTs often justified this by stating that there is a lack of suitable standardised assessments to use. There is a specific lack in assessments that are affordable, and time efficient, sensitive to change, and easy to administer (9). And lastly, as mentioned before, no clear assessment has emerged that will consider the patient's functioning in the South African context. In previous studies the subjects also stated that some standardised assessments do not reflect the individuality of patients, and that such clear cut assessments are more relevant in research (9).

In a climate of OTs moving towards EBP, it is crucial to have evidence of the effectiveness on OT in neurological rehabilitation. The OTs in the survey have shown that their theoretical knowledge is not as sound as it should be, with poor justification for their use of theories (table 4.3.4) and reasons for choice (figure 4.3.19). Therefore, if OTs are not familiar with all the neurological rehabilitation theories they use they should use standardised measures to ascertain the effectiveness of their therapy techniques. If they choose not to use and apply standardised assessments, due to the barriers and impracticalities mentioned, and they use collateral information and general observations to measure their effectiveness, OTs should base their therapy on techniques that are well researched and shown to be effective in their type of setting and with the specific types of patients. As mentioned previously, there is no conclusive evidence for the effectiveness of any of the neurological rehabilitation theories, and as the minority of the subjects always use EBP, as seen in figure 4.3.23, one cannot confidently say that OTs in South Africa have evidence that they are doing what is best for their patients in neurological rehabilitation.

The setting of standards in quality of health care is an international concern, as seen in the publication by the United States Department of Health: Post stroke rehabilitation clinical practice guideline. This guideline recommends that practitioners "use well-validated standardised

measures throughout acute care and rehabilitation, to achieve consistency of treatment decisions, facilitate team communication, and monitor progress for each survivor" (26:1011). Pressure has also been placed on OTs in the health care systems in Australia and the UK to provide quality and evidence based techniques at the lowest possible cost (35). The best method of indicating the effectiveness of therapy is to provide quantifiable measures to indicate the improvement in stroke patients' functioning, and measurements should be made at two points in time, for example at admission and then at discharge (35). OTs should use standardised measures to document the effectiveness of their therapy. This is not just important in terms of fiscal constraints, but also due to the importance of providing the best quality rehabilitation to patients (35).

Numerous evaluations have been developed to identify impairments caused by stroke. Obtaining a measurement of the effectiveness of a therapy method is becoming very important due to the controversies surrounding the effectiveness of the neurological rehabilitation theories (36) as well as proving the value of OT in neurological rehabilitation (35). The OT should first determine the roles, tasks, and activities important to the patient. The OT should then evaluate the patient's ability to perform these roles in their specific context, and then consider which client factors are causing the dysfunction. This will guide the OT in what needs to be addressed first to start restoring function (38). Due to the very specific function of the OT's assessment, the standardised assessment has specific requirements, and this will now be discussed.

Fortunately, there is no lack of standardised assessments in OT, but there is a lack of well integrated and practically viable standardised assessments that will capture the essence of the main dysfunctions in client factors and areas of occupation dysfunctions to be addressed by the OT in neurological rehabilitation (35). The answer may be in using a reliable assessment of the stroke patient's occupational well-being, considering their outcomes for neurological rehabilitation, then breaking down the functional tasks into client factors. The client factors to be included in the treatment programme should only be considered if these have a significant influence on the stroke patient's ability to function normally. With the development of the OTPF II (38), it is a step closer in defining these important factors of what make people occupationally healthy, and research can focus on developing assessment measures to capture the stroke patients' dysfunctions within their personal context, in a cost effective and time efficient manner.

It must become a focus of research to develop such relevant tools in order for OTs in the South African context to measure the improvement of their patients' functional abilities, and to evaluate

the effectiveness of the techniques they use. OTs are not using the currently available standardised assessments, as was seen in the fact that they use general observations more often in the current study as well as previous studies (9). OTs should use the standardised assessments that are available, and identify the problems, to support the research and development of current and new assessments. However, this culture of using reliable and valid assessments must be nurtured from an undergraduate level, and this standard of practice must be set early on in the OTs' careers, and will be discussed in the training section to follow. The research and development of suitable OT and South African neurological rehabilitation theories and assessments cannot take place outside of the EBP process. Steps to this process should be followed, as recommended by literature (84) (85).

5.2.5 Recommendations for development

Research is needed to show the effectiveness of the commonly used neurological rehabilitation theories within the OT and South African contexts. Research and development of newer neurological rehabilitation theories should be boosted in the case where current theories are not meeting the needs of the stroke patients in these contexts.

OTs should use the currently available standardised assessments to show the effectiveness of their therapeutic interventions. Currently available assessments should be used more often and OTs should research the suitability of these assessments. In the case where these assessments are deemed to be unsuitable, research and development should be done on more efficient and suitable standardised assessments for the OT and South African contexts.

5.3 TRAINING

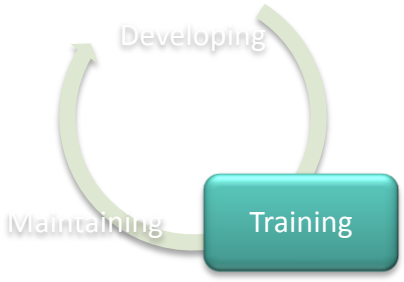


Figure 5.3.1: The second step, training

Training is not the only factor that influences OTs' techniques and methods of practice; it is also shaped by past work experiences, their own background and experience with patients (1), their

clinical skills and their personal preferences (23). Undergraduate training often shapes the interest of OT students in choosing a field of practice and therefore this is a starting point for improving the current management of stroke patients in South Africa.

The results from the curriculum audit will be discussed in terms of the four principles identified in literature (31). The foreseen obstacles from the data will be stated, and recommendations for improvement in the South African context will be given under each principle.

5.3.1 Principle 1: Integrated foundation studies

5.3.1.1 The obstacles

From the results in part two of this study, it is seen that the OTs in the South African sample lack the theoretical justification of their choice of neurological rehabilitation theories (table 4.3.4), as none of the subjects cited current research or based their justification on science based theory. A lack of understanding regarding the underlying science of neurological rehabilitation could be arising in undergraduate training and therefore qualified OTs do not show a solid foundation in order to support theoretical assumptions underlying practice. Previous studies also found that OTs often used treatment methods without sound understanding of their theoretical foundations and contraindications (9) (23) (25). These theories are rather used due to tradition or history, despite the increase in pressure to base intervention on sound EBP (1).

Beliefs regarding the reasons for the behaviour of people after CNS damage shape methods and techniques when treating CNS dysfunctions (63). An OT's understanding of the underlying principles of different neurological rehabilitation theories is fundamental in clinical reasoning in selecting the correct and most effective theory to use in rehabilitation of stroke patients (63). Understanding of basic sciences is mainly expected at an undergraduate level, which includes courses such as biology, anatomy, physiology, psychology and more. OT students often find it difficult to understand the relevance of these subjects in an OT course, as it is often unrelated to their perceived roles in the assessment and treatment (31). These basic sciences are taught in the junior years, and treatment techniques are only studied in the senior years, therefore making the link even less obvious (31).

According to higher education governing bodies in South Africa, it is required that experts in the basic sciences should be teaching the courses, and therefore the curriculum designers and teachers are not OTs. They may lack insight into the role and value of OT, and therefore do not apply the understanding of the basic sciences with the relevance to OT. The questionnaire to

the training centres was limited in that it did not request input regarding the departments' involvement in basic sciences courses, but it is assumed that involvement is minimal.

5.3.1.2 Overcoming the obstacles

Due to the restrictions placed on the teaching of basic sciences, OT lecturers will not be able to teach these courses in an integrated and applied manner. It is therefore recommended that OT experts are involved in the design of the basic sciences curricula to ensure an increased understanding of the principles underlying neurological functioning, and therefore a clear understanding of the expected dysfunctions and effective methods of assessment and treatment. This could increase the understanding of the underlying neuroscience in neurological rehabilitation, and this understanding will be carried over to the students, which will form a solid foundation in their theoretical knowledge.

Furthermore, the OT lecturers should integrate the knowledge of basic sciences into their neurological rehabilitation courses. This will encourage lecturers to ground their teaching in sound and correct science of neurological rehabilitation, which will strengthen the understanding of the scientific concepts in this field.

5.3.2 Principle 2: The art of thorough assessment

5.3.2.1 The obstacles

From the results in part one and part two of the study, shown in figures 4.2.2 and 4.3.20, it is clear that OTs are not taught to use standardised assessments during their undergraduate training and they are not using standardised assessments in their treatment protocols. Clinicians felt strongly that students should know what to do when faced with a stroke patient (31). Assessments should not be based on observations and subjective opinion only, but the survey showed that general observations were used most frequently in figure 4.3.20. OTs have been widely criticised regarding their lack of use of standardised assessments (4) (26) (35). The challenges of using suitable standardised assessments has been discussed in the development section of the discussion.

With the training of non-standardised assessments in figure 4.2.1, the three less frequently taught client factors were selective control of movement, cardiac and muscular endurance and muscle strength. These client factors have been indicated in research as essential in assessment and treatment in neurological rehabilitation to ensure the improvement in functioning in areas of occupation (17). Training of these client factors should be revised to

ensure thorough assessment, which will lead to more focused and successful treatment. The term selective control of movement may be misleading and difficult to understand, as different theorists call this client factor by different names. For instance, in NDT it may be referred to as "normal movement patterns". This frequency may be accurate, as the strong belief that spasticity causes abnormality in movement still exists (23), thus students may be taught that by treating the client factor tone (spasticity), normal movement will return.

5.3.2.2 Overcoming the obstacles

Regarding the use of standardised assessments, OTs need to "set rehabilitation goals related to activity and participation that are specific, measurable and attainable, realistic, and relevant to the individual person" (4:S99). As universities aim at training competent OTs, part of their competence should be to assess stroke patients thoroughly, which will be credible within the multi disciplinary team (MDT), within the OT profession and, most importantly, in the best interest of the patient. It is therefore recommended that training centres explore possible standardised assessments that are time efficient, inexpensive and easy to administer. As was suggested in the development section, OT lecturers and expert OT clinicians can guide the process to research appropriate standardised assessments and in synthesising the results. A philosophy should be nurtured in the OT profession that a sound assessment or re-assessment cannot be based on observations only, but the only credible method is using standardised assessments (33). The development of a suitable standardised assessment for OT in the SA context has also been discussed in the previous section.

Regarding the need for assessment of all affected client factors, it is important that the undergraduate curriculum makes it clear to students what causes abnormal movement, and that abnormalities in muscle tone do not cause dysfunction alone (17) (47) (59). The treatment of negative impairments are becoming more important in reducing disability after stroke, therefore muscle strengthening and improvement of endurance should be a priority in treatment (47) (59), and skills in adequate assessment should therefore be a priority. The improvement of muscle strength and reduction of secondary impairments have been shown to be correlated with an improvement in function of stroke patients (17) (47), and may therefore be more suitable according to the OT philosophy. As the client factor selective control of movement is mainly based on the concepts of the Brunnström theory, the lack of evidence regarding the effectiveness of this theory limits the sufficient evidence that an increase in selective control of movement will increase functioning in areas of occupation. Research regarding the effect of an increase in selective control of movement on the functioning of a stroke patient is needed.

It is therefore recommended that the neurological rehabilitation courses are revised based on the latest research on the importance of muscle strengthening in stroke, with a reduced focus on the treatment of spasticity. The lack of knowledge regarding the latest research on effective assessment and treatment of these client factors is related to the poor use and access of EBP by OTs. This will be discussed in the section on sustaining the importance of EBP.

5.3.3 Principle 3: Appropriate neurological rehabilitation theories

5.3.3.1 The obstacles

5.3.3.1.1 Current training

As seen in table 4.2.1, the majority of training centres provide training in one theory only, the NDT theory. The survey also showed the highest frequencies in both undergraduate and postgraduate training (table 4.3.1). These frequencies are alarming, as NDT has not been shown to be the most effective or superior theory to use in practice (9) (34).

The other centres trained the students in three or more theories, which may also be difficult for the students to grasp, and may lead to confusion when selecting the most appropriate theory, combining the principles of the theories and knowing the contraindications when using a mix of theories. This was also indicated in a previous study (1).

MRT is a relatively new theory (23), and not yet taught at all the centres (refer to table 4.2.1). The training in MRT is mainly addressed in postgraduate degrees, and there are no specific associations in South Africa, not associated with a degree providing training in OT in this theory. Training in MRT and awareness of this new theory has also increased since some of the subjects have qualified, and therefore they may have only encountered this theory in the postgraduate courses and degrees. The option of MRT training specifically as a short course and not only in a postgraduate degree should be investigated.

NDT training is an independent eight week course for a basic qualification, with an opportunity for advanced qualifications at a later stage. These courses are run and regulated by the NDT association of South Africa, and a popular choice of neurological rehabilitation OTs to improve their skills, and they not need to necessarily need to complete a postgraduate degree.

In table 4.3.1 it was also seen that the majority of subjects received training in the Brunnström theory in undergraduate only and second most in the Rood theory, and third in Brunnström theory in both undergraduate and postgraduate. Rood and Brunnström theories have been

considered less relevant in current practice, yet training centres are currently providing training in both. Few subjects have received Rood and Brunnström theory training in their postgraduate training, and these two theories showed the highest frequency for undergraduate training only, as seen in table 4.3.1. The Rood theory was a popular theory in the past and it is the least frequently taught at the training centres, as seen in figure 4.2.1. This may be indicating that the Rood and Brunnström theories are becoming outdated and they do not need advanced training in these theories (23) (31).

PNF training was only received by the subjects who have been qualified for longer than 20 years. This is interesting, as modern literature is encouraging training the students in this theory (31). It seems to be unpopular in South Africa, as none of the centres train OTs in this theory and only two subjects were trained in the study, and OTs do not commonly use it in practice (9).

Literature suggests that training in the NDT theory, MRT and PNF should continue (31). A study in the United States of America also found that the OTs and physiotherapists were most commonly trained in the NDT, Brunnström and PNF theories (23).

5.3.3.1.2 The distribution of subjects' use of neurological rehabilitation theories according to the training received

Based on the highest frequency and number of subjects in figure 4.3.15, postgraduate training increases the use of NDT and MRT, and slightly with the Rood theory, but training has no influence on the use of the Brunnström theory. This shows that subjects become more likely to use a theory if they have received advanced training.

As seen in figure 4.3.11, the subjects showed the highest frequencies in familiarity with the NDT and the Brunnström theories. The high number of subjects very familiar and familiar with NDT correlates with previous studies (9), but a comparison cannot be made with the Brunnström theory as this was not included.

The results from MRT and Rood theory compared well to the previous study (9), with the lowest frequencies of subjects who are familiar with it and the highest frequency for subjects who have only heard of this theory. There were more subjects very familiar with the Rood theory than MRT, and more subjects familiar with the MRT than the Rood theory, which is also similar to literature (9). This is an interesting finding, as Rood is a theory frequently trained in undergraduate degrees, and MRT is frequently trained in postgraduate degrees (table 4.3.1).

Subjects were therefore more familiar with a theory where they have received undergraduate training versus a theory that they have received during postgraduate training.

Subjects with postgraduate training felt familiar with the MRT, but very few subjects with postgraduate training, with or without undergraduate training as well, are very familiar with the theory (figure 4.3.12). This may indicate that the MRT postgraduate courses are not adequately increasing the OTs' familiarity in the theory, and the curricula content should be revised.

As seen in figure 4.3.12, subjects with undergraduate training only, felt familiar, and with both undergraduate and postgraduate training felt very familiar with the NDT theory. The postgraduate training in terms of the NDT basic and advanced courses are intensive and will increase the users' competence and familiarity in using the theory. With the high frequency of OTs and physiotherapists (9) (5) (34) using the NDT theory, there are also more role models and experts in this theory.

5.3.3.1.3 The distribution of subjects' familiarity according to their training in neurological rehabilitation theories

When considering the ranking of choice of theories and the undergraduate training the subjects received, it is seen in figure 4.3.17 that the choices varied for all the theories. Undergraduate training therefore does not seem to change according to the choice of theory.

MRT had the highest frequency for postgraduate training only (table 4.3.1), but even with a higher level of training, it was chosen equally as first and third choice. Postgraduate training in the Brunnström theory also showed little change according to choice, as it was placed as third and fourth choice. A postgraduate level of training only does not seem to change according to the choice of theory.

With both undergraduate and postgraduate training, NDT remained as first choice, Rood theory remained as second choice, MRT remained at third choice and the Brunnström theory was equal first, second and fourth choice. Both undergraduate and postgraduate training changed the most significantly according to choice, as seen in figure 4.3.17, but the familiarity changes more according to level of training.

The theories with higher frequencies for very familiar and familiar were placed as subjects' first and second choices. This is seen in figure 4.3.18, as the higher frequencies for very familiar and familiar are in the first and second choice and the higher frequencies for only heard of the theory are seen in third and fourth choices. There are however exceptions, as one subject who

has only heard of the MRT use it as their first choice, and one subject who is familiar with the NDT theory placed it as their third choice, and one subject who has just heard of the Brunnström theory uses it as their second choice. These are however isolated cases. A previous study found that past experience also has an influence on the choice (9). Choice may therefore change according to the OTs' amount of experience in using a theory, regardless of the level of training. There seems to be a bigger change in choice according to familiarity, than a change in choice according to the level of training. This will be discussed next under the fourth principle.

A further study to determine what influences the OTs' familiarity with theories is needed, as this would shed light on how training can be focused on making OTs more competent and confident, which would influence their first choice of theory. For now, it can be concluded that familiarity increases to some degree with postgraduate training, but experience and actual time of using the theory has a greater effect on OT's use and choice of theory, as seen in the results.

5.3.3.2 Overcoming the obstacles

It is crucial that OT training curricula and continuing professional development courses teach students and OTs the most recent evidence available regarding the management of stroke patients in South Africa and therefore training centres should reconsider the decision to solely teach NDT, and reconsider the continuation of teaching the Rood and Brunnström theories.

It is also recommended that the PNF theory's feasibility is studied in the South African OT context, as it has been recommended in literature as an effective neurological rehabilitation theory (31).

Training in newer theories should also be investigated by increasing the undergraduate training and postgraduate courses available on theories such as the MRT. If South African OTs are to keep up with the latest research, the training (table 4.3.1), subjects being very familiar with the theory (figure 4.3.11) and choice (figure 4.3.16), should be improved through more effective training on an undergraduate and postgraduate level.

According to the results of this survey, it seems that OTs in South Africa are not familiar with the MRT. This may be affected by the time since subjects were trained (average 13 years). OTs are hesitant to use it in practice, and improved training would thus be assisting OTs who qualified more than 10 years ago to keep abreast in their knowledge and ability to role model to the OT students who will be taught in the newer theories. The use of MRT is increasing with

postgraduate training, but has little effect on the familiarity. This then supports the reasons why subjects may have poor justification for their use of this theory, as they are not very familiar with it. The training of the MRT should therefore be revised and researched in depth, and the problems should be identified in order to make the training more effective. The need for improved postgraduate training was also reinforced in literature (9) (23).

The training centres should be involved in the development of suitable neurological rehabilitation theories for the South African OT context. This includes evaluating the effectiveness of the current neurological rehabilitation theories used, and should form part of the development process mentioned.

5.3.4 Principle 4: Building confidence

5.3.4.1 The obstacles

From the results of the survey in part one of the study, it emerged that there are no set requirements regarding the assessment and treatment of stroke patients, particularly the number of patients seen during the four year undergraduate training course. This is alarming, as confidence in treating patients can only be developed if enough opportunity for practice has been given. A study on the graduates' perceptions of their preparation for clinical roles indicated that they felt ill-prepared for more specific evaluation procedures and they need more practical knowledge in their curricula (1). As literature states that the majority of the patients in a general physical dysfunction OT practice will be stroke patients, confidence is essential to deal effectively with this large workload (25). If a student at any of the seven training centres who completed the survey met the minimum requirements to pass the course, they may have only come across one stroke patient in four years. As stroke is such a common and very complex condition (30) (31), surely it is of essence in the OT course to prepare the future OTs to competently manage patients with this condition.

Another obstacle is that the role models, or OTs supervising and training the OT students, are not familiar and confident in using the newer neurological rehabilitation theories. This problem is discussed in the previous principle.

5.3.4.2 Overcoming the obstacles

The first step in overcoming this obstacle is to recognise the importance of being effective in the management of stroke patients. Stroke is a condition to be taken seriously in South Africa due to the increase morbidity rate, and the overwhelming number of people living with the disabilities

as a result of stroke (7). The OT curricula should revise the requirements, in order for an OT to practice the management of more than one stroke patient during their undergraduate training, as practice is needed in order to build competence and confidence, and therefore familiarity. The number of stroke patients a student needs to assess and treat during the four year course to be competent is debatable, but one patient in the total time of the course is not adequate.

The second step is to ensure the brief encounters with stroke patients during the four year course are valuable learning opportunities, guided by good role models. The clinicians guiding the future OTs need to be role models in the use of EBP and in their use of scientific clinical reasoning and justifying their treatment protocol choices. If the clinicians are lacking the skills due to inadequate undergraduate training, then it is the duty of the undergraduate academic to fill this gap. The OTs in the academic and research roles should disperse their knowledge and ensure that the role models stay updated in the latest developments in the field of neurological rehabilitation, which links with the training process.

In order for OTs to improve the knowledge to choose the most appropriate neurological rehabilitation theory, and to be very familiar with the theory, the previous results reinforced the thinking that familiarity improves use of a theory more than training (9). Therefore, to be more familiar, a theory should be used more, and in the case of training, the students should have more opportunity to be familiar with the theory by using it more often with the appropriate patients. It is also essential that they see the theory being used more, and this raises the importance of OTs being trained more effectively and given the opportunity to use the theories more confidently, as was discussed under the previous principle.

Continuing professional development must be used as a tool to facilitate the role model's development of skills and use of EBP, and they should have support in place to encourage their development and upkeep of knowledge on latest research (23). There are only a few OT specific neurological rehabilitation interest groups in the whole of South Africa, and this is therefore currently a dire need. OTs with the knowledge and skill due to their roles as researchers, expert clinicians and academics may be suitable to guide the less experienced clinicians. An interest group will fulfill this need, as well as the widely used platform of websites and blogs to encourage interpersonal sharing and learning. The importance of dissemination information was discussed in the EBP process.

Another electronic-learning tool that could benefit students and clinicians would be visual materials such as photos and videos in accessible formats. In the case where the current role

models cannot be effective in showing the students what to do in neurological rehabilitation of stroke patients, this is a suggested method of ensuring that examples of good techniques and treatment sessions are always accessible to both student and OT clinician.

As neurological rehabilitation is a distinct field of practice, it is time to acknowledge the high level of skill needed for OTs to be truly effective in assessment and treatment. The training centres should develop postgraduate short courses of degrees of a high standard and suitable to meet the market needs, which has been indicated to be neurological rehabilitation in South Africa. The newer theories should be incorporated in postgraduate courses as some of the clinical staff who are role models to the OT students need to be proficient when showing the students what to do, using techniques they were taught in lectures. Although the results show an increase in use with postgraduate training, the familiarity does not increase without adequate practice and support.

In order to be good role models, the OTs in practice supervising students should maintain their standards of practice and stay up to date with the latest findings in the field. This process is discussed in detail in the maintaining section.

5.3.5 Recommendations for training

It is recommended that the basic science course should be applied to OT, and OT courses should be applied to basic sciences. Therefore, with this two way application of basic sciences on the role of OT in neurological rehabilitation, we may be more successful in ensuring valid justification by knowledgeable OTs in the choice of neurological rehabilitation theories in rehabilitation of stroke patients.

OTs should use standardised assessments to show the effectiveness of their intervention strategies, and these assessments should be included in the undergraduate curricula. The curricula should also be revised to include the assessments of the most affected client factors, as stated by the latest research, which includes secondary impairments, muscle strengthening and endurance. The focus on reduction of spasticity in neurological rehabilitation should also be reconsidered due to the lack of effectiveness.

The inclusion of the NDT theory as the only neurological rehabilitation theory in the curricula should be reconsidered. The newer neurological rehabilitation theories should be included, as theories such as the MRT have been shown to have potential to agree with the OT philosophy.

Researching the less common theories, for example the PNF theory, for its effectiveness in the OT and South African context is recommended.

The training opportunities for the MRT should increase to improve the familiarity of OTs with this theory. Postgraduate courses and further research and development into this theory are recommended and opportunities to equip more role models should be explored.

Specific requirements regarding the number of stroke patients student need to manage before qualifying should be implemented. Opportunities for skill development and practice will increase when OT clinicians become role models in the use of the latest techniques in this field. Electronic learning can be used as an effective tool to support the role models.

5.4 MAINTAINING

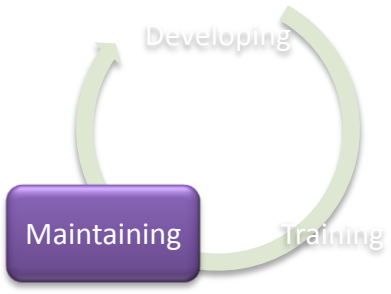


Figure 5.4.1: The third step, maintaining

As the final year of the OT course is mainly practical, the OT student will function as part of the staff constituent at several types of institutions. Their main source of instruction and learning is the OT clinicians working at these institutions, such as the subjects in the sample. The clinicians are therefore the students' role models. The most effective way to be a good role model is to maintain sound knowledge and skills in the management of stroke patients. The following should be considered: The justification for the use of a neurological rehabilitation theory, providing correct reasons for the choice of intervention, treating the patient effectively, evaluating the results of intervention and keeping up to date with EBP. These factors will now be discussed.

5.4.1 Sound justification for the use of a neurological rehabilitation theory

The subjects provided little detail regarding theoretical frameworks they use and they did not refer to research in this question, as seen by the responses in table 4.3.4. This is alarming, as more than half the sample stated that they usually use, and a few stated that they always use

EBP (seen in figure 4.3.23), but they were unable to refer to any evidence. Similar results were found previously, as none of the subjects was able to justify their treatment on any relevant research or published papers (9).

There is a clear lack of the understanding of the theoretical underpinning of the role of neuroplasticity in the latest neurological rehabilitation research. Neuroplasticity was described as the primary theoretical justification in the previous study (91), but none of the South African OTs stated this as a justification. The foundational knowledge regarding neuroplasticity should be reinforced in OT training, as previously discussed in the integration of foundations studies principle.

Poor postural control leads to dysfunctional limb control, increased risk of falls, contracture and deformity, diminished sitting and standing endurance, decreased visual feedback and swallowing difficulties, and impaired ability to interact with the environment (26) (27). Postural control is therefore an important client factor to treat first, as it has an impact on many other client factors affecting the functioning of the patient. The highest frequency of subjects indicated that their justification for their choice of therapy was that improvement in postural control and sitting balance is needed for improvement in independence in areas of occupation, and that postural control is a prerequisite for upper limb movement. Even with this statement being the highest in justification, improvement in postural control was the third highest aim chosen (table 4.3.2), which means the OTs are not practicing according to prescribed knowledge.

The use of the NDT theory showed the second highest frequency. This theory is not seen as a justification, but a theoretical framework. They therefore base what they do on the theory, but do not justify the use of the theory by using a foundation of evidence (9). As has been stated previously, there is a lack of evidence on the effectiveness of NDT, and the effectiveness of the theory should be researched first, as seen in the development section. The use of the NDT theory should be based on evidence, not just initial education, experience or custom. The effective use of EBP will be discussed in detail.

Another factor to consider is the lack of theoretical evidence to base treatment on, due to the lack of research internationally (9), not just locally. Therefore, OTs may not be able to find the most recent evidence for the correct and effective management of stroke patients, due to the lack of information. This highlights once more the need for further research into an appropriate neurological rehabilitation theory, as discussed in the development section.

Lastly, the accessing of higher levels of EBP sources will improve the ability of OTs to justify their treatment choices based on sound knowledge obtained from higher levels of EBP sources. This will be discussed later in the importance of EBP.

5.4.2 Valid reasons for choice of using neurological rehabilitation theories

The majority of the reasons stated for the use of the different theories were given for the NDT theory (figure 4.3.19). This question was asked to ascertain which theoretical frameworks the subjects use and what factors inform their decisions. The most frequently stated reasons for the use of NDT were facilitation of normal movement and prevention of spasticity.

Improvement of quality of movement as a main aim of treatment was equally chosen by subjects for the NDT theory and MRT, and to a lesser extent for the Brunnström theory. Facilitation of normal movement was also chosen by a very high frequency of subjects as a reason for the NDT theory. This reason was also selected for MRT and Brunnström theories, but at a lower frequency. A critique of the NDT theory is that quality of movement and normal movement are not measurable client factors, or even possible to standardise, as it differs so greatly from person to person and task to task. There is a lack of proof to state that normal quality of movement will produce normal function (70). Again, it was reinforced that a focus on the specific movements is not as important as the stroke patient's ability to function in areas of occupation. As the NDT theory requires the reduction of spasticity to influence the quality of movement, which is unfounded by research, this reason is not scientifically sound (47), and has been discussed. Therefore, although the NDT theory advocates for these two reasons, they are not realistic or clinically useful to the improvement of function in stroke patients. The subjects also indicated the NDT theory as their justification for the aims they choose, which is unfounded as their reasons for the choice is not appropriate. The lack of evidence regarding the factors that are the most effective to improve function reinforces the need for a neurological rehabilitation theory more suitable for the OT philosophy, as discussed in the development section.

Prevention of spasticity was stated as a significant reason for the use of NDT and the Rood theories, and at a lower frequency for the Brunnström theory, and this is supported by literature (23) (65) (91). This was not significant for the MRT. The reduction of spasticity is shown to be ineffective to improve function (47) (17), and by preventing spasticity, OTs will not perform their crucial function or fulfill their philosophy of improving independence in all areas of occupation. This aim is the main focus of the Rood theory, but the popularity of this theory is decreasing,

and is the least taught theory at an undergraduate level by the training centres (figure 4.2.1), the least used (figure 4.3.13) and the least familiar and second least very familiar (figure 4.3.11). Although this theory was the second highest frequency in what the subjects were taught at undergraduate level, this may be due to length of time the subjects were qualified for, as this was a popular approach more than 10 years ago. Although it is stated that subjects were trained in this theory, they are not very familiar with the theory. Therefore, the principles for reduction of spasticity are more commonly supported by NDT, and although implemented by the Rood theory, less subjects use this theory in practice. Revision of this treatment approach is therefore needed before these principles are researched in the OT and South African contexts, as discussed in the development section.

According to the dysfunctions seen after neurological dysfunction (17) (59), the two main reasons for using the NDT theory are not the most important aspects to treat in a stroke patient. It has been shown in research that improving strength (48) and reducing secondary impairments are more important in returning function in stroke patients (47) (59). Reducing secondary impairments was the third highest for NDT as well as MRT, with the reason for using the MRT as half of that of NDT. The latest revisions of the NDT theory did include the treatment of secondary impairments, but the greatest focus was still on the reduction of spasticity (71) (91). There is therefore poor understanding of some of the underpinnings of the NDT theory, even though this theory was the most commonly used and indicated as first choice, seen as being very familiar to the subjects. With the increase in application of EBP and neuroscience, NDT theory and MRT principles may be better understood.

The main reasons for choosing the Brunnström theory were to improve quality of movement, to facilitate normal movement, to prevent spasticity and to give clear guidelines to indicate the stages of recovery of movement. This theory was indicated as the highest frequency for subjects being familiar, and second for very familiar in figure 4.3.11, and according to the reasoning, these are accurate according to the theoretical construct of the theory. This theory is used by the subjects second most (figure 4.3.13), but there is no previous research to support or reject this theory, and no evidence to compare the South African results to. The basis for preventing spasticity has however been shown to be ineffective (17) (47), but to show evidence for the remainder of the theoretical constructs, this theory is in need of revision and further research, as discussed in the development section.

The main reasons for MRT were returning quality of movement, facilitating normal movement, addressing secondary impairments and addressing muscle strengthening. These reasons are correct in terms of the theoretical basis for MRT (17) (59). MRT focuses on the reduction of secondary impairments and muscle strengthening, but as MRT was indicated as the third choice of the majority of subjects (figure 4.3.16) and the lowest frequency for subjects being very familiar (figure 4.3.11), it seems that these important aims are not being met in therapy. OTs are therefore not managing stroke patients effectively as they appear not to be following the latest research or implementing the correct treatment techniques. As seen in the results regarding the training and familiarity of the MRT, OTs that are using MRT are knowledgeable on the theory, but not very familiar with it due to lack of exposure and few role models, and not implementing the theory correctly. This is discussed in detail under the building confidence section.

As discussed previously, there seems to be a lack of understanding with regards to the latest findings in the effectiveness of reducing spasticity and improving muscle strength in stroke patients. Both the training centres and OTs should be encouraged to improve their knowledge regarding these findings through consulting EBP resources, and by improving their familiarity with the theories advocating these techniques. With an increase in understanding of the NDT theory's justifications and underlying science, OTs may realise the incorrect focus on reduction of spasticity, and with better familiarity and use of the MRT, it may be realised that the focus on muscle strengthening and reduction in secondary impairments is more in line with latest research. The improvement of muscle strength was not indicated as a significant aim of treatment, as seen in table 4.3.2., and the aims are not identified by a majority of subjects as an important focus of the MRT (figure 4.3.19). Therefore, the revision of the important client factors affected by stroke and the effective treatment needed to improve a stroke patient's functioning should be revised, as seen in the section regarding training, under the principle of thorough assessment. The poor understanding of the MRT is again reinforced, which leads to the need to improve the OTs' familiarity with the theory, as discussed.

Very few of the theories were indicated as useful for addressing perceptual deficits, apraxia and memory. It is therefore important to use other cognitive perceptual frameworks, as the four indicated theories do not adequately address these factors. The theories stated in this study are more appropriate for the return of movement, and the improvement of mental functions should be addressed in conjunction with the return of movement (29). Previous studies show that motor, cognitive and perceptual factors all make a significant contribution to the ability of a

person to function after stroke (29). The lack of these important factors may be due to the fact that these theories are not developed within the OT context, and physiotherapists are not trained in the assessment and treatment of mental functions. The need for a neurological rehabilitation theory based on the philosophy of OT is again reinforced, and the inclusion of mental functions is essential.

Lack of time does not seem to play a crucial role in the decision of using specific neurological rehabilitation theories, and only NDT had a significant response to this question. This is evident in the demographics of the clinical settings the subjects work in. According to figures 4.3.7, 4.3.8 and 4.3.9, most of the subjects have adequate time available for the use of any theory. The neurophysiological theories, for e.g. NDT, are usually used for treatment over longer periods of time, as it is a slow, step by step process due to the contact needed with the therapist (64). Only one previous study found that patients treated using the MRT had a shorter stay in hospital when compared to the group treated using the NDT theory. It was concluded that the MRT may be effective more rapidly (68), but very few subjects indicated this as a reason for use of the MRT. Therefore, the reason for the choice of the NDT theory being that it was the most rapid in showing recovery, is unfounded in previous studies (64), and not seen as a reason for the use of the MRT. This may be due to the subjects not being very familiar with this theory, and not using it often enough to test its effectiveness.

Another reason that revealed a significantly high frequency was using the NDT theory due to lack of progress with other theories. This is expected as most subjects were very familiar with the NDT theory (figure 4.3.11), this was the theory mostly used (figure 4.3.13) as first choice (figure 4.3.16). It could then be questioned whether the NDT is used due to poor progress with other theories, or whether the subjects just do not know how to use the other theories effectively. The need for research on the effectiveness of the current neurological rehabilitation theories is therefore reinforced, as discussed under the development section.

As was seen in the previous section on sound justification, providing valid reasons for the use of certain neurological rehabilitation theories is best substantiated through the effective use of EBP principles. OTs should access EBP sources and apply the knowledge in their interventions in order to be effective clinicians. OTs should always implement EBP in neurological rehabilitation, and they should source the information from the higher levels of evidence. The EBP profiles of the subjects will now be discussed.

5.4.3 The importance of EBP

EBP is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. It integrates individual clinical expertise with the best available external clinical evidence from systematic research" (85:45.)

"OTs have a duty to ensure wherever possible their practice is evidence based and consistent with established research" (25:256).

The two quotes above provide the essence of effective practice in neurological rehabilitation. Although there is a lack of research to guide EBP in neurological rehabilitation in the OT and South African contexts, it seems that OTs are not using the available information effectively. Previous research has found that even when evidence is available, this information is not easily accessed by OTs as they do not have the time or skills to locate the evidence or to differentiate studies that are methodologically sound (83). This survey showed that only half the sample usually uses EBP and very few always use it (figure 4.3.23). OTs should become more aware of the EBP available, and they should use it consistently, before further research can be done on effective standardised assessments and neurological rehabilitation theories suitable for the OT and South African contexts, as discussed in the development section. Several researchers in OT in South Africa have made recommendations for the improvement of EBP in the OT profession, as this problem exists in all fields of practice, not just in neurological rehabilitation (37). As it is out of the scope of this research to make specific recommendations on the improvement of the overall use of EBP, this is a very current topic in OT, and should be researched further.

In order to know what has been found to work most effectively in the management of stroke patients, OTs should consult different sources of information to become knowledgeable on the latest research, but the OT should still use clinical judgement and knowledge about the patient before making the decision regarding intervention (81). All sources of information are not rated equally, and are classified according to a hierarchy. Meta-analysis of RCTs and RCTs are at the higher levels and case studies and expert opinion at a lower level (25). It was recommended that therapy choices must be based on the higher levels of evidence, if these levels are available. This problem has been identified throughout this discussion, as there is not enough information in terms of meta-analyses of RCTs and RCTs available for OTs to use in the South African context. Therefore more research should be done, as was discussed in the development section.

The fact that OTs' own experience was the factor that influenced knowledge the greatest in EBP (figure 4.3.22), and that custom and practice was the highest frequency of evidence used daily (figure 4.3.24) is of concern. The majority of the sample had 2 – 5 years experience as OTs and in the field of neurological rehabilitation (figure 4.3.4 and 4.3.5), which could easily be viewed as insufficient experience to be used as sound EBP. A third of the subjects defined EBP as treatment methods shown to be effective in their own experience, not based on formal research (table 4.3.5). Two factors showing a significant impact on the subjects' ability to use EBP, as seen in figure 4.3.25, were lack of time and high cost. Using one's own experience as a source of EBP, and continuing to use techniques that are custom and practice, limits the effect of both these factors, as it does not cost anything and no time is spent, except for time for reflection. Considering these findings, it is becoming clear that OTs rely on their own experience as a source of EBP, and custom and practice is used daily, although they have very little experience and don't always use EBP. The practice of EBP is therefore not sufficiently maintained at a high standard, and an urgent change is needed if OTs were to remain a crucial and efficient member of the neurological rehabilitation MDT. EBP has to become integral to the practice of OT in neurological rehabilitation. Improvement may be seen with the implementation of strategies to develop appropriate standardised assessments and neurological rehabilitation theories, as well as improvement in the training strategies, as discussed previously.

The second highest factor influencing knowledge was postgraduate courses, which shows the high regard subjects have for postgraduate level training in terms of courses rather than degrees. This agrees with the results from the previous study (25). Considering the factors that the subjects indicate as affecting their ability to use EBP, i.e. lack of time and high cost, this reveals an interesting challenge. OTs regard doing postgraduate courses as very important for the use of EBP, but these are the most expensive and time consuming of all the stated factors, and are therefore difficult to pursue. OTs should be made aware of EBP sources they could use that are less expensive in cost and time, which will encourage them to use EBP more often. As discussed in the building confidence principle, under the training section, e-learning and support groups are resources that can be utilised to disseminate higher levels of EBP information at a small, or even no cost. This also links with the findings that postgraduate degrees and courses may have increased the use of certain neurological rehabilitation theories, but it did not increase the familiarity of the subjects with the techniques. Again, an increase in good role models and opportunities to use the theories with guidance should be encouraged, as discussed in the training section. Other therapists were shown to be the factor with the third highest effect on

use of EBP (figure 4.3.22), and OTs seem to value hands-on and practical teaching to increase their familiarity and confidence in using techniques, as was also seen in literature (25).

Only two subjects used research papers and published case studies daily and even less used it weekly, and occasionally. This is of concern, as the field of neurological rehabilitation is evolving so fast, clinicians can only keep abreast with the latest research by reading the relevant literature (23). Own case studies were used in different frequencies by the subjects, and therefore do not seem to be a significant source among the subjects, which is similar to the results of a previous study (25). As RCTs are seen as the highest level of EBP, OTs should be encouraged to access this source of information, as it is through these trials that OTs will be informed of effective and the latest treatment techniques.

The lack of knowledge, stated as the highest factor that has importance in the subjects' use of EBP, may be the reason why OTs don't access this level of EBP. OTs may need to be made aware of how these sources can be accessed through the strategies discussed for increasing support groups and methods of distributing information via e-learning, or the use of journal clubs. Although studying and discussing published research requires time, the OTs may find it more accessible in terms of cost and time than other sources, such as postgraduate courses. The OTs involved in the development of new research should also ensure that their results are easily accessed, as discussed in the EBP process in the development section.

5.4.4 Recommendations for maintaining EBP

In order for OTs to provide sound justification and valid reasons for their choices in interventions techniques, they should use the principles of EBP. The use and application of EBP should be increased in the field of neurological rehabilitation, but firstly the amount and quality of research should increase to provide adequate evidence. Methods of increasing the use of EBP should be explored, specifically in the South African context.

5.5 Conclusion to discussion

The major issues regarding the effective management of stroke patients in neurological rehabilitation were highlighted, and throughout the framework for the cyclical process to improve the curricula and the clinical skills of OTs in South Africa, recommendations were made.

Under the development section, important shortcomings in neurological rehabilitation in OT in South Africa were discussed. Firstly, the NDT theory is commonly used and advocated for, but

little evidence is available for its effectiveness. The MRT is under-utilised and unfamiliar, but has some potential to provide treatment principles important to improve functioning of stroke patients. The Rood and Brunnström theories were also discussed. Secondly, a need exists for the research and development of a neurological rehabilitation theory appropriate for the use within the OT philosophy, as well as the South African context. Thirdly, there is a need to perform research and to show effectiveness of treatment, standardised assessments are required for client factors as well as functioning in areas of occupation. Standardised assessments should be used more often in OT practice, and there is a need for research and development in terms of the suitability of current standardised assessments within the OT philosophy and the South African context.

The next section dealt with training. Obstacles and ways of overcoming the obstacles were presented in terms of the training of neurological rehabilitation. Factors identified were the importance of integrating foundation studies to improve justification of choices in treatment, the importance of using thorough assessments that are standardised and based on the most important client factors. The use, choices and familiarity of neurological rehabilitation theories were discussed in building confidence in neurological rehabilitation in terms of the latest research, and importance of good role models, adequate requirements and need for support to maintain a high level of skills.

To complete the process, information was given regarding the requirements to sustain the ability to manage stroke patients effectively. The importance of using EBP was reinforced. A significant problem was identified: There is a lack of sound evidence in the correct techniques in neurological rehabilitation. This enforced the need for the development of appropriate standardised assessments to measure effectiveness, as well as appropriate neurological rehabilitation theories to ensure effective management of stroke patients. OTs should however start by using the current available EBP sources, and nurturing of this essential component of excellent practice is crucial for the OT to remain a valuable member of the neurological rehabilitation MDT.

5.6 Evaluation of the study

5.6.1 Limitations of the study: Part 1

The validity of the curriculum audit form was compromised, as a pilot study was not performed.

The curriculum audit was limited due the information gathered only in the form of a survey. Although the survey set specific questions regarding the courses, lecturers completed the survey very differently to one other, as the structures of the courses differ greatly. To ensure comprehensive analysis and understanding of the content, a more in depth study of the content of the neurological rehabilitation courses is recommended. The researcher only aimed at obtaining a general understanding of what is currently taught regarding the neurological rehabilitation theories. Completing a survey would not be the most effective method, but rather more intensive interviews, visits to departments and focus groups should be done.

The lecturers who completed the survey in the curriculum audit were not asked to give their opinions regarding the courses they taught, and it is therefore not clear whether they are satisfied with the content or in the process of developing a course based on the latest research. Lecturers often teach content due to the influence of historical and traditional structures of the department, or based on their own expertise and training, and not necessarily based on EBP. An in-depth study could reveal information that is more comprehensive.

5.6.2 Limitations of the study: Part 2

The questionnaire's validity was compromised because the researcher did not conduct a content validity investigation of the questionnaire. However, a pilot study was done to determine whether questions will elicit appropriate data to answer the objectives of the study.

The response rate may have been affected by the substantial length of the questionnaire. Although the time for completion was 15 minutes according to the pilot study, the length may have made the questionnaire daunting to complete. The researcher however, did not receive feedback from the subjects notifying her of the effect of the length of the questionnaire, therefore this is an assumption.

The survey was not specifically focused on postgraduate courses and degrees relevant to neurological rehabilitation. This information could enrich the information regarding the subjects' level of expertise. The researcher did however specify undergraduate only, postgraduate only and undergraduate and postgraduate training under the question regarding the neurological rehabilitation theories the subjects received training in (table 4.3.1), which aided in the data

analysis. Data were limited by the researcher not specifically asking the proportion of stroke patients seen in the subjects' total workload, as this would have aided in understanding the neurological rehabilitation resources more effectively.

The subjects were not asked whether they belong to a neurological rehabilitation interest group. This would have been useful to clarify the amount of interest the subjects have in practicing in the field as this will have an impact on knowledge and experience, and their contact with other experts in the field.

The questionnaire was limited as it only gave an option for "yes", "no" and "unsure" for the use of the theories. More accurate information could be obtained by stipulating "always/very often", "often/sometimes" and "rarely/never", as was used in the previous studies. This was covered to some extent in the section of this questionnaire where subjects were asked to rank their use of theories (figure 4.3.16).

The questionnaire did not ask the subject to give a reason for their use or non-use of standardised assessments. Some subjects indicated in the comment section that they are unable to afford expensive standardised tests, and that time is limited to use lengthy tests. It is not clear whether the OTs in the private sector use the FIM/FAM due to policy or due to their own choices.

The questionnaire should have requested clearly what the subjects' theoretical basis is for the treatment options they have chosen and not the theories in general. The question regarding the reasons for the choice of neurological rehabilitation theories has covered some theoretical assumptions made by the subjects.

The OTs were asked in general what their reason for the choice of the neurological rehabilitation theory would be which led to many subjects answering for almost each theory. It would be more useful to ask the subject to only state the reason for the theory they favour the most for the option. The subjects should have been given an open ended question, but due to poor justification, this may have been a vague answer, therefore options based on previous research were given.

The section on the subjects' use of EBP was affected by their poor knowledge of the definition of EBP. The questionnaire should have stated a short description of EBP, which would guide the accurate answers of the remainder of the section.

Regarding the sample size, a limitation of the study was the small sample size. Although all efforts were made to increase the response rate, the sample may not be representative of the whole population of OTs working in the field of neurological rehabilitation.

5.6.3 Recommendations for future studies

Subjects did not have the opportunity to voice what challenges they face in management of stroke patients in South Africa. As this was out of the scope of the study, a future study to give background to the requirements to be met by neurological rehabilitation theories in the OT and South African contexts will be useful.

The research into the effectiveness of the NDT theory, MRT, Rood and Brunnström theories within the OT and South African contexts was reinforced throughout the study. This should be in the form of RCTs, as this is the highest level of EBP.

The uncommon theories' effectiveness in the OT and South African contexts should be researched so that it can be considered for inclusion in undergraduate and postgraduate training. One specific theory, PNF, was identified.

The research into the currently available standardised assessments is recommended, in order to ascertain the suitability within the OT and South African contexts. This includes the research into the challenges of the existing assessments, as well as the development of more suitable assessments.

The study did not find in depth information regarding the factors influencing the familiarity of OTs with the neurological rehabilitation theories. A future study is recommended to investigate the factors that would increase the competence and confidence in the use of techniques prescribed by certain neurological rehabilitation theories.

The lack of use of EBP was identified as a concerning factor in the practice of neurological rehabilitation, as well as all other field of practice in South Africa. It is recommended that a future study is conducted to investigate the reasons for the poor use of EBP and to identify factors preventing OTs from implementing knowledge and skills prescribed by EBP.

CHAPTER 6: CONCLUSION

The study reinforced the concern that there is a lack of research to show the effectiveness of the currently used neurological rehabilitation theories, and there are very few studies available that are suitable for the use in the OT and South African contexts.

The NDT theory is most commonly taught and used in South Africa, but there is a lack of evidence that this theory is superior to other theories.

The MRT is still unfamiliar and not commonly used, although it has potential for successful use within the OT philosophy. The need to research the effectiveness of this theory was reinforced, as well as the revision of the current training to improve OTs' skills and knowledge in this theory.

The Rood theory is commonly used in South Africa, although the OTs are not familiar with the theory, or very knowledgeable regarding the techniques. The theory's use is decreasing worldwide, and the theory has not been shown to be effective in isolation within OT intervention.

Subjects were knowledgeable and familiar with the Brunnström theory, although it is not a significant choice in therapy. The Fugl-Meyer assessment of stroke recovery should be studied for its effectiveness in the OT and South African contexts.

OTs are not trained in the use of standardised assessments, and are not using this essential component of practice to show the effectiveness of their interventions. The currently available standardised assessments have some challenges for their effective use, therefore may not be ideal. General observations alone are not reliable methods of obtaining valid and reliable information regarding the progress and effectiveness of intervention, therefore the importance of using valid and reliable assessments should be reinforced in the training as well as standards of practice.

In order for research into the effectiveness of neurological rehabilitation theories, a standardised assessment is required to enable the comparison of results. There are currently only a few suitable assessments identified. OTs should be encouraged to use these currently available standardised assessments and to study their usefulness, or a new standardised assessment suitable for the OT and South African contexts should be developed.

The obstacles regarding the lack of training and use of standardised assessments, and the focus on incorrect client factors such as tone in returning functional movement were identified.

The recommendations were made in improving the use and training of standardised assessments, as well as the revision of the curricula to include the focus of client factors such as secondary impairments, muscle strength and endurance. The effectiveness of treating selective control of movement to improve function in areas of occupation should be investigated.

The obstacles to building confidence in a curriculum in neurological rehabilitation were the lack of requirements in the curricula for the management of stroke patients during training and the lack of role models who use the latest techniques in this field. The recommendations to overcome these obstacles are to increase the requirements of the undergraduate training of students in managing stroke patients to allow for more opportunities to practice techniques, and this should occur with the guidance of good role models. Recommendations were also made to improve the support to role models to ensure their knowledge and skills are up to date, and an example is the use of electronic learning media.

The subjects showed poor justification and reasoning for their choices of theories. It is recommended that the OTs in South Africa become more aware, and increase their knowledge and implementation of EBP, to improve the effectiveness of their management of stroke patients. With the improved use of EBP, the focus on treating spasticity will reduce, and the focus on more important client factors such as muscle strengthening and reduction of secondary impairments will increase.

And finally, OTs should use the current evidence in neurological rehabilitation more frequently, and higher levels of evidence are recommended for use, if available. Evidence will only be available if more research is done on the effectiveness of the current neurological rehabilitation theories, especially within the OT and South African contexts. OTs should be made aware of cost effective and time efficient sources of EBP, which may boost the use of EBP.

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Appendix A

The Training and Practice in Neurological Rehabilitation Theories in the Occupational Therapy Management of Stroke Patients in South Africa.

QUESTIONNAIRE:

Please answer the following questions and return via fax to 086 533 7840

1. ***Which neurological rehabilitation theories or treatment approaches are taught to the students during the 4 year undergraduate course?***

☐ Bobath/NDT

☐ Motor re-learning (Carr and Shepherd)

☐ Neurotechniques (Rood)

☐ Selective control of movement (Brunnström)

Other:

_____

_____

_____

2. ***Which neurological assessments, standardised and non-standardised, are taught to the students during the 4 year undergraduate course?***

☐ Selective control of movement (Brunnström)

☐ Balance

☐ Muscle tone, Modified Ashworth , or Mild-Moderate-Severe spasticity scale

☐ Cardiac and muscle endurance

☐ Postural control

☐ Gait

☐ Postural reflexes

☐ Hand function

☐ Coordination

☐ Range of motion

☐ Muscle strength

☐ Sensation

☐ Assessment of motor and process skills (AMPS)

☐ Barthel index

☐ Perceptual skills

☐ Fugl-Myer assessment

☐ Cognitive skills

☐ Rivermead Activities of daily living (RADL)

☐ Canadian occupational performance measure (COPM)

☐ Chessington occupational therapy assessment battery (COTNAB)

☐ Rivermead perceptual assessment battery (RPAB)

☐ Arm motor ability test (AMAT)

☐ Motor assessment scale (MAS)

☐ Rivermead behavioural memory assessment (RBMA)

Other:

_____

_____

_____

3. ***Please give an overview of the Neurological Rehabilitation course within the total 4 year curriculum. Please include timing of the lectures (i.e. in which years this course is taught) and number of credits, and the structure of Neurological rehabilitation within major subjects/modules.***

_____
_____
_____
_____

4. ***Please state the percentage of estimated time spent on Neurological rehabilitation lecturing, in relation to the total subject or module.***

_____
_____

Comments or additional information:

_____
_____

5. ***Are there any requirements in the course specifying the number of neuro patients that should be assessed and treated during the 4 year course?***

☐ Yes

☐ No

☐ Unsure

Comments or additional information:

_____
_____

6. ***How many neuro patients would you estimate a student would assess and/or treat during the 4 year course?***

_____
_____

Comments or additional information:

_____
_____

7. ***Do the students practice practical skills in assessing and treating neuro patients <u>specifically</u> during the 4 year course, i.e. as part of the neurological rehabilitation course?***

☐ Yes

☐ No

☐ Unsure

Comments or additional information:

_____
_____

8. ***Please attach or insert learning outcomes or objectives of the Neurological rehabilitation course, if this is available.***

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.

Occupational Therapy

School of Therapeutic Sciences • Faculty of Health Sciences • 7 York Road, Parktown 2192, South Africa
Tel: +27 11 717-3701 • Fax: +27 11 717-3709 • E-mail: denise.franzsen@wits.ac.za

INFORMED CONSENT

O.T TRAINING CENTRES

I hereby give consent for the curriculum of the Neurological rehabilitation course presented at an undergraduate level at this O.T training centre to be analysed.

I understand that participation is voluntary and that information sent to the researcher may be withdrawn from the study at any time.

Name: _____

Position held at O.T training centre: _____

Signature: _____

Date: _____

Yours sincerely,

Juliana Horne

Occupational Therapy lecturer

Tel: 011 643 5769

Fax: 086 533 7840

Cell: 082 486 5627

Please return this informed consent letter via fax.

Occupational Therapy

School of Therapeutic Sciences • Faculty of Health Sciences • 7 York Road, Parktown 2192, South Africa
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INFORMATION LETTER: O.T TRAINING CENTRES

Dear Head of Department,

My name is Juliana Horne. I am currently a registered student for the M.Sc.(O.T) course at the University of the Witwatersrand. The title of my research is:

"The Carryover of Undergraduate Occupational Therapy Training in Neurological Rehabilitation to the Treatment of Acute Stroke Patients in South Africa".

The first part of the study will consist of a survey to gather information regarding the content of the curricula on the Neurological rehabilitation theory taught at an undergraduate level. This will form the basis of the study, as the information gathered will then be compared to information collected from Occupational Therapists working in Neurological rehabilitation. The conclusion will then be based on whether O.T's working in the field of Neurological rehabilitation are using the theory taught at an undergraduate level when treating stroke patients.

All eight O.T training centres will be invited to participate. The content of the curricula will be analysed in terms of:

- Outcomes and learning objectives for the course.
- Rationale for content of course.
- Theories taught.
- Methods of teaching, i.e. theory and practical skills.
- Hours/credits of teaching as a part of the total course.
- Timing of lectures in the course.
- Clinical practice obtained during the course and opportunities for application of theory taught.
- The number of stroke patients seen during training.
- Requirements of students to assess and treat a stroke patient during the time of the course.

Participation in this study is voluntary, and the training centre is entitled to refuse to participate in the study, and may withdraw from the study at any time. In the case of withdrawal from the study, the information sent by your training centre will be removed from the study. The training centres will remain anonymous. The sending of the information should not cost the training centre any money, but in case of any costs, the researcher will cover this if necessary.

If this training centre is willing to participate in this study, it will be appreciated if an electronic copy of the attached questionnaire is sent to the following e-mail address: leilane.mackay@wits.ac.za, before 15 September 2009. Please forward this questionnaire to the appropriate lecturer or course coordinator.

If the training centre would like feedback from the study, this will be provided at your request.

Thank you in advance for the centre's participation,

Yours sincerely,

Juliana Horne,

Occupational Therapy lecturer

Tel: 011 643 5769

Fax: 086 533 7840

Appendix D

The Training and Practice in Neurological Rehabilitation Theories in the Occupational Therapy Management of Stroke Patients in South Africa.

Instructions:

Please complete the following questionnaire and return it to leilane.mackay@wits.ac.za or via fax 086 533 7840.

SECTION A: DEMOGRAPHIC DETAILS

Basic qualification: _____

University of undergraduate qualification: _____

Year of undergraduate qualification: _____

Topics of all postgraduate degrees/courses: _____

Years of experience as an Occupational Therapist: _____

Years of clinical experience in Neurology: _____

Description of clinical setting:

Please indicate the type of clinical setting you work in:

☐ Government

☐ Private hospital

☐ Private practice

☐ Primary health care clinic

☐ Academic facility

☐ Neuro rehabilitation centre

Please state the average length of time (in minutes) of an average treatment session a patient attends at your clinical setting.

_____

Please state the average number of treatment sessions a stroke patient attends before discharge during their stay in your clinical setting.

_____

Please state the average length of hospitalisation of stroke patients in your clinical setting.

_____

Please state the average number of stroke patients you treat your clinical setting per month.

_____

Which stroke patients do you treat most often?

☐ In-patients	☐ Out-patients

SECTION B: QUESTIONNAIRE

Question 1:

Which of the following theories have you have received training in? Please indicate whether you received the training during your undergraduate degree or postgraduate courses/degree.

Bobath (NDT)	☐ Undergraduate	☐ Postgraduate	☐ No training received
Motor re-learning (Carr & Shepherd)	☐ Undergraduate	☐ Postgraduate	☐ No training received
Rood	☐ Undergraduate	☐ Postgraduate	☐ No training received
Brunnström	☐ Undergraduate	☐ Postgraduate	☐ No training received

Please state any other theories you have been trained in and specify, by ticking in the appropriate box, whether this occurred during your undergraduate degree or during postgraduate courses/degree:

Other theories or methods	Undergraduate	Postgraduate
	☐ Undergraduate	☐ Postgraduate
	☐ Undergraduate	☐ Postgraduate

Question 2:

Do you use the following theories currently as part of your stroke treatment protocol?

Bobath (NDT)	☐ Yes	☐ Unsure	☐ No
Motor re-learning (Carr & Shepherd)	☐ Yes	☐ Unsure	☐ No
Rood	☐ Yes	☐ Unsure	☐ No
Brunnström	☐ Yes	☐ Unsure	☐ No

Please state any other theories you use during treatment of stroke patients:

_____

Question 3:

How familiar are you with these theories?

Bobath (NDT)	☐ I don't know this theory	☐ I've heard of this theory	☐ I'm familiar with this theory	☐ I'm very familiar with this theory
Motor re-learning (Carr & Shepherd)	☐ I don't know this theory	☐ I've heard of this theory	☐ I'm familiar with this theory	☐ I'm very familiar with this theory
Rood	☐ I don't know this theory	☐ I've heard of this theory	☐ I'm familiar with this theory	☐ I'm very familiar with this theory
Brunnström	☐ I don't know this theory	☐ I've heard of this theory	☐ I'm familiar with this theory	☐ I'm very familiar with this theory

Question 4:

Please indicate the reason for your choice of theory used in neurological rehabilitation. Please tick the relevant box/boxes. You may select one or more theories.

I use this theory as there is poor progress with alternative theories	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A

In this setting, there is a need for early discharge, lack of time to use other theories	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
Improvement of quality of movement is my main aim in treatment	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
I like that perceptual problems are addressed in this theory	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
I like that apraxia is addressed in this theory	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
Facilitation of normal movement is the main aim of my treatment	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
Prevention of spasticity is the main aim of my treatment	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
A patient with memory problems shows success when I use this theory	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
This theory is easier to carry over to nurses	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
This theory works more successfully with elderly patients	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
This theory works the most effectively with sensory impairment	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A

This theory addresses secondary impairments caused by tone changes	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
This theory gives a clear guideline on how patients recover	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A
This theory addresses muscle strengthening which improves functioning in patients	☐ Bobath/NDT	☐ Motor re-learning	☐ Rood	☐ Brunnstrom	☐ I don't know	☐ N/A

Comments or additional information:

_____

Question 5:

Rank in order of priority how often you use the following theories. Indicate the number in the box provided (number priority 1 to 4).

Bobath (NDT)	
Motor re-learning (Carr & Shepherd)	
Rood	
Brunnström	

Question 6:

Have you used any of the following assessments in your treatment of stroke patients?

Barthel Index	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most

Rivermead Activities of Daily Living (RADL)	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Nottingham 10-point Activities of Daily Living	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Frenchay activity index	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Nottingham Extended Activities of Daily Living	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Eakin Activities of Daily Living index	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Assessment of Motor and Process Skills (AMPS)	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Canadian Occupational Performance Measure (COPM)	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Chessington Occupational Therapy Neurological Assessment Battery (COTNAB)	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most

Rivermead Perceptual Assessment Battery (RPAB)	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Stroke Driver Screening Assessment	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Loewenstein Occupational Therapy Cognitive Assessment (LOTCA)	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
General observations and non-standardised assessments	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
FIMS/FAM	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Other: Specify	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most
Other: Specify	☐ Never / unfamiliar with	☐ Rarely	☐ Sometimes (only with specific patients)	☐ Often (with most

Comments or additional information:

_____

Question 7:

Please state in order of importance three aims that you generally wish to achieve in the treatment of acute stroke patients in your clinical setting, i.e. as an in-patient or less than 6 weeks after the stroke.

1) _____

2) _____

3) _____

Question 8:

Please indicate how often you supply the following assistive devices to acute stroke patients.

Dressing stick	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Stocking /tights aid	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Helping hand	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Elastic shoelaces/ no-bows	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Bath board or bath seat	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often

Washing aids e.g. extended sponge or wash mitt	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Nelson knife/ specialised cutlery	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
One handed fork	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Non-slip mat	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Plate guard	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Kitchen aids e.g. one-handed bread board, kettle tipper	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often
Other Please specify: ☐	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often

Other Please specify:	☐ Never	☐ Sometimes (average of 50% of	☐ Often (only with specific patients)	☐ Very often

Comments or additional information:

Question 9:

Please indicate which neurotechniques you are using most often in treatment of stroke patients in your specific clinical setting

Prolonged stretch	☐ Yes	☐ No	☐ Not a familiar technique
Quick stretch	☐ Yes	☐ No	☐ Not a familiar technique
Heavy joint compression	☐ Yes	☐ No	☐ Not a familiar technique
Light joint compression	☐ Yes	☐ No	☐ Not a familiar technique
Traction of the joint surface	☐ Yes	☐ No	☐ Not a familiar technique
Linear acceleration	☐ Yes	☐ No	☐ Not a familiar technique
Pressure on the musculotendinous junction or on tendon (e.g. splinting)	☐ Yes	☐ No	☐ Not a familiar technique
Gentle shaking of the limb	☐ Yes	☐ No	☐ Not a familiar technique
Slow passive rolling	☐ Yes	☐ No	☐ Not a familiar technique
Alternate trunk tapping	☐ Yes	☐ No	☐ Not a familiar technique

Brushing	☐ Yes	☐ No	☐ Not a familiar technique
Slow C icing	☐ Yes	☐ No	☐ Not a familiar technique
Fast A icing	☐ Yes	☐ No	☐ Not a familiar technique
Slow icing	☐ Yes	☐ No	☐ Not a familiar technique
Warmth	☐ Yes	☐ No	☐ Not a familiar technique
Vibration	☐ Yes	☐ No	☐ Not a familiar technique
Weight bearing	☐ Yes	☐ No	☐ Not a familiar technique
Other Please specify: ☐	☐ Yes	☐ No	☐ Not a familiar technique

Question 10:

Please indicate the degree of effect of factors you would consider that are influencing your knowledge on your choice of acute stroke treatment.

Undergraduate training	☐ Doesn't affect at all	☐ Slightly affects	☐ Moderately affects	☐ Greatly affects
Reviewing literature and latest research	☐ Doesn't affect at all	☐ Slightly affects	☐ Moderately affects	☐ Greatly affects
Working with other therapists	☐ Doesn't affect at all	☐ Slightly affects	☐ Moderately affects	☐ Greatly affects

My own experience with patients and using techniques that seem to work	☐ Doesn't affect at all	☐ Slightly affects	☐ Moderately affects	☐ Greatly affects
Attending postgraduate courses	☐ Doesn't affect at all	☐ Slightly affects	☐ Moderately affects	☐ Greatly affects
Attaining a postgraduate degree	☐ Doesn't affect at all	☐ Slightly affects	☐ Moderately affects	☐ Greatly affects

Please state any other factors that influence your knowledge on the choice of stroke treatment.

_____

Question 11:

Please explain briefly, in your own words, your understanding of Evidence Based Practice (EBP):

_____
_____
_____

Question 12:

How frequently do you use Evidence Based Practice (EBP)?

☐ Never	☐ Occasionally	☐ Usually	☐ Always

Question 13:

Please indicate what evidence you base your choice of stroke treatment on. Please indicate how often you use this type of resource/method.

Research papers	☐ Never	☐ Occasionally	☐ Monthly	☐ Weekly	☐ Daily
Case studies – published	☐ Never	☐ Occasionally	☐ Monthly	☐ Weekly	☐ Daily

Case studies – own	☐ Never	☐ Occasionally	☐ Monthly	☐ Weekly	☐ Daily
Expert opinion	☐ Never	☐ Occasionally	☐ Monthly	☐ Weekly	☐ Daily
Textbooks	☐ Never	☐ Occasionally	☐ Monthly	☐ Weekly	☐ Daily
Custom and practice i.e. conventional treatment	☐ Never	☐ Occasionally	☐ Monthly	☐ Weekly	☐ Daily

Question 14:

How do the following factors affect your use of evidence based practice, i.e. how important are the following factors in determining the evidence based practice you use?

Lack of time	☐ No importance	☐ Little importance	☐ Some importance	☐ Significant importance
High cost	☐ No importance	☐ Little importance	☐ Some importance	☐ Significant importance
Little relevance to neurological rehabilitation	☐ No importance	☐ Little importance	☐ Some importance	☐ Significant importance
Lack of knowledge of available resources/ methods	☐ No importance	☐ Little importance	☐ Some importance	☐ Significant importance

Lack of support to use EBP	☐ No importance	☐ Little importance	☐ Some importance	☐ Significant importance

SECTION C: CASE SCENARIO

Please answer the following questions based on the case scenario, based on the stroke treatment protocol you will use in your clinical setting.

The patient is a 75 year old woman, who previously lived with her 3 grandchildren and 20 year old niece in a 4 roomed brick house in a formal settlement. She suffered a stroke 1 week ago. She currently needs assistance to sit up and she needs maximal assistance with transfers. She presents with a typical pattern of tone in her right upper and lower limbs. She only has active elevation and abduction of the right shoulder and a mass grasp in her right hand. She has particular problems in cutting up food and getting dressed. There is reference in the medical notes to her having perceptual problems on admission, but no other details were given.

Question 1

Please rate, in order of importance, three aims that you wish to achieve in the treatment of this patient.

1) _____

2) _____

3) _____

Question 2

How would you describe/justify the theoretical basis for your choice of treatment of this patient?

_____
_____
_____

Question 3

How would you evaluate the effectiveness of your treatment of this patient?

_____
_____
_____

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.

Occupational Therapy

School of Therapeutic Sciences • Faculty of Health Sciences • 7 York Road, Parktown 2192, South Africa
Tel: +27 11 717-3701 • Fax: +27 11 717-3709 • E-mail: denise.franzsen@wits.ac.za

INFORMATION LETTER

O.Ts WORKING IN THE FIELD OF NEUROLOGICAL REHABILITATION

Dear Occupational Therapist,

My name is Juliana Horne. I am currently a registered student for the M.Sc. (O.T) course at the University of the Witwatersrand. The title of my research is:

"The Carryover of Undergraduate Occupational Therapy Training in Neurological Rehabilitation to the Treatment of Acute Stroke Patients in South Africa".

The study consists of two parts. The first part of the study will consist of a survey to gather information regarding the content of the curricula on the Neurological rehabilitation theory taught at an undergraduate level. This will form the basis of the study, as the information gathered will then be compared to information collected from the questionnaires sent to O.T's.

The second part of the study will consist of information gathered from O.T's working in the field of Neurological rehabilitation. Information gathered from the questionnaire will enable the researcher to understand which theories O.T's are using when treating acute stroke patients, and whether the information taught at an undergraduate level is sufficient for practice in the field of Neurological rehabilitation.

The conclusion of the study will then be based on whether O.T's working in the field of Neurological rehabilitation are using the theory taught at an undergraduate level, when treating acute stroke patients.

You have been selected for the study as you have been qualified for more than 2 years and you are working in the field of Neurological rehabilitation. Participation in this study is voluntary, and you are entitled to refuse to participate in the study, and may withdraw from the study at any time. In the case of withdrawal from the study, the information sent by you will be removed from the study. Informed consent will be assumed if you complete and return the questionnaire. You will remain anonymous, and therefore you do not need to put your name on the questionnaire. The sending of the information should not cost you any money, but in case of any costs, the researcher will cover this if necessary.

If you are willing to participate in this study, it will be appreciated if you would complete the attached questionnaire. It will take approximately 20 to 30 minutes to complete. Please return the electronic copy of the questionnaire to the following e-mail address: leilane.mackay@wits.ac.za or fax the printed version to 086 533 7840.

If you would like feedback from the study, this will be provided at your request.

Thank you in advance for your participation,

Yours sincerely,

Juliana Horne

Occupational Therapist

Tel: 011 717 3701

Fax: 086 533 7840

Cell: 082 486 5627

Appendix F

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Horne

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER** M080523
PROJECT	The Carryover of Undergraduate Occupational Therapy training in Neurological Rehabilitation to the treatment of stroke patients in South Africa
INVESTIGATORS	Miss J Horne
DEPARTMENT	Occupational Therapy
DATE CONSIDERED	08.05.30
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 08.06.23 **CHAIRPERSON** .....
(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Mrs D Castelelijn

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Filtering information: Table summarising filtering for the familiarity with theories and the level of training received

	NDT					MRT					R						BR				
	Total answered*	**Don't know**	**Heard of**	**Familiar with**	**Very familiar with**	**Total answered***	**Don't know**	**Heard of**	**Familiar with**	**Very familiar with**	**Total answered***	**Don't know**	**Heard of**	**Familiar with**	**Very familiar with**	**No answer**	**Total answered***	**Don't know**	**Heard of**	**Familiar with**	**Very familiar with**
Training UG only	**15**	0	0	12	3	**8**	0	5	3	0	**18**	0	5	8	5	1	**20**	0	4	10	6
Percentage*		0.00	0.00	80.00	20.00		0.00	62.50	37.50	0.00		0.00	27.78	44.44	27.78			0.00	20.00	50.00	30.00
Training PG only	**1**	0	0	0	1	**7**	0	0	6	1	**0**	0	0	0	0	0	**3**	0	0	2	1
Percentage*		0.00	0.00	0.00	100.00		0.00	0.00	85.71	14.29		0.00	0.00	0.00	0.00			0.00	0.00	66.67	33.33
Training UG and PG	**12**	0	0	3	9	**4**	0	1	2	1	**6**	0	0	4	2	0	**4**	0	0	2	2
Percentage*		0.00	0.00	25.00	75.00		0.00	25.00	50.00	25.00		0.00	0.00	66.67	33.33			0.00	0.00	50.00	50.00
No training	**1**	0	1	0	0	**9**	1	5	3	0	**3**	0	3	0	0	0	**2**	0	0	2	0
Percentage*		0.00	100.00	0.00	0.00		11.11	55.56	33.33	0.00		0.00	100.00	0.00	0.00			0.00	0.00	100.00	0.00
Not answered	**0**					**1**					**1**						**0**				
	29	0	1	15	13	**29**	1	11	14	2	**28****	0	8	12	7	**1**	**29**	0	4	16	9

* Percentage calculated according to total number of questions answered.

** Total questions answered in "training received" section + no answers from "familiarity" questions = 29 (full sample).

Filtering information: Table summarising filtering for the degree of use of theories and the level of training received

	NDT					MRT					R					BR				
Training received	Total answer*	Currently used	Not sure	Not used	No answer	Total answer*	Currently used	Not sure	Not used	No answer	Total answer*	Currently used	Not sure	Not used	No answer	Total answer*	Currently used	Not sure	Not used	No answer
Training UG only	**15**	14	0	1	0	**6**	3	0	3	2	**16**	12	1	3	3	**18**	13	2	3	2
Percentage		93.33	0.00	6.67			50.00	0.00	50.00			75.00	6.25	18.75			72.22	11.11	16.66	0
Training PG only	**1**	1	0	0	0	**7**	7	0	0	0	**0**	0	0	0	0	**3**	2	1	0	0
Percentage		100.00	0.00	0.00			100.00	0.00	0.00			0.00	0.00	0.00			66.67	33.33	0.00	
Training UG and PG	**12**	12	0	0	0	**4**	4	0	0	0	**5**	5	0	0	1	**3**	3	0	0	1
Percentage		100.00	0.00	0.00			100.00	0.00	0.00			100.00	0.00	0.00			100.00	0.00	0.00	
No training	**1**	0	0	1	0	**9**	4	2	3	0	**3**	1	1	1	0	**2**	2	0	0	0
Percentage		0.00	0.00	100.00			44.44	22.22	33.33			33.33	33.33	33.33			100.00	0.00	0.00	
Not answered	**0**					**1**					**1**					**0**				
Total	**29**	27	0	2	**0**	**27****	18	2	6	**2**	**25****	18	2	4	**4**	**26****	20	3	3	**3**

* Percentage calculated according to total number of questions answered.

** Total questions answered in “training received” section + no answers from “frequency of use” questions = 29 (full sample).

Filtering information: Table summarising filtering for the choice of theories and the level of training received

	NDT							**MRT**						
	Total answered*	1st choice	2nd choice	3rd choice	4th choice	Not done	No answer	Total answered*	1st choice	2nd choice	3rd choice	4th choice	Not done	No answer
Training UG	**15**	**7**	**2**	**1**	**5**	**0**	**0**	**8**	**1**	**1**	**2**	**3**	**1**	**0**
Percentage*		46.67	13.33	6.67	33.33	0.00			12.50	12.50	25.00	37.50	12.50	
Training PG	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**6**	**2**	**1**	**2**	**1**	**0**	**1**
Percentage*		0.00	100.00	0.00	0.00	0.00			33.33	16.67	33.33	16.67	0.00	
Training UG	**11**	**8**	**1**	**0**	**2**	**0**	**1**	**4**	**0**	**0**	**4**	**0**	**0**	**0**
Percentage*		66.67	8.33	0.00	16.67	0.00			0.00	0.00	100.00	0.00	0.00	
No training	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**9**	**2**	**1**	**2**	**3**	**1**	**0**
Percentage*		0.00	0.00	0.00	100.00	0.00			22.22	11.11	22.22	33.33	11.11	
Not answered	**0**							**1**						
Total	**28****	15	4	1	8	0	**1**	**28****	5	3	10	7	2	1
	R							**BR**						
	Total answered*	1st choice	2nd choice	3rd choice	4th choice	Not done	No answer	Total answered*	1st choice	2nd choice	3rd choice	4th choice	Not done	No answer
Training UG	**19**	**1**	**9**	**4**	**4**	**1**	**0**	**20**	**6**	**5**	**6**	**2**	**1**	**0**
Percentage*		5.26	47.37	21.05	21.05	5.26			30.00	25.00	30.00	10.00	5.00	
Training PG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**2**	**1**	**0**	**0**
Percentage*		0.00	0.00	0.00	0.00	0.00			0.00	0.00	66.67	33.33	0.00	
Training UG	**5**	**0**	**3**	**1**	**1**	**0**	**1**	**3**	**1**	**1**	**0**	**1**	**0**	**1**
Percentage*		0.00	60.00	20.00	20.00	0.00			33.33	33.33	0.00	33.33	0.00	
No training	**3**	**0**	**0**	**1**	**2**	**0**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**
Percentage*		0.00	0.00	33.33	66.67	0.00			0.00	50.00	50.00	0.00	0.00	
Not answered	**1**							**0**						
Total	**28****	1	12	6	7	1	**1**	**28****	7	7	9	4	1	**1**

* Percentage calculated according to total number of questions answered.

** Total questions answered in “training received” section + no answers from “choice” questions = 29 (full sample).

Filtering information: Table summarising filtering for the familiarity with theories and ranking of choice

	NDT				MRT					R				BR			
	Total*	Heard of	Familiar with	Very familiar with	Total*	Don't know	Heard of	Familiar with	Very familiar with	Total*	Heard of	Familiar with	Very familiar with	Total*	Heard of	Familiar with	Very familiar with
1st choice	**15.00**	**0.00**	**5.00**	**10.00**	**5.00**	**0.00**	**1.00**	**3.00**	**1.00**	**1.00**	**0.00**	**0.00**	**1.00**	**7.00**	**0.00**	**4.00**	**3.00**
		0.00	33.33	67.67		0.00	20.00	60.00	20.00		0.00	0.00	100.00		0.00	57.14	42.86
2nd choice	**4.00**	**0.00**	**3.00**	**1.00**	**3.00**	**0.00**	**0.00**	**3.00**	**0.00**	**12.00**	**0.00**	**8.00**	**4.00**	**7.00**	**1.00**	**5.00**	**1.00**
		0.00	75.00	25.00		0.00	0.00	100.00	0.00		0.00	66.67	33.33		14.29	71.43	14.29
3rd choice	**1.00**	**0.00**	**1.00**	**0.00**	**10.00**	**0.00**	**4.00**	**5.00**	**1.00**	**7.00**	**4.00**	**1.00**	**2.00**	**9.00**	**1.00**	**5.00**	**3.00**
		0.00	100.00	0.00		0.00	40.00	50.00	10.00		57.14	14.29	28.57		11.11	55.56	33.33
4th choice	**8.00**	**1.00**	**5.00**	**2.00**	**8.00**	**1.00**	**5.00**	**2.00**	**0.00**	**6.00**	**4.00**	**2.00**	**0.00**	**4.00**	**1.00**	**1.00**	**2.00**
		12.50	62.50	25.00		12.50	62.50	25.00	0.00		66.67	33.33	0.00		25.00	25.00	50.00
Not done	**0.00**				**2.00**					**1.00**				**1.00**			
Not answered	**1.00**				**1.00**					**2.00****				**1.00**			
	29.00				**29.00**					**29.00**				**29.00**			

* Percentage calculated according to total number of questions answered.

** One subject did not answer the familiarity question + one subject did not answer the ranking of use of R theory question = Total of 2

Appendix K

Reasons for choice of neurological rehabilitation theory

		NDT	MRT	Rood	Brunnström	Don't know	Not applicable
Poor progress with other theories	%	48.28	20.69	20.69	20.69	13.79	27.59
	n	14	6	6	6	4	8
Lack of time to use other theories	%	44.83	17.24	20.69	17.24	6.90	34.48
	n	13	5	6	5	2	10
Quality of movement an aim	%	55.17	55.17	20.69	31.03	6.90	3.45
	n	16	16	6	9	2	1
Perceptual problems addressed	%	27.59	13.79	0.00	6.90	27.59	31.03
	n	8	4	0	2	8	9
Apraxia addressed	%	37.93	24.14	0.00	6.90	17.24	17.24
	n	11	7	0	2	5	5
Facilitation of normal movement an aim	%	79.31	55.17	13.79	44.83	0.00	0.00
	n	23	16	4	13	0	0
Prevention of spasticity an aim	%	72.41	17.24	48.28	27.59	0.00	3.45
	n	21	5	14	8	0	1
Can be used with memory problems	%	27.59	20.69	6.90	10.34	20.69	17.24
	n	8	6	2	3	6	5
Easy to carry over to nurses	%	34.48	13.79	0.00	3.45	17.24	20.69
	n	10	4	0	1	5	6
More successful with elderly	%	55.17	10.34	10.34	10.34	24.14	0.00
	n	16	3	3	3	7	0
Effective with sensory impairment	%	44.83	10.34	44.83	17.24	10.34	6.90
	n	13	3	13	5	3	2
Addresses secondary impairments	%	62.07	34.48	13.79	24.14	6.90	3.45
	n	18	10	4	7	2	1
Gives guidelines for recovery	%	27.59	10.34	0.00	62.07	13.79	3.45
	n	8	3	0	18	4	1
Addresses muscle strength	%	34.48	55.17	0.00	20.69	13.79	0.00
	n	10	16	0	6	4	0

Use of standardised assessments

	Never		Rarely		Sometimes		Often	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Barthel index	14	44.83	6	20.69	9	31.03	1	3.45
RADL	18	62.07	6	20.69	5	17.24	0	0.00
Nottingham 10 point ADL	23	79.31	4	13.79	2	6.90	0	0.00
Frenchay	26	89.66	2	6.90	1	3.45	0	0.00
Nottingham extended ADL	28	96.55	1	3.45	0	0.00	0	0.00
Eakin ADL	29	100.00	0	0.00	0	0.00	0	0.00
AMPS	21	72.41	5	17.24	2	6.90	1	3.45
COPM	16	55.17	7	24.14	2	6.90	4	13.79
COTNAB	12	41.38	5	17.24	11	37.93	1	3.45
RPAB	7	24.14	10	34.48	9	31.03	3	10.34
Stroke driver	26	89.66	1	3.45	2	6.90	0	0.00
LOTCA	8	27.59	6	20.69	10	34.48	5	17.24
FIM/FAM	8	27.59	4	13.79	4	13.79	14	44.83
General observations	0	0.00	0	0.00	1	3.45	28	96.55