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A COMPARISON OF THE CATHERINE BERGEGO SCALE AND THE SEMI-STRUCTURED SCALES FOR FUNCTIONAL EVALUATION OF HEMI-INATTENTION IN PATIENTS WITH STROKE

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A Dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, in fulfilment of the requirements for the degree of Master of Science in Physiotherapy
Johannesburg, 2022

DECLARATION

I, Kara Vorster, declare that the work contained in this dissertation is my own work, except to the extent indicated in the acknowledgement sections.

This dissertation is being submitted for a degree of Masters of Science in Physiotherapy, at the University of the Witwatersrand, Johannesburg, South Africa.

This work has not been submitted for any other degree or examination in this or any other university.

Kara Vorster

Date

ABSTRACT

Background

It is common to experience unilateral neglect after suffering from a stroke. This can have an effect on the patient's activities of daily living, the rehabilitation process and the length of stay in hospital. There are many different outcome measures that can be used to measure unilateral neglect. It is therefore important to determine which outcome measure is best used in a South African in-patient rehabilitation hospital.

The aim of this study was to compare the responsiveness of the CBS via the KF-NAP to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention when measuring unilateral neglect in adult patients following a stroke in a neurological rehabilitation unit.

Method

Forty-one patients from Witrand Hospital Rehabilitation unit were recruited to participate in this study. All of the participants included in this study experienced a first-ever stroke and they were excluded if they had severe speech impairments, were confused or had impairments or activity limitations that are not related to stroke.

All participants gave informed consent and thereafter the Catherine Bergego Scale (CBS) and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention was then administered.

The scores were calculated for the CBS & the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention by adding the results of each item for each patient. The different categories were also scored individually. Frequencies and percentages for the CBS via KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were calculated.

Results

It was determined that the majority of study participants experienced neglect on admission at the Rehabilitation unit. The unilateral neglect mean score during admission was higher than the score on discharge with the CBS and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. The p-value comparing mean scores of the two methods, was 0,308 which showed that statistically there was no difference when comparing the two outcome measures.

Conclusion

This study found that either the CBS via the KF-NAP or the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention are responsive when measuring unilateral neglect in a rehabilitation setting.

Keywords

Unilateral neglect; spacial neglect; rehabilitation unit; stroke; outcome measure; Catherine Bergego Scale; Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

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LIST OF ABBREVIATIONS

ADLs	Activities of daily living
ACA	Anterior Cerebral Artery
BIT	Behavioural Inattention Test
CBS	Catherine Bergego Scale
DALY	Disability-adjusted life years
EBP	Evidence based practice
IRF	In-patient Rehabilitation Facility
KF-NAP	Kessler Foundation Neglect Assessment Process
MCA	Middle cerebral artery
PCA	Posterior cerebral artery

CHAPTER 1: INTRODUCTION AND SCOPE OF THE RESEARCH REPORT

1.1 Introduction

Unilateral neglect is defined as the failure to report or respond to stimuli such as people or objects presented to the side opposite a brain lesion, when this failure cannot be attributed to either sensory or motor defects (Plummer et al., 2003). This disorder can have an effect on many activities of daily living.

Unilateral neglect can be divided into different patterns of impairment according to the specific frame of reference (personal, extra-personal, peri-personal) that can be selectively affected according to distinct coordinates (Vallar, 1998). Personal neglect implies a general inattention for the contralesional side of the body (Caggiano & Jehkonen, 2018). Extra-personal neglect refers to a form of unilateral neglect where patients fail to acknowledge and respond to stimuli in their extra-personal space (Yang et al., 2013). Peri-personal space refers to a space immediately surrounding our bodies, where objects can easily be grasped or manipulated (de Pellegrino & Làdavas, 2015).

Unilateral neglect may be multimodal, including sensory and motor neglect. Motor neglect refers to patients that show a considerable reduction in spontaneous use of the contralesional limbs, which is not explained by their associated motor impairments (Punt & Riddoch, 2006; Sampanis & Rinoch, 2013). Sensory neglect is an inability to attend to sensory information on one side of the body due to a brain injury (American Psychological Association, 2018).

In South Africa, stroke is responsible for roughly 25000 deaths annually and 95000 people live with disabilities due to stroke (Taylor, 2019). In the United States the incidence rate for unilateral spatial neglect is upwards of 80% in patients with right-sided stroke (Barrett et al., 2017). Right-sided unilateral neglect resulting from left hemisphere damage was found at least to some degree in 43.5% of patients with stroke (Beis et al., 2004).

There are many different outcome measures that can be used to measure extra-personal unilateral neglect and these include figure copying, clock drawing and paper-and-pencil tests, such as the bells test and the line bisection test. A normal performance on one test alone is not sufficient to rule out the presence of neglect in a given patient (Beis et al., 2004). Examples of measures of personal unilateral neglect include the Behavioural Inattention Test (BIT), the Catherine Bergego Scale (CBS) and the Two Semi-structured Scales for Hemi-inattention (Plummer et al., 2003).

Azouvi et al. (2017) mentioned that conventional paper-and-pencil tests of unilateral neglect are of limited ecological validity. Therefore, the issue was addressed by proposing a number of assessment procedures to provide clinicians and researchers with more ecologically valid assessments of unilateral neglect. In a study by Azouvi et al. (2017) the Behavioural Inattention Test (BIT), the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention, The Subjective Neglect Questionnaire, The Baking Tray Task, Wheelchair

Obstacle Course, Standardised Activities of Daily Living Testing and the Catherine Bergego Scale (CBS) were compared. They found that the choice of measure depends on the moment and the time available to do the tests as well as the setting.

Another study compared a wide variety of different assessment methods, including: line bisection tests, cancellation tests, copying and drawing tests, Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention, BIT and CBS (Plummer et al., 2003). It was found that all these tests can provide the administrator with an indication of whether the patient has unilateral neglect and it can be used as an evaluation tool to determine how the patient responds to changes in task demands (Plummer et al., 2003).

After reading through the previously mentioned studies, it was evident that the most frequently used outcome measures in recent times were the CBS, BIT and the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention.

The BIT only tests the patient in a peri-personal space, but it can evaluate the impact of neglect in visually based function tests (Plummer et al., 2003). Goedert et al. (2012) determined that the BIT showed good reliability. The once off purchase cost of using the BIT is $280.00, which is roughly about R4200.00, which is expensive, making it difficult to use all over South Africa, as some of the clinics and smaller hospitals will not have the finances to pay this amount for a measure that might not be used often.

The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention can differentiate between personal and extra-personal neglect, but does not differentiate between sensory or motor neglect (Plummer et al., 2003). The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention consists of two scales, namely the Personal and the Extra-personal scales. The Extra-personal scale detected asymmetry in most neglect. The Personal Scale measures a different dimension than both the Extra-personal Scale and standard tests for neglect. The Extra-personal Scale was correlated with standard tests of neglect, but not the Personal scale (Zoccolotti et al., 1992). The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention is easy and quick to use, but requires some effort to set up all of the different tests.

The CBS is a functional scale where the administrator uses direct observation of the patient's functioning during activities of daily living (Azouvi et al., 1996). The CBS uniquely predicted deficits in activities of daily living (ADLs) assessed by using the Barthel Index, but did not predict clinical and laboratory assessments of motor-intentional bias. The results indicated that assessments of unilateral neglect may be used to detect specific motor-exploratory deficits in unilateral neglect. The study also determined that by obtaining CBS scores frequently, it might improve the detection of acute-stage patients with unilateral deficits who require more assistance that may be prolonged to the chronic stage of recovery (Goedert et al., 2012).

The CBS provides a way of distinguishing personal or unilateral neglect, but does not discriminate between sensory and motor neglect (Plummer et al., 2003). Azouvi et al. (2017) did however indicate that if the patient

is still in a rehabilitation facility, the CBS is possibly the best suited measure, due to the fact that it looks at ADLs such as grooming, eating, dressing, which are functional.

The CBS however had no formal description on how it must be used and additional instructions were needed for reliable CBS administration, which is why the Kessler Foundation Neglect Assessment Process (KF-NAP) was developed. The KF-NAP provides detailed administration instructions and a scoring chart for the 10 original CBS categories of behaviour (Chen et al., 2015). The KF-NAP is a comprehensive explanation of how the CBS can be administered. By using the KF-NAP to administer the CBS it standardises the administration (Shirley Ryan Ability Lab, 2019). Rehabilitation researchers may be able to use the CBS via the KF-NAP to measure ecological outcomes and specific, separable perceptual-attentional and motor-exploratory spatial behaviours (Chen et al., 2012). The CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention will be compared in this study.

1.2 Problem Statement

It is important to find valid outcome measures that can be used to measure unilateral neglect. These valid and reliable outcome measures should then be compared and it is also important to see whether the patients and administrators understand them. The ability of the outcome measures to identify impairments should also be determined. It is important to compare outcome measures in South Africa, because some of them cannot be used due to the financial implications thereof, like the BIT. Some of the outcome measures, like the figure copying, clock drawing and paper-and-pencil tests are very easy to use, but are of limited ecological validity. Other tests like the CBS and the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention are more complex to use, but are more valid and reliable than the previously mentioned tests. Comparison of the responsiveness of the CBS and the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention will give an indication of which of these two tests if not both, can be considered for use in a South African stroke rehabilitation setting.

1.3 Research Question

What is the most responsive outcome measure to use when testing unilateral neglect in a South African stroke rehabilitation context between the CBS and the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention?

1.4 Aim of the Study

To compare the responsiveness of the CBS to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention when measuring unilateral neglect in adult patients following a stroke in a neurological rehabilitation unit.

1.5 Objectives of the Study

1.5.1 To assess unilateral neglect in adult patients following a stroke by using the CBS via the KF-NAP

1.5.2 To assess unilateral neglect in adult patients following a stroke by using the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

1.5.3 To determine the responsiveness of the CBS in measuring unilateral neglect in an inpatient rehabilitation unit

1.5.4 To determine the responsiveness of the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention in measuring unilateral neglect in an inpatient rehabilitation unit

1.5.5 To compare the responsiveness of the CBS via the KF-NAP to the responsiveness of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

1.6 Significance of the Study

Many different outcome measures are being used to test unilateral neglect all over the world, some are however more expensive and others are less efficient to use. To the researcher's knowledge, there are no commonly used tests for unilateral neglect following stroke in South Africa. It is therefore important to determine which outcome measure is best suited to use in a South African setting. It is important to know whether a patient has unilateral neglect, because it slows down the rehabilitation process and my result in a longer length of stay in the rehabilitation unit (Chen et al., 2015). Patients with unilateral neglect also require different treatment modalities than those without neglect. This is why it should be known if unilateral neglect is present and whether it is improving or not. This study will hopefully be able to determine the best suited outcome measure to test unilateral neglect that can be used in a South African in-patient hospital setting and hopefully many healthcare providers will then routinely test for unilateral neglect to take the neglect into consideration when planning the treatment programme.

1.7 Organisation of the research report

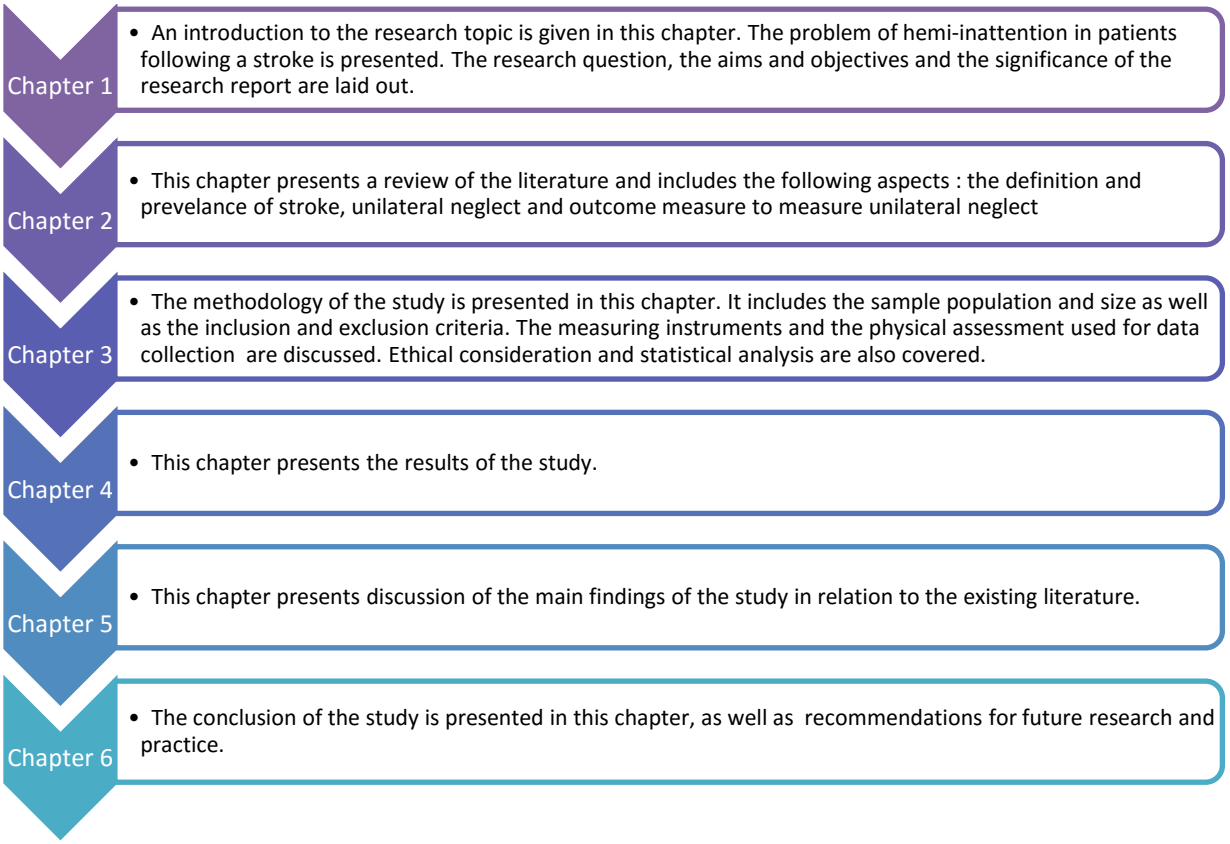


Figure 1-1 Organisation of the research report

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the current available literature documenting unilateral neglect following a stroke. The term stroke will be defined and there will be an overview of the anatomy of the blood supply to the brain and the different areas of the brain with their functions. The anatomy of the areas mostly responsible for unilateral neglect will be presented. Unilateral neglect will be discussed in terms of the effect it has on patients and the functional limitations thereof. Different outcome measures to test whether unilateral neglect is present will be presented. There is no standard protocol to measure unilateral neglect in South Africa and thus two of the best suited measures will be reviewed: CBS and the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention.

Literature was sourced from online medicine and science literature databases, including PubMed, CINAHL, PEDro, Elsevier and Google Scholar, and included English articles published between 2001 and December 2021. Search words used in the search were stroke, isch(a)emic stroke, intracerebral h(a)emorrage, h(a)emorrhagic stroke, unilateral neglect, spatial neglect, hemineglect, spatial cognition, KFNAP, CBS.

2.2 Stroke

A stroke occurs when the blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or ruptures. When that happens, part of the brain is deprived of sufficient blood, so that part of the brain and brain cells die (American Heart association, 2021). Statistics noted in the Global Burden of Diseases, Injuries and Risk Factors Study determined that in 2019 stroke was the second-leading cause of death and the third-leading cause of death and disability combined in the world. From 1990 to 2019 the burden of stroke in terms of the absolute number of cases increased significantly (Global Burden of Diseases, Injuries and Risk Factors Study, 2021). The findings indicate that the bulk of the global stroke burden (86.0% of deaths and 89.0% of disability adjusted life years (DALYs)) is in lower-income and lower-middle-income countries (Global Burden of Diseases, Injuries and Risk Factors Study, 2021).

A stroke is generally divided into subcategories, such as: Ischaemic, intracerebral haemorrhagic and a subarachnoid haemorrhagic stroke. An ischaemic stroke is an episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction. An intracerebral haemorrhagic stroke is defined as: “rapidly developing clinical signs of neurological dysfunction attributable to a focal collection of blood within the brain parenchyma or ventricular system that is not caused by trauma”. Subarachnoid haemorrhagic stroke is a “rapidly developing signs of neurological dysfunction and/ or headache because of bleeding into the subarachnoid space (the space between the arachnoid membrane and the pia mater of the brain or spinal cord), which is not caused by trauma” (Sacco et al., 2013 p.2066).

Statistics indicate that ischaemic stroke constitutes the largest proportion of all new strokes (comprising 62.4% of all incident strokes in 2019), followed by intracerebral haemorrhage (27.9%), and subarachnoid haemorrhage (9.7%) (Global Burden of Diseases, Injuries and Risk Factors Study, 2021).

Stroke can affect different areas of the brain such as the frontal lobe, temporal lobe, parietal lobe, occipital lobe, cerebellum and brain stem. Injury to these different areas can cause different impairments of function as seen in figure 2-1. (Puthenpurakal & Crussell, 2017).

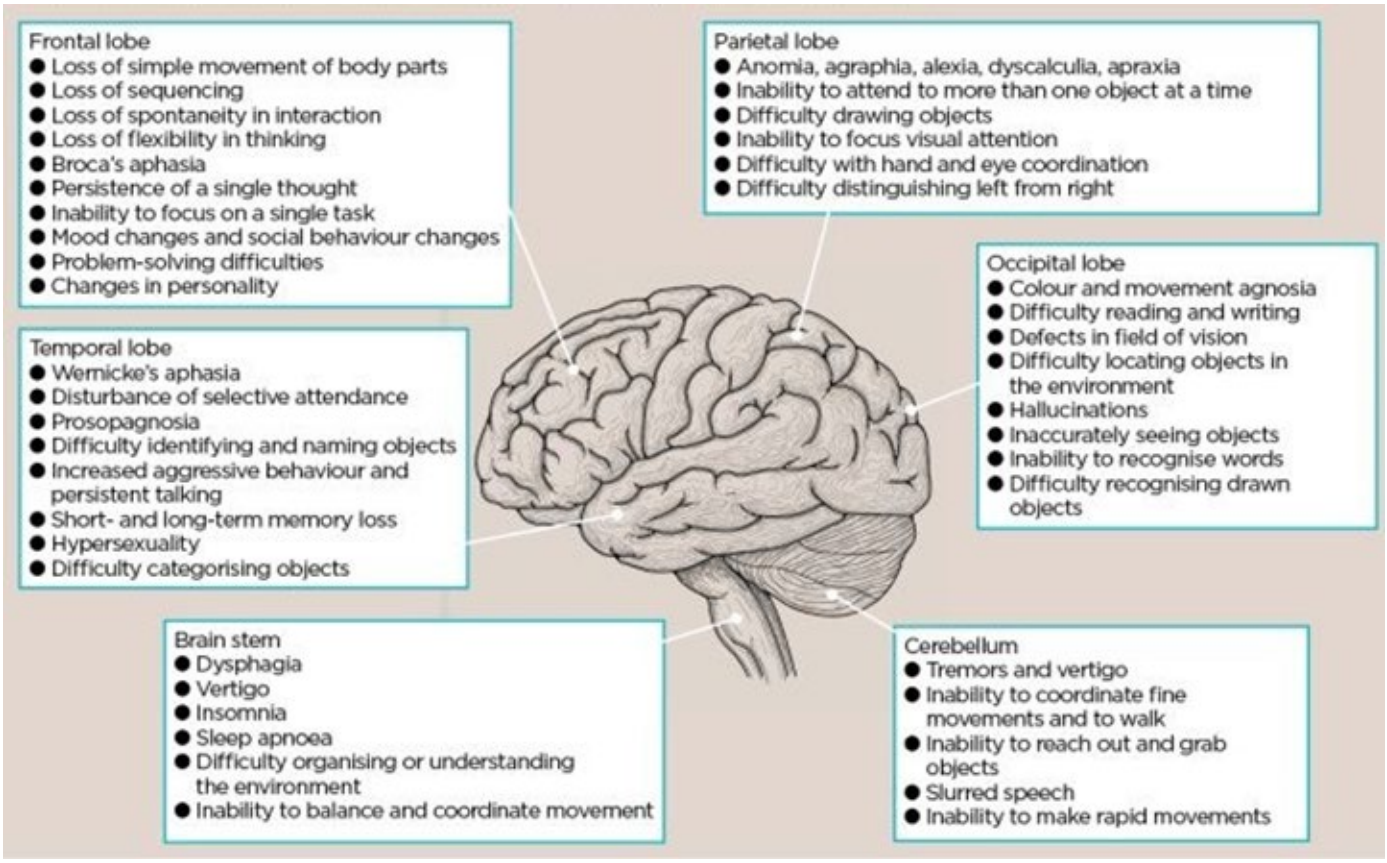


Figure 2-1 Potential impairments from stroke according to brain areas (Puthenpurakai & Crussel, 2017)

These different lobes are supplied by the anterior cerebral artery (ACA), middle cerebral artery (MCA) and posterior cerebral artery (PCA) as seen in figure 2.2. The anterior cerebral artery supplies most of the medial and superior surfaces of the brain as well as the frontal pole. The middle cerebral artery supplies the lateral surface of the brain and the temporal pole. The posterior cerebral artery supplies the inferior surface of the brain and the occipital pole (Moore et al., 2014).

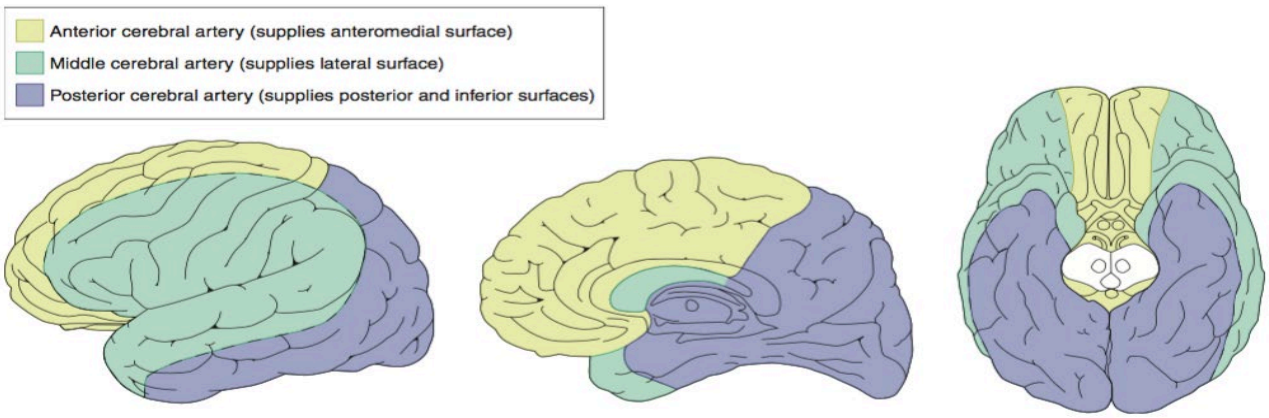


Figure 2-2 Blood supply to the brain (https://memorang.com/flashcards/155064/Neurology+Anatomy+and+Physiology)

Yee Sing Ng et al. (2007) reported that the MCA stroke was the most common stroke (50.8%) followed by small-vessel stroke (12.8%) and brain stem stroke (11.4%). An MCA stroke is the most common stroke due to the size of the territory and the direct flow from the internal carotid artery into the MCA which provides the easiest path for an embolus (Nogles & Galuska, 2021). The parietal lobe is supplied by the MCA and ACA and thus a stroke in one of these arteries can lead to unilateral neglect.

2.3 Unilateral neglect

2.3.1 Definition

Unilateral neglect is a syndrome that frequently happens after a stroke (Appelros et al., 2002), it is not just a single condition, but a complex syndrome (Vallar, 2001). It can be defined as a multifaceted and incapacitating cognitive syndrome frequently occurring after a stroke, other brain injury or neurodegenerative disease (Andrade et al., 2010; Bender, 2011). Unilateral neglect has multiple subcategories depending on the specific networks that are damaged (Husain & Nachev, 2007; Harvey & Rossit, 2011). Unilateral neglect may be divided into subcategories such as sensory modality (Jacobs et al., 2012), sectors of space (Van der Stoep et al., 2013), and spatial frame of reference (Chechlacz et al., 2010). Patients with unilateral neglect tend to be oblivious of half of the space around them as well as half of their own body. Patients tend to present with a permanent deviation of their head and gaze towards the right, in the most severe cases. The patient also ignores inputs from the side opposite to the brain lesion (Azouvi, 2017).

2.3.2. Types of unilateral neglect

Neglect can be egocentric or allocentric. Egocentric neglect is apparent when objects are neglected relative to the person's own position, whereas allocentric neglect involves neglect occurring in relation to the object itself, regardless of its position relative to the person experiencing neglect (Jang & Jang, 2018). Previous studies have investigated the neuroanatomical correlates of unilateral neglect related to spatial frames of reference. These studies have determined that egocentric neglect was associated with injury to the premotor cortex, right angular and supramarginal gyrus and that allocentric neglect is associated with damage to the inferior temporal gyrus and superior temporal cortex (Grimsen et al., 2008; Hillis et al., 2005). However structural damage to the interparietal sulcus and the tempero-parietal cortex appears to be related to both forms of neglect (Chechlacz et al., 2010). Other studies that were done on right-hemisphere stroke patients reported that a shortfall in target-directed tasks, such as reaching, was associated with lesions in basal ganglia nuclei and frontal regions (pre-central and inferior frontal gyri) (Rossit et al., 2009; Vossel et al., 2010). Increased difficulty with target directing reaching tasks was associated with lateral and medial parieto-occipital regions (Rossit et al., 2009; Vossel et al., 2010).

2.3.3 Prevalence of unilateral neglect

According to Antonia et al. (2017) left and right sided unilateral neglect are both common after stroke. It is estimated that unilateral neglect occurs in 50% of patients after a right sided hemisphere stroke and in 30% of patients after a left-sided hemisphere stroke (Chen, Chen, et al., 2015). Most studies report that unilateral neglect is more persistent and severe after right sided hemisphere injury compared to left sided hemisphere damage (Chen et al., 2015; Gainotti et al., 1972; Ogden, 1985; Ringman et al., 2004).

2.3.4. Effect of unilateral neglect on functional outcomes

Unilateral neglect has a substantial effect on inpatient rehabilitation outcomes (Chen, Chen et al., 2015; Chen, Hreha et al., 2015; Chen et al., 2021). Some barriers affecting rehabilitation outcomes in patients with unilateral neglect include: Symptoms of unilateral neglect, unilateral related self-awareness problems, decreased motivation or poor therapy engagement, physical weakness, other co-morbidities and poor treatment efficiency due to previously mentioned barriers (Chen et al., 2021).

Unilateral neglect can decrease independence in ADLs and has a negative impact on the patient's quality of life (Bowen et al., 2013; Chen et al., 2015; Chen et al., 2021). When the patient is eating, they might neglect plates located to their left or only eat half of the food located on the plate. They omit the left sided page in a book or will neglect details on the left of pictures (Azouvi et al., 2017). There can also be deficits when reading or with appropriate social interactions (Chen, Hrera et al., 2015) which affects memory retrieval and mental imagery (Chen et al., 2021). Unilateral neglect also affects the patient's movement and balance (Shiraishi et al., 2010; Ten Brink et al., 2017) and appears to impair paralysis recovery (Nijboer et al., 2014). This influences the patient's mobility such as walking, using a wheelchair, driving and overall community mobility (Oh-Park et al., 2014; Chen et al., 2015). The patient will also be a higher fall risk due to the above-mentioned impairments (Chen et al., 2021).

If unilateral neglect is present, it is associated with prolonged hospitalisation and poorer functional outcomes (Chen, Hreha, et al., 2015; Nijboer et al., 2013; Wilkinson et al., 2012). In a study done by Hammerbeck, et al. (2019) data was collected from 88,000 UK hospital admissions, the study concluded that those with neglect had an increased length of stay (27 vs. 10 days) and on discharge they were still "dependent" on the modified Rankin scale (76% vs. 57%). In general, unilateral neglect is also linked to higher disability (Appelros et al., 2002; Chen, Chen, et al., 2015; Nijboer, et al., 2013). Many individuals with unilateral neglect are unaware of their own symptoms or the consequences of their deficits and this causes delays in seeking suitable treatment or learning compensatory strategies (Chen, et al., 2021). Despite breakthroughs in rehabilitation research on unilateral neglect interventions and known barriers to evidence based practice (EBP), recent reports have shown the same poor outcomes associated with unilateral neglect as reports published years ago (Chen et al., 2021).

Generally, the lateralized attention deficit is better in right unilateral neglect than in left unilateral neglect, although the consequences at the level of physical functioning and physical independence are largely similar. The deficit in lateralized attention is more severe with respect to the neuropsychological outcomes and observations of unilateral neglect in ADL (Antonia et al., 2017).

Antonia et al. (2017) mentioned that even though left unilateral neglect is more frequent, from a clinical perspective, it is important to screen for unilateral neglect after right- and left hemisphere damage. There are national clinical guidelines which recommend the thorough and timely screening and diagnosis of neglect as an essential part of post-stroke clinical care planning, e.g., the Royal College of Physicians London, the

Canadian Stroke Association (Hebert et al., 2016), the American Heart Association, and the National Stroke Foundation of Australia's clinical guidelines for stroke management. These guidelines lack specific guidance on which of the many neglect tests would be best suited, for which subtypes of neglect and at which timepoints. There are various standardized outcome measures of neglect, or of functions that could be affected by neglect. There are tentative signs of an emerging consensus, an identified need for a combined approach to screening and diagnosis, and for further training (Checketts et al., 2021).

2.4 Outcome measures used to assess post stroke unilateral neglect

Different outcome measures for unilateral neglect mostly fall into four broad categories: cognitive assessment, functional assessment, neurological assessment, and neuroimaging. Currently it is unknown how various clinical professional groups screen, assess, or diagnose unilateral neglect and whether they use any or all of the four categories (Checketts et al., 2021).

A cognitive assessment for unilateral neglect refers to the measurement of skills and processes like attention and memory by means of standardised tests (Checketts et al., 2021). Examples of such a standardised test are:

- The behavioural inattention test (BIT): This test is made up of 15 subtests involving target cancellation, drawing, line bisection, text reading, clock reading, and visual description (Wilson et al., 1987). The BIT only tests the patient in a peri-personal space, but it can evaluate the impact of neglect in visually based function tests (Plummer et al., 2003). Goedert et al. (2012) determined that the BIT showed good reliability. Disadvantages of the BIT include, all tests are performed only in the peri-personal space, it requires fluency in English and it is time-consuming (Plummer et al., 2003).
- Cancellation tests are also examples of cognitive assessments. When performing cancellation tests, a sheet of paper with different targets is placed before the patient, and the patient is asked to cross out or cancel all the targets. Increasing the number of targets, placing them randomly on the sheet, and using foils that are difficult to discriminate from the targets are methods that can be used to increase the sensitivity of the task. It is important to note the manner in which the patient explores the sheet the patient is performing the task. The sensitivity of the task can be increased by increasing the amount of target on the sheet or by placing them in no particular order (Heilman et al., 2000). Disadvantages of cancellation tests are that they are not testing an individual in a functional capacity and if not administered correctly the sensitivity is questionable (Plummer et al., 2003).
- Drawing can also be used to measure intentional or representational deficits such as the memory of one side of the objects. Drawing can be tested by letting a patient copy an examiner's drawing or letting the patient draw spontaneously. The sensitivity of this task can be increased by using a more detailed drawing or asking the patient to copy an asymmetric figure for neglect. The more detailed the drawing, the more sensitive the task (Heilman et al., 2000). Disadvantages of these tests include that they are insensitive, difficult to interpret and have questionable validity which is why these tests are not recommended to measure unilateral neglect (Plummer et al., 2003).

The problem with using conventional methods of assessing unilateral neglect as mentioned above, such as the paper-and-pencil or computerised tasks, is that they are not easily translatable to functional outcome (Chen et al., 2015).

A functional assessment of unilateral neglect refers to structured appraisal of a patient's ability to perform ADLs (Checketts et al., 2021). Examples of functional unilateral neglect measures include:

- The BIT as mentioned above.
- The CBS is a 10-item structured functional assessment, which focuses on personal space and performance of ADLs in extra-personal space. Each item is scored by direct observation from 0-3, giving a maximum total score of 30 (Bergego et al., 1995). This standardised test can be used to diagnose personal, peri-personal and extra-personal neglect and it indicates the severity of the unilateral neglect (Plummer et al., 2003). Disadvantages of the CBS include that the score does not differentiate between personal and spatial behaviours and there is no formal description on how to administer the CBS (Plummer et al., 2003). This is why the CBS via the KF-NAP will be used in this study, which is also an example of a functional assessment (Checketts et al., 2021) and will be discussed later in this chapter.
- The Two Semi-Structured Scales for the Evaluation of Hemi-inattention consists of the extra-personal hemi-neglect scale and the personal hemi-neglect scale. The extra-personal scale looks at items such as serving tea, dealing cards to four people sitting round a square table, describing three complex pictures, and describing a room. The personal scale consists of ADLs such as hair combing, shaving and putting glasses on. (Zoccolotti et al., 1992). It is also scored from a 0-3. Interrater reliability is good. A statistical analysis of the internal validity of the test showed a differentiation between extra-personal and personal items (Azouvi et al., 2017). Disadvantages of this measure includes that the personal scale still requires validation, it requires that the therapist who will administer the measure will have to be trained in rating scale and the extra-personal scale does not differentiate between peri-personal and far space (Plummer et al., 2003).

Neurological assessment of unilateral neglect refers to the clinical examination of signs and symptoms including, but not specific to, those indicative of neglect (Checketts et al., 2021). In an acute phase after a stroke the National Institutes of Health Stroke Scale (Brott et al., 1989) is primarily used, this determines immediate treatment and subsequent rehabilitation and some subscales can screen for neglect. Visual field testing and extinction tests can also be used in neurological assessment (Checketts et al., 2021).

Neuroimaging is used in an acute phase to determine the type of lesion, the location and the extent of the lesion, which could also foreshadow neglect (Checketts et al., 2021). These findings are then used to guide the assessment. Some professionals use these findings for a first prediction of cognitive and functional deficits by determining the lesion location and/or damage to distributed neural networks (Vuilleumier, 2013).

The selection of neglect assessments varies widely across different research studies (Chen, Chen et al., 2015). This emphasises the wide variety of assessments available. A Cochrane review of cognitive

rehabilitation for stroke mentioned that there was no specific neglect outcome measure that was common across included studies (Bowen et al., 2013). In literature it was also determined that there were also modest differences between countries. It was also found that individual neglect-specific outcome measures generally chosen based on professional choice rather than institutional policy (Checketts et al., 2021).

2.5 Catherine Bergego Scale via KF-NAP

2.5.1 Description of the CBS via the KF-NAP

The CBS is a functional scale that thoroughly assesses the functional performance in personal, peri-personal, and extra-personal spaces, as well as performance in perceptual, mental imagery and motor domains. Thus, the CBS can capture the heterogeneity of spatial neglect and is more sensitive than paper-and-pencil tests to problems in ADLs (Chen et al., 2012; Azouvi et al., 2003). Assessing spatial neglect during ADLs instead of using paper-and-pencil or computerized tasks may enable clinicians to better understand the impact of spatial neglect (Chen et al., 2014; Chen, Chen et al., 2015). The CBS takes approximately 30 minutes to administer (Plummer et al., 2003)

The CBS however had no formal description on how it must be used and the additional instructions were needed for reliable CBS administration, thus the KF-NAP was created. The authors of the KF-NAP modified some of the CBS category labels to shorten some of the wording and to better explain the purpose of the observation. The KF-NAP manual also provides more information regarding observation and a more detailed scoring sheet. In the manual, the examinator is also instructed to provide the patients with verbal cuing to initiate or perform certain actions (Chen, Chen et al., 2015).

The KF-NAP also specifies the environment where the observations should take place and also includes the observation of left and right asymmetry when performing tasks. The KF-NAP also focuses on observing spontaneous behaviour of participants, rather than functional ability in a certain situation. This is to enable the patients to explore their environment spontaneously. The reason why it is also important to measure right and left asymmetry, is for the examiner to have something to compare the findings to. Another description that was added, was to observe all 10 categories in one session. Scoring the patients during or immediately after a session leads to direct observation, not just summarised impressions of their behaviour (Chen, Chen et al., 2015).

The KF-NAP can be seen as a process to measure unilateral neglect using the CBS. It can easily form part of the clinical assessment of ADLs and it can uniquely measure some deficits which cannot be assessed by other functional outcome measures.

2.5.2. Psychometric properties of the KF-NAP

The KF-NAP provides detailed instructions for administering the tests and it includes a scoring chart for the CBS categories (Chen et al., 2014). The KF-NAP was developed to reduce ambiguity and to increase the reliability of the outcome measure (Chen et al., 2012). Reliability and Factor Structure of KF-NAP

Cronbach's alpha was .96, indicating excellent internal consistency. Thus, the process of the KFNAP may increase consistency among the observational categories (Chen, Chen et al., 2015).

2.5.3. Advantages and Disadvantages of the CBS via the KF-NAP

The CBS via KF-NAP is highly sensitive in detecting signs of unilateral neglect, especially in those patients with mild severity, because it covers several aspects of unilateral neglect manifestations (Pitteri et al., 2018). The CBS is the only outcome measure that assesses performance in all the different spatial areas such as personal, peri-personal and also extra-personal space, as well as assessing spatial errors in various processing stages (Barrett, 2013). A disadvantage of the CBS via the KF-NAP is that even though there are personal and spatial tasks included in this measure, the score does not differentiate between whether it is personal, peri-personal or extra-personal neglect (Plummer et al., 2003).

2.5.4. Why this measure can be used in a South African setting

The measure is easy to use and needs no formal instructions as the test already includes instructions and a scoring chart. There are no costs to using this outcome measure and it can be performed on patients with speech impairments since instructions are given and no questions need to be answered. There was no literature found regarding the use of the CBS via the KF-NAP in the South-African setting.

2.6 Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

2.6.1. Description of Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention:

The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention can be used as a screening tool to determine whether unilateral neglect is present in a personal or extra-personal space (Zeltzer & Menon, 2008).

The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention screen patients while performing functional tasks, such as some ADLs. Menon & Korner-Bitensky (2004) reported that these subscales test some high-level activities which may be challenging for patient to perform soon-after a stroke, therefore this outcome measure is better used if the patient approaches discharge from the acute setting or when entering the sub-acute setting. It takes approximately 5 minutes to complete the Personal neglect subscale and 15 minutes to complete the Extra-personal neglect subscale (Plummer et al., 2003).

2.6.2. The Psychometric properties of Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

Zoccolotti et al. (1992) assessed the inter-item correlations of the scale and found that items within the personal subscale had adequate correlations ranging from $r = 0.57$ to $r = 0.62$, and items within the extra personal subscale had adequate correlations ranging from $r = 0.44$ to $r = 0.71$. Zoccolotti et al. (1992) also found excellent inter-rater reliability for both the personal neglect items and extra personal neglect items of the scale ($r = 0.88$ and $r = 0.96$, respectively). However, it is important to note in this study, raters underwent intense training, which may limit the generalizability of these findings (Zeltzer & Menon, 2008).

In a study by Zoccolotti et al. (1992) the responsiveness of the subscales was examined and the study determined that the personal neglect subscale was not responsive to clinical change following rehabilitation, but the extra personal subscale was responsive to clinical change after rehabilitative treatment. The study also determined the concurrent validity of the subscales by comparing the personal and extra-personal subscales with the patient's performance in four other standard diagnostic tests (Line Cancellation Test, Letter Cancellation Test, Wundt-Jastrow Area Illusion Test, and Sentence Reading Test). The extra personal subscale correlated with each conventional test. However, performance on the personal subscale did not correlate with performance on these conventional tests. The authors attributed the failure of the personal scale to correlate with the conventional tests to the fact that the personal scale measures different dimensions of neglect, therefore, personal subscale requires further validation.

2.6.3. Advantages and Disadvantages of the Two Semi-Structured Scales for the Evaluation of Hemi-inattention

Plummer et al. (2003) mentioned that some of the advantages of the Two Semi-Structured Scales for the Evaluation of Hemi-inattention include that it differentiates between whether personal and extra-personal neglect is present and also indicates the severity of unilateral neglect during functional tasks. Disadvantages according to Menon & Korner-Bitensky (2004) are that although this scale is quick and easy to use, it has minimal evidence of validity and thus further testing is required regarding the validity and reliability of these Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. Plummer et al. (2003) also mentioned that therapists need to be trained in the rating scale and that the extra-personal scale does not differentiate whether peri-personal or far space neglect is present.

2.6.4. Why the Two Semi-Structured Scales for the Evaluation of Hemi-inattention can be used in a South African setting

The Two Semi-Structured Scales for the Evaluation of Hemi-inattention is quick and easy to use. This scale is free to use to the public. There was no literature found regarding the use of the Two Semi-Structured Scales for the Evaluation of Hemi-inattention in the South-African setting.

2.7 Conclusion of literature review

The literature review was presented in this chapter and it was established that no studies mentioned unilateral neglect testing specific to South African setting taking into consideration the contextual factors such as resources (staffing and equipment).

The measures that were compared in the literature review, were the BIT, cancellation tests, copying and drawing tests, the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. The disadvantages of the BIT were that it only tests the patient in the peri-personal space, it required fluency in English, so patients with speech impairments cannot use this outcome measure and it is time consuming, taking about 40 minutes to administer (Menon & Korner-Bitensky, 2004). Cancellation tests do not functionally test impairments caused by unilateral neglect and the sensitivity is questionable, if

t\not administered in a specific manner. Drawing can also be used, but these tests are insensitive, difficult to interpret and the validity is questionable.

After comparing the different outcome measures it was determined that the two that would be best suited for this study will be the CBS via the KF-NAP as well as Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. The main reasons for choosing these two outcome measures are that both are able to measure neglect in different spatial areas, both are functional assessments, these measures are free to use to the general public, have definite instructions on how to administer them and are also relatively quick to use.

Some of the biggest differences between the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention include that the CBS via the KF-NAP is scored out of 30 with 10 sub-categories and definite explanations of the scores with regards to severity, where the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention is scored out of a possible 27 with nine sub-categories. This CBS via the KF-NAP requires no formal training and can also be used on patients who have speech difficulties and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention requires some setup, but cannot be used for participants with severe speech impairments.

It is beneficial to determine which one of these outcome measure would be better to use in South Africa to make sure there is a certain standardised test that is used throughout South Africa. This would lead to a better carry-over of patients between hospitals or clinics. It is time-consuming to administer both the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention and more materials are required if both are to be performed.

CHAPTER 3: METHODOLOGY

3.1 Type of Study

This study is a longitudinal quantitative descriptive study design.

3.2 Participants

3.2.1 Study Setting

This study was conducted at Witrand Hospital in Potchefstroom, North West, South Africa. The rehabilitation unit is a 15-bed unit and is the only rehabilitation unit of its kind in North West. This unit caters for all sub-acute neurologically impaired rehabilitation patients in North West. It has a fully equipped gym, an indoor pool, offices for speech therapists, medical doctors and psychologists and a room including a biodex machine. This is a multi-professional unit and includes physiotherapists, occupational therapists, speech and language therapists, psychologists, social workers, dieticians, nursing staff, medical doctors and a unit manager. The unit caters to patients who have neurological conditions, such as stroke, spinal cord injuries and traumatic brain injuries. The unit caters for all age groups; however, the majority of patients are adults.

Patients at the Witrand Hospital are evaluated on admission and discharge with outcome measures such as the Oxford Muscle Testing Scale, the Modified Ashworth Scale, the Berg Balance scale and Range of Motion. Patients are also scored weekly using the Functional Independence Measure (FIM) in order to give feedback of the patient to the medical aid regarding their progress within the unit during their stay.

3.2.2 Source of Participants

A consecutive sampling method was used to ensure that the maximum sample size is attained. The study required the use of patient data in real time, which is why sample size determined how many patients we needed to collect the data from.

The sample size was calculated using the Raosoft sample size online calculator (http://www.raosoft.com/samplesize.html) and are shown in table 3-1 below:

Table 3-1 Sample size

Parameters				**Sample size for research**
Margin of error	Level of confidence	Response distribution	Population size (number of patients with stroke that the rehab unit usually has in 3 months' time)	
5%	95%	50%	45 patients	41 patients

3.2.3 Sample Selection

Inclusion Criteria

Participants were included in this study if they:

- presented with a first-ever unilateral stroke in Witrand Hospital during the duration of the data collection.

Exclusion Criteria

Participants were excluded from the study if they:

- had severe speech problems
- were confused
- had impairments or activity limitations that are not related to stroke

3.3 Instrumentation and Outcome Measures

The CBS is a scale that evaluates the impact of unilateral neglect on everyday life of patients after stroke. It is a functional scale where the administrator uses direct observation of the patient's functioning in 10 activities of daily living, such as grooming, eating, dressing, wheelchair driving, mouth cleaning, gaze orientation, left limb knowledge, auditory attention, spatial orientation and finding personal belongings (Azouvi et al., 2017).

The CBS is scored from a 0-3, 0 being no neglect and 3 being severe neglect. The total score is then calculated by adding all of the scores. This then determines whether the patient has mild, moderate or severe behavioural neglect. The CBS has excellent interrater and intrarater reliability (Marques et al., 2019).

The KF-NAP (Appendix I) gives a detailed description of how to use the CBS. It is used to standardise the use of the CBS which makes the results more reliable. The KF-NAP is free to use and can be obtained by anyone online and will be used accordingly. No permission is required to use this scale.

The Two Semi-Structured Scales for the Functional Evaluation of Personal Neglect (Appendix II) consists of the extra-personal hemi-neglect scale and the personal hemi-neglect scale. The extra-personal scale looks at items such as serving tea, dealing cards to four people sitting round a square table, describing three complex pictures, and describing a room. The personal scale consists of ADLs such as hair combing, shaving and putting glasses on. (Zoccolotti et al., 1992). It is also scored from a 0-3. Interrater reliability is good. A statistical analysis of the internal validity of the test showed a differentiation between extra-personal and personal items (Azouvi et al., 2017). This scale is available online and is free to use by the public, no permission is required to use this scale.

3.4 Procedure

3.4.1 Pilot Study

A pilot study was performed to identify potential sources of problems early on. It was done to establish responsiveness by looking at the understanding of the tests, the duration it takes and logistics in terms of booking assessment time and space as well as data capturing. Two patients participated in the pilot study and no major changes were made to the methodology; thus, these participants were also included in the final data.

Patients were admitted to the rehabilitation unit on Mondays and Tuesdays. One day after the admission the researcher went to the rehabilitation unit and determined who of the patients had a stroke. The patients who

had a stroke and met the inclusion criteria were then recruited and informed consent was obtained. Written informed consent or verbal informed consent was given, but in some cases where the patient was unable to give the informed consent themselves the next of kin was contacted to ask for informed consent. Just before lunch the patients were taken into the rehabilitation gym. In the gym, the setup needed for the tests was already done. The researcher then conducted the study as described in the CBS via the KF-NAP. Just before dinner, the researcher conducted the study as described in the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. The CBS via the KF-NAP was administered first for the first patient, followed by the Two Semi-Structured Scales for functional evaluation of hemi-inattention. Thereafter the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention was administered first for the next patient, followed by the CBS via the KF-NAP.

The tests were re-administered on a weekly basis and again on discharge. The results of these tests were noted and kept locked in a safe space, where only the researcher had access to. The information was then entered into an excel spreadsheet and a data analysis was done.

3.4.2 Main Study

The procedure for the main study was the same as the procedure for the pilot study. The only difference was that the outcome measure that was used first will switch after two patients. This was done to make the setup and transitioning between the two outcome measures easier for the researcher. This means the KF-NAP was administered first for the first two patients, followed by the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. Thereafter the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention was administered first for the next two patients, followed by the KF-NAP. Then the KF-NAP was used first for the next two patients followed by the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention after which the outcome measures were switched again. This was done to ensure that the participants do not perform better in the first test and then worse in the second test due to fatigue for example. The results of these tests were noted and kept locked in a safe space, where only the researcher had access to. The information was entered into an excel spreadsheet until data analysis was done.

3.5 Ethical Considerations

Ethical clearance was obtained from the University of the Witwatersrand Human Research Ethics Committee. Permission to access the patients was obtained from Witrand Hospital and the Department of health in North West (Appendix III). Patients received an information sheet and informed written consent was obtained from patients (Appendices IV & V) and in some cases where the participant was unable to give informed consent, the participant's family were contacted. Participants were informed that they can withdraw from the study at any time without suffering any repercussions. Participants were not exposed to any risks. Information was only used for the purpose intended for this study and will only be released to the participants. All participants were assigned a number. The key to the numbers assigned will be kept in the possession of the researcher only.

3.6 Data Analysis

A summary of the Data analysis is done in table 3-2 below.

Table 3-2 Data analysis

Objective	Outcome measure	Type of data	Statistical test
To assess the existence and the extent of unilateral neglect during observations of the patient	CBS via KF-NAP	Categorical data (total scores) Continuous data (Age of patient)	Frequencies and percentages Mean and standard deviation
To assess the existence of unilateral neglect during observations by means of a personal and extra-personal scale	Semi-structured Scales for Functional Evaluation of hemi-inattention	Categorical data (total scores) Continuous data (Age of patient)	Frequencies and percentages Mean and standard deviation

The data was collected, captured, coded and edited using STATA version 16 by entering the collected data into an electronic data file and creating a data set.

In this study, descriptive statistical techniques were used to describe the gathered data and to provide more insight into the demographic profile of the participants. For the purpose of this study, the internal consistency reliability of the outcome measures was assessed by calculating the Cronbach's α coefficient. This measures the average covariance between item-pairs and the variance of the total score. When a Cronbach's alpha coefficient is greater than 0.70 or more, the measure can be considered reliable.

Frequencies and percentages for qualitative variables such as the total score and the subscales of each of the CBS via KF-NAP questionnaire and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were obtained.

The scores were calculated for the CBS & the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention by adding the results of each item for each patient. The different categories were also scored individually. The Pearson correlation coefficients between the CBS and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were also calculated. In all tests, a p-value of $p<0.05$ was considered significant. Mean scores were determined for the participants' ages and for the outcome measures. These different scores were retested weekly and the scores of each patient was compared to determine the responsiveness of the tests.

3.7 Conclusion of the methodology

The study design, aims, sample size and inclusion and exclusion criteria have been presented in this chapter. The procedure and method of the study have been described, as well as the data collection, data recording and statistical analysis. The results of the study are presented in Chapter 4.

CHAPTER 4: RESULTS

The aims of this study were to assess unilateral neglect in adult patients following a stroke using the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. Thereafter the responsiveness of the CBS and the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention in measuring unilateral neglect in an inpatient rehabilitation unit was determined. The CBS and the Two Semi-Structured Scales for Functional Evaluation were then compared with regards to the responsiveness.

Results of the study are reported in this chapter, starting with the characteristics of study participants, followed by the results of the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation for Hemi-inattention. The results of comparison of the CBS and the Two Semi-structured Scales for Functional Evaluation are also presented in this chapter.

4.1 Study Participants

The number of participants admitted into Witrand Hospital during the period September 2021 until December 2021 and the recruitment of participants to the study is summarised in the flow diagram in Figure 4-1.

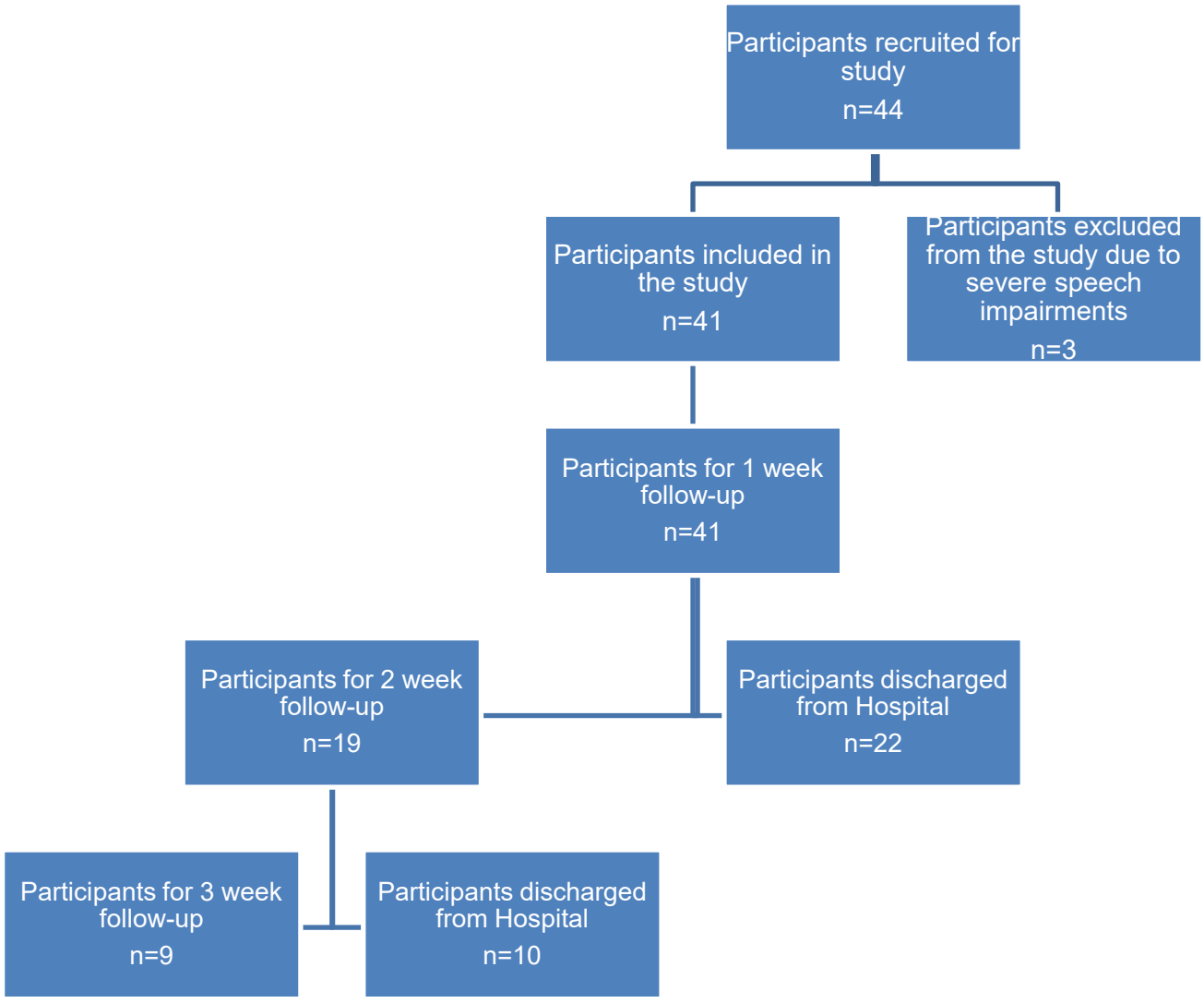


Figure 4-1 Participants of the study

Forty-four participants that had a stroke were recruited for this study. Three participants were excluded due to severe speech impairments and no patients dropped out of this study. Forty-one participants were in hospital for the one-week follow-up. During the two-week and third week follow-up 22 and 10 of the participants (respectively) were discharged from the hospital and only patients who remained in hospital (19 and 9 participants) took part in this study.

4.1.1 Age of the study participants

The age of the participants recruited in this study is summarized in Figure 4-2.

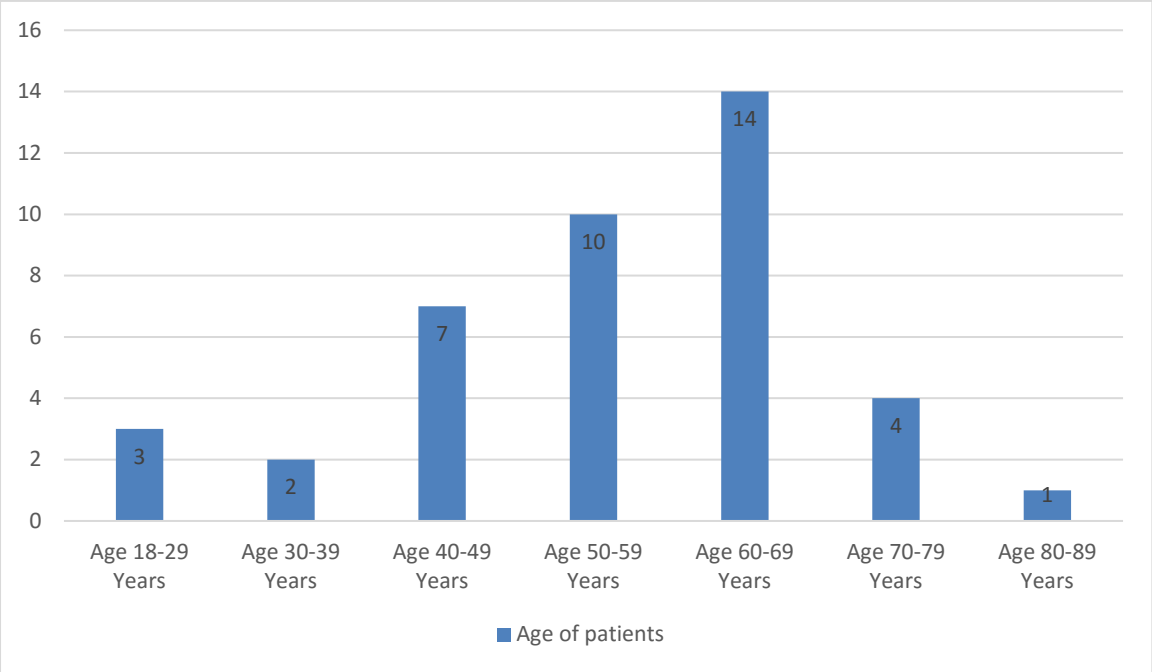


Figure 4-2 Age of participants (n=41)

Most of the study participants were within the age group of 60-69 years old (n=14; 34,1%). The mean age for the participants was 54 (±15.5) years with the minimum age being 18 years, and the maximum age being 83 years.

4.1.2 Gender

The participant population will be discussed in the figure below (Figure 4-3).

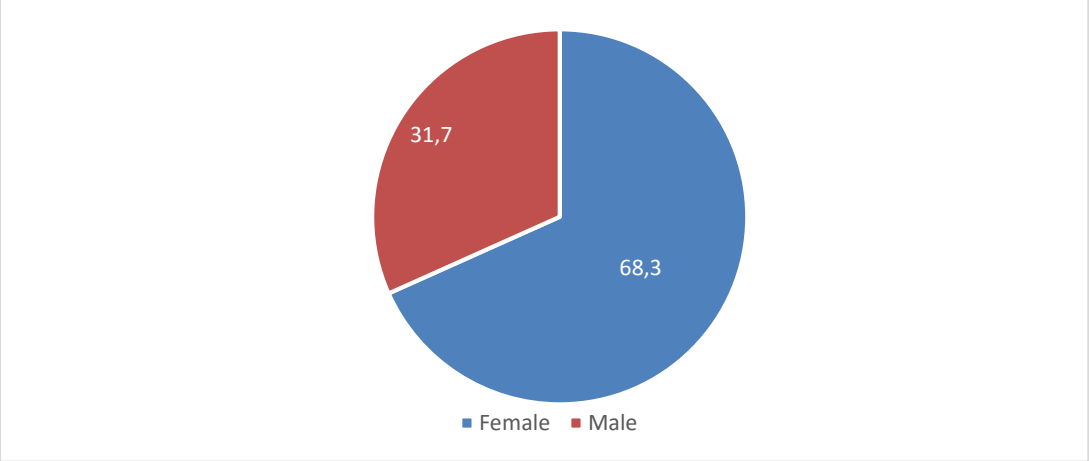


Figure 4-3 Gender distribution (n=41)

Most of the participants in the study were females (n=28; 68,3%).

4.1.3 Type and side of stroke

Figure 4-4 summarizes the most common type of stroke as the side of the brain that was most affected.

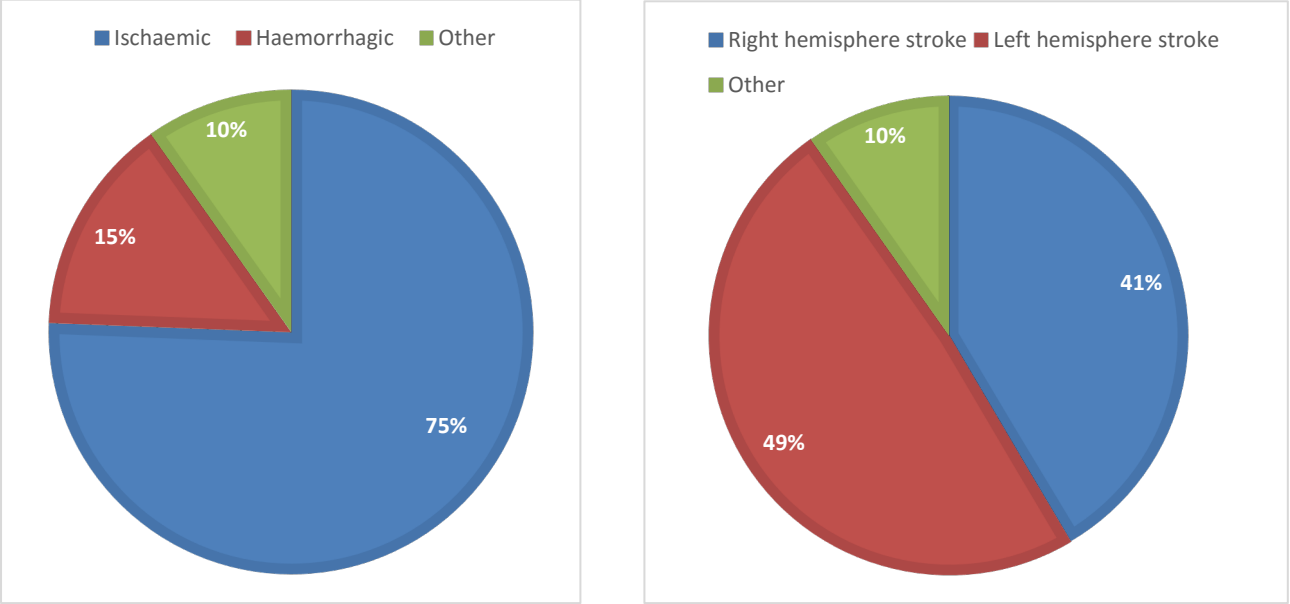


Figure 4-4 Type and side of stroke (n=41)

The most common type of stroke was an ischaemic stroke affecting 31 participants of the study (75,6%). The most common hemisphere that was affected by a stroke in this study population was a stroke in the left hemisphere, affecting 20 of the participants (49%).

4. 2. Catherine Bergego Scale via the KF-NAP

The results of the CBS via the KF-NAP are presented in Table 4-1.

Table 4-1 Unilateral neglect scores of participants when using the CBS via the KF-NAP

	Baseline scores (n=41)	One-week follow-up (n=41)	Two-week follow-up (n=19)	Three-week follow-up (n=9)
No neglect	7 (17,1%)	10 (24,4%)	4 (21,0%)	0 (0%)
Neglect	34 (82.9%)	31 (75,6%)	15 (79,0%)	9 (100%)
Mild severity of neglect	22 (53,7%)	19 (46,3%)	12 (63,2%)	8 (88,9%)
Moderate severity of neglect	9 (21,9%)	9 (21,9%)	3 (15,8%)	1 (11,1%)
Severe neglect	3 (7,3%)	3 (7,3%)	0 (0%)	0 (0%)

When administering the Catherine Bergego Scale via the KF-NAP it was determined that 82,9% (n=34) of the participants experienced unilateral neglect to some degree and 17,1% of the participants (n=7) experienced no neglect during admission to the Rehabilitation unit. Most of the participants in this study experienced mild severity of neglect (n=22, 53,7%) at baseline. There were no patients with severe neglect during the two- and three-week follow-up. There is a decrease in the CBS via the KF-NAP scores from baseline to the two-week follow-up.

The sub-categories results of the CBS via the KF-NAP are presented in Table 4-2.

Table 4-2 The subcategory scores of the CBS via the KF-NAP over the course of the study

	Absent (0)				**Mild (1)**				**Moderate (2)**				**Severe (3)**			
	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)
Gaze orientation	18 (43,9%)	19 (46,3%)	8 (42,1%)	4 (44,4%)	11 (26,8%)	18 (43,9%)	10 (52,6%)	5 (55,5%)	10 (24,4%.)	4 (9,8%)	1 (5,3%)	0 (0%)	2 (4,9%)	2 (4,9%)	0 (0%)	0 (0%)
Limb awareness	9 (21,9%)	15 (36,6%)	7 (36,9%)	3 (33,3%)	**21 (51,2%)**	18 (43,9%)	11 (57,9%)	5 (55,5%)	9 (21,9%)	8 (19,5%)	1 (5,3%)	1 (11,1%)	2 (4,9%)	0 (0%)	0 (0%)	0 (0%)
Auditory attention	28 (68,3%)	29 (70,7%)	16 (84,2%)	7 (77,8%)	9 (21,9%)	8 (19,5%)	2 (4,9%)	2 (22,2%)	3 (7,3%)	4 (9,8%)	1 (5,3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Personal belongings	22 (53,7%)	24 (58,5%)	12 (63,2%)	6 (66,7%)	11 (26,8%)	10 (24,4%)	6 (31,6%)	2 (22,2%)	7 (17,1%)	5 (12,2%)	1 (5,3%)	1 (11,1%)	2 (4,9%)	2 (4,9%)	0 (0%)	0 (0%)
Dressing	12 (29,3%)	18 (43,9%)	8 (42,1%)	4 (44,4%)	**18 (43,9%)**	13 (31,7%)	9 (47,4%)	4 (44,4%)	7 (17,1%)	10 (24,4%)	2 (10,5%)	1 (11,1%)	4 (9,8%)	4 (9,8%)	0 (0%)	0 (0%)
Grooming	15 (36,6%)	19 (46,3%)	8 (42,1%)	3 (33,3%)	**18 (43,9%)**	17 (41,5%)	10 (52,6%)	5 (55,6%)	8 (19,5%)	5 (12,2%)	1 (5,3%)	1 (11,1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Navigation	18 (43,9%)	20 (48,8%)	9 (47,4%)	4 (44,4%)	15 (36,6%)	14 (34,1%)	9 (47,4%)	4 (44,4%)	7 (17,1%)	6 (14,6%)	1 (5,3%)	1 (11,1%)	1 (2,4%)	0 (0%)	0 (0%)	0 (0%)
Collisions	19 (46,3%)	21 (51,2%)	6 (31,6%)	3 (33,3%)	12 (29,3%)	11 (26,8%)	10 (52,6%)	5 (55,6%)	9 (21,9%)	8 (19,5%)	3 (15,8%)	1 (11,1%)	1 (2,4%)	1 (2,4%)	0 (0%)	0 (0%)
Meals	17 (41,5%)	21 (51,2%)	10 (52,6%)	2 (22,2%)	11 (26,8%)	9 (21,9%)	6 (31,6%)	6 (66,7%)	11 (26,8%)	10 (24,4%)	3 (15,8%)	1 (11,1%)	2 (4,9%)	1 (2,4%)	0 (0%	0 (0%)
Cleaning after meals	16 (39,0%)	20 (48,8%)	10 (52,6%)	2 (22,2%)	12 (29,3%)	9 (21,9%)	5 (26,3%)	6 (66,7%)	9 (21,9%)	10 (24,4%)	4 (21,1%)	1 (11,1%)	4 (9,8%)	2 (4,9%)	0 (0%)	0 (0%)

When comparing the CBS via the KF-NAP scores as seen above during the two-week follow-up and the three-week follow-up there were no participants with severe neglect sub-category scores. During admission most of the participants with neglect (n=21 ;51,2%) experienced mild severity of neglect in the category of limb awareness and the second highest scoring categories were dressing and grooming (n=18; 43,9%).

With the one-week follow-up, limb awareness was still the highest scoring sub category (n=18; 43,9%), followed by grooming (n=17; 41,5%). The two-week follow-up had less participants (n=19), but also showed limb awareness as the highest scoring subcategory (n=11; 57,9%), followed by gaze orientation, grooming and collisions (n=10; 52,6%). There were nine participants during the third-week follow-up, which showed the highest scoring subcategory as meals and cleaning after meals (n=6; 66,7%).

4.3 The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

The results of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention are presented in Table 4-3 below.

Table 4-3 Unilateral neglect scores of participants by using the Two Semi-Structured Scales

	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)
No neglect	11(26,8%)	13 (31,7%)	6 (31,6%)	0 (0%)
Neglect	30 (73,2%)	28 (68,3%)	13 (68,4%)	9 (100%)
Mild severity of neglect (1-10)	17 (41,5%)	18 (43,0%)	12 (63,2%)	8 (88,9%)
Moderate severity of neglect (11-20	11 (26,8%)	9 (21,9%)	1 (5,3,8%)	1 (11,1%)
Severe neglect (21-27)	2 (4,9%)	1 (2,4%)	0 (0%)	0 (0%)

When using the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention 30 participants (73,2%) experienced unilateral neglect to some degree and 11 participants (26,8%) experienced no neglect during admission to the Rehabilitation unit. Most of the participants in this study experienced mild severity of neglect (n=17, 41,5%) at baseline. There were no patients with severe neglect during the two- and three-week follow-up. There is a steady decrease in the scores of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention over the course of the one- and two-week follow-up.

The subcategory scores of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention are presented in Table 4-4.

Table 4-4 Subcategories of the Two Semi-Structured Scales for the duration of this study

	Absent (0)				**Mild (1)**				**Moderate (2)**				**Severe (3)**			
	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)	Baseline (n=41)	One-week (n=41)	Two-week (n=19)	Three-week (n=9)
Tea Serving	19 (46,3%)	19 (46,3%)	7 (36,8%)	3 (33,3%)	13 (31,7%)	14 (34,1%)	11 (57,9%)	5 (55,6%)	7 (17,1%)	7 (17,1%)	1 (5,3%)	1 (11,1%)	2 (4,9%)	1 (2,4%)	0 (0%)	0 (0%)
Card dealing	19 (46,3%)	21 (51,2%)	8 (41,1%)	3 (33,3%)	11 (26,8%)	11 (26,8%)	10 (52,7%)	5 (55,6%)	10 (24,4%)	8 (19,5%)	1 (5,3%)	1 (11,1%)	1 (2,4%)	1 (2,4%)	0 (0%)	0 (0%)
Picture description 1	17 (41,5%)	20 (48,8%)	12 (63,2%)	5 (55,6%)	14 (34,1%)	15 (36,6%)	6 (31,6%)	3 (33,3%)	9 (21,9%)	5 (12,1%)	1 (5,3%)	1 (11,1%)	1 (2,4%)	1 (2,4%)	0 (0%)	0 (0%)
Picture description 2	15 (36,6%)	17 (41,5%)	12 (63,2%)	4 (44,4%)	14 (34,1%)	17 (41,5%)	6 (31,6%)	4 (44,4%)	10 (24,4%)	5 (12,1%)	1 (5,3%)	1 (11,1%)	2 (4,9%)	2 (4,9%)	0 (0%)	0 (0%)
Picture description 3	13 (31,7%)	14 (34,1%)	7 (36,8%)	1 (11,1%)	12 (29,3%)	14 (34,1%)	11 (57,9%)	7 (77,8%)	10 (24,4%)	8 (19,5%)	1 (5,3%)	1 (11,1%)	6 (14,6%)	5 (12,1%)	0 (0%)	0 (0%)
Environmental description	14 (34,1%)	15 (36,6%)	8 (42,1%)	3 (33,3%)	**18 (43,9%)**	21 (51,2%)	10 (52,7%)	4 (44,4%)	6 (14,6%)	3 (7,3%)	1 (5,3%)	2 (22,2%)	3 (7,3%)	2 (4,9%)	0 (0%)	0 (0%)
Comb hair	16 (39,0%)	18 (43,9%)	9 (47,4%)	3 (33,3%)	16 (39,0%)	18 (43,9%)	9 (47,4%)	5 (55,6%)	8 (19,5%)	5 (12,1%)	1 (5,3%)	1 (11,1%)	1 (2,4%)	0 (0%)	0 (0%)	0 (0%)
Groom	14 (34,1%)	17 (41,5%)	8 (42,1%)	2 (22,2%)	**17 (41,5%)**	17 (41,5%)	10 (52,7%)	6 (66,7%)	9 (21,9%)	6 (14,6%)	1 (5,3%)	1 (11,1%)	1 (2,4%)	0 (0%)	0 (0%)	0 (0%)
Glasses	26 (63,4%)	27 (65,8%)	13 (68,4%)	5 (55,6%)	9 (21,9%	10 (24,4%)	5 (26,3%)	3 (33,3%)	6 (14,6%)	4 (9,8%)	1 (5,3%)	1 (11,1%)	0 (0%)	0 (0%)	0 (0%	0 (0%)

On admission and during the one-week follow-up there were participants who experienced severe neglect, however there were no participants who experienced severe neglect during the two-week and three-week follow-up.

The highest scoring subcategory for participants experiencing neglect during admission was the environmental description (n=18; 43,9%), followed by grooming (n=17; 41,5%). During the one-week follow-up the highest scoring category was also the environmental description (n=21; 51,2%), followed by hair combing (n=18; 43,9%). During the two-week follow-up the highest scoring subcategories were tea serving and picture description (n=10; 52,7%) and with the three-week follow-up the highest scoring subcategory was picture description (n=7; 77,8%), followed by grooming (n=6; 66,7%).

4.4 Comparison between the two outcome measures:

The mean scores of the two outcome measures over the four-week period are presented in Table 4-5.

Table 4-5 The mean scores of the outcome measures over the four-week period

	Baseline **Mean (SD)**	**One-week follow-up Mean (SD)**	**Two-week follow-up Mean (SD)**	**Three-week follow-up Mean (SD)**
CBS via the KF-NAP/30	8,5 (±7.5)	7,1 (±7,0)	5,9 (±5.3)	6,6 (±4,5)
Two Semi-Structured Scales/27	8,0 (±7,1)	6,9 (±6,5)	5,1 (±4,7)	6,7 (±4,5)

SD: Standard deviation

As seen in the table above there was a steady decrease in mean scores of the CBS via the KF-NAP as well as the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention from baseline to the two-week follow-up.

Table 4-5 is put into a graph in Figure 4-5, to show how the mean score of the two outcome measures has changed over the duration of the study.

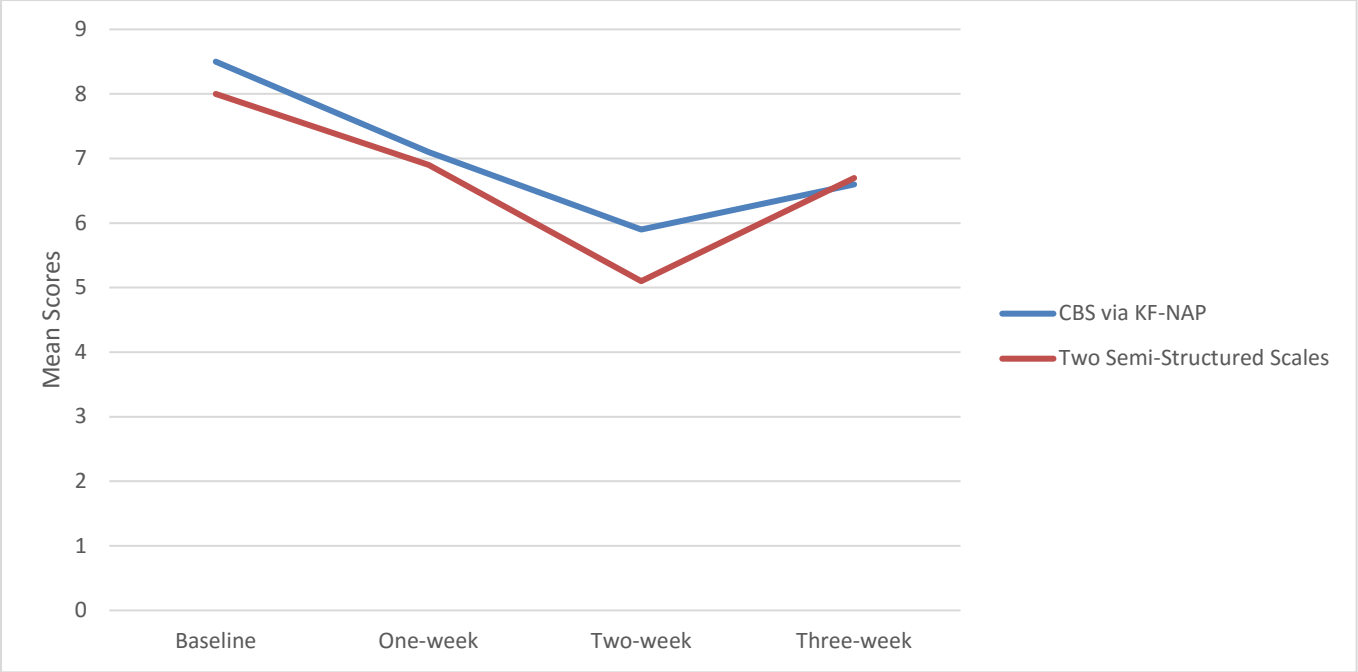


Figure 4-5 The mean scores of the outcome measures over the four-week time period

When comparing the CBS via the KF-NAP to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention it can be seen that both scales show a steady decrease in scores from the first week to the third week, with a slight increase toward week four. The CBS via the KF-NAP, as shown by the light blue line, starts slightly higher, where the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention, shown by the darker blue line, is slightly lower. This graph shows that the unilateral neglect detection rate is slightly higher in the CBS via the KF-NAP, compared to the Two Semi-Structured Scales. The two lines show the same trajectory when using the mixed model, when comparing the mean score over the four-week hospital stay (Figure 4-5). The p-value comparing mean scores of the two outcome measures is 0,308 which shows that statistically there was no difference when comparing the two outcome measures. The p-value for the time period of the 4 weeks was <0,001, which shows that there was a statistically significant change in the scores over the course of the study.

4.5 Differences in data collection process between The CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

Some of the differences while comparing the two outcome measures were that the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention took about 20 minutes to be administered compared to the CBS via the KF-NAP which took 10-15 minutes. The patients struggled more with the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention with regards to the picture description category. The participants found it difficult to describe Tissot's painting titled: The dance on the ship, which could be because this painting is quite far from this population's frame of reference. It was slightly easier to administer the CBS via the KF-NAP and there was less setup required. The CBS via the KF-NAP also had specific instructions with regards to the implementation and interpretation of findings. The CBS via the KF-NAP could be used on all patients, even the patients with severe speech impairments, as the patients do not have to describe any content, whereas due to the Two Semi-Structured Scales for Functional Evaluation of

Hemi-inattention some patients could not be used in this study as they had to describe different pictures as well as the environment surrounding them.

4.6 Conclusion of the results

The CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were able to determine that hemi-neglect was present in patients in the Rehabilitation unit. Over the period of admission to the Rehabilitation unit, there were definite changes in the scores of the severity of hemi-neglect from admission to discharge with a decrease of neglect over time. The CBS and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were able to detect these changes over time and were both seen as responsive outcome measures. There were no statistically significant differences when comparing the responsiveness of the two outcome measures: the p-value was 0,308 (which is >0,05) which shows that statistically there was no differences when comparing the two scales. The CBS via the KF-NAP was however easier and quicker to administer compared to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention.

CHAPTER 5: DISCUSSION

The aim of this study was to compare the CBS via the KF-NAP to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention when measuring unilateral neglect in adult patients following a stroke in a neurological rehabilitation unit.

Chapter 5 will discuss the main findings of the research and the comparison between the different outcome measures.

5.1 Participants

The sample size for this study was 41 patients who were admitted to Witrand Hospital over the data collection period. Forty-four participants were originally recruited, but 3 participants were not included in this study due to severe speech impairments. The participants had a mean age of 54 years (±15,5 years), this is similar to a study done by Azouvi et al. (2003) where 83 participants were recruited with a mean age of 54,5 years (±15,9). Goedert et al. (2012) recruited 51 patients and the mean age of participants in this study was 57 years (±8) and in a study by Beis, et al. (2004) 78 participants were recruited, and the mean age was 54,6 years (±15,7). Kenneth et al. (2007) recruited 54 participants; the mean age of the participants was 69.7 (±10.5) years. Nishida et al. (2021) recruited 23 patients for the CBS group and 22 participants for the KF-NAP group, the mean age of the CBS group was 64,4 years (±12,2) and the mean age of the KF-NAP group was 65,4 years (±13,5). The participants in the current study are thus comparable to these other studies in sample size and age.

The participants in this study were predominantly female (n=28, 68,3%) and when comparing these findings to other studies, Beis et al. (2004) had 58.9% male participants and Kenneth et al. (2007) had thirty-four (63%) male participants. Nishida et al. (2021) recruited 17 male participants (73,9%) and six female participants (26,1%) in the CBS group and there were 17 males (77,3%) and five females (22,7%) in the KF-NAP group. The reason why the study participants were predominantly female in this study, could be due to the fact that more females are affected by stroke in South Africa. According to the Southern Africa Stroke Prevention Initiative (2004) 66 of their participants were female stroke survivors compared to only 37 males.

Participants in this study diagnosed with right hemisphere stroke made up 41,4% (n=17) of the population and 49% (n=20) of the participants were diagnosed with strokes affecting the left hemisphere of the brain. These findings are in line with the literature which showed left-hemispheric strokes were more common (54%) than right-hemispheric strokes (46%) (Hedna et al., 2013).

In this study the most common stroke was an ischaemic stroke (n= 31; 75,6%) compared to 14,6% (n=6) of participants experiencing haemorrhagic stroke. When comparing these findings to previous studies, Beis et al. (2004) reported 69,3% of their population had ischaemic stroke, Azouvi et al. (2003) reported that 55,4% of their cases were ischaemic stroke and Nishida et al. (2021) mentioned that 65,2% of their participants had ischaemic stroke. When looking at global statistics, it is indicated that ischaemic stroke constitutes the largest proportion of all new strokes, followed by intracerebral haemorrhage and subarachnoid haemorrhage (Global

Burden of Diseases, Injuries and Risk Factors Study, 2021). This comparison between these studies indicates that ischaemic stroke is the most common type of stroke and the participants in this study are thus a reflection of a typical stroke population.

5.2. Unilateral neglect scores of study participants

5.2.1. The CBS via the KF-NAP

The Catherine Bergego Scale via the KF-NAP was used to determine presence of unilateral neglect and it was established that on admission the majority of the participants experienced neglect (n=34, 82,9%). The neglect varied in severity and most of the participants experienced only a mild severity of neglect (n=22, 53,7%), followed by moderate severity of neglect (n=9, 21,9%). Nishida et al. (2021) determined that the KF-NAP diagnosed neglect in 63,6% of their participants and Chen et al. (2015) reported that 67,8% of their participants had spatial neglect when using the KF-NAP. Thus, in this study, the percentage of patients who experienced neglect, was slightly higher when being compared to other studies that were previously done. This could be due to the fact that the other studies had participants scoring higher in the moderate to severe categories, compared to the participants in this study that have mostly mild severity of neglect.

Limb awareness was the highest scoring sub-category on admission (n=21; 51,2%) and throughout the study. The reason for the limb awareness scoring the highest could be because it was observed that a considerable number of patients will forget about their limb throughout the session, whether it was during ADLs, eating or with propelling the wheelchair.

5.2.2. The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention determined that 30 of the participants (73,2%) experienced hemi-neglect to some degree on admission to Witrand Hospital. The total mean score on admission was 8,0 (±7,1) and this score is comparable to scores mentioned by van Kessel, et al. (2013).

The highest scoring sub-categories of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention was the environmental description (n=18; 43,9%) and grooming (n=17; 41,5%). reason the participants scored high in the environmental description could be due to the fact that it is an unknown environment for them in the hospital, the grooming could have scored high due to the fact that they did not always understand what the instrument is that is given to them and the picture description scored high, because some of the pictures used in this scale are outdated and not used frequently in their frame of reference.

5.2.3 Comparing the CBS to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention

As seen in this study, the unilateral neglect scores were lower at discharge compared to higher scores during admission. More participants experienced severe neglect during admission, these scores decreased weekly and by the last week 0 participants (0%) experienced severe neglect. Chen et al. (2015) also reported a

decrease in neglect scores from admission to discharge. This study seems to follow the same trend as Chen et al. (2015).

The CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were both able to determine whether hemi-neglect is present in an individual. The CBS via the KF-NAP has a slightly higher unilateral neglect detection rate when compared to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. This could also be due to the CBS via the KF-NAP being scored out of a possible 30 points and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention having a total score of 27. Both of these outcome measures also test neglect in special areas, such as personal or extra-personal space and both these outcome measures do not differentiate whether neglect is due to sensory or motor neglect.

The CBS via the KF-NAP measures the participant's functioning in 10 activities of daily living, such as grooming, eating, dressing, wheelchair driving, mouth cleaning, gaze orientation, limb awareness, auditory attention, spatial orientation and finding personal belongings. The Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention looked at items such as serving tea, dealing cards to four people sitting round a square table, describing three complex pictures, and describing a room, as well as ADLs such as hair combing, shaving and putting glasses on.

In this study there was also a steady decrease in the mean score values from baseline to the two-week follow-up, with a slight increase at the three-week follow-up, but this score was still lower than on admission. In a study done by van Kessel et al. (2013) the mean scores for admission were higher than the scores on discharge. This study is thus comparable to other studies when looking at the downward trend of the mean scores from admission to discharge.

The unilateral neglect detection rate of the CBS via the KF-NAP was slightly higher than that of the Two Semi-Structured Scales for Hemi-inattention as seen in Figure 4-5. In the study by Nishida et al. (2021) the KF-NAP detection rate was also higher than the measure they compared it against, the BIT. The BIT measured in neglect in 22,7% of the participants in the study compared to the CBS that measured neglect to some extent in 63,6% of the participants. The CBS via the KF-NAP has a lot of functional items and also requires a lot of observation when the participants are performing ADLs (Chen et al., 2012), this could be the reason for the higher detection rate.

When looking at the sub-categories, one of the categories of the CBS via the KF-NAP that the participants scored higher in during admission, was the limb awareness, with 32 participants (78,0%) forgetting about their limbs at some time during a session, which could be due to sensory or motor impairment. This limb awareness category continued to score slightly higher compared to the others throughout the study. With the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention, the sub-categories that participants scored higher in, were the picture descriptive categories. This could be because the participants

struggled to understand some of the pictures such as Tissot's painting titled: The dance on the ship. This could be due to the painting being outdated and not fitting in to this patient population's frame of reference.

In this study, as mentioned above, there was a difference in the weekly unilateral neglect scores when looking at the CBS via the KF-NAP as well as the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. These scores showed a definite change and steady decrease, with this it is seen that both outcome measures were able to detect change in unilateral neglect over a period of time, making both these outcome measures responsive when testing unilateral neglect. When comparing these two outcome measures in terms of responsiveness, there was no statistically significant differences between the two outcome measures, thus concluding that either of these outcome measures are responsive when measuring unilateral neglect in patients following a stroke in an in-patient rehabilitation setting. The CBS via the KF-NAP scores were however slightly higher compared to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention, which indicated that the CBS via the KF-NAP detected more people with unilateral neglect.

There was a slight increase in participants experiencing neglect compared to those experiencing no neglect by week-four. This is because all of the participants who were in hospital by week four experienced neglect, which increased the mean scores. This could be due to the fact that the participants who were kept in hospital so long had more severe neglect compared to those who were discharged sooner. These participants have significant impairments and decreased functionality and are therefore kept longer to attempt to improve their functionality, since unilateral neglect increases length of stay in hospital. Chen, Hrera et al. (2015) mentions that average length of stay were ten days longer in participants with unilateral neglect.

Both of these outcome measures can be used in a rehabilitation setting in South Africa, however the CBS via the KF-NAP is the recommended outcome measure. The CBS via the KF-NAP was easier to administer and easier for the patients to understand. The CBS via the KF-NAP provided less challenges with regards to the patient understanding and if the patient had speech impairments if compared to the Two Semi-Structured Scales for Hemi-inattention.

5.3 Conclusion of the discussion

The study has compared the responsiveness of the CBS via the KF-NAP to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention and found no statistically significant difference between the two outcome measures with regards to the responsiveness. This means that either of these scales can be effectively used to determine changes in unilateral neglect in patients over a period of time. There was a steady decrease in the mean scores of both the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention from admission to discharge. Both the different outcome measures followed this trend.

The recommended outcome measure to use is the CBS via the KF-NAP. This is because it is faster and easier for all participants to understand, it also does not exclude participants due to severe speech impairments.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

6.1 Conclusions

The aim of this study was to compare the CBS to the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention when measuring unilateral neglect in adult patients following a stroke in a neurological rehabilitation unit. Objective one was to assess unilateral neglect in adult patients following a stroke by using the CBS via the KF-NAP. Objective two was to assess unilateral neglect in adult patients following a stroke by using Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. Objective three was to determine the responsiveness of the CBS in measuring unilateral neglect in an inpatient rehabilitation unit. Objective four was to determine the responsiveness of the Two Semi-structured Scales for Functional Evaluation of Hemi-inattention in measuring unilateral neglect in an inpatient rehabilitation unit. Objective five was to compare the responsiveness of the CBS via the KF-NAP to the responsiveness of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention.

It was determined that the CBS via the KF-NAP or the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention could be used to determine whether a patient is experiencing hemi-neglect. The detection rate of the CBS via the KF-NAP was slightly higher in comparison to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention.

During this study both the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were able to detect changes in the patients' unilateral neglect from admission in hospital to discharge, which shows that both these outcome measures are responsive. It was also seen that both these outcome measures experience a steady decrease in mean scores over the period of the study and the scores followed more or less the same trend.

There was no statistically significant difference in the responsiveness of the CBS via the KF-NAP when being compared to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention. This showed that both measures can be used to detect changes in a patients' unilateral neglect in an in-patient hospital setting. During the study there were some differences in the testing of the different outcome measures. The CBS via the KF-NAP could be used on all patients, even the patients with severe speech impairments, as the patients do not have to describe any content, whereas due to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention some patients could not be used in this study as they had to describe different pictures as well as the environment surrounding them, which could not be done due to their speech impairment. The CBS via the KF-NAP was also quicker to use than the two semi-structured scales for functional evaluation of hemi-inattention and required less setup and more observation. In this specific setting, some of the tasks of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention were difficult for some of the patients, as they struggled to describe Tissot's painting titled: The dance on the ship, which could be because this painting is quite far from this population's frame of reference.

6.2 Strengths of this study

This study was able to complete the objectives which were measuring unilateral neglect by using the CBS via the KF-NAP and the Two Semi-Structured Scales for Functional Evaluation of Hemi-neglect, as well as measuring the responsiveness of these outcome measures and comparing the responsiveness of these measures.

The two outcome measures were alternated, where one was used first for two consecutive days and then the other was used for two consecutive days. This ensured that the one researcher administering the outcome measures would not influence the results. This was done to ensure that participants don't perform better in the one measure and then worse in the next measure due to fatigue for example. This was also done to make it easier for the researcher with regard to setup.

6.3 Limitations of this study

During this study, even though the researcher managed to collect data and reach the estimated sample size, there was the possibility of collecting more data from a bigger sample size.

The participants were also recruited from a single hospital and we acknowledge that this might have affected the outcomes generated in this study and this also limited the extent of generalization with regards to the clinimetric properties of the outcome measures used to assess the unilateral neglect.

During this study there was only one researcher to administer the outcome measures, which could have affected the results of this study, but as mentioned in the strengths of this study, this was addressed.

The big difference in the study population from baseline to the two-and three-week follow-up also made it very difficult to make comparisons between these weeks, which could have had an affect on the study results, such as the mean score rising during the three-week follow-up.

6.4 Clinical Recommendations

There are a few notable clinical recommendations that arose from this study. Firstly, it is important to measure unilateral neglect in a clinical setting. Some of the patients did not seem to have unilateral neglect, but upon testing it was noted. This will influence the rehabilitation the patient will receive. Secondly, it is recommended that the CBS via the KF-NAP be used in a clinical setting, this measure is quick and easy to use and it mostly uses observation, so this measure can be used for all patients, even if severe speech impairments are present. It also has specific ways in which to measure for unilateral neglect and how to interpret the findings. This would standardise the manner in which unilateral neglect is tested among therapists in an in-patient rehabilitation setting.

6.5 Recommendations for Future Studies

It is recommended that more research be done around this topic in future to include more rehabilitation hospitals in more provinces around South Africa to determine whether these results are representative of the broader rehabilitative community with regard to stroke survivors experiencing unilateral neglect.

In this study all outcome measures used only tested personal, peri-personal and extra-personal neglect, but were unable to determine whether this was from sensory or motor neglect, thus in future it is recommended to develop outcome measures to determine whether it is sensory or motor neglect, to be able to adequately adjust treatment plans.

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Appendix A: KF-NAP

II. INSTRUCTIONS

In this manual, we provide instructions for assessing ***left-sided*** spatial neglect, commonly occurring after right brain damage. However, you may use the same principles to assess ***right-sided*** neglect, commonly occurring after left brain damage. The scoring sheet is applicable to both left and right-sided spatial neglect.

1. ***Gaze Orientation*** -- *observe throughout the entire session*

   Before you start this assessment, make sure that the patient does not have any deficits that critically impair eye movement. If you do determine such deficits, you will be unable to perform this assessment, and you need to make a note on the scoring sheet.

   Throughout the entire session, observe how the patient spontaneously shifts his/her gaze. Observe how he/she explores the space.

   Does the patient move his/her head when you are talking? Does the patient look toward you with his/her eyes? Does the patient look around the room?

   Take notes of how much time the patient is engaged in exploring both the left and the right sides of the space.

   Score Assignment

   Score = 3 The patient is easily able to direct his gaze toward the right side of space but does not attempt to orient the eyes toward the left side.

   Score = 2 There are constant and clear asymmetries in the gaze direction toward the left and right sides of space. The patient explores the environment by looking toward the right first, and after a long delay, slowly looks toward the left. During the entire session, the patient spends much more time looking to his right side.

   Score = 1 There are inconsistent but observable asymmetries in the gaze direction toward the left and right sides of space. The patient explores an environment by looking toward the right first, and then slowly toward the left with some hesitation. During the entire session, the patient looks toward the right more often than the left.

   Score = 0 The patient spontaneously directs his/her gaze toward the right and left sides of space without hesitation and without any prompting.

2. ***Limb Awareness*** *-- observe throughout the entire session*

Depending on the activity being assessed, the term limb or limbs can refer to either the upper or lower extremities, or both.

Because of the right-brain stroke, patients may have significant weakness in their left arm and leg. However, this does not mean all stroke patients neglect their weak arms or legs. If that is the case, you may then see the patient passively straighten out the fingers of the left hand to avoid cramping or discomfort. The same may be observed for the left leg as well because attention to left limbs is normal.

Score Assignment

Score = 3 The patient completely ignores the left limbs and never attempts, with the assistance of the right hand, to move the left arm or and leg, or verbally acknowledge any discomfort in the left arm and leg. You cannot observe any spontaneous caring for the left limbs.

Score = 2 Time spent in caring for the left limbs is short with incomplete performance. For example, during the entire session, he/she cares for his/her left arm once, by moving it over to the arm rest, but for the rest of the session, he/she does not care much for it and lets it accidentally hang outside the chair. Another example is when asked to wash his/her hands, he/she does not wash his/her left hand or only wash it incidentally. Or you may think of the entire session in a continuous time period. If the patient takes care of his/her left limbs only one third of time, you give him/her a score of 2.

Score = 1 … If the patient takes care of his/her left limbs two thirds of time, you give him/her a score of 1.

Score = 0 The patient pays attention and cares for his/her left limbs or as much as he/she does for his/her right limbs. The patient receives a score of 0, even if he/she complains of difficulty in moving the left limbs and may even ask for help, because it means he/she does pay attention to the left limbs.

3. ***Auditory Attention*** *-- observe when making loud noise*

Make sure that the patient does not have a severe hearing loss in both ears. Such bilateral hearing deficit makes it difficult to hear anything at all, and you will be unable to assess this category. Be sure to note the hearing loss on the scoring sheet. However, even with loss of hearing in one ear, you can still perform the assessment because impairment in one ear does not necessarily impair the ability to locate the source of a sound.

To observe this category, make sure to be out of the patient's sightlines, and then, without warning, make a loud noise to the patient's right or left side. You can drop an object, like a trash can, or clap loudly. Do it once to the right side. Do it again to the left side later in the session.

Observe whether the patient shows any immediate reaction. An immediate reaction can be a startle reaction like blinking or wincing. Another example could be a quick turn of the head toward the location of the sound.

Score Assignment

Score = 3 The patient shows an immediate reaction to the sound from the right side but no reaction from the left side at all.

Score = 2 The patient shows an immediate reaction to the sound from the right side, but the reaction to the sound from the left is inadequate and incorrect. For example, the patient may state that he/she heard something but is not able to identify the location of the noise that was made on his/her left side. Or he/she shifts his/her eye, head, or body to his/her right when the noise is actually coming from the left.

Score = 1 The patient immediately reacts to the sound from the right correctly but takes an observably longer time or hesitates to the sound from the left.

Score = 0 All the reactions observed are correct and immediate on both left and right sides.

4. ***Personal Belongings*** *-- observe by asking for locations of 3 personal belongings on patient's right, and 3 on patient's left*

   An object can be considered as "personal belonging" for the purpose of this assessment only if it is almost always kept at a certain location by the patient. For example, if the patient always hangs his coat in a specific closet. Another example could be the reading glasses are always in a specific drawer, or the flowers are always by the window. Observe if the patient can tell you where the personal objects are located. He/she may answer you verbally or point to the location. Personal belongings are objects that are used by the patient regularly and are likely to stay in the same location. These objects may include a handbag, eye glasses, toothbrush, picture frames, clothing, flowers, greeting cards, and so on.

   When observing this category, do not hide or arrange the objects for the patient to find. The preferred locations for these objects should be determined by the patient, whether conducted at a facility or the patient's home.

   Make sure you ask for the same number of objects on the patient's left and right sides. We suggest you ask 3 or 6 objects on each side in order to make it easy for you to determine which score to assign to the patient. If there are a limited number of objects, you may ask for the same objects later in the session when the patient's position relative to the object has changed. For example, at the beginning of the session, the patient was facing the door, with toothbrush and reading glasses on the left and sweater on the right. Later in the session, when the patient has turned around, the relationship to the objects is reversed: the sweater is now on the left, and toothbrush and reading glasses are on the patient's right.

   In asking the patient to locate these objects, it is important not to phrase your question in such a way that shows spatial bias. For example, rather than saying "*Can you tell me whether your glasses are on your right or on your left?*" you should say "*I can't find your reading glasses. Can you tell me where they are?*"

   As part of your observation, you can take note of how the patient looks around to locate the object and explore their environment. You may notice that the patient moves his or her eyes toward one side or keeps their head positioned to the right side. Such observations could then provide additional information to better score "Gaze Orientation." As the part of the Personal Belongings assessment, you can ask the patient to locate his or her coat and then move on to the "Dressing" category.

Score Assignment

Score = 3 The patient always locates and points to the objects on his/her right side but fails to locate any object on the left side.

Score = 2 The patient always locates and points to the objects on his/her right side but fails to locate two-thirds of the objects on the left side.

Score = 1 The patient always locates and points to the objects on his/her right side but fails to locate and point to one-third of the objects on the left side.

Score = 0 The patient does not hesitate to locate and point toward all objects on the right and left side.

5. ***Dressing*** -- *observe by asking patient to put on an open-front shirt or coat*

Use an open-front shirt or a button-down coat in this assessment. You can say to the patient *"Would you please put this on?"* Or you can say *"Show me how you would put this on."*

Observe how the patient goes about the task. Look for differences in performance on the left and right sides of the body.

Score Assignment

Score = 3 The patient only attempts to dress the right arm, and completely ignores the left, making no attempt to put the left arm through the sleeve, and does not acknowledge a need for help.

Score = 2 The patient does not acknowledge a need for help. He/she starts by putting his/her right arm in the sleeve and continues to the left. However, he/she spends significantly less time in dressing his/her left arm, and the shirt is very messy on the left side. In the end, the performance on the left side is incomplete and ineffective

Score = 1 The difference between a score of 1 and 2 is a matter of degree. In assigning a score of 1, the patient, again, does not acknowledge a need for help. He/she may first attend to his/her right side, putting his/her right arm in the sleeve and eventually with some hesitation, work the left arm into its sleeve as well. In the end, the patient is able to put on the shirt, but the left side is not completely pulled down or does not appear as nicely as the right side. The patient does not acknowledge a need for help.

Score = 0 The patient asks for help with the left side of the body, and is paying attention to his/her left arm by trying hard to complete the task on the left side.

This may be confusing. Why might you give a score of 0 to someone who is unable to complete the task? That's because you are not assessing the ability to dress but rather the awareness of the disability. This is important. If the patient is physically unable to put on the shirt over the left shoulder or onto the left arm, but is aware of their disability and asks for help, then it indicates that the patient does not neglect the left arm during the dressing activity. If asked, go ahead and give some assistance

6. ***Grooming*** *-- Observe by asking patient to perform 3 grooming tasks*

This category will be assessed by a sink and the mirror over the sink. Usually, they are located in the hospital room you are already in, or the bathroom in the patient's home. If the bathroom or sink is in another room, you may assess "Navigation" and "Collisions" prior to "Grooming."

If you're at the patient's home during this grooming observation, you can also ask the patient to search for personal belongings in their own bathroom – a toothbrush, towel, comb and so on. This will help you in scoring "Personal Belongings". However, DO NOT assess "Personal Belongings" while observing "Grooming" if the assessment does not take place at the patient's home. In other settings such as a clinic or hospital, it is likely that toiletries will be moved about without the patient's awareness.

During grooming, you can also ask patients to wash their hands and observe if they take care of both hands or ignore the left or the right hand. This will help the observation of "Limb Awareness".

Alright, let's focus on "Grooming" now. In assessing spatial neglect in grooming activities, you will need some supplies such as a comb, a hair brush, soap, cloth or paper towels. If applicable, you can provide an electric shaver. However, if the bathroom or any sink is not accessible like in an outpatient examination room, you should set up the environment to accommodate the grooming tasks. For more information, see "KF-NAP™ Examiner's Kit".

We suggest that you ask the patient to perform 3 grooming tasks before assigning a score. You can ask the patient to wash his/her face, to wipe clean and dry his/her face, and to comb or brush his/her hair.

Score Assignment

Score = 3 In all three tasks, the patient only pays attention to the right and always ignores the left side.

Score = 2 The patient always takes care of the right side first, and miss the left side in at least one of the tasks.

Score = 1 The patient completes all three tasks in a satisfactory manner. He/she always takes care of the right side first, and spends significantly shorter time and puts in less effort on the left.

Score = 0 The patient completes all three tasks with no apparent left-right asymmetry.

7. ***Navigation*** *-- Observe by asking patient directions to a familiar place, with equal numbers of left and right turns*

Before observing "Navigation", make sure that the functional level of the patient is known. Consult with the therapy team, the doctor or family members to determine the extent of the patient's mobility. If you are not trained in how to ambulate or transfer a person who may need help, please ask for proper assistance.

Ask the patient to find his way to a familiar place. The patient may be walking or wheelchair-bound. In the inpatient setting, it is likely that the patient has to stay in the wheelchair. Depending on the facility policy or patient's physical condition, he may walk with or without assistance, or he may use the wheelchair by hand or by foot. You can always push the patient's wheelchair while he directs you to the familiar location. He can direct you by hand gestures and oral suggestions.

If there is plenty of space navigating in the patient's room, you can ask him to navigate to the bathroom or the sink as a transition to "Grooming" assessment. When grooming activities are over, you can ask him to navigate back to the bed. But it is better to choose a location outside the patient's room, so that you can observe the ability of navigation better. Familiar location beyond the patient's room can be the cafeteria or therapy gym. You can say "Can you take me to the therapy gym?"

It is best if this location requires an equal number of "right" and "left-turn" options. When there are a limited number of turns on the route, you may ask the patient to find the way to the destination, and then back to the original location. It is best if the distance traveled between locations is far enough to determine if there is a deficit in spatial awareness.

Score Assignment

Score = 3 The patient only tries to do right turns to get to the final destination. The patient usually is unable to reach the final destination.

Score = 2 The patient makes more right turns than necessary and only turns left when there is no other option. At a left turn, he/she may hesitate for several seconds or more, and may take a longer route than necessary because of a preference to turn right. In the end, the patient may not be able to reach the final destination.

Score = 1 The patient makes more right turns than necessary and some left turns to get to the final destination. He/she hesitates at left turns and may take a longer route than necessary because of a preference to turn right. In the end, the patient may be able to reach the final destination..

Score = 0 The patient employs approximately an equal number of left and right turns to get to the final location. He/she is able to reach the final destination correctly.

8. ***Collisions*** -- *observe when patient moves from one location to another by him/herself*

   The objective of this assessment is to determine whether the patient can navigate in the environment without colliding with an object.

   What about veering when patients are supposed to walk straight? Veering and collisions are different. Patients with spatial neglect can veer right or left when they are supposed to walk straight. Therefore, veering is not the best way to determine if patients neglect one side or the other. However, colliding with an object usually occurs on the left side, the side where patients pay little attention to.

   So we are focusing on the observation of collisions. If the patient has a cardiac deficit, or cannot walk even with an assistance device, or cannot use a wheelchair, and is unable to push the wheelchair independently, then mark this category on the scoring sheet as "n/a" for "not applicable" and write down the reason.

   Collisions are most likely to be observed when the patient makes a left or right turn. Collisions are also likely to be observed when there are objects along a straight path. You can strategically place items along the path of the patient. It is important that an equal number of these obstacles be placed on the right and left sides of the patient.

   If, at any time during the observation, the patient places himself in harm's way, and is in obvious and immediate danger of crashing into a wall or piece of furniture, please step in and prevent that from happening. If it is obvious to you that a collision would have taken place without your help, you can record the incident as a collision as part of this assessment.

Score Assignment

Score = 3 The patient bumps into objects or walls on the left side with almost every turn and movement.

Score = 2 The patient bumps into objects or walls on the left side frequently and much more often than items on the right side.

Score = 1 The patient bumps into objects or walls on the left side infrequently, but more often than into items on the right side.

Score = 0 The patient does not collide into any objects along the path.

9. ***Meals*** -- *observe when patient is having a meal*

The following categories "Meals" and "Cleaning after Meals" can be observed at the same time. In this category of Meals, you'll observe and assess the patient's attempt to eat a meal or large snack. However, you are not assessing ability to chew or swallow, which also may be impaired. You are assessing how the patient locates items on the tray.

Make sure to prepare and arrange items on the food tray before presenting it to the patient. All the related items, the food, the utensils, the spices, the coffee and creamer should be organized on the tray in a conventional manner. However, it must be as symmetrical as possible.

We recommend that you observe this category during the actual meal time if it is the inpatient rehabilitation setting. If the setting is a clinic, you may ask the patient or their caregiver to bring in food items. If the patient only brings a snack, you should have extra plates, utensils and even additional food on hand to provide an adequate number of items for the assessment.

In this tutorial, we focus on the inpatient setting. You can sit down and carry casual conversations with the patient while he is having a meal like breakfast or lunch. When the patient is asking you for a certain item, you should give an unbiased response. For example, you may observe that the patient looks around to locate a particular item on the tray. These observations will help in scoring "Gaze Orientation". If the patient takes a long pause and stops eating, it is permissible for you to ask "Are you finished or would you like something else?"

Score Assignment

Score = 3 The patient eats food only on the right side and is unable to find items on the left. For example, he/she asks for coffee despite it being on the tray. Once told that coffee is on the tray, he/she remains unable to look toward the left or find it.

Score = 2 The patient eats food mainly on the right side and rarely eats food on the left side. The patient searches food or other items from right to left, but he/she has a hard time finding items on the tray. He/she does not always find items on the left.

Score = 1 The patient eats food mainly from the right side of the array and hesitates to have food on the left side. The patient searches food or other items from right to left.

Score = 0 The patient finds/eats food on his/her right and left sides without any difficulty or observable asymmetry. He/she is able to find, touch or acknowledge all the items on the plate and on the tray.

10. Cleaning after Meals *-- observe when patient is having a meal and at the end of a meal*

You will observe whether the patient wipes and cleans both sides of their mouth spontaneously during and after a meal.

Score Assignment

Score = 3 The patient only wipes and cleans the right side of his/her mouth. During the meal, the patient rarely perceives the need to wipe his/her mouth, and some food could remain on the left corner of the mouth both during and after the meal.

Score = 2 The patient wipes and cleans the right side of his/her mouth, but shows an incomplete and ineffective effort in cleaning the left side. The patient wipes the left side of the mouth a few times, but as many times or as thoroughly as he/she does on the right side. At the end of the meal, there may be food at the left corner of his/her mouth.

The difference between scores of 1 and 2 is a matter of degree. If quantifying it, for the score of 2, the patient wipes the right side roughly 3 times more often than the left, and …

Score = 1 the patient wipes the right side 2 times more often than the left. The left side, if wiped, is not as clean as the right.

Score = 0 The patient cleans both the right and left sides of his/her mouth during and after the meal, and leaves no food on or around the mouth.

KF-NAP™ Scoring Sheet

Date:_____ Name of Examinee:_____

Time:_____ am/pm Examiner(s):_____

Kessler Foundation Neglect Assessment Process (KF-NAP™)

How to use the Catherine Bergego Scale to assess spatial neglect

	Category	0 no neglect	1 mild neglect	2 moderate neglect	3 severe neglect	NA (provide reasons)
1	Gaze orientation					
2	Limb awareness					
3	Auditory attention					
4	Personal belongings					
5	Dressing					
6	Grooming					
7	Navigation					
8	Collisions					
9	Meals					
10	Cleaning after meals					

Neglected side (circle one): ***left-sided*** spatial neglect ***right-sided*** spatial neglect

Sum of assigned scores:_____ x 10 = **Final score** _____

Number of scored categories:

Neglect severity (circle one): **Absent** (0); **Mild** (1-10); **Moderate** (11-20); **Severe** (21-30)

Notes

- See the *KF-NAP™ 2015 Manual* for detailed instructions of each category.
- It is recommended that the KF-NAP™ be administered by trained individuals only. The KF-NAP™ may help clinicians to make a diagnosis related to spatial neglect. The Kessler Foundation is not responsible for a clinical diagnosis.

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The Semi-strucured Scale for the Functional Evaluation of Extrapersonal Neglect. This comprises four subscales:

1. Serving tea. The patient is brought to a table on which there is a tray containing four cups and saucers, a teapot, a sugar bowl, teaspoons, and paper napkins. The three examiners are seated, respectively, on the right, in front of, and on the left of the patient who is requested to serve tea for him/herself and for those who are with him/her, to distribute napkins and teaspoons, and also to serve the sugar. The examiner, who is seated in front of the patient, asks: "Would you like to serve the tea?". If the patient serves the tea but not the napkins and/or teaspoons, the examiner asks: "Would you like to give us the teaspoons (the napkins)?"

2. Card dealing. The examiners and the patient are seated as in the tea serving situation. The patient is asked if he/she knows how to play "Scopa". If necessary, he/she is reminded of the basic rules (three cards for each player and four in the middle of the table).[1]

Then the examiner seated in front of the patient asks: "Would you like to deal the cards for a game of Scopa?"

3. Picture description. A picture is placed in front of the patient and he/she is asked: "Will you describe everything you see in this picture?" Three pictures are used. Two are cards 3 and 6 (45 × 32 cm) of Set 1 of the Progressive Picture Compositions by Byrne (1967); one is Tissot's painting *The dance on the ship* (60 × 100 cm). The examiner indicates the persons and objects pointed out by the patient with progressive numbers on a photocopy of the stimulus figure in the order in which they are reported, without soliciting in any way.

When the description is finished, the patient is asked: "Well, what does this picture represent?' The patient's response is transcribed but it does not contribute to the score attribution.

4. Description of an environment. The patient is placed in a room full of objects on both sides (armchairs, pictures, lamps) and is asked to describe it. The patient is told: "Will you describe everything you see in this room?" To facilitate scoring, each judge recorded the elements described by the patient on a schematic drawing of the environment.

The Semi-structured Scale for the Functional Evaluation of Personal Neglect. In this test the patient is asked to demonstrate the use of common objects. He/she is presented with the objects one at a time and is asked:

1. "Show me how you comb your hair?"
2. "Show me how to use the razor?" (male)/"Show me how to powder yourself?" (female)
3. "Show me how to put the eyeglasses on?"

For each subscale one examiner, who did not serve as a judge, introduced the patient's task. The patient was not given any feedback on the correctness of their performance or any solicitation to complete the various tasks. The two judges provided their evaluations separately immediately following the administration of each subscale.

Each evaluation identifies one out of four performance levels. In particular, the patient's behaviour is considered normal where no systematic asymmetries in exploration are found (score = 0). At a second level, the patient

may complete the task exploring the entire space or only very slight asymmetries may be present (score = 1); what characterises this level is the presence of uncertainty and slowness in arriving at the targets in the space opposite that of the lesion. At a third level, clear omissions for stimuli in the space opposite that of the lesion are present (score = 2). At the final level, the patient is only able to explore a very reduced portion of the space (relative to that ipsilateral to the lesion) (score = 3).

The three subscales relative to "serving tea", "dealing cards", and "description of an environment" each produce a single evaluation; the "picture description" provides for one evaluation for each of the three proposed pictures. Thus, on the whole, the extrapersonal scale produces a total of six evaluations of patients' explorative behaviour with a total score between 0 and 18.

The subscale relative to object use (use of comb, eyeglasses, and razor/powder) produces three distinct evaluations. Thus, the personal scale has a total score between 0 and 9.

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO: Ms K Vorster
School of Therapeutic Sciences
Department of Physiotherapy
Medical School
University

E-mail: vorster.kara18@gmail.com

CC: Supervisor: Professor V Ntsiea
<Veronica.Ntsiea@wits.ac.za>
and <HREC-Medical Research Office@wits.ac.za>

FROM: Mr Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2021/06/15

REF: R14/49

PROTOCOL NO: **M2011109** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)

PROJECT TITLE: *A comparison of the Catherine Bergego Scale and The Semi-structured Scales for Functional Evaluation of Hemi-inattention in patients with stroke*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Ms K Vorster

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M2011109

NAME: (Principal Investigator) — Ms K Vorster

DEPARTMENT: — School of Therapeutic Sciences
Department of Physiotherapy
Medical School
University

PROJECT TITLE: — *A comparison of the Catherine Bergego Scale and The Semi-structured Scales for Functional Evaluation of Hemi-inattention in patients with stroke*

DATE CONSIDERED: — 2020/11/27

DECISION: — Approved unconditionally

CONDITIONS:

SUPERVISOR: — Professor V Ntsiea

APPROVED BY: — CB Penny
Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL: — 2021/06/15

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **November** and therefore reports and re-certification will be due in the month of **November** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator — Date

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

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2030 NDP

RESEARCH, MONITORING AND EVALUATION DIRECTORATE

Name of researcher: **Ms. K. Vorster**
University of the Witwatersrand

Physical Address (Work/ Institution) Witrand Hospital
2 Deppe Street
Potchefstroom ; 2531

Subject **Research Approval Letter – A comparison of the Catherine Bergego Scale and the semi-structured scales for functional evaluation of hemi-inattention in patients with stroke.**

This letter serves to inform the Researcher that permission to undertake the above mentioned study has been granted by the North West Department of Health. The Researcher must arrange in advance a meeting with the District Chief Director and District Director to introduce their research team/members on the proposed research to be undertaken. Further to the above the researcher must produce this letter to the District and chosen facilities as proof that the research was approved by the NWDoH. The

This letter of permission should be signed and a copy returned to the department. By signing, the Researcher agrees, binds him/herself and undertakes to furnish the Department with an electronic copy of the **final research report that will be shared with the Department before publication.** Alternatively, the Researcher can also provide the Department with electronic summary highlighting recommendations that will assist the Department in its planning to improve some of its services where possible. Through this the Researcher will not only contribute to the academic body of knowledge but also contributes towards the bettering of health care services and thus the overall health of citizens in the North West Province.

Below are the contact details of Office of the Chief Director and District Director for Dr. Kenneth Kaunda District.

DEPARTMENT OF HEALTH
OFFICE OF THE SUPERINTENDENT GENERAL
01 -07- 2021
PRIVATE BAG X 2068 MMABATHO, 2735

To whom it may concern,

RE: Master's Degree Research

I am currently a Master's Degree student at the University of Witwatersrand. I am conducting a research project regarding patients who had a stroke. I hereby request approval to do this research study titled, A comparison of the Catherine Bergego Scale (CBS) and The Two Semi-Structured Scales for Functional Evaluation of hemi-inattention in patients with stroke at Witrand Hospital, South Africa.

The study will be done on patients after a stroke in the rehabilitation unit of Witrand Hospital. The aim of the study to compare the CBS to the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention when measuring unilateral neglect in a neurological rehabilitation unit. The objectives are to determine whether patients are experiencing unilateral neglect by using the CBS, to determine whether patients are experiencing unilateral neglect by using the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention, to determine the responsiveness of the CBS in measuring unilateral neglect in an inpatient rehabilitation unit, to determine the responsiveness of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention in measuring unilateral neglect in an inpatient rehabilitation unit and to compare the responsiveness of the CBS to the responsiveness of the Two Semi-Structured Scales for Functional Evaluation of Hemi-inattention.

It is important to know whether a patient has unilateral neglect, because it slows down the rehabilitation process and may result in a longer length of stay in the rehabilitation unit. Patients with unilateral neglect also require different treatment modalities than those without neglect. Many different outcome measures are being used all over the world, some are however more expensive and others are less efficient to use. It is therefore important to determine which outcome measure is best suited to use in a South African setting.

The study population will consist of patients who present with a first-ever unilateral stroke in Witrand Hospital during the duration of the data collection.

The tests will be administered during the week of admission and will then be repeated weekly until discharge to monitor the changes in the scores. The patient will be informed about the research and an information document will be given to the patient. The information document will explain the study and that participation is voluntary and may be stopped at any time, the information given is confidential, no harm will be done and no remuneration will be given. The patient will then be asked to sign a letter of informed consent. Once the patients have signed consent and agreed to the study, the tests will be administered.

Our sampling size as calculated will be more or less 56 participants during the data collection time.

I also request that results of this study may be used at the University of Witwatersrand and may be published.

For more information regarding the study, please contact the researcher mentioned below.

Contact details of main researcher:
Kara Vorster 0820732337

Kind regards.
Kara Vorster
PT-0137146

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

02 Deppe Street Dassierand
Potchefstroom
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018 294 6435
Dr. Isaac Wana
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WITRAND HOSPITAL

Office of the Senior Manager Medical Services

To : **Ms K Vorster**
University of the Witwatersrand

From : **Dr. IZ Wana**
Senior Manager Medical Services
Witrand Hospital

Date : **12th April 2021**

Re : **Permission to undertake study at Witrand hospital**

This letter serves to respond to your request dated 9th April 2021 regarding the permission to undertake the study at Witrand hospital.

Study title: A comparison of the Catherine Bergego Scale and the semi-structured scales for functional evaluation of hemi-inattention in patients with stroke.

You are hereby granted the permission to undertake the study at Witrand hospital.

Kind regards

WITRAND HOSPITAAL
2021 -04- 12
POTCHEFSTROOM
WITRAND HOSPITAL

Dr. IZ Wana
Senior Manager Medical Services
Witrand Hospital

ME Mpolokeng

Mrs M. E. Mpolokeng
Acting Chief Executive Officer
Witrand Hospital

WITRAND HOSPITAAL
12 APR 2021
POTCHEFSTROOM
WITRAND HOSPITAL

INFORMATION ABOUT RESEARCH STUDY

Study title: A comparison of the Catherine Bergego Scale and The Two Semi-Structured Scales for Functional Evaluation of hemi-inattention in patients with stroke

Good day

I am Kara Vorster and I am currently doing research towards an MSc degree in Physiotherapy from the University of the Witwatersrand, Johannesburg, to see which of the above-mentioned scales will be best fit to measure hemi-inattention in patients following a stroke. Research is a process used in seeking new knowledge. In this study I want to learn which scale will be best to measure unilateral neglect. Unilateral neglect is the failure to report, respond, or orient to novel or meaningful stimuli presented to the side opposite a brain lesion, when this failure cannot be attributed to either sensory or motor defects. It is important to measure unilateral neglect, because patients with unilateral neglect require different treatment modalities and have a slower rehabilitation process than those without neglect.

Invitation

I am inviting you to participate in a research study. This study will be done in the rehabilitation hospital. Two different outcome measures will be used to test unilateral neglect. One will be administered earlier the day and the other later the day. This will be administered once a week for the duration of your stay in the unit. The tests will each take about 20-30 minutes to administer. You will be asked to demonstrate certain tasks such as dealing cards, eating, grooming and putting on a coat. The researcher will be supervising how you do these tasks.

Risks

There are no health risks involved in this study.

Cost and payment

There is no payment to you for taking part in this study and no direct benefits, nor will it cost you anything.

Results

You will receive all necessary information regarding the study during your participation and the results will also be made available to you after the completion of the study.
The results of this study may determine which of the scales can be included in the management of patients who suffered a stroke. This might determine how the unilateral neglect is progressing.

Results regarding this study might be published, but no participants will be identified by name.

Voluntary participation

Your participation is voluntary, and refusal to participate will have no effect on your hospital treatment, nor will it involve any penalty or loss of benefits to which you are otherwise entitled; you may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

Confidentiality

Personal information will normally be kept confidential. The only exceptions, and both are rare, would be if information had to be disclosed by law, or was required by the University's Human Research Ethics Committee (Medical), in order to respond to a complaint, or the purpose of a process audit.
Study records will be retained for 2 years, if a publication appears from the study, or 6 years if there is no publication, after which it will be destroyed.

Enquiries

If you have questions about the study at any time, you may contact:
Ms Kara Vorster, Principal Investigator, telephone no. 082 073 2337, or by e-mail at vorster.kara18@gmail.com

Professor Veronica Ntsiea, Supervisor, on telephone no. 011 717 3721, or by e-mail at Veronica.Ntsiea@wits.ac.za

Ethical clearance

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human participants who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the chairperson of this committee who is Dr Clement Penny, who may be contacted on the telephone number 011 717 2301, or by e-mail on clement.penny@wits.ac.za The telephone numbers for the Committee secretariat are 011 717 2700/1234/2656 and the email addresses are Mapula.Ramaila@wits.ac.za, Rhulani.Mkansi@wits.ac.za and Zanele.Ndlovu@wits.ac.za

Thank you for reading this Study information Sheet

June 2021

CONSENT TO PARTICIPATE IN RESEARCH

Study title: A comparison of the Catherine Bergego Scale and The Two Semi-Structured Scales for Functional Evaluation of hemi-inattention in patients with stroke

1. I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto;
2. I was given time to read it, or had it read to me, in the language I best understand;
3. I was given time to ask any questions I wanted to and found any answers given to me to be reasonable and satisfactory;
4. I believe I fully understand why the study is being conducted and what the intended outcomes will be;
5. I understand that there will be no immediate benefit to me, should I agree to participate, nor will I receive any payment; conversely, participation will not cost me anything but my time;
6. I understand that, even if I initially consent to take part in the study, I may subsequently withdraw at any time and would not be required to give any reasons; if that happened, any data collected about me for the purposes of the study would immediately be destroyed, unless I give consent for it to be retained
7. I have been given a range of contact details, listed below. If I require further information or become concerned about any aspect of this study I am free to speak to any of these contacts.

Contact details:

Ms Kara Vorster, Principal Investigator, telephone no. 082 073 2337, or by e-mail at vorster.kara18@gmail.com

Professor Veronica Ntsiea, Supervisor, on telephone no. 011 717 3721, or by e-mail at Veronica.Ntsiea@wits.ac.za

Dr CB Penny, Chairperson of the Human Research Ethics Committee (Medical) at the University of Witwatersrand, on telephone no. 011 717 2301, or by e-mail at Clement.Penny@wits.ac.za.
Ms Zanele Ndlovu or Mr Rhulani Mkansi, Committee Secretariat, telephone nos.: 011 717 2700 or 1234, or by e-mail at: Zanele.Ndlovu@wits.ac.za or Rhulani.Mkansi@wits.ac.za

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:

Name of Witness: _____
Signature: _____
Date: _____

Data sheet:

Participant number:	1	
Gender:	2	1. Male 2. Female
Age:	3	1. 18-29 years 2. 30-39 years 3. 40-49 years 4. 50-59 years 5. 60-69 years 6. 70-79 years 7. 80-89 years 8. 90-99 years
Diagnosis:	1	1. Ischaemic stroke affecting left cerbral hemisphere 2. Ischaemic stroke affecting right cerebral hemisphere 3. Haemorrhagic stroke affecting left cerebral hemisphere 4. Haemorrhagic stroke affecting right cerebral hemisphere 5. Other
Week:	3	
Total CBS score	0	

Gaze orientation	0	0-3
Limb awareness	0	0-3
Auditory attention	0	0-3
Personal belongings	0	0-3
Dressing	0	0-3
Grooming	0	0-3
Navigation	0	0-3
Collisions	0	0-3
Meals	0	0-3
Cleaning after meals	0	0-3

Semi-structured total score 0

Serving tea	0	0-3
Card dealing	0	0-3
Picture description	0	0-9
Environmental description	0	0-3
Extrapersonal neglect score	0	0-18
Comb hair	0	0-3
Groom	0	0-3
Glasses	0	0-3
Personal neglect score	0	0-9

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Private Bag 3 Wits, 2050

Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

08 September 2020
Person No: 1105652
TAA

Miss K Vorster
26 Geranium Drive
Riviera Park
2745
South Africa

Dear Miss Kara Vorster

Master of Science in Physiotherapy: Change of title of research

I am pleased to inform you that the following change in the title of your Dissertation for the degree of **Master of Science in Physiotherapy** has been approved:

From:

To: **A Comparison of the Catherine Bergego Scale and The Semi-Stuctured Scales for Functional Evaluation of hemi-inattention in patients with stroke**

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I Kara Vorster (Student number: 1105652) am a student registered for the degree of MSc in Physiotherapy in the academic year 2022.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 30/03/2022

Kara Vorster dissertation- M2011109

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