COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA

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BY

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JULY, 2015
DECLARATION

This is to certify that this thesis is the result of research undertaken by Ophelia Anarfi under supervision towards the award of Master of Philosophy in Clinical Psychology Degree in the University of Ghana, Legon.

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DEDICATION

To all families across the globe with relatives diagnosed with stroke.
ACKNOWLEDGEMENT

I side with the words of Albert Einstein on his quote: ‘I am thankful to all those who said NO to me, it is because of them I did it myself’. I would like to acknowledge the Almighty God who has been my Alpha and Omega, my help in ages past for giving me the grace and favour to come this far. I also wish to express my heartfelt gratitude to my supervisors; Professor C. C. Mate-Kole and Dr. Kingsley Nyarko for helping in making this dream a reality. I would like to thank my model, Prof. Yaa Ntiamoa- Baidu for her relentless support in my career path.

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ABSTRACT

Stroke has been documented to be the second commonest cause of death, and a major disability in survivors. In sub-Saharan Africa, stroke is the leading cause of preventable death and disability in adults. There are a lot of challenges associated with stroke ranging from cognitive to behavioural changes as well as problems with perceived quality of life. The aim of the study was to examine the cognitive and behavioural changes as well as perceived quality of life of in individuals diagnosed with stroke in Ghana. One hundred (100) participants comprising 50 stroke patients and 50 aged matched healthy controls were recruited. Using a battery of cognitive tests and behavioral measures, data was collected at the Stroke Unit, Korle-Bu Teaching Hospital. The results revealed statistical significant differences between the stroke patients and the healthy control group on the cognitive tests, the behavioural and the quality of life measures. Moreover, of all the variables, age of onset and level of education predicted cognitive functioning of respondents. Finally, among the stroke patients, there were significant positive correlations between; spirituality and anxiety, cognitive failures and depression, and, quality of life and cognitive tests; and negative correlations between spirituality and physical health, quality of life and depression and quality of life and cognitive failures. These results have implications for clinical management and research design in psychological studies involving stroke patients.
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LIST OF ABBREVIATIONS

APA   American Psychiatric Association
AHA   American Heart Association
ASA   American Stroke Association
NSF   National Stroke Foundation
NIH   National Institute of Health
NINDS National Institute of Neurological Disorders and Stroke
CVD   Cerebrovascular Disease
CVA   Cerebrovascular Accident
CDC   Centers for Disease Control and Prevention
MRI   Magnetic Resonance Imaging
ECG   Electrocardiogram
CT    Computerised Tomography
CI    Cognitive Impairment
SP    Stroke Patients
HCG   Healthy Control Group
GHS   Ghana Health Service
MOH   Ministry of Health
KBTH  Korle Bu teaching Hospital
CHAPTER ONE

INTRODUCTION

Background of the study

Stroke (Cerebrovascular Accident - CVA) is regarded as one of the most common neurological conditions. Stroke as defined by the World Health Organisation is “a focal (or at times global neurological impairment of sudden onset, and lasting more than 24 hours (or leading to death) and of presumed vascular origin” (Sacco et al., 2013, pp. 3).

Cerebrovascular disease has been documented globally to be the sixth commonest cause of an ongoing disease burden; but it is expected to move to the fourth (United States- Centres for Disease Control and Prevention, 2013).

The American Heart Association (AHA) has categorised stroke into three (3) main types: ischaemic stroke (obstruction of the blood vessels), haemorrhagic stroke (rupture of the blood vessels) and transient ischaemic attacks (caused by a temporary clot. Often called a “mini-stroke”) (American Heart Association, 2012; American Stroke Association, 2012).

Ischaemic stroke accounts for 87% of all stroke cases (National Institute of Neurological Disorders and Stroke, 2009; American Heart Association, 2012; American Stroke Association, 2012).

Diagnosis is typically with medical imaging such as Computerised Tomography (CT) scan, Magnetic Resonance Imaging (MRI) scan along with a physical examination. Others such as Electrocardiogram (ECG) and blood tests are done to determine risk factors and rule-out possible causes (National Institute of Health, 2014).
The main risk factor for stroke is uncontrollable high blood pressure (National Stroke Foundation, 2015). Other risk factors include tobacco smoking, obesity, high blood cholesterol, diabetes mellitus, previous transient ischaemic attacks, atrial fibrillation, drug abuse, the use of birth control pills, smoking, heart diseases, sickle-cell anaemia, family history of stroke, high fat diet and excessive alcohol intake (National Stroke Foundation, 2015). Agyemang and Sanuade (2012) recorded increasing rates of high blood pressure, diabetes and obesity as major determinants of stroke in Ghana; yet uncontrolled hypertension is the leading cause of stroke in Ghana.

In 2010, approximately 17 million people had a stroke and 33 million who had previously had a stroke survived (Kutty & Kamraj, 2014). Between 1990 and 2010, the number of stroke cases which occurred each year decreased by approximately 10% in the developed world and increased by 10% in the developing world (Feigin et al., 2014). In 2013, stroke was the second most frequent cause of death after coronary artery disease, accounting for 6.4 million deaths (12% of the total) (Global Burden of Disease, 2014). About 3.3 million deaths resulted from ischaemic stroke whereas 3.2 million deaths resulted from haemorrhagic stroke (Global Burden of Disease, 2014). Generally, two-thirds of stroke occurred in those over age 65 (Feigin et al., 2014).

However, South Asians are at particularly high risk for stroke accounting for 40% of global stroke deaths (Indian Heart Association, 2015). In the United States, stroke is the leading cause of disability and recently declined from the third leading to the fourth leading cause of death (Towfigil & Saver, 2011; American Heart Association, 2013).
The incidence of stroke increases exponentially with age from 30 years, and the etiology varies by age. Advanced age is one of the most significant stroke risk factors. About 95% of strokes occur in people age 45 and older; and two-thirds of stroke occur in those over the age of 65 (National Institute of Neurological Disorders and Stroke, 1999; Longo et al., 2012).

Men are 25% more likely to suffer strokes than women (National Institute of Neurological Disorders and Stroke, 1999), yet 60% of deaths from stroke occur in women (Villarosa, Singleton & Johnson, 1993). Stroke costs the United States an estimated $34 billion each year (Mozaffarian et al., 2015). The total include the cost of health care service, medications to treat strokes, and mixed days of work.

In sub-Saharan Africa, stroke is emerging as a leading cause of preventable death and disability in adults (Lemogoum et al., 2005). It has been documented that cardiovascular diseases (CVD), particularly ischaemic heart disease and stroke, cause almost 17 million deaths worldwide every year. Although data existing on CVD mortality are still limited, it is now well recognized that stroke is a major cause of death in developing countries (Reddy & Yusuf, 1998).

More than 80% of stroke burden occurs in low and middle-income countries, yet accurate epidemiological data on stroke in Africa is scanty (Sajjad et al., 2013). However, age-adjusted standardised annual stroke incidence rates may be up to 316 per 100,000, and age adjusted standardised prevalence rates may be up to 981 per 100,000 (Owolabi et al., 2015).

From the Global Burden of Disease model-based estimates, stroke incidence appears to be increasing in Africa. There are few studies on the cost of stroke care in Africa. A study in
Togo estimated direct cost of stroke care of a person to be 936 Euros in only 17 days, about 170 times more than the average annual spending of a Togolese (Guinhouya et al., 2010).

Moreover, there is dearth of data on the epidemiology of stroke in Ghana. Evidence by Center for Disease Control and Prevention (CDC, 2013) in Ghana showed that stroke accounted for 80% of death in Ghana as well as 5% of ischaemic heart disease.

Data from admission and discharge registers from the Korle-Bu Teaching Hospital Stroke Unit records the number of cases from January to November, 2014 (Stroke Unit, Korle-Bu Teaching Hospital, 2014). The number of cases constituted an estimated record of 48.49% males, and 2.95% females with a mean age of 30.9 years. The mortality rate is 16.29% and the total admission is 81.44%. In contrast, Agyemang and Sanuade (2012) reported female admissions and deaths to be greater than that of the males. But it confirms that most of the cases reported are haemorrhagic stroke.

The data from the hospital could be said to be underreported because people have attributed the incidence of stroke to spiritual causes; hence rely on spiritualists and herbalists for treatment thereby neglecting biomedical management (Stroke Unit, Korle-Bu Records, 2014). An average stroke patient spends about two hundred and twenty Ghana Cedis (GHS 220.00) which is equivalent to sixty-four dollars eight-eight cents (USD 64.88) per week on treatment (1USD=GHS 3.40). Most pharmacological agents are not insured under the National Health Insurance Scheme (NHIS), making treatment a challenge (Stroke Unit, Korle-Bu Records, 2015). This shows how expensive it is to treat and manage stroke in Ghana.

Medical conditions associated with stroke include; cardiovascular dysfunction (Roth, Muller & Green, 1992); swallowing difficulties (Veis & Logermann, 1985), stress ulcers (Kitamura,
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1976), seizures (Shinton, Gills & Melnick, 1988; Kilpatrick et al., 1990), bowel dysfunction, contractures and pressure pores, and depression (Stern & Bachman, 1991; Starkstein et al., 1993).

Again, Langhorne et al. (2000) outlined specific complications associated with stroke. They were; neurological (recurrent stroke, epileptic seizure), infections (urinary tract infections, chest infections), mobility related (falls, pressure sores), thromboembolism (deep venous thrombosis, pulmonary embolism), pain, and psychological distress (depression, anxiety, emotionalism, and confusion).

Approximately two-thirds of stroke patients experience cognitive impairment with majority going on to develop dementia (Jin et al., 2006; Pendlebury & Rothwell, 2009). Moreover, there are several cognitive domains where stroke seems to influence greatly but the most pronounced areas being affected is executive function, attention, visuospatial, memory, and speed of processing.

Stroke has an influence on cognitive functioning and moreover affects quality of life of patients. Cognitive impairments can reduce one’s ability to understand task instructions, to plan, execute, initiate, self-directed activities and to solve problems. The executive function of the individual becomes impaired after stroke. Subtle stroke impairment persists beyond initial stage yet this information is critical in planning rehabilitation strategies.

Cognitive Functioning and Stroke

Cognition involves multiple domains comprising attention (focusing, shifting, dividing, or sustaining attention on a particular stimulus or task), executive function (planning, organizing thoughts, inhibition, control), visuospatial ability (visual search, drawing, construction),
memory (recall and recognition of visual and verbal information), and language (expressive and receptive) (Cumming, Marshall & Lazar, 2012).

There is the possibility of cognitive deficits being either a single or dominant presenting feature of stroke (Ferro, 2001; Ballard et al., 2003). There are deficits in measures of global cognition as well as domain-specific impairments despite variations in the type of cognitive impairment in post-stroke.

In addition to the medical complications of stroke, some of the devastating effects are the cognitive and behavioral consequences. These include memory, visuospatial deficits, executive functions, neglect, attention, depression, anxiety, and among others. Inasmuch as stroke has impact on cognitive functioning, executive functioning is the predominant domain mostly affected (Buffon et al., 2006; Hachinski, 2011). Thus, Lesniak and colleagues observed the effects of executive function deficits in 18.5% of the population of stroke patients at the post-acute stage (Lesniak et al., 2008).

Executive functions are considered to be the highest cognitive domain. Executive Function is ‘a product of the co-ordinated operations of various processes to accomplish a particular goal in a flexible manner’ (Funahashi, 2001, pp.147). Executive function enables a person to initiate, organize and plan purposeful activity. A person with a deficit in executive function may present with impairment in judgment, organization, planning, decision-making, behavioral disinhibition, impaired intellectual abilities, and task-switching (Elliot, 2003). Therefore, executive dysfunction can refer to both neurocognitive deficits and behavioral symptoms that include impaired judgment, slow decision making, disorganisation, impulsiveness, and risk-taking behaviours (Stuss, 2011).
Speed of processing is a common compliant after stroke whereby majority of survivors of stroke exhibit marked slowness in processing information (Hochstenbach et al., 1998; Rasquin, Lodder & Verhey, 2005). This has clinical implications as it makes an independent contribution to functional outcome after stroke (Barker-Collo et al., 2010). It also serves as an independent predictive of dependency in stroke survivors (Narasimhalu et al., 2011). Processing speed is not a stand-alone domain, but has a major influence on cognitive performance.

Aphasia and neglect are the two most prominent focal cognitive deficits after stroke (Gotten & Hillis, 2010). The limitation to expressive output is a feature of Broca’s aphasia which is associated with damage in the left posterior, inferior frontal gyrus, as well as other regions supplied by the upper division of the left middle cerebral artery (Hillis, 2007). On the other hand, Wernicke’s aphasia is characterized by fluent but relatively in comprehensible speech alongside with poor language comprehension. It is as a result of damage of the left posterior, superior temporal gyrus (Hillis, 2007). Other deficits include hemispatial neglect, the visuospatial component which is linked to the right inferior parietal lobe, the visuomotor element to the right dorsolateral prefrontal cortex and the object-centered component to the deep temporal lobe regions (Verdon et al., 2010).

Risk factors previously identified as important in the development of post-stroke cognitive impairment include old age, lower level of education, family history of dementia, greater stroke severity and functional impairment, disturbed level of consciousness at stroke onset, smoking, hypertension, and atrial fibrillation. Others include; ischaemic heart disease, high-plasma homocysteine, large size infarctions, territorial infarctions of the left and right carotid arteries, dominant hemispheric lesions, large artery atherosclerosis, the occurrence of cardioembolic and haemorrhagic strokes (Khedr et al., 2009).
Cognitive dysfunctions which accounts for one third of general deficits affect nearly half of stroke survivors. Physical disability is mostly commonly associated with stroke, but cognitive changes and other non-motor consequences are quite common among stroke survivors (Pendlebury, 2009). Studies have reported that about 60% of stroke survivors suffer some amount of cognitive impairment and about 30% of them develop dementia. Post-stroke cognitive dysfunction comes up with a multi-domain impairment of attention and concentration, executive function, language, memory and visuospatial function with executive dysfunction being the earliest the domain mostly affected (Hachinski et al., 2006).

**Quality of life and Stroke**

Health-related quality of life (HRQOL) is an extensive notion which focuses on the aspects of quality of life directly linked to a person’s post-stroke health. HRQOL is a multi-dimensional concept which involves diverse domains covering one’s life. These comprise physical, functional, mental, psychosocial and social health. HRQOL is defined as ‘the value assigned to duration of life as modified by the impairments, functional states, perceptions, and social opportunities influenced by disease, injury, treatment, or policy’’ (Patrick & Erikson, 1993). There are domains that constitute HRQOL. These include; the domain of physical functioning, the domain of psychological functioning, and social functioning domain as well as the concept of general well-being. A number of symptoms are manifested in patients who are suffering from stroke. And they might include changes in cognition, perception, speech, physical functioning and mood. Therefore, these have diverse impact on their HRQOL.

Since HRQOL is important in tracking the effectiveness of a treatment regime and health-care planning, it is most favourable to stroke survivors than any other outcomes such as impairments (e.g. weakness) or any activity limitations (e.g. difficulty walking) (Sturm et al., 2002). Some
studies have shown lower HRQOL in individuals with stroke compared with those without stroke; HRQOL has also been shown to decrease over time after stroke (Carod-Artal & Egido, 2009). Stroke survivors mostly experience physical and cognitive disabilities as well as behaviour difficulties which impact on their health-related quality of life (HRQOL).

**Cognitive Functioning, Quality of Life and Stroke**

Typically, post-stroke cognitive impairment is associated with poor quality of life, but the relative importance of deficits in different cognitive domains have not been established (Cao et al., 2006). However, cognition, particularly attention and visuospatial ability, is strongly associated with quality of life after stroke (Cumming, Brodtmann, Darby & Bernhardt, 2014). An association exists between the persistent cognitive deficit and a severe impact on wellbeing and may contribute to a lot of challenges to the patient and caregivers (Anderson, Linto & Stewart-Wynne, 1995; Clarke, 2002).

Hochstenbach, Anderson, van Limbeek and Mulder (2001) found that several cognitive tasks mostly in the attention domain administered at 2 months post-stroke were predictive of quality of life at 10 months. In a multivariate analysis, the Trail-making part B task (requiring executive function, and as well as incorporating visuospatial scanning) appeared as an independent predictor of QOL. Likewise, Nys et al. (2006) reported that cognitive impairment in the first month poststroke was as an independent predictor of decreased quality of life at 6–10 months. In this instance, visuospatial ability was the cognitive domain with the strongest link to QOL. Given that the quality of life scales adopted in these two studies included specific items on cognition. However, it might be argued that these associations are to some extent circular.
Post-stroke cognitive impairment has a connection with poor quality of life. Cumming, Brodtmann, Darby and Bernhardt (2014) recruitment of stroke patients into subgroups completed 2 computerised cognitive task basically on simple and choice reaction time within 2 weeks of stroke. Results indicated that presence of cognitive impairment at 3 months was independently associated with lower quality of life at 12 months. Attention and visuospatial ability were the cognitive domains most closely associated with quality of life. It was concluded that cognition, particularly attention and visuospatial ability, is strongly associated with quality of life after stroke.

**Spirituality as a Coping Strategy**

For patients confronting life-threatening illnesses, spirituality has been an important factor influencing their quality of life (Abraido-Lanza, 2004). Thus, spiritual has been one of the resources people have adopted as coping strategies in the face of medical conditions. Moreover, spirituality serves to provide a sense of purpose and meaning for seemingly incomprehensible events or chronic adversity, though in a secondary way (Thomas & Retsas, 1999; Chow & Nelson-Becker, 2010). Faith and spirituality are the most variables that can be measured objectively. It is commonly evident in the experience of medical conditions such as stroke.

Nevertheless, questions have been raised concerning the interconnectivity between spirituality and health. However, the association between faith and chronic health problems is almost impossible to explain with certainty (Giaquinto, Spiridigliozi, & Caracciolo, 2007). Africans and for that matter Ghanaians have been described as more religious, who use spirituality as a buffer when struck down by medical conditions. Stroke as a medical condition has compelled scientists across the globe to investigate into the relationship between spirituality and stroke (Giaquinto, Spiridigliozi, & Caracciolo, 2007).
Stroke has a larger influence on a vast array of a person’s life resulting in major adjustment and long-term challenges for the person and which even extend to his or her family. Investigators have noted that stroke survivors have been shown to have a lower average quality of life as compared to their counterparts (Majo et al., 1997; Clarke et al., 2002). Quality of life becomes as seen as the endpoint most important to a person (Lau et al., 2003). This move has been sped up by treatment conditions such as in cancer. An instance is the current chemotherapy which keeps one alive, but the question is; “Is it a life worth living?” Previously, the focus of rehabilitation after stroke was improving physical function which had a positive effect on quality of life.

**Statement of the Problem**

This work seeks to determine the level of cognitive functioning and quality of life among stroke patients in Ghana. Stroke in Ghana has become an increasing cause of mobility, mortality and disability due to changes in lifestyle and an emerging ageing population. Stroke is currently one of the top five causes of death in Ghana, and also one of frequent causes of admission to hospitals. Although, stroke patients improve overtime, others are left with a disability after suffering a stroke.

Moreover, little is not known about the severity and frequency of cognitive impairments following stroke. But the incidence of stroke in African context has not been well-documented. This can be attributed to the nature of our environment in terms of stroke support as compared with western societies. There is the need to find out the nature and the extent of which an enriched environment and culture improve quality of life in Ghana and African setting as a whole.
In addition, it is important to study the development of cognitive impairments after stroke which is a value in prognosis. It has been well thought of that most stroke patients mostly seek rehabilitation in terms of physiotherapy and other treatment regimens, and few pay less attention to their psychological and behavioral needs. This study intends to aid in examining the cognitive functioning and quality of life among stroke survivors.

Finally, studies have reported that stroke is the final manifestation of cerebrovascular diseases, and a well-recognized risk for vascular dementia; the study is intended to ascertain the possibility of the onset of dementia among stroke patients (Iadecola, 2013; Pendlebury & Rothwell, 2009). According to Qui, Winbald and Fratiglioni (2002), the risk of cognitive decline in patients with stroke is 2.27 (95%). Hence, a study on the cognitive functioning and quality of life among individuals diagnosed with stroke is needful to report a better clinical picture.

**Aims and Objectives of the Study**

The main aim of this work is to investigate the cognitive functioning and perceived quality of life among individuals living with stroke. Specific objectives for this study are;

1. To examine the effect of stroke on cognitive functioning.
2. To investigate the impact of cognitive functioning and quality of life on lesion sites.
3. To explore the perceived quality of life among stroke patients.
4. To identify the relationship between cognitive functioning and quality of life of stroke patients.
5. To examine the effect of stroke on other psychological functioning.
6. The influence of spirituality as a coping strategy on stroke patients.
Relevance of the study

This study seeks to provide information for health practitioners and other stakeholders in the management of stroke. These findings will inform these practitioners of screening, diagnostics, management, and referral services when working on individuals diagnosed with stroke in Ghana.

Results from this study will also inform practicing Clinical Neuropsychologists in sub-Saharan Africa to identify adequate test batteries from the study needed not only to screen individuals diagnosed with stroke but to identify distinct deficits and also measure progress in management. This is necessary in the current practice of clinical neuropsychology in Ghana, as it stands as an emerging field in the management of stroke across the globe (CDC, 2008).

In addition, findings from this study will also make recommendations that will be valuable for future researches on the cognitive functioning and quality of life of individuals with stroke. This will be a valuable enhancement to literature since this study will provide additional data on Ghanaian patients with stroke.
CHAPTER TWO

LITERATURE REVIEW

Introduction

Overview of Literature Review

For many years investigators have sought to understand the cognitive function of stroke (Schouten et al., 2009; Hajek et al., 2013). That has led to several theories and explanations to the causes of cognitive patterns in stroke and its impact on quality of life. Theories include executive function theory, Stuss’ (2011) theory, Luria’s theory (Luria, 1966) and Health-related Hypothesis. These in totality seek to provide a total understanding of the cognitive functioning and quality of life in stroke.

Theoretical Framework

Executive function Theory

The function of the frontal lobes is used interchangeably as the executive functions whereby changes in the cognitive functions are attributed to. Damage to this region of the brain is not due to predictable changes in the cognitive functioning; rather the changes that are observed seem to be diverse depicting the nature of the impairment to the brain by injury, vascular damage, tumour or any other neurological disease. The term ‘executive function’ is simply an essential part of overall regulation of cognitive function such as planning, initiation, cessation of action, perseveration and alterations of goal-directed behaviours (Stuss, 2011).

Lezak defined executive functions as “those capacities that enable individuals to engage successfully in independent, purposive, self-serving behaviour” (Lezak, 2004, pp. 35). They differ from cognitive functions in several ways. Executive functions ask questions like “how” or “whether a person goes about doing something” (e.g.: Will you do it; and, if so, how and
when?); questions about cognitive functions are normally phrased as “what” or “how much” (e.g.: what can you do? How much do you know?). So long as the executive functions are intact, a person can sustain considerable cognitive loss and still remain independent, constructively self-serving, and productive. When executive functions are damaged, one may no longer be capable of satisfactory self-care, of performing rewarding or useful work independently, or of maintaining normal social relationships irrespective of how well-preserved the cognitive capacities are or how high the person scores on the tests of skills, knowledge, and abilities.

Cognitive deficits usually involve specific functions or functional areas; impairments in executive functions tend to show up globally, affecting all aspects of behaviour.

Nevertheless, executive disorders can affect cognitive functioning directly in compromised strategies to approaching planning, or carrying out cognitive tasks, or in defective monitoring of the performance (Lezak, 1982a; Ogden, 1996; Burgess et al., 1998; Goldberg, 2001). Therefore, since the executive system plays a supervisory role in a range of cognitive domains, damage to the frontal lobes may result in impairment in attention, language, visuospatial functioning, personality functioning, and both visual and verbal memory (Anderson, 1994).

The argument for the adoption of the executive function theory as the theoretical framework is based on the historical controversy that has been the role of the frontal lobe in memory which has created a dichotomy; if damage to the frontal lobes does/does not lead to memory disturbances. Several ways to establish this include memory (list-learning performance and implicit and explicit recall), attention, and verbal fluency (Stuss & Alexander, 2000).
On the list-learning performance, Stuss, Alexander, Palumbo, Buckle, Sayer and Pogue (1994a) did their initial study to demonstrate separation of processes within the frontal lobe.

The first observation was that the left frontal and bifrontal lesions resulted in a significant recognition deficit. That has been a contradiction to most studies. The procedure used to explain this incongruence was to: list all patients in order of performance, like split-half division, or a standard comparison to the control group; and to establish and test hypotheses as to why the specific individuals were impaired. Thus, lesion location and differentiation of processes were used to examine the hypothetical reasons as to why some patients with frontal lobe lesions had a recognition deficit, and some did not.

An implication of the study was impairment on a particular test or process may not be linked to one brain region. Instead, the neural systems underlying the task must be understood. Consequently, this approach has proven successful in understanding disorders such as neglect (Heilman, Watson & Valenstein, 1985).

Again, the role of frontal functions in implicit and explicit recall addresses the control and automatic distinction in relation to ‘frontal processes’. Automatic functions are governed by implicit memory. An implicit memory task will not depend on equations of the frontal lobe if a strict difference is created between control and automatic processes which are related to frontal and posterior brain regions. Winocur, Moscovitch and Stuss (1996) observed a double dissociation after comparing young and old subjects on word-stem and word-fragment tasks that required either explicit recall or implicit recall will revealed a significant implication.
Most clinicians would not dispute the impact of frontal lobe lesion on attention. Dr. Benson at the Maudsley Hospital in London, England studied on the major impairment after orbitofrontal leucotomy which leads to severe attentional disorder. But, there was no significant differences between control group and leucotomized patients with larger lesions on the Stroop test (Stuss et al., 1981). The frontal lobe have been hypothesized to play a central role and different role from posterior brain regions in attentional function (Posner, 1988; Mesulam, 1981; Shallice, 1988).

Moreover, Stuss and Alexander (2000) adopted three measures to evaluate the effects of task complexity; and examined the specificity of supposed anterior attentional processes to the frontal lobes. They were interferences, negative priming and inhibition of return. The results suggested; (1). Different anterior attentional processes that can be isolated, and the attentional processes can be related to different brain regions within the frontal lobe. (2). Actually, simple processes can be related to the frontal lobe. (3). There is an interaction between anterior and posterior attentional processes, suggesting that the only way to address the results is to use the concepts of neural functional systems. (4). Inhibition is not simply a function of the frontal lobe.

The frontal lobes also play a role in humour, affect and self-awareness. Damage of the frontal lobe is associated with changes in personality and affect. This illustrates the case of Phineas Gage. One path way for the frontal lobes to influence responsiveness is through the amygdala (Adolph, Tranel, Damasio & Damasio, 1995) which is essential for modulation of emotion (Angrilli, et al., 1996).
In conclusion, the distinction between the unitary versus diversity of the functions of the frontal lobes have yielded a long-standing controversy, but the evidence presented support the proposition that distinct processes are related to different regions of the frontal lobe. Under certain circumstances, impairments can be found after damage in many if not most areas of the frontal lobes. When functions of the frontal lobes are tested with complex tasks, this brain region appears functionally homogenous.

**Fractionation of Frontal Lobe Functioning- Stuss (2011).**

Stuss proposed the functions of the frontal lobes in relation to executive functions. This is an assumption that, specific frontal regions control discrete functions and that basic cognitive processes can be systematically manipulated to reveal those functions. He further postulated the evidence for fractionation of frontal lobe functioning. The conceptual empirical concept has been the anatomical and functional reductionism as a means of understanding the component processes related to the frontal regions of the brain. Success has not been fully attained to the extent that for some frontal regions, there is sufficient confidence to state that there are at least approximately level of component processes. However, for other regions of the frontal lobes, research is still in the preliminary stages, and more general terms such as “functions” are more appropriate.

The suggestion for the three distinct ‘supervisory’ attention as a framework is the role of the frontal lobes in attention with identifiable anatomical substrates. They are: 1) energizing, 2) monitoring, and 3) task setting (Stuss, 2011).

Energizing refers to initiating and sustaining a response, by which performance maintenance over extended periods of time is confirmed. Patients with superior medial (dorsomedial—primarily in areas 24, 9, and 6) damage had a unique cluster of deficits. They were
significantly slower on all tasks that required speeded responses or time constrained suppression of responses. They could not sustain the beneficial effects of a warning signal over a 3s period. They had a uniquely disparate decline in words during the last 45s of a letter fluency task compared with the first 15s. They underrated a count of stimuli under both speeded and vigilant conditions, a deficit that worsened with task progression. Performance on all of these apparently disparate tasks is due to a failure of “energization,” (Stuss et al., 1998, 2002, 2005, 2008, Alexander et al., 2005, 2007; Picton et al., 2007; Shallice et al., 2008).

Monitoring as the second control system refers to the checking of task performance over time. It ensures “quality control” and behavioral adjustment, and is linked to processes such as adequate timing of behavior, anticipation of future events, error detection and discrepancies between behavioral responses and the external reality. Patients with right lateral damage, primarily in areas 44, 45, 46, 9, 9/46, and 47/12, had increased individual variability, impaired variable foreperiod effect, and an increase of all types of errors, including false negatives. They also had difficulty keeping track of the count of stimuli under speeded conditions only. This combination suggested poor monitoring of ongoing performance on very different tasks (Stuss et al., 2002, 2005; Picton et al., 2006; Shallice et al., 2008).

The third control system, task setting, refers to the ability to set a stimulus-response relationship. This includes initial learning, and implies the suppression of irrelevant behaviors in specific stimulus contexts. This is associated with flexible adaptation of behaviour in the face of changing stimulus-response contingencies. Patients with comparable left lateral damage had increased false positives (poor criterion setting) in any task (e.g., Stroop, word list learning, etc.) usually most prominent in the early stages of learning (ROBBIA
concentrate and ROBBIA suppress) (Alexander et al., 2005, 2007; Shallice et al., 2008; Alexander, Stuss, & Gillingham, 2009; Floden, Vallesi, & Stuss, 2011). Task setting requires both the processes of ‘‘if-then’’ logic and ‘‘adjustment of contention scheduling.’’

Stuss conclude by rephrasing a summary in the 1995 study which still remains relevant, that ‘the frontal lobes do not equal a central executive. Executive functions represent only one functional category within the frontal lobes. These frontal functions are domain general, possibly because of the extensive reciprocal connections with virtually all other brain regions, integrating information from these regions’ (Stuss, 2011, pp. 763).

**Luria’s Theory**

Infarctions of the frontal lobes are relatively uncommon other than in the lateral convexity in the middle cerebral artery. As a consequence, few studies of executive functions have been restricted to patients with stroke (Swick & Knight, 1999; Duarte, Rangarath, & Knight, 2005). Luria (1966, 1973) as the first proponent described the human brain to comprise three basic functional units that are interrelated. The brain stem has the responsibility of housing the first unit which regulates and maintains the arousal of the cortex. The lobes (parietal, temporal, occipital) as the second unit regulate encoding, processing and storage of information. The third unit which is the anterior region (frontal lobe) is responsible for regulating human behaviour. The prefrontal cortex is part of this functional unit and it is the seat of judgment. It regulates mental activities and behaviours. An injury to the frontal lobe can result in a disruption in complex behavioral programmes and one’s ability to regulate behavioral outcomes.
Damage to one area has adverse effect on any other region which inadvertently affects the frontal lobe due to the interconnected nature of the brain. Implications of frontal lobe damage are attention and executive problems (Chao & Knight, 19997; D’Esposito & Postle, 1999), memory deficits (Moscovitch & Winocar, 1992, 1995; Moscovitch & Melo, 1997), language challenges (expression and comprehension) (Cabeza & Nyberg, 2000; Troyer, Moscovitch, Winocar, Alexander, & Stuss, 1998), inhibition (Fuster, 1997; Levine, Freedman, Dawson, Black, & Stuss, 1999; Rolls, 1999).

All things being equal, frontal lobe deficit can affect other brain regions and the reverse is true. This suggests that stroke patients with frontal lobe infarcts are more likely to present with cognitive dysfunctions such as attention and executive skills, memory, language, and academic challenges.

**Stuss and Benson’s tripartite model**

Stuss and Benson (1986) proposed the three systems which interacts and monitors attention and executive functions in an individual. They are the anterior activating system (ARAS), the diffuse thalamic projection (DTP) and the fronto-thalamic gating systems (FTGS) (Stuss & Benson, 1986). According to them, the ARAS and the DRP are responsible for maintaining alertness and damage to these systems lead in loss of consciousness and distraction by external stimuli.

They further argued that the fronto-thalamic gating system is in-charge of high-level cortical activities such as planning, stimuli and response selection, and monitoring of performance (Stuss & Benson, 1986). A damaged front-thalamic gating system manifests inattentiveness, impairment in insights, and goal-directed behaviours.
The notion of schema explained by Stuss, Shallice, Alexander and Picton (1995) is a network of connected neurons which is activated by sensory input and by the executive control system. This theory identifies various executive components such as sustaining (right frontal area), concentrating (cingulated region), sharing (cingulated and orbitofrontal areas), suppressing and preparing (dorsolateral prefrontal and media frontal areas), and goal setting (left dorsolateral prefrontal cortex).

The task identified by Stuss and colleagues to assess executive attentions based on SAS include WCST, trail making test and verbal fluency that demand mental switching between subtasks or categories. This shows that damage to the ARAS, the diffuse thalamic projection and the fronto-thalamic gating systems will affect an individual’s ability to perform tasks that demands cognitive flexibility and attention. This theory may explain why stroke patients present cognitive deficits.

As evident in neuropsychological (Vataja et al. 2003) and functional imaging (Fassbender et al., 2004), executive processes are not limited to the frontal lobes but are subserved by a distributed network of cortical, subcortical, and intratentorial areas. It has been argued that dysfunction of distributed cortical networks for attention provides a better account than structural damage to specific regions even in the case of neglect (Vataja et al. 2003; Fassbender et al., 2004).

The Health-Related Quality of Life (HRQOL) Theory (Wilson & Cleary, 1995)

The Health-Related Quality of Life (HRQOL) Theory according to Wilson and Cleary (1995) explains and measures the quality of patient care in an illness situation. Quality of life (QOL) is defined as the general attitudes, feelings, or the capacity of persons to perceive an ultimate...
contentment in a specific aspect of health. This aspect of health life (physical, mental or social), which is recognized by the individual as highly significant to their well-being, in an illness situation, is endangered by the development of disease or health-related dysfunctions.

Five domains were identified as fluctuating range. It ranges from biological factors and social factors up to psychological components of one’s health life. In addition to these factors, the individual’s personal characteristics and environmental factors seem to affect one’s placement on the continuum (Wilson, & Cleary, 1995). According to Wilson and Cleary (1995), these personal domains consist of physiological factors, symptom status, functional status, general health perceptions, and overall quality of life. These factors are very important as they do change greatly an individual’s perception of life and the general effect of the illness.

As observed in Bonomi, Patrick, Bushnell and Martin’s (2000) validation of the World Health Organization Quality of Life (WHOQOL) instrument, individuals with chronic conditions had significantly lower mean score on various quality of life domains fairly as healthy adults or reproductive women. Hence, the study observed alterations in life situations like pregnancy states, aging and chronic illness as negative to a person’s perceived quality of life. In this study, stroke is noted as the chronic medical illness, which is likely to affect the quality of life of patients.

**Review of Related Studies**

**Cognitive Functioning and Stroke**

Schouten, Schiemancks, Brand and Marcel (2009) conducted a study to investigate the relationship between ischaemic lesion characteristics (hemispheric side, cortical and
subcortical level, volume) and memory performance. With regards to the side of lesion, left hemisphere damage was 53.5% (46 patients) and right hemisphere was 46.5% (40 patients).

Further analysis with a univariate analysis of variance with age, sex, and educational level as covariates showed that patients with a left hemispheric lesion performed significantly poorer on the trials of verbal immediate recall and the delayed recall trial than patients with a right hemispheric lesion. The multiple regression analysis demonstrated that poor verbal memory (immediate and delayed recall and recognition) could be predicted by lesion characteristics: patients with left hemispheric, subcortical, and large lesions showed poor memory performance.

Kin, Luo, Lim, Ween and Craik (2009) focused on prospective memory (PM) function in stroke patients. The sample consisted of 12 stroke patients and 12 controls who were matched on age and education. Cognitive tests scores indicated a significant interaction effect between the groups and the component such that patients showed deficits in the prospective memory component but not in the retrospective memory component. The results suggested that stroke patients show deficits in prospective memory performance, especially on more demanding tasks. Findings in prospective memory and memory function measures suggest that prospective memory deficits may be attributed to problems of self-initiation.

As a follow-up study, Kant, van de Berg, van Zandvoot, Frijins, Kappelle and Postman (2014) observed that 41% of the stroke patients performed significantly worse than control participants on prospective memory tasks. Deficits in prospective memory occurred as frequently as impairments in retrospective memory in a naturalistic and experimental event- and- time based
prospective memory tasks, as well as standard neuropsychological measures of (retrospective memory) processing speed and attention/executive functioning.

Planton and colleagues (2012) examined the neuropsychological outcome in a specific population of patients after a first symptomatic stroke without previous cognitive decline and with a good motor, linguistic, and functional recovery (i.e. good outcome). The secondary aims were to identify the profile of this potential impairment and relations between brain lesions and neuropsychological outcome. It was found out that patients showed lower performance in every cognitive domain compared with controls.

Man et al. (2011) did the first study on the use of MRI and MRA in relation with ischaemic stroke. The objective of the study was to evaluate the clinical, cognitive and functional outcomes in ischaemic stroke patients with small vessel, intracranial and extracranial large artery disease (SLAD) by examining 132 patients using the Standardised Neuropsychological measures and other behavioral measures such as Hamilton Anxiety and Depression Scale (HAD) and Chinese Neuropsychiatry Inventory (NPI). It was observed that a significantly lower score on MMSE was associated with the stroke patients as compared with those without SLAD. Behavioral symptoms were more and they posed more stress in caregivers when the NPI and multiple regression analysis showed SLAD was significantly associated with lower MMSE.

In a study concerning children, Hajek and other fellows (2013) also examined the cognitive outcomes following pediatric arterial ischaemic stroke and explore predictors in children. The primary objectives were to determine whether children with ischaemic stroke display deficits
in cognitive functioning; and whether specific stroke-related factors account for individual deficits in cognitive outcome functioning following pediatric ischaemic.

There was a confirmation that children with ischaemic stroke performed worse on standardised tests of cognitive functioning than children with asthma as well as compared with the normative population.

Hachinski et al. (2006) assessed executive function/mental speed, memory, language, and visuospatial/visuoconstructive functioning. Among the stroke survivors 57 (39.9%) had cognitive impairment without dementia while 12 (8.4%) were demented at baseline.

In this present study, the sample size was increased as compared to previous studies which focused on smaller sample sizes (Kin et al., 2009; Schouten et al., 2009; Hajek et al., 2013; Kant et al., 2014, Planton et al., 2012), although they groups were matched on age, sex and education. Also, to consider the fatigue associated with stroke, an extensive cognitive testing would not be done in this study, but a short and comprehensive cognitive testing was employed.

Again, this study focused on healthy controls without factoring in any specific medical condition as an object of interest. Additionally, cognitive screening tool (Quick Revised Cognitive Screening Test- RQCST) was adopted which seemed more comprehensive than the MMSE. Behaviour measures used in most studies dwelt only on depression (Man et al. 2013), disregarding other psychological disorders associated with stroke. It also ended up focusing more on the depression on caregivers. Finally, as a clinical study with the adoption of a case-control study, the current study recruited healthy participants as its comparison group which other studies failed to adopt (Man et al., 2011).
Stroke and Lesion Sites

To determine the severity and pattern of cognitive dysfunction in patients with basal ganglia (BG) hemorrhage within the first 6 months after stroke and to identify its clinical correlates, Chwen-Yng and others sampled 30 patients with BG hemorrhage and 37 healthy controls. Relative to healthy controls, BG patients performed significantly worse across different cognitive domains after controlling for age, sex, and education. 96.7% of patients displayed defective performance on at least three neuropsychological tests (Chwen-Yng et al., 2007).

Peñaloza, Rodríguez-Fornells, Rubio, De Miquel and Juncadella (2014) concluded after their search that although a substantial improvement of language function can be expected after non-thalamic subcortical stroke, but findings suggested that language recovery may not be fully achieved at 1 year post stroke. The role of the affected hemisphere and the lesion site in the occurrence and recovery of language deficits in non-thalamic subcortical stroke were examined. In fact, the language impairments following left and right basal ganglia stroke mirrored the language dysfunction observed after cortical lesions in the same hemisphere. A significant overall language improvement was observed at 3 months after stroke, although residual deficits in language executive function were the most commonly observed impairment at 1 year follow-up.

The study reviewed focused on just an aspect of subcortical lesion (Chwen-Yng et al., 2007), but the present study emphasized on various subcortical lesions such as the thalamic region. Also the duration of the assessment was restricted to 3 months or 6 months but even few days after the onset of stroke.
Predictors of Cognitive Functioning

Akinyemi et al. (2014) assessed the baseline profile and factors associated with vascular cognitive impairment (VCI) in stroke survivors. It was observed that there was a high frequency of early VCI in older Nigerian stroke survivors apart from aging, neurodegeneration and cognitive decline, educational level and diet which were modifiable factors. Again, baseline profile and factors were assessed and an association was found in vascular cognitive impairment (VCI) in stroke survivors participating in the Cognitive Function After Stroke (CogFAST) Nigeria Study. This emphasized the vital role of education and healthy nutrition in building reserves to ameliorate cognitive dysfunction after stroke.

An unequal number of participants were recruited whereby one group had more participants than the other as observed in Akinyemi and colleagues study (Akinyemi et al., 2014). Also, the adoption of cognitive test with local norms would be employed in this study as Akinyemi and colleagues used a more local measure. This study also attempts to include other variables such as the onset of stroke as a predictor of cognitive functioning.

Stroke and Quality of Life

In Cortez, Wilder, McFadden and Majersik (2014) study as one of the few data on HRQOL after intra-arterial therapy (IAT) for acute Ischaemic stroke (AIS), they assessed through mailed questionnaire by Subcortical Stroke- QOL (SSQOL) and Modified Rankin Scale (mRS) for disability status. With the aim of finding out the relationship between stroke severity and mRS and QOL and time since stroke, the ANOVA and Pearson correlations were adopted respectively. It was concluded that scores were higher in recanalised patients in 11 of 12 domains but was significant only for mood with a suggestion that SS-QOL is an independent outcome from stroke severity and disability status.
Gunaydin, Karatepe, Kaya and Ulutas. (2011) explored quality of life at the third month after stroke and found out the factors related with and its determinants in geriatric stroke population. The stroke severity, functional status, and ambulation level were assessed by the Canadian neurological scale (CNS), the functional independence measure (FIM), and the functional ambulation classification scale (FACS) within the first week of stroke respectively.

The QOL of 80 patients according to the SF-36 were found to be lower than those of general population whereas no significant difference was found in stroke severity, functional status at baseline and third month, depression and QOL between geriatric and non-geriatric patients. Stroke patients had an impaired QOL, and geriatric patients did not demonstrate a difference in terms of QOL compared to non-geriatric patients (Gunaydin, Karatepe, Kaya & Ulutas, 2011).

In a 2010 study by Haley, Roth, Kissela and Howard, the aims were to examine the impact of stroke on quality of life; and to analyse if race, gender, age, income, or living alone moderate these changes. 136 medically documented stroke patients and 136 demographically matched stroke-free controls were drawn from the Reasons for Geographic and Racial Differences in stroke study without history of stroke completed baseline SF-12 mental (MCS) and Physical Component Summary (PCS) measure and a depression scale. A repeated measure after 1231 days reported that stoke patients showed significant worsening than the stroke-frees in all the three quality of life measures. It was also found out that stroke survivors who lived alone were at greater risks for increases in depressive symptoms.

In a contrast, a randomized clinical trials by Sarnowski et al. (2012) reported significant improvement in mortality and functional outcome as measured with modified Rankin Scale
(mRS) or Barthel Index (BI) in stroke patients with space-occupying anterior circulation infarctions treated with hemicraniectomy. It was observed that subscales related to physical mobility and functioning were severely impaired, while subscales related to psychological well-being were impaired to a lesser extent. In conclusion, although physical components of HRQOL are highly impaired, these stroke patients achieved a satisfying level of psychological well-being which was endorsed by a nearly unanimous retrospective appraisal of life-saving hemicraniectomy.

In a prospective observational study done in 2002 by Rasquin and colleagues, it was observed that the prognosis of cognitive functioning after stroke is generally favourable especially in younger patients when an investigation was done in a cohort of patients with a first-ever stroke. In addition, it was explored whether age, sex and level of education are risk factors for vascular cognitive disorders. Memory, simple speed, cognitive flexibility and overall cognitive functioning were observed in 139 patients at 1 and 6 months post-stroke with a mean age of 69.3 years. Patients were compared with a healthy control group matched for age, sex and level of education, and cognitive disturbances were more prominent in older and female patients.

In an attempt to explore the association between lesion location and quality of life in stroke patients Moon et al. (2004) recruited 69 consecutive patients diagnosed of ischaemic stroke followed-up 2 months after the onset of stroke at the Stroke Unit in South Korea. The investigation was on how clinical and anatomical correlates can predict quality of life in stroke patients. Quality of life was assessed during the 2-months follow up period after the stroke. Baseline information or data including clinical and anatomical correlates using Beck Depression Inventory, Beck Anxiety Inventory, Barthel’s Index, MRI data at the time of the
stroke event were collected by performing a review of each patient’s chart and research data files. The results depicted that severe subcortical gray matter lesion and depressive symptoms in the acute phase of stroke were of importance in predicting low QOL 2 months after stroke.

Finally, Becker and Karnath (2007) reported unilateral visual neglect among 24% of stroke survivors. Moreover, deficits in episodic memory (Hanks et al. 1999), visual perception (Whitson et al., 2007), executive functions (Grigsby et al., 2002), visual attention (Chen Sea et al., 1993) and language (Duncan et al., 2005) are associated with difficulties on the capacity to accomplish activities of daily living (IADL). Thus, stroke results in a number of cognitive deficits that have significant impact on the ability to carry out activities of daily living.

Quality of life measures employed had no environmental and social support domains, whereby the issue of culture was very much undermined (Sarnowski et al., 2012). Furthermore, previous studies have dwelt on more depression and anxiety without emphasizing on other constructs like psychoticism (Fruhwald et al., 2001; Moon et al., 2004; Kreiter et al., 2013).

**Predictors of Quality of Life**

A variety of factors have been identified that seemed to affect quality of life ranged from age, educational level, employment status, monthly household, income, to disease severity. It was observed that old age, low education, unemployment, low household/income and high disease severity resulted in a poor quality for the stroke outpatients. Paul et al. (2005) also observed similar findings which reported that age, socioeconomic status, and stroke severity negatively affected the quality of life among stroke patients.
With an evidence of dependency and additional attention needed by stroke survivors, Singhpoo and his fellows in a hospital-based analytical study aimed to investigate on the factors related to quality of life among stroke survivors in Khon Kaen province of Thailand. The Thai 36-item Short Form (SF-36) rating scale was used for the study. With 237 stroke survivors, the age range between 20 and 91 years with a mean of 63.76. There was a statistical differences in male gender, aged under 50, educational level higher than bachelor degree, and unemployed status. For mental health summary scale, the education level, employment status, household income, and disease severity. To sum up, factors related to QOL were educational level, occupation, monthly household income, and mRS score (Singhpoo et al., 2012).

The first exploration health-related quality of life by describing the profile of and factors associated with HRQOL among stroke survivors in Ghana (Donkor et al., 2014), involved stroke survivors and healthy-controls matched on age and sex. A robust HRQOL questionnaire involving seven domains was used to collect data from the study participants. Clinical epidemiology data were also collected from stroke survivors on parameters such as stroke severity and risk factors. 86 of the stroke survivors had mild stroke and 55 had moderate stroke, whereas 19 had severe stroke. Hypertension was found to be the most common risk factor (89%) among the stroke survivors, followed by diabetes (29%).

HRQOL scores ranged from 57.7% (cognitive domain) to 80.0% (spirit domain) for stroke survivors, whereas HRQOL scores on the control group ranged from 65.6% (cognitive domain) to 85.2% (soul domain). For each HRQOL domain, significantly higher scores were observed for the control group compared with the stroke survivors. Determinants of HRQOL of stroke survivors in multivariate analysis included age, stroke severity, post-stroke duration, stroke
recurrence, frequency of laughter, and negative emotions. But the most affected HRQOL
domains were of the physical, psycho-emotional, and cognitive domains.

In a clinical trial to examine quality of life (QOL) among stroke survivors with lacunar
stroke, Dhamoon and Colleagues sought to describe its course and predictors. Based on the
hypothesis to affirm that there would be a decline in QOL after recovery from lacunar stroke,
a linear mixed models were used. Adjusted variables included demographics, medical risk
factors, cognitive factors and functional status. The Bartel Index (BI) used observed a mean
score of 95.4 assessed on average of 6 months after stroke. Also, the multivariate analysis
revealed an average increase in QOL of .6% per year.

It was established that, age, any college education, prior stroke and BI were the factors that
associated with decline in QOL. In conclusion, the clinical trial of lacunar stroke patients
assessed had an overall slight annual increase in QOL and the attributed determinants were
age, level of education, prior stroke, whereas multiple strokes may cause decline in QOL over
time in the absence of recurrent events (Dhamoon et al., 2014).

The present study adopted a spirituality measure but not as a domain of quality of life to assess
its association with quality of life and how stroke patients use spirituality as coping strategy.

**Psychological Health and Stroke**

Carod-Artal, Trizotto, Coral and Moreira (2009) also found that post-stroke depression and
disability are consistent determinants of HRQOL in Brazilian stroke patients. About 260
stroke patients with a mean age of 55.9 %. 88 % with ischaemic infarction were assessed on
NIH Stroke Scale, Barthel index (BI), Lawton scale, modified-Rankin scale, Cumulative
Illness Rating Scale for Geriatrics, Mini-Mental State Examination, Hospital Anxiety and Depression Scale, and Stroke Impact Scale (SIS); had a BI score $\leq 60$ (severe disability), and 34.5% were independent in the activities of daily living. The estimated prevalence of post-stroke depression was significantly higher in females than in males.

Yet, post-stroke depression was associated with female sex, disability, and lower cognitive functioning. SIS Physical Composite Domain mean score was 46.6. Hand Function, Strength, Mobility, Social participation, and Emotion were the most affected domains. HRQOL of stroke survivors decreased in a significant way as motor impairment severity, disability, functional status and mood worsened.

As part of stroke patients dealing with a wide range of physical and psychological problems, they are being hindered in carry-out their daily living activities (ADL). Haghgoo and Colleagues (Haghgoo et al., 2013) in a cross-sectional study aimed at examining the relationship between the activity of daily living performances and degree of after stroke depression (ASD) coupled with QOL in Iranian stroke survivors. The Pearson and Spearman correlation coefficients showed that about 65.5% of the total participants were either fully dependent or needed help in ADL; 72.5% showed mild to severe ASD leading to a significant negative correlation between ADL performances and ASD; and also between QOL and ASD. Furthermore, strong relationship was found between ADL and QOL. It was concluded that ADL have a strong relationship with both level of depression and QOL in patients with stroke, by recommending that motivating to perform ADL may enhance QOL.

Furthermore, in an attempt to show how Neuro-Linguistic Programing (NLP) and health education could lessen depression and anxiety right after intervention, but not at the 6-month
follow-up; Peng et al. (2015) created an intervention that could also progress the awareness of stroke information and benefit patients on quality of life and physical function. A brief intervention NLP brief therapy and health education, to evaluate the changes in patients with ischaemic stroke were assessed on 180 patients randomly assigned to receive 4 sessions of NLP plus health education or usual care. The results indicated that more patients in the intervention group attained remission of depressive and anxious symptoms after intervention.

**Stroke and Spirituality**

Strong religious beliefs can protect stroke patients from emotional distress, perhaps aiding recovery, according to a new Italian study (Giaquinto, Spiridiglizzi, & Caracciolo, 2007). Emotional distress, specifically depression, has been shown in other research to negatively influence recovery during a stroke individual’s admission or after discharge from hospitals. In this study, researchers from Rome interviewed 132 survivors of stroke with the median age of 72 years. They asked about the survivors’ religious beliefs and spirituality while assessing their depression and anxiety levels.

The observation was that the higher the anxiety and depression scores, the lower the religious and spirituality beliefs. Researchers controlled certain variables that could have affected emotional distress such as the degree of physical functioning after the stroke, marital status, and living conditions. The contention was the inability to find predictors that link strong faith to less distress. The speculation was based on the fact that people who are active in religious activities may have more social support, and that can positively influence the outcomes in stroke as well as other illnesses.
While most of the patients surveyed were Roman Catholic, the researchers note that religious coping mechanisms have been identified in non-Catholic people as well. They recommended that post-stroke rehabilitation should incorporate an element of faith and religious beliefs, and that patients be provided spiritual assistance if desired.

**Summary of the Chapter**

This study investigated the cognitive functioning and quality of life among patients in Ghana. Based on a systematic thematic review of literature, theories (executive functions and health related quality of life) and related studies were analysed.

**Rationale of the Study**

This study is necessary based on the following research gaps identified in the literature that must be filled. Mostly, studies reviewed before this thesis worked on either the cognitive functioning (Hachinski et al., 2006; Chwen-Yng et al., 2007; Schouten et al., 2009; Hajek et al., 2013; Akyinyemi et al., 2014) or the quality of life (Haley, Roth, Kissela & Howard, 2010; Singhpoo et al., 2012; Donkor et al., 2014) among stroke patients in Ghana without considering the interaction between the two constructs. Therefore, a critical look at the interaction effect of these two variables on stroke is critically examined in this study.

Unlike studies (Haghgoo et al., 2013; Peng et al., 2015) which emphasized on secondary data with few measures, this study works on primary data from all research respondents. With respect to this, this work compares stroke samples with healthy controls. Thus, this study sets out to employ measure (RQCST) that stands-out to correct the limitation of the MMSE.
Finally, this study serves as a link between other researches globally with that of Ghanaian samples. Hence, this provides a data on Ghanaian samples and serves as a starting point for other future researchers.

**Statement of Hypotheses**

Hypothesis 1: Stroke patients will perform poorer on the cognitive function, behavioral, quality of life and spirituality measures than healthy control group.

Hypothesis 2: Stroke patients with left hemisphere damage will perform poorer on the cognitive tests, quality of life, behavioral measures than those with right hemisphere damage.

Hypothesis 3: Stroke patients with cortical lesion will perform poorer on the cognitive tests, behavioral and quality of life measures than those with right hemisphere damage.

Hypothesis 4: Age, years of education, lesion level and age of onset will predict cognitive deficits of respondents.

Hypothesis 5: There will be significant relationship among cognitive tests, quality of life and spirituality measures, somatisation, depression, anxiety, and hostility.

**Proposed Conceptual Framework**

Figure 1 shows the proposed conceptual framework of the study’s hypothesized findings. The figure indicates expected significant relationships between the variables used in this study. Stroke is expected to affect cognitive functioning and quality of life of patients. It has also been proposed that stroke is expected to have an effect on psychological functioning of individuals based on the Brief Symptom Inventory (BSI) subscales, and psychological functioning will have a significant effect on spirituality. Again, variables such as age of respondents, age of stroke onset, level and years of education, level of lesion, side of stroke and diagnosis. The study also proposed that, spiritual will have a significant effect on quality of life.
Figure 1

Proposed Conceptual Framework
Operational Definitions

Adult: An individual above 18 years of age.

Stroke Patients: Individuals diagnosed clinically with stroke either ischaemic, haemorrhage or transient ischaemic attacks.

Health Belief: It is one’s perception about health being influenced either by cultural or medical factors.

Cognitive functioning: Skills related with memory, executive functions, attention, visuospatial skills, visuomotor coordination and mood.

Quality of Life: It is the general and specific views a person holds about how good their everyday life is.
CHAPTER THREE

METHODOLOGY

Introduction

This section examines the method employed by this study. Information on the setting, population, sample size, sample technique, participants, research design, measures, and procedure used for the study is presented in this section.

Setting

Participants for the study were recruited from the Stroke Unit at the Korle-Bu Teaching Hospital (KBTH), Accra. The Stroke Unit was chosen because it is one the multi-disciplinary Units in West Africa and for that matter the first in Ghana.

Population

The primary population comprised both male and female stroke patients (in-patients and out-patients) with their families at the Stroke Unit of the Korle-Bu Teaching Hospital (KBTH). This population was chosen due to the fact that it covered individuals with various socioeconomic and disorder characteristics across the country. This region was selected because being the capital city of Ghana, it is the most populated of all the regions and consists of diverse ethnic groups with different cultures.

Sample Size Determination

A sample size of one hundred (100) respondents comprising fifty (50) stroke patients and fifty (50) healthy controls was sampled. This sample size was arrived at by using Epi-info™ sample size calculation for unmatched Case-Control Studies Version 3.03.17 (Centers for Disease Control and Prevention, 2012).
Control and Prevention, 2012). Using the Kelsey formula, an alpha of 0.05 and a power of 80 gave a calculated sample size forty-four (44) case group and forty-four (44) control group. In order to decrease the chances of non-response case effects on the test outcomes, an additional six (6) respondents were added to each of the groups to add up to a total of hundred (100) respondents.

**Sampling Technique**

The purposive sampling method was used to select case samples (i.e. the stroke patients) because the sample was based on who would be appropriate for the study. In other words, due to the specialized nature of the study and the selective nature of samples to suit the study. Healthy controls were selected using convenience sampling technique to identify available family members/care givers who accompanied them to the clinic or people who shared similar demographic characteristics with respondents. This was based on the availability and willingness to participate in the research and also recruit participants for the study (Gravetter & Forzano, 2006).

**Participants**

The study sample participants were made up of stroke patients with healthy controls who were matched only on age and educational levels. The inclusion criteria for participation in this study included participants with at least a basic level of education and aged above 18 years who would be willing to participate. Some potential participants were excluded on the basis of cognitive contra-indications like dementia, central nervous system disease, and unstable medical illness. Other Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision [DSM-IV-TR] Axes I and II disorders, drug or alcohol dependence, head trauma (American Psychiatric Association [APA], 2000) and/or refusal to willingly participate.
Participants’ selection criteria were based on the following criteria:

**Stroke Group (SG)**

**Inclusion Criteria:**

1. Had met the clinical medically diagnosis for Stroke.
2. Aged 18 years and above.
3. Could read and write in order to complete the tests.

**Exclusion Criteria:**

1. Had unstable medical conditions.
2. Had mental co-morbidity (dementia or psychiatric disorders as determined by clinical examination and results from the MMSE).
3. Had a history of DSM-IV-TR axes I and II disorders.
5. Had disabilities of the upper extremities that significantly affect motor performance.

**Healthy Control Group (HCG)**

**Inclusion Criteria:**

1. Not clinical medically confirmed diagnosis with MRI or CT images for Stroke.
2. Aged 18 years and above.
3. Had matched demographic qualities with the stroke patients.
4. Could read and write in order to complete the tests.

**Exclusion Criteria:**

1. Had a history of cognitive contra-indications like dementia, central nervous system disease, and unstable medical illness.
2. Had mental co-morbidity (dementia or psychiatric disorders as determined by clinical or neurological education and results from the MMSE.

3. Had a history of DSM-IV-TR axes I and II disorders.


6. Had disabilities of the upper extremities that significantly affect motor performance


**Demographic Data**

The demographic characteristics were taken with regards to the frequencies and percentages of the variables. The mean and standard deviation of variables were measured. These included; sex (males and females), marital status (married, single, divorced, cohabit, and widowed), types of complications, types of stroke (ischemia, haemorrhage, and transient Ischaemic attacks), risk factor (genetics, alcoholism, hypertension, diabetes, smoking, and obesity).

Also, the means and standard deviations of the variables in terms of the age, education and diagnosis all in years were computed.
Table 3.1: Means and Standard Deviations of Stroke Patients and Healthy Control Group on Some Demographic Variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Stroke Group (n=50)</th>
<th>Healthy-Control Group (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Years</td>
<td>52.02 (13.06)</td>
<td>54.54 (15.34)</td>
</tr>
<tr>
<td>Education in Years</td>
<td>13.08 (5.45)</td>
<td>13.70 (4.28)</td>
</tr>
<tr>
<td>Education in levels</td>
<td>2.16 (0.82)</td>
<td>2.30 (0.74)</td>
</tr>
<tr>
<td>Age of onset</td>
<td>50.96 (12.64)</td>
<td></td>
</tr>
</tbody>
</table>

Research Design

The Case-Control Study was employed as the study’s research design. This design was selected because it enables researchers to find relationships between two varied existing groups. In this study, the two populations selected different in their existing type of case exposure. Thus, the case group had an existing exposure to stroke while the control group were healthy participants (non-stroke). Moreover, this design permits the groups selected to be compared on cognitive functioning and some behavioral measures.

The use of Case-Control Study design in stroke studies have been supported (Liang et al., 2009; Zheng & Liu, 2014; Kraft et al., 2015) and used in several studies including diabetes, sexuality (Jiménez-Garcia et al., 2012), drug-induced Parkinsonism (Ma et al., 2009), alexithymia and depression (Chatzi et al., 2009) to outline significant differences between individuals diagnosed with stroke and healthy controls.
Instruments/Measures

The study adopted and adapted the following set of tests (cognitive and behaviour measures) as tools for data collection. The number of tools would not be numerous because of the challenges stroke pose on individuals.

Revised Quick Cognitive Screening Test [RQCST] (Mate-Kole et al., 2009)

The mid-range test of the Quick Cognitive Test (QCST) was initially developed and subsequently adopted from the original unpublished work by the late John McFie. It was designed to detect cognitive dysfunctions and specific areas of cognitive deficits (Mate-Kole, Lenzer, & Connolly, 1994). The RQCST is the revised version of the QCST (Mate-Kole et al., 2009).

The RQCST is a 48-item cognitive screening test with seven subtests. They are orientation (e.g., Place and time), verbal abilities (attention/concentration {verbal}, memory-immediate recall, arithmetic, vocabulary, naming, abstract reasoning - both similarities and analogies, memory-delayed recall and new learning) and visual/spatial/constructional abilities (attention/concentration {visual}, spatial neglect, constructional praxis, memory-immediate recall {visual}, unusual views, spatial orientation and memory-delayed recall {visual}). It has a multi-dimensional score with each subset having a score, plus summary and global scores. It has the ability to discriminate between healthy controls and neuropsychiatric patients. There are three (3) major subscales of the RQCST: Orientation has the Cronbach alpha of .78, total verbal is .84 and total non-verbal is .84. It has the Cronbach alpha of 0.92.

Orientation consists of 12 items assessing time, place, person, and age.

Attention/concentration comprised 3 items with 2 parts: verbal and visual. This subset evaluates one’s ability to maintain attention, concentration, and tracking of a particular
problem. Spatial neglect measures one’s visual spatial abilities and neglect. Arithmetic is made up of 4 items of mathematical calculations like addition, subtraction, multiplication and division. Constructional praxis requires the respondent to copy a drawing of 3 interconnected geometry to test for the person’s planning, spatial organization, and visual constructional skills. Memory also has two distinct parts: verbal and non-verbal. The verbal part comprise 5 items verbally presented and the participant is expected to repeat the 5 items immediately after presentation and after 5 minutes delay. The non-verbal portion is where the participant is required to redraw the 3 geometric figures from memory immediately after presentation and after delay period.

New learning asks the participant to repeat the Babcock sentence. Ten trials are given for the participant to repeat the sentence successfully without error. Vocabulary consists of 5 items in which the participant is asked to identify words with the same meanings or definitions. Naming consists of 5 items requiring the participant to identify pictures of objects such as an umbrella, a butterfly, a teapot, a knife, and a book. Abstract reasoning comprises 2 parts; similarities and analogies. Similarities require the participant to identify a word or phrase that best describes a pair of words given. Analogies require the participant to identify words that best complete given sentences. Unusual views requires the participant to identify objects from an unconventional angle. It assesses individual’s perception and object recognition. Spatial orientation requires the participant to identify matching designs. This subtest measures the individual’s visual spatial orientation and relations.

Each of the 17 subtests has its own score. There is a summary score for orientation (the ratio of observed scores by 12), for the verbal tests (the ratio of the observed scores by 44), and for the nonverbal tests (the observed score divided by 44). The 3 scores are summed to make up the global score (summation of the scores on the three domains divided by 90).
The Cognitive Failures Questionnaire [CFQ] (Broadbent, Cooper, FitzGerald, & Parkes, 1982)

The Cognitive Failures Questionnaire (CFQ) is a 25-item self-report questionnaire which measures failures in perception, memory, and motor function. It was designed by Broadbent and colleagues in 1982 to measure a person’s chances of committing an error in the execution of an everyday task. Items on CFQ evaluate or assess a general factor of cognitive failure that comprises; perception, memory, and motor function. An example of questions on CFQ is ―Do you lose your temper and regret it? Which is rated on a 5-point Likert-type scale [0 = never, 4 = very often] (Broadbent et al., 1982). Participants’ score ranged from 0-100. The Cronbach’s alpha for the CFQ is 0.91, with a test-retest reliability of 0.82 over an interval of 2 months (Vom Hofe, Mainemare, & Vannier, 1998). Responses to all questions tend to be positively correlated. Respondents were asked to indicate the frequency with which they make such mistakes. All questions are worded in the same direction rather than adopting the device of wording some questions positively and some negatively to cancel out biases favouring affirmations and denials.

Brief Symptom Inventory [BSI] (Derogatis, & Melisaratos, 1983)

The Brief Symptom Inventory (BSI) is a 53-item self-report inventory intended to reveal the clinical psychological manifestations of psychiatric, medical and healthy subjects alike. It was developed from the Symptom Check List-90-R. It measures nine profiles of primary symptom areas and three global dimensions of psychological distress. The answers are on a 5-point Likert scale, from 0 = —not at all, to 4 = —extremely. Sample item on the test include ‘Feeling fearful’, ‘Getting into frequent arguments’, etc. BSI’s component subscales measure numerous dimensions of psychological dysfunctions. The Global severity index (the total score on the scale) is attained by adding up all the items on the subscales and dividing it
by 53 (the total number of items on the scale). These subscales contain the succeeding item additions: Somatization (Items 2, 7, 23, 29, 30, 33, 37), Obsession-Compulsion (Items 5, 15, 26, 27, 32, 36), Interpersonal Sensitivity (Items 20, 21, 22, 42), Depression (Items 9, 11, 16, 17, 18, 25, 35, 39, 50, 52), Anxiety (Items 1, 12, 19, 38, 45, 49), Hostility (Items 6, 13, 40, 41, 46), Phobic Anxiety (Items 8, 28, 31, 43, 47), Paranoid Ideation (Items 4, 10, 24, 48, 51) and Psychoticism (Items 3, 14, 34, 44, 53). Items on each domain include: How much were you distressed by; somatisation (“Faintness or dizziness”), obsession-compulsion (“Feeling blocked in getting things done”), interpersonal sensitivity (“Feeling very self-conscious with others”), depression (“Feeling hopeless about the future”), anxiety (“Feeling so restless you could not sit still”), hostility (“Feeling easily annoyed or irritated”), phobic anxiety (“Having to avoid certain things, places, or activities because they frighten you”), paranoid ideation (“Feeling that most people cannot be trusted”), and psychotism (“The idea that something is wrong with your mind”).

The scoring for each domain is the total summation of the scores divided by the number of items on that specific domain. The BSI has a high Cronbach's $\alpha$ that ranges from 0.71 to 0.85 (Derogatis, & Melisaratos, 1983).

**Spitzer Quality of Life Index [SQLI] (Spitzer, Dobson & Hall, 1981)**

The Spitzer Quality of Life Index is a universal quality of life index that covers five dimensions of quality of life (activity, daily living, health, support of family and friends, and outlook). It was intended for use by medical practitioners to help them assess the comparative benefits and hazards of a variety of treatments and management. The psychometric properties of SQLI were identified in a series of validation tests by over 150 physicians to assess 879 patients with an average completion time of one minute. Fifty-nine percent of physicians
claimed that they were at least very confident of the validity of their scores. An evaluation of internal consistency established a significantly high coefficient (Cronbach's $\alpha = 0.775$).

**World Health Organisation Quality Of Life (WHOQOL) (WHOQOL GROUP, 1998)**

The WHOQOL-BREF is a 26-item Likert type scale that assesses four domains of quality of life: physical health (e.g., “How much do you need any medical treatment to function in your daily function in your daily life?”), psychological health (e.g., How often do you have negative feelings such as blue mood, despair, anxiety or depression?”), social relationships (e.g., “How satisfied are you with your sex life?”), and environmental wellbeing (e.g., “How safe do you feel in your daily life?”). These subscales contain the succeeding item additions: Physical Health- 3, 4, 15, 16, 17, 18), Psychological domain (5, 6, 7, 11, and 26), Social relationships domain (20, 21, and 22), and Environmental domain (8, 9, 12, 13, 14, 23, 24, and 25).

There are various facets that are incorporated within the four domains; physical health (activities of daily living, dependence on medicinal substances and medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity); psychological (bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality/religion/personal beliefs, thinking, learning, memory and concentration); social relationships (personal beliefs, social support, sexual activity; and environment- financial resources, freedom, physical safety and security, health and social care: accessibility and quality, home environment and opportunities for acquiring new information and skills, participation in and opportunities for recreation/leisure activities, physical environment pollution/traffic/noise, and transport).
Items 1 and 2 are examined separately, which assess overall perception of quality of life and overall perception of their health respectively. The four domains scores denotes one’s perception of quality of life in each particular domain. Domain scores are scores in a positive direction (i.e. Higher scores denotes higher quality of life). The mean score of items within each domain is used to calculate the domain score. Mean scores are then multiplied by 4 in order to makes domain scores comparable with the scores used in the WHOQOL-100. There are three negative phrased items (items 3, 4, and 6) which must be transformed into positive frame questions (11=5, 2=4, 3=3, 2=4, 1=5).

The WHOQOL Group (1998) assessed Cronbach alpha for the four domains: physical health being 0.8; psychological health being 0.76; social relationship is 0.66 and environmental wellbeing is 0.80. Test retest reliabilities for the four domains were 0.66 for physical health, 0.72 for psychological health, 0.76 for social relationship and 0.87 for environmental wellbeing. The WHOQOL-BREF was found to correlate 0.90 with the longer version of the instrument, the WHOQOL-100.

The Index of Core Spiritual Experiences (INSPIRIT) (Kass et al., 1991)

The INSPIRIT measures core spiritual experience, which involves an event producing a personal conviction of the existence of God (or some form of higher power as defined by the person) and a highly internalized relationship with God. The INSPIRIT is criticized for it’s heavily monotheist orientation, which may delimit its accuracy with some subjects who characterize their spirituality in polytheistic or nontheistic terminology. However, MacDonald et al. (1995) elaborated a number of strengths of the INSPIRIT: it is grounded in both theoretical and clinical research experience; it is quite parsimonious, consisting of 6 items, administered quickly and easily; the INSPIRIT has already demonstrated a significant
empirical relationship between spiritual experience and both psychological and physical health.

For this reason, the INSPIRIT was the inventory used in my current study for the measurement of spirituality. It is rated on a 5-point Likert scale with the least number indicating the lesser experience. It is scored by summing up the items. It has a lower score of 1 and higher score of 30. It has an internal consistency of .90.

Pilot Study

Pilot study was done to determine the appropriateness and the suitability of the tests and the questionnaires on Ghanaian samples. It was also conducted to find-out the required time to be used to complete each set of test and also estimated time that a participant completes the study. Stroke patients who have been diagnosed with Stroke by a medical practitioner were used in the pilot study. The participants (n=10) for the study were drawn from the Stroke Unit at the KBTH. Both males (5) and females (5) were represented during the pilot study.

Procedure

Ethical clearance to conduct the research was obtained from the Ethical committee of the Humanities (ECH) in the University of Ghana. After the approval, a letter of introduction was obtained from the Department of Psychology, Legon introducing the researcher to the Stroke unit in the Korle-Bu teaching Hospital (KBTH) to permit data collection within three month period. A pilot study was first conducted to confirm the appropriateness and reliability of the adopted psychological measures on Ghanaian clinical samples with 10 samples. Details of the reliability co-efficient for the various measures are as follows: Revised Quick Cognitive
Screening Test (RQCST) Global = .810, Cognitive Failures Questionnaire (CFQ) = .816, World Health Organisation Quality of Life (WHOQOL) Global = .814, Spitzer’s Quality of Life = .544, Brief Symptom Index (BSI) Global = .324 and Index of Core Spiritual Experience (INSPIRIT)= .956.

After the initial screening, all participants were offered a battery of cognitive tests which lasted for an average of 45 minutes in a session. Individuals within the inclusion criteria were sampled and allowed to sign the informed consent form to indicate their willingness to be part of the study before administration of questionnaires. The assessment procedure involved an administration of a demographic questionnaire, cognitive tests, behaviour measures and quality of life tests to measure selected participants. On the course of the testing period, boredom and fatigue were concurrently checked by frequently enquiring if participants needed a recess or wanted to discontinue.

Testing took place in a testing room to ensure confounding variables like noise, lighting challenges were controlled to a high degree. After the completion of the testing, participants were offered a toke (Monetary value) as a sign of appreciation for their time. Completed tests were then collected at the end of each session, scored and placed into a sealed envelope to ensure confidentiality and safety of responses.

After that, the participants were administered the Revised Quick Cognitive Screening (RQCST) to screen for any cognitive deficits and was consequently followed with the rest of the tests on the protocol: Brief Symptom Inventory (BSI). Cognitive Failures Questionnaire (CFQ), Spitzer’s Quality of life, World Health Organisation Quality of Life (WHOQOL) and the INSPIRIT. Participants were given periodic breaks to reduce fatigue which informed the decision not to administer an extensive neuropsychological assessment.
CHAPTER FOUR

RESULTS

4.1 Introduction

Preliminary Analysis

This section involves the analysis of collected data. The study sought to investigate the cognitive functioning and quality of life among stroke patients. The formulated hypotheses in this study were tested using the Statistical Package for the Social Sciences (SPSS) version 22.2 for windows (IBM Corporation, 2013). Following the assumptions required for the selection and usage of parametric test, the hypotheses were tested with the Multivariate Analysis of Variance, Pearson-Moment Correlation Coefficient and Hierarchical Linear Regression analysis.

The multivariate analyses were used to compare the stroke patients and the healthy controls; and stroke patients with left hemisphere and right hemisphere damage, and with cortical and subcortical level of lesion on cognitive tests, quality of life and psychological measures. The Bonferroni Correction was used to correct for type 1 errors associated with multiple relationship between quality of life and cognitive tests in stroke patients and healthy control group, stroke patients with left and right hemisphere damage, and stroke patients with cortical and subcortical lesions. Pearson product-moment correlation coefficient was used to establish the relationships between, quality of life, psychological measure and cognitive tests. The hierarchical linear regression analysis was used to identify the predictors of cognitive functioning among the respondents.

The data was further screened for possible missing data and outliers in the data. In addition, other data transformations which included calculation of grand and subscale scores on the behaviour measures were done before continuing with the hypothesis testing. The Cronbach’s
alpha of the various tests was computed for the present sample. Summary of results are
displayed in table three (3) below.

Table 4.2: Summary of Cronbach’s alpha of the tests for the present sample

<table>
<thead>
<tr>
<th>Tests</th>
<th>Cronbach Alpha (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQCST orientation</td>
<td>.35</td>
</tr>
<tr>
<td>RQCST Verbal Score</td>
<td>.76</td>
</tr>
<tr>
<td>RQCST Non-verbal Score</td>
<td>.70</td>
</tr>
<tr>
<td>RQCST Global</td>
<td>.85</td>
</tr>
<tr>
<td>Cognitive Failures Questionnaires (CFQ)</td>
<td>.91</td>
</tr>
<tr>
<td>Global Severity Index (BSI)</td>
<td>.95</td>
</tr>
<tr>
<td>Somatisation</td>
<td>.73</td>
</tr>
<tr>
<td>Depression</td>
<td>.76</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.76</td>
</tr>
<tr>
<td>Hostility</td>
<td>.69</td>
</tr>
<tr>
<td>Phobic Anxiety</td>
<td>.65</td>
</tr>
<tr>
<td>Paranoid Ideation</td>
<td>.80</td>
</tr>
<tr>
<td>Interpersonal Sensitivity</td>
<td>.68</td>
</tr>
<tr>
<td>Psychoticism</td>
<td>.94</td>
</tr>
<tr>
<td>Obsession-Compulsion</td>
<td>.53</td>
</tr>
<tr>
<td>WHOQOL</td>
<td>.91</td>
</tr>
<tr>
<td>Physical Domain</td>
<td>.72</td>
</tr>
<tr>
<td>Psychological Domain</td>
<td>.61</td>
</tr>
<tr>
<td>Social Relationships Domain</td>
<td>.63</td>
</tr>
<tr>
<td>Environmental Domain</td>
<td>.69</td>
</tr>
<tr>
<td>Spitzer’s QOL</td>
<td>.82</td>
</tr>
<tr>
<td>INSPIRIT</td>
<td>.72</td>
</tr>
</tbody>
</table>
Table 4.3: Summary of Skewness and Kurtosis for the measures on the sample.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQCST Global</td>
<td>-1.063</td>
<td>.930</td>
</tr>
<tr>
<td>CFQ</td>
<td>.237</td>
<td>-1.006</td>
</tr>
<tr>
<td>Global Severity Index (BSI)</td>
<td>.142</td>
<td>-1.325</td>
</tr>
<tr>
<td>WHOQOL</td>
<td>-.909</td>
<td>.418</td>
</tr>
<tr>
<td>Spitzer’s QOL</td>
<td>.251</td>
<td>15.018</td>
</tr>
<tr>
<td>INSPIRIT</td>
<td>.241</td>
<td>.478</td>
</tr>
</tbody>
</table>

RQCST Global: Revised Quick Cognitive Screening Test, CFQ: Cognitive Failures Questionnaire; Global Severity index (BSI): Brief Symptom Index, WHOQOL: World Health Organisation Quality of Life, Spitzer’s QOL: Spitzer’s Quality of Life, INSPIRIT: The Index Core of Spiritual Experiences.
Table 4.4: Pearson’s correlation between Cognitive test, cognitive failures and Quality of life measures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. RQCST Orientation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. RQCST Verbal Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.57*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. RQCST Non-Verbal Score</td>
<td></td>
<td>.50*</td>
<td>.67*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. RQCST Global</td>
<td></td>
<td>.61*</td>
<td>.95*</td>
<td>.86*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. CFQ</td>
<td></td>
<td>-.21*</td>
<td>-.33*</td>
<td>-.27*</td>
<td>-.34*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. WHO Physical</td>
<td></td>
<td>.28*</td>
<td>.40*</td>
<td>.39*</td>
<td>-43*</td>
<td>.63*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. WHO Psychological</td>
<td></td>
<td>.24*</td>
<td>.20*</td>
<td>.31*</td>
<td>.27*</td>
<td>.60*</td>
<td>.70*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. WHO Social</td>
<td></td>
<td>.21*</td>
<td>.36*</td>
<td>.40*</td>
<td>.40*</td>
<td>.51*</td>
<td>.60*</td>
<td>.50*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. WHO Env’t</td>
<td></td>
<td>.23*</td>
<td>.21*</td>
<td>.28*</td>
<td>.26*</td>
<td>-46*</td>
<td>.54*</td>
<td>.71*</td>
<td>.51*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Global WHOQOL</td>
<td></td>
<td>.29*</td>
<td>.33*</td>
<td>.39*</td>
<td>.39*</td>
<td>-65*</td>
<td>.84*</td>
<td>.92*</td>
<td>.71*</td>
<td>.85*</td>
<td></td>
</tr>
<tr>
<td>11. Spitzer’s QOL</td>
<td>.003</td>
<td>-.02</td>
<td>.08</td>
<td>.08</td>
<td>.18</td>
<td>-.21</td>
<td>-.08</td>
<td>-.12</td>
<td>.04</td>
<td>-.10</td>
<td></td>
</tr>
</tbody>
</table>

NB: N=100. 1= Orientation, 2= Verbal Score, 3= Non-verbal score, 4= RQCST Global, 5= CFQ, 6= WHOQOL Physical Health, 7= WHOQOL Psychological, 8= WHOQOL Social Relationship, 9= WHOQOL Environment, 10= WHOQOL Global, 11= Spitzer’s QOL.
*p < 0.05 level (2-tailed)     ** p < 0.01 level (1-tailed).

The findings from the table indicates that, there is a significant positive correlation between the RQCST Global and WHOQOL \([r_{100} = .39, p = .000 \text{ (1-tailed)}]\). This shows a linear/direct relationship between the two measures. This means that all things being equal, the higher/lower the scores on RQCST, the higher/lower the quality of life among participants.
On the account of the correlation among domains of the RQCST and the domains of the WHOQOL, significant positive correlations were observed: WHOQOL Physical Health: Orientation \( [(r_{100}) = 0.280, p=0.010 \text{(1-tailed)}] \), Verbal Score \( [(r_{100}) = 0.40, p=0.000 \text{(1-tailed)}] \) and Non-verbal Score \( [(r_{100}) = 0.39, p=0.000 \text{(1-tailed)}] \); WHOQOL Psychological: Orientation \( [(r_{100}) = 0.24, p=0.010 \text{(1-tailed)}] \), Verbal score \( [(r_{100}) = 0.202, p=0.26 \text{(2-tailed)}] \) and Non-verbal score \( [(r_{100}) = 0.31, p=0.001 \text{(1-tailed)}] \); WHOQOL Social Relationship: Orientation \( [(r_{100}) = 0.21, p=0.02 \text{(1-tailed)}] \), Verbal score \( [(r_{100}) = 0.36, p=0.000 \text{(1-tailed)}] \) and Non-verbal score \( [(r_{100}) = 0.40, p=0.000 \text{(1-tailed)}] \) and WHOQOL Environment: Orientation \( [(r_{100}) = 0.23, p=0.01 \text{(2-tailed)}] \), Verbal score \( [(r_{100}) = 0.21, p=0.020 \text{(2-tailed)}] \), Non-verbal score \( [(r_{100}) = 0.26, p=0.005 \text{(1-tailed)}] \). Therefore, the higher/lower the scores on the RQCST test, the lower/higher quality of life among participants.

Again, there was a significant negative correlation between RQCST Global and Global CFQ \( [(r_{100}) = -0.34, p=0.000 \text{(1-tailed)}] \). The same significant negative correlation was observed in the domains of the RQCST and the CFQ: Orientation \( [(r_{100}) = -0.21, p=0.021 \text{(2-tailed)}] \), Verbal Score \( [(r_{100}) = -0.33, p=0.001 \text{(1-tailed)}] \), and Non-verbal score \( [(r_{100}) = -0.27, p=0.000 \text{(1-tailed)}] \). This shows an inverse/indirect relationship between the RQCST and CFQ, whereby the higher/lower the scores on the RQCST, the lower/higher the scores on CFQ.

Finally, there was also a significant negative correlation between CFQ and QOL measures \( [(r_{100}) = -0.65, p=0.000 \text{(1-tailed)}] \). Its domains also reports a significant negative correlation; WHOQOL Physical Health \( [(r_{100}) = -0.63, p=0.000] \), WHOQOL Psychological \( [(r_{100}) = -0.60, p=0.000 \text{(1-tailed)}] \), WHOQOL Social Relationship \( [(r_{100}) = -0.51, p=0.000 \text{(1-tailed)}] \) and WHOQOL Environment \( [(r_{100}) = -0.46, p=0.000 \text{(1-tailed)}] \). This shows an inverse/indirect
relationship between the CFQ and QOL whereby all things being equal the higher/lower the scores on CFQ, the lower/higher the scores on QOL.

Table 5.5: Pearson’s correlation table of cognitive tests and psychological measures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. RQCST Global</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. CFQ</td>
<td></td>
<td>-.34**</td>
<td></td>
</tr>
<tr>
<td>3. Global Severity</td>
<td>-.32**</td>
<td></td>
<td>.67**</td>
</tr>
<tr>
<td>Index</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1= RQCST global, 2= CFQ, 3= Global Severity index (BSI).  
*p < 0.05 level (2-tailed)  ** p < 0.01 level (1-tailed).

From the table, there was a significant negative correlation between RQCST Global and CFQ \([r_{(100)} = -.34, p= .000 (1-tailed)]\). This implies that there was an inverse/indirect relationship between the scores on RQCST Global and CFQ. Hence, the higher/lower the cognitive function, the lower the chance of committing an error in the execution of an everyday tasks.

Also, a significant negative correlation was observed between RQCST Global and BSI measures \([r_{(100)} = -.32, p=.001 (1-tailed)]\). This shows the inverse relationship between RQCST Global and BSI measures. Therefore, the higher/lower the psychological distress, the lower/higher the cognitive functioning. In conclusion, all things being equal the higher/lower the psychological disorders, the lower/higher one’s cognitive functioning.

Finally, significant positive correlation existed between CFQ and BSI \([r_{(100)} = .67, p= .000(1-tailed)]\). This implies that there was a linear/direct relationship between the scores on CFQ and BSI. Therefore, the higher/lower the cognitive failures, the higher/lower the
psychological disorders among participants. This indicates that the higher/lower the chance of committing an error in the execution of an everyday task, the higher/lower the psychological distress.

**Testing of Hypothesis 1**

**Hypothesis 1:** Stroke patients will perform poorer on the cognitive tests, quality of life, psychological and spirituality measures than the healthy control group.

To test this hypothesis, Multivariate Analysis of Variance (MANOVA) was used to assess the effect of stroke on specific cognitive tests. Since the covariance and homogeneity assumptions underlying the MANOVA were violated, Pillai’s Trace was selected \[ F_{(1, 91)} = 7.778, \rho = .000, \, \text{Pillai's Trace} = .711, \, \text{Partial Eta Squared} = .711 \]. The result of the One-Way MANOVA is summarised in Table 6.
Table 5.6: Summary of the Multivariate test results of the difference in scores on cognitive tests between stroke patients and healthy control participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Stroke Patients (n=50)</th>
<th>HCG (n=50)</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RQCST Orientation</td>
<td>11.50 (.82)</td>
<td>12.00 (.00)</td>
<td>13.31</td>
<td>1, 78</td>
<td>.002</td>
<td>.146</td>
</tr>
<tr>
<td>RQCST Verbal Score</td>
<td>35.20 (8.76)</td>
<td>43.31 (6.00)</td>
<td>22.27</td>
<td>.000</td>
<td>.222</td>
<td></td>
</tr>
<tr>
<td>RQCST Non-Verbal</td>
<td>22.98 (5.37)</td>
<td>27.94 (3.49)</td>
<td>22.86</td>
<td>.000</td>
<td>.227</td>
<td></td>
</tr>
<tr>
<td>RQCST Global</td>
<td>69.68 (13.29)</td>
<td>83.25 (7.07)</td>
<td>30.45</td>
<td>.000</td>
<td>.281</td>
<td></td>
</tr>
<tr>
<td>CFQ</td>
<td>43.82 (16.64)</td>
<td>20.67 (15.95)</td>
<td>53.30</td>
<td>.000</td>
<td>.338</td>
<td></td>
</tr>
<tr>
<td>BSI Somatisation</td>
<td>1.79 (.63)</td>
<td>.71 (.69)</td>
<td>42.65</td>
<td>.000</td>
<td>.406</td>
<td></td>
</tr>
<tr>
<td>BSI Obsession Compulsion</td>
<td>1.73 (.57)</td>
<td>.77 (.76)</td>
<td>53.30</td>
<td>.000</td>
<td>.354</td>
<td></td>
</tr>
<tr>
<td>BSI Interpersonal Sensitivity</td>
<td>1.81 (.78)</td>
<td>.57 (.72)</td>
<td>42.65</td>
<td>.000</td>
<td>.408</td>
<td></td>
</tr>
<tr>
<td>BSI Depression</td>
<td>1.87 (.70)</td>
<td>.50 (.62)</td>
<td>53.82</td>
<td>.000</td>
<td>.519</td>
<td></td>
</tr>
<tr>
<td>BSI Anxiety</td>
<td>1.62 (.67)</td>
<td>.55 (.70)</td>
<td>84.14</td>
<td>.000</td>
<td>.383</td>
<td></td>
</tr>
<tr>
<td>BSI Hostility</td>
<td>.83 (.69)</td>
<td>.42 (.51)</td>
<td>48.32</td>
<td>.002</td>
<td>.102</td>
<td></td>
</tr>
<tr>
<td>BSI Phobic Anxiety</td>
<td>.89 (.63)</td>
<td>.41 (.54)</td>
<td>8.88</td>
<td>.000</td>
<td>.142</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.6: Summary of the Multivariate test results of the difference in scores on cognitive tests between stroke patients and healthy control participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Stroke Patients (n=50)</th>
<th>HCG (n=50)</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSI Paranoid Ideation</td>
<td>1.93 (.90)</td>
<td>.72 (.92)</td>
<td>12.90</td>
<td>1, 78</td>
<td>.00005</td>
<td>.310</td>
</tr>
<tr>
<td>BSI Psychotism</td>
<td>1.10 (.55)</td>
<td>.34 (.53)</td>
<td>35.04</td>
<td></td>
<td>.000</td>
<td>.331</td>
</tr>
<tr>
<td>Global Severity Index</td>
<td>13.58 (4.32)</td>
<td>4.99 (5.11)</td>
<td>38.65</td>
<td></td>
<td>.000</td>
<td>.460</td>
</tr>
<tr>
<td>WHO</td>
<td>15.84 (4.29)</td>
<td>20.94 (2.11)</td>
<td>66.39</td>
<td></td>
<td>.000</td>
<td>.312</td>
</tr>
<tr>
<td>Psychological</td>
<td>21.16 (5.62)</td>
<td>28.08 (3.46)</td>
<td>42.41</td>
<td></td>
<td>.000</td>
<td>.348</td>
</tr>
<tr>
<td>WHO Social Relationship</td>
<td>8.70 (2.39)</td>
<td>10.97 (1.99)</td>
<td>20.68</td>
<td></td>
<td>.000</td>
<td>.210</td>
</tr>
<tr>
<td>WHO Environment</td>
<td>23.89 (5.12)</td>
<td>26.50 (3.06)</td>
<td>7.25</td>
<td></td>
<td>.0045</td>
<td>.085</td>
</tr>
<tr>
<td>Global WHOQOL</td>
<td>69.59 (15.00)</td>
<td>86.50 (7.33)</td>
<td>38.21</td>
<td></td>
<td>.000</td>
<td>.329</td>
</tr>
<tr>
<td>Spitzer’s QOL</td>
<td>6.09 (3.46)</td>
<td>7.86 (1.93)</td>
<td>7.49</td>
<td></td>
<td>.004</td>
<td>.088</td>
</tr>
<tr>
<td>INSPIRIT</td>
<td>26.11 (2.97)</td>
<td>25.14 (3.51)</td>
<td>1.814</td>
<td></td>
<td>.09</td>
<td>.023</td>
</tr>
</tbody>
</table>

From the table, there was a significant difference between the two groups on the three domains of the RQCST; Orientation, Verbal and Visual/Spatial subsets. Orientation observed a significant difference between the two groups \( F(1, 78) = 13.32, p = .000 \) with an effect size of \( \eta^2 = .146 \) and also a mean difference of \( [(MSP= 11.50) < (MHCG = 12.00)] \). Verbal Subset \( F(1, 78) = 22.27, p = .000 \) with an effect size of \( \eta^2 = .222 \) with a mean difference of \( [(MSP= 35.20) < (MHCG= 43.31)] \), and Non-verbal \( F(1, 78) = 22.86, p = .000 \) with an effect size of \( \eta^2 = .227 \) \( [(MSP= 22.98) < (MHCG = 27.94)] \). The RQCST Global and CFQ were \( F(1, 78) = 30.45, p = .000 \) with an effect size of \( \eta^2 = .281 \) with a mean difference of \( [(MSP= 69.68) < (MHCG= 83.25)] \) and \( F(1, 78) = 39.78, p = .000 \) with an effect size of \( \eta^2 = .338 \) reporting a mean difference of \( [(MSP= 43.82) > (MHCG= 20.78)] \) respectively. In effect the stroke group performed poorer on the cognitive tests by committing daily cognitive errors as compared to the healthy control group respectively.

Further, there was a significant difference between stroke patients and the healthy controls on the BSI scores \( F(1, 78) = 38.65, p = .000 \) with an effect size of \( \eta^2 = .460 \) with a mean difference of \( [(MSP= 13.58) > (MHCG= 4.99)] \).

Scores on somatisation showed significant difference between both groups \( F(1, 78) = 42.65, p = .000 \) with an effect size of \( \eta^2 = .406 \). The stroke patients had a higher score than the health control group \( [(MSP= 1.79) > (MHCG= .71)] \). This implies that their distress arises from perceptions of bodily dysfunction.

With respect to the scores on obsessive- compulsive a significant difference existed between the two groups \( F(1, 78) = 53.30, p = .000 \) with an effect size of \( \eta^2 = .354 \). The stroke patients scored higher than the healthy control group \( [(MSP= 1.73) > (MHCG= .77)] \). This indicates
that stroke patients focuses on thoughts, impulses, and actions that are experienced as unremitting and irresistible and that are of an ego-alien or unwanted nature.

With regards to interpersonal sensitivity, a significant difference existed between the two groups \(F(1, 78) = 42.65, p = .000\) with an effect size of \(\eta^2 = .354\). The stroke patients had a higher score than the healthy control group \([\text{MSP} = 1.81] > [\text{MHCG} = .57]\). This means that the stroke patients has feelings of inadequacy and inferiority, particularly in comparison with other people.

There was a significant difference between the scores on depression between the two groups \(F(1, 78) = 53.82, p = .000\) with an effect size of \(\eta^2 = .519\). The stroke patients scored higher on depression than the healthy controls \([\text{MSP} = 1.87] > [\text{MHCG} = .50]\). This implies that they has symptoms of dysphoric mood and affect which represented signs of withdrawal of life interest, lack of motivation, and loss of vital energy.

Scores on anxiety showed a significant difference between the stroke patients and the healthy control group \(F(1, 78) = 84.14, p = .000\) with an effect size of \(\eta^2 = .383\). Thus, the former had higher scores on the anxiety than the healthy participants \([\text{MSP} = 1.62] > [\text{MHCG} = .53]\). There is an indication that stroke patients showed general signs of anxiety such as nervousness, tension, and trembling as it manifests as panic attacks and feelings of terror, apprehension, and dread.

Concerning hostility, a significant difference existed between the two groups \(F(1, 78) = 48.32, p = .002\) with an effect size of \(\eta^2 = .102\). The stroke patients had a higher score than the healthy control group \([\text{MSP} = .83] > [\text{MHCG} = .42]\). There was a reflection of feelings and actions characterized by negative affect state of anger among the stroke patients.
Again, scores on phobic anxiety showed a significant difference between the stroke patients and healthy control groups ($F_{(1, 78)} = 8.88$, $p=.000$ with an effect size of $\eta^2 = .142$). The stroke patients had a higher score than the healthy control patients $[(\text{MSP}= .89) > (\text{MHCG}= .41)]$. This implies that there were persistent fear response- to a specific person, place, object, or situation- that is irrational and disproportionate to the stimulus and leads to avoidance or escape behaviour.

There was a significant difference between the two groups on paranoid ideation ($F_{(1, 78)} = 12.90$, $p=.00005$ with an effect size of $\eta^2 = .310$). The stroke patients had a higher score than the healthy control group $[(\text{MSP}= 1.93) > (\text{MHCG}= .72)]$. This showed that the stroke patients had a higher disordered mode of thinking with a cardinal characteristics of projective thought, hostility, suspiciousness, grandiosity, centrality, fear of loss of autonomy, and delusions.

With regards to Psychotism there existed a significant difference between the stroke patients and the health control participants ($F_{(1, 78)} = 35.04$, $p=.000$ with an effect size of $\eta^2 = .331$). The former had a higher score than the latter group on the score of Psychotism $[(\text{MSP}= 1.10) > (\text{MHCG}= .34)]$. This indicates that the stroke patients showed the experiences of withdrawal, isolation, schizoid lifestyle.

With effect a significant difference existed between the stroke patients and healthy controls on the global severity index ($F_{(1, 78)} = 68.909$, $p=.000$ with an effect size of $\eta^2 = .439$). The stroke patients had a higher score than the healthy control participants $[(\text{MSP}= 13.52) > (\text{MHCG}= 5.13)]$. This showed that the stroke patients had higher psychological distress than the healthy controls.

In addition, a significant difference existed among all the domains of the WHOQOL and Spitzer’s Quality of Life measure, when the stroke patients were compared with the healthy
control group. With respect to the WHOQOL measure, a significant difference existed between the two groups on all the four domains: physical health domain psychological domain, social relationship domain and environmental domain. The difference between them are indicated as follows; WHOQOL Physical Health \[ F_{(1, 78)} = 66.39, p=.000 \text{ with an effect size of } \eta^2 = .312 \], WHOQOL Psychological \[ F_{(1, 78)} = 42.41, p=.000 \text{ with an effect size of } \eta^2 = .348 \], WHOQOL Social Relationship \[ F_{(1, 78)} = 20.68, p=.000 \text{ with an effect size of } \eta^2 = .210 \] and WHOQOL Environment \[ F_{(1, 78)} = 7.25, p=.0045 \text{ with an effect size of } \eta^2 = .085 \]. The overall WHOQOL measure between the two groups reported \[ F_{(1, 78)} = 38.21, p=.000 \text{ with an effect size of } \eta^2 = .329 \].

Moreover, as evident from table, the stroke patients performed poorer on all the domains as well as the global scores on the WHOQOL measure as compared with the healthy control group: Physical Health \[(\text{MSP} = 15.84) < (\text{MHCG} = 20.94)\], Psychological \[(\text{MSP} = 21.16) < (\text{MHCG} = 28.08)\], Social Relationship \[(\text{MSP} = 8.70) < (\text{MHCG} = 10.97)\], and Environment \[(\text{MSP} = 23.89) < (\text{MHCG} = 26.50)\], and the overall mean score between the two groups also showed \[(\text{MSP} = 69.59) < (\text{MHCG} = 86.50)\]. Hence a significant difference between the stroke patients and the healthy control group on the WHOQOL measure.

In addition, a significant difference existed between the two groups on the Spitzer’s QOL test \[ F_{(1, 78)} = 7.49, p=.004 \text{ with an effect size of } \eta^2 = .088 \text{ with a mean difference of } [(\text{MSP} = 6.09) < (\text{MHCG} = 7.86)] \]. Thus, the stroke patients had lower scores on the Spitzer’s Quality of Life measure than the healthy control group.

Finally, there was no significant difference between the stroke patients and the healthy control group on the spirituality measure \[ F_{(1, 78)} = 3.13, p = .09 \text{ with an effect size of } .034 \]. Therefore, the hypothesis on the basis that stroke patients will perform poorer on cognitive tests, psychological and quality of life measures was supported by the data.
Testing of Hypothesis 2

Hypothesis 2: Stroke patients with left hemispheric damage will perform poorer on the cognitive tests, quality of life and, behavioral measures than those with right hemispheric damage.

To test this hypothesis, Multivariate Analysis of Variance (MANOVA) was used to assess the effect of stroke on specific cognitive tests between the left hemisphere and the right hemisphere stroke patients. Since the covariance and homogeneity assumptions underlying the MANOVA were violated, Pillai’s Trace was selected \[ F(2, 29) = 1.192, \rho = .162, \text{ Pillai’s Trace} = 1.246, \text{Partial Eta Squared} = .623 \]. The result of the One-Way MANOVA is summarised in Table B of appendix VI.

From the table (see Table B of appendix VI), there were no significant differences between the stroke patients with cortical lesion and those with subcortical lesion on the cognitive tests, psychological and quality of life measures: RQCST \[ F(2, 29) = .384, p = .34 \] with an effect size of \( \eta^2 = .006 \); Global Severity Index \[ F(2, 29) = .498, p = .31 \] with an effect size of \( \eta^2 = .011 \) and WHOQOL \[ F(2, 29) = .240, p = .39 \] with an effect size of \( \eta^2 = .016 \) and Spitzer’s QOL \[ F(2, 29) = .740, p = .24 \] with an effect size of \( \eta^2 = .049 \). Therefore, the hypothesis that “stroke patients with cortical lesion will perform poorer on cognitive test, psychological and quality of life measures than those with subcortical lesion” was not supported by the data.

Testing of Hypothesis 3

Hypothesis 3: Stroke patients with cortical lesion will perform poorer on the cognitive tests, behavioral and quality of life measures than those with right hemisphere damage.

To test this hypothesis, the Multivariate Analysis of Variance (MANOVA) was used to assess the effect lesion level on specific cognitive tests, quality of life, behavioral and spirituality
measures. Since the covariance and homogeneity assumptions underlying the MANOVA were violated, Pillai’s Trace was selected \[F (1, 42) = .921, \rho = .568, \text{Pillai’s Trace} = .422,\] \[\text{Partial Eta Squared} = .422\]. The result of the One-Way MANOVA is summarised in Table C of Appendix VI.

From the table, (see Table D of appendix VI) there was no significant difference between stroke patients with left and right hemisphere damage on the cognitive tests, behavioral and quality of life measures: RQCST \[F (1, 42) = .028, p = .13 \text{ with an effect size of } \eta^2 = .029\]; CFQ \[F (1, 42) = 2.193, p= .07 \text{ with an effect size of } \eta^2= .050\]; Global Severity Index \[F (1, 42) = .413, p= .20 \text{ with an effect size of } \eta^2= .010\]; Global WHOQOL \[F (1, 42) = .988, p= .16 \text{ with an effect size of } \eta^2= .163\] and Spitzer’s QOL \[F (1, 42) = .321, p= .23 \text{ with an effect size of } \eta^2= .013\]. Therefore the hypothesis that ‘stroke patients with cortical lesion will perform poorer on the cognitive tests, behavioral and quality of life measures’ was not supported by the data.

**Testing of Hypothesis 4**

**Hypothesis 4: Age, years of education, lesion level and age of onset will predict cognitive functioning of respondents.**

A hierarchical multiple regression analysis was conducted for the outcome variable, cognitive functioning. Age of respondents was entered in step 1 as possible predictor. The respondents’ years of education was entered in step 2, followed by lesion level in step 3. The age of onset was entered in step 4. In this study, decision on the hierarchical order was based on the claim by Newton and Rudestam, that —**the variables that are entered first are those that are regarded as (a) being particularly important or previously determined to relate to the**
dependent variable” [p. 255]. Table 7 shows the summary of the individual predictors and the overall Hierarchical Multiple Regression Model Summary.

Table 5.7: Summary of Hierarchical Regression Analysis for Variables Predicting Cognitive Function of Stroke Patients (n = 50)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>67.04</td>
<td>7.41</td>
<td>.36</td>
</tr>
<tr>
<td>Age</td>
<td>0.35</td>
<td>0.91</td>
<td>.36</td>
</tr>
<tr>
<td>Years of Education</td>
<td>1.39</td>
<td>0.30</td>
<td>.59*</td>
</tr>
<tr>
<td>Lesion Level</td>
<td>-0.34</td>
<td>3.24</td>
<td>-0.01</td>
</tr>
<tr>
<td>Age of Onset</td>
<td>-0.65</td>
<td>0.94</td>
<td>-0.64</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>66.72</td>
<td>6.63</td>
<td>.35</td>
</tr>
<tr>
<td>Age</td>
<td>0.34</td>
<td>0.90</td>
<td>.35</td>
</tr>
<tr>
<td>Years of Education</td>
<td>1.39</td>
<td>0.29</td>
<td>.59*</td>
</tr>
<tr>
<td>Age of Onset</td>
<td>-0.64</td>
<td>0.92</td>
<td>-0.63</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>66.53</td>
<td>6.55</td>
<td>.35</td>
</tr>
<tr>
<td>Years of Education</td>
<td>1.41</td>
<td>0.29</td>
<td>.60*</td>
</tr>
<tr>
<td>Age of Onset</td>
<td>-0.29</td>
<td>0.12</td>
<td>-0.29*</td>
</tr>
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</table>

Note: $R^2 = .35$ for step 1; $\Delta R^2 = .00$ for step 2; $\Delta R^2 = .00$ for step 3 ($p < .001$). *$p < .05$.

From the model in table 5.7 above, years of education ($t (47) = 4.92; p < .05$) and age of onset of stroke ($t (47) = -2.37; p < .05$) both are significant predictors of cognitive dysfunction of stroke patients.

Years of education (Standardized $\beta = .60$): This value indicates that as years of education increase by one standard deviation (5.45), cognitive function of stroke improves by .60 standard deviations. The standard deviation of cognitive dysfunction is 12.77, and this constitutes a change of 7.66 cognitive dysfunction (12.77 x .60). Therefore, for every 5.45 more years of education spent, there is improvement in cognitive functioning of stroke patients.
Age of onset \((\text{Standardized } \beta = -.29)\): This value indicates that as the age of onset of stroke increase by one standard deviation (12.64), cognitive dysfunction worsens by .29 standard deviation. The standard deviation for cognitive dysfunction is 12.77, and this constitutes a change of -3.70 cognitive dysfunction \((12.77 \times -.29)\). Therefore, for every 12.64 more years of stroke onset, there is a further deterioration of cognitive functioning of patients.

From the direction and the magnitude of unstandardized b values, it was observed that years of education of stroke patients as a predictor had a positive relationship with cognitive functioning. The more years spent in education improves stroke patients cognitive functioning. However, age of onset as a predictor had a negative relationship with cognitive functioning. This means that as the year of onset increases, the more deteriorating the cognitive functioning of stroke patients. Thus, years of education and age of onset were the only predictors of cognitive functioning.

Hence, the hypothesis which stated that age, years of education, lesion level and age of onset will significantly predict cognitive functions was supported by the data.

**Testing of Hypothesis 5**

**Hypothesis 5**: There will be a significant relationship among cognitive tests, quality of life and spirituality measures, somatisation, depression, anxiety, and hostility.

To test this hypothesis, the Pearson-Moment Correlation was computed to examine the significant relationship among cognitive tests, quality of life and spirituality measures, somatisation, depression, anxiety, and hostility. The result of the Pearson Product Moment Correlation is summarised in Table 5.8:
Table 5.8: Pearson Product-Moment Correlation Coefficient showing the relationship among RQCST, WHOQOL, somatisation, depression, anxiety, hostility, cognitive failures and spirituality for the stroke patients.

<table>
<thead>
<tr>
<th>Variable</th>
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<tr>
<td>1. RQCST Orientation</td>
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<tr>
<td>2. RQCST Verbal Score</td>
<td>.45**</td>
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<tr>
<td>3. RQCST Non-Verbal</td>
<td>.34**</td>
<td>.61**</td>
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<td>4. RQCST Global</td>
<td>.50**</td>
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<td>5. CFQ</td>
<td>-.001</td>
<td>-.09</td>
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<td>6. BSI Soma.</td>
<td>.26*</td>
<td>.13</td>
<td>-.02</td>
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</table>

1= WHOQOL Physical Health, 2= WHOQOL Psychological, 3= WHOQOL Social Relationship, 4= WHOQOL Environment, 5= Global WHOQOL, 6= Spitzer’s QOL, 7= BSI Somatisation, 8= BSI Depression, 9= BSI Anxiety, 10= BSI Hostility, 11= BSI CFQ, 12= BSI INSPIRIT. ** Correlation is significant at the 0.01 level (1-tailed) * Correlation is significant at the 0.05 level (1-tailed)
Table 5.9: Pearson Product-Moment Correlation Coefficient showing the relationship among RQCST, WHOQOL, somatisation, depression, anxiety, hostility, cognitive failures and spirituality for the stroke patients.

<table>
<thead>
<tr>
<th>Variable</th>
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</thead>
<tbody>
<tr>
<td>BSI Dep.</td>
<td>-.24*</td>
<td>-.23</td>
<td>-.19</td>
<td>-.24*</td>
<td>.37*</td>
<td>.36*</td>
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<tr>
<td>BSI Anx.</td>
<td>-.02</td>
<td>-.02</td>
<td>-.14</td>
<td>-.07</td>
<td>.34**</td>
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<td>.61**</td>
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<td>BSI Hosti.</td>
<td>.15</td>
<td>-.09</td>
<td>-.09</td>
<td>.11</td>
<td>.38**</td>
<td>.26**</td>
<td>.50**</td>
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<tr>
<td>WHO Phys.</td>
<td>.16</td>
<td>.27**</td>
<td>.34**</td>
<td>.33**</td>
<td>-.44*</td>
<td>-.09</td>
<td>-.47*</td>
<td>-.42*</td>
<td>-.07</td>
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<td>WHO Psych.</td>
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<td>.008</td>
<td>.15</td>
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<td>-.39**</td>
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<td>-.32*</td>
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<tr>
<td>WHO Social</td>
<td>.12</td>
<td>.26*</td>
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<td>-.38*</td>
<td>-.24*</td>
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<td>WHO Env’t</td>
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<td>.28*</td>
<td>.25*</td>
<td>.35*</td>
<td>.12</td>
<td>-.45**</td>
<td>-.29*</td>
<td>.007</td>
<td>.59**</td>
<td>.75**</td>
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<tr>
<td>Global</td>
<td>.18</td>
<td>.19</td>
<td>.33**</td>
<td>.27*</td>
<td>-.46*</td>
<td>.02</td>
<td>-.52**</td>
<td>-.38**</td>
<td>-.001</td>
<td>.82**</td>
<td>.91*</td>
<td>.71**</td>
<td>.89**</td>
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<tr>
<td>IINSPIRIT</td>
<td>-.07</td>
<td>.02</td>
<td>.16</td>
<td>.07</td>
<td>.20</td>
<td>.07</td>
<td>.28*</td>
<td>.14</td>
<td>-.14</td>
<td>-.26*</td>
<td>-.05</td>
<td>-.08</td>
<td>-.17</td>
<td>.113</td>
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</tbody>
</table>

1= WHOQOL Physical Health, 2= WHOQOL Psychological, 3= WHOQOL Social Relationship, 4= WHOQOL Environment, 5= Global WHOQOL, 6= Spitzer’s QOL, 7= BSI Somatization, 8= BSI Depression, 9= BSI Anxiety, 10= BSI Hostility, 11= BSI CFQ, 12= BSI= IINSPIRIT. ** Correlation is significant at the 0.01 level (1-tailed) * Correlation is significant at the 0.05 level (1-tailed)

The findings from the table 5.8 indicates that, there was a significant positive correlation between the spirituality and depression \[r_{(50)} = .28, p=.033\] (2-tailed). The linear relationship implies that the higher the levels of depression among stroke patients, the higher one’s quest for spirituality as a coping strategy. The reverse is true.
Again, there was a significant positive correlation between spirituality and physical health \([r (50) = -.26, p=.04 \text{ (2-tailed)}]\). The indirect relationship means that, as stroke patient’s physical health deteriorate, then their resort for spiritual interventions as a coping strategy increases. The reverse is true.

Also, a significant positive correlation was observed between quality of life and specific domains of the cognitive tests: RQCST Non-verbal \([r (50) = .33, p=.012 \text{ (1-tailed)}]\), RQCST Global \([r (50) = .27, p=.033 \text{ (2-tailed)}]\). This direct relationship means that the more/less stroke patients score on the RQCST, the more/less their scores on the WHOQOL.

However, there was a significant positive correlation among CFQ and depression \([r (100) = .37, p=.005 \text{ (1-tailed)}]\) and anxiety \([r (50) = .34, p=.009 \text{ (2-tailed)}]\). There is a direct relationship among CFQ, anxiety and depression. This implies that the higher the levels of depression and anxiety among stroke patients, the higher the errors committed on the tasks of their daily living.

Nonetheless, a significant negative correlation between spirituality and physical health domain of the quality of life measure: \([r (50) = -.26, p=.04 \text{ (2-tailed)}]\). This shows an inverse relationship between spirituality and physical health. This implies that the higher the stroke patients’ stand on spirituality, the lower the manifestation of physical health. However, there was no significant correlation between spirituality and the Global WHOQOL and the other three domains.

There was a significant negative correlation between QOL and psychological distresses of depression \([r (50) = -.52, p=.000 \text{ (1-tailed)}]\) and anxiety \([r (50) = -.38, p=.004]\). There is an indirect relationship among quality of life, depression and anxiety. This means that all things being equal, the higher the levels of depression and anxiety among stroke patients, the lower their quality of life.
Furthermore, there was a significant negative correlation between quality of life and cognitive failures \[ r(50) = -.46, p= .001 \text{ (2-tailed)} \]. There is an indirect relationship which signifies that the more stroke patients commit daily errors, the lesser their quality of life issues, and the reverse of this findings is true.

**Summary of findings**

This study tested four main hypotheses to assess the cognitive functioning and quality of life among Stroke patients in Ghana. The summary of findings is presented below:

- Stroke patients differ significantly on cognitive tests, quality of life, behavioral and spirituality measures than healthy participants.
- Years of education and age of onset significantly predict cognitive deficits of respondents.
- Among the stroke patients, there are significant positive correlations between; spirituality and anxiety, cognitive failures and depression, and quality of life and cognitive tests; and negative correlations between spirituality and physical health, quality of life and depression and quality of life and cognitive failures.
- Within the healthy controls, there are significant positive correlation between; cognitive failures, depression, somatisation, anxiety and hostility; and quality of life and spirituality. Significant negative correlations were found between; quality of life, somatisation, depression, anxiety and hostility; and cognitive failures and quality of life.
CHAPTER FIVE

DISCUSSION

Introduction

This section addresses the studies and theories that both support and reject the hypotheses tested. This is based on the hypotheses that stroke patients differ significantly on cognitive tests, behavioral and quality of life measures; years of education and age of onset significantly predict cognitive deficits of respondents.

With respect to the correlation between the stroke patients and the healthy controls on specific variables there were; significant positive correlations between; spirituality and anxiety, cognitive failures and depression, and, quality of life and cognitive tests; as well as negative correlations between spirituality and physical health, quality of life and depression, and, quality of life and cognitive failures were found among the stroke patients.

Also, significant positive correlations were found among the healthy control group between; cognitive failures, depression, somatisation, anxiety and hostility, and quality of life and spirituality. Finally, significant negative correlations were found between; quality of life, somatisation, depression, anxiety and hostility; and cognitive failures and quality of life were found among the healthy controls.

Stroke and Cognitive Functioning

Findings from the study supported the hypothesis that stroke patients differed from healthy control participants on cognitive tests. Nys et al. (2005) confirmed this when the prevalence of neuropsychological impairment on stroke patients were compared with 75 matched healthy
controls. 71% of patients showed long-term cognitive impairment. Basic and instrumental ADL disturbances remained present in 19% and 24% of patients. Domain-specific cognitive functioning predicted cognitive and functional outcome better than any other variable.

Moreover, the prediction of instrumental ADL functioning improved when cognitive predictors were added to the standard medical model. Also, impairments in abstract reasoning and executive functioning were independent predictors of long-term cognitive impairment. Inattention and perceptual disorders were more important in predicting long-term functional impairment. Evidence is beginning to accumulate showing that attentional function is frequently affected in stroke and may be a cognitive factor that contributes to variability in outcomes following stroke. Rao and colleagues (1999) reported that stroke survivors were impaired on a number of cognitive functions, including attention. This confirms that attentional tasks are more closely related to cognitive function among patients with cerebral infarction (Kato et al., 2012).

In a study by Planton and colleagues, stroke patients showed lower performance in every cognitive domain compared with the control participants. Alongside, important executive deficit, patients were also impaired on attention and memory (Planton et al., 2011).

**Stroke and Quality of Life**

Findings from the study supported the claim that stroke patients perform poorer on quality of life measures as compared with healthy control participants. There is an indication that, challenges in other cognitive functions like executive dysfunction and memory have placed some burden on visuospatial abilities. Moreover, Stuss and Alexander (2000) maintained the fact that the frontal lobe is connected to the human limbic system. Therefore, challenges in
other areas like executive functions and memory are more likely to have also influenced these results too. Stroke survivors have been shown to have a lower average of quality of life than groups of age-matched people without stroke (Clarke, Marshall, Black & Colantino, 2002; Majo et al., 2002).

Quality of life is a subjective self-concept (Suenkeler et al., 2002). It has been examined that patients with brain damage have negative self-image than those without brain injury (Kin et al., 1999). Hence, it can be speculated that the negative self-concept following the stroke brain damage might induce decreased quality of life.

Psychological Health and Stroke

As noted from the results of this study, the Brief Symptom Inventory [BSI] (Derogatis & Melisaratos, 1983) was able to discriminate the two groups on the various domains: somatisation, depression, anxiety, obsession-compulsion, interpersonal sensitivity, hostility, phobic anxiety, paranoid ideation, psychosis and global severity index. In all these areas, the stroke patients scored higher on the various domains than the healthy control group. This confirms Carod-Artal et al. (2012) studies where depression was regarded as the determinant of HRQOL. Patients were not more depressed than controls, although they were more apathetic. It was concluded that patients considered as asymptomatic were, in fact, exhibiting a multi-domain cognitive deficit that could impact return to life as before stroke (Planton et al., 2011).

Several studies reported that the presence of depressive symptoms is one of the most essential predictors of quality of life (Kravetz et al., 1995; Suenkeler et al., 2002). Patients with depression have negative self-concept about self, world, self-experiences and future (Finlay–
Jones, 1997). They tend to have negative concepts about situations in life due to their cognitive decline (Fruwald et al., 2001).

Depression and anxiety affect nearly half of patients with stroke during the first year of recovery and it is associated with poor quality of life (Kreiter et al., 2013, D’Aniello et al., 2014). However, previous studies did not find anxiety as a psychological disorder to affect quality of life (Castillo, 1995; Robinson, 1997).

**Cerebral Hemispheric Differences, Stroke and Cognitive Function, Behaviour and Quality of Life.**

The verbal subtest of the cognitive tests, behavioral and quality of life tests did not significantly discriminate stroke patients with left hemisphere damage from those with right hemisphere damage. These findings are in line with one of the assertion that memory differs in many ways between the left and right cerebral hemispheres, the nature of these differences remain controversial (Metcalfe et al., 1995). The bone of contention has been the neural basis of memory and how best to describe the role of the right hemisphere in memory for verbal information (Metcalfe et al., 1995; Chiarello & Beeman, 1997). This has led to the emergence of two approaches. They are; the veridicality of memory traces which vary across hemispheres and stimulus items which produce various degrees of associative activation across hemispheres which influence memory for the items.

First, Metcalfe, Funnell and Gazzaniga (1995) explained that memory traces are stored in a relatively interpretive/inferential manner in the left hemisphere but in a relatively veridical/accurate mode in the right hemisphere. This is affirmed by Zaidel (1994) in his theoretical position, which claims that the left hemisphere stores traces that include not only
the information that are perceived during encoding, rather draw inferences from the information. This results in an occurrence where category and schema-consistent phenomena are frequently mistakenly recalled as being presented when actually they do not exist. On the other hand, the right hemisphere stores traces that are more veridical, capturing relatively accurate information about only the events that actually happened.

However, it was evident in a recognition memory experiment when a split-brain patient was better able to correctly reject new words from the same category in a subsequent recognition task when the test items were presented to the left visual field (right hemisphere) than to the right visual field (left hemisphere) during the studying of list of words with a common category (e.g.: words naming different fruits).

Second, Phelps and Gazzaniga (1992) also indicated that right hemisphere memory traces reflect actually presented information very precisely while the left hemisphere memory traces reflect the results of a more interpretive process in their study on memory for individual slides presented within a slide showing a semantic event.

Furthermore, behavioral, electrophysiological and neuroimaging evidence also support the role of the right hemisphere in language comprehension (Gernsbacher & Kaschak, 2003). Divided visual-field (VF) studies maintain that the right hemisphere keeps a wider array of word meaning than the left hemisphere (Beeman, 1998; Faust & Chiarello, 1998).

Moreover, explicit memory for emotional words are more dependent more on the right hemisphere while perception of both emotional and non-emotional words are more dependent
on the left hemisphere (Nagae & Moscovitch, 2002). Lincoln, Long and Bayne (2007) suggested that the right hemisphere activates shape information during sentence comprehension when a shape description is explicit, whereas the left hemisphere activates such information both when the shape is described explicitly and when it is implied.

On the contrary, another opposing perspective also explains how both cerebral hemispheres store information in a fairly interpretive manner, but are distinct to the extent that a to-be-remembered item activates associated semantic information during retrieval. Relatively restricted activation occurs in the left hemisphere while relatively diffuse activation occurs in the right hemisphere (Chiarello & Beeman, 1997; Chiarello, 1998).

Hemispheric asymmetries have been found in studies like false alarms in the recognition of items from word lists (Westerberg & Marsolek, 2003). Schirmer and Kotz (2006) suggested that the left hemisphere is more heavily involved in processing segmental contrasts whereas the right hemisphere typically processes prosodic cues including affective prosody.

Anaki, Faust and Kravertz (1998), Beeman (1998) and Koivisto (1999) also explained that although the left hemisphere is dominant for most language processes which is an aspect of memory (verbal memory), the right hemisphere seems to play a vital role in the activation of a broad range of word meaning.

Long, Johns and Jonathan (2012) results indicated that both hemispheres store explicit concepts from discourse, but these concepts are organized in different ways. The left hemisphere perceives structural information concerning “Who did what to whom” in memory. The right hemisphere on the contrast appears to be sensitive to temporal/spatial information. Evans and Federmeier (2007) also observed in the representation of verbal information between the two hemispheres. The left hemisphere has a retention interval which is relatively
short (1-20 intervening words) whereas the right hemisphere at a longer intervals (30-50 intervening words) when the former discriminated old and new items.

Hence, hemispheric asymmetries appear to be important example of such differences in cognitive processing, and the present study helps to further our understanding of the asymmetries of the cerebral hemisphere.

Lesion Sites, Cognitive Functioning, Quality of Life and Behavioral Measures

Cognition has a great influence on quality of life which needs to be emphasized, and find their effects on lesion sites. Notwithstanding the fact that some studies have focused on local (Schouten et al., 2012) and global dysfunctions (Hachinski et al., 2006) due to stroke, the effect of cognition has been supported by previous and present studies with respect to the domains of cognition. Cortical and subcortical lesions have been shown to influence cognitive deficits in patients with brain damage including patients with stroke. Thus, previous studies have found severe cognitive deficits on patients with cortical lesions than those with subcortical lesions (Madureira, Guerreira & Ferro, 2001; Nys et al., 2005).

Nys et al. (2007) observed in the acute stage of stroke that, cognitive impairments were detected in 74% of patients with cortical lesion but in less than 50% of those with subcortical or intratentorial stroke patients. Nys (2005) found more cognitive dysfunctions after cortical rather than subcortical stroke. Wagner and Cushman (1992) found that patients with subcortical vascular lesions have more verbal memory deficits than patients with cortical lesions.

On the account of the findings of the present study, the hypothesis can also be supported by the concept of cognitive reserve. The cognitive reserve proposes that a specific type of brain
damage will have the same influence in each person. Because of individual changeability in how they cope with brain injury, similar amount of damage will have different effects on different people, even if brain reserve capacity is held constant (Stern, 2009).

This might entail the ability of the cognitive pattern underlying a task to maintain disruption and still operate effectively. On the other hand, this could comprise the ability to use other paradigms to approach a problem when the more usual approach is no more operational. The concept of cognitive reserve provides a ready explanation for why many studies have established that higher levels of intelligence, and of educational and occupational attainment are good predictors of which individuals can sustain greater brain damage before demonstrating functional dysfunction. Instead of suggesting that these individuals’ brains are totally anatomically different than those with less reserve (e.g., they have more synapses), the cognitive reserve hypothesis postulates that they process tasks in a more efficient manner (Stern, 2009).

In addition, Madureira, Guerreiro and Ferro (2001), Ferro (1995), and; Corbett, Bennett and Kos (1994) proposed that cognitive dysfunctions after subcortical infarction could be explained on the basis of frontal lobe impairment. The assumption is that small subcortical infarctions may disrupt corticocortical association pathways leading to frontal cortical disconnection. Various neural networks of widely distributed cortical and subcortical areas are mediated by memory functions. Whenever there is a strategically positioned subcortical lesion, it may disrupt an entire neuronal circuit and its memory processing, only if other structures cannot take over the function of the impaired area.

It is generally accepted that the striatum receives input from all cortical regions, the thalamus, and the limbic system (amygdala and hippocampus), and plays an integrative role in
cognitive information processing regardless of stimulus modality (Nakano, Kayahara, Tsutsumi, & Ushiro, 2000; Rektor et al., 2004). As a consequence, the noticeable impairment throughout cognitive domains observed in basal ganglia patients may be partly ascribed to the engagement of striatum in the neuronal interactive processes of the diverse information from different regions of the brain, as well as the direct effects from striatal dysfunction.

Another probable explanation for the generalized cognitive dysfunction seen in basal ganglia patients is that different aspects of cognitive functions normally operate in an interdependent concert, although each function constitutes a distinct class of behaviors (Lezak, 1995). Thus, cognitive deficits in certain domains may lead to deficits in other related domains.

Finally, discriminant function analysis showed that visuospatial function and memory were the best predictors of group membership (patient/control), with an overall classification rate of 95.5%. Only side of stroke and admission Glasgow Coma Scale (GCS) score correlated significantly with some of the cognitive domains. The widespread pattern of cognitive deficits seen in basal ganglia patients provides evidence for the substantial involvement of the basal ganglia in many neuronal pathways connecting cortical and subcortical brain areas responsible for various cognitive functions (Chwen-Yng et al., 2007).

**Predictors of Cognitive Functioning**

The findings of the present study showed that age of stroke onset and years of education in respondents predict cognitive functioning. However, cognitive functioning is related to age of stroke onset and years of education.

Chaudhari et al. (2014) found post-stroke impairment being frequently associated with poor functional outcome; and is being predicted by lower educational status, strategic lesion site, greater severity of mean age related white matter changes and baseline stroke severity.
Previous studies have identified numerous factors related to cognitive functioning among older adults in western and eastern countries. Several sociodemographic factors were found to be risk/protective factors for cognition. Being old, female, having less education, having lower income, and not being married were all associated with lower cognitive functioning (Albert et al., 1995; Herzog & Wallace, 1997; Lee & Shinkai, 2005; Hakansson et al., 2009; Langa et al., 2009; Kim et al., 2011). Tombaugh and McIntyre (1992) demonstrated that both education and socio-economic status as well as depression could negatively impaired cognitive pattern. Tatemichi (1993) found an association of post-stroke cognitive impairment with lower education. Also an independent predictors of cognitive impairment at 3 months were increasing age, stroke severity and diabetes mellitus (Rasquin, Lodder & Verhey, 2005). Rothenburg et al. (2010) found increased concentrations of serum CRP predicted lower post-stroke global cognition with age, level of education, infarct side, IL-6, and IFN-γ being eliminated from the final model.

**Spirituality, Quality of Life, Psychological Health, and Cognitive Functioning**

Spirituality is recognized as a significant feature of Ghanaians (Okraku et al., 2009) and the African American way of life (Mattis & Jagers, 2001).

According to Bediako and Neblett (2011), spirituality takes on an appreciative awareness of the continued presence of ancestors, prayers or requests for assistance form a higher power, and respect for the presence of “spirit” in others. Spirituality is also considered as that aspect of humanity that refers to the way individuals search for meaning and purpose by connecting to the moment, to self, to others, to nature, to significant experience, or to the sacred (Canda & Furma, 1999; Hill, Shima & Canda, 2006; Consensus Conference, 2009). Chow and
Nelson-Becker (2012) also regard spirituality as an evident in peoples’ quest for renewed meaning and purpose, though in a secondary way.

Blumenthal et al. (2007) found little evidence that self-reported spirituality, frequency of church attendance, or frequency of prayer is associated with cardiac morbidity or all-cause mortality post-acute myocardial infarction (AMI) in patients with depression and/or perceived social support.

Although it is likely that spiritual coping influences quality of life in particular ways, it is equally possible that patients who experience better quality of life also resort to religious resources for coping with their illnesses and other stressors. Also, spirituality may be related to other variables such as optimism, which may in turn influence quality of life. Giaquinto, Spiridigliozi and Caracciolo (2007) found social support and optimism as mediating factors of spirituality, and not self-efficacy. The findings also reveal how individuals in collective cultures express the psychological distresses in a somatic form and not expressing it in terms of emotions. And, also religion and the belief in deities also accounts for these relationships.

Research has shown that in addition to social support, patients may use spirituality as a resource to facilitate emotional adjustment and resilience: they have more positive feelings and pay attention to the positive elements in their life (Bartlett, Piedmont, Bilderback, Matsumoto, & Bathon, 2003; Faircloth et al., 2004).

**Observed Conceptual Framework**

Figure 2 shows the revised conceptual framework presenting the significant relationships between the variables measured in this study. The results showed that stroke affected significantly cognitive functioning and quality of life of participants in the study. Again,
stroke was observed to affect the psychological functioning of patients. In addition, level of education and age of stroke onset strongly predicted cognitive functioning. Finally, psychological disorders had significant effect on spirituality; whereas spirituality compromised quality of life.

Figure 2

Revised Conceptual Framework
Implications of Findings for Clinical Practice

The main findings from this study confirm that stroke may affect the cognitive functioning and quality of life of patients. Crucial to these findings is the level of education being a strong predictor of cognitive functioning. Owing to these challenges, the clinical management skills of professionals have to be upgraded to include skills required to screen subtle deficits to control these dysfunctions and also inculcate in rehabilitative procedures in the treatment of stroke patients.

In effect, neuropsychological screening tests and other quality of life measures must be added to the routine care of individuals living with stroke. This integration between medical and neuropsychological care will call for an intensive training and upgrading of technical knowledge among clinicians. Additionally the results of this study offers indications for the need of the Ministry of Health and Ghana health Service to employ qualified Clinical Psychologists into the various health care institutions to assist and also be part of the Multiplinary Disciplinary Team (MDT) of Stroke care for the psychological management of stroke. In the light of this, professional bodies and training institutions offering psychology at all levels as well can incorporate and train their students and researchers on the psychological burden that chronic illness imparts on the overall outlook of people. This to a large extent will grant the future of clinicians to be well grounded in the scope of handling all aspects of psychological challenges faced by patients.

In line with the behavioral burden that stroke places on people, clinicians will have to plan a goal attainment strategy that will ensure structured monitoring of recovery. This will not only boast the quality of life of patients but will also create an insight on the part of caregivers to better understand the condition.
Limitations of the Current Study

The most significant limitation of the study was the use of non-probability sampling techniques during data collection. The convenience and purposive sampling techniques served as a form of limitation factor in generalising the study results. It lacks external validity.

Follow-up scans were not available for all patients, therefore no firm conclusions were not made on size and severity of the strokes, which meant that some may have had strokes too mild to exhibit everyday problems. The use of cross-sectional, retrospective recruitment, and small sample size.

Another important limitation worth noting is the fact that the study used only the quantitative approach to research. Concepts like quality of life and health beliefs are better understood when patients are allowed to express themselves. Future researches should use the mixed method approach to be able to handle these concepts adequately.

With regards to the screening tool used in this study, it was limited to measure the exact executive domain of cognitive functioning. Thus, it had no component measuring executive function as a domain.

The study failed to find the significant difference in terms of gender among the stroke patients. And, also within the stroke patients, information concerning their stroke severity and the lesion volume were not examined.

Moreover, the study failed to employ extensive neuropsychological measures to examine the cognitive patterns and to examine the predictors of quality of life among the participants.
Finally, the sample size of hundred although may be justified in the scope of clinical studies reduces the generalisation of findings.

Nonetheless all these shortfalls, this study fills some research gaps in stroke studies and may serve as a good basis for future studies.
Direction for future research

There is a need for further studies to look at the following areas:

- The cognitive functioning and other behaviour measures can be taken with blood samples to identify specific glucose levels and other blood related complications.

- This present study retrospectively followed-up on patients for three months, and long-term follow-up studies are needed in the future to evaluate the association of cognition and quality of life with stroke patients in a more detailed manner.

- Brain scans in the form of MRI and/or CT scans showing lesion volume can be added as part of the data collection process to identify the specific area of brain damage.

- Functional and nutritional measures may be added as part of data collection instruments.

- An additional number of controls with other chronic medical conditions and/or clinical neurological dysfunctions can be added.

- Studies can take a qualitative approach to look at the role quality of life, health belief and spirituality play in the lives of individuals diagnosed with stroke.

- To include promising tools such as the Montreal Cognitive Assessment (MOCA) which is sensitive to dysfunction in specific cognitive domains frequently affected in stroke such as attention and frontal-executive skills.
Conclusion

Stroke (Cerebrovascular Accident - CVA) is regarded as one of the most common neurological condition; which poses a lot of cognitive, behavioral and quality of life challenges. Although, the impact of stroke is known; it is not well-documented in Ghana. Depending on the Ministry of Health to establish MDTs in stroke Units in various health-care institutions, additional research on cognitive functioning will boast the care of stroke patients in Ghana. This study sought to identify the cognitive functioning and quality of life among stroke patients in Ghana. Analyses were performed using a systematic thematic review of literature and other related studies.

Results from the study depicted statistical difference existed between the stroke patients and the healthy control group on the cognitive tests, behavioral and quality of life measures. No significant difference was observed on the scores of the spiritual measures between the two groups.

Furthermore, on the within group analysis, stroke patients with left hemisphere damage did not differ significantly on the cognitive tests, quality of life and psychological measures than those with right hemisphere damage. There was no significant difference between stroke patients with cortical lesion and those with subcortical lesion on cognitive tests, quality of life and psychological measures. Moreover, of all the variables, age of onset and level of education predicted cognitive functioning of respondents.

With regard to the correlation on specific variables between the stroke patients, significant positive correlations were observed among; spirituality and anxiety, cognitive failures and depression, and quality of life and cognitive tests; while negative correlations were found
among spirituality and physical health, quality of life and depression, and, quality of life and cognitive failures.

Likewise, among the healthy control group, significant positive correlations were observed among; cognitive failures, depression, somatisation, anxiety and hostility, and quality of life and spirituality. Also, significant negative correlations were found between; quality of life, somatisation, depression, anxiety and hostility; and cognitive failures and quality of life.

The study was limited on the adoption of a screening tool whereby a detailed tool could have been used. There should have been an equal sample size between the stroke patients with left and right hemisphere damage as well as those with cortical and subcortical lesion. Also, the inclusive of neuroradiological, behavioral and CAT scan assessments which would mark the future of multidisciplinary approach.

Thus, results have implications for clinical management and research design in psychological studies involving stroke patients. Even though this study has some significant shortfalls, results of the study have implications for clinical management and future stroke research. Hence, the results reinforce the idea that cognitive function is very important to quality of life after stroke.
REFERENCES


Conference, Consensus (2009). *Improving the quality of spiritual care as a dimension of palliative care.* Pasadena, CA (Funded by Archstone Foundation and City of Hope).


Cognitive Functioning and Quality of Life Among Stroke Patients in Ghana


COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA


COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA


COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA


COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA

of Life stroke survivors. *Journal of Stroke and Cerebrovascular Disease*, 21 (8), 716-781.


COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA


My Ref. No...........................

Ms. Ophelia Anarfi
Department of Psychology
University of Ghana
Legon

Dear Ms. Anarfi,

ECH 054/14-15 NEUROPSYCHOLOGICAL FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA

This is to advise you that the above reference study has been presented to the Ethics Committee for the Humanities for a full board review and the following actions taken subject to the conditions and explanation provided below:

Expiry Date: 3/09/15
On Agenda for: Initial Submission
Date of Submission: 17/02/15
ECH Action: Approved
Reporting: Quarterly

Please accept my congratulations.

Yours Sincerely,

Rev. Prof. J. O. Y. Mante
ECH Chair

CC: Prof. C. C Mate- Kole, Dept of Psychology

Tel: +233-303933866 Email: ech@isser.edu.gh
The Director  
Principal Nursing Officer  
Korle-Bu Teaching Hospital  
Korle-Bu -Accra

Dear Sir/Madam,

LETTER OF INTRODUCTION

MS. ANARFI OPHELIA

The above-named is an M.Phil Clinical Psychology student at the University of Ghana, Legon.

In partial fulfillment of the requirement for the award of the M.Phil degree Ms. Anarfi Ophelia has to write and submit an original thesis. She has selected the topic: “Neuropsychological Functioning and Quality of Life Among Stroke Patients in Ghana.”

To enable her collect data for her work she would need to administer questionnaires and/or conduct interviews. She has selected your institution as suitable for her data collection.

Attached is her institutional approval/clearance to enable her carry on with her research work.

Any assistance you may give her would be greatly appreciated.

Yours sincerely,

(Prof. C. C. Mate-Kole)
HEAD OF DEPARTMENT
Appendix III

UNIVERSITY OF GHANA

OFFICE OF RESEARCH, INNOVATION AND DEVELOPMENT

Ethics Committee for Humanities (ECH)

PROTOCOL CONSENT FORM

Section A – BACKGROUND INFORMATION

Title of Study: COGNITIVE FUNCTIONING AND QUALITY OF LIFE AMONG STROKE PATIENTS IN GHANA.

Principal Investigator: OPHELIA ANARFI

Certified Protocol Number

Section B– CONSENT TO PARTICIPATE IN RESEARCH

General Information about Research

You are being asked to participate in an academic research project which is purported to examine the challenges associated with the structure and function of the brain as related to human behaviour and quality of life in patients living with stroke. I am investigating on this issue to understand the relationship that stroke has on the function of the human brain, which may be experienced in the activities of daily living and on quality of life (QOL. It is a
paper and pencil test that will require you to either remember or recall some items or do some drawings on a paper. It is estimated to take between 45 minutes.

Benefits/Risk of the study

This study is designed to offer patients free cognitive assessment. However, participation in the study will enhance our understanding of the cognitive functioning and quality of life among stroke patients. Hopefully, these results can be used to help improve issues related to cognitive functioning and QOL and also optimize the functioning of individuals.

Confidentiality

Any and all information obtained from you during the study will be confidential. Your privacy will be protected at all times. You will not be identified individually in any way as a result of your participation in this research. The data collected however, may be used as part of publications and papers related to neuropsychological functioning and quality of life among stroke patients in Ghana.

Compensation

This study will not include any compensation apart from a verbal appreciation of your valued time and effort.

Withdrawal from Study

Participants’ participation in this study is entirely voluntary. You may refuse to participate in this research. Such refusal will not have any negative consequences for you. If you begin to participate in the research, you at any time, for any reason, discontinue you participation without any negative consequences.
Contact for Additional Information

Researcher: Ophelia Anarfi  
Supervisor: Prof. C. C. Mate-Kole

Tel: 0242768179  
Tel: 0274313254

Email: boafoba@gmail.com  
Email: cmkole@ug.edu.gh

Section C-VOLUNTEER AGREEMENT

"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and am willing to give consent for me, my child/ward to participate in this study. I will not have waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my personal records."

________________________________________________
Name of Volunteer

________________________________________________
Signature or mark of volunteer  
Date
If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_________________________________________________
Name of witness

____________________________________________   _______________________
Signature of witness                                       Date

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_________________________________________________
Name of Person who Obtained Consent

____________________________________________   _______________________
Signature of Person Who Obtained Consent      Date
Appendix IV

DEMOGRAPHIC INFORMATION

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Please provide answers that are best to you

1. Marital status?
   a) Single    b) Living with partner    c) Married    d) Divorced
   e) Widowed

2. Highest level of education completed?

3. Have you ever been employed? Yes No

4. Are you currently working? Yes No

5. What is your most recent occupation?

6. Do you smoke (current)? Yes No

7. If yes, number of packs per day

8. Have you smoked in the past? Yes No

9. Do you drink alcoholic beverages? Yes No

10. If yes, estimate the average number of drinks per week

11. Did you drink alcohol in the past? Yes No

12. List the medications you are currently taking

13. Comorbid condition(s):

   .................................
14. Risk factor (s):

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15. Post-stroke duration:

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Table A: Frequency and Percentages of Stroke Patients and Healthy Control Group.

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Appendix VI

Table B: Pearson’s correlation table of RQCST, CFQ and BSI scores

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1= orientation, 2= verbal score, 3= non-verbal score, 4= RQCST global, 5= Global CFQ, 6= Somatisation, 7= Obsession-Compulsion, 8= Interpersonal Sensitivity, 9= Depression, 10= Anxiety, 11= Hostility, 12= Phobic Anxiety, 13= Paranoid Ideation, 14= Psychotism, 15= Global BSI. *p < 0.05 level (2-tailed) ** p < 0.01 level (1-tailed).
Table B: Pearson’s correlation table of RQCST, CFQ and BSI scores

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1= orientation, 2= verbal score, 3= non-verbal score, 4= RQCST global, 5= Global CFQ, 6= Somatisation, 7= Obsession-Compulsion, 8= Interpersonal Sensitivity, 9= Depression, 10= Anxiety, 11= Hostility, 12= Phobic Anxiety, 13= Paranoid Ideation, 14= Psychotism, 15= Global Severity of index (BSI). *p < 0.05 level (2-tailed) ** p < 0.01 level (1-tailed).
Table C: Summary of MANOVA results of the difference in scores on cognitive tests, quality of life and behavioral measures between stroke patients with left hemisphere damage and those with right hemisphere damage.

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<td>.34</td>
<td>.026</td>
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<td>36.82 (8.03)</td>
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<td>.37</td>
<td>.021</td>
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<td>.127</td>
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<td>.44</td>
<td>.009</td>
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</table>

NB: p= .05, Bonferroni adjustment. LH: Left hemisphere damage stroke patients, RH: Right hemisphere damage stroke Patients, RQCST: Revised Quick Cognitive Screening Test and CFQ: Cognitive Failures Questionnaire
Continuation:

Table C: Summary of MANOVA results of the difference in scores on cognitive tests, quality of life and behavioral measures between stroke patients with left hemisphere damage and those with right hemisphere damage.

<table>
<thead>
<tr>
<th>Variable</th>
<th>LH Stroke Patients</th>
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<th>p</th>
<th>η²</th>
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<td>1.01 (.55)</td>
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<td>Global Severity Index</td>
<td>13.44 (3.89)</td>
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<td>.43</td>
<td>.011</td>
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<td>15.35 (4.03)</td>
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<td>.43</td>
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<td>23.43 (5.88)</td>
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<td>2, 29</td>
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<td>WHOQOL</td>
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NB: p= .05, Bonferroni adjustment. LH: Left hemisphere damage stroke patients, RH: Right hemisphere damage stroke patients, RQCST: Revised Quick Cognitive Screening Test and CFQ: Cognitive Failures Questionnaire
Table D: Summary of the Multivariate test results of the difference in scores on cognitive tests, quality of life and behavioural measures between stroke patients with cortical lesion and those with subcortical lesion.

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<th>Subcortical Stroke Patients</th>
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NB: p= .05, Bonferroni adjustment. CSP: Cortical Stroke Patients, ScSP: Subcortical Stroke Patients damage, RQCST: Revised Quick Cognitive Screening Test and CFQ: Cognitive Failures Questionnaire.
Continuation:

Table D: Summary of the Multivariate test results of the difference in scores on cognitive tests, quality of life and behavioural measures between stroke patients with cortical lesion and those with subcortical lesion.

<table>
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<th>Variable</th>
<th>Cortical Stroke Patients</th>
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NB: p= .05, Bonferroni adjustment. CSP: Cortical Stroke Patients, ScSP: Subcortical Stroke Patients damage, RQCST: Revised Quick Cognitive Screening Test and CFQ: Cognitive Failures Questionnaire.
Table E: Pearson Product-Moment Correlation Coefficient showing the relationship among RQCST,WHOQOL,somatisation,depression,anxiety,hostility,cognitive failures and spirituality among the healthy-control group

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University of Ghana                              http://ugspace.ug.edu.gh
Cognitive Functioning and Quality of Life among Stroke Patients in Ghana

1= RQCST Orientation, 2= RQCST Verbal score, 3= Non-Verbal score, 4= RQCST Global, 5= CFQ, 6= BSI Somatisation, 7= BSI Depression, 8= BSI Anxiety, 9= BSI Hostility, 10= WHOQOL Physical Health, 11= WHOQOL Psychological, 12= WHOQOL Social Relationship, 13= WHOQOL Environment, 14= Global WHOQOL, 15= Global INSPIRIT

** Correlation is significant at the 0.01 level (1-tailed)  
* Correlation is significant at the 0.05 level (1-tailed)

Table F: Summary of Means and Standard Deviation of Predictor Variables and Criterion (N = 50)

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<th>Variables</th>
<th>Mean</th>
<th>Std. Deviation</th>
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<tr>
<td>Age</td>
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<tr>
<td>Years of Education</td>
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<tr>
<td>Lesion level</td>
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<tr>
<td>Age of Onset</td>
<td>50.96</td>
<td>12.64</td>
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</table>

n = 50 sample size for each predictor

Table G: Intercorrelation matrix indicating relationship between Predictor Variables and Cognitive Function

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<th>2</th>
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<td>5. Age of Onset</td>
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</table>

**p < .01; *p < .05; n = 50