EFFECTS OF STRESS AND SOCIAL SUPPORT ON NEUROCOGNITIVE FUNCTIONING AMONG HIV POSITIVE INDIVIDUALS IN LUSAKA, ZAMBIA

BY

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DECLARATION

1, **Moonga Hakalyamba**, declare that this dissertation represents my own work, and that it has not previously been submitted for a degree, diploma or other qualification at the University of Zambia or any other institution. All the work of scholars as used in this document has been acknowledged.

Signature …….. Date……

CERTIFICATE OF APPROVAL

This dissertation of Moonga Hakalyamba has been approved as partial fulfilment of the requirements for the award of the Degree of Master of Science in Clinical Neuropsychology by the University of Zambia.

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ABSTRACT

Statement of the problem: Both the medical and psychological literature has indicated that stress impacts people's wellbeing. HIV positive individuals are among the most heavily stressed people. Stress comes from various sources such as relationships, lack of acceptance by family and friends, as well as other worries of day to day living (Lazarus and Folkman, 1984). However, stress has not been extensively researched in Zambia to examine its effects on neurocognitive functioning among individuals living with HIV and AIDS. Moreover, although social support has been found to reduce disease progression among chronically ill cancer patients, little is known about the interaction effects of social support and stress on neurocognitive functioning among HIV positive individuals.

Objective: This study sought to examine the effects of stress and social support on neurocognitive functioning among HIV positive individuals in Lusaka, Zambia.

Methods: Sample of the study consisted of 263 men and women (men= 107, women= 156) from six Clinics in Lusaka district. Their age ranged between 20 to 65 years. Their education was at least 5 years of schooling and above. This was a cross- sectional study. The International neurobehavioural test battery was used to assess neurocognitive functioning. It assessed the neuropsychological performance of participants by administering various neuropsychological tests that measure brain function. Other measures included Perceived Stress Scale (PSS- 10) for stress and Medical Outcome Study Social Support Survey (MOS-SS) for social support**.** ANOVA, T- test and other statistics were used to analyse data with the help of SPSS version 16.

Results: The results also indicated that stress has a significant relationship with working memory and verbal fluency, but not with other neurocognitive domains. Social support and its interaction with stress has no effect on neurocognitive functioning. Marital status was also related to stress and social support. The divorced group reported high stress (although the results were not statistically significant) levels and low social support received. The married group reported low stress levels and high social support. The results indicated that stress levels between participants did not differ by gender. Males and females were equally stress.

Conclusion: HIV and AIDS affects neurocognitive functioning. Although the sample was mildly stressed, stress was significantly associated with working memory and verbal fluency. It is recommended that future study should consider the chronically stressed individuals to better understand the relationship between stress and neurocognitive dysfunctions. It is also recommended that government and other service providers continue the process of counseling even after the HIV positive individual has started antiretroviral.

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ACRONYMS

Affsup	:	Affectionate support
AIDS	:	Acquired Immunodeficiency Syndrome
ANOVA	:	Analysis of variance
ART	:	Antiretroviral Therapy
BDI- II	:	Beck's Depression Inventory
BVMT	:	Brief Visuospatial Memory Test
COWAT- FAS	:	Controlled Word association Test
DRC	:	Democratic Republic of Congo
Emosup	:	Emotional support
GDS	:	Global Deficit score
HAART	:	Highly Active Antiretroviral Treatment
HAND	**:**	HIV-Associated neurocognitive disorders
HDMT	:	Hiscock Digit Memory Test
HIV	:	Human Immunodeficiency Virus
HPN	:	Humanitarian Practice Network
HVLT	:	Hopkins Verbal Learning Test
IHDS	:	International HIV Dementia Scale
LES	:	Life Experience Survey
MHI	:	Mental Health Inventory
MOS- SS	:	Medical Outcome Study social support survey

NGO	:	Non Governmental Organization
PAOFI	:	Patients Assessment of own Functioning Inventory
PASAT	:	Paced Auditory Serial Addition Test
PFC	:	Prefrontal Cortex
PSI	:	Positive Social Interaction
PSS	:	Perceived Stress Scale
SD	:	Standard Deviation
SIP	:	Speed of Information Processing
Tansup	:	Tangible Support
UN	:	United Nations
UNAIDS	:	United Nations AIDS programme
UNZABREC	:	University of Zambia Biomedical Ethics committee
WAIS- R	:	Wechsler Adult Intelligence Scale- Revised
WCST	:	Wisconsin Card Sorting Test
WHO	:	World Health Organization
WMS-III	:	Wechsler Memory Scale III
ZAT	:	Zambia Achievement Test

CHAPTER ONE

INTRODUCTION

1.0. Background

Sub- Saharan Africa is one of the heavily affected regions in the world by Human Immunodeficiency Virus (HIV) and the Acquired Immunodeficiency Syndrome (AIDS). An estimated 22.9 million people in the region who are living with the virus that causes AIDS is about two- thirds of the global total (UNAIDS, 2011). Both the HIV prevalence and mortality rates vary across African countries. Somalia and Senegal have under 1% prevalence rate among the adult population while in Zambia, Namibia, and Zimbabwe, the number of those infected with HIV is estimated at 10- 15%, with Zambia at 14.3% in 2010 (UNAIDS, 2010).

The discovery of the HIV is credited to Luc Montagnier, a French scientist and researcher as well as Robert Gallo, an American scientist and researcher (Popovic, et al., 1984). Montagnier discovered HIV in 1982 while Gallo was the first to published articles that HIV was really a cause of the AIDS disease (Barré-Sinoussi, et al., 1983).

Since its discovery, HIV has affected people's lives in various ways. If the infection is not detected and treated, the immune system gradually weakens and AIDS develops. The symptoms of AIDS are mainly the result of infections that do not normally develop in people with a healthy immune system. These are called opportunistic infections (Dugdale, Vyas and Zieve, 2012). People with AIDS have had their immune system damaged by HIV and are very susceptible to these opportunistic infections. The virus attacks the immune system and leaves the body vulnerable to a variety of life-threatening infections and cancers. As result, many people with HIV die because of the opportunistic infections because of the weakened immune system.

HIV disease is a major source of emotional and physiological stress for those who are infected (Faulstich, 1987). The lives of individuals diagnosed with HIV and the subsequent illness, AIDS, are often challenging because these individuals deal the physical, emotional, and interpersonal sequelae of this illness. HIV positive people usually experience stress related to the symptoms and stigma associated with their illness (Galvan, et al., 2008). These include relationships, (e.g. death of a friend due to AIDS, interpersonal violence, lack of social support) and health (i.e. experiencing significant medication side-effects). People who

live under stressful conditions often have poor health practices, which eventually increase their risk for disease and disease progression (Kathryn, et al., 2005). Experience of stressful life events may deter HIV positive people from performing well in their day to day activities as well as contributing to decline in their neurocognitive functioning (Vosvick, et al., 2003). Chronic psychological stress, for instance, is said to be a factor in the reduction of the immune system's reactions to hormonal secretions that are normally used to fight the inflammatory response (Miller, et al., 2002).

A number of arguments have been brought up as to how stress gets into the body to affect the immune response. First, the sympathetic fibers descend from the brain into both primary (bone marrow and thymus) and secondary (spleen and lymph nodes) lymphoid tissues (Felton and Felton, 1994). These fibers release a variety of substances that influence immune responses by binding to receptors on white blood cells (Ader, Cohen and Felton, 1995). Though all lymphocytes have adrenergic receptors, differential density and sensitivity of adrenergic receptors on lymphocytes may affect responsiveness to stress among cell subsets.

Second, the hypothalamic–pituitary–adrenal axis, the sympathetic–adrenal–medullary axis, and the hypothalamic–pituitary–ovarian axis secrete the adrenal hormones epinephrine, norepinephrine, and cortisol; the pituitary hormones prolactin and growth hormone; and the brain peptides melatonin, β-endorphin, and enkephalin which bind to specific receptors on white blood cells and have different regulatory effects on their distribution and function (Ader, Cohen and Felton, 2001). Third, behavior represents a potentially important pathway linking stress with the immune system. People's efforts to manage the demands of stressful experience sometimes lead them to engage in behaviors—such as alcohol use or changes in sleeping patterns—that also could modify immune system processes (Kiecolt- Glaser and Glaser, 1988).

Evidence abounds and indicates that stress affects disease progression in HIV infected individuals (Menon, et al., 2007). Although antiretroviral therapy has increased the overall life expectancy of those infected with HIV and AIDS, research has shown a varied picture among individuals (Evans, et al., 1997). In some people, HIV progresses faster to AIDS, while in others, the symptoms are delayed. This variation can, to a large extent, be attributed to other factors and not solely to the virus that causes AIDS. For instance, Evans et al (1997) found that stressful life events and difficulties were predictive of a clinical decline in HIV infected individuals. Stress can, therefore, be assumed to affect the mental acumen as well,

and hence it is important to understand the extent to which stress would affect neuropsychological functioning in HIV positive individuals.

Since the onset of the HIV and AIDS epidemic, a number of HIV- associated neurocognitive disorders (HAND) have also been reported (Woods, et al., 2009). This is despite the use of a combination of antiretroviral therapy, which has reduced medical morbidity and mortality with HIV infection (Heaton, Franklin, et al., 2011). In the existing literature, the neurocognitive dysfunction in the HIV positive population is attributed in part to the virus, due to poor central nervous system penetration of some antiretroviral agents (Lawler, et al., 2010).

Because of the many devastating economic, social, health and psychological impacts that HIV brings in the lives of the infected individuals, concerns have been raised as to the urgent need of alleviating the suffering of those infected. International declarations have been made by organizations such as the Humanitarian Practice Network (HPN) (2005), United Nations (UN) declaration of Commitment on HIV and AIDS, and the Madrid International Plan of Action on aging all explicitly urging governments to address the particular needs of people infected with HIV. Other Organizations such as HelpAge International (in Kenya) and the Germany Development Agency (GTZ) (which ran a two year program from 2005- 2007 in Zambia) have identified areas of need, including emotional support, psychosocial coping mechanisms to deal with stress, illness and grief, and treatment and support for those with AIDS, and have offered programs that combine prevention, care and the need for support to meet the needs of those infected (HPN, 2005).

Social support at family and community levels has also been recommended for in the mitigation of the stress-related challenges which HIV-infected people face (Galvan, et al., 2008). The Northern Territory Aboriginal Health Forum and Social wellbeing Working Party (2003) postulates that enhancing emotional and social wellbeing involves support for healthy relationships between families and communities. This party further argues that strong healthy communities are those where individuals experience a strong sense of belonging, trust, participation and social support.

However, it has been observed that not every kind of social support is helpful for HIV positive adults (Vosvick, et al., 2004). It was, therefore, important to investigate the kind of social support which is helpful in mitigating the impact of stress in HIV positive individuals.

1.1. Statement of the Problem

Both the medical and psychological literature has indicated that stress impacts people's wellbeing. HIV positive individuals are among the most heavily stressed people. Stress comes from various sources such as relationships, lack of acceptance by family and friends, as well as other worries of day to day living (Lazarus and Folkman, 1984). However, stress has not been extensively researched in Zambia to examine its effects on neurocognitive functioning among people living with HIV and AIDS. Moreover, although social support has been found to reduce disease progression among chronically ill cancer patients, little is known about the interaction effects of social support and stress on neurocognitive functioning among HIV positive individuals.

1.2. Objectives

1.2.1. General Objective

The objective of this study was to examine the effects of stress and social support on neurocognitive functions among HIV positive individuals in Lusaka, Zambia.

1.2.2. Specific Objectives

The specific objectives of this study were as follows:

i. To examine if stress affects neurocognitive functioning among HIV positive individuals.
ii. To find out the relationships between stress and social support on neurocognitive performance among HIV positive individuals.
iii. To find out if there are differences in stress and social support among HIV positive individuals based on marital status.
iv. To find out if there are differences in stress and social support among HIV positive individuals based on gender.

1.3. Research Questions

i. What are the effects of stress on neurocognitive functioning of HIV positive individuals?
ii. Is there any relationship between stress and social support with neurocognitive performance among HIV positive individuals?
iii. Are there any differences in stress and social support as experienced by the sample based on marital status?

iv. Are there any differences in stress and social support as perceived by the sample based on gender?

1.4. Hypotheses

i. Highly stressed HIV positive individuals will exhibit lower neurocognitive functioning than less stressed HIV positive individuals.
ii. Social support will buffer stress effects on neurocognitive functioning among HIV positive individuals.
iii. Perceived stress and social support levels are largely as a result of an individual's marital status (divorced will report high stress and low social support levels than the married).
iv. HIV positive males will report low stress and high social support levels than HIV positive females.

1.5. Justification of the Study

Zambia is a heavily HIV - infected country in Southern Africa. HIV positive individuals experience many stressful events that affect their day to day life (Galvan, et al 2008). It is therefore important to study how stress affects not only a person's health, but their neurocognitive functioning as well. Literature suggests that chronically ill people are most vulnerable to stressful life events (Brown and Harris, 1989; Komblith, et al., 2001). Little research has been done concerning stress and neurocognitive functioning among HIV positive people; hence it is important to understand if psychosocial variables like stress have any impact on the neurocognitive deterioration of the infected people. Most research has not included important variables like marital status. Social support is a broader concept as there are many kinds of social support. It is therefore important to investigate the relationships between social support and stress to find out which kind of social support is helpful in buffering stress effects.

This research may uncover the differences in stress levels within the sample, which may allow the most vulnerable group to be identified and remedial measures to be put in place. This study would have implications for Zambia in terms of clinical practice and research. For instance, if it is established that HIV- positive individuals are highly stressed and stress is related to neurocognitive dysfunctioning, the treatment plan could involve stress management interventions. The study might also help in the area of research, not only in the HIV realm but also in other chronic illnesses like cancer which could evoke stress.

1.6. Operational Definitions

a. Social support – This was defined as an individual's perception that s/he is cared for and loved, esteemed and valued, and belongs to a network of communication and mutual obligation.

b. Stress- was defined as the body's reaction to a situation that is viewed as a danger and requires physical, mental or emotional adjustment.

c. Neurocognitve function- performance at the level of the 'normal' sample on the neurocognitive tests (As measured by performance on the International Neurobehavioural test Battery);

- **Working Memory**, based on performance on the Paced auditory Serial Addition Test and WMS-III Spatial Span.
- **Verbal Fluency**, based on performance on Noun, verb and sound fluency.
- **Speed of Information Processing**, based on performance on WAIS III- Digit Symbol, WAIS-III Symbol Search, Trail Making Test A, Colour Trails (CTT) Trails 1 and Stroop Colour and Word Test- Colour Trails.
- **Learning and Delayed Recall** based on performance on Hopkins Learning Test– Revised and Brief Visuospatial Memory Test–Revised.
- **Executive functioning** based on performance on The Wisconsin Card Sorting Test, Computer Version-2, Halstead Category Test, Colour Trails 2 and Stroop and Word Test-Colour/Word Trails.
- **Motor Speed and Dexterity** based on performance on the Grooved Pegboard Test

d. Marital status stands for the following;

- Single
- Married
- Divorced
- widowed

1.7. Identification of Variables

- Independent variables

- Stress- was measured by the 10- item perceived stress scale (PSS)
- Social support- was measured by the Medical Outcome Study social support survey (MOS-SS).
- Marital status
- Gender

- Dependent variable- neurocognitive functioning, and was measured by the International Neurobehavioral Test Battery.

1.8. Organization of the Report

In the subsequent chapters, chapter Two makes an attempt at giving an overview of effects of stress and social support on neurocognitive functioning, and the difference in stress and social support as has been revealed by previous research findings. Ensuing from this, chapter Three outlines the methods and procedures and testing instruments used in the current study in an effort to determine the effects of stress and social support on neurocognitive functioning. Chapter Four presents the findings of the present study. Chapter Five discusses the findings of the current study in relation to the research findings obtained by previous studies. Furthermore, attempts are made at deliberating on the implications of the findings from the current study on neuropsychological testing in relation to clinical practice. Additionally, suggestions are made on possible endeavors worth pursuing in this area of study.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

This chapter reviews literature on HIV and neurocognitive functioning, stress, social support and related articles. The studies cited here were sourced from various neuropsychological online Journals and books. The key terms employed in searching for the literature were cognitive functioning, neuropsychology, stress and social support.

2.1. HIV and Neurocognitive Functioning

Neurocognitive impairments among people living with HIV and AIDS have been intensely studied. The World Health Organization (WHO) contracted Maj, Satz, et al (1994) to conduct a study in Thailand, Zaire; now Democratic Republic of Congo (DRC), Kenya, Germany, and Brazil. In this study, the rate of neurocognitive impairment among symptomatic HIV positive individuals varied from 13% in Brazil to 19% in DRC (Maj, et al., 1994). In another study, 31% of HIV positive people in a Ugandan sample met the criteria for dementia and 47% for mild cognitive impairment (Nakasujja, et al., 2004). Neurocognitive and motor impairments among the clade C HIV positive subjects were found in the Pacific Countries. Like the Asia Pacific countries, Clade C is the most common HIV type among the Zambian population living with the virus (Kraft, 2008). However, HIV-1C sequences revealed distinct genetic differences between HIV-1C isolates from Southern African countries and those from Southeast Asia (Rao, et al, 2013). The analysis by Rao, et al (2013) also indicated that the HIV-1C Tat sequences from South Africa and Zambia formed a separate cluster segregating from the Southeast Asian HIV-1C sequences from India and Bangladesh. Interestingly, the most distinguishing feature of Tat sequences from South Africa and Zambia was the relatively common occurrence of variants with an intact C30C31 motif (26% and 20% respectively), which were rare among sequences from India and Bangladesh (3% and 2% respectively). The present study will not consider the HIV type in the participants. A similar study among HIV positive individuals without functional impairment showed that 60.5% had mild to moderate neurocognitive impairments in the spheres of working memory, verbal fluency and learning/memory (Gupta, et al., 2007).

The cognitive deficits resulting from HAND can be global, however, psychomotor skills, speed of information processing, executive functioning, episodic memory, attention/working memory, and sensory perception are most commonly affected by HIV infection (Dawes, et al., 2008; Zahir, 2011), while long term memory, many language skills, and visuo-spatial abilities may remain intact (Dawes, et al., 2008; Grant et al., 1987; Heaton, et al., 1995). Learning and memory prevalent rates range from 40% to 60%. Generally these impairments tend to be mild to moderate but could worsen as the diseases progress (Zahir, 2011).

However, the pattern of neurocognitive dysfunction is not consistent across individuals, (Dawes, et al., 2008) and may be even less consistent across individuals from markedly different backgrounds. Individuals exhibit considerable variation in strength and weakness of ability domains, some exhibiting strong motor skill with weak executive function and verbal memory, some retaining processing speed but exhibiting weak visual memory and executive function, and still others may feature strong memory but weak motor skills (Dawes, et al., 2008).

Lawler et al (2010) conducted a cross-sectional study in Botswana to investigate the prevalence of neurocognitive dysfunction among HIV positive people. The sample included 120 HIV positive adults on Highly Active Antiretroviral Treatment (HAART) in urban health centres. The results as assessed by the International HIV Dementia Scale (IHDS) showed that 38% had neurocognitive impairments. The subjects scored low on auditory verbal learning for both total number of words learned ($p=0.023$) and delayed recall ($p= 0.026$), but not recognition ($p= 0.897$), an implication that not all neurocognitive domains were affected. The patients also had slower processing speed on digit symbol coding ($p< 0.001$). This research excluded people who were HIV positive but not on HAART, which limits their conclusions about HIV infected people in general.

2.2. Stress and HIV

Reif et al (2011) used data from a longitudinal study of 611 HIV positive individuals from the Southeastern United States to determine the frequency and types of incident stress reported in a 27- month period. Among participants, 91 percent reported at least one stressful experience, and 10 percent reported traumatic stress in any given nine- month reporting period. Deo, et al (2010) conducted a cross sectional, descriptive study to assess level of stress among HIV positive persons in Nepal. Five hundred cases of age range of 20- 50 years were considered for this study. Of these, 55.4% were males and 44.6% females. The average score on

perceived stress scale was 25.5 out of 56. Regarding perceived stress, 31.0% subjects felt as unable to control the important thing, 30% nervous and stressed, 39.0% just could not cope, 41.0 % expressed anger and 49.0% worried on the situation. Majority of the participants the Deo, et al were living in rehabilitation centers at different cities, with others from community. In the present study, all participants were from community.

Hand et al (2006) conducted research to determine the correlation of perceived stress with selected physiological and psychological variables in a sample of HIV- infected men and women. They also wanted to establish the differential effects of those correlates on the level of perceived stress in the sample. The sample consisted of 79 HIV-infected women and men recruited from a local primary health care association. Of these, 42 (53%) were women and 37 (47%) were men. The majority of the participants were single (n=/64, 82%) with the remaining 14 participants (18%) reporting some type of partnership, while one participant's information was missing. The age ranged from 24 to 63 (M = 39.99, SD = 7.8). 13 participants were asymptomatic, 25 participants were symptomatic and 18 had developed AIDS. 23 participants did not report their disease stage. Fifty six (73%) participants were receiving combination antiretroviral therapy. An independent sample T-test indicated no difference (t= 0.50, p= 0.62) in perceived stress between participants who were and were not receiving combination antiretroviral therapy. Depression correlated significantly with perceived stress. The majority of subjects (84%) reported a significant amount of HIV-related symptomatology. The HIV-related symptom scores correlated significantly with perceived stress. All participants reported pathological sleep disturbances and daytime dysfunction in the previous month.

These findings showed that stress was prevalent among HIV positive individuals whether asymptomatic or symptomatic, and whether on antiretroviral therapy or not. Stress was significantly associated with depression. There is, therefore, need to find out if there is any relationship between perceived stress and neurocognitive functioning.

2.3. Stress and Neurocognitive Functioning

The term stress was coined by Hans Selye in 1936, who defined it as the non-specific response of the body to any demand for change (Lahey, 2009). It is the body's reaction to a change that requires physical or mental or emotional adjustment. The most frequently reported psychosocial stressors among adults include breakup of intimate romantic relationships, death of a family member or friend, economic hardships, discrimination, poor physical health, and assaults on physical safety (Holmes and Rahe 1967; Lazarus and Folkman, 1984). Although some stressors can evoke severe mental distress in most mentally healthy people, they are more likely to cause mental disorders in people who are vulnerable psychologically (Brown and Harris, 1989). Stress is associated with certain demographic variables. For instance, marital status has been associated with certain mental health problems such as depression and stress (Bulloch, et al., 2009). In this study high prevalence of depression was reported in the separated and divorced sample. Scott and colleagues (2010) reported a significant relationship between marriage and mental disorders. Marriage was associated with reduced risk of first onset of most mental disorders in both genders.

Psychological stress affects people's wellbeing in different ways. It impairs memory, reduces mental wellbeing, affects the digestive tract, destroys cardiovascular health and reduces lifespan in general (Meletis, 2009). Stress influences the prefrontal cortex (PFC), an important brain area that controls cognition and emotions and memory (Meletis, 2009; Yven, et al., 2009). Despite the arguments by Meletis above, conflicting research findings in the relationship between stress and neurocognitive functioning have been reported elsewhere. Pukay-Martin and others (2003), for example, conducted research to examine the relationship between stress and neurocognitive functioning in 82 HIV negative and 251 HIV positive subjects.

The neurocognitive domains that were measured included memory, executive functioning, attention and information processing speed, and motor dexterity. To measure these domains, a test battery that included the Wechsler Adult Intelligence Scale-Revised, Selective Reminding test, visual memory span forward and backward from the Wechsler memory scale-revised, the verbal attainment test, Wisconsin card sorting test, verbal fluency, figural fluency, Trail making A and B, Grooved pegboard, and Paced auditory serial addition test were used. The study showed cognitive impairments only in HIV positive subjects with executive function and attention and information processing speed being the most affected.

One of the most unexpected findings in the Pukay-Martin and colleagues' study was that no relationship was observed between stressful life events and memory. The Pukay-Martin and colleagues study implies that HIV-positive individuals are highly stressed and, therefore, there is a need to study the effects of stress in the neurocognitive functioning of these people so as to come up with remedial measures.

2.3.1. Stress and Immunity

Stress affects the immune system in the human body and the immune system has a great impact on neuropsychological functioning (Meletis, 2009; Yven, et al., 2009). Hoegar and colleagues (2002) stated that powerful stress hormones suppress the immune system, making the body less capable of fighting disease and infection. This is possible in the sense that stress suppresses the immune system's ability to produce lymphocytes (white blood cells necessary for killing infection) and natural killer cells (cells that seek out and destroy foreign invaders), both of which are crucial in the fight against disease and infection (Hoeger, et al., 2002). Psychoneuroimmunology (PNI), one scientific field that studies the chemical basis of communication between the body and the mind as it relates to the nervous system and the immune system has demonstrated that hormones and neurotransmitters released under stressful condition can change immune cell behavior (Laserman, et al., 1999; Vedhara and Irwin, 2005; The Scientist, 1996).

Reduction in CD4+ count signals changed immunity. The reduced defense against microorganisms has been associated with the depletion of tryptophan in the human body (Schrocksnadel, et al., 2006). Tryptophan is an essential amino acid in the body's needs (Schrocksnadel, et al., 2006). Scholars have argued that low levels of tryptophan in the blood stream leads to impairments in the executive functioning (Gallagher, et al., 2003) and long term memory (Schmitt, et al.,2000). It would be ideal to examine the relationship between low immunity, stress, and neurocognitive functioning.

2.4. Social Support

Social support, the emotional and practical assistance that family members, friends, and support networks provide for people (Taylor, 2011) can be measured as the perception that assistance is available (perceived support), the actual received assistance (received support), or the degree to which a person is integrated in a social network (Barrera, 1986). Although social support is an important resource in preventing the effects of HIV to professional

caregivers, immediate family members providing direct care, in the bereavement following AIDS-related death; it particularly becomes important for HIV positive people (Hoffman, 1996; Shippy, 2004). It buffers the psychosocial stresses that may negatively impact affected patients (Laserman, et al., 1999; Shippy, 2004; Updegraff et al., 2002).

2.5. Social Support and Stress

Scholars have suggested that social resources and support serve significant roles in buffering the stressful life events as well as moderating the psychological and physical wellbeing of people (Ashton, et al., 2005). This support has been shown to help mitigate stressful life events, speed recovery from illness, and increase the likelihood that a person will follow the advice of his or her doctor (Kaplan and Saccuzzo, 2005). The presence of social support therefore predicts the individual's ability to cope with stress. Second, perception of social support has been found to be predictive of mental health for individuals affected by other chronic illnesses as well (Bennett, et al., 2001; Uchino, et al., 1996) so its impact on those with HIV may be comparable.

Komblith, et al (2001) conducted a study to test the additive model and the buffering hypothesis of social support. The additive model postulates that social support and stressful life events each directly affect chronically ill patients' (in this case, cancer patients) adjustment, while the buffering hypothesis says that stressful life events occurring in the presence of social support produces less distress than if they occur in its absence (Komblith, et al., 2001). Social support was measured by the Medical Outcome Study Social Support Survey (MOS- SSS) and stress by the Life Experience Survey (LES) - a 57- item measure of stressful life events that occurred within the past 12 months and their impact upon an individual's life. The Mental Health Inventory (MHI) was used to measure the psychological state.

When the interrelationship of psychological status with other measures of quality of life were examined, the MOS-SS total score and the LES total negative impact score were found to be the most highly significant variables to correlate with the MHI Global subscale scores of psychological distress: (MOS- SS, $r = -0.47$, $p < 0.0001$; LES total negative impact, $r = 0.50$, $p < 0.0001$) and wellbeing (MOS- SS, $r = 0.58$, $p < 0.0001$; LES total negative impact, $r = -0.50$, $p < 0.0001$). The results from the study conducted by Komblith and colleagues showed that social support plays an important role in bringing about the psychological wellbeing of

stressed patients. The study, however, supported the additive model in the sense that breast cancer patients most vulnerable to serious psychological distress were those who both had minimal social support and high negative stressful experiences. Each (social support and negative stressful events) independently influenced emotional state irrespective of the presence of the other. It would be ideal to understand the role of social support in HIV positive people who, according to the researcher, could be undergoing stressful experiences like their cancer counterparts.

Scholars have argued that the beneficial aspect of social support is only tenable if the support given matches that which is desired by the patient, a concept known as the matching hypothesis (Cohen and Wills, 1985). This implies that if a different form of social support is given to the patient than is expected, stress may increase (Horowitz, et al., 2001). Social support has not always been linked to positive physical and mental health outcome (Bolger, et al., 2000). Social support is a broad term. This study shall consider perceived social support and not received social support.

2.6. Marital Status, Social Support and Stress

Social support and stress levels among people have been linked to marital status. According to Shapiro and Keyes (2009), marriage, which represents a social contract that bonds individuals together in an intimate relationship, can be stress-buffering and socially integrative. Studies have shown that married adults were at reduced risk for premature mortality and physical morbidity (e.g., cardiovascular disease) (Stroebe and Stroebe, 1995). In short, marriage purportedly confers social integration to its participants, providing them with a feeling of belonging and purpose (Waite and Gallagher, 2000); primarily through kin based social networks. From this view, it can be argued that marriage promotes an individual's sense of social and psychological well being. Alberta Reappraising AIDS Society (2011) reported HIV incidence (per 100 person- year) of 3.6 for unmarried, 3.88 for married and 4.81 for divorced, separated or widowed. Divorce has been associated with certain mental health problems such as depression and stress (Bulloch, et al., 2009). The relationship between marital status and perceived stress is a worthwhile undertaking so that remedial measures, if necessary, are suggested for incorporation in the fight against the effects of HIV on the affected people.

2.7. Stress and Social Support by Gender

Campbell and Stephen (2011) conducted a study on gender differences in susceptibility to stress. The respondents consisted of 84 participants, 40 males and 44 females. Two surveys were administered, the Susceptibility to Stress Scale (SUS) and the Perceived Stress Scale (PSS). No significant gender effects were observed on both surveys, with $F(1, 83) = 1.64$, $p > .05$ on PSS and $F(1, 85) = 2.98$, $p > .05$ on SUS. The current study only administered the PSS.

Wang and others (2007) conducted a study on gender difference in neural response to Psychological stress. The measured behavioral and physiological data indicated that the experimental paradigm successfully elicited a mild to moderate level of psychological stress in both male and female subjects. The main effect of gender was not significant for perceived stress or salivary cortisol measures. However, the interaction of experimental condition and gender was significant for perceived stress [$F(5, 26) = 5.52$, $P = 0.001$]. Post hoc analyses indicated that males reported a greater acute response in perceived stress from the low to high stress task [$F(1, 30) = 4.39$, $P = 0.045$] compared to females.

Concerning social support, females tend to report larger social networks than males and turn to others for emotional support in stressful circumstances more than males do (Taylor, et al., 2000). It is, therefore, argued that the females' sense of wellbeing is more strongly influenced by the availability and quality of social support relations (Cyranowski, et al., 2000). In line with this, research indicates that females report more depression symptoms than males when they experience a lack of social support (Slavin and Rainer, 1990), and females more than males profit more from support when it is available (Taylor, et al., 2000). Because females tend to turn to their social support relations when they experience stress, rather than coping by "fight versus flight", they are more likely than males to benefit from available support in confining the consequences of stress (Taylor, et al., 2000).

CHAPTER THREE

METHODOLOGY

3.0. Introduction

This chapter outlines the methods that were used in data collection. The chapter covers the research design, target population, sample size and sampling procedure, exclusion and inclusion criteria, measures used in the study, data collection and data analysis techniques employed.

3.1. Research Design

This study was cross sectional. It assessed the neuropsychological performance of participants by administering various neuropsychological tests that measure brain function. The participants were required to answer questionnaires that elicited information on their demographic details, stress and perceived social support. This ensured that all relevant information for the study was collected, and would be useful to other researchers who may want to undertake research of a similar nature. This study used quantitative methods of data collection.

3.2. Target Population

The target population of this study included HIV positive adults (with and without AIDS status) in the urban population of Lusaka province of Zambia.

3.2.1. Study Sample

This study involved 263 HIV positive individuals, of which 107 (40.7%) were males and 156 were (59.3%) females. The sample was obtained from six urban clinics. The clinics were chosen and allocated to the researchers for research by the Ministry of Health. These were Matero Referal, Matero Main, Chipata, Kabwata, Kalingalinga, and Chilenje. The education level of participants ranged from 5 to 20 years of schooling. Mean years of education was 10.01 with a standard deviation of 2.223. Their age range was between 20 and 65 years with the mean age of 41 years. This sample was similar to the one from which the norms for neurocognitive functioning in Zambian adults were established. This sample size was also ideal considering time- intensive battery administration (approximately 3 hours per participant).

Figure 1: Sample Distribution by Gender.

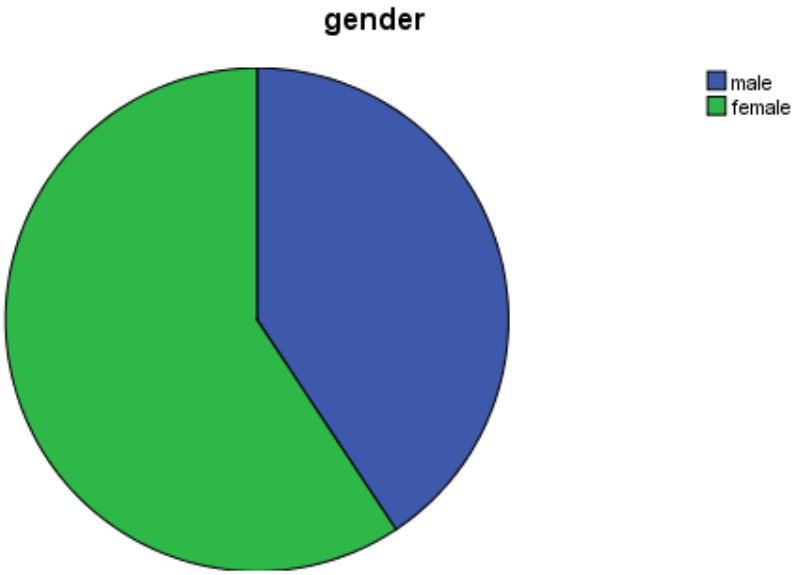
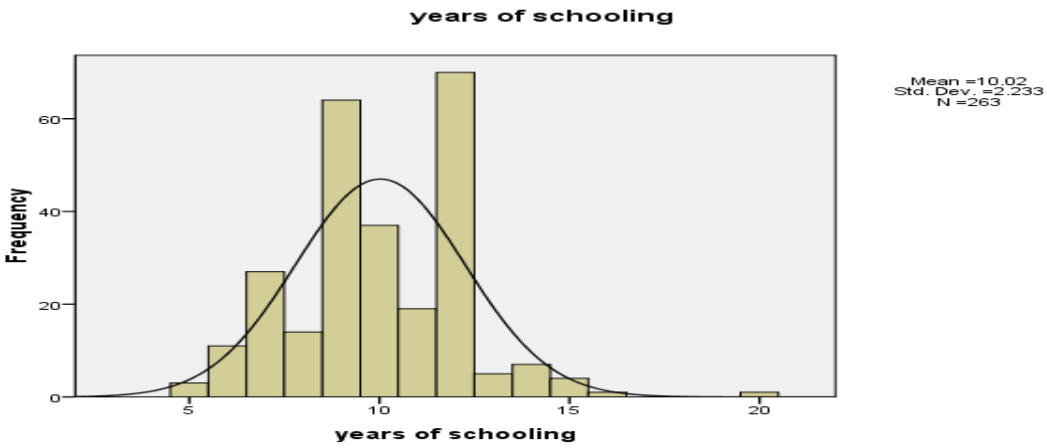


Figure 2: Education Level of the Sample



3.3. Sampling Procedure

Purposive sampling was used as only HIV positive adults with above 5 years of education were included in the sample. Participants were recruited from the urban Antiretroviral Therapy (ART) clinics in Lusaka District. Before commencement of the research, the researcher was cleared by the University of Zambia Biomedical Ethics committee (UNZABREC) (see appendix G). The researcher worked closely with health personnel, who helped in making appointments with potential participants. Before screening, the researcher explained the purpose and nature of the study to potential participants, who were also given an information sheet to read. The researcher also answered questions and made clarifications in helping would be participants who had questions and needed some clarifications. Those who agreed to participate were then given the informed consent to sign (see appendix C).

Once the informed consent form was signed, the participants underwent a screening procedure. They were screened for the ability to read and understand English using the Zambia Achievement Test (ZAT) (see appendix E); depression using the Beck Depression Inventory; and psychiatric and drug abuse assessment using the Chinese substance abuse scale and substance abuse questionnaire. These instruments have been used in Zambia before. Participants also completed the social demographic questionnaire (see appendix D). After screening, all eligible research participants underwent a neurocognitive assessment using the International neurobehavioral test battery (see appendix F). This instrument measured seven domains of neurocognitive functioning, including memory malingering, learning and memory, executive functioning, attention/working memory, speed of information processing, verbal fluency and motor dexterity. After being assessed for neurocognitive functioning, the participants were given the perceived stress scale (see appendix A) and the medical outcome study social support scale (appendix B).

3.4. Inclusion and Exclusion criteria

Inclusion criteria- only HIV positive men and women between 20 and 65 years old with 5+ years of schooling were recruited to participate in the study. In addition, participants were required to have the ability to read in English as the testing was done in English.

Exclusion criteria- Those who were severely ill, who were on substance abuse or intoxication, with psychiatric disorders, and who could not give consent were excluded from the study.

3.5. Measures

Various measures were used in the process of data collection in addressing the research questions of the study. These included neuropsychological performance, measures of stress, and of social support.

3.5.1. Neurocognitive Functions

The International neurobehavioral test battery was used to assess performance in various neurocognitive domains. This test battery is comprised of widely used measures that have documented reliability and validity for use in adult samples (Heaton, et al., 1995; Woods, et al., 2006; Power, et al., 1995). The International neurobehavioral test battery has been previously used in Zambia (Hestad, et al., 2012).The test battery is composed of 14 tests measuring 7 domains of neurocognitive functioning (see appendix F). These domains include: faking memory, learning and memory, executive functioning, Attention/working memory, speed of information processing, verbal fluency and motor dexterity. These were measured using the following tests:

1. Screening for Effort

Memory malingering was assessed with the Hiscock Digit Memory Test (HDMT). This test was designed in a way that can identify a person who willfully fakes memory impairment (Prigatano and Amin, 1993). The 18- item HDMT which has been used in Zambia is a forced- choice visual memory task used in detecting factitious sensory or perceptual impairment and also in situations where a person claims memory loss. Participants view, in succession, a series of 5-digit numbers presented to them on note cards for five seconds each and then asked to remember them. 19

2. Learning and Memory

This contains two domains, the visual episodic domain and the verbal episodic domain. For the visual episodic domain, the Brief Visuospatial Memory Test (BVMT) was used while the verbal episodic domain was assessed using the Hopkins Verbal Learning Test- Revised (HVLT- R).

The BVMT measures visual learning and memory. It also assesses immediate and delayed recall. It has been standardized and norms created for use with adults of 18+ years of age

(Benedict, 1997).The participants were shown geometric visual designs which they were expected to reproduce with accuracy in terms of shapes and spatial location.

The HVLT- R is a test of learning ability and delayed recall of verbal information across three (3) trials. It also assesses the individual's capacity to retain, reproduce and recognize information after delay (Strauss, et al., 2006). HVLT- R consists of 12 nouns (4 each from animals, minerals, and human habitats). According to Strauss and others (2006), reliability and construct validity of the standard learning and recall measures on the HVLT-R include evidence of convergent, construct and discriminant validity.

3. Speed of Information Processing (SIP).

Speed of information processing was measured using a number of tests. These included the Trail Making Test A, Digit Symbol, Symbol Search, Wechsler Adult Intelligence Scale-Revised (WAIS- R), Stroop task, and Color Trails.

Trail making test is a neuropsychological test of visual attention and task switching. The task required the subject to 'connect- the- dots' of 25 consecutive targets on a sheet of paper. In part A, which was used, the targets were all numbers (1, 2, 3, etc) (Gaudino, et al., 1997). The goal of the subject was to finish the test as quickly as possible.

Digit symbol and symbol search were adapted from Wechsler Adult Intelligence scale. In digit symbol, the subject matched a symbol with a specific digit, the task was to be completed within 120 seconds without stopping or changing answers. In the symbol search, the subject viewed two symbols on the left and indicated whether any of them was found in the right column by writing 'yes' or 'no' in the spaces that were provided.

Both WAIS Digit Symbol and Symbol Search have psychometric integrity and portability across cultural boundaries (Gorsuch, et al., 2000).These tests have confirmed reliability and validity across cultures and have been used to measure decline in old age. Their reliability across cultures has also been confirmed by Paul and Kreiner (2000).

The Stroop Task, particularly the color card (C) measured processing speed. It consists of a sheet with a series of Xs printed in red, blue, and green. The subject was required to accurately mention the color as quickly as possible.

The color trail task consists of numbers 1 to 25 alternating between pink and yellow circles. All odd numbers are circled pink while all even numbers are circled yellow. The subject was

required to switch from a pink one to a yellow two to a pink three and so on. This was to be done as fast as possible.

4. Executive Functioning Abstraction

To measure executive functioning, we used the Wisconsin card sorting test (WCST, 64- item version), the Stroop word- color task, Color Trails, and the Halstead Category Test. WCST is a neuropsychological test of 'set- shifting', thus, ability to display flexibility in the face of changing schedules of reinforcement. It contains cards of different shapes, colors, and quantity. A participant was required to match the cards, but was not told how to match, except whether a particular match was correct or wrong. The participant was expected to master the changing rules.

Stroop word-color task measured selective attention, cognitive flexibility and processing speed, and executive functioning. It consisted of the names of colors (e.g. 'blue', 'red', or 'green') which were not printed in congruent color ink. When the name of a color was printed in a color not denoted by the name (e.g. color 'blue' printed in 'red'), naming the color of the word took longer and the participant was more prone to errors than when the color of the ink matched the name of the color. Reliability was found at 0.74 to 0.88 for the reading card (word), 0.74 to 0.90 for the colours and 0.67 to 0.91 for the word- colour interference. It has the ecological validity as reported in the findings by Van der Elsr and colleagues (2008) in which they measured the correlation with the Neurological test performance and scores on the physical functioning scale of medical outcomes study item form 36 items from the health survey.

Halstead category test (Standard category test) assessed the ability to comprehend qualities such as size, shape, number, position and color. The subtests have varied principles which may be number of objects, odd stimulus, spatial position, a combination of different principles, etc. Participants were given feedback based on correct or incorrect guesses to show what the principle was. The test has a reliability coefficient of between Pearson's r of 0.40 to 0.85 (Dikmen, et al., 1999).

5. Attention/Working Memory

We used the Paced Auditory Serial Addition Test (PASAT) and the Wechsler Memory Scale III (WMS-III)/ spatial span to assess attention and/or working memory. PASAT assesses capacity and rate of information processing and sustained and divided attention (Spreen and Strauss, 1998). The participants were given a number by the computer every 3 seconds and were asked to add the number they had just heard to the number they had heard before. The Wechsler Memory Scale third edition spatial span subtest has 10 cubes in which the participant was required to follow a sequence of tapping the blocks both forwards and backwards.

6. Verbal Fluency

Verbal fluency was measured by two subtests: the controlled Word association Test (COWAT- FAS) and the Category Fluency test which is composed of animal naming and action naming. The participant was required to name as many animals as possible in 60 seconds. He or she was then asked to mention as many verbs or actions that people do.

7. Motor Dexterity.

The Grooved Pegboard Test was used to measure motor dexterity. It tests how fast a person is able to put small pegs into grooves. Both the dominant and non- dominant hands are assessed. It is a manipulative dexterity test consisting of 25 holes with randomly positioned slots. Pegs with a key long one side must be rotated to match the hole before they can be inserted. The task requires complex visual- motor coordination than most pegboard tests (Strauss, et al., 2006). It measures performance speed in a fine motor task and by examining both sides of the body, and is good for testing lateralized brain damage (Swiercinsky, 2001).

3.5.2. Social Support

Social support was measured using the Medical Outcome Study 19-item social support survey (MOS-SS) (see appendix B). This is a comprehensive scale with four subscales that measures perceived social support. These include: emotional/ informational support, tangible support, affectionate support, positive social interaction, and an additional item. These subscales were found to be highly correlated, with the *r* of between 0.68 and 0.82 (Sherbourne and Steward, 1991), an indication that they measure the same factor. The scale

elicited information about how readily available help would be at the time the patient needed it. The grading or scoring range was 1 to 5. (e.g. 1= none of the time and 5= all the time)

This scale has a number of advantages over other scales in that it is short and therefore could not wear out the subjects; it is self administered; has been used on patients with chronic illnesses (Sherbourne and Stewart, 1991) and therefore was seen to be ideal for HIV positive people. The support measures were found reliable, (with all alphas > 0.91) and stable over time (one year stability coefficient of 0.78) (Sherbourne and Stewart, 1991). Moreover, it has been used in identifying patients with poor postsurgical quality of life with the sensitivity of 81% and the specificity of 77 % (Moskovitz, et al., 1999). The instrument has been useful in evaluating yoga- based peer support group for human immunodeficiency virus (HIV) positive adolescents in Zambia (Menon and Glazebrook, 2012).

3.5.3. Stress

Stress was measured using the 10-item perceived stress scale (PSS). This scale measures the extent to which events in one's life are viewed as stressful. The respondent estimates how unpredictable, uncontrollable, and overloaded they find their lives to be. The scale also measures the present levels of stress in the respondent. It is a 4-point scale where respondents tick from 0- 4 (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often & 4 = very often) the statement that best suits their situation. All negatively framed items (1, 2,3,6,9 &10) are scored by adding what the respondent has ticked. The four positively framed questions (4, 5, 7, &8) are scored in the reverse order. The total possible score is 40, with higher scores indicating greater stress.

This scale was ideal for this study in the sense that the items were easy to comprehend and it did not discriminate people with low levels of education (at least one with basic education). It had been administered on HIV positive people (Koopman, et al., 2000). The PSS has evidence for validity as higher PSS score were related to failure to stop smoking and greater vulnerability to depressive symptoms from stressful- life events. It had also been used in different regions in Africa (Hamad, et al., 2008) and Asia (Hattar- Pollar, et al., 2006). In the Zambian set up, Menon and Munalula (2007) used the perceived stress scale to explore the stressful aspects of a doctor's job.

Table 1: Summary Table of all the Measures used in the present Study

1. Measuring cognition	
Executive functioning	• Wisconsin Card Sorting Test- 64 • Colour Trails Test 2 • Stroop Colour and Word Test • Halstead Category Test
Working memory	• Paced Auditory Serial Addition Test (PASAT) • Wechsler Memory Scale (WSM)-III • Spatial Span
Speed of information processing	• Wechsler Adult Intelligence Scale (WAIS)- III Digit Symbol • Wechsler Adult Intelligence Scale (WAIS)-III Symbol search • Trail making Test-A • Colour Trails Test (CTT) Trails 1 • Stroop Colour and Word Test
Verbal fluency	• Controlled Oral Word Association (FAS) Test • Category Fluency (Animals, Actions)
Learning and delayed recall	• Brief Visuospatial Memory Test-Revised • Hopkins Verbal Learning Test, Revised-II
Motor speed	• The Grooved Pegboard (Dominant and Non-dominant hand Test)
2. Measuring Alcohol consumption	• Chinese substance use form
3. Psychiatric screening and health history	• The Beck Depression Inventory (BDI) • Neurobehavioural Screening form
4. Demographics	• Demographic Questionnaire
5. Reading Level	• Zambia Achievement Test
6. Stress	• Perceived Stress Scale (PSS- 10)
7. Social Support	• Medical Outcome Study Social Support Survey (MOSS-S).

3.6. Data Collection

Once permission was granted by the Lusaka District Health Management Board (see appendix G), and informed consent obtained, data collection commenced. This was done in collaboration with the medical personnel who assisted in making appointments with potential participants. After screening, eligible participants were given questionnaires that measured patients' own functioning and activities of daily living. Those who could complete them independently were allowed to do so while those who needed assistance from the researcher were helped by the researcher who asked questions and wrote the responses for them.

After filling in the questionnaires, the participant's neurocognitive functioning was assessed using the International Neurobehavioral Test Battery. Some tests were paper and pencil, others were computerized, and yet others were performance tests. After completing the International Neurobehavioural Test Battery, the participants were given more questionnaires to complete. These included the Medical Outcome Study Social Support Survey for social support and Perceived Stress Scale for stress. The data was then screened and coded.

3.7. Data Analysis

To facilitate clinical interpretation and to avoid undue influence of discrepancy in scales, all raw scores of the neuropsychological measures assessing neurocognitive function were transformed to T - scores (a distribution with a mean of 50, and a standard deviation of 10) using data correcting for age, gender and level of education. We used the mean T- scores to assess the level of impairment on specific domains. Typically, any score more than one standard deviation below the mean (i.e., T-score less than 40) is considered "impaired." The descriptions go from mild to severe as below. Deficit scores come from T-scores, and are designed to assign an increasing value as the degree of impairment increases.

Table 2: Neurocognitive Impairment Descriptions

T- Score	description	Deficit score
40+	average	0
35-39	mild impairment	1
30-34	mild to moderate impairment	2
25-29	moderate impairment	3
20-24	moderate to severe impairment	4
<19	severe impairment	5

Deficit scores on all tests were averaged to create the Global Deficit Score (GDS). GDS was used to detect impairment across all neurocognitive domains. A GDS $\geq$ 0.5 is a clinically validated and reliable cutoff (Carrey, et al., 2004) which indicates that, on average, an individual is at least mildly impaired in at least half the single neuropsychological measure in the battery. It is recommended for detecting HIV-associated neurocognitive disorders (HAND) (Blackstone, et al., 2012). It considers number and severity of impairments across all measures.

We screened data for accuracy of data entry and detection of missing values. The data was analyzed using the Statistical package for social sciences (SPSS) version 16. The researcher performed descriptive analyses to examine the demographic and clinical characteristics of participants so as to come up with percentages, frequencies, means and standard deviations. The following tests were also generated from SPSS;

- Analysis of Variance to examine if stress had an impact on neurocognitive functioning (specific domains).
- ANOVA to find the effect of stress and social support on neurocognitive dysfunction (GDS).
- Analysis of Variance to investigate if stress differed by age, education level, and gender.
- ANOVA to establish if social support and stress differed by marital status

Other Analyses

- Independent samples T- test to find out if there were significant mean differences in stress and social support based on gender.
- Linear Regression analysis to assess the predictive power of stress on working memory and verbal fluency.
- Pearson's correlation coefficient to explore the relationship between stress and social support.

3.8. Ethical Consideration

Like any other research in both human and animals, this research had ethical issues. There was need to be cleared by the Biomedical Research Ethics Committee (see appendix 5). The ethical issues included the following: Informed Consent- the research was voluntary. An informed consent form was prepared and forwarded to participants for them to read. The researcher then discussed the process of the research with the subjects and any concerns were clarified. Participants who did not want to take part were not coerced. Confidentiality is a critical requirement in research. To ensure confidentiality, all study - related information was kept under lock and key, with the researcher being the only custodian of the password. Only initials were used so as to ensure anonymity. Measures were put in place to ensure that no participant was injured physically and/or emotionally.

Another ethical consideration was that of fatigue due to the length of time taken in order to complete the test battery. To this effect, participants were allowed to take short breaks during testing so as to minimize fatigue.

CHAPTER FOUR

RESULTS

4.0. Introduction

This chapter covers different tests that were used in the current study. It includes results presentations in form of tables and figures.

4. 1: Sample Characteristics

Table 3: Distribution of the Whole Sample

Demographics		Frequency	Percentage
Gender	Male	107	40.7
	Female	156	59.3
Education level	Primary (5-7)	41	15.6
	Junior secondary (8-9)	79	30
	High school (10- 12)	125	47.5
	Tertiary (13- 20)	18	6.8
Marital status	Single	43	16.4
	Married	140	53.4
	Widowed	51	19.5
	Divorced	27	10.3
	Living with another	1	.4

We start our results presentation with the descriptive statics. Our first task was to find out the distributions in terms of age, gender, education levels and marital status. Age, gender, marital status, and the global deficit score impairment were entered for descriptive statistics. The total number of participants was 263. Of these, 107 (40.7%) were males and 156 (59.3%) were females. Their age ranged from 21 to 65, with the mean age of 41. The years of schooling ranged from 5 to 20. About 41 (15.6%) had completed primary education, 79 (30%) junior secondary, 125 (47.5%) high school, and 18 (6.8%) tertiary education. The

proportions of marital status of the participants were as follows: 43 (16.4%) single, 140 (53.4%) married, 51 (19.5%) widowed, 27 (10.3%) divorced, 1 (.4%) living with another person, while 1 person did not disclose his/ her marital status.

The sample had a higher percentage of female participants (59.3%), while the male participants were fewer (40.7%). The difference was, however, non significant.

Table 4: Education Level by Gender

Gender	Mean	N	S D
Male	10.47	107	2.332
Female	9.69	156	2.112
Total	10.01	263	2.223

The T- test was computed to find the differences in the education levels between genders. There was no significant difference in education level between males and females ($p > .05$). The education mean score for males was 10.47 (SD=2.33) while that of females was 9.69 (SD=2.11). The two groups were therefore comparable.

Table 5: Mean Education Level

Education level	Frequency	Mean Age (SD)	F	P value
Primary	41	39.88 (7.36)	2.014	.112
Junior secondary	79	40.28 (9.06)		
High school	125	40.69 (9.12)		
Tertiary	18	45.61 (9.19)		

There were no significant differences between the mean age and education level with f (2.014) at p= .112. The age cohorts were, therefore, comparable with respect to education levels.

4.2. Demographic Variables and Neurocognitive Impairments.

Using a cut off of GDS ≥ 0.5 to indicate neurocognitive impairment, of the 263 participants, 89 (33.8%) were impaired while 174 (66.2%) were not impaired. Of the 89 who were impaired, 35 (39.8%) were males while 53 (60.2%) were females.

Table 6: Domain Means T scores based on the Whole Sample

Domain	N	means T
Executive function	263	46.34
Working memory (Wrk Memory)	263	44.51
Learning	263	44.22
Fluency	263	46.43
Recall	263	45.13
Motor	263	51.95
Speed of information processing (SIP)	263	45.93
Global	263	46.30

We computed descriptive statistics for the mean T scores of the seven domains. The results showed that six cognitive domains had means below the standardized mean T score (50). None of the six t- scores were in the impairment range ($t < 40$). However, the motor domain had a mean T score above 50 (51.95). This means that on average, the motor domain was not affected by HIV and AIDS.

Table 7: Cognitive Domains by Impairment levels (%) (N= 263)

	Executive Function	wrk memory	fluency	learn	recall	motor	SIP
Normal	82.9	73.8	83.7	70.7	71.1	87.8	81.4
Mild	12.9	13.3	9.5	14.8	19.0	6.8	11.8
Mild- moderate	4.2	7.2	4.2	10.3	7.2	3.0	5.3
Moderate	-	4.6	2.7	3.8	2.3	1.1	1.5
Moderate- severe	-	1.1	-	.4	.4	1.1	-
Severe	-	-	-	-	-	-	-

We computed the frequency distribution to explore impairment distributions across neurocognitive domains. All the seven domains were entered. The results showed that the ability to learn was the most affected domain (70.7% normal and 29.3% impaired) while the least affected was the motor domain (87.8% normal and 12.2% impaired. Among the impaired, most of the participants were in mild impairment level.

4.3. Stress and Neurocognitive Functioning

The mean stress level for all the participants (N= 263) was 17.78 (SD= 5.84). The range was 32 with the highest score being 34 and the lowest score being 2. This was a low stress level.

Table 8: Stress based on Demographic Variables

Variable (N= 263)	F	P value.
Age	1.887	.133
Education level	2.875	.037*
Gender	.046	.830
Marital status	1.890	.114

*p> .05

To investigate if stress differed by demographic variables, ANOVA (univariate) was computed. Age, education level, gender and marital status were entered as independent variables while stress was entered as a dependent variable. The results showed that education level had significant effect on stress (f= 2.875, p= .0370). The effect size was, however, low (partial eta squared= .044). Those with higher levels of education (10- 12 and 13- 20 years of schooling) had lower mean stress levels as compare to those with low levels of education (5-7

and 8-9 years of schooling). Age, gender, and marital status had no effect on stress with the value p> .05, and no interaction main effects with age, gender, and marital status (p> .05)

Table 9: Mean Stress levels based on Years of Schooling

Education level	Mean	N	SD
5-7 years of schooling	18.46	41	6.473
8-9 years of schooling	19.16	79	4.372
10- 12 years of schooling	17.05	125	6.055
13-20 years of schooling	15.17	18	7.172
Total	**17.78**	**263**	**5.844**

Table 10: Stress and Neurocognitive Function (GDS and Mean T score)

	F	P value
GDS	1.298	.150
Executive mean T	1.115	.320
Fluency mean T	1.729	.015*
Wrk mem mean T	1.657	.023*
Learn mean T	1.296	.151
Recall mean T	.757	.814
Motor mean T	.957	.533
SIP	1.371	.106

*p< .05

We computed a univariate ANOVA to examine the relationship between stress and neurocognitive functioning. Stress was entered as independent variable while GDS and neurocognitive domains as dependent variables. Stress showed some relationship with verbal fluency (f = 1.729, p = .015) and working memory (f = 1.657, p = .023). However, no relationships were observed between stress and GDS, executive function, learning, recall, motor skills, and speed of information processing.

Table 11: Linear Regression of Stress on Working Memory and Verbal Fluency

	Beta	t	P value	R^2
Working memory	.127	2.063	.040*	.016
Verbal fluency	.008	.132	.895	.000

a. Predictor (constant), stress

b. Dependent, working memory and verbal fluency.

Linear regression analysis was computed to examine whether stress predicts working memory and verbal fluency performance. Only working memory and verbal fluency were selected for regression because preliminary analysis showed significant relationship with stress while other domains showed no significant relationship. Stress was entered as independent variable while working memory and verbal fluency were entered separately as dependent variables. The results indicated that stress predicted working memory (t = 2.063, p = .040) but not verbal fluency (t = .132, P = .895). About 1.6% of the variance in working memory could be explained by stress (R squared = 1.6).

Table 12: Stress and Social Support on Neurocognitive Dysfunction (GDS)

Variable	F	P value
Stress	.873	.645
Affectionate support	.582	.846
Stress + affectionate	.458	.945
PSI	.639	.799
Stress + PSI	.495	.957
Tangible support	.268	.994
Stress + tangible support	.495	.691
Emotional support	.231	1.00
Stress + emotional support	.580	.809

The univariate ANOVA was performed to find the effect of stress and social support on neurocognitive dysfunction. Stress and social support were entered as continuous independent variables while the global deficit score was entered as the dependent variable. There were no significant effects of stress and social support or their interaction effects (Stress + Social support) on the GDS, with $p > .05$.

Table 13: Correlations between types of Social Support and Stress.

(N= 263)	Socialsup	emosup	tansup	affsup	PIS	stress
Socialsup. Pearson correlation	1	.860	.829	.793	.776	-.416
p		.000	.000	.000	.000	.000
Emosup. Pearson correlation	.860	1	.632	.497	.508	-.308
p	.000		.000	.000	.000	.000
Tansup. Pearson Correlation	.829	.632	1	.627	.536	-.372
p	.000	.000		.000	.000	.000
Affsup. Pearson Correlation	.793	.497	.627	1	.723	-.381
p	.000	.000	.000		.000	.000
PSI. pearson Correlation	.776	.508	.536	.723	1	-.323
p	.000	.000	.000	.000		.000
Stress. Pearson Correlation	-.416	-.308	-.372	-.381	-.323	1
p	.000	.000	.000	.000	.000	

P = .001 (2- tailed). Emosup (emotional support); tansup (tangible support), affsup (affectionate support), PSI (positive social interaction).

We performed a correlation analysis to examine the relationship between social support and stress. Pearson's correlations showed significant positive relationships between different kinds of social support (emotional, tangible, affectionate, and positive social interaction) and all kinds of social support showed a negative correlation with stress. Less social support was significantly associated with greater stress. The results were significant at $p < .01$.

4.4. Social Support and Stress based on Marital status

Table 14: Social Support and Stress based on Marital status

Variable	F	P value
Stress	1.228	.299
Social support	3.510	.008**
Emotional support	2.541	.040*
Tangible support	2.630	.035*
Affectionate support	2.989	.019*
Positive social interaction (PSI)	5.148	.001**

*p< .05; **p< .01

To establish if social support and stress differed by marital status, one way ANOVA was computed. Stress, social support, emotional support, tangible support, affectionate support, and positive social interaction (PSI) were entered as dependent variables while marital status was entered as an independent variable. Social support was significantly related to marital status ($p < .05$). Stress did not statistically differ among the marital status groups ($F = 1.228$, $p = .229$).

Table 15: Means Stress and Social Support based on Marital status

Marital status		social sup	emotional sup	tansup	affsup	PSI	stress
Single	Mean	63.65	25.72	13.79	10.86	9.93	18.19
	N	43	43	43	43	43	43
	SD	19.06	8.75	4.85	3.63	3.91	5.65
Married	Mean	69.22	27.66	15.06	11.94	11.44	17.77
	N	140	140	140	140	140	140
	SD	16.47	7.85	4.29	3.44	3.41	5.52
Widowed	Mean	68.14	28.63	13.75	11.45	10.82	16.47
	N	51	51	51	51	51	51
	SD	16.14	6.85	4.76	3.27	3.27	6.44
Divorced	Mean	57.37	23.74	12.70	9.56	8.48	19.41
	N	27	27	27	27	27	27
	SD	19.01	8.70	4.70	3.82	3.85	6.47

Table 16: Pair wise Mean Stress comparison based on Marital status

(I)Marital status	(J) marital status	means difference (I – J)	P	95% confidence interval for distance	
				Lower bound	Upper bound
Single	Married	.385	.705	-1.617	2.386
	Widowed	1.715	.157	-.663	4.094
	Divorced	-1.221	.395	-4.042	1.599
Married	Single	-.385	.705	-2.386	1.617
	Widowed	-1.331	.164	-.546	3.208
	Divorced	-1.606	.191	-4.019	.807
Widowed	Single	1.715	.157	-.663	4.094
	Married	-1.331	.164	-.546	3.208
	Divorced	-2.937	.035*	-5.671	-.203
Divorced	Single	-1.221	.395	-4.042	1.599
	Married	-1.606	.191	-4.019	.807
	widowed	-2.937	.035*	-5.671	-.203

Mean difference is significant at .05

Although stress did not generally differ across marital status, ANOVA showed that the divorced group was differently stressed from the widowed. The pair wise mean stress comparison indicated that the divorced was more stressed than the widowed but not different from the married and the single. The mean difference (-2.937) between the divorced and the widowed group was significant at P = .035. The divorcees had the highest mean stress level (M= 19.41). The unlikely result was that the widowed group had the least mean stress levels (M= 16.47) (See table 15).

Table 17: Social Support pair wise comparison by Marital status

(I)marital status	(J) marital status	means difference (I – J)	P [a]	95% confidence interval for distance [a] Lower bound	Upper bound
Single	married	-5.519	.065	-11.395	.356
	Widowed	-4.486	.207	-11.469	2.497
	Divorced	6.281	.137	-2.001	14.562
Married	single	5.519	.065	-.356	11.395
	Widowed	1.033	.712	-4.478	6.544
	Divorced	11.800	.001*	4.715	18.885
Widowed	Single	4.486	.207	-2.497	11.469
	Married	-1.033	.712	-6.544	4.478
	Divorced	10.767	.009*	2.740	18.794
Divorced	Single	-6.281	.137	-14.562	2.001
	Married	-11.800	.001*	-18.885	-4.715
	Widowed	-10.767	.009*	-18.794	-2.740

Mean difference is significant at .05

ANOVA showed some differences in the social support received by different marital status groups. The divorced group reported lower mean perceived social support (M= 57.37; SD= 19.01) as compared to other marital status groups. (See table 15). A pair wise mean social support comparison indicated that the mean difference between divorced and married (- 11.80) was statistically significant at p = .001 and with the widowed (- 10.77) at p = .009. However, there was no statistically significant social support mean difference between the divorced and the single (P> 0.5).

Figure 3: Estimated means Social Support by Marital Status

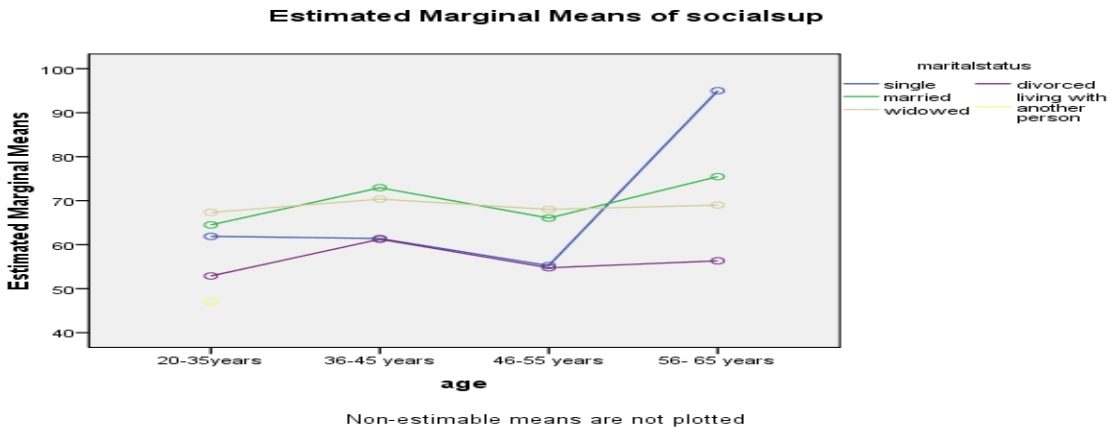
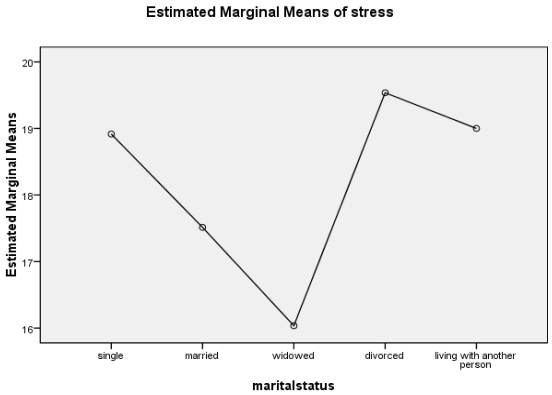


Figure 3 above shows that divorced group reported lowest mean social support across age cohorts while the married and widowed generally reported higher social support. The singles reported higher support from ages of 46- 65. The older they became, the more social support is rendered to them.

Figure 4: Mean stress based on Marital Status



The divorced group reported higher levels of perceived stress while the widowed reported the lowest perceived stress levels. The married reported more perceived stress levels than the widowed but less than the divorced and singles. This was, however, not statistically significant.

4.5. Stress and Social Support based on Gender

Table 18: Mean Stress and Social Support based on Gender

Variable	males n= 107 Mean (SD)	females n= 156 Mean (SD)	t	p value
Stress	17.11 (6.49)	18.23(5.33)	2.337	.128
Social support	67.78 (17.1)	66.07 (17.74)	.607	.437
Emotional support	26.97 (8.01)	27.17 (8.03)	.040	.842
Tangible support	15.21(4.13)	13.69 (4.77)	7.188	.008*
Affectionate support	11.33 (3.64)	11.49 (3.47)	.129	.719
PSI	10.94 (3.69)	10.62 (3.65)	.518	.472

*p< .05

An independent samples T- test was computed to find out if stress and social support levels differed by gender. Gender was entered as an independent variable while stress and all kinds of social support as dependent variables. The mean levels did not differ between males and females on stress (male 17.11, female 18.23), social support (male 67.78, female 66.07), emotional support (male, 26.97, female 27.17), affectionate support (male 11.33, female 11.49), and positive social interaction (male 10.94, female 10.62). The differences were not statistically significant at p>.05. There was, however, a significant mean difference on tangible support between males (15.21) and females (13.69). The result was statistically significant with t = 2.681, p =.008. Males reported more tangible support than females.

CHAPTER FIVE

DISCUSSION

5.0. Introduction

This chapter discusses the results of the study. It discusses demographic variables and neurocognitive functioning, stress and neurocognitive functioning, stress and social support, and stress, social support, and neurocognitive functioning.

5.1. Demographic Variables and Neurocognitive Functioning

We started by examining the neurocognitive functioning of the entire sample. The results showed that of the 263 participants, 89 (33.8%) were impaired while 174 (66.2%) were not impaired. These results indicate that HIV and AIDS affected the neurocognitive functioning of about one-third of the HIV positive individuals. The frequency of impairment was greater than the study conducted by Maj, Satz, et al, 1994 in the DR Congo (19%) but within the range of what Lawler and colleagues (2010) found among the Botswana sample where 38% of HIV positive individuals had impaired neurocognitive functioning.

The one third of the sample affected is a significant number with an implication that HIV and AIDS has an impact on the executive function, verbal fluency, working memory, learning ability, recalling, and speed of information processing among patients. This implies that the affected people tend to have a decrease in abilities that have to do with planning, speaking well and normally, the speed of processing information, storing and retrieving this information.

We can thus argue that the results have an impact on the community. For instance 1 in 3 HIV positive individuals in our study having neurocognitive impairment is such a big effect. These cross sectional results possibly mirror socio-economic problems in our communities such as occupational function, quality of work and output and interpersonal relations among others.

5.2. Impairments by Neurocognitive Domains

The neurocognitive domains that were assessed included executive functioning, working memory, learning, fluency, recall, motor, and speed of information processing. These were analyzed using the Mean T score. In addition, we assessed the general neurocognitive functioning using the Global Deficit Score (GDS).

The mean T scores for HIV positive individuals on neurocognitive domains were almost all lower than 50. This means that on average HIV positive individuals perform somewhat more poorly than normal comparison subjects. However, the mean T scores were within one standard deviation (1 SD), meaning that they were still within the range considered normal. The reason why the mean T scores were within the normal range could have been due to the fact that despite being HIV positive, the larger number was still in normal range. Of 263 participants, only 89 (33.8%) were in the impaired range. It could be that HIV and AIDS had not yet progressed to the extent of impairing cognition.

However, further analysis on the whole sample indicated that executive function, working memory, learning, verbal fluency, recall, and speed of information processing were affected while the motor domain was not affected. This finding was in line with other researchers who found that executive functioning, working memory, learning, recalling, and the speed of information processing are affected by HIV and AIDS (Dawes, et al., 2008). Based on the findings of the present study, motor domain is the least to be affected by HIV and AIDS. However, the pattern of impairment may not be always consistent across individuals, as argued by Dawes and colleagues (2008).

We went further to assess levels of impairment among the HIV positive individuals in the impaired category. The levels were categorized as > 40 (normal), 35- 39(mild), 30- 34 (mild- moderate), 25- 29 (moderate), 20- 24 (moderate-severe), and less than 20 (severe). The levels of impairment ranged from moderately severe to mild. Most of the participants were mildly impaired. The most affected domains were the ability to learn, recall, working memory, and speed of information processing. Executive function, verbal fluency and motor domains still ranged within normal (within 1 SD below or above the mean) in both the whole sample and the impaired sample. The motor domain was generally not impaired. Impairment could range from mild to severe and among HIV and AIDS patients, mild to moderate neurocognitive impairments have been cited by other researchers (Zahir, 2011; Lawler, et al., 2010; Nakasujja, et al.; 2004; Gupta, et al, 2007). The finding of the present study was therefore, consistent with other studies.

Although performance on the motor domain was normal (above mean T score of 50), there were a few participants whose motor domain was impaired. Other than HIV and AIDS affecting the individuals differently (Dawes, et al., 2008), it is equally possible that the disease affects the neurocognitive domains differently. Some domains could be more prone to HIV and AIDS than others. What is clear, however, in the current study is that the most affected domains are learning, recalling, working memory and speed of information processing while executive functioning,

verbal fluency, and motor domains are least affected. However, we cannot rule out the possibility of practice affecting performance. People use their motor skills, verbal skills, and even aspects of executive functioning in their day to day lives and this could give them an upper hand on neuropsychological tests that demand such skills. On the other hand, learning and recalling are not so much of a need in day to day human activities. Based on the findings of the current study, it can be concluded that the motor domain could be more resistant to the virus than the other domains. A further longitudinal study would be required to ascertain this assumption.

5.3. Stress and Neurocognitive Functioning

Stress levels in the sample were generally minimal (M= 17.17). However, there were participants who were substantially stressed, scoring as high as 34 out of 40. Despite being HIV positive, the findings suggest that participants led a 'normal' life and therefore, fell outside the clinical range of stress. However, the present study found some effects between stress and verbal fluency and working memory.

Literature is inconsistent on stress, working memory and verbal fluency relationships. According to Oei, et al (2006), working memory is thought to be particularly sensitive to stress-related cortisol secretion. At high loading, stress impairs working memory. On the other hand, Pukay-Martin et al (2003) found that stress had an effect on neurocognitive functioning in the domains of executive function and attention, with information processing speed being the most affected and not on memory and verbal fluency.

The current study is in line with Oei, et al (2006). It could be that there is a level at which stress has a significant relationship with neurocognitive functioning. It also appears that, of all neurocognitive domains, working memory has the most significant relationship with stress. It should however, be mentioned that participants in the current study had generally low levels of stress and this could have been the underlying factor to not statistically significant findings in other domains. In other words, the participants led a normal life and that could be the reason why no relationships were found between stress and neurocognitive functioning other than working memory and verbal fluency. Future study should focus on chronically stressed participants to see if there would be a shift in terms of the findings.

Although the Univariate analysis of variance showed some significant relationship between stress and verbal fluency, further analysis by linear regression showed that stress does not predict verbal fluency. This means that other variables, which were not part of this study, could have an

interacting effect with stress to impact verbal fluency.

5.4. Stress and Social Support on Neurocognitive Functioning

Our second objective was to investigate the effects of stress and social support on neurocognitive performance among HIV positive individuals. Before investigating how social support and stress interacts and affects the neurocognitive functioning, we examined the relationship between stress and social support. The results indicated that there was a significant negative correlation between stress and social support. Thus, the more social support was reported, the less the stress levels. This means that social support helps in moderating the effects of stress.

This is in line with literature. Social support has been found to cushion patients from intense effects of stress during their period of enduring the impact of the disease especially when the period is advanced (Komblith, et al., 2001). Suffice to say that if families, communities and their Community Based Organisations, churches and their Faith Based Organisations, Non Governmental Organisations and central government departments provide more social support, most if not all, patients would have less stress and thus stay healthier.

On the other hand, if stress has an effect on neurocognitive functioning, we expected to find the interaction with social support to reduce this effect. Contrary to this assertion, there were no significant interaction effect of stress and social support on neurocognitive functioning.

Literature says that social support buffers the psychosocial stresses that may negatively impact affected patients (Laserman, et al., 1999; Shippy, 2004; Updegraff, et al., 2002). It has been shown to help mitigate stressful life events, speed recovery from illness, and increase the likelihood that a person will follow the advice of his or her doctor (Kaplan and Saccuzzo, 2005). The presence of social support has been found to predict the individual's ability to cope with stress, and of mental health of the individual (Bennett, et al., 2001; Uchino, et al., 1996). On the other hand, Bolger, Zuckerman, and Kessler (2000) say that social support has not always been linked to positive physical and health neurocognitive outcome.

In the present study, we follow an argument advanced by Bolger, Zuckerman, and Kessler (2000). Social support is not always a predictor of positive neurocognitive functioning. Social support may reduce stress levels in HIV positive individuals but its influence on neurocognitive functioning is an issue for debate. It may have a buffering effect on stress levels and yet no direct relationship with neurocognitive impairments. There are two possibilities from the finding. Firstly, the role played by social support in mitigating the impact of stress on neurocognitive functioning could be a

secondary one. It has no direct relationship with neurocognitive functioning. What social support may do is to reduce stress levels in an individual. It is this stress reduction that may benefit the patient in the sense that it would improve their general welfare. Secondly, it could be that the buffering role of social support is obvious when there is a cognitive stressor. Our instrument did not measure the kinds of stressors the participants were experiencing. Future research could focus on such areas.

5.5. Stress, Social Support and Marital status

Our third objective was to find out the differences in stress and social support based on marital status. The results showed that social support in general was significantly associated with marital status. Different kinds of social support such as emotional support, tangible support, affectionate support, and positive social interaction were equally significantly associated with marital status. The married reported the highest level of social support while the divorced reported the lowest perceived social support.

Scott and colleagues (2010) reported a significant relationship between marriage and mental disorders. Marriage was associated with reduced risk of first onset of most mental disorders in both genders. Married persons have greater psychological and physical well-being than their single counterparts (Glenn and Weaver, 1988; Kessler and Essex, 1982; Shapiro, 1996; Stroebe and Stroebe, 1995). Divorce has been associated with certain mental health problems such as depression and stress (Bulloch, et al., 2009).

The present research is consistent with previous studies. Perhaps the married spouses knew the participant's HIV status and gave them the necessary support. It is possible that when couples know and accept their HIV status, it helps them live peacefully with another. The divorced, on the other hand, reported lower social support. Most of them could have been divorced after revealing to their spouses about their HIV status. Our instrument, however, could not measure this aspect and so future research may be needed to ascertain this speculation. Are divorces among HIV positive individuals related to the revelations to their spouses? The divorced individuals reported the lowest mean scores on all kinds of social support. The lowest was perceived social interaction, followed by affectionate support, and emotional support. These kinds of social support are associated with lack of care and acceptance from the significant others such as the immediate family, distant relations and friends.

The divorced had the highest levels of stress. High stress levels among the separated and divorced samples could be due to marital disruptions (Bulloch, et al., 2009). People who have undergone

divorce feel lack of acceptance from both their spouses and families. What worsens their situation could be when divorce subjects them to single parenthood. They need to take care of children in terms of food, school requisites, clothing, and rentals for accommodation. Moreover, most of them could have not been in formal employment. These, coupled with a sense of rejection and self pity could have further worsened their situation.

Divorce has emotional, economic and social implications to the divorcing couples. It is traumatizing on the affected family, including children. Witnessing loss of love between parents, having parents break their marriage commitment, adjusting to going back and forth between two different households, and the daily absence of one parent while living with the other, all create a challenging new family circumstance in which to live (Pickhardt, 2011).

It should however, be mentioned that the present study focused on the current marital status of the participants. We can however not ignore the fact that marital history could have an influence on present stress levels of the divorced participants. For people to arrive at divorce, they could have passed through lot of both physical and/or psychological torture whilst still in marriage, which can result into being stressed.

The widowed reported high perceived social support. It is possible that when someone has lost a beloved one, people tend to show sympathy towards such a one. Such people are easily accepted into society. Members of the families of the spouses have a tendency of staying close to widowed persons, offering material, financial and other forms of support regularly. In some cases this is so because of cultural influences that maintain a widow/widower as a member of the family until he/she remarries. Therefore, though the widowed may experience stress of losing a spouse, the social support given to them could buffer stress.

5.6. Stress and Social Support by Gender

We then explored the relationship between stress and social support and gender. Gender did not show significant relationship with stress. The results are consistent with previous studies (Campbell and Stephen, 2011; Wang, et al., 2007).

Although previous studies reported gender effect on social support, they did not indicate what kind of social support as there are different kinds of social support. The current study investigated the relationship between gender and different kinds of social support (emotional support, tangible support affectionate support and positive social interaction). The results showed a highly significant relationship of gender with tangible support, but no significant relationship with social support in general, emotional support, affectionate support, and positive social interaction. The mean tangible

support for males was 15.21 (SD= 4.13) and that of females at 13.69 (SD= 4.77), with t (7.188), p= .008. It was, however, not established where high perceived tangible support in males come from. Is it from their spouses, family members, friends or workmates?

Lower tangible supports as perceived by females could also be as a result of the socialization patterns. Women in Zambia are socialized to expect support from relatives, friends, and others. When they are in need, they expect others to come to their aid. This perception could have influenced their response on tangible support.

The other reason for the differences in tangible support between men and women could be that men, in our society, have more opportunities than women to meet, bond, and just hang- out. Men can go out of the house after dark and interact with one another in various taverns and shops while women are expected to stay indoors. It is expected that women stay inside while men are more often walking about in the community. We would suggest the possibility that the higher instance of tangible support offered to men is directly related to their ability to build and maintain more social connections than the women folk.

Previous studies have shown that females report more depression symptoms than males when they experience a lack of social support (Slavin and Rainer, 1990), and profit more from support when it is available (Taylor, et al., 2000). Results in the current study showed no significant differences in social support between males and females, except in tangible support. We can therefore speculate that unless tangible support has a significant relationship with depressive symptoms (beyond the scope of the current study), we can speculate that there were no significant differences in depressive symptoms based on gender in this study.

5.7. Implications of the study

Literature shows that HIV prevalence rates in Zambia have been oscillating between 14.3% and 14.5% since 2010. The study has established that HIV and AIDS impair neurocognitive functioning of infected individuals. This has implications to both young and the old. Firstly, it implies that infected students in Universities and colleges, and pupils in schools performance academically are affected.

Secondly, this has implications in the labor force. If the infected people are in employment, their output will be affected. This is so because efficiency at work depends on neurocognitive functioning. This could be worse if infected people are old since the results showed that old age has an effect on neurocognitive functioning.

The study also showed that there is a relationship between social support and stress. Less social support is linked to high stress levels. Divorced individuals reported low social support and therefore are likely to be more stressed. These people need social support from government, NGOs, churches, family members and many others.

CHAPTER SIX

CONCLUSION

6.0. Conclusion

One of the strengths of this study is that previous studies on social support concentrated on social support in general. This study considers various kinds of social support such as emotional, tangible, affectionate, and positive social interaction. Secondly we considered marital status, a variable which was less considered in previous studies to find out if it had an effect on stress and neurocognitive function among HIV positive individuals.

The current study focused on the effect of stress and social support on neurocognitive functioning among HIV positive individuals. It was composed of 263 HIV positive participants, of which 107 were males and 156 were females. Prior to administration of the International Neurobehavioral Test Battery, participants were administered demographic questionnaires. They were also administered measures of social support (MOS- SS) and stress (PSS- 10).

The results indicated that the sample was generally not impaired (all domains had mean T scores within 1 SD). However, there were individual participants within the sample who moderately to severely were impaired while the majority of the participants were mildly impaired. HIV and AIDS impair neurocognitive domains of executive functioning, working memory, learning, recall, verbal fluency, and speed of information processing. The study also indicates that stress has an effect on neurocognitive functioning in the areas of working memory and verbal fluency. Age is a possible confounding variable in neurocognitive impairments. Elderly HIV positive individuals are more prone to neurocognitive impairments than younger ones.

This study is unique in the fact that comparisons are made between different marital statuses. While marital status has no effect on neurocognitive functioning among HIV positive people, it is a possible source of stressor. The divorcees and single participants reported more stress and less social support than the married and widowed counterparts.

6.1. Limitations

There are inherent limitations to consider when interpreting the results of this study. When completing the measures of social support and stress, particularly over the past one month, participants may have been focused on their present state of mind and thus answered questions accordingly. Thus measurement imprecision may have played a role in the outcomes of this study. The measures of stress and social support were self report. It would have been important to combine the perceived stress scale with other measures of stress such as saliva cortisol to concretize the results. The current study also looked at the current marital status of an individual and not the historical perspectives. A comparative study considering the current status and the historical perspectives would be important as there could be a possibility that history and the current status influence stress levels.

The results are based on GDS and domain mean T scores and not specific neurocognitive tests, future research can consider performance on these tests to ascertain the tests on which stressed people perform poorly.

6.2. Recommendations

- Based on the findings of this study pertaining to the effects of stress on neurocognitive functioning among HIV positive individuals, it is recommended that future study should consider the chronically stressed individuals to better understand the relationship between stress and neurocognitive dysfunctions.
- Although stress was generally mild, the results indicated that stress has a significant relationship with working memory, a vital aspect in day to day living. It is recommended that government and other service providers continue the process of counseling even after the HIV positive individual has started antiretroviral.

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Appendix A: Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or though a certain way.

Name……..... Date…… Age ……. Gender (Circle): M F Other……

0 = Never 1 = almost never 2 = sometimes 3 = fairly often 4 = very often

1. In the last month, how often have you been upset because of something that happened unexpectedly? ….…….. 0 1 2 3 4
2. In the last month, how often have you felt that you were unable to control the important things in your life?…….… 0 1 2 3 4
3. In the last month, how often have you felt nervous or stressed? ….. 0 1 2 3 4
4. In the last month, how often have you felt confident about your ability to handle your personal problem……. 0 1 2 3 4
5. In the last month, how often have you felt that things were going your way?…….. 0 1 2 3 4
6. In the last month, how often have you found that you could not cope with all the things that you had to d…….….. 0 1 2 3 4
7. In the last month, how often have you been able to control irritations in your life? ……..……. 0 1 2 3 4
8. In the last month, how often have you felt that you were on top things? 0 1 2 3 4
9. In the last month, how often have you been angered because of things that were outside of your control? …… 0 1 2 3 4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? …… 0 1 2 3 4

Please feel free to use the perceived stress scale for your research.

References: The PSS Scale is reprinted with permission of the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behavior, 24, 386 – 396.

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APPENDIX B: MOS SOCIAL SUPPORT SURVEY (MOSS-S)

Fill in your details correctly and then answer the questions in this questionnaire.

Name…….. Residence……
Date……Age…….. Gender (circle) M F Education Attained…….Marital Status.....

1= married 2= single 3= widowed 4= divorced

People sometimes look to others for companionship, assistance, or other types of support. How often does each of the following kinds of support available to you when you need it. Circle only one number in each line.

Emotional/ informational support	None of the time	A little of the time	Some of the time	Most of the time	All the time
Someone you can count on to listen to you when you need to talk	1	2	3	4	5
Someone to give you information to help you understand a situation	1	2	3	4	5
Someone to give good advice about a crisis	1	2	3	4	5
Someone to confide in or talk to about your problems	1	2	3	4	5
Someone whose advice you really want	1	2	3	4	5
Someone to share your most private worries and fears with	1	2	3	4	5
Someone to turn to for suggestions about how to deal with a personal problem	1	2	3	4	5
Someone who understands your problems	1	2	3	4	5
Tangible Support					
Someone to help you if you were confined to bed	1	2	3	4	5
Someone to take you to the doctor if you needed it	1	2	3	4	5
Someone to prepare your meals if you were unable to do it yourself	1	2	3	4	5
Someone to help with daily chores if you were sick	1	2	3	4	5
Affectionate support					

Someone who shows you love and affections	1	2	3	4	5
Someone to love and make you feel wanted	1	2	3	4	5
Someone who holds you close	1	2	3	4	5
Positive Social Interaction					
Someone to have a good time with	1	2	3	4	5
Someone to get together with for relaxation	1	2	3	4	5
Someone to do something enjoyable with	1	2	3	4	5
Additional Item					
Someone to do things with to help you get your mind off things	1	2	3	4	5

APPENDIX C: Informed Consent Form

Informed Consent for Participants

University of Zambia

Department of Psychiatry

PLEASE READ THIS DOCUMENT CAREFULLY. SIGN YOUR NAME BELOW ONLY IF YOU AGREE TO PARTICIPATE AND YOU FULLY UNDERSTAND YOUR RIGHTS. YOUR SIGNATURE IS REQUIRED FOR PARTICIPATION. FOR THIS PROJECT, YOU MUST BE BETWEEN 20 AND 65 YEARS OF AGE TO PARTICIPATE. IF YOU DESIRE A COPY OF THIS CONSENT FORM, YOU MAY REQUEST ONE AND WE WILL PROVIDE IT.

Description of the Study:

You are being invited to take part in this study of the effects of stress and social support on neurocognitive functioning among HIV positive individuals in Lusaka, Zambia. You will be required to answer questionnaires and take a group of tests of attention, language, motor functions and memory. The tests will involve answering questions and doing certain activities.

Time Involvement

The whole process will take approximately 2:30 to 3:00 hours to complete.

Risks and Benefits:

1. You may experience fatigue due to the length of time required for the testing process. To reduce on this you are free to ask for a short break whenever you require it.
2. We cannot guarantee that you will receive any direct benefits from this study though you will have an opportunity to contribute to neuropsychological assessments that will help Zambians in general by participating in this study.

Compensation for Your Time: You will be compensated for your time with a transport and meal allowance of K50, 000.

Participation Rights:

1. Participation in this study is purely voluntary so that if you decide to withdraw at any point, the care or benefit you receive will not be affected by your withdrawal from the study.
2. All personal identifying information will be kept confidential and the data sheets will be kept in secured lockers in accordance with the standards of the University of Zambia Biomedical Ethics Committee. If the results of this study are required for publication as we hope, your identity will still be kept private.

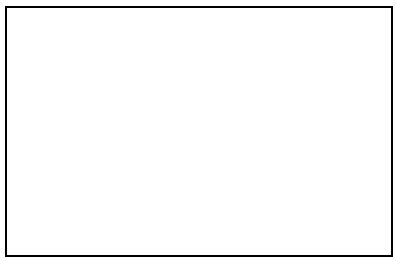
I,……(name) have read and understood the above information. As the participant in this project, my signature testifies that I understand the consent process and management of confidentiality as indicated above. I also understand that I can withdraw at any time.

Signature of Research Participants:…….Date……...

Name and Signature of Witness……Date……..

Name and Signature of Researcher..…….Date……..

THUMBPRINT



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APPENDIX D

THE UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

DEPARTMENT OF PSYCHIATRY

P. O. Box 32379, Lusaka, Zambia

CLINICAL NEUROPSYCHOLOGY

DATA COLLECTION QUESTIONNAIRE

Q1. What is your age?

FOR OFFICIAL USE ONLY

Date:……

Clinic/Centre:……

Examiner:……

Subject Study Number:……

INSTRUCTIONS

A. Please give/tick [√] the appropriate answer to the question.

B. All the information you will provide will be used for the purpose of this study only, therefore, provide genuine information and ensure that all questions are carefully answered.

Q1. What is your age?

1.1. 20 – 35 [ ]

1.2. 36 – 45 [ ]

1.3 . 46 – 55 [ ]

1.4 . 56 – 65 [ ]

Q.2. What is your gender?

2.1. Female [ ]

2.2. Male [ ]

MARITAL STATUS

Q. 3. What is your marital status?

3.1. Single [ ]

3.2 Married [ ]

3.3. Widowed [ ]

3.4. Divorced [ ]

3.5. Living with opposite sex [ ]

EDUCATION

Q4. What is your highest attained level of education?

4.1. 5 -7 years [ ]

4.2. 8 – 9 years [ ]

4.3. 10 – 12 years [ ]

4.4. 13 years + [ ]

Q5. Has your education been helpful in your execution of daily activities?

1.1 . Yes [ ]

5.2. No [ ]

EMPLOYMENT, INCOME, & RESIDENCE

Q6. What are you currently doing?

6.1 Unemployed [ ]

6.2. Self-employed [ ]

6.3. Employed [ ]

6.4. Retired [ ]

Q7. What is your occupation?

1.1. Unskilled (e. g maid, farm laborer, etc) [ ]

1.2. Semi-skilled (e. g plumber, bus driver, etc) [ ]

1.3. Skilled (e. g, accountant, physician, etc) [ ]

1.4. Specialist (e. g consultant, economic analysts) [ ]

Q8. What is your income per year?

8.1. Less than K30 million [ ]

8.2. K30 million to less than K60 million [ ]

8.3. K60 million to less than K120 million [ ]

8.4. K120 million and above [ ]

Q9. Where do you currently live?

9.1. Low cost rural area (e. g village) [ ]

9.2. High cost rural area (e. g 'boma') [ ]

9.3. Low cost urban area (e. g high density area) [ ]

9.4. High cost urban area (e. g low density area) [ ]

LANGUAGE & TECHNOLOGY

Q10. What is your mother tongue?

10.1. Bemba [ ]

10.2. Tonga [ ]

10.3. Lozi [ ]

10.4. Kaonde [ ]

10.5. Luvale [ ]

10.6. Lunda [ ]

10.7. Other (please indicate)..... [ ]

Q11. How much do you use your mother tongue in communicating?

11.1. Rarely (just know and use one or two words) [ ]

11.2. Sometimes (few times at home) [ ]

11.3. Often (in home conversations) [ ]

11.4. Very often (in almost all my conversations) [ ]

Q12. How much would you say you use the English language in communicating?

12.1. Rarely (just know and use one or two words) [ ]

12.2. Sometimes (only in formal situations) [ ]

12.3. Often (at least in one conversation in a week) [ ]

12.4. Very often (in almost all my conversations) [ ]

Q13. How often do you use computers?

13.1. Not at all [ ]

13.2. Sometimes (less than 4 times in a year) [ ]

13.3. Often (at least once in a month) [ ]

13.4. Very often (at least once in a week) [ ]

DOMESTIC VIOLENCE

Physical/Psychological Abuse

Q14. Now I need to ask some more questions about your relationship with your (last/current) partner. Does your (last/current) partner ever:

14.1. Say or do something to humiliate you in front of others?

14.1.1. Rarely [ ]

14.1.2. Often [ ]

14.1.3. Very often [ ]

14.1.4. Not at all [ ]

14.2. Threaten to hurt or harm you or someone you care about?

14.2.1 Rarely [ ]

14.2.2. Often [ ]

14.2.3. Very often [ ]

14.2.4.Not at all? [ ]

14.3. Insult you or make you feel bad about yourself?

14.3.1 Rarely [ ]

14.3.2. Often [ ]

14.3.3. Very often [ ]

14.3.4. Not at all? [ ]

14.4 How often did this happen during the last 12 months?

14.4.1 Rarely [ ]

14.4.2. Often [ ]

14.4.3. Very often [ ]

14.4.4. Not at all? [ ]

14.5. How often does it happen in a month?

14.5.1 Rarely [ ]

14.5.2. Often [ ]

14.5.3. Very often [ ]

14.5.4. Not at all? [ ]

14.6. Did your (last/current) partner ever do any of the following things to you:

Attack or threaten you with a knife, gun, or other weapon?

14.6.1 Rarely [ ]

14.6.2. Often [ ]

14.6.3. Very often [ ]

14.6.4. Not at all? [ ]

14.7 Try to choke or burn you on purpose?

14.7.1 Rarely [ ]

14.7.2. Often [ ]

14.7.3. Very often [ ]

14.7.4. Not at all [ ]

14.8 Kick you, drag you, or beat you up?

14.8.1 Rarely [ ]

14.8.2 Often [ ]

14.8.3 Very often [ ]

14.8.4 Not at all [ ]

14.9 Punch you with his/her fist or with something that could hurt you?

14.9.1 Rarely [ ]

14.9.2 Often [ ]

14.9.3 Very often [ ]

14.9.4 Not at all? [ ]

14.10 Push you, shake you, or throw something at you?

14.10.1 Rarely [ ]

14.10.2 Often [ ]

14.10.3 Very often [ ]

14.10.4 Not at all [ ]

14.11 Slap you?

14.11.1 Rarely [ ]

14.11.2 Often [ ]

14.11.3 Very often [ ]

14.11.4 Not at all [ ]

14.12 Twist your arm or pull your hair?

14.12.1 Rarely [ ]

14.12.2 Often [ ]

14.12.3 Very often [ ]

14.12.4 Not at all [ ]

14.13. Did the following ever happen as a result of what your (last/current) partner did to you:

14.13.1 You had cuts, bruises, or aches?

14.13.1.1. Yes [ ]

14.13.1.2. No [ ]

14.13.2 You had eye injuries, sprains, dislocations, or burns?

14.13.2.1 Yes [ ]

14.13.2.2 No [ ]

14.13.3. You had deep wounds, broken bones, broken teeth, or any other serious injury?

14.13.3.1 Yes [ ]

14.13.3.2 No [ ]

Sexual Abuse

Q15. Has your partner(husband/wife) or any person of opposite sex ever done any of the following;

15.1 Force you to have sexual intercourse with him/her when you did not want to?

15.1.1 Rarely [ ]

15.1.2 Often [ ]

15.1.3 Very often [ ]

15.1.4 Not at all [ ]

15.2 Physically force you to perform any other sexual acts you did not want to?

15.2.1 Rarely [ ]

15.2.2 Often [ ]

15.2.3 Very often [ ]

15.2.4 Not at all [ ]

15.3 Threatens in any way to perform sexual acts you did not want to?

15.3.1 Rarely [ ]

15.3.2 Often [ ]

15.3.3 Very often [ ]

15.3.4 Not at all [ ]

15.4 How long has this been happening?

15.4.1 Less than 6months [ ]

15.4.2. 6 – 12 months [ ]

15.4.3. 1 – 2 years [ ]

15.4.4. 2 – 5 years [ ]

15.4.5. More than 5 years [ ]

FAMILY RELATIONSHIPS

Q16. How would you rate your family relationships?

16.1 satisfactory [ ]
16.2 very satisfactory [ ]
16.3 dissatisfactory [ ]
16.4 very dissatisfactory [ ]
16.5 neither [ ]

Q17.How satisfied are you with the support you get from your family?

17.1 very satisfied [ ]
17.2 satisfied [ ]
17.3 dissatisfied [ ]
17.4 very dissatisfied [ ]
17.5 neither [ ]

Q18. How satisfied are you with your living conditions?

18.1 very satisfied [ ]
18.2 Satisfied [ ]
18.3 Dissatisfied [ ]
18.4 very dissatisfied [ ]
18.5 neither [ ]

Q19. I interact the most with

19.1 Mother
19.1.1 Yes [ ]
19.1.2 No [ ]
19.2 Father
19.2.1 Yes [ ]
19.2.2 No [ ]

19.3. Guardian
19.3.1 Yes [ ]

19.3.2 No [ ]
19.4 Wife
19.4.1 Yes [ ]
19.4.2 No [ ]
19.5 Children
19.5.1 Yes [ ]
19.5.2 No [ ]
19.6 Siblings
19.6.1 Yes [ ]
19.6.2 No [ ]
19.7 Friends
19.7.1 Yes [ ]

19.7.2 No [ ]

Q20. I am involved in making decisions in the family.

20.1 Rarely [ ]

20.2 Sometimes [ ]

20.3 Very often [ ]

20.4 Never

Q21. How far do you travel to access your treatment?

21.1 Far [ ]

21.2 Very far [ ]

21.3 Near [ ]

21.4 Very near [ ]

Q22. How does this movement affect your family relationships?

22.1 Very much [ ]

22. 2 Very little [ ]

22.3 No much [ ]

22.4 Not at all [ ]

Q23. To what extent do you feel your life is meaningful?

23.1 Not at all [ ]

23.2 A little [ ]

23.3 Moderate [ ]

23.4 very much [ ]

Q24. How would you rate your quality of life?

24.1 Very satisfied [ ]

24.2 Satisfied [ ]

24.3 Dissatisfied [ ]

24.4 very dissatisfied [ ]

24.5 neither [ ]

NUTRITION

Q25. Have you ever received nutritional advice since testing?

25.1 Yes [ ]

25.2. No [ ]

Q26. Are you following the nutritional advice given to you at the health centre?

26.1. Yes [ ]

26.2 No [ ]

Q27. If not, what would be the reasons for not following the nutritional advice?

27.1 Advice is not necessary to me [ ]

27.2 Lack of money to buy the prescribed foods [ ]

27.3 Lack of time to prepare the food [ ]

27.4 Too many family members [ ]

27.5 Others reasons please indicate…….. [ ]

Q28. How many meals do you eat per day?

28.1 One meal [ ]
28.2 Two meals [ ]
28.3 Three or more meals [ ]

Q29 .How would you describe the quality of food that you usually eat at each meal

29.1 Not enough [ ]
29.2 Just enough [ ]
29.3 Plenty [ ]

Q30. How much fluid (water, juice, coffee, tea, milk) do you consume per day?

30.1 Less than one cup/ glass [ ]
30.2 Three to five cups/glasses [ ]
30.3 More than 5 cups/glasses [ ]

Appendix E - ZAT – READING RECOGNITION TEST

1

Eat	Four
Good	She

2

Old	His
Fly	Round

3

Five	Green
Sing	Around

4

Warm	Fall
Start	Drink

5

Outside	Fishing
Town	Smile

6

Wagon	Houses
Meaning	Families

7

Question	Change
Joined	Brook

8

Instead	Blaze
Signs	Colt

9

Pleasant	Dangerous
Ledge	Escape

10

Northern	Towel
Kneel	Height

11

Exercise	Observe
Ruin	License

12

Uniforms	Pigeon
Moisture	Artificial

13

Issues	Quench
Hustle	Thigh

14

Guardian	Vein
Civilisation	Anchor

15

Composition	Elegant
Sympathy	Authorities

16

Utensil	Geometry
Condemn	Unparalleled

17

Reign	Adjourned
Limousine	Manoeuvres

18

Heroine	Statistics
Phenomenal	Vicinity

19

Judicial	Medieval
Rheumatism	Silhouette

20

Diminutive	Celestial
Navigable	Ecstasy

Appendix F – International Neurobehavioural Test Battery

THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

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Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

25th September, 2012.

Your Ref: 002-05-12.

Mr. Moonga Hakalyamba,
School of Medicine,
Department of Psychiatry,
PO Box 50110,
Lusaka.

Dear Mr. Hakalyamba,

RE: RE-SUBMITTED RESEARCH PROPOSAL: **"EFFECTS OF STRESS AS MEDIATED BY SOCIAL SUPPORT ON NEUROCOGNITIVE FUNCTIONING AMONG HIV POSITIVE INDIVIDUALS IN ZAMBIA"**

The above mentioned research proposal was re-submitted to the Biomedical Research Ethics Committee with recommended changes on 13th July, 2012. The proposal is approved.

CONDITIONS:

- This approval is based strictly on your submitted proposal. Should there be need for you to modify or change the study design or methodology, you will need to seek clearance from the Research Ethics Committee.
- If you have need for further clarification please consult this office. Please note that it is mandatory that you submit a detailed progress report of your study to this Committee every six months and a final copy of your report at the end of the study.
- Any serious adverse events must be reported at once to this Committee.
- Please note that when your approval expires you may need to request for renewal. The request should be accompanied by a Progress Report (Progress Report Forms can be obtained from the Secretariat).
- **Ensure that a final copy of the results is submitted to this Committee.**

Yours sincerely,

Dr. J.C Munthali
CHAIRPERSON

Date of approval: 25 September, 2012 **Date of expiry:** 24 September, 2013

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In reply please quote

No.....

Republic of Zambia

MINISTRY OF HEALTH

LUSAKA DISTRICT HEALTH MANAGEMENT TEAM

Thursday, July 19, 2012.

Professor MPS Ngoma
Associates Professor
Paeadiatrics and Child Health
University Teaching Hospital
LUSAKA.

Dear Dr. Ngoma,

RE: PERSMISSION TO CONDUCT RESEARCH AT LUSAKA DISTRICT CLINICS: MASTERS IN CLINICAL NEUROPSYCHOLOGY.

The District Health Office is in receipt of your letter dated 16th July, 2012 on the above subject.

Approval has been granted for the ten named students to conduct research in the Lusaka District Clinics.

However, the research should only commence upon production of a copy of UNZA REC approval.

You will also be required to furnish the DHO with a summary of your research findings at the completion of the study.

Yours sincerely,

DR. M. M. CHIKO
ACTING PRINCIPAL CLINICAL CARE OFFICER
For/ACTING DISTRICT MEDICAL OFFICER.

c.c: Health Centre in-charges.