EFFECTS OF ANXIETY ON NEUROCOGNITIVE PERFORMANCE IN HIV POSITIVE ADULTS LIVING IN LUSAKA

BY

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DECLARATION

I hereby declare that this is wholly my own work, and that the work of other persons utilized in this dissertation has been duly acknowledged. The work presented here has not been previously presented at this university or any other university for similar purposes.

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CERTIFICATE OF APPROVAL

This dissertation of Joyce Msumba Ncheka has been approved as partial fulfillment 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

Aims: Anxiety has been associated with poor treatment compliance, disease progression, increased use of the health care services and it has been found to take up cognitive capacity leaving less attentional resources for a number of tasks leading to poor cognitive performance. On the other hand, it has been consistently demonstrated that HIV has increased risk for neuropsychological dysfunction in later stages of the infection. However, mixed results have been obtained in previous studies, some studies have shown these relationships whilst others have not (Airaksinen, 2006). Therefore, the aim of the study was to examine the effects of anxiety on neuropsychological performance among HIV positive adults.

Methods: A cross-sectional study was carried out to investigate the effects of HIV related anxiety on neurocognitive performance in adults living in Lusaka Province. A sample of 263 participants was recruited, comprising 107 (40.7%) males and 156 (59.3%) females. There were 150 participants (57%) with no anxiety, 60 (22.8%) showed mild anxiety, 27 (10.3%) moderate and 26 (9.9) had severe anxiety. The participants' ages ranged between 21 and 65 years.

All the participants were conversant with the English language, and their level of education was between 5 and 20 years of schooling. Nurses identified the HIV positive prospective participants who upon giving informed consent to taking part in the study, were evaluated on their cognitive functioning and anxiety levels using the International Neurobehavioural Test Battery and Beck Anxiety Inventory respectively.

Results: Severe anxiety results obtained using the Beck Anxiety Inventory and cognitive functioning as measured by the International Neurobehavioural Test Battery, showed a weak positive correlation (r=.148), indicating that high levels of anxiety are associated with poor cognitive performance. A standard multiple regression was conducted on anxiety, age, World Health Organisation staging and CD4 count to determine the cognitive deficits associated with cognitive performance. Anxiety did not reach statistical significance on any of the cognitive domains. However, age reached statistical significance on the learning (B=.116, SE=.058, β=.338, p=.011), verbal fluency (B=.162, SE=.063, β=.118, p=.010) and recall domain (B=.161, SE=.062, β=.146, p=.010). The other variable that reached statistical significance was CD4 count on Speed of information processing (SIP) domain (B=.004, SE= .002, β= .188, p= .037) and the global mean (B=.004,

SE=.002, β=.188, p=.007). A logistic regression analysis was conducted to investigate the impact of anxiety and cognitive performance on instrumental activities of daily living (IADL) status. Out of 205 participants included in this analysis, 188 were IADL independent and 17 were IADL dependent. Anxiety reached statistical significance on all the seven domains assessed (p<005) indicating that participants who were IADL dependent were more likely to be anxious than the ones who were IADL independent.

Gender effects were seen on the global mean, executive functioning and SIP domains, indicating that males and females differed in performance on these domains.

Conclusion: Results obtained from this study seem to imply that in general there are minimal differences in performance between non anxious and anxious participants, though, a weak positive correlation between severe anxiety and neurocognitive performance was seen. This is not a significant result and cannot be generalized as the sample size for severe anxiety was small (n= 26). The study revealed that those who were IADL dependent were more likely to be anxious.

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ACRONYMS

AIDS	Acquired immunodeficiency syndrome
APA	American Psychiatric Association
BAI	Beck Anxiety Inventory
CABG	Coronary artery bypass draft
GAD	Generalised anxiety disorder
HAND	HIV associated Neurological Disorder
HIV	Human immunodeficiency virus
IADL	Instrumental Activities of Daily Living
PTSD	Post traumatic stress disorder
SIP	Speed of Information Processing
ZAT	Zambia Achievement Test

CHAPTER ONE

1.0 Background and Introduction

Hemelaar et al., 2006, as cited in Robertson, Liner & Heaton, 2009 states that Human immuno deficiency virus (HIV) is a global disease affecting approximately 33 million people all over the world, most of which live in the developing countries where cultural values, social influences, educational opportunities and access to other resources are different from those in the West. Africa and the Middle East account for over 66% of worldwide infections, Asia for over 20%, Eastern Europe and Central Asia approximately 4%, and Latin America and the Caribbean for around 6% (Hemelaar et al., 2006, as cited in Robertson, Liner & Heaton, 2009). HIV is the cause of acquired immune deficiency syndrome (AIDS) and has continued spreading making it the commonest cause of death worldwide. Approximately, a total of 34.5 million people died of HIV by 2000, of these 24.5 million were from the sub Saharan Africa (Kumar & Clark, 2004). Zambia has not been spared from the HIV and AIDS epidemic with a prevalence of 14.3% among adults aged 15 to 49 years old in a population of approximately 13.5 million people (USAID, 2010).

HIV invades the central nervous system after the initial systemic infection. The virus enters the blood brain barrier and enters central nervous system (CNS) parenchymal tissue and infects various cell populations (Smith, Adnams & Eley, 2008). This leads to significant impact on the CNS and immune system. This in turn has an effect on cognitive functioning.

The nature of HIV infection is likely to cause many non specific symptoms, such as open sores or ulcers on the skin, mouth or genitals, diarrhea, weight loss or dry cough, before the onset of AIDS and may be misinterpreted as an indication of the progression of HIV infection. This may in turn exacerbate existing levels of anxiety and trigger anxious responses (Perdices, Dunbar, Grunseit, Hall, Cooper, 1992). The prevalence of HIV associated anxiety has been estimated between 4 % and 19 % which is higher compared with those in the general population (Fernandez & Ruiz, 2006). Anxiety symptoms associated with general medical conditions, such as HIV infection are common and include panic attacks, generalized anxiety, obsessions and compulsions, and other signs of distress. These signs and symptoms are due to the direct physiological effects of the medical condition (Sadock and Sadock, 2007, DSM-IV-TR 2000). Sadock and Sadock (2007, p. 579) reports that anxiety is commonly experienced by every individual. They define anxiety in general as “a

diffuse, unpleasant, vague sense of apprehension, often accompanied by autonomic symptoms such as headache, perspiration, palpitations, tightness in the chest, mild stomach discomfort, and restlessness, indicated by an inability to sit or stand still for long". They further state that, it is an alerting signal warning of impending danger that enables a person to take measures to deal with a threat which could either be internal or external. It is a normal and adaptive response that is lifesaving as it warns of threats of bodily damage, pain, helplessness, possible punishment, or frustration of social or bodily needs such as separation from loved ones, threat to one's success, status, unity or wholeness. It prompts a person to take the necessary steps to avoid the threat or reduce its consequences. This preparation is accompanied by increased somatic and autonomic activity controlled by the interaction of the sympathetic and parasympathetic nervous systems. A wide range of medical conditions can cause symptoms similar to those of anxiety disorders. This has been attributed to a pheochromocytoma that produces epinephrine which causes paroxysmal episodes of anxiety symptoms. Neurobiological anxiety research studies have shown that the medial and frontal lobe structures are affected in anxiety disorders. Positron emission tomography (PET) scans have revealed an involvement of the hippocampus area and abnormalities in blood flow in the medial temporal lobe, amygdala and hippocampus (Sadock & Sadock, 2007). Neurobiological studies suggests that PET studies demonstrate abnormal blood flow in medial temporal lobe including amygdala and hippocampus and in patients with obsessive compulsive disorder suggesting a frontal-subcortical circuit involvement (Airaksinen, Larsson,and Forsell, 2004). Gainotti (1972) and Galin, (1974) cited in Lezak, Howieson and Loring (2004) add that anxiety is also said to be a common feature of the left hemisphere involvement.

Owing to the impairment on the central nervous system arising from both HIV and anxiety, it is important that this study is carried out to examine the impact they have on an individual's neurocognitive performance which in turn can affect one's performance on activities of daily living. This study will look at anxiety and other general medical conditions, such as coronary heart disease and HIV related anxiety and neurocognitive functioning.

1.1 Rationale for study.

It is important to recognise and treat anxiety in the HIV positive population because anxiety has been associated with poor treatment compliance, high risk behaviours,

disease progression and increased use of the health care services (Fernandez & Ruiz, 2006). Furthermore, anxiety takes up cognitive capacity and leaves less attentional resources for the tasks at hand, leading to poor cognitive performance (Butters, Bhalla, Andreescu, Wetherell, Mantella and Begley 2011). HIV disease progression into AIDS is associated with cognitive decline which in turn decreases independence in activities of daily living (Cysique, Letendre, Ake, Jin, Franklin and Gupta, 2010) Therefore, this study will explore the impact of anxiety in HIV positive adults on their neurocognitive functioning. This study explored the impact of anxiety in HIV infection on neurocognitive functioning.

1.2 Significance

The study investigated the relationship of HIV and anxiety on the neurocognitive functioning of HIV positive individuals using the International Neurobehavioral Test Battery with the Beck Anxiety Inventory as a measure of anxiety levels. The study looked at whether there were significant differences in levels of performance among HIV positive individuals with anxiety. Literature has shown that, anxiety has effects on the motor, thinking, perception, and learning functioning which produces confusion and distortions of perception of time, space, persons and meanings of events. The distortions interfere with learning by lowering concentration, recall, and impairing the ability to make associations (Sadock & Sadock, 2007). However, the literature is mixed (Airaksinen, Larsson, and Forsell (2004). There is a discrepancy in that most of the available evidence on neuropsychological functioning in anxiety is based on clinical samples investigating persons affected by obsessive compulsive disorder, and there is a knowledge gap regarding cognitive functions. This study sought to extend the current literature in the following ways: 1) clarify nature of neurocognitive functioning in a medical sample, 2) aid in the management of HIV positive individuals as the associated anxiety will be recognised and treated, 3) determine effects of anxiety on instrumental activities of daily living (IADL).

1.3 General Objective

The aim of the study was to examine the effects of anxiety on neuropsychological performance among HIV positive adults.

1.4 Specific Objective

- To identify patterns of neurocognitive functioning associated with anxiety in HIV positive adults.
- To determine how anxiety and neurocognitive functioning affect IADL.
- Make comparisons on the effect of gender and anxiety on neurocognitive functioning.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 HIV and Neurocognitive Functioning

Research has consistently demonstrated an increased risk for neuropsychological dysfunction in later stages of HIV infection. This is supported by observational cohort study conducted in rural China by Cysique, Letendre, Ake, Jina, Franklin and Gupta (2009) to quantify and characterize the nature of cognitive change over a one year period in HIV positive former plasma donors. The results showed significant cognitive decline in 27% of individuals in later stages of HIV compared to 5% of HIV negative individuals. Neuropsychological decline was also associated with decreased independence in activities of daily living. Studies on AIDS related complex patients have reported global neuropsychological dysfunction at rates of 29 to 87%. AIDS related complex refers to symptoms that signal the transition from asymptomatic HIV infection to symptomatic HIV infection, the symptoms include recurring fever, unexplained weight loss, swollen lymph glands, diarrhea, or fungal infection of the mouth or throat (AIDS info, 2011). The rate at which neuropsychological dysfunction has been reported is very high and this can negatively impact on the lives of the individuals infected with HIV in the everyday functioning such as activities of daily living. However, neuropsychological dysfunction has also been found in the early stages of infection (Heaton, Velin, Mccutchan, 1994). Lezak, Howieson and Loring (2004) report that word fluency tests are particularly sensitive to early cognitive changes in HIV positive individuals. Several studies have reported that, HIV infection has an effect on neuropsychological functioning ranging from mild to severe (Heaton, Thomas, Rivera-Mindt, Sadek & Moore, 2004). Neurocognitive decline in HIV positive individuals was found to be greater than in the control group of the HIV negative individuals and was associated with decreased independence in activities of daily living (Cysique, et. al, 2009).

Studies done in developed countries have shown a pattern in which executive functioning, speed of information processing, attention, working memory, motor speed, new learning and retrieval of new information predominantly affected. Semantic memory, language skills and visuo-spatial abilities remained intact (Robertson, Liner, Heaton, 2009).

Studies done in African countries such as Uganda on pattern of neuropsychological performance among HIV positive patients have revealed significant differences on

measures of verbal learning and memory, speed of processing, attention and executive functioning between HIV seropositive and seronegative subjects (Robertson, Nakasujja, Wong, Musisi, Katabira & Parsons, 2007).

Lawler, Mosepele, Ratcliffe, Seloiliwe, Steele and Nthobatsang (2010) conducted a pilot study in Botswana with the aim of determining the prevalence of neurocognitive impairment among HIV positive individuals using the International HIV Dementia Scale (IHDS). Findings were that the prevalence of neurocognitive impairment was 38%. Despite 97.5% of the sample being on highly active antiretroviral therapy (HAART), they met the criteria for IHDS defined dementia. This is an indication that HIV has a serious impact on the neurocognitive performance of an individual. Although virology management of HIV has improved, good treatment for HIV associated neurological disorders (HAND) is still unavailable.

A study done in Zambia revealed that, 22 % of HIV positive individuals met the criteria for IHDS defined neurocognitive impairment. These results suggest underlying subcortical dementia. The study results showed a lower prevalence compared to other studies carried out in the sub Saharan region (Holguin, Banda, Willen, Malama, Chiyenu and Mudenda, 2011). However, the differences in results have been attributed to the differences in HIV clades, HIV clade C which is more prevalent in Zambia has been thought to be less neutrogenic than clades A and D found in regions where high prevalence has been recorded (Lawler, et. al. 2010). The study done in Zambia had shortfalls in that the neuropsychological instruments were based on norms from other countries and not Zambia. Furthermore, the results were based on the IHDS which has been seen to be incomprehensive and lacks the ability to assess specific cognitive domain (Kanmogne, Kuate, Cysique, Fonsah, Eta and Doh, (2010).

2.2 Anxiety and Neuropsychological Functioning

Airaksinen (2006) states that anxiety is regarded as a normal part of human life and only considered as an illness when distress and impaired functioning in social, occupational, or other important areas of functioning are present. Studies done on effects of anxiety have found that emotional arousal actually enhances performance. Moderate levels of anxiety have been found to be beneficial to maintaining optimum performance as opposed to high levels which may be detrimental. This is shown by

the Yerkes Dodson law which states that performance increases with physiological or mental arousal, but when levels of arousal become too high, performance decreases (Darke, 1988 cited in Goldstein and McNeil, 2004). A small to medium increase in arousal will actually result in accuracy and high arousal level will interfere with accuracy. Buckelew and Hannay (1986) cited in Lezak, Howieson and Loring (2004) add that, high arousal of anxiety may lead to mental problems such as, slowing, scrambled or blocked thoughts and words, and memory failure. This can interfere with one's performance on neuropsychological assessment. Literature has shown that, anxiety takes up cognitive capacity and leaves less attentional resources for the tasks at hand, leading to poor cognitive performance (Butters, Bhalla, Andreescu, Wetherell, Mantella and Begley 2011). Lezak, Howieson and Loring (2004) add that, attentional deficits can disturb the patient's ability in almost all areas of cognitive functioning. Goldstein and McNeil (2004) attributed the attentional deficits to the general worry associated with anxiety which impairs attention on more demanding tasks. However, little is known regarding the relationship between anxiety and cognitive functioning and that the reported observations are inconclusive (Airaksinen 2006).

Studies done in healthy men and patients with open heart surgery, psychiatric patients without brain damage, patients with traumatic brain injury showed that anxiety did not affect cognitive performance (Gasquoine, 1977, Vingerhoets, De Soete and Jannes, 1995, Reitan and Wolfson, 1997 cited in Lezak, Howieson and Loring, 2004). It has however, been seen that anxiety has effects on the motor, thinking, perception, and learning functioning and produces confusion and distortions of perception of time, space, persons and meanings of events. The distortions interfere with learning by lowering concentration, recall, and impairing the ability to make associations (Sadock & Sadock, 2007).

Studies from other countries have shown conflicting results on the effects of gender on anxiety. A study was done on gender differences in anxiety among undergraduates from ten Arab countries to investigate gender differences in anxiety among volunteer undergraduates recruited from 10 Arab countries namely Kuwait, Saudi Arabia, Emirates, Oman, Egypt, Syria, Lebanon, Palestine (Nablus and Gaza), Jordan and Iraq. A sample of 3,064 was enrolled and the Kuwait University Anxiety Scale (KUAS) was used. Results of the study were that females had a higher rate of anxiety compared to their male counterparts in all the 10 countries (Abdel-Khalek

and Alansari 2004). Other studies revealed that gender had no effect on the development, levels of anxiety and neurocognitive functioning **(**Airaksinen, Larsson,and Forsell, 2004**).**

2.3 Anxiety and Neurocognitive Functioning in other health conditions

Neurocognitive dysfunction has been seen is conditions other than HIV in which anxiety is a feature, these include, anxiety disorders and general medical conditions such as cancer and cardiac conditions. The anxiety has been reported to also have an impact on neurocognitive functioning.

2.3.1 Anxiety Disorders and Neurocognitive Functioning

Anxiety disorders are among the most prevalent mental disorders in the general population. Nearly 30 million persons are affected in the United States, with women affected nearly twice as frequently as men (Sadock and Sadock, 2007). A study done by Samuelson, Metzler, Rothlind, Choucroun, Neylan and Lenoci (2004) on neuropsychological functioning in posttraumatic stress disorder and alcohol, reported differences in neuropsychological functioning between groups with posttraumatic stress disorder (PTSD) and control participants. However, this was attributed to history of comorbid alcohol abuse that is often associated with PTSD, but when alcohol and depression were controlled for, PTSD was associated with decreased verbal memory, attention, and processing speed performance. However, findings of neuropsychological deficits in PTSD are not consistent as several other studies have not shown differences between samples with and without PTSD in memory performance. In one study a sample of 128 veterans divided into four groups was recruited. The groups were, participants with and without PTSD, and with and without a history of alcohol abuse or dependence in the past 5 years. The structured diagnostic interviews, 90 item self report clinical rating scale of psychiatric symptomatology, lifetime drinking history, a battery of neuropsychological tests that assessed verbal memory, visual memory, visual spatial skills, attention, working memory and processing speed were used. The results revealed that the group who had PTSD and abused alcohol did not differ from the group without PTSD and abused alcohol and showed an association between PTSD and decreased performance on measures of verbal learning, working memory, attention and processing speed. The results of this study may have been influenced by a number of

factors. The sample consisted of war veterans from wars in Afghanistan and Iraq who could possibly had other comorbidities such as depression, alcohol abuse or other psychiatric disorders which also have an impact on neuropsychological functioning (Samuelson, Metzler, Rothind, Choucroun and Neylan, 2006).

A study done on changes in neuropsychological functioning following treatment for late life generalised anxiety disorder (GAD) with the aim to examine neuropsychological functioning in older adults with GAD in comparison with psychiatrically healthy older adults. A sample of 160 participants aged 60 and above with a diagnosis of GAD and 37 individuals in a comparison group without psychiatric history underwent neuropsychological assessment. Assessments were repeated after treatment for those with GAD. After treatment, cognitive functions for the participants with GAD reported clinical improvement in cognitive functioning. Factors associated with anxiety in older adults with GAD were, worry about medical problems, family or finances. However, the impairments that were identified could be the result of having a psychiatric disorder and related to age of the participants. The participants with GAD performed worse than the comparison group in the following domains, information processing speed, working memory, inhibition, problem solving and immediate and delayed memory (Butters, et. al. 2011). However, a study done by Airaksinen, Larsson,and Forsell (2004), showed no cognitive dysfunction in GAD.

2.3.2 Anxiety associated with other general medical conditions

Anxiety has been reported to be higher than generally assumed among general hospital patients compounding the basic medical condition prognosis (Michopoulos, Douzenis, Kalkavoura, Christodoulou, Michalopoulou, Kalemi, 2008). The occurrence of anxiety symptoms associated with general medical conditions is common. Symptoms include panic attacks, generalized anxiety, obsessions and compulsions, and other signs of distress and these signs and symptoms may be due to the direct physiological effects of the medical condition (Sadock and Sadock, 2007).

Tsushima, Johnson, Lee and Matsukawa (2005) conducted a study on depression, anxiety and neuropsychological test scores of candidates for coronary artery bypass graft surgery with the objective to examine the effect of depression and anxiety on neuropsychological test scores of candidates for coronary artery bypass graft (CABG) surgery. A sample of sixty patients was enrolled, and instruments used

were, the Beck Depression Inventory, the State-Trait Anxiety Inventory, and a battery of neuropsychological tests. Results were that, low levels of preoperative depression and anxiety states did not affect neuropsychological functioning among CABG candidates and preoperative neuropsychological deficits might have been from cardiovascular disease but might also relate to emotional factors, such as anxiety. Other studies done on patients before and after CABG found no relation between mood factors such as anxiety and depression and a series of cognitive tests (Andrew, Baker, Knweebone, & Knight, (2000) and McKhann, Borowicz, Goldsborough, Enger, & Selnes, (1997) cited in Tsushima, Johnson, Lee, Matsukawa (2005). These studies present inconsistent results pertaining to the effects of anxiety and depression on neurocognitive abilities. However, results of this study cannot be generalised because the results could have been compromised as patients had a history of stroke and the sample size used was small which may have led to Type II error.

Earlier studies have shown that, pain which was previously tolerable may become intolerable if anxiety and depressive states are present. Additionally, patients who had undergone treatment for cancer and had clinical anxiety had their somatic symptoms reduced by discussing the nature of anxiety and its possible manifestation as somatic distress (Snaith, 2003).

2.4 HIV infection and Anxiety

Anxiety is a normal healthy response to a diagnosis, onset, or progression of HIV related illness. Mild to moderate anxiety has been reported to be very common in HIV infection. HIV positive individuals often request psychological intervention to deal with anxiety symptoms such as, worries, agitation, shakiness, insomnia, irritability, feeling on edge or hyper vigilant, muscle tension, difficulty concentrating, or concerns about the many uncertainties and unpredictability of living with HIV disease. Phillips-Bute, Mathew, Blumenthal, Grocott, Laskowitz, and Mark (2006) report that about 40% to 60% of HIV positive people experience an adjustment reaction that subsequently goes away and the incidence of clinical anxiety is only slightly higher for people with HIV than for people in the general population. Phillips-Bute et al (2006) further adds that, some of the factors that trigger symptoms of anxiety in HIV infection are, the HIV diagnosis, worry about opportunistic infections, viral load and CD4 count, diminishing and lost functions, fear of

disclosure, becoming ill, frustrations with treatment, death, concerns about negotiating safer sex and certain medications used to treat HIV. Other factors associated with HIV anxiety are, lack of strong social support, poor coping strategies, unresolved grief, history of physical, sexual or emotional abuse and family history of anxiety. However, not all clients are able to identify the causes of their anxiety. (American Psychiatric Association (APA), 2001).

Literature has shown that, anxiety takes up cognitive capacity and leaves less resource for attention leading to poor cognitive performance (Butters, et. al, 2011). The most common type of anxiety disorders that individuals with HIV can suffer from is generalized anxiety disorder, posttraumatic stress disorder, and obsessive compulsive disorder (Sadock & Sadock, 2007). There is increasing evidence suggesting that psychosocial factors such as anxiety and depression have a harmful impact on the course of many diseases and may heighten susceptibility to infectious diseases.

A longitudinal study was done on anxiety and depressive disorders in women with HIV infection by Morrison, Petitto, Have, Gettes, Chiappini and Weber (2002) with the objective of examining whether there were differences in the rate of anxiety and depressive disorders between HIV infected women. The sample consisted of 93 infected women and 62 uninfected women. HIV positive subjects were recruited from outpatient medical clinics, county health departments, and organizations focusing on HIV illness and care in North Central Florida. Participants underwent extensive clinical, psychiatric, neuropsychological, and immunological assessments. The diagnosis of anxiety and depression were made using the structured clinical interview for DSM-IV and symptoms of anxiety and depression were evaluated with the Hamilton depression Rating Scale for depression symptoms and the Hamilton anxiety Rating Scale for anxiety symptoms. The study revealed no significant difference between the HIV positive and HIV negative women in the proportion having any of the anxiety disorders. However, the study used a rural sample which could have limited the generalization of the results. The participants were women residing in rural Florida and represented two predominant racial groups, African American and Caucasian making it difficult to generalize to other settings.

Studies have shown conflicting results on the effect of anxiety and depression on the immune function of HIV positive individuals, some studies have found a positive relationship whereas others have found no association. The mechanisms by which

anxiety and depression influence disease progression and mortality in HIV infection remain to be determined. The current study was done to aid in clarifying the discrepancies noted in earlier studies and set standards for Zambia. On the other hand, several studies looking at the relationship between HIV and psychological variables have shown that patients who have adjusted well to their HIV positive status tended to have lower levels of mental distress and expressed hope (Chipimo, Tuba, Fylkesnes, 2011).

2.5 Measures of Anxiety

It is important to assess the contribution of mood disorder such as anxiety in order to understand the experience of suffering in the setting of medical practice. Assessment tools are used for the purpose of screening and detection of cases. Measuring anxiety levels is useful in medicine to determine appropriate treatments, measure therapeutic progress and track post therapy outcomes. Numerous instruments have been designed for measuring anxiety levels each with different advantages and disadvantages (Snaith, 2003). Some of the tools that have been used in the assessment of anxiety levels are discussed below.

The Hospital Anxiety and Depression Scale (HADS) was developed by Zigmond and Snaith in 1983 for the purpose of providing clinicians with an acceptable, reliable, valid and easy to use practical tool for identifying and quantifying depression and anxiety in a non psychiatric population. It is particularly used for identifying general hospital patients who need further psychiatric evaluation and assistance rather than making diagnosis (Michopoulos, Douzenis, Kalkavoura, Christodoulou, Michalopoulo & Kalemi, 2008). It has widely been used in measuring psychological morbidity in cancer patients and its reliability using Cronbach's alpha coefficient has been found to be 0.78 for the HADS anxiety. It is sensitive to changes both during the course of disease and in response to medical and psychological interventions (Montazeri, Vahdaninia, Ebrahimi and Jarvandi, 2003).

Hamilton anxiety scale is another measure of anxiety level. It has been used in monitoring of the severity of anxiety and measure effects of treatment particularly with pharmacological agents (Sadock and Sadock 2007).

The state-trait anxiety inventory specifically targets the anxiety symptoms as compared to other instruments that elicit anxiety and depressive symptoms. It was developed by Spielberger to measure anxiety. It examines both transient and

enduring anxiety (Kvaal, Ulstein, Nordhus and Engedal, 2005). The tool takes approximately 10 minutes to administer (Tilton, 2008). It is made up of two subscales, one measuring state anxiety and the other measuring trait anxiety. It has been widely used to assess anxiety in both clinical and non clinical samples (Michopoulos, et. al. 2008).

The Beck Anxiety Inventory (BAI) was used for this study. It is a 21 item 4 likert scale that measures the severity of self reported anxiety in adults and adolescents consisting of descriptive statements of anxiety symptoms. The scale was specifically designed to reduce the overlap between depression and anxiety scales by measuring anxiety symptoms shared minimally with those of depression. A total score of 0 to 7 reflect minimal level of anxiety, 8 to 15 indicate mild anxiety, 16 to 25 reflect moderate anxiety and scores of 26 to 63 indicate severe anxiety. This measure has been chosen because it has been used in research and clinical samples, and possibility of reducing the overlap between depression and anxiety. The BAI has been used in both clinical settings and research to assess and establish a baseline anxiety level, as a diagnostic aid, to detect the effectiveness of treatment as it progresses, and as a post-treatment outcome measure. Advantages of the BAI are that it is fast and easy to administer, repeatability, discrimination between symptoms of anxiety and depression, ability to highlight the connection between mind and body for those seeking help to reduce their anxiety, and proven validity across languages, cultures, and age ranges .Its reliability has been reported to have an internal consistency (alpha) coefficient of 0.92 and test- retest reliability of 0.75. Concurrent and divergent validity has been reported to be moderate (Beck and Steer, 1993).

2.6 Measures of Neurocognitive Functioning

Several test batteries have been used to assess neurocognitive functioning worldwide. The Halstead-Reitan test battery is one of the widely used and includes measures of intelligence, language, tactile, manipulative skills and auditory sensitivity (Reitan & Wolfson, 1993 cited in Stirling, 2002).

Another test battery that has been used is the Luria-Nebraska test battery that takes about two to three hours to administer and has over 250 test items. This makes it unsuitable for individuals with dementia or psychiatric conditions who do not have the requisite attention span (Luria, 1966 cited in Stirling, 2002). Lezak, Howieson

and Loring (2004) add that this test battery is useful in gross screening of memory though it has been argued that it is diagnostically unreliable.

The test battery that was used in this study is the International Neurobehavioural Test Battery with Zambian norms. This test battery has been found to be sensitive to HIV. The battery has 14 tests assessing 7 neurocognitive domains. The seven domains are: The visual episodic domain comprising the brief visual memory test-revised, assessing learning and delayed recall. The second domain is the verbal episodic comprising the Hopkins verbal learning test-revised targeting learning and delayed recall. The verbal fluency domain comprises the controlled oral word association test (FAS), category fluency test (animals and actions naming) and the Stroop Word. Speed of information processing assessment was done using the trail making test part A, colour trails 1, WAIS digit symbol, WAIS symbol search and Stroop colour. The Executive functioning domain comprises the colour trails 2, Halstead category test, Wisconsin Card sorting test and Stroop colour-word. The working memory and attention domain were assessed using the paced auditory serial addition test (PASAT) and the spatial span. The grooved pegboard test, dominant and non-dominant hand was utilised in the assessment of motor dexterity and strength. The International Neurobahavioural Test Battery was used in a pilot study conducted in Zambia on sex differences in neuropsychological performance as an effect of human immunodeficiency virus infection (Hestad, Menon, Silalukey-Ngoma, Franklin, and Imasiku, 2012). It has also been used in the United States and international sites in China, India, Brazil, Romania and Cameroon coordinated by the University of California San Diego HIV Neurobehavioral Research Center (Heaton et al., 2008, 2010; Kanmogne et al., 2010 cited in Hestad, Menon, Silalukey-Ngoma, Franklin, and Imasiku, 2012).

A normal range of functioning using the T-score would be a score between 41 and 59, a participant who scored 10 points or more below 50 was considered to be impaired and 10 points or more above 50 was considered to have cognitive strength in a particular domain. Reliability and validity of some of the tests contained in the International Neurobehavioural Test Battery are as follows.

Wisconsin Card Sorting Test (WCST) which is a computerized test has construct validity in that it shows an increase in preservative errors among individuals with frontal lobe dysfunction. Reliability of the test showed low retest reliability with an average of 0.43 on Pearson's r which shows that almost 80% of the results could be

attributed to error variance. Although its reliability is low and it may not be very good with specificity, it however reports high sensitivity to frontal lobe lesions (Bowden, 1998). Colour Trails Test 2 (Strauss, Sherman and Spreen, 2006) report its reliability to be at 0.64 and a validity of 0.50. Stroop colour and word Test has a test-retest reliability of between 0.74 to 0.88 on the reading card (word), 0.74 to 0.90 for the colours and 0.67 to 0.91 on the word colour interference. A study by Dikmen, Heaton, Grant and Timken (1999) found that the Halstead Category Test has a reliability coefficient of between Pearson's r of 0.40 to 0.85. The category test has also been cited to have a better sensitivity to brain damage than the WCST. It is said that the category Test should be a preferred measure if the clinician would like to measure a more difficult and sensitive measure of abstraction ability (Strauss, Sherman and Spreen, 2006).

The reliability of the PASAT was reported to be at Cronbach's alpha of 0.90 and the validity of the computerized and audiotape versions appear comparable at r=0.85 and r=0.95 and is said to be sensitive to mild concussion and sensitive as an indicator of information processing (Strauss, Sherman and Spreen, 2006). Trail Making Test A and Colour Trails Test (CTT) Trails 1 has a reliability of 0.64 and a validity of 0.41 (Strauss, Sherman and Spreen 2006).

Stroop Colour and Word is said to have a test re-test reliability of 0.67 to 0.91. It is also said to have ecological validity (Van der Elsr, Van Boxtel, Van Breukenden and Jolles 2008).

Other assessment tools that were used in the collection of data for the study were, the Beck Anxiety Inventory (Beck and Steer, 1993) to screen for anxiety, patient's assessment of own functioning and activities of daily living (Heaton, etal. 2004) to determine participant's everyday performance, substance use and substance use history to screen for substance misuse. The neurobehavioral medical screen was used to determine neurological stability of the participants. Use of academic skills and Zambia achievement test (ZAT) questionnaires gave the participants' ability to speak and understand English and test instructions. Behavioral Notes gave the participant's description of the attitude and behaviour during the assessment.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY.

This chapter will focus on the methods that were used to evaluate the effects of HIV related anxiety on neurocognitive functioning. The data was collected as part of a larger project entitled Neurobehavioral Effects of HIV in Zambian adults whose aim was to study the impact of HIV on neurobehavioural functioning.

3.1 Study Design

The study utilised a cross sectional study design. Data was collected from participants aged 20 to 65. The participants were assessed using the International Neurobehavioural Test Battery which assesses seven domains of cognition namely, visual episodic domain, verbal episodic, verbal fluency, speed of information processing, executive functioning, working memory and attention, and motor dexterity domains. This ensured that most of the cognitive functions were assessed. Additionally the Beck Anxiety Inventory was used to assess the participants' levels of anxiety.

3.2 Study Sample

A total of 263 participants were recruited in the study comprising of individuals aged 20 to 65 years, from urban clinics of Lusaka province which was determined in consultation with ministry of health. Participants were required to have had attained 5 years of education.

This study was conducted at several anti-retroviral clinics under the Lusaka district health management team, namely, Chipata, Matero main, Matero referral, Kabwata, Kalingalinga and Chilenje clinics. These clinics provide HIV counselling, testing and treatment facilities to HIV positive individuals living in Lusaka. These clinics were chosen because they conduct HIV testing and provide care to individuals infected with HIV.

3.3 Study Population

The study population included HIV positive adults aged 20 to 65 from urban areas of Lusaka province with at least five (5) years of education, a similar sample was used for the normative data. This age range was chosen because the same ages were used in the normative data. A total of 263 HIV positive adults were recruited for the study.

3.4 Recruitment

Participants were recruited by the nurses at the selected clinics. Purposive sampling was used to select the participants who met the inclusion criteria. The participants were then referred to the researcher who obtained the informed consent after administering the Zambia achievement test (ZAT) to determine the participant's ability to speak and understand English. A total of 263 participants of different ages and gender from urban areas of Lusaka were enrolled. All participants took an HIV test through the Lusaka district health clinics. Patients who were HIV positive and attending Antiretroviral therapy (ART) clinics were requested to take part in the study. However, those who did not meet the inclusion criteria were dropped from participating in the study. Medical records were used to ascertain participant's HIV status. The Lusaka district health management team gave guidance on clinics which fall under urban area.

3.5 Inclusion Criteria

The study enrolled participants who met the following criteria:

- Aged between 20 and 65 years (because this is the age group for which norms have been established. This was determined by demographic information).
- Level of education above 5 years (which was established in the demographic information).
- Ability to speak and understand English. (This was determined by use of the academic skills questionnaire and the ZAT).
- HIV positive (this was determined by medical records).

3.6 Exclusion Criteria

The study sample excluded:

- Individuals with active psychiatric conditions as determined by clinical assessment following the DSM IV diagnostic criteria and neurobehavioural medical screen (because they might be out of touch with reality or the condition may interfere with their neurocognitive functioning).
- Those who abuse substance as determined by the Chinese substance abuse questionnaire (because it has Zambian norms).
- Physical handicap of the upper limbs (which may interfere with the performance on the tests).

- Physically unwell determined clinically and the pregnant women in third trimester (who might get tired as administration of the test battery take 2 and half to 3 hours).
- Neurological conditions such as epilepsy unrelated to HIV status (which was assessed using the neurobehavioural medical screening).
- Inability to give consent (as may be seen in individuals with learning disabilities with severe neurocognitive impairment).

3.7 Procedure

The data was collected from a total of 263 participants. The recruited participants were those who were HIV positive and attending ART clinics. The recruitment was done by the clinic nurses. The researcher obtained the consent from the participants after which the ZAT was administered to determine the ability to speak and understand English. This was followed by anxiety rating using the Beck Anxiety Inventory and neuropsychological assessment. The participants were assessed using the International Neurobehavioural Test Battery which took approximately 2 and half hours to 3 hours to administer. All this was done after approval from the ethics committee, obtaining permission from the District Health Management Board and management of the selected clinics (see Appendix). Permission was also sought from individual participants in written form and verbally. The International Neurobehavioural Test Battery that was used in collection of data and assessed the brain functioning in seven (7) cognitive domains. The seven domains and tests used to assess them are summarised in the table shown below.

Table 1 Neuropsychological Tests used in the Study

Cognitive Domain	
Speed of Information Processing	WAIS-III Digit Symbol WAIS-III Symbol Search Trail Making Test Part A
Learning and Delayed Recall *(2 domains)*	Hopkins Verbal Learning Test, Revised-II*)* Brief Visuospatial Memory Test Revised
Attention/Working Memory	Paced Auditory Serial Addition Test Category fluency test (Animals, Action) WMS-III Spatial Span
Language	Word Sound Fluency Category Fluency
Abstraction/Executive Functioning	Wisconsin Card Sorting Test (64-item version) Color Trails Stroop Color Word Test Category Tests – Computer version
Motor	Grooved Pegboard
Screening for Effort	Hiscock Memory Test
Medical Screening Interview	Behavioral Notes Summary Academic Skills Questionnaire Zambia Achievement Test

The Beck Anxiety Inventory was used to assess the levels of anxiety in the participants. It is a 21 item scale that measures the severity of self reported anxiety in adults and adolescents consisting of descriptive statements of anxiety symptoms which are rated on a 4 point scale (Beck and Steer, 1993). This instrument was

chosen because it has been used for research as well as clinical purposes (Miguel, 2012; Trame, Greene, Modderman, Kanstatakos, & Parada, 2008). Other measures that were used are the Substance use and Chinese Substance Use History, Patient`s Assessment of Own functioning, and Activities of daily living.

3.8 Data Analysis

Statistical Package for Social Sciences (SPSS) was used for data analysis.

- Descriptive Analyses was used to obtain means and standard deviation for the independent and dependent variables. The descriptive analyses were also used to determine amount of variability and association between gender in relation to anxiety and neurocognitive performance.
- Standard multiple regression was used to determine effects of anxiety on an individual's neurocognitive performance. Other variables that can bring about anxiety were also included in the analysis. These included age, CD4 count and WHO staging.
- Logistic regression was used to determine the effects of HIV related anxiety and neurocognitive functioning on IADL. Logistic regression was used because it uses categorized variables, IADL was analysed as a categorized variable.
- ANOVA was run to determine the effects of anxiety and gender on neurocognitive functioning.

3.9 Data Management

The raw data obtained from the study was converted into standardized scaled scores with a mean of 10 and standard deviation of 3. T- Scores were also generated to allow for analyzing results in a more meaningful way. T-Scores have a mean of 50 and a standard deviation of 10. T-Scores were used for analysis in this study and were corrected for Age, Education and Gender for neurocognitive tests only. These transformations are meant to give raw scores more intuitive meaning and do not change the characteristics of the distribution (Kaplan and Saccuzzo 2001).

3.10 Ethical Considerations

The research was submitted to the University of Zambia biomedical research ethics committee for approval. After the approval, permission was sought from the

management of the following clinics to obtain permission to collect data; Matero main, Matero referral, Chipata, Kalingalinga, Chilenje and Kabwata. The participants were informed of the study objectives both orally and in writing so that they could make an informed decision regarding their participation. The participants did not materially or financially benefit from the study, but there will be long term benefits as the study findings will be used to inform policy and improve patient care. Potential risks that could have arisen from the questions asked about HIV infection that might have evoked emotional reactions, were explained to the participants. And in case of this occurrence, arrangements with the clinic medical officer and nurses were made before hand to attend to any participants who may have had this experience.

Participants were informed that the participation was voluntary and that they were free to withdraw from the study at anytime and that no punitive action would be taken against them such as withdrawal of medical services. They were not coerced into participating in the study. Participants were asked to sign a consent form and the researcher counter signed. Confidentiality was maintained regarding the data collected. Names and codes were used and kept separately from the data to avoid it being linked to the participants. The names were used for follow up purposes only to ensure anonymity. All the collected data was kept in a locked cabinet and key kept by the researcher. Privacy was maintained during the assessments, rooms were secured from the selected clinic management.

3.11 Study Limitation

The neuropsychological assessment might have evoked anxiety in the test taker that could have interfered with the findings of the study. The researcher administered the BAI before the test battery was administered to minimize on the test anxiety that might have been evoked by the test battery. Furthermore, participants were put at ease by the researcher who, created a good working relationship, and encouraged the participant throughout the testing session. The pre-requisite of English as an inclusion criterion might have posed a challenge especially in people with low education. Years of education may compromise the result. The lengthy test battery may affect the performance of participants due to fatigue. Participants were encouraged to ask for breaks in between testing to minimise on fatigue.

CHAPTER FOUR

4.0 RESULTS

This chapter outlines the results that were obtained in the study. It shows the various analyses that were carried out. The results will be presented in relation to the research questions which were to identify neurocognitive deficits associated with anxiety in HIV positive adults, determine how HIV related anxiety and IADL affect cognitive functioning and the effect of gender and anxiety in HIV on neurocognitive functioning**.**

4.1 Characteristics of Participants

The sample had a higher percentage of female participants than the males. The participants consisted of 107 (40.7%) males and 156 (59.3%) females. Participants' educational level ranged from 5 to 20 years. Participants' educational level ranged from 5 to 20 years. A total of 202 (76.8 %) participants had attained secondary education. 16% (42) had primary education and 7.2 % (19) had attained 13 and above years of education. The mean education was 10.02 and SD was 2.23. The ages of participants ranged from 21 to 65 years old. The majority of the participants were in their forties at 38.4% (101). 10.3% (27) were in their twenties, 34.2% (90) were in their thirties, 15.2% (40) in their fifties and only 1.9% (5) were in their sixties. The mean age was 40.78 and SD was 8.9 as shown in the table below.

Table 2: To show Participants' Characteristics

Variable	**Frequencies**	**Percent**
Gender (N=263)		
Males	107	40.7
Females	156	59.3
Educational Level (N=263) **(Mean=**10.02, **SD=**2.233)		
Primary (1-7years)	42	16
Secondary (8-12years)	202	76.8
Tertiary (12 and above)	19	7.2

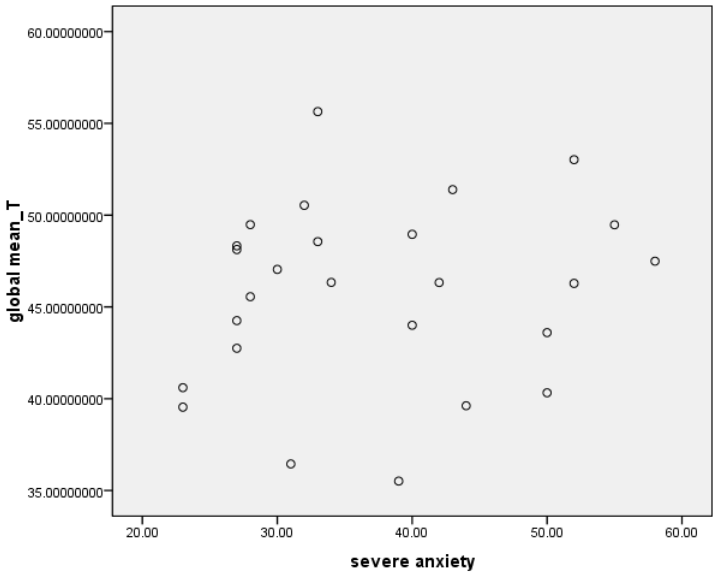
Table 2 Continued		
Age Group (N=263) **(Mean=**40.78**, SD=** 8.911)		
Twenties (20-29 years)	27	10.3
Thirties (30-39 years)	90	34.2
Forties (40-49 years)	101	38.4
Fifties (50-59 years)	40	15.2
Sixties (60-69 years)	5	1.9
WHO Staging N=207		
Stage I	58	28
Stage II	42	20.3
Stage III	94	21.3
Stage IV	13	6.3
CD4 Count (N=244) **(Mean= 480.90, SD=241.965)**		
0-499	132	54.1
500-999	104	42.6
1000-1499	7	2.9
1500-1999	1	4
Global Deficit Scores (N=263)		
Impairment	88	33.5
Normal	175	66.5

4.2 Anxiety and Neurocognitive Functioning

Anxiety levels among the participants were assessed using the Beck Anxiety Inventory, which comprises of 21 questions on a 4 likert scale.

Scatter plots were generated to investigate the relationship between neurocognitive performance using T scores and anxiety, as well as different levels of anxiety. A scatter plot that showed relationship is presented below.

Figure 1: Scatter Plot to Show Relationship between Severe Anxiety and Cognition (N=26)



r = .148

The relationship between severe anxiety and neurocognitive performance was investigated using Pearson correlation coefficient, and the results showed a weak positive correlation between the two variable (r=.148, p=.472) indicating that severe levels of anxiety is related to cognitive performance, though the strength of the relation can be said to be small.

Anxiety, age, WHO staging and CD4 count were used in a standard multiple regression analysis to identify patterns of neurocognitive functioning associated with anxiety in HIV positive individuals, as they can also impact on neurocognitive performance. This was done per domains of cognitive functioning and anxiety did not reach statistical significance on any of the domains, indicating that anxiety did not make a statistically significant unique contribution to neurocognitive performance. However, age reached statistical significance on verbal fluency (.046), learning (.011), and the recall domain, meaning it made a statistically significant unique contribution to one's neurocognitive performance. CD4 count also reached statistical significance on SIP (.037) and the global mean (.007) while WHO staging did not reach statistical significance on any domain, indicating that CD4 count did make a statistically significant contribution to neurocognitive performance while WHO did not (See table below).

Table 3: Anxiety and Neurocognitive functioning

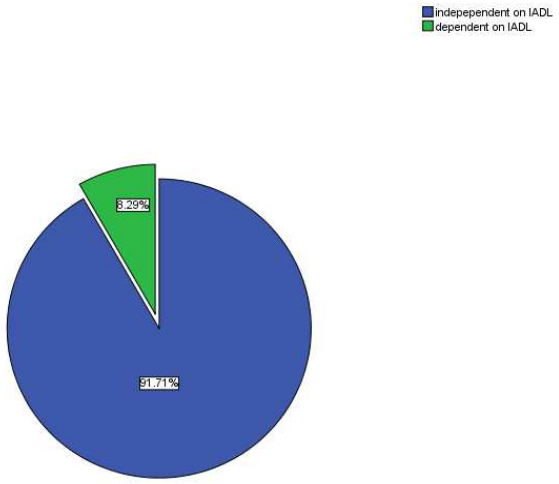
Global Mean				
Variable	**B**	**SE**	**Beta**	**Sig**
Anxiety	-.013	.045	-.019	.778
Age	.086	.043	.139	.046*
WHO Staging	-.139	.408	-.024	.734
CD4 Count	.004	.002	.188	.007*
Executive Functioning				
Anxiety	.000	.005	-.003	.962
Age	.007	.005	-.095	.180
WHO Staging	-.006	.046	-.009	.903
CD4 Count	-.000	.000	-.048	.500
Verbal Fluency				
Anxiety	.002	.005	.030	.667
Age	-.006	.005	-.083	.234
WHO Staging	-.044	.049	-.065	.362
CD4 Count	-.000	.000	-.145	.039
Working Memory				
Anxiety	.005	.007	.054	.445
Age	-.006	.007	.066	.354
WHO Staging	.006	.065	.007	.923
CD4 Count	.000	.000	-.030	.670
Learning				
Anxiety	.001	.304	.010	.880
CD4 Count	-.016	.007	-.183	.009
WHO Staging	-.016	.059	-.019	.791
Table 3 Continued				
Age	.000	.000	-.115	.099
Recall				
Anxiety	.004	.006	.049	.000
Age Count	-.014	.006	-.168	.025
WHO Staging	.033	.053	.043	-.072
CD4	.000	.000	-.119	.000

Table 3 Continued				
Motor				
Anxiety	.001	.231	.011	.870
Age	.012	.005	.173	.014
WHO Staging	.012	.005	.019	.788
CD4 Count	1.93	.000	.008	.911
SIP				
Anxiety	.000	.005	.005	.939
CD4 Count	-.009	.005	-.130	.065
WHO Staging	.003	.044	.005	.940
Age	.000	.000	-.109	.121

4.3 Anxiety and Neurocognitive Functioning on Instrumental Activity of Daily Living (IADL)

In this section, the effects of anxiety and cognitive performance on IADL were explored. IADLs were assessed using a self administered questionnaire in which one was considered impaired if they had 2 or more IADL complaints. IADLs includes, housekeeping, buying groceries, cooking, planning social activities, transporting, using a telephone, home repairs, bathing, dressing, shopping, laundry, keeping track of medicines, child care and ability to work. A total of 205 participants were included in the descriptive analysis and showed that 91.7% (188) were independent and 8.3% (17) were dependent on IADLs. IADL independent in this study will refer to an individual capable of performing IADLs independently, while IADL dependent will refer to one who is impaired and needing assistance in performing IADLs. Even though only 17 participants reached criteria for IADL dependent, most of the participants had problems in performing the named IADL tasks ranging from zero (0) to eleven (11). 64.6%. (170) had no complaints and 0.4 % (1) had eleven (11) complaints. This shows that even though 91.7% (188) participants were IADL dependent, they still had IADL complaints which could have affected their cognitive performance.

Figure 2: IADL Status Distribution



Key: in-IADL independent

di-IADL dependent

A logistic regression was performed on the seven cognitive domains to determine the effect of anxiety and neurocognitive functioning on IADLs.

Anxiety reached statistical significance on all the seven (7) domains ($p < .05$), indicating that the participants who were IADL dependent were more likely to be anxious than those who were IADL independent. Cognitive performance was only seen to have contributed to one's performance on IADL on the motor domain ($p < .05$), indicating that participants who were IADL dependent were more likely to be cognitively impaired on the motor domain than the ones who were IADL independent.

Wald test results revealed that anxiety was a strong predictor of IADL status on all the seven domains while cognition showed to have contributed less to the model.

Results are shown in the table below.

Table 4: Impact of Anxiety and Neurocognitive Performance on IADLs

	B	SE	Wald	Df	P	Odds Ratio
Global Mean	-.017	.047	.133	1	.715	.98
Anxiety	.039	.017	5.391	1	.020*	1.04
Executive Functioning	-.022	.040	.299	1	.585	.98
Anxiety	.040	.017	5.536	1	.019*	1.04
Verbal Fluency	.050	.036	1.883	1	.170	1.05
Anxiety	.039	.017	5.489	1	.019*	1.04
Working Memory	.037	.031	1.392	1	.238	1.04
Anxiety	.041	.017	5.890	1	.015*	1.04
Learning	-.009	.031	.089	1	.766	.99
Anxiety	.039	.017	.427	1	.020*	1.04
Recall	-.19	.031	.349	1	.555	.98
Anxiety	.040	.017	5.508	1	.019*	1.04
Motor	-.058	.027	4.502	1	.034*	.94
Anxiety	.035	.017	4.511	1	.034*	1.04
SIP	-.037	.038	,963	1	.326	.96
Anxiety	.039	.017	5.394	1	.020*	1.04

Results obtained from the logistic regression also showed that verbal fluency (x^2 (2, 205) =6.766, p=.034), working memory (x^2 (2, 205) = 6.232, p=.044) and the motor domain (x^2 (2, 205) = 9.530, p=.009) models containing both predictors reached statistical significance, indicating that the models were able to distinguish performance between the IADL independent and IADL dependent participants. When the logistic regression was run on the global mean, anxiety again reached statistical significance (p=.02). The model explained between 24% (Cox & Snell R Squared) and 55% (Nagelkerke R Squared) of the variance in IADL status and correctly classified 91.7% of the cases on the global mean. Anxiety made a unique statistically significant contribution to the model. It also was a stronger predictor of reporting being IADL dependent with an odds ratio of 1.040, indicating that participants who were IADL dependent were 1.04 times more likely to be anxious than those who were IADL independent. This is shown in the table below.

Table 5: Anxiety as a Predictor of IADL Status

x^2	P	Cox & Snell R^2	Negelkerke R
Global Mean			
4.962	.084	.024	.055
Verbal Domain			
6.766	.034*	.033	.075
Working memory			
6.232	.044*	.030	.069
Motor domain			
4.962	.009*	.046	.105

4.4 Anxiety and Gender on Neurocognitive Performance

The effects of anxiety and gender on cognitive performance was explored in this section. The results showed that 64 males and 86 females had no anxiety. Most participants with anxiety fell in the mild category (N=50; 23 males and 37 females) and the least had severe anxiety (N=26; 11 males and 15 females).

Table 6: Anxiety levels according to Gender

	Gender	N	Mean	SD
Normal	Male	64	.48	.666
	Female	86	.45	.607
Mild	Male	23	.52	.665
	Female	37	.38	.545
Moderate	Male	9	.78	.667
	Female	18	.50	.707
Severe	Male	11	.27	.467
	Female	15	.53	.516

A two way between groups ANOVA was conducted to explore the impact of anxiety and gender on neurocognitive performance as assessed by the International Neurobehavioural Test Battery. Participants were divided into four (4) groups according to the anxiety levels (mild 0-7; mild 8-15; moderate 16-22; severe 23-63).

This was done per domain and only results that reached statistical significant are shown below.

Table 7: Anxiety and Gender on Neurocognitive functioning

Global Mean	Sum of Squares	Df	Mean Square	F	Sig
Anxiety	95.459	3	31.820	1.050	.371
Gender	12.078	1	12.078	.399	.528
Anxiety*Gender	286.657	3	95.552	3.153	.025*
Error	7228.386	255	30.307		
Corrected Total	574403.754	263			
Executive Functioning					
Anxiety	377.902	3	125.967	3.333	.020*
Gender	21.609	1	21.609	.572	.450
Anxiety*Gender	461.628	3	153.879	4.071	.008*
Error	9638.508	255	37.798		
Corrected Total	10384.839	262			
SIP					
Anxiety	129.721	3	43.240	.851	.467
Gender	6.349	1	6.349	.125	.724
Anxiety*Gender	404.736	3	134.912	2.655	.049*
Error	12956.215	255	50.809		
Corrected Total	13458.320	262			

There was a significant interaction effect on anxiety and gender (MS=95.552, F (3, 255) =3.153, p=.025) on the global mean, indicating that there were significant differences in the effect of anxiety on the global mean for males and females. There was no main effect for both anxiety (MS=31.820, F (3, 255) = 1.050, p= .371) and gender (MS=12.078, F (1, 255) = .399, p= .528) on the global mean indicating that males and females did not differ in terms of their performance on the test battery.

There was a significant interaction effect between anxiety and gender (MS=153.879, F (3, 255) =4.071, p=.008) on the executive functioning domain, indicating that there is a significant difference in the effect of anxiety on the executive functioning domain for males and females. A main effect for anxiety (MS=125.967, F (3, 255) = 3.333, p= .020) was seen, but no main effect for gender meaning that males and females do not differ in terms of performance on this domain.

The interaction between anxiety and gender (MS=134.912, F (3, 255) =2.655, p=.049) on the SIP domain showed a significant effect indicating that there was a significant difference in the effect of anxiety on this domain for males and females. However, both anxiety (MS=43.240, F (3, 255) = .851, p= .467) and gender (MS=6.349, F (1,255) =.125, p=.724) did not reach statistically significant main effect indicating that males and females did not differ in performance on SIP.

CHAPTER FIVE

4.0 DISCUSSION

This chapter will discuss the results presented in chapter four (4). The results will be presented in relation to the research questions which were to identify neurocognitive deficits associated with anxiety in HIV positive adults, determine how HIV related anxiety and IADL affect cognitive functioning and the effect of gender and anxiety in HIV on neurocognitive functioning**.** The chapter will begin with a presentation of an overview of the salient findings, and then a more detailed account of the findings in relation to previous findings will be presented.

5.1 Summary of Findings

Anxiety did not yield any statistically significant result on cognition indicating that there were no statistical significant differences in performance between the participants with anxiety and those without anxiety on any of the cognitive domain. Effects were seen with age on the learning, verbal fluency and recall domain. CD4 count also showed an effect on executive function, SIP domain and the global mean.

Anxiety revealed an effect on IADL status on all the seven cognitive domains while the motor domain was the only cognitive function that reached statistical significance on IADL.

5.2 Neurocognitive Deficits in HIV related Anxiety

In order to identify the cognitive deficits associated with HIV related anxiety a standard multiple regression analysis was run, anxiety did not reach statistical significance on any of the seven cognitive domains, despite 43 % of the participants showing anxiety. This result could have occurred due to participants over reporting the anxiety symptoms which was assessed using a self administered questionnaire. Further, previous studies have shown that when one does not view the assessment as a threat, cognitive dysfunction may not be seen (Bierman, Comijs, Rijmen, Jonker, and Beekman, 2013). The threat was responsible for distracting the participants leading to poor performance as it impaired participant's attention and concentration on the task.

However, when correlation was run between severe anxiety and cognitive performance, the results showed a weak positive correlation (r=.15), indicating that severe anxiety is related to cognitive performance of a small strength. It can thus be

said that these findings appear consistent with previous studies. Bierman, Comijs, Rijmen, Jonker, and Beekman (2013), reported a similar result, which did not show a significant effect of anxiety on cognitive performance but suggested that severe anxiety was associated with worse cognition. Further, anxiety was seen to affect cognitive performance when the task was complex (Bertrams, Englert, and Dickhäuser, 2013, Dutke and Stober, 2001). Miguel (2012) found similar results in a study of the effects of anxiety on cognitive performance, which showed that adverse effects of anxiety increase as the task complexity increases and impairs response time and not the accuracy. These results could have differed with the current study in that not all the tests used in the current study were time oriented which seems to be affected by anxiety but were based on accuracy which has been reported not to be affected by anxiety.

Inconsistent with this study, Airaksinen (2006) on a study entitled cognitive functions in anxiety and depression, reported that, anxiety and mild depression showed significant deficits in episodic memory functioning and impaired executive functioning. This result could have occurred because of the presence of comorbid depression which could have accounted for the poor cognitive performance.

Although the results obtained from this study seem not to imply that there may be some cognitive deficits associated with HIV related anxiety, literature has shown that it is important to recognise and treat anxiety in the HIV positive population because it has been associated with poor treatment compliance, high risk behaviours, disease progression and increased use of the health care services (Fernandez & Ruiz, 2006). Anxiety has also been reported to take up cognitive capacity leaving less attentional resources for the tasks which in turn lead to poor cognitive performance (Butters, Bhalla, Andreescu, Wetherell, Mantella and Begley 2011). Based on this information, it is proposed that HIV patients are screened for anxiety and appropriate intervention taken.

5.3 Anxiety and Neurocognitive Functioning on IADL

In order to determine the impact of anxiety and cognitive functioning on IADL, a logistic regression was run on all the cognitive domains. This study revealed that anxiety contributed significantly to one being IADL dependent on all domains ($p<.05$).

This is in line with previous studies that revealed similar findings. Hamza, Rasheed, and Kahla (2006) conducted a study on the impact of anxiety, depression and cognitive impairment on functioning in the physically ill in Egypt showing that anxiety and cognition were significant on the IADL (p= .024). This result however, could have occurred because the participants were also depressed and physically ill which could have further impacted on the cognitive abilities of the participants.

Another study in line with the current study's findings was done by Norton, Ancelin, Stewart, Berr and Ritchie (2009) on anxiety symptoms and disorder predict activity limitations in the elderly. The study showed that anxiety disorder was associated with an increased risk of incident IADL limitation (p=0.048). IADL limitations could have been as a result of participants' age.

However, results obtained from the current study cannot be said to be representative and cannot be generalized as the sample size for participants who were IADL dependent was small (n=17). Further studies need to be done on a larger sample to determine the effects of HIV related anxiety and cognitive performance on IADL.

This study has confirmed that HIV related anxiety is a strong predictor of one being IADL dependent, it is therefore important that anxiety in HIV is considered in the assessment and treatment of HIV positive individuals.

5.4 Anxiety and Gender on Neurocognitive Functioning

In order to identify the gender effects on anxiety and cognitive functioning, ANOVA was conducted and results showed that more females (70) had anxiety compared to males (53). This is in line with previous studies that have reported higher numbers of females reporting anxiety than males. Bandalos (1995) Hembree, (1988), Volkmer & Feather, (1991) Zeidner, (1990) cited in Cassady and Johnson, (2002) reported that females have repeatedly been found to report higher levels of anxiety than males. The result could have occurred because females generally worry more than males and are highly emotional.

This study found that females and males differed in performance on the executive functioning, SIP domain and the global mean. It can thus be said that these findings appear consistent with previous studies that have reported differences in performance between males and females though on different domains. A noted study done on gender differences and cognition among older adults also showed a gender effect on verbal ability and there was a male advantage on visuospatial tasks (Parsons, Rizzo,

Zaag, Bcgee and Buckwalter, 2005). These findings may have differed with the current study because of the age differences and lack of mastery on motor skills in children.

On the contrary, Seidman, Biederman, Monuteaux, Valera and Doyle (2005), in their study on the impact of gender and age on executive functioning with Attention Deficit Hyperactivity Disorder, did not reveal a gender effect on the domain as both males and females performed badly on the executive functioning tasks. This result can be attributed to the ADHD rather than one's gender.

The differences in performance can be attributed to the fact that more women showed anxiety compared to males.

CHAPTER SIX

6.0 CONCLUSION

The objective of this study was to examine the effects of anxiety on neurocognitive performance.

The study utilised a cross sectional design. The participants were all HIV positive. The International Neurobehavioural Test Battery was used to measure cognitive performance after the administration of questionnaires to assess anxiety levels, activities of daily living, and health history. Standardized instructions were adhered to in the administration of the International Neurobehavioural Battery. The raw scores obtained were converted to T scores corrected for age, gender and education.

Results obtained from this study imply that HIV related anxiety has no effect on cognitive performance, though severe anxiety showed a weak positive correlation ($r = 0.148$).

The implications of the current study are that in the neuropsychological assessment of the HIV clients, it might not be necessary to correct for anxiety, as no cognitive deficits have been identified as being associated to HIV related anxiety. Hence, it is expected that anxious and non anxious patients will perform the same on the test battery. However, it is recommended that HIV patients are screened for anxiety as it has been reported to have an effect on IADL.

The current study also showed that anxiety was a strong predictor on one's IADL status and reached statistical significance on all the seven domains ($p<.05$). Therefore, information obtained from this study would prove helpful in determining the functional capabilities and prognosis of individuals with HIV related anxiety.

6.1 Limitations and Strengths of the Study

Limitation of this study is that the anxiety and IADL were self reported meaning that participants could have over reported or under reported the symptoms. However, the tool used for the assessment of anxiety, the Beck Anxiety Inventory prevents the overlap of anxiety and depressive symptoms.

A noted strength of this study is the age distributions which ranged from 20 to 65, previous studies mostly have used a particular age group such as children, or the elderly.

6.2 Recommendations

Based on the findings of this study as regards the high levels of anxiety among the HIV positive population, it is recommended that further studies be conducted on the identification of the possible factors associated with anxiety in the HIV + individuals.

Further studies on the effects of HIV anxiety and cognitive performance on IADL on a larger sample are recommended as this study only had 17 participants who were IADL dependent.

The Beck Anxiety Inventory or any other anxiety scale should be administered as routine in the assessment of HIV patients as anxiety impacts on one's drug compliance, as well as IADL status.

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APPENDICES.

Appendix A

Information Sheet

University of Zambia

School of Medicine

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 IT WILL BE PROVIDE TO YOU.

Introduction:

This study is entitled, **Effects of Anxiety on Neurocognitive Performance in HIV positive adults living in Lusaka.** The aim of the study is to examine how being anxious or uneasy in people living with HIV affect their brain functioning. This research is directed by Joyce Msumba Ncheka, a Masters Student in Clinical Neuropsychology at the University of Zambia, sponsored by NOMA project. This document defines the terms and conditions for consenting to participate in this study. A total number of 320 participants will be recruited for the study.

Description of the study

You are being invited to take part in the study entitled **Effects of Anxiety on Neurocognitive Performance in HIV positive adults living in Lusaka.** You will be required to undergo medical screening and blood tests which will be done by qualified medical personnel. Medical records will also be used to determine participant's HIV status. Thereafter, you will be required to complete questionnaires and take a group of tests to assess brain functioning using the neuropsychological test battery. In addition, you will be required to complete the Beck Anxiety Inventory questionnaire to assess the presence or/and level of anxiety.

Confidentiality

All the information you will give shall be confidential and shall be kept under key and lock. The findings in the research shall be presented in aggregate form with no identifying information to ensure confidentiality.

Risks and Benefits:

- You may experience minimal pain during drawing of blood. A cold compress will be used to reduce pain.
- 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 short breaks whenever you require them.
- It cannot be guaranteed 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.

Time Involvement

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

Compensation for Your Time:

You will be compensated as follows:

- Transport refund - K30, 000
- Refreshments - K20, 000 to ensure your wellbeing.

Participation Rights:

- Participation in this study is purely voluntary so that if you decide to withdraw at any point, your withdrawal or refusal to take part in the study will not affect the care or benefits you receive.
- 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 hoped, your identity will still be kept anonymous.

Contacts

If you have any further questions about this Research please contact:

The Principal Investigator	**Biomedical Research Ethics Committee**
Joyce Msumba Ncheka	Ridgeway Campus
University of Zambia	P.O. Box 50110
School of Medicine	University of Zambia
Department of Psychiatry	Lusaka.
Lusaka	Telephone: +260-211- 256067
Cell no: 0955837148	Fax: + 260-211-250753
Email: nchekajoyce@gmail.com	unzarec@zamtel.zm or unzarec@unza.zm

Appendix B

Consent Form

I…… (Name) have read and understood the terms and conditions of this study and I hereby agree to participate in the above-described research study. I understand that my participation is voluntary and that I may withdraw at any time without any consequences. As the participant in this project, my signature under here testifies that I understand the consent process and management of confidentiality as indicated above. I also understand that I can withdraw at any time without any consequences.

Signature of Research Participant:

…….……Date……...

…….Date ……..

Right Thumbprint of participant

Name and Signature of Witness:

……..……/…….Date……

Name and Signature of Researcher:

……/……...Date……

Appendix C

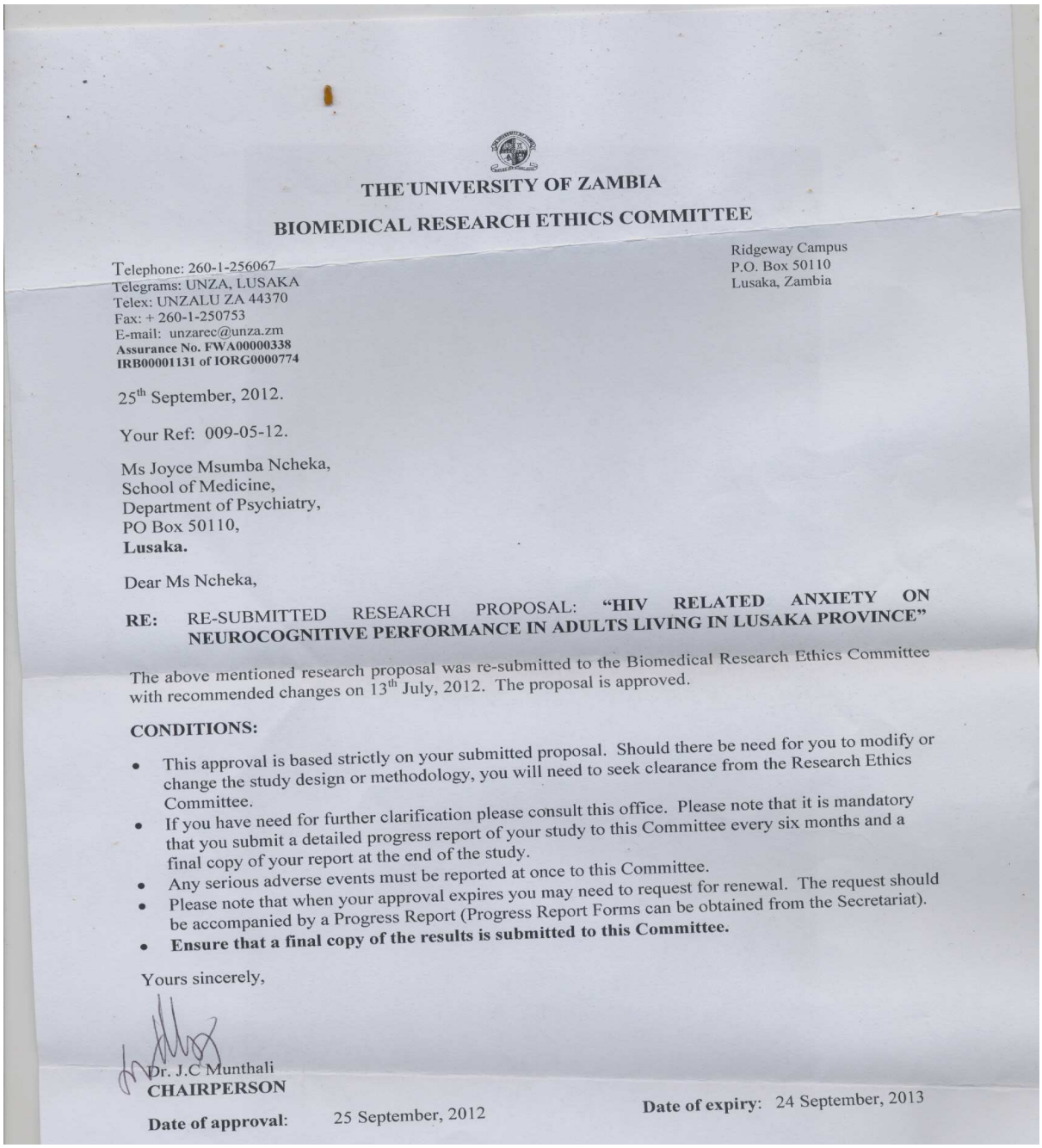
Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not at all	Mildly but it didn't bother me much	Moderately – it wasn't pleasant at times	Severely – it bothered me a lot
Numbness or tingling	0	1	2	3
Feeling hot	0	1	2	3
Wobbliness in the legs	0	1	2	3
Unable to relax	0	1	2	3
Fear of worst happening	0	1	2	3
Dizzy or lightheaded	0	1	2	3
Heart pounding/racing	0	1	2	3
Unsteady	0	1	2	3
Terrified or afraid	0	1	2	3
Nervous	0	1	2	3
Feeling of choking	0	1	2	3
Hands trembling	0	1	2	3
Shaky/unsteady	0	1	2	3
Fear of losing control	0	1	2	3
Difficulty in breathing	0	1	2	3
Fear of dying	0	1	2	3
Scared	0	1	2	3
Indigestion	0	1	2	3
Faint/lightheadedness	0	1	2	3
Flushed face	0	1	2	3
Hot/cold sweats	0	1	2	3
Column Sum				

Scoring – Sum each column. Then sum the column totals to achieve a grand score. Write that score here _____.

Appendix D
Ethics Approval



THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
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Assurance No. FWA00000338
IRB00001131 of IORG0000774

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

25th September, 2012.

Your Ref: 009-05-12.

Ms Joyce Msumba Ncheka,
School of Medicine,
Department of Psychiatry,
PO Box 50110,
Lusaka.

Dear Ms Ncheka,

RE: RE-SUBMITTED RESEARCH PROPOSAL: **"HIV RELATED ANXIETY ON NEUROCOGNITIVE PERFORMANCE IN ADULTS LIVING IN LUSAKA PROVINCE"**

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:

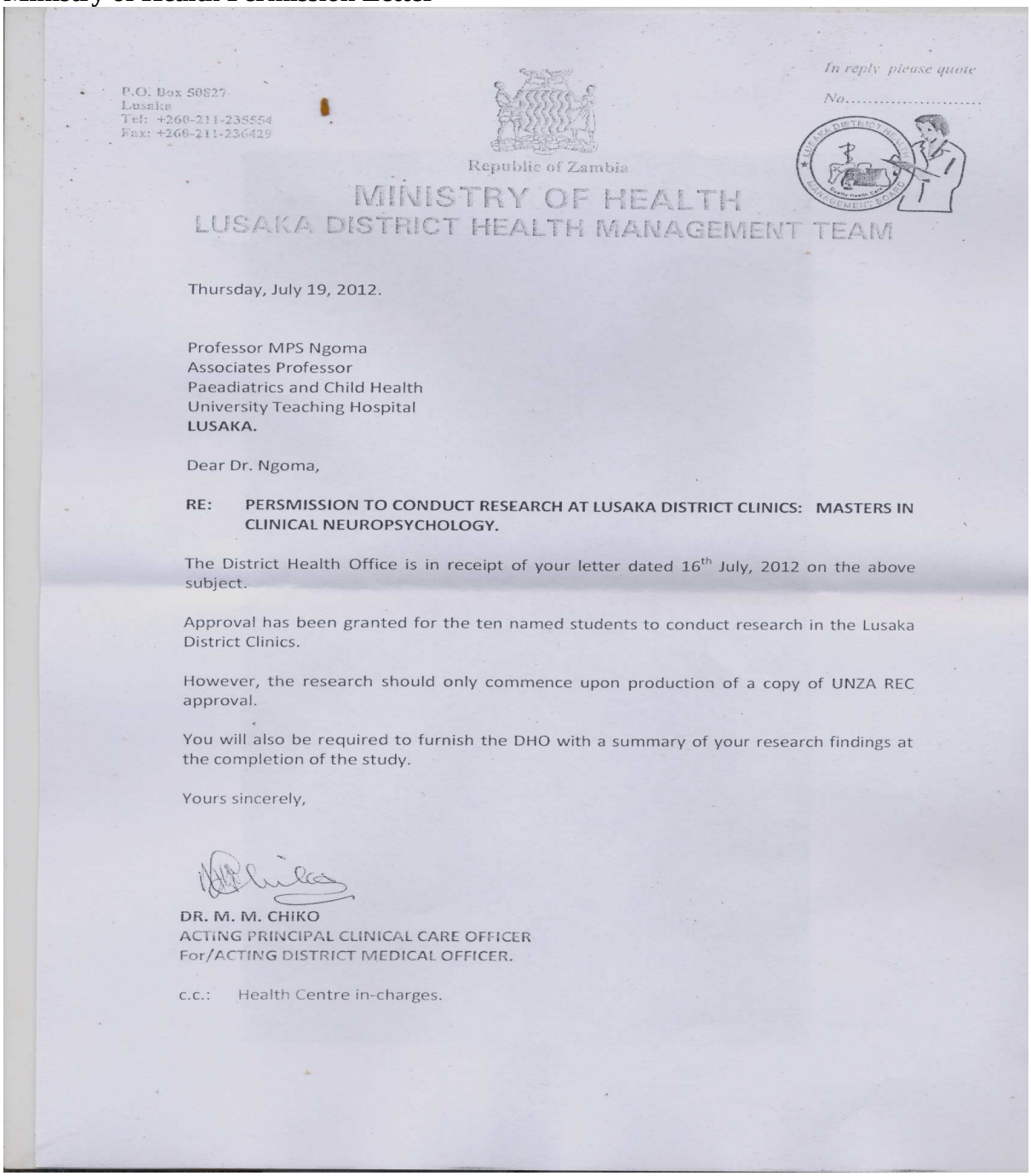
- This approval is based strictly on your submitted proposal. Should there be need for you to modify or change the study design or methodology, you will need to seek clearance from the Research Ethics Committee.
- If you have need for further clarification please consult this office. Please note that 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

Appendix E
Ministry of Health Permission Letter



P.O. Box 50827
Lusaka
Tel: +260-211-235554
Fax: +260-211-236429

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.

Appendix F
Zambia Achievement Test

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 G
International Neurobehavioural Test Battery