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NEUROPSYCHOLOGICAL FUNCTIONING AMONG ADULTS LIVING WITH HIV

BY

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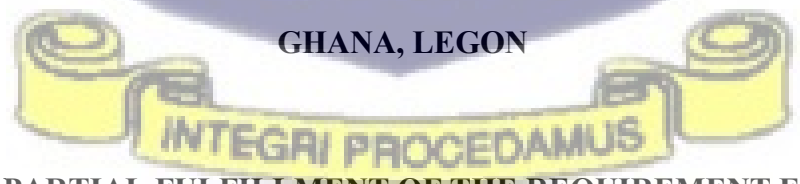
THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON



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DECLARATION

I hereby declare that all references are duly acknowledged, and this thesis is my own work submitted for the award of MPhil Clinical Psychology to the Department of Psychology, University of Ghana.

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DEDICATION

To to all HIV patients and their families around the world..

ACKNOWLEDGEMENT

I give glory to God for his grace, favour and provision which have kept me. I am grateful to my supervisors Professor C. C. Mate-Kole and Doctor Adote Anum for their immense inputs, guidance and patience which helped me tremendously in the production of this work. I appreciate my father Apostle Komi Edina Agbavitoh and my mother Philomina Akouwoi Akakpo for their financial support as well as their prayers for me daily. I will not forget all my colleagues and friends who have been a support system for me throughout the course. My God richly bless you.

ABSTRACT

The Human Immunodeficiency Virus known as HIV is an infection that attacks and weakens an individual's immune system, and exposes them to various opportunistic diseases and medical complications. The infection also affects the individuals neuropsychological functioning.This study looked at the differences in neuropsychological functioning between a group of adults living with HIV and a group of healthy controls. One hundred and twelve (112) adults living with HIV were recruited from an Infectious Disease Unit at the Korle-Bu Teaching Hospital. In order to enable comparisons, 60 healthy controls were selected from the University of Ghana and the Korle-Bu Teaching Hospital, using the convenience sampling method. The two groups were compared on memory, attention, concentration, perception, abstract reasoning, spatial neglect, depression, anxiety, somatization, and quality of life. Measures used included the CVLT-II Short Form, the Digit Span Subtest of the WAIS, the RQCST, the BSI-18, the CFQ, and WHOQOL-Bref. The findings indicated that adults living with HIV performed poorer than healthy controls in the areas of memory, attention, concentration, and abstract reasoning. Healthy controls also performed better than HIV patients in the physical, and psychological quality of life measures. Findings from this study are relevant to the understanding of the neuropsychological profile of adults living with HIV in Ghana. The results were discussed and recommendations have been given. Cognitive testing and behavioral assessment are recommended to be included in diagnosing, managing, and treating patients living with HIV in Ghana. of people living with HIV. This would lead to a more holistic and adequate management of their condition. A strong social support system, and adherence to antiretroviral treatment are crucial in increasing the quality of life of adults living with HIV.

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LIST OF ABBREVIATIONS

BSI: Brief Symptom Inventory

CFQ: Cognitive Failures Questionnaire

HAND: HIV-Associated Neurocognitive Disorders

HC: Healthy Controls

HIV: Human Immunodeficiency Virus

MOH: Ministry of Health

QOL: Quality of Life

RQCST: Revised Quick Cognitive Screening Test

WHOQOL: World Health Organization Quality of Life

CHAPTER ONE

INTRODUCTION

Background of the study

Patients living with HIV/AIDS experience neuropsychological impairments. HIV has become in recent years, a lifelong disease. Thus, these neuropsychological impairments reduce their quality of life (Alford & Vera, 2018). Human Immunodeficiency Virus known as HIV is a virus typically transmitted through means such as sex acts, contaminated blood transfusions, syringe and needle use. The infection could also be passed onto an infant by the mother from birth or while they are being breastfed (Rajendra, Chainesh, Ayush & Yogini, 2013, Shaw & Hunter, 2012). Some body fluids like saliva or tears are not known to transmit HIV. The virus attacks an individual's immune CD4 cells. The infection progressively weakens the immune system, reduces the ability of the body to combat other diseases, and causes an increased risk of opportunistic infections and cancers (Maartens, Celum & Lewin, 2014).

HIV infection has three stages; the acute stage, the clinical latency stage, and AIDS. In the acute stage, an infected individual, 2 to 4 weeks after the infection may experience flu-like symptoms such as aching muscles, chills, fatigue, fever, mouth ulcers, night sweats, rashes, sore throat, and swollen lymph nodes (Rai, Dutta & Gulatti, 2010). The virus reproduces slowly in the clinical latency. Certain individuals however do not experience any symptoms during the first two stages. Thus, their CD4 count may decrease slowly till they develop AIDS if the infection is not detected early enough (Rai, Dutta & Gulatti, 2010). Only a HIV test would reveal that the individual is infected. AIDS is a syndrome that gives rise to the occurrence of diverse infections due to the weakening of the immune system (Maartens, Celum & Lewin, 2014))

Some of the more common symptoms include: blotches under the skin or in the mouth and nose, blurred vision, chronic diarrhea, continuous swelling of the lymph glands, extreme fatigue, fever that keeps returning, neurological issues including memory loss, pneumonia, rapid weight loss, sores in the mouth, anus, or genitals. AIDS (Acquired Immunodeficiency Syndrome) typically develops between 2 and 15 years after the infection if the individual is not treated. The progression of

the infection and disease is also dependent on factors such as the individual's age, general health, genetics, the presence of other infections, and standard of health care. AIDS can be diagnosed if an individual's CD4 count drops to under 200 cells/mm^3. The CD4 cell count in healthy individuals ranges from 500 to 1600 cells per cubic millimeter of blood (Moncivaiz, 2020).

HIV/AIDS has been a serious challenge to health and life worldwide, necessitating global concerted efforts to deal with the epidemic. In 1991, the Global Programme on AIDS at the World Health Organization predicted that by 2000 the cumulative global total of HIV infections in men, women and children would be 40 million (Global Programme on AIDS, 1991). However, the figure proved to be a serious underestimate as the cumulative total number of HIV infections in 2000 stood at 56 million (Joint United Nations Programme on HIV/AIDS and World Health Organization, 2000). HIV is one of the leading contributors to the global burden of disease. In 2010, HIV was the leading cause of disability adjusted life years worldwide for people aged 30-44 years and the fifth leading cause worldwide for all ages. Over 20 million individuals have already died of HIV/AIDS by the year 2001 (Piot, Bartos, Ghys, Walker & Schwartländer, 2001).

There have been a lot of campaigns to disseminate information on preventive measures. HIV infection can be prevented through safe sex practices such as the usage of condoms, reduction of sexual partners, abstinence from sex, and avoiding sharing needles. There is no known vaccine or cure for HIV. However, antiretroviral therapy has been been very beneficial to patients in boosting their immune system. The treatment reduces the viral burden and raises the cluster of differentiation (CD4) cell counts. With the immune system boosted, there is a resulting reduction of opportunistic infections and an improved health-related quality of life. Antiretroviral treatment increases the rate of survival of patients (Powderly, 2002, Maartens, Celum & Lewin, 2014). Early detection of HIV followed by antiretroviral treatment may help patients live a healthy and normal life. Since the introduction of antiretroviral therapy, there has been a decrease in the global incidence of HIV infections and an increase in the global prevalence of HIV.

The global prevalence of HIV increased from 31 million in 2002 to 35.3 million in 2012, whereas the global incidence decreased from 3.3 million in 2002 to 2.3 million in 2012. The increase in prevalence can be attributed to the fact that many patients are able to live longer due to

antiretroviral therapy. Meanwhile, the reduction in the incidence could be attributed predominantly to the reduction in contamination between heterosexual partners. The Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO), have indicted that there were 37.9 million people living with HIV globally in 2018, of which 36.2 million were adults (UNAIDS, 2019) representing 95.51 % of the global figure. Statistics show that Sub-Saharan African is the most burdened region in the world by the Human Immunodefficiency Virus. 24.2 million of 36.2 million adult patients live in Sub-Saharan Africa. Ghana however has a low-level HIV epidemic (Ali et al., 2019)

There are 330 000 people living with HIV/AIDS in Ghana and 310 000 of them are above 15 years old. There are about 121 985 people on antiretroviral treatment in Ghana as at June 2019 (UNAIDS, 2019).

HIV and Neuropsychological Functioning

Combined antiretroviral treatment has reduced mortality in HIV/AIDS. This reduction in mortality however has also increased the prevalence of cognitive deficits (Heaton et al., 2011). HIV infection exposes patients not only to medical complications but also to neurocognitive impairments (Mohammed, 2014; Mogambery, Dawood, Wilson & Moodley, 2017). The blood-brain barrier normally acts as a filter and prevents access of viruses into the the brain. Nonetheless, immune and structural compromise may facilitate the passage of viral particles into the central nervous system . Thus, the Human Immunodeficiency Virus is able to pass through this filter or gate, and cause damage to brain structures. There is evidence that the virus can also enter the central nervous system through the filter between the cerebrospinal fluid, and the blood. When this barrier is breached, the contamination of the virus could be spread to structures such as the choroid plexus (Schwerk, Tenenbaum, Kim & Schroten, 2015; Sillman, Woldstad, Mcmillan, & Gendelman, 2018). It is not known exactly how the infection from the Human Immunodeficiency Virus is spread among structures of the brain. However, it is believed that the contamination to the structures of the central nervous system is facilitated through infection of glial cells, macrophage transmigration, and transcytosis (Sillman, Woldstad, McMillan & Gendelman, 2018).

After the invasion of the CNS, the virus is able to damage some brain cells. The sizes of structures such as the pons, the hippocampus, and the basal ganglia could be altered by the virus. This could result in impairments in learning and processing speed. In very severe cases, especially without antiretroviral therapy, the patient may suffer from AIDS dementia. However, with many HIV patients on combined Antiretroviral Therapy (cART), there has been evidence of milder forms of deficits. Half the population of HIV-Positive patients suffer from HIV-Associated Neurocognitive Disorders (Cysique et al., 2015; Smail & Brew, 2018) These alterations of brain structures lead to deficits in information processing, motor deficits, working memory/attention deficits, learning and retrieval memory impairmment, verbal fluency deficits, and executive dysfunctions (Gupta et al., 2007; Robertson et al., 2007; Yepthomi et al., 2006). Mostly, affected patients show symptoms of cognitive slowing, poor concentration, and memory problems. These deficits are detected through neuropsychological testing and brain imagery. According to Habib et al. (2013), HIV is a major predisposing factor for cognitive impairment. Also, 37% of HIV+ patients showed deficits in all cognitive and motor domains (memory, executive functioning, psychomotor speed, language, information processing speed and capacity, as well as fine motor ability) when compared to matched, uninfected control participants (Lawler et al., 2011). Studies have also shown that HIV positive individuals who are being treated with antiretroviral therapy may experience cognitive deficits (Seider et al, 2014, Nightingale & Winston, 2017)

HIV infected individuals also experience a lot of psychosocial difficulties (Mohammed, 2014; Mogambery, Dawood, Wilson & Moodley, 2017). Psychosocial factors are said to influence the individual's ability to cope with HIV/AIDS even more than the severity of the disease. HIV infection comes with a lot of stigma and discrimination. HIV/AIDS related stigmatization and discrimination is "a process of devaluation of people either living with or associated with HIV and AIDS" (Patankar & Pandit, 2014). Due to the stigma and discrimination associated with the infection, patients have to hide their status and live in a sort of 'isolation' even when they are surrounded by other people because they cannot open up about their seropositive status. This can be a significant source of stress for the patient. This sense of isolation may lead to depression. Also, the thought of having to live with an incurable disease affects the individual in their daily activities. Most people consider HIV to be a

death sentence. This makes it difficult for HIV patients to be able to attend to their daily activities normally.

They may experience low productivity and lack of motivation. Some may even engage in risky sexual behaviors.

From the study of Banerjee, Pensi, Lohia and Gurprit (2007), 80.7% of the retro-infected patients had behavioral problems as compared to 18.3% of healthy control group (Banerjee, Pensi, Lohia & Gurprit, 2007). Cognitive impairments and psychosocial difficulties associated with HIV infection affect the quality of life of the patients (Miners et al., 2014).

People living with HIV/AIDS do not only face stigma and discrimination but also face other mental health challenges. Mental health disorders in people living with HIV may impede on treatment initiation, treatment adherence and also treatment outcome. Two of the most common mental health conditions faced by people living with HIV/AIDS are depression and anxiety (Hafeez, 2018). According to Chandra, Desai and Ranjan (2005), depression is the commonest psychiatric syndrome in people living with HIV/AIDS. In addition majority of patients with depressive symptoms also present with prominent anxiety symptoms.

Studies have shown that depression for instance is more common among patients who are not on treatment. However, antiretroviral therapy does not directly address mental health problems. Factors that are likely to influence mental health prevalence are viral load, central nervous system pathology, associated psychosocial stressors and the nature of HIV as a life-threatening and stigmatized illness (Nightingale & Winston, 2017).

HIV and Quality of Life

A person's quality of life (QOL) can be defined as their own "perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, standards, expectations and concerns" (Basavaraj, Navya & Rashmi, 2010). A review by Basavaraj, Navya & Rashmi (2010) highlights the relevance and complexity of physical, psychological, and social factors as determinants of health-related quality of life in HIV-infected persons. Existing data

suggest that physical manifestations, antiretroviral therapy, psychological well-being, social support systems, coping strategies, spiritual well-being, and psychiatric comorbidities are all important predictors of QOL of HIV-positive patients. Cognitive impairments and psychosocial difficulties associated with HIV infection affect the quality of life of the patients (Miners et al., 2014)

Problem Statement

The inception of combined antiretroviral therapy has given HIV positive patients the opportunity to live longer. Thus, the therapy helps to reduce the weakening effects of the virus on the immune system. However, as patients live longer, they also present with mild cognitive and behavioral impairments (McArthur, 2004). Meanwhile, information on the neuropsychological functioning of adults living with HIV seems not to be available for the better treatment and management of patients living with HIV in Ghana. Studies conducted on HIV positive patients in Ghana have focused on their medication adherence as is the example of the study by Ankrah et al. (2016) who did an investigation on the factors that facilitate the adherence to antiretroviral therapy as well as the barriers to antiretroviral medication adherence. Aside medication adherence, other studies on HIV patients in Ghana have looked at experiences of HIV positive patients in terms of stigmatization (Asiedu & Myers-Bowman, 2014), and also interventions to reduce stigma (Nyblade et al., 2020) The aim of this study is to determine the neuropsychological functioning of adults living with HIV in Ghana, and the resulting impact on their quality of life.

Aim and Objectives

The main aim of this study is to examine the neuropsychological functioning and quality of life of adults living with HIV.

Specific objectives of this study are:

1. To examine the effects of HIV infection on patients' neuropsychological functioning.
2. To investigate behavioral functioning and quality of life among HIV patients.
3. To examine the relationship between neuropsychological functioning and quality of life of HIV patients.

4. To investigate disease duration and its impact on psychological distress and quality of life of HIV patients.

Relevance of the study

This study seeks to provide the Ministry of Health, the Ghana Aids Commission and other stakeholders in the management of HIV/AIDS like the Ghana Health Service with information about the neuropsychological functioning of affected individuals. There is evidence that about half of the population of HIV-positive patients experience cognitive deficits. However, to the knowledge of the researcher, there is not enough evidence on the neuropsychological functioning among adults in Ghana. Findings from this study will present evidence that would be beneficial to practitioners in the screening, diagnostics, management and referral services when working with patients. This study uses neuropsychological tests to detect neuropsychological impairments which complements the use of brain imagery in the detection of neurocognitive defects used in other studies (Thomadis et a.l, 2010)

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter discusses theories that were employed to guide this study, which are Luria's working brain model and the Health Related Quality of Life (HRQOL) theory. These theories help explain and understand the neuropsychological functioning of people living with HIV/AIDS. Related studies on neuropsychological functioning among HIV positive patients are reviewed. The rationale of the study, and the statement of hypotheses are introduced. Finally, this chapter explains the proposed conceptual model and the operational definition of terms used in the study.

Theoretical Framework

Luria's working brain model

Luria posited that the brain has three functional units. These three units, though they are individually associated with different brain structures do not work in isolation but rather work together, and each unit is important and necessary in the execution of any mental activity. Luria identified the first unit as the arousal and attention unit, the second unit as the sensory input and integration unit, and the third unit as the executive planning and organization unit (Zaytseva, Chan, Pöppel & Heinz, 2015).

The arousal and attention unit which is the first unit contains structures of the brain stem particularly the reticular activation system, the thalamus, and the monoaminergic cell groups in the brainstem. This unit activates cortical tone, and regulates alertness (Grønli, & Ursin, 2009, Téllez & Sánchez, 2016). Thus, this unit allows an individual to move into different activities and initiate a selective focus of attention . An impairment in the first unit would lead to an impairment in the cognitive activities in the other two functional units (Languis & Miller, 1992).

The brain structures involved in the second unit known as the sensory input and integration unit, are in the neortex, including the parietal, occipital, and temporal lobes. As the sensory input and

integration unit of the brain, the function of this component is to receive, process, integrate, and store information from external stimuli (Kostyanaya & Rossouw, 2013). An important principle of this unit is that, there is a hierarchical organization that characterizes it's functioning. There are three zones or areas. The primary zone of the cortex within this unit has sensory and motor neurons that respond to various types of stimuli and other cells that do not respond to any modally specific type of stimuli. The secondary area contains cells that are more associative. These neurons process the impulses received and integrate them into complex sensations, as well as synthesizing the information into complex perceptions (Zaytseva, Chan, Pöppel & Heinz, 2015). The tertiary area known as the "zones of overlapping is responsible for complex forms of mental activity which requires the integrated participation of various structures of the cortex.

The third functional unit which is the executive planning and organizing unit is associated with the frontal and prefrontal lobes. This unit is responsible for higher mental processes such as planning, intention, programming, controling impulses, regulating voluntary behaviors, spontaneous speech, sustained attention, awareness, insight, problem-solving, planning, and self-monitoring (Stretton & Thompson, 2012, Téllez & Sánchez, 2016).

These three functional units work together in the execution of any mental activity. Every type of behavior requires the simultaneous performance of all three units. The ability to produce a specific or desired behavior is regulated by the concerted functioning of all three units. Thus, for the execution of a conscious mental activity, the first unit would provide the needed cortical tone, the second unit would analyze and synthesize the information being received, and the third unit would regulate and verify the conscious activity (Languis & Miller, 1992).

The Human Immunodeficiency Virus invades the central nervous system (Carroll & Brew, 2017). A damage to a structure in one unit does not only impair the function of that unit but impairs the function of the entire system. The inability to perform a particular task does not however necessarily indicate an impairment in one part of the brain, but rather indicates a dysfunction in the entire integrative function of all units. Consequently, the cohesion of the system made up of the three units is disrupted, and functions differently from desired functioning, when there is a damage to a structure in any unit. Thus, an HIV positive patient may experience undesired behavioral patterns due

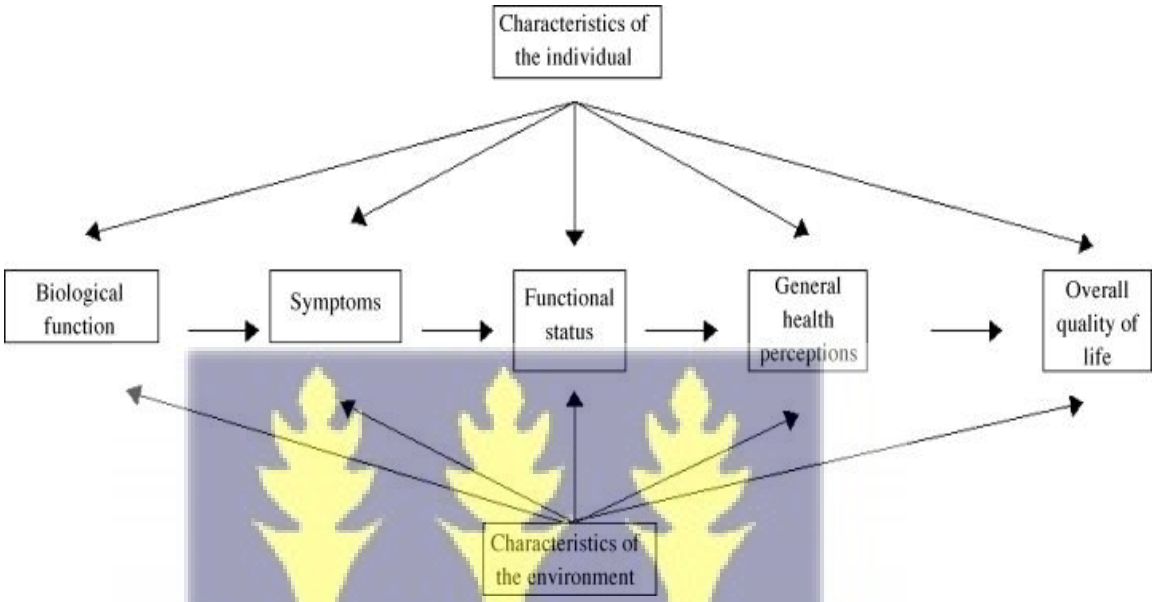
to the propagation of the infection to structures of the brain. Montgomery, Dawood, Wilson and Moodley (2017) have reported that HIV affects brain structures which leads to impairment in some brain functions. These cognitive impairments may include deficits in cognitive areas such as verbal skills and language, attention, recall and learning (Nightingale & Winston, 2017). The cohesion of the system made up of the three units is disrupted, and functions differently from desired functioning, when there is a damage to a structure in any unit (Zaytseva, Chan, Pöppel & Heinz, 2015). This means that damage to any unit of the brain affects the concerted functioning of all three units. This will result in deficits in behavioral functioning for patients living with HIV if there is damage to any of the unit or structures involved in attention, recall, learning, and verbal skills.

The Health-Related Quality of Life (HRQOL) Theory (Wilson & Cleary, 1995; Ferrans, Zerwic, Wilbur & Larson, 2005)

The Health-Related Quality of Life (HRQOL) Theory is a theory that looks at how health or an ailment affects one's quality of life. It was revised by Ferrans, Zerwic, Wilbur and Larson (2005). The theory posits that there are five types of measures of patient outcomes. The five outcomes are biological function, symptoms, functional status, general health perceptions, and overall quality of life. The patient's biological function, is assessed through laboratory tests and medical diagnosis. Symptoms can be physical, emotional, and cognitive. Thirdly, the functional status of the patient refers to how they function physically, psychologically, and socially. The fourth outcome, general health perceptions, refers to how subjectively a patient rates all the preceding outcomes. The overall quality refers to how satisfied a patient is with their life. Figure 2.1 describes the relationships between the variables. The presence of a pathology alters the patient's biological function which has effects on the other patient outcomes. Similarly, any challenge to a particular outcome affects the outcome or outcomes that follows it as described by Figure 2.1. There are also individual characteristics as well as environmental characteristics that have the tendency of influencing each of the 5 patient outcomes. These individual characteristics are factors such as sex, family history, race, age, motivation that are associated with certain health outcomes. Social relationships and health

providers are factors related to the environment. Together, individual characteristics and the environment can affect a person's quality of life.

Figure 2.1: Health-Related Quality of Life Model



Review of Related Studies

Neuropsychological Deficits in HIV

The HIV epidemic has been a serious issue as it poses a threat to an individual's immune system. Aside weakening the immune system, the virus also affects brain structures which leads to impairment in some brain functions (Mogambery, Dawood, Wilson & Moodley, 2017; Mohammed, 2014). Antiretroviral treatment has been very beneficial to HIV positive patients because it decreases viral burden, boosts the immune system, and helps HIV positive patients to live a normal and longer life. In spite of the benefits of adhering to the treatment, there are mild cognitive challenges that are still prevalent in the era of antiretroviral treatment (Saloner & Cysique, 2017)

Giancola et al. (2006) examined how antiretroviral therapy affects the neuropsychological performance of HIV positive patients. 165 patients adhering to treatment were recruited and

administered cognitive tests which assessed memory, concentration, information processing speed, cognitive flexibility, fine motor skills, and visuospatial and constructional skills. The results indicated that 50.3 % of the participants showed deficits. Older age was also found to be associated with the likelihood of cognitive deficits.

In the USA, Heaton et al. (2010) sampled 1555 people living with HIV. They examined the neuropsychological performance of the participants and found that 52% of the participants showed neuropsychological deficits.

Blackstone et al. (2012) examined the cognitive profile of 1574 respondents living with HIV, using clinical ratings and global deficit scores. The results showed a concordance of 83 % between the two approaches. Using individual approaches, clinical ratings showed that 56% of the respondents were impaired while 41% of the respondents showed deficits by global deficit scores.

In Poland, Gawron et al (2018) investigated the impact of HIV infection and age on the neuropsychological functioning of people living with HIV and adhering to combined antiretroviral treatment. For the purpose of the study, they recruited 91 adult participants for the HIV group and 95 other adult participants for the healthy control group. The two groups were compared on a range of neuropsychological measures. Results showed that Human Immunodeficiency Virus infection was related to impairments in verbal fluency, working memory, attention, and visuomotor function. Older age was also related to impairments in the aforementioned cognitive areas. Further, age played a moderating role on the relationship between duration of combined antiretroviral therapy and visuomotor skills.

In Uganda, a study by Robertson et al (2007), sought to examine the neuropsychological functioning of HIV patients, 210 participants were recruited to investigate the neuropsychological functioning of HIV positive patients. The participants of the study were made up of 110 HIV positive patients for the case sample, and 100 respondents without HIV infection for the control sample. The two groups were compared on neuropsychological tests assessing learning, memory, mental flexibility, concentration, attention, and motor function. The results showed that the two groups were significantly on executive function, information processing, mental flexibility, concentration, attention, verbal learning, memory, and motor functioning.

In Malawi, Kelly et al (2014) conducted a study in which the prevalence of mild cognitive deficits in HIV was assessed. Participants in the study comprised 106 people living with HIV and adhering to combination antiretroviral therapy. Diagnosis of HIV associated neurocognitive disorder was done using the Frascati Criteria and Global Deficit Score. 15 % of the HIV participants were diagnosed with symptomatic neurocognitive impairment. Also, 55% of the HIV sample was diagnosed with asymptomatic neurocognitive impairment.

In Cameroon, Kanmogne et al. (2010) assessed the neurocognitive functioning of 44 adults living with HIV who were matched demographically with 44 healthy controls. The findings indicated that the HIV sample performed worse than the health controls. Impairments were noticed in these cognitive domains: working memory, exucutive function, information processing speed, and psychomotor speed. Further, comparing HIV patients with AIDS and HIV patients without AIDS, showed worse deficits in the HIV with AIDS group. This suggested that performance on cognitive tests gets worse with the progression of HIV infection into advanced stages..

In South Africa, Casimjee and Motswai (2017) also found significant differences between a HIV positive sample and a HIV negative sample, on neuropsychological functioning. The sample sizes for each group were 33 and 17 respectively. The findings showed worse performance from the case sample compared to the control sample. These impairments were seen in executive function, processing speed, memory, and global cognitive functioning. Impairments were also seen in visuoconstructional abilities and psychomotor function. The findings suggest that further research in South Africa and other parts of Africa including Ghana will be relevant to knowledge of the neuropsychologicalfunctioning of HIV positive adult patients. These findings will also contribute towards better and holistic intervention strategies that address patients' mental health in addition to their physical health.

In Ghana, Mohammed (2014) did a study to determine the pattern of neuropsychological and psychosocial problems experienced by paediatric HIV outpatients on highly active antiretroviral therapy. Forty-two participants comprising twenty HIV pediatric patients on antiretroviral therapy, and twenty-two healthy controls from a school based population matched on age, socioeconomic status and education were recruited. Findings indicated that pediatric HIV patients experience

neurocognitive impairments in the domains of attention and information processing speed as compared to the healthy controls. Further, paediatric HIV patients had more problems with psychosocial functioning particularly in relation to stigma as compared to their healthy controls.

Neuropsychological Functioning and Quality of Life

Doyle et al. (2012) investigated associations between prospective memory and health-related quality of life in 72 older (≥50 years) and 41 younger (≤40 years) HIV-infected adults. Results showed that self-reported performance complaints predicted health-related quality of life among both older and younger adults. Further, a significant interaction was found between performance-based prospective memory and age group on health-related quality of life, such that lower time-based prospective memory was associated with lower health-related quality of life in the younger cohort. In addition, time-based and self-reported prospective memory significantly predicted mental health-related quality of life independent of other risk factors, in the younger group. The findings show the unique role that prospective memory plays in health-related quality of life outcomes among younger persons living with HIV infection.

Moore et al. (2014) recruited seventy younger (≤40 years) and 107 older (≥50 years) HIV+ adults, as well as age-matched seronegative comparison groups of younger (N = 48) and older (N = 77) participants.They completed a comprehensive battery of neuropsychological, psychiatric, medical, and health-related quality of life assessments. The results showed that HIV infection had effects on coginitive impairments which also affected the health related-quality of life of adults living and growing with HIV.

In a study by Szymańska et al. (2017) that sought to investigate the neuropsychological functioning and quality of life among HIV positive men on antiretroviral therapy who have sex with men, ninety five HIV(+) individuals and 95 HIV-uninfected controls, matched on socio-demographic variables were recruited. A battery of neuropsychological tests and psychological questionnaires including quality of life were administered to the participants. Results from performance on the tests showed worse outcomes in attention, working memory, language, storage, retrieval, and process of

learning for the HIV positive cohort. They also performed worse than the uninfected controls in quality of life.

Amara (2019) examined the association between neurocognitive impairment and health-related quality of life. Thousand three hundred and forty HIV positive individuals participated in the study.Factor analysis was employed to summarize the 35-item Medical Outcome Survey questionnaire into physical and mental health-related quality of life scores. General linear models were employed to investigate the association between neurocognitive impairment and health-related quality of life. Results showed worse performance for impaired participants versus unimpaired participants in quality of life.

Mayo et al. (2019) designed a cross-sectional study to estimate the extent to which HIV-related variables, cognition, and other brain health factors interrelate with other HIV-associated symptoms to influence function, health perception, and QOL in older HIV+ men in Canada. Seven hundred and seven (707) men aged 35 and above, whom were HIV+ for at least one year, without clinically diagnosed dementia participated in the study. Five latent and 21 observed variables from the World Health Organization's biopsychosocial model for functioning and disability and the Wilson–Cleary Model were analysed. SEM was used to link disease factors to symptoms, impairments, function, health perception, and QOL with a focus on cognition. The results showed that the participants' cognitive performance had effects on their quality of life.

Rubstova et al.(2020) sought to determine the independent effects of neurocognitive impairment and frailty, and the interactive effects with HIV serostatus on health-related quality of life.. They recruited 121 adults comprising 63 adults living with HIV and 58 healthy controls. Health-related quality of life was measured with the Medical Outcome Study SF-36 scale. Results showed a stronger significant association between frailty and health-related quality of life in the HIV sample compared to the healthy controls..

A cross-sectional cohort study by van Opstal et al. (2021) sought to investigate the neuropsychological and psychosocial functioning of a group of perinatally HIV-infected children in the Netherlands by comparing their outcomes with Dutch normative data and outcomes of a control

group of uninfected siblings. Findings showed compromised functioning when compared to Dutch normative data for HIV-infected children in the areas of attention, sensory processing, social-emotional functioning, and health-related quality of life.

Psychological Wellbeing and Quality of life in HIV

Dalmida, Koenig, Holstad and Wirani (2013) looked at depression in HIV positive patients, and how they cope with the disease. They selected 292 HIV positive patients. The results indicated that 56.7% of the sample showed symptoms of depression. Further, their adherence to treatment was poor as well as their quality of life. The researchers also found that social support played a mediating role in the relationship between symptoms of depression and religious coping. This is an indication that psychological testing is important in the management of HIV positive people.

Zhang, Li, Liu, Zhou, Shen and Chen (2018) conducted a cross-sectional study in Guangxi Zhuang Autonomous Region (Guangxi) from 2012 to 2013 in China, on how stigma affects HIV positive individuals. 2,987 participants completed the survey. HIV stigma including perceived, internalized, and enacted stigma, were measured. The results showed that stigma leads to higher psychosocial distress. However, resilience, and self-esteem can decrease psychosocial distress.

In Ghana, Oppong Asante (2012) conducted a study in which he examined the psychological wellbeing of HIV positive patients. A sample of 107 was used for this study. Females presented more depressive symptoms as well as more stress and anxiety than men. Low social support significantly predicted depressive and stress symptoms. Older age was associated with increasing scores of stress. This highlights the necessity of interventions for HIV positive patients and a meaningful social support system.

A review by Basavaraj, Navya and Rashmi (2010) made light of major factors that are crucial as far as the quality of life of HIV positive patients is concerned. Some of the factors were seen to mainly be adherence to treatment, coping skills, spirituality, and supportive systems. These factors are important in improving quality of life.

Hipolito, Oliveira, Costa, Marques, Pereira and Gomes (2017) developed a study in Brazil to assess the quality of life of HIV positive patients. They also looked at variables such as disease

duration and health satisfaction. Higher satisfaction with health was associated with better quality of life. Being able to cope with the disease necessitates spirituality and good social support systems.

To assess HIV positive patients' quality of life, Andrade et al. (2020) developed a study, carried out in two Specialized Assistance Services, with 356 HIV positive people. The comparison between the domain scores of the measure was performed. The domains that showed the best results in averages were Psychological, Social Relations, and Level of Independence. The domain that had the greatest determination was the Psychological, followed by Social Relations. The lowest determination was the Spirituality domain. No domain had a score considered high.

Cecilio, Oliveira, Oliveira, Domingues, and Marques (2018) studied the quality of life of HIV positive patients. A sample size of 281 was selected. The findings indicated that males performed better than women. Education, employment, adherence to treatment, disease duration, preventive measures, good perception of health were important factors affecting good quality of life.

Handayani, Ratnasari, Husna, Marni, Tantut and Susanto (2019) assessed the quality of life of HIV patients. They selected 39 HIV patients. The results suggested that HIV affects all the domains of quality of life. Thus, social relationships and support groups are important in improving the quality of life of HIV patients.

Studies reviewed focused on either neurocognitive, behavioral and quality of life of patients living with HIV. In order to understand better the neuropsychological profiles of HIV adults as well as the mental health challenges they face, it is necessary for this current study to look at the cognitive functioning, behavioral functioning and quality of life of adults living with HIV.

Folasire, Irabor and Folasire (2012) conducted a study to assess the quality of life of people living with HIV and AIDS in Nigeria. 150 patients who were on antiretroviral treatment were sampled. Satisfaction with perceived social support and quality of life were measured. The results showed high quality of life scores on the physical, psychological, and environmental domains of quality of life. These findings may indicate the effectiveness of treatment and interventions the HIV patients are exposed to. However, the relatively low social domain scores may indicate weak social support systems due to stigmatization and discrimination.

Enimil et al (2015) recruited 40 adolescents living with HIV for a for a mixed-method study. Respondents reported issues with inadequate social support, stigma, limited resources and low quality of life and barriers to treatment adherence.

Osei-Yeboah et al (2017) conducted a study to assess the quality of life of people living with HIV in Ghana. A sample of 158 participants was selected for the study. 79.75 % of the sample showed good overall quality of life. Poor overall quality of life was associated with factors such as occupation, perception of health , and sexual activity.

Critique of studies to date

Studies reviewed to date showed that HIV affects the neuropsychological functioning of people living with the infection even in the era of antiretroviral therapy (Cysique et al 2014). Before the era of combined antiretroviral therapy, HIV-associated dementia was more common. However, with the use of antiretroviral therapy, the prevalence of HIV-associated dementia has decreased while milder levels of cognitive deficits have become more prevalent (McArthur, 2004, Sacktor et al., 2016). Predominantly, studies reviewed showed deficits across cognitive domains such as executive function (Kanmogne et al, 2010), attention and concentration, verbal learning and memory, visuoconstructional skills, information processing speed, and psychomotor functioning (Gawron et al., 2018, Robertson et al., 2007)

However, these studies were narrow in their focus. Many studies looked at a single aspect or few aspects of neuropsychological functioning while ignoring others. Mohammed (2014) studied the neuropsychological functioning of children living with HIV. Cognitive testing and behavioral assessment were employed but quality of life was not studied. Quality of life is an important aspect of neuropsychological functioning (Martindale et al., 2016).

HIV patients face various psychological issues such as stigma and discrimination. Stigma and discrimination are likely to lead to depression and anxiety (Saki, Kermanshah, Mohammadi & Mohraz, 2015). Some studies looked at the quality of life of people living with HIV, but did not measure their level of depression or anxiety. Depression and anxiety are likely to lead to low quality of life. Depression and anxiety could also be associated with neurocognitive impairments (Perini et

al., 2019). Thus, the HIV patient may show symptoms of depression because they are not able to function adequately as they think they should. Some studies investigated the cognitive profiles of HIV patients without looking at how their cognitive functioning impact their behavioral functioning (Blackstone, 2012, Heaton et al., 2010; Sacktor et al., 2016)

Rationale

Most of the studies reviewed were outside Ghana. To the best knowledge of the researcher, only one study was found on the neuropsychological functioning of people living with HIV in Ghana. One study by Mohammed (2015) focused on pediatric patients. About 94 % of HIV positive patients in Ghana are adults. This makes it very necessary to study the neuropsychological functioning of HIV positive adults in the Ghanaian population.. Also, the study by Mohammed (2015) did not take into account quality of life as an important variable to measure as far as HIV patients are concerned. The current work will thus investigate the neurocognitive functioning, and the behavioral functioning of HIV patients, as well as their quality of life.

Statement of Hypotheses

Hypothesis 1: Adults with HIV will perform poorer compared to healthy controls with respect to neuropsychological functioning.

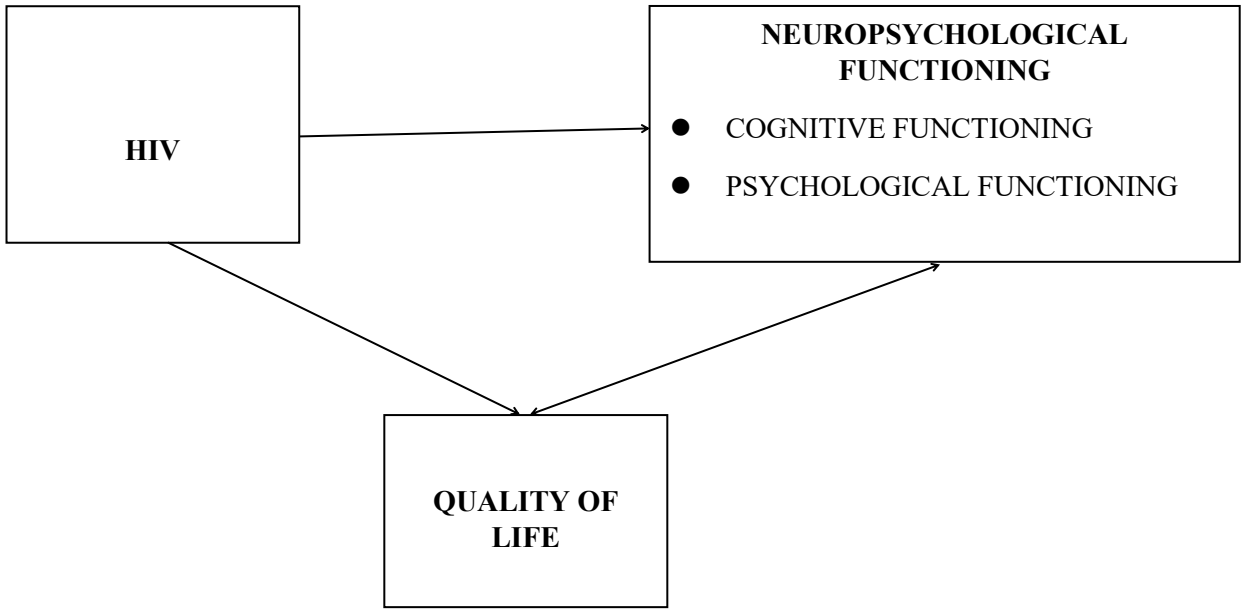
Hypothesis 2: There will be a statistically significant difference between HIV patients and healthy controls on behavioral functioning and quality of life

Hypothesis 3: There will be a statistically significant positive relationship between neuropsychological functioning and quality of life of HIV+ patients.

Hypothesis 4: HIV patients who have lived with the condition for less than 1 year will experience more general distress compared to HIV patients who have lived with the infection for more than 1 year.

Hypothesis 5: HIV patients who have lived with the condition for more than 1 year will have a better quality of life compared to HIV patients who have lived with the condition for less than 1 year.

Figure 2.2: Proposed Conceptual Model



Operational Definitions

Adults: A person who is at least 18 years of age

HIV: Human Immunodeficiency Virus

HAART: (Highly Active Antiretroviral Therapy) are a group of drugs used in managing HIV/AIDS. They can reduce viral burden, and reduce opportunistic infections, thus improving health-related quality of life.

HIV patients: Individuals diagnosed clinically with Human Immunodeficiency Virus.

Healthy Controls: Individuals who have no known medical condition.

Neuropsychological/Cognitive functioning: Skills related to attention, concentration, memory, and visuospatial skills.

Behavioral functioning: This has to do with a person's psychosocial health. The ability to respond appropriately in social interactions with other people, behave in socially acceptable ways and to be able to control maladaptive patterns of thought and behaviour.

Quality of Life: The general and specific views an individual holds about how good their everyday life is.

CHAPTER THREE

METHODOLOGY

Research Design

This is a quantitative study. A case-control design was employed to examine differences between two different populations. The first population is infected by HIV while the second population is made up of seronegatives in terms of HIV infection.

Population/Participants

The primary population comprised male and female adult patients living with HIV at the Korle-Bu Teaching Hospital. This population was chosen due to the fact that it covered individuals with various socioeconomic and disorder characteristics across Ghana. A varied level of demographic qualities was easier and possible at a tertiary-level health provider like Korle-Bu Teaching Hospital. Participants were made of adult HIV patients at the Korle-Bu Teaching Hospital. Healthy controls were also recruited at the University of Ghana and Korle-Bu Teaching Hospital..

HIV Sample (HIV)

Inclusion criteria

1. Is at least 18 years old.
2. Medical diagnosis as HIV positive
3. Should have a minimum of a BECE certificate in order to be able to comprehend the test.

Exclusion criteria

1. Diagnosed of a psychiatric condition
2. Has an alcohol or drug addiction.
3. Has any physical challenges that could impair motor performance.
4. Has a history of traumatic brain injury.

Healthy Control Sample (HC)

Inclusion Criteria:

1. No diagnosis of HIV
2. Should have a minimum of a BECE certificate in order to be able to comprehend the test.

Exclusion Criteria:

1. Diagnosed of a psychiatric condition
2. Has an addiction with alcohol or drug use.
3. Has a history of traumatic brain injury.

Sampling Technique

A purposive sampling technique was used to select the HIV adult patients at the Korle-Bu Teaching Hospital because the study targeted a specific population and the respondents were available at the Korle-Bu Teaching Hospital.

The control sample was recruited using the convenience sampling technique. Only respondents who were willing to participate were included in the study. Healthy controls were selected from the University of Ghana, Legon and Korle-Bu Teaching Hospital. Biases associated from the selection of controls may stem from their level of education which on average may be higher than that of the case sample. Age, gender, and number of years of education were controlled.

Sample size

A sample size of 172 comprising 112 patients living with HIV and 60 controls was selected to participate in this study. The sample comprised 94 females and 78 males. There were more females than male participants in the HIV sample (63.4% versus 36.6). In the Healthy Controls sample, there were more males than female participants (61.7% versus 38.3%). Majority of the respondents were between 18-29 years for the Healthy Controls sample (86.7%), while majority of the respondents from the HIV sample were between the ages of 30-55. Also, most of the respondents from the Healthy Controls sample have a tertiary education (15 years) while most of the respondents from the

HIV sample have a secondary education (9.46). Further, it can also be observed from the table that most of the respondents are Christians (HIV, 84.7%; HC, 93.3%)

Instruments/Measures

California Verbal Learning Test-Second Edition Short Form [CVLT-II Short Form] (Delis, Kramer, Kaplan & Ober, 2000)

The CVLT-II Short Form is a shorter form compared to other forms such as the standard and the alternate. The test is a verbal learning and memory test which presents a list of 9 words that the person being tested is supposed to learn and immediately recall in no particular order over 4 trials. After the 4 immediate recall trials, there are delayed free recall trials (short and long), as well as cued recall trials that they are tested on. The list contains words that are fruits, clothing, and tools. The interviewee is also tested with a longer list of words containing false positives in order for them to recognize or recall the words on the original list. The test has similar psychometric properties as the longer forms and has a split-half reliability between 0.87 and 0.89.

Digit Span Subtest of the Wechsler Adult Intelligence Scale (Wechsler, 2008)

This test examines an individual's attention and working memory. For the purpose of this work, the Forward and Backward sequences of the test were used. Each of the Forward and Backward sections has a sequence of 8 items. Each item has two trials. The interviewer reads the trials and the person being tested is required to repeat the same sequence of digits being read out. The test is discontinued when the examinee gets both trials of the same item wrong. The sequence becomes longer and more difficult with time. The examinee is awarded a point for each correct trial. A maximum of 16 can be obtained by the participant.

The Cognitive Failures Questionnaire [CFQ] (Broadbent, Cooper, FitzGerald,& Parkes, 1982)

This test has 25 items and is self-reported. It is designed to measure an individual's daily slips with respect to motor function, as well as memory and perception. These slips may suggest forgetfulness or absentmindedness. These errors are reported on a 5 point Likert scale to determine the frequency with which they occur. A sample item on the test is: "Do you find you forget why you went from one

part of the house to the other?" The items are summed up and an overall value between 0 and 100 is generated. The Cognitive Failures Questionnaire has a good reliability value of sores of 0.91 which makes it a good test to rely on.

Brief Symptom Inventory 18 [BSI-18] (Derogatis, 2001)

The BSI-18 is a short version derived from the Symptom Checklist which has 90 items, and the BSI 53. This test is self-reported and has 3 subscales which are Anxiety, Depression, and Somatization. Each of these subscales has 6 items on a 6 point Likert scale. The subscale scores are computed by summing up all the items under the subscales and dividing the sum by the number of items. The general distress score is arrived at by adding up the subscale scores and dividing them by the number of subscales. The BSI-18 has good reliability values between 0.71 and 0.85

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

The Revised Quick Cognitive Screening Test has 48 items and is used as a cognitive screening tool across various cognitive areas such as orientation, spatial neglect, verbal abilities, visuospatial and constructional skills among others. This test has good reliability values that range from .78 to .92.

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

The WHOQOL-BREF has 26 items, and is a shorter version of the original version which has 100 items. The test examines an individual's quality of life across 4 domains which are physical, psychological, social relationships, and environment. The test has similar psychometric properties to the original version of 100 items, and the reliability values range from 0.66 to 0.87.

Pilot Study

A preliminary study was first conducted to determine the appropriateness of the measures on Ghanaian samples. A sample of 20 participants comprising 10 adults living with HIV and 10 healthy controls was collected. The sample was made up of 8 males and 12 females. The data was analyzed using the Statistical Package

for Social Sciences (SPSS) software version 23. A reliability analysis showed high Cronbach alphas for all the measures.

Procedure

An approval to collect data and conduct this study was sought from the Ethical Committee of the Humanities (ECH) of the University of Ghana.

After the approval, a letter of introduction was obtained from the Department of Pychology, Legon introducing the researcher to the HIV clinic in the Korle-Bu teaching Hospital (KBTH) to permit data collection within three months. Individuals who satisfy the inclusion criteria were asked to sign an informed consent to willingly partake in the study.

After an initial screening, a demographic questionnaire, the respondents were administered a battery of neuropsychological tools, as well as a quality of life measure. Testing averagely took about forty five minutes to complete. During testing, boredom and fatigue were checked frequently to make sure participants are comfortable to continue or given a break if needed. Compensation in the form of a monetary token was given as a sign of appreciation of their time. The nature of this study does not require very sensitive information. Thus, participants did not need any psychological intervention. Findings from this study will be published. Thus, participants were asked to sign to seek their informed consent. The publication of findings would not include any information that would reveal the identity of participants.

Analysis of Data

The data collected was entered into an excel sheet, and analyzed with IBM SPSS tool version 23. Preliminary analyses were foremost conducted to check for the reliability of scores on the measures employed. The normality of scales was also checked. The means, standard deviations, minimum and maximum scores of the variables, and skewness and kurtosis were derived. The relationship among the variables was also analyzed using the Pearson product moment correlation. The hypotheses were tested using the Multiple Analysis of Covariance (MANCOVA), Regression Analysis, and t test.

CHAPTER FOUR

RESULTS

Introduction

This current study sought to examine the neuropsychological functioning of adults living with HIV in Ghana. A quantitative study was conducted to test some hypotheses regarding the cognitive and psychological functioning of HIV patients and how they affect their quality of life. Also, the case sample was compared to healthy controls on the cognitive measures to find out whether there are any differences between the two groups.

Specific objectives of this study are:

i. To examine the effects of HIV infection on patients' neuropsychological functioning
ii. To investigate behavioral functioning and quality of life among HIV patients
iii. To examine the relationship between neuropsychological functioning and quality of life of HIV patients
iv. To investigate disease duration and its impact on psychological distress and quality of life of HIV patients

Preliminary Analyses

Preliminary analyses were first conducted before testing the hypotheses of the study. A data screening was first done. Data transformations were then computed which involved computation of total and subscale scores on the neuropsychological, and quality of life measures. The reliability of the scales, normality of the data distribution, group differences on the variables measured and demographic characteristics of participants were checked. The researcher used Bonferroni Correction to prevent issues of multiple comparisons between the variables measured in this research work.

Table 4.1: Frequency and Percentages of Participants

Variables	Category	Frequency/Percentage	
		HIV(112)	HC(60)
Gender	Male	41(36.6)	37(61.7)
	Female	71(63.4)	23(38.3)
Age	18-29	21(18.8)	52(86.7)
	30-55	91(81.3)	8(13.3)
Mean age of groups		37.14(8.71)	25.85(3.80)
Number of years of education (mean)		9.46yrs	15yrs
Religion	Christianity	94(84.7)	56(93.3)
	Islam	15(13.5)	4(6.7)
	Others	2(1.8)	0(0)

Table 4.1 shows that in terms of gender distribution, there were more females than male participants in the HIV sample (63.4% versus 36.6). In the Healthy Controls sample, there are more males than female participants (61.7% versus 38.3%). Majority of the respondents were between 18-29 years for the Healthy Controls sample (86.7%), while majority of the respondents from the HIV sample were between the ages of 30-55. Also, most of the respondents from the Healthy Controls sample have a tertiary education (15 years) while most of the respondents from the HIV sample have a secondary education (9.46). Further, it can also be observed from the table that most of the respondents are Christians (HIV, 84.7%; HC, 93.3%)

Descriptive Statistics, Normality and Reliability of Variables

The Cronbach alpha coefficient was used to test the reliability of the scales. A value higher than .70 is required for the reliability of scores. The normality of the data was examined to check the skewness and kurtosis of the data According to Tabachnick and Fidell (2007) a data is said to be normally distributed when the skewness values lie within the range of between -1.00 and +1.00 and the kurtosis values lie within the range of between -2.00 and +2.00. Preliminary analyses are summarized in Table 4.2

As shown in Table 4.2 below, the Cronbach alpha coefficient values of most of the tests range between α = .82 and α = .92, which demonstrates high reliability scores. The skewness values also lie

between -.668 and 1.491 and the kurtosis values lie between -.920 and 2.195. Pallant (2011) suggests that skewed scores do not automatically indicate problems with a test.

Table 4.2: Summary of Means, Standard Deviation, Reliability, Minimum, Maximum, Skewness and Kurtosis of Variables

Instruments	*M*	*SD*	Min	Max	A	Skewness	Kurtosis
RQCST	64.14	14.048			.85	-.668	-.239
CVLT	22.53	7.478			.84	-.312	-.920
DIGIT SPAN	14.76	5.234			.82	.258	-.002
SPATIAL SPAN	11.40	5.096			.85	.116	-.833
CFQ	28.64	17.102			.92	.576	.312
BSI	.76	.655			.85	1.491	2.195
QOL	92.78	10.7			.88	-.608	.763

N=172; RQCST = Revised Quick Cognitive Screening Test; CVLT = California Verbal Learning Test II Short Form; DIGIT = Digit Span Subtest of the WAIS; SPATIAL = Spatial Span Subtest of the WAIS; CFQ = Cognitive Failures Questionnaire; BSI = Brief Symtom Inventory-18; QOL = World Health Organization Quality of Life Bref

Table 4.3: Pearson's correlation between Psychological measure and Quality of Life

Variables	1	2	3	4	5	6	7	8	9
1. ANX									
2. SOM	.45**								
3. DEP	.72**	.51**							
4. GSI	.85**	.77**	.88**						
5. PHYS	-.15	-.07	-.25**	-.22**					
6. PSYC	-.15	-.13	-.26**	-.21*	.50**				
7. SOC	-.19*	-.09	-.35**	-.19*	.32**	.34**			
8. ENV	-.12	-.16	-.24**	-.23**	.44**	.53**	.34**		
9. QOL	-.27*	-.30**	-.42**	-.40**	.71**	.78**	.58**	.82**	

NB: 131. 1= Anxiety, 2= Somatization, 3= Depression, 4= Global Severity Index, 5= WHOQOL Physical, 6= WHOQOL Psychological, 7= WHOQOL Social Relationships, 8= WHOQOL Enviroment, 9= WHOQOL Global. *$p < 0.05$ level (2-tailed) ** $p < 0.01$ level (2-tailed)

Table 4.3 shows a significant negative relationship was observed between general distress and quality of life [(r (112) = -.40, p= .000 (2-tailed)]. This indicates an inverse/indirect relationship between the scores on general distress and quality of life. In effect, the higher/lower the level of general distress, the lower/higher the quality of life.

In addition, the relationship between anxiety and quality of life was significant and negative [(r (118) = -.27 p = .003 (2-tailed)], somatization and quality of life [(r (118) = -.30, p= .001 (2-tailed)], depression and quality of life [(r (116) = -.42, p= .000 (2-tailed)]. It indicates an inverse/indirect relationship between the scores on general distress and quality of life. So, when scores on the BSI-18 increase/decrease, the scores on the WHOQOL-BREF will decrease/increase.

With respect to the subscales of the BSI-18 and the subscales of the WHOQOL-BREF, the relationship between, anxiety and social relationships was significant and negative [(r (141) = -.193, p= .022 (2-tailed)], depression and physical[(r (144) = -.25, p= .002 (2-tailed)], depression and psychological [(r (146) = -.26, p= .001 (2-tailed)], depression and social relationships [(r (138) = -.35, p= .000 (2-tailed)], depression and environmental [(r (144) = -.24, p= .003 (2-tailed)]. It indicates that the relationship between the subscales of the BSI-18 and the subscales of the WHOQOL-BREF is indirect. Therefore, when the scores on the BSI-18 increase, the scores on WHOQOL-BREF decrease, and vice versa.

Table 4.4: Pearson's Correlation Table of Cognitive tests and Psychological measure

Variables	1	2	3	4	5	6	7	8	9	10
1. RQCST OR										
2. RQCST VER	.41**									
3. RQCST VIS	.43**	.40**								
4. CVLT IMM	.51**	.69**	.51**							
5. CVLT SD	.59**	.68**	.44**	.86**						
6. CVLT LD	.57**	.67**	.50**	.83**	.86**					
7. DIGIT SPAN	.43**	.70**	.41**	.76**	.67**	.65**				
8. SPATIAL SPAN	.53**	.64**	.53**	.76**	.71**	.70**	.74**			
9. CFQ	.26**	.27**	.25**	.27**	.31**	.31**	.39**	.41**		
10. GSI	-.25**	-.22**	.004	-.18*	-.18*	-.23*	-.04	-.12	.44**	

NB: N=131. RQCST OR = Revised Quick Cognitive Screening Test Orientation; RQCST VER = Revised Quick Cognitive Screening Test Verbal; RQCST VIS = Revised Quick Cognitive Screening Test Visual; CVLT IMM = California Verbal Learning Test Trial 1-4; CVLT SD = California Verbal Learning Test Short Delayed Recall; CVLT LD = California Verbal Learning Test Long Delayed Recall; DIGIT = Digit Span Test; SPATIAL = Spatial Span Test; CFQ = Cognitive Failures Questionnaire; GSI = Brief Symptom Inventory Global Severity Index

*$p < .05$ level (2-tailed) ** $p < .01$ level (2-tailed)

Table 4.4 presents a significant negative relationship between RQCST Orientation and General Distress [(r (143) = -.25 p = .003 (2-tailed)], and between RQCST Verbal and General Distress [(r (143) = -.22, p= .009 (2-tailed)]. This is an inverse/indirect relationship. Thus, when the scores on the RQCST increase/decrease, the scores on General Distress decrease/increase.

Again, the relationship between the CVLT Immediate and General Distress was significantly negative [(r (131) = -.18, p= .037 (2-tailed)], CVLT Short Delayed and General Distress [(r (127) = -.18, p= .040 (2-tailed)], and CVLT Long Delayed and General Distress [(r (126) = -.23, p= .011 (2-tailed)]. It is an indication that the relationship between the CVLT and General Distress is indirect. Therefore, increasing scores on the CVLT are associated with decreasing scores on General Distress, and vice versa

In addition, the relationship between CFQ and General Distress was significantly positive [(r (141) = .44, p= .000 (2-tailed)]. It is an indication that a linear/direct relationship exists between CFQ and General Distress. Therefore, when scores on CFQ increase/decrease, scores on General Distress decrease/increase.

Test of Hypotheses

This sub-section presents the findings from the hypotheses that were tested in the study.

Group Differences on Neuropsychological measures

Hypothesis 1: HIV patients will obtain lower scores on neuropsychological measures compared to healthy controls in these areas:

i) Attention

ii) Memory

iii) Visuospatial abilities

iv) Verbal abilities

A One-Way Multivariate Analysis of Covariance (MANCOVA) was employed to compare the two samples on neuropsychological measures. Age, sex, and number of years of education were used as covariates. Nine dependent variables were used: RQCST Orientation, RQCST Verbal, RQCST Visual, CVLT Immediate, CVLT Short Delayed, CVLT Long Delayed, Digit Span, Spatial Span, and CFQ. The independent variable was the group with two levels (HIV patients against Healthy controls). Table 4.5 shows a summary of the results.

Table 4.5: Summary of MANCOVA results for Cognitive measures

Variables	HIV Patients (N = 73)	Healthy Controls (N = 60)	*F*	*P*	*ŋ2*
RQCST OR	10.86 ± 1.60	11.98 ± .129	4.098	.045	.031
RQCST VER	23.07 ± 8.81	36.15 ± 4.38	27.872	.000	.179
RQCST VIS	24.04 ± 5.78	28.18 ± 3.05	.832	.364	.006
CVLT IMM	18.53 ± 5.60	29.53 ± 3.12	45.487	.000	.262
CVLT SD	4.99 ± 1.92	8.15 ± .86	35.962	.000	.219
CVLT LD	4.48 ± 2.0	7.55 ± 1.06	22.511	.000	.150
DIGIT SPAN	11.86 ± 3.31	19.60 ± 3.88	35.191	.000	.216
SPATIAL SPAN	8.68 ± 3.40	16.42 ± 3.05	45.598	.000	.263
CFQ	23.38 ± 18.39	39.43 ± 11.91	10.831	.001	.078

NOTE: RQCST OR = Revised Quick Cognitive Screening Test Orientation; RQCST VER = Revised Quick Cognitive Screening Test Verbal; RQCST VIS = Revised Quick Cognitive Screening Test Visual; RQCST GLB = Revised Quick Cognitive Screening Test Global; CVLT IMM = California Verbal Learning Test Immediate; CVLT SD = California Verbal Learning Test Short-Delayed; CVLT LD = California Verbal Learning Test Long Delayed; DIGIT = Digit Span; SPATIAL = Spatial Span; CFQ = Cognitive Failures Questionnaire. Bonferroni's correction, $p<.006$

Table 4.5 shows mean differences in scores obtained on neurocognitive measures between HIV positive adults and the control group. Preliminary assumption testing was conducted to check for normality, linearity, multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity. The violation of the covariance and homogeneity assumptions with respect to MANCOVA necessitated the selection of Pillai's Trace.

HIV patients differed significantly from healthy controls on the combined dependent variables, F (9, 120) = 11.55, p = .000; Pillais' Trace =.464; with an effect size $\eta 2$ = .464, Bonferroni's correction, p < .006.

When the results for the dependent variables were considered separately, and using a Bonferroni adjusted alpha level of .006, there was a statistically significant difference between the HIV positive group differed significantly from the control group on RQCST Verbal, F(1, 128) =

27.87, p = .000; CVLT Immediate, F(1, 128) = 45.49, p = .000; CVLT Short Delayed, F(1, 128) = 35.96, p = .000; CVLT Long Delayed, F(1, 128) = 22.51, p = .000; Digit Span, F(1, 128) = 35.19, p = .000; Spatial Span, F(1, 128) = 45.6, p = .000; and CFQ, F(1, 128) = 10.83, p = .001. The only differences that did not reach statistical significance, using a Bonferroni adjusted alpha level of .006, were on the RQCST Orientation F(1, 128) = 4.10 , p = .045, partial eta squared = .031; and RQCST Visual F(1, 128) = .83, p = .364, partial eta squared = .006

An inspection of the mean scores indicated that Healthy Controls (HC) performed better than HIV patients on the cognitive tests: RQCST Orientation [HC, (M = 11.98, SD = .13); HIV, (M = 10.86 , SD = 1.60)]; RQCST Verbal [HC, (M = 36.15, SD = 4.38); HIV, (M = 23.07, SD = 8.81)]; RQCST Visual [HC, (M = 28.18, SD = 3.05); HIV, (M = 24.04 , SD = 5.78)]; CVLT Immediate [HC, (M = 29.53, SD = 3.12); HIV, (M = 18.53 , SD = 5.60)]; CVLT Short Delayed [HC, (M = 8.15, SD = .866.08); HIV, (M = 4.99 , SD = 1.92)]; CVLT Long Delayed [HC, (M = 7.55, SD = 1.06); HIV, (M = 4.48 , SD = 2.00)]; Digit Span [HC, (M = 19.60, SD = 3.88); HIV, (M = 11.86, SD = 3.31)]; Spatial Span [HC, (M = 16.42, SD = 3.05); HIV, (M = 8.68 , SD = 3.40)]; CFQ [HC, (M = 39.43, SD = 11.91); HIV, (M = 23.38, SD = 18.39)].

In summary, the findings indicate that compared to the HIV patients, the Healthy controls performed better on almost all the cognitive measures assessing attention, memory, and verbal abilities, with the exception of visuospatial and orientation measures.

Hypothesis 2: There will be a statistically significant difference between HIV patients and healthy controls on psychological functioning and quality of life.

Differences between the two samples with respect to BSI and Quality of Life were tested using a One-Way Between-Groups Multivariate Analysis of Covariance (MANCOVA). Nine dependent variables were used: BSI-18 Anxiety, BSI-18 Somatization, BSI-18 Depression, BSI-18 General Distress, WHOQOL-Bref Physical Domain, WHOQOL-Bref Psychological Domain, WHOQOL-Bref Social Relationships Domain, WHOQOL-Bref Environmental Domain, WHOQOL-Bref Global Quality of Life. Age, gender, and number of years of education were used as covariates. Table 4.6 presents the results.

Table 4.6: Summary of MANCOVA results for Behavioral measures and Quality of Life

Variables	HIV Patients (*N* = 51)	Healthy Controls (*N* = 60)	*F*	*P*	*η2*
ANX	.67 ± .88	.67 ± .72	.240	.625	.002
SOM	.93 ± .83	.64 ± .62	3.891	.051	.035
DEP	.94 ± .93	.76 ± .62	7.068	.009	.063
GSI	.85 ± .75	.69 ± .56	3.931	.050	.036
PHYS	57.9 ± 14.30	63.3 ± 8.87	2.507	.116	.023
PSYC	63.67 ± 16.36	65.4 ± 8.75	1.666	.200	.015
SOC	68.89 ± 18.78	68.62 ± 14.60	.016	.901	.000
ENV	66.92 ± 16.92	64.40 ± 11.90	.187	.667	.002
QOL	91.86 ± 14.09	93.17 ± 7.11	.772	.382	.007

NOTE: MANCOVA = Multivariate Analysis of Covariance; ANX = Anxiety; SOM = Somatization; DEP = Depression; GSI = Global Severity Index; PHYS = Physical Domain; PSYC = Psychological Domain; SOC = Social Relationships Domain; ENV = Environmental Domain, QOL = Quality of Life, Bonferroni's correction $p < .006$

Table 4.6 shows mean differences in scores obtained on the Brief Symptom Inventory (BSI-18) and WHO Quality of Life Bref (WHOQOL-Bref) of HIV patients and healthy controls. HIV patients and healthy controls differed significantly on the combined dependent variables, F (8, 99) = 2.456, p = .018; Pillai's Trace =.166; with an effect size $\eta 2$ = .166. When the results for the dependent variables were considered separately using a Bonferroni adjusted alpha level of .006, there were no statistically significant differences observed between the HIV patients and Healthy Controls, on Anxiety, F(1, 106) = .240, p = .625, partial eta squared = .002; Somatization, F(1, 106) = 3.89, p = .051, partial eta squared = .035, depression, F(1, 106) = 7.07, p = .009, partial eta squared = .063, General Distress, F(1, 106) = 3.93, p = .05, partial eta squared = .036, WHOQOL Physical, F(1, 106) = 2.51, p = .116, partial eta squared = .023, WHOQOL Psychological, F(1, 106) = 1.67, p = .200, partial eta squared = .015, WHOQOL Social Relationships, F(1, 106) = .02, p = .901, partial eta

squared = .000, WHOQOL Environment, $F(1, 106) = .187$, $p = .667$, partial eta squared = .002, WHOQOL Global, $F(1, 106) = .772$, $p = .382$, partial eta squared = .007.

Comparing the mean scores, the results indicated that the HIV patients experience higher Somatization ($M = .935$, $SD = .831$) than the Healthy Controls ($M = .642$, $SD = .620$). The HIV patients also reported higher Depression ($M = .941$, $SD = .929$) than the controls ($M = .764$, $SD = .623$). Again, the HIV patients recorded more General Distress ($M = .850$, $SD = .750$) than the Healthy Controls ($M = .691$, $SD = .564$). On the domains of the WHOQOL, the Healthy controls obtained higher scores on the WHOQOL Physical ($M = 63.30$, $SD = 8.87$) than the HIV patients ($M = 57.90$, $SD = 14.30$). Healthy Controls ($M = 65.40$, $SD = 8.75$) did better on WHOQOL Psychological than HIV patients ($M = 63.67$, $SD = 16.36$). Healthy controls also obtained higher scores ($M = 66.92$, $SD = 16.92$) than HIV patients ($M = 64.40$, $SD = 11.90$) on WHOQOL Environment. Further, the Healthy Controls ($M = 93.17$, $SD = 7.11$) showed a higher quality of life than HIV patients ($M = 91.86$, $SD = 14.09$)

However, Healthy Controls and HIV patients obtained approximately the same scores on Anxiety [HIV ($M = .67$, $SD = .88$), HC($M = .67$, $SD = .72$)] and WHOQOL Social Relationships [HIV ($M = 68.88$, $SD = 18.78$), HC($M = 68.62$, $SD = 14.60$)].

Hypothesis 3: There will be a statistically significant positive relationship between neuropsychological functioning and quality of life of HIV patients.

Table 4.7: Summary of Hierarchical Multiple Regression for Hypothesis 3

Predictor Variables	B	Std. Error	*β*	*t*	*P*
Model 1	94.395	13.229		7.136	.000
AGE	.022	.220	.014	.098	.922
GENDER	-.514	4.000	-.019	-.129	.898
EDU	-.205	.469	-.064	-.436	.665
Model 2	72.040	20.058		3.592	.001
AGE	-.007	.251	-.005	-.029	.977
GENDER	.011	4.430	.000	.002	.998
EDU	-.852	.569	-.265	-1.497	.142
RQCST OR	1.821	1.601	.212	1.138	.262
RQCST VER	.090	.259	.061	.348	.730
RQCST VIS	.239	.406	.110	.589	.559
CVLT IMM	-.019	.571	-.008	-.034	.973
CVLT SD	-2.274	1.860	-.326	-1.223	.228
CVLT LD	.907	1.616	.137	.562	.577
DIGIT SPAN	.918	.744	.245	1.233	.224
SPATIAL SPAN	.077	.789	.020	.097	.923
CFQ	-.121	.126	-.151	-.956	.344

Hypothesis 3: stated that there will be a statistically significant positive relationship between cognitive functioning and quality of life of HIV patients. A hierarchical multiple regression was carried out to test this hypothesis. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Age, gender, and number of years of education were entered in step 1, explaining 0.4% of the variance in quality of life of HIV patients. After entry of the cognitive measures, the total variance explained by the model as a whole was 15.2%, $F(12, 41) = .611$, $p = .820$. The cognitive measures explained an additional 14.7% of the variance in quality of life, after controlling for age, gender, and number of years of education, R squared change = .147, F change $(9, 41) = .791$, $p = .626$. The cognitive measures were not significant predictors of quality of life. The hypothesis therefore was not supported.

Hypothesis 4: Differences in distress among newly diagnosed HIV patients and those who have been living with the condition for more than a year were investigated. An independent t test analysis was conducted and results are summarized in Table 4.8

Table 4.8: Summary of t-test results on Global Severity Index between the newly diagnosed HIV patients and those who have lived with the condition for more than 1 year

Tests	≤12 months	>12 months	df	*t*	*p*
	N= 31	N= 24			
ANX	.84 ± 1.11	.47 ± .68	50.80	1.559	.125
	N= 32	N= 26			
SOM	1.06 ± .95	.69 ± .76	56	1.594	.117
	N= 30	N= 24			
DEP	1.17 ± 1.05	.53 ± .75	52	2.525	.015
	N= 28	N= 24			
GSI	.95 ± .80	.57 ± .66	50	1.842	.071

Table 4.8 shows mean differences in HIV patients who have lived with the condition for less than 1 year and those who have lived with the condition for over 1 year. It can be concluded that there was no statistically significant difference in distress of the two groups, 0-12 months (*M*= .95, *SD*= .80) and > 12 months (*M*= .57, SD= .66; *t* (50) = 1.842, *p* = .071, two-tailed.

The mean difference observed is = .38, 95% CI: -.03 to .79)

Therefore the hypothesis was not supported.

In addition, there was no statistically significant difference in anxiety and somatization between the two groups.

Anxiety: 0-12 months (*M* = .84, *SD* = 1.11) and >12 months (*M* = .47, *SD* = .68; *t* (50.80) = 1.559, *p* = .125, two-tailed.

Somatization: 0-12 months (*M*= 1.06, *SD*= .95) and >12 months (*M*= .69, *SD*= .76.; *t*(56)= 1.594, *p* = .117, two-tailed.

However, there was a statistically significant difference between the two groups in depression, 0-12 months (M= 1.17, SD= 1.05) and >12 months (M= .53, SD= .75.; $t(52)$= 2.525, p = .015, two-tailed.

Hypothesis 5: Differences in quality of life among newly diagnosed HIV patients and those who have been living with the condition for more than a year were investigated. An independent t test analysis was conducted and results are summarized in Table 4.8

Table 4.9: Summary of t-test results on Global Severity Index between the newly diagnosed HIV patients and those who have lived with the condition for more than 1 year

Tests	≤12 months	>12 months	*df*	*t*	*p*
	N= 34	N= 24			
PHYS	56.97 ± 16.38	63.46 ± 7.72	49.93	-2.014	.049
	N= 32	N= 27			
PSYC	60.66 ± 15.55	64.22 ± 14.76	57	-.898	.373
	N= 29	N= 24			
SOC	68.10 ± 21.29	71.58 ± 21.17	51	-.594	.555
	N= 32	N= 25			
ENV	66.81 ± 12.32	62.40 ± 21.25	55	.983	.330
	N= 21	N= 15			
QOL	93.10 ± 10.47	96.40 ± 12.50	34	-.861	.395

Table 4.9 shows mean differences in HIV patients who have lived with the condition for less than 1 year and those who have lived with the condition for over 1 year. It can be concluded that there was no statistically significant difference in the quality of life between the two groups, 0-12 months (M= 93.10, SD= 10.47) and > 12 months (M= 96.40, SD= 12.50; t (34) = -.861, p = .395, two-tailed.

The mean difference observed is = .38, 95% CI: -.03 to .79)

Therefore the hypothesis was not supported.

In addition, there was no statistically significant difference in psychological, social relationships, and environmental domains of quality of life between the two groups.

Psychological: 0-12 months (*M*= 69.66, *SD*= 15.55) and >12 months (*M*= 64.22, *SD*= 14.76; *t*(57)= -.898, *p* = .373, two-tailed.

Social Relationships: 0-12 months (*M*= 68.10 , *SD*= 21.29) and >12 months (*M*= 71.58, *SD*= 21.17; *t*(51)= -.594, *p* = .555, two-tailed.

Environmental: 0-12 months (*M*= 66.81, SD= 12.32) and >12 months (*M*= 62.40, *SD*= 21.25; *t*(55)= .983, *p* = .330, two-tailed.

However, there was a statistically significant difference between the two groups in the physical domain of quality of life, 0-12 months (*M*= 56.97, *SD*= 16.38) and >12 months (*M*= 63.46, *SD*= 7.72.; *t*(49.93)= -2.014, *p* = .049, two-tailed.

Summary of Findings

Five main hypotheses were tested to assess the neuropsychological functioning of adults living with HIV in Ghana. The summary of findings is presented below:

HIV patients differ significantly on cognitive tests assessing attention, memory, and verbal abilities from healthy participants. HIV patients perform poorer compared to Healthy Controls in these cognitive areas.

The was no significant differences between HIV patients and Healthy Controls on anxiety, somatization, depression, and general distress.

There was no statistically significant relationship between cognitive functioning and quality of life of HIV patients. .

There was no statistically significant difference between HIV patients who have lived with the condition for less than 1 year and HIV patients who have lived with the condition for more than 1 year on general distress. However there was a statistically significant difference between both groups on depression.

There was no statistically significant difference between HIV patients who have lived with the condition for less than 1 year and HIV patients who have lived with the condition for more than 1 year on quality of life. However there was a statistically significant difference between both groups on the physical domain of quality of life.

CHAPTER FIVE

DISCUSSION

Introduction

This section discusses the findings, and addresses the studies and theories that both support and reject the hypotheses tested.

With respect to the correlations between the HIV patients and the Healthy Controls on specific variables, there were significant negative relationships observed between general distress and quality of life, anxiety and quality of life, somatization and quality of life, depression and quality of life, anxiety and social relationships, depression and WHOQOL physical domain, depression and WHOQOL psychological domain, depression and social relationships, and depression and environment.

HIV and Neuropsychological Functioning

The findings from this study have shown mostly that HIV patients and Healthy Controls differ significantly with regards to their neuropsychological functioning. First of all, the HIV patients experienced more cognitive challenges compared to healthy controls. These challenges manifested in the areas of memory (verbal), attention and concentration, and verbal fluency. This findings are consistent with the study by Robertson et al. (2017) who found that Healthy controls do better than HIV patients on measures that test cognitive areas such as memory, attention and verbal abilities. This suggests that HIV patients have cognitive deficits, which is consistent with the findings from this study. There is growing evidence on the deficits and impairments that adults living with HIV experience.

On the CVLT which is a verbal learning test which also assesses memory, there were significant differences between HIV patients and Healthy Controls on Immediate Recall, Short Delayed Recall, and Long Delayed Recall. The means obtained by the Healthy Controls were also higher than the means of the HIV patients. This means that HIV patients experience memory deficits which is consistent with the findings of Casimjee and Motswai (2017). They compared a group of

HIV+ adults and older adults to an HIV- matched control group in South Africa,on some neuropsychological tests. They found that the HIV positive adults performed poorer compared to the HIV negative group in cognitive domains that included memory and executive functioning. Findings from the study of Mason et al (1998) indicated that the HIV positive patients struggled more in tasks that required maintained attention and also performed poorly on measures of immediate and delayed verbal recall as was shown in this current study. However, this current study did not find any significant differences between adults living with HIV and healthy controls on visual ability which is consistent with that of Mason et. al (1998) which showed that HIV status was not related to visual memory. This may suggest that there are higher chances for the Human Immunodeficiency Virus (HIV) to damage brain structures that are involved in attention, concentration, verbal learning and memory than there are chances for the virus to damage brain structures involved in visual abilities. Barnes and Duke (2018) found that the most common neurocognitive deficits associated with HIV-associated neurocognitive disorder (HAND) include attention and memory and not visual abilities. Cysique, Maruff and Brew (2006) also found similar results. Their results showed that there were moderate deficits in the domain of attention whereas visuospatial functions were relatively preserved.

With respect to behavioral functioning, there were no statistically significant differences observed between HIV patients and Healthy Controls. Social support may be a key factor in the psychosocial functioning of HIV patients. Pozniac (2014) found that HIV patients may make adjustments and have similar behavioral functioning as the general population if they receive social support from friends and family. Thus, for the HIV patient, they would not report high scores of depression and anxiety if there is no stigma. Seth et. al (2014) studied the psychosocial functioning and factors associated with depressive symptoms among patients living with HIV attending HIV care and treatment clinics in Kenya, Namibia, and Tanzania. They sampled in total 3,538 participants. Results showed that majority of the participants (72%) did not report clinically significant depressive symptoms. This finding is consistent with the finding of this current study. However, in the study by Seth et. al (2014), 28% of the participants reported clinically significant depressive symptoms. The regression models in their study showed that greater levels of depressive symptoms were associated with factors that include non adherence to antiretroviral treatment and less social support. This may

explain why there is no statistically significant difference between HIV adults and Healthy Controls in this current study. Adherence to antiretroviral treatment by the HIV patients and the social support they receive from their family and friends may contribute to the fact that there is no statistically significant difference between the HIV patients and the Healthy Controls.

Findings from this current study are also consistent with the findings from the study by Das, Mukherjee, Lodha and Vatsa (2010). They assessed the psychosocial problems of HIV infected children with the Pediatric Symptom Checklist. They compared 41 HIV infected children with 30 children with cystic fibrosis as a control group. Results showed that a significant greater number of children with cystic fibrosis suffered from psychosocial problems as compared to HIV children. Thus, the behavioral functioning in HIV patients is relatively good.

Findings from this current study are also in line with the findings from the study by Smith et. al (2001). They compared 82 HIV positive women with a healthy control group constituted of 122 women on levels of psychosocial functioning. There were no statistically significant differences between the two groups in psychological distress which is in line with the findings from this current study. Further, Smith et al (2001) also found no statistically significant difference between the two groups in social support and also close relationships. Thus, this may explain why there was no statistically significant difference between the HIV patients and the Health Controls.

Even though there was no statistically significant difference between the HIV patients and the Healthy Controls in behavioral functioning in this current study, an inspection of the means showed that HIV patients recorded higher scores than Healthy Controls on Somatization, Depression, and General Distress. This means that HIV patients may experience higher levels of psychological distress compared to Healthy Controls. Smith Fawzi et. Al (2010) found that HIV patients experience some level of anxiety. This is consistent with the findings of Louthrenoo, Oberdorfer and Sirisanthana (2014) who found out that HIV patients experience more psychological problems compared to healthy controls, and also consistent with the study by Dalmida, Koenig, Holstad and Wirani (2013) who found that HIV patients show depressive symptoms.

HIV and Quality of Life

From the findings of this study, there was no statistically significant difference between HIV patients and Healthy Controls on quality of life, and on the domains of quality of life. This is consistent with the study of Bunupuradah et. Al (2013) who also found that there was no significant difference between HIV patients and healthy controls. This may be due to the antiretroviral therapy that HIV patients adhere to. Karkashadze, Gates, Chkhartishvili, DeHovitz and Tsertsvadze (2017) found that antiretroviral treatment is a predictor of good quality of life of HIV patients. This means that compliance or adherence to antiretroviral medications and treatment would increase the quality of life of HIV patients, which may explain why there was no statistically significant difference between HIV adults and Healthy Controls in this current study.

However, Healthy Controls obtained higher means compared to HIV patients on quality of life, the physical domain of quality of life, and the psychological domain of quality of life. In the study by Bunupuradah et. Al (2013), their results showed similarly that healthy controls had higher scores than HIV patients on quality of life. This suggests that Healthy Controls may regard their everyday life to be better in terms of physical and psychological quality of life than that of HIV adults.

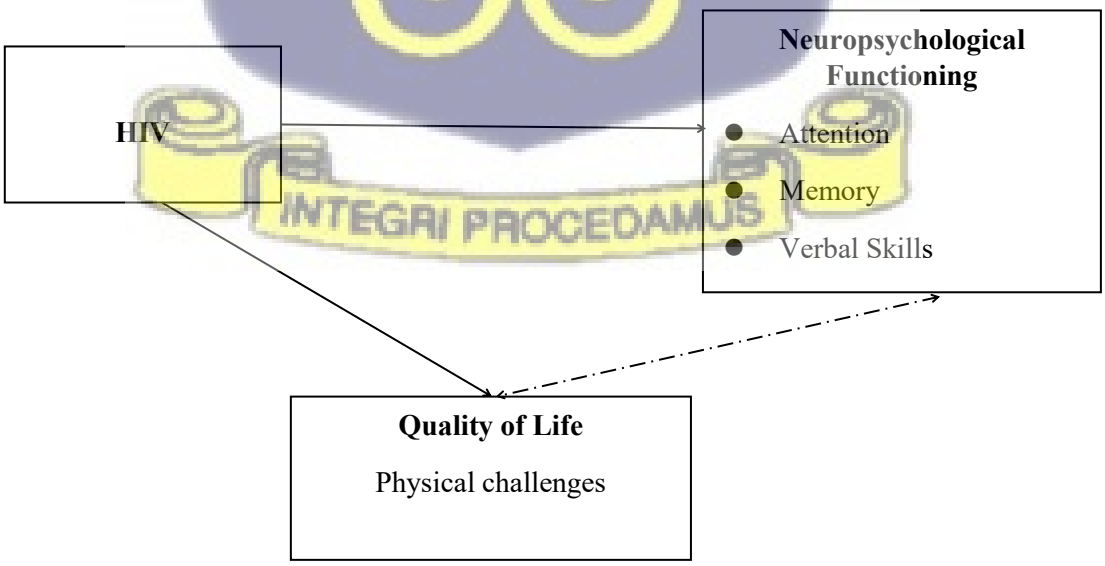
The means on the Social Relationships domain of quality of life between HIV patients and Healthy Controls were approximately the same, with HIV patients obtaining a marginally higher mean. This may suggest that the HIV patients receive some meaningful social support from relatives which may may also explain why there was no significant difference between HIV patients and Healthy Controls on general distress and quality of life. This confirms the findings by Charkhian et al. (2014). They conducted a study to determine the association between social support and health-related quality of life (HRQL) for a sample of 120 patients living with HIV/AIDS in Tehran. Results showed social support as a variable that plays an important role in increasing the quality of life of HIV patients for both males and females. Degroote, Vogelaers and Vandijck (2014) reviwed 49 studies on the determinants of health-related quality of life among people living with HIV. They found that social support was a key factor in good quality of life of HIV patients.

HIV patients obtained higher means compared to Healthy Controls on the Environment domain of Quality of Life. This may suggest that a person's perception or rating of their environment may not depend on their Seropositive status but on the quality of the environment itself.

There was no statistically significant difference between HIV patients who have lived with the condition for more than a year and HIV patients who have lived with the condition for less than a year. This corroborates the findings by Haseli et al. (2014). They found that the mean difference between HIV patients and Healthy Controls was not significant based on length of disease. This may be due again to compliance with antiretroviral therapy by the HIV patients which is consistent with the study by Basavaraj, Navya and Rashmi (2010) who found that compliance to antiretroviral treatment is related to good quality of life for individuals living with HIV. Aragonés-López, Pérez-Ávila, Smith Fawzi, and Castro (2012) also did a study in Cuba and found that patients treated with aniretroviral medications show a greater perception of general health.

Figure 5.1: Observed Conceptual Model

Figure 5.1 presents the observed conceptual model which demonstrates the significant relationships among the variables that were measured in this work. Findings show that HIV has significant effects on the neurocognitive functioning of adults living with HIV. Again, HIV patients experience physical challenges.



Implications of Findings for Clinical Practice

The main findings from this study confirm that HIV may affect the cognitive functioning and quality of life of patients. Again, HIV affected the quality of life of HIV patients in the physical domain. Social support and adherence to medication are variables that may be crucial in increasing the quality of life of adults living with HIV, and helping them have a behavioral functioning similar to individuals without HIV.

Thus, neuropsychological testing and other quality of life measures should be added in the diagnosis and management of adults living with HIV. An integration between medical and neuropsychological care will be beneficial and effective for both professionals and patients. The findings from this study also show the importance of, and the need for Clinical Psychologists and Neuropsychologists in the various healthcare institutions to help with better diagnosis and management of patients with diverse conditions. Employing more Clinical Psychologists by the Ministry of Health and the Ghana Health Service would be very helpful.

Limitations of the Study

One of the limitations of this study is the lack of neurological testing and imagery tests. There were no MRI or CT scans used. These scans would have shown the sites of brain damage. Thus, brain scans should be considered in future studies.

A mixed-method would have been ideal because an additional qualitative approach to explore variables such as stigma, social support, and quality of life would complement the quantitative approach. In a qualitative study, respondents would be able to express themselves.

Another limitation was that, the participants were tested only once with no baseline data to compare their scores with. A pretest-postest design could be used in future studies to compare performance on different occasions

This study also failed to compare participants who receive meaningful social support to those who do not on behavioral and quality of life measures.

Finally, the sample size of the HIV positive patients (112) is adequate in the context of this study. However, it is not large enough, as it decreases the generalizability of the findings.

Notwithstanding all these limitations, this study fills some research gaps in HIV studies and may serve as a good basis for future studies.

Direction for future research

In addition to neuropsychological measures, neurological testing could also be added in the data collection process, which could include brain/imaging scans such as MRI and CT scans to identify the specific areas of brain damage associated with the neurocognitive deficits.

Other chronic conditions such as diabetes, systemic lupus erythematosus, sickle cell could be added to HIV in order to make comparisons among various conditions.

A mixed method could be employed. A qualitative study could be added to the quantitative study to explore issues of stigma, social support and coping.

Religion, and spirituality are two variables that could be examined to determine their importance in coping with HIV.

Conclusion

Human Immunodeficiency Virus known as HIV is a virus typically transmitted through means such as sex acts, contaminated blood transfusions, syringe and needle use. The infection could also be passed onto an infant by the mother from birth or while they are being breastfed (Rajendra, Chainesh, Ayush & Yogini, 2013). HIV is a chronic condition which affects an individual's cognitive and behavioral functioning, and their quality of life. However, the neuropsychological profile of HIV positive adults in Ghana has not been studied enough. This current study examined the neuropsychological functioning among adults living with HIV in Ghana.

A quantitative approach was employed with a survey of 172 participants, comprising of 112 HIV patients and 60 Healthy Controls.

The findings indicated that a statistically significant difference exists between HIV positive adults, and adults without HIV, on cognitive measures. Also, the HIV patients reported more physical challenges in quality of life compared to Healthy Controls. There were no significant differences between HIV patients who have lived with the condition for less than a year and HIV patients who have lived with the condition for more than a year on behavioral and quality of life measures.

However, HIV patients who have lived with the condition for less than a year showed more depressive symptoms than HIV patients who have lived with the condition for more than a year. Social support and adherence to medication may be instrumental in increasing the overall quality of life of HIV patients, as well as helping them have a normal behavioral functioning.

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APPENDIX I: ETHICAL CLEARANCE

UNIVERSITY OF GHANA

ETHICS COMMITTEE FOR THE HUMANITIES (ECH)

P. O. Box LG 74, Legon, Accra, Ghana

My Ref. No…ECH 023/ 19-20…

May 26, 2021

Joseph Mawupemor Kossi Agbavitoh

Department of Psychology

University of Ghana

Legon

ETHICAL CLEARANCE

(ECH 023/ 19-20)

The protocol title below has been reviewed and approved by the ECH Committee.

TITLE OF PROTOCOL**: NEUROPSYCHOLOGICAL FUNCTIONING AMONG ADULTS LIVING WITH HIV**

PRINCIPAL INVESTIGATOR**: JOSEPH MAWUPEMOR KOSSI AGBAVITOH**

Please note that the final review report must be submitted to the Committee at the completion of the study. Your research records may be audited at any time during or after the implementation. Any modification of this research project must be submitted to ECH for review and approval prior to implementation.

Please report all serious adverse events related to this study to ECH within seven (7) days verbally and in writing within fourteen (14) days.

This certificate is valid till May 25, 2022. You are to submit annual reports for continuing review.

Please accept my congratulations.

Yours Sincerely,

Professor Akosua K. Darkwah

ECH Vice – Chair

Cc: Prof. Charles Christopher Mate-Kole, Department of Psychology, UG Dr. Adote Anum, Department of Psychology, UG

Tel: +233-303933866 Email: ech@ug.edu.gh

APPENDIX II: CONSENT FORM

UNIVERSITY OF GHANA

Official Use only
Protocol number

Ethics Committee for Humanities (ECH)

PROTOCOL CONSENT FORM

Section A- BACKGROUND INFORMATION

Title of Study:	Neuropsychological Functioning among Adults Living with HIV
Principal Investigator:	Agbavitoh Kossi Mawupemor Joseph
Certified Protocol Number	

Section B– CONSENT TO PARTICIPATE IN RESEARCH

General Information about Research

This study seeks to investigate the neuropsychological functioning among adults living with HIV.

This study will specifically investigate the differences between adults living with HIV and healthy controls in cognitive functioning, behavioral functioning and quality of life, using a battery of cognitive tests, and psychosocial and quality of life measures.

It is estimated that the entire process will take about 45 minutes on average to complete

Benefits/Risks of the study

This study does not require that sensitive information be disclosed. However, in case participants may feel any discomfort or emotional disturbances as a result of the study, they will receive some psychological intervention. This study does not hold any direct benefit to participants as it is a purely academic study. However, findings from this study will provide information that will aid in a better management of adults living with HIV in Ghana.

Confidentiality

Participants are assured of confidentiality. Data collected will be accessible to only the principal investigator and supervisors.

To protect the identity of participants, their names would not be requested at any stage of the study. Data collected will be encrypted with a password on the personal computer of the principal investigator which is password protected. The data collected will be analyzed and results will be published in an academic

journal, however, there will be no information that will indicate the identity of the participants. Participants may get access to the data by signing or thumb printing a written consent form.

Compensation

A small token in cash will be given to participants as an appreciation for their time.

Withdrawal from Study

Participation in this study is entirely voluntary as no one will be forced to participate. Also, no participant will be punished if they withdraw from the study at any point in time.

Contact for Additional Information

For more information or questions about the research, do not hesitate to contact any of the following: Prof. C. Charles Mate-Kole, University of Ghana, Department of Psychology, Email: djabatey@hotmail.com, Tel.: 0274323154; Dr. Adote Anum, University of GFhana, Department of Psychology, Email: aanum@ug.edu.gh, Tel.: 0249107770; and Agbavitoh, Kossi Mawupemor Joseph, University of Ghana, Department of Psychology, Email: pafrik10@gmail.com, tel.: 0541842411

If you have any questions about your rights as a research participant in this study you may contact the Administrator of the Ethics Committee for Humanities, ISSER, University of Ghana at ech@ug.edu.gh or 00233- 303-933-866.

Section C- PARTICIPANT AGREEMENT

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

_____

Name of Participants

_____ _____

Signature or mark of participants Date

If participants cannot read and or understand the form themselves, a witness must sign here:

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

_____

Name of witness

_____ _____

Signature of witness /Mark Date

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

_____

Name of Person who Obtained Consent

_____

_____

Signature of Person Who Obtained Consent Date

APPENDIX III

Table 4.1: Frequency and Percentages of Participants

Variables	Category	Frequency/Percentage	
		HIV(112)	HC(60)
Gender	Male	41(36.6)	37(61.7)
	Female	71(63.4)	23(38.3)
Age	18-29	21(18.8)	52(86.7)
	30-55	91(81.3)	8(13.3)
Mean age of groups		37.14(8.71)	25.85(3.80)
Number of years of education (mean)		9.46yrs	15yrs
Religion	Christianity	94(84.7)	56(93.3)
	Islam	15(13.5)	4(6.7)
	Others	2(1.8)	0(0)

APPENDIX IV

Table 4.2: Summary of Means, SD, Reliability, Skewness and Kurtosis of Variables

Instruments	M	SD	A	Skewness	Kurtosis
RQCST	64.14	14.048	.85	-.668	-.239
CVLT	22.53	7.478	.84	-.312	-.920
DIGIT	14.76	5.234	.82	.258	-.002
SPATIAL	11.40	5.096	.85	.116	-.833
CFQ	28.64	17.102	.92	.576	.312
BSI	.76	.655	.85	1.491	2.195
QOL	92.78	10.7	.88	-.608	.763

N=172; RQCST = Revised Quick Cognitive Screening Test; CVLT = California Verbal Learning Test II Short Form; DIGIT = Digit Span Subtest of the WAIS; SPATIAL = Spatial Span Subtest of the WAIS; CFQ = Cognitive Failures Questionnaire; BSI = Brief Symtom Inventory-18; QOL = World Health Organization Quality of Life Bref

APPENDIX V

Table 4.3: Pearson's correlation between Psychological measure and Quality of Life

Variables	1	2	3	4	5	6	7	8	9
10. ANX									
11. SOM	.45**								
12. DEP	.72**	.51**							
13. DIST	.85**	.77**	.88**						
14. PHYS	-.15	-.07	-.25**	-.22**					
15. PSYC	-.15	-.13	-.26**	-.21*	.50**				
16. SOC	-.19*	-.09	-.35**	-.19*	.32**	.34**			
17. ENV	-.12	-.16	-.24**	-.23**	.44**	.53**	.34**		
18. QOL	-.27*	-.30**	-.42**	-.40**	.71**	.78**	.58**	.82**	

NB: 131. 1= Anxiety, 2= Somatization, 3= Depression, 4= General Distress, 5= WHOQOL Physical, 6= WHOQOL Psychological, 7= WHOQOL Social Relationships, 8= WHOQOL Enviroment, 9= WHOQOL Global. *p < 0.05 level (2-tailed) ** p < 0.01 level (2-tailed)

Table 4.4: Pearson's Correlation Table of Cognitive tests and Psychological measure

Variables	1	2	3	4	5	6	7	8	9	10
11. RQCST OR										
12. RQCST VER	.41**									
13. RQCST VIS	.43**	.40**								
14. CVLT IMM	.51**	.69**	.51**							
15. CVLT SD	.59**	.68**	.44**	.86**						
16. CVLT LD	.57**	.67**	.50**	.83**	.86**					
17. DIGIT	.43**	.70**	.41**	.76**	.67**	.65**				
18. SPATIAL	.53**	.64**	.53**	.76**	.71**	.70**	.74**			
19. CFQ	.26**	.27**	.25**	.27**	.31**	.31**	.39**	.41**		
20. DIST	-.25**	-.22**	.004	-.18*	-.18*	-.23*	-.04	-.12	.44**	

NB: N=131. RQCST OR = Revised Quick Cognitive Screening Test Orientation; RQCST VER = Revised Quick Cognitive Screening Test Verbal; RQCST VIS = Revised Quick Cognitive Screening Test Visual; CVLT IMM = California Verbal Learning Test Trial 1-4; CVLT SD = California Verbal Learning Test Short Delayed Recall; CVLT LD = California Verbal Learning Test Long Delayed Recall; DIGIT = Digit Span Test; SPATIAL = Spatial Span Test; CFQ = Cognitive Failures Questionnaire; DIST = Brief Symptom Inventory General Distress
*p < .05 level (2-tailed) ** p < .01 level (2-tailed)

Table 4.5: Summary of MANCOVA results for Cognitive measures

Variables	HIV Patients (N = 73)	Healthy Controls (N = 60)	*F*	*P*	*η2*
RQCST OR	10.86 ± 1.60	11.98 ± .129	4.098	.045	.031
RQCST VER	23.07 ± 8.81	36.15 ± 4.38	27.872	.000	.179
RQCST VIS	24.04 ± 5.78	28.18 ± 3.05	.832	.364	.006
CVLT IMM	18.53 ± 5.60	29.53 ± 3.12	45.487	.000	.262
CVLT SD	4.99 ± 1.92	8.15 ± .86	35.962	.000	.219
CVLT LD	4.48 ± 2.0	7.55 ± 1.06	22.511	.000	.150
DIGIT	11.86 ± 3.31	19.60 ± 3.88	35.191	.000	.216
SPATIAL	8.68 ± 3.40	16.42 ± 3.05	45.598	.000	.263
CFQ	23.38 ± 18.39	39.43 ± 11.91	10.831	.001	.078

NOTE: RQCST OR = Revised Quick Cognitive Screening Test Orientation; RQCST VER = Revised Quick Cognitive Screening Test Verbal; RQCST VIS = Revised Quick Cognitive Screening Test Visual; CVLT IMM = California Verbal Learning Test Immediate; CVLT SD = California Verbal Learning Test Short-Delayed; CVLT LD = California Verbal Learning Test Long Delayed; DIGIT = Digit Span; SPATIAL = Spatial Span; CFQ = Cognitive Failures Questionnaire. Bonferroni's correction, p<.006

Table 4.6: Summary of MANCOVA results for Behavioral measures and Quality of Life

Variables	HIV Patients (N = 51)	Healthy Controls (N = 60)	*F*	*P*	*η2*
ANX	.67 ± .88	.67 ± .72	.240	.625	.002
SOM	.93 ± .83	.64 ± .62	3.891	.051	.035
DEP	.94 ± .93	.76 ± .62	7.068	.009	.063
GSI	.85 ± .75	.69 ± .56	3.931	.050	.036
PHYS	57.9 ± 14.30	63.3 ± 8.87	2.507	.116	.023
PSYC	63.67 ± 16.36	65.4 ± 8.75	1.666	.200	.015
SOC	68.89 ± 18.78	68.62 ± 14.60	.016	.901	.000
ENV	66.92 ± 16.92	64.40 ± 11.90	.187	.667	.002
QOL	91.86 ± 14.09	93.17 ± 7.11	.772	.382	.007

NOTE: MANCOVA = Multivariate Analysis of Covariance; ANX = Anxiety; SOM = Somatization; DEP = Depression; GSI = Global Severity Index; PHYS = Physical Domain; PSYC = Psychological Domain; SOC = Social Relationships Domain; ENV = Environmental Domain, QOL = Quality of Life, Bonferroni's correction $p < .006$

Table 4.7: Summary of Hierarchical Multiple Regression for Hypothesis 3

Predictor Variables	B	Std. Error	*β*	*t*	*P*
Model 1	94.395	13.229		7.136	.000
AGE	.022	.220	.014	.098	.922
GENDER	-.514	4.000	-.019	-.129	.898
EDU	-.205	.469	-.064	-.436	.665
Model 2	72.040	20.058		3.592	.001
AGE	-.007	.251	-.005	-.029	.977
GENDER	.011	4.430	.000	.002	.998
EDU	-.852	.569	-.265	-1.497	.142
RQCST OR	1.821	1.601	.212	1.138	.262
RQCST VER	.090	.259	.061	.348	.730
RQCST VIS	.239	.406	.110	.589	.559
CVLT IMM	-.019	.571	-.008	-.034	.973
CVLT SD	-2.274	1.860	-.326	-1.223	.228
CVLT LD	.907	1.616	.137	.562	.577
DIGIT	.918	.744	.245	1.233	.224
SPATIAL	.077	.789	.020	.097	.923
CFQ	-.121	.126	-.151	-.956	.344

Table 4.8: Summary of t-test results on Global Severity Index between the newly diagnosed HIV patients and those who have lived with the condition for more than 1 year

Tests	≤12 months	>12 months	df	t	p
	N= 31	N= 24			
ANX	.84 ± 1.11	.47 ± .68	50.80	1.559	.125
	N= 32	N= 26			
SOM	1.06 ± .95	.69 ± .76	56	1.594	.117
	N= 30	N= 24			
DEP	1.17 ± 1.05	.53 ± .75	52	2.525	.015
	N= 28	N= 24			
GSI	.95 ± .80	.57 ± .66	50	1.842	.071

Table 4.9: Summary of t-test results on Global Severity Index between the newly diagnosed HIV patients and those who have lived with the condition for more than 1 year

Tests	≤12 months	>12 months	df	t	p
	N= 34	N= 24			
PHYS	56.97 ± 16.38	63.46 ± 7.72	49.93	-2.014	.049
	N= 32	N= 27			
PSYC	60.66 ± 15.55	64.22 ± 14.76	57	-.898	.373
	N= 29	N= 24			
SOC	68.10 ± 21.29	71.58 ± 21.17	51	-.594	.555
	N= 32	N= 25			
ENV	66.81 ± 12.32	62.40 ± 21.25	55	.983	.330
	N= 21	N= 15			
QOL	93.10 ± 10.47	96.40 ± 12.50	34	-.861	.395