

**BINGE DRINKING AND PSYCHOMOTOR PERFORMANCE IN FEMALE SOCIAL
DRINKERS OF KALINGALINGA IN LUSAKA, ZAMBIA**

BY

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A Dissertation Submitted to the University of Zambia in partial fulfilment of the requirements
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DECLARATION

I, **Likashi Danny Vumbi**, do here by declare that this research paper is my own work and that the works of other persons used in this dissertation have been duly acknowledged. The work presented here has not been previously submitted for the award of a degree to The University of Zambia or any other universities.

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CERTIFICATE OF APPROVAL

This dissertation of **Likashi Danny Vumbi** has been approved as partial fulfilment of the requirements for the award of the Degree of Master of Science in Clinical Neuropsychology by the University of Zambia.

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ABSTRACT

Consuming large amounts of alcohol on an irregular basis is a common form of alcohol misuse among female adolescents and young women. This form of alcohol misuse is called binge drinking (BD) and is associated with harm to the CNS mainly due to repeated alternations between intense intoxication and withdrawal episodes. Adverse effects of BD on cognitive functions such as psychomotor skills negatively impact on women's daily living.

Using a matched-pairs design and snowball sampling method, the present study investigated the relationship between binge drinking and psychomotor performance in a population of female social drinkers of Kalingalinga in Lusaka, Zambia. Two specific objectives based on continuity hypothesis guided the study; to identify characteristics of binge drinking among female social drinkers; to compare motor skills performance between female binge drinkers and their non-drinking female counterparts.

Sixty female participants (30 drinkers and 30 non-drinkers) were enrolled. Data was collected through a two-phase approach; AUDIT questionnaires in the first place and neuropsychological testing of motor skills using Grooved Pegboard and Finger Tapping tests, over a two-weeks period. Pearson's Chi-square test revealed no significant differences in demographic characteristics. Data was normally distributed as shown by Shapiro Wilk's test and skewness and kurtosis results. Hence the use of the independent samples t-test whose results showed slower psychomotor performance among binge drinkers ($M=84.07$, $SD=10.581$; $M=1.2167$, $SD=7.260$ and $M=42.17$, $SD=.88749$) on both the Grooved Pegboard and Finger tapping tests than non-drinkers ($M=66.77$, $SD=8.295$; $M=.5167$, $SD=5.050$ and $M=50.45$, $SD=.62261$).

In conclusion, these results seem to suggest that there is a statistically significant relationship between BD and psychomotor performance among female social drinkers. The implication is that these women may be at risk of home and/or road accidents and that BD may impinge on their multitask-taking skills which may in turn affect their families and society. It is hoped that the results of the study will; open research prospects on female alcohol BD in Zambia and help therapists to consider focusing their efforts on the intensity and frequency of alcohol consumption as predicted by the study's regression analyses.

Key words: Binge drinking, Psychomotor performance, Grooved Pegboard, Finger Tapping

DEDICATIONS

I wish to dedicate this paper to Christine Likashi, my dear mother, who together with her late husband (my father) believed and envisaged great academic accomplishments in me that would go beyond their lack of modern contemporary education. Her love, faith and certitude, have been a form of motivation that has helped me to excel over all sorts of restrains in life including challenges I have faced in my academic trajectory.

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ABBREVIATIONS AND ACRONYMS

AUD	Alcohol Use Disorders
AUDIT	Alcohol Use Disorders Identification Test
BD	Binge Drinking
CNS	Central Nervous System
FTT	Finger Tapping Test
GPT	Grooved Pegboard
NIAA	National Institute on Alcohol Abuse and Alcoholism
WHO	World Health Organization

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CHAPTER ONE

INTRODUCTION

This chapter covers the background of the study, statement of the problem, significance, aim, specific objectives, the research question, research hypotheses and definition of terms.

1.1 Background of the Study

Alcohol is a psychoactive substance with dependence-producing properties and whose harmful use causes a large burden disease, social and economic burden in societies (WHO, 2014). Grucza, Bulcholz, Rice and Bierut (2008) and Wilsnack (2013) have stressed that though harmful use of alcohol is the leading risk factor for death in males aged 15-59 years, the evidence of women involvement in alcohol misuse and their vulnerability to alcohol-related harm is a major public concern.

Binge drinking is one of the commonest forms of alcohol misuse and has been on an increase among many young people who find alcohol a source of pleasure and enjoyment when they have time out with friends and peers. Several studies have indicated that, since alcohol binge drinking involves drinking to intoxication followed by periods of abstinence, it may cause severe neuronal damage that manifest as neurocognitive impairments (Leonard & Blane, 1999; Strauss, et al., 2006; Ward, Lallemand & de Witte, 2009; and Miller, 2013). Many drinkers, unaware of the neuronal damage due repeated binges and withdrawals, are likely to think that binge drinking is not harmful because it is done occasionally. Brumback, Cao and King (2007) indicate that motor skills, are among the primary neurocognitive functions that are impaired by repeated binges and withdrawals.

Particularly important to women drinkers is the study done by IAS (2007) which has shown that the pharmacological impact of a given dose of alcohol is greater in women than men implying that females that binge drink are more likely to experience the adverse effects of alcohol misuse than their male counterparts. A typical woman in Zambia, like in many other African societies, is a multitask taker-managing households,

children, jobs and extended family relationships. Because most habitual binge drinkers may have false beliefs in their behavioural tolerance to psychomotor impairing effects of alcohol (Brumback, Cao & King; 2007), female binge drinkers could be at risk of road and household accidents, involvement in violence and unsafe sex practices. Therefore, binge drinking and psychomotor performance in females is a viable study because it addresses an issue that affects family life and the wider society which the female is part of.

However, in Zambia there have been no studies done to directly assess the effects of alcohol abuse on the nervous system among females apart from those that focus on generic issues related to HIV/AIDS. The present study investigated the relationship between binge drinking and psychomotor performance in a population of female social drinkers in Kalingalinga township of Lusaka, Zambia. The broader question that the study was intended to answer is whether the effect of binge drinking on psychomotor performance is significant or not.

1.2 Statement of the Problem

The effects of alcohol binge drinking on motor skills and other neuropsychological domains of drinkers in Zambia are highly unexplored and remain elusive to academia. Studies done elsewhere indicate that binge drinking can have damaging effects on the neurocognitive domains that include motor skills and that women are more affected by the alcohol neurotoxicity than their male counterparts (Ward, Lallemand & de Witte, 2009; and Miller, 2013). Impairment of motor skills in female drinkers can mean failure in everyday life roles such as childcare and management of many household chores, because women have multiple tasks that are of great importance to their families and society.

Media reports, both private and public, show that binge drinking particularly among women in most of Zambia's urban towns has been on an increase. For instance, findings by the World Health Organisation published in the Washington Post, show that there is no nation that has harder-drinking women in the world than Zambia (Mwale, 2014). This is despite Zambia undergoing through a salient alcohol policy development

process since 2006, aimed at mitigating effects of harmful alcohol use (WHO, 2011 & WHO, 2014). Despite, making these significant developments that include the enactment of the 2011 liquor licensing Act, there are no studies that have been done to address the harmful effects of alcohol on neurocognitive functions like cognitive motor skills, whose impairment can lead to problems such as road and household accidents, which are alarmingly on an increase in Zambia today.

In response to this gap in knowledge, this study carried out an investigation into the effects of alcohol binge drinking on the cognitive motor skills of female binge drinkers. In this regard, the study identified characteristics of alcohol binge drinking in the said social drinkers and further, compared their cognitive motor performance with a control group of female non-drinkers of the same age group, social status, among others.

1.3 Significance of the Study

The study was done to fill the gap in knowledge with regard to alcohol misuse among females in Zambia. This study was a viable proposition because it has generated knowledge on binge drinking among female social drinkers of Kalingalinga in Lusaka, Zambia. More important is the implication of binge drinking on central nervous system of female drinkers, specifically the neuropsychological domain of motor skills.

Since there is not much research done on female alcoholism in Zambia, the results of the present study may open research prospects particularly on the prevalence of binge drinking and its social, economic and health implications on the Zambian community as well as neuropsychological studies of all cognitive domains of both chronic and binge drinkers, among others.

The findings from this study will increase awareness on the part of female social drinkers that binge alcohol misuse can have negative effects on their cognitive skills such as the motor skills that were under study. Benefit that is more direct is the giving of information about support groups such as AA (alcoholic anonymous) and the therapeutic services available at University Teaching Hospital and Chainama, to women who were screened positive on the AUDIT scale.

The results from the present study will as well contribute to the understanding of what policy makers and other stakeholders need to do to help females that binge drink.

1.4 Aim

The aim of this study was to investigate the relationship between binge drinking and psychomotor performance in a population of female social drinkers in Kalingalinga township of Lusaka, Zambia.

1.5 Specific Objectives

1. To identify characteristics of binge drinking among female social drinkers
2. To compare psychomotor performance between female binge drinkers and their non-drinking female counterparts

1.6 The Research Question

Is there a significant difference in psychomotor performance between female binge drinkers and their non-drinking female counterparts?

1.7 Research Hypothesis

Null Hypothesis:

There is no significant difference in psychomotor performance between female binge drinkers and their non-drinking counterparts.

Alternative Hypothesis:

There is a significant difference in psychomotor performance between female binge drinkers and their non-drinking counterparts.

1.8 Definition of terms

Alcohol: Any intoxicating beverage containing alcohol

Alcoholic drinks: Wine, beer, spirits, ciders, both locally and foreign produced.

Alcohol use: How often females consume alcohol (Alcohol consumption frequency)

Alcohol Use Disorders (AUDs): are the alcohol-related psychiatric disorders recognized by the DSM-IV

Binge drinking: consuming large amounts of alcohol on an irregular basis

Harmful Use: alcohol consumption that results in consequences to physical and mental health.

Hazardous drinking: is a pattern of alcohol consumption that increases the risk of harmful consequences for the user or others.

Psychomotor Skills- functions that involve precise movement of muscles with the intent to perform a specific act

Social Drinker-a person that drinks alcohol on social occasion and only in moderate quantities

Standard Alcoholic Drink- a measure of the amount of pure alcohol consumed, usually between 8 grams and 14 grams of pure ethanol.

CHAPTER TWO

LITERATURE REVIEW

This chapter covers the relevant literature reviewed in line with the present study. The literature is organised around the study's research question: "Is there a significant difference in psychomotor performance between female binge drinkers and their non-drinking female counterparts?"

2.1 Theoretical Framework

The study is guided by the *continuity hypothesis* formulated by Ryback Ralph, S. in 1971. Continuity hypothesis asserts that there is a continuum of alcohol effects, which ranges from subtle deficits on social drinkers through a subclinical amnesic disorder to full-blown Korsakoff's syndrome (Snel & Lorist, 1998). More important to this study is the assumption that 'at some level of social drinking, detectable levels of impairment will become apparent (Knight & Longmore, 1994). It is also significant to note here that this hypothesis posits that cognitive impairment due to alcohol intake occurs gradually and is determined by indices; quantity, frequencies and duration (Snel & Lorist, 1998).

The continuum hypothesis has been used in several researches especially for those that focus on neurological evidence of Wernicke-Korsakoff's syndrome-WKS (Butters, 1985; Cutting, 1985; Brion, et al, 2014). WKS is the combined presence of Wernicke's encephalopathy that results from severe thiamine deficiency and Korsakoff's syndrome which is a chronic neurologic sequela of Wernicke's encephalopathy (Thomson & Marshall, 2006). The syndrome is a form of brain damage that is associated with long-term alcoholics that have severe nutritional deficiency especially in thiamine (a B vitamin that plays a role in metabolizing carbohydrates).

Most findings on chronic alcoholism show that long-term alcohol intake results in neurological damage. On the contrary, Snel and Lorist (1998) have indicated that most studies on social drinking have been inconclusive and difficult in interpreting due to inconsistent results. A study done in Zambia by Kabuba, Menon and Hestad (2011) showed that male participants seemed to benefit from moderate alcohol consumption

whereas female moderate alcohol consumers seemed to have negative effects on their cognitive functioning.

The present study adopted the continuum hypothesis firstly because the theory does not seek to explain causation but deals with the effect of alcohol on the brain, which in a way, has been depicted in this study's quest to establish a relationship between binge alcohol drinking and psychomotor performance. Hence, a positive relationship will imply that binge drinking has adverse effects on the motor areas of the cerebral cortex. Secondly, this study is utilising another important tenet in the hypothesis; 'cognitive impairment is determined by the indices of quantity, frequencies and duration.' The AUDIT questionnaire's major questions that determine binge drinking focus on the indices of 'quantity, frequency and duration,' which are central in this theory.

2.2 Prevalence of Female Binge Drinking in General Population

World Health Organisation (2011) has revealed that about 2.5 million deaths per year were attributed to alcohol misuse in 2010 and that more than half of these deaths are indirectly and directly associated to binge drinking. This figure rose to about 3.3 million deaths in 2012 giving a corresponding percentage of 5.9% of all deaths, or one in every twenty deaths in the world (7.6% for men, 4.0% for women). Several studies have shown that binge drinking is common among males than females (Andersson, et al, 2013, Culley, et al, 2013, Kanny, 2013). This is in line with the gender role theory on alcohol consumption founded on the ideas that alcohol consumption is part of the male gender role, but is discouraged as part of the female gender role (Nolen-Hoeksema, 2004). Several studies find that people, particularly women, who endorse traditionally feminine traits (nurturance, emotional expressivity) report less quantity and frequency of alcohol use. Adolescent girls and young women who hold more traditional gender role attitudes are less likely to drink at all (Nolen-Hoeksema, 2004).

According to Kanny (2013) in 2011, more than 13.6 million (12.5%) U.S. adult women binge drank (prevalence) an average of three times a month (frequency), and consume on average six drinks on occasion (intensity). The prevalence and intensity of

binge drinking was highest among women aged 18–24 years (Kanny, 2013). In 2011, binge drinking was common among U.S. adult women, and women who binge drank tended to do so frequently (average of three times per month) and intensively (average of six drinks on occasion), placing themselves and others at a greater risk for alcohol-attributable harms. Indeed, recent studies report that young women have begun to show drinking patterns similar to those of their male peers, especially regarding heavy episodic drinking (Anderson, et al, 2013).

Castro, et al (2012) states that binge drinking is also common in poor countries and that higher rates occur during the late adolescence and early adulthood. It should be noted that late adolescence and early adulthood (18-35 years) in women implies that it is a childbearing age group. Motsoeneng (2012), Africa has the world's highest proportion of binge drinkers with about 25% of its population engaging in alcohol binge drinking despite its large numbers of Muslims and evangelical Christians who abstain from alcohol. Among women who drink in South Africa, Zambia and Chad 30-50% report binge drinking yet the prevalence of women drinking alcohol in these countries ranges from 15-30% (Culley, et al, 2013). Binge drinking is mirrored here as being the highest form of excessive alcohol drinking in females.

Though there is no much data on the prevalence of binge drinking and alcohol misuse in general, Kabuba, Menon and Hestad (2011) have shown Zambia to be amongst the nations with the highest levels of drinking in Africa. Despite efforts by the Drug Enforcement Commission to reduce the demand for substance abuse, alcohol use is on the increase suppressing all illicit drugs, partly because alcohol is not thought to be a drug since it is widely used for cultural and social purposes (Kabuba, Menon & Hestad, 2011).

In addition, World Health Organisation's country profile report for Zambia released in 2014 shows that heavy episodic drinking is high in males than females (WHO, 2014). The proportions of binge drinking are high in late adolescence and early adulthood though the sex ratio is different from the general population especially among student populations where an estimated 45.1% females compared to 38.7% males get drunk (WHO, 2011). This is remarkable because in the general population, non-student

female adolescents and young adults have a much lower tendency to binge drink compared to their male peers.

2.3 Characteristics of Binge Drinking

Binge drinking is not a new phenomenon on the world scene but has become a matter of current social, media and political concern (Mwale, 2014) especially among women and girls. However, binge drinking can be a confusing concept and its use can mean different things in different contexts (Berridge, Thom & Herring, 2007). Therefore, definitional characteristics are key and paramount to understanding this concept although there is currently no standard definition of binge drinking worldwide.

According to Oxford English Dictionary (OED, 1989) binge drinking is “a heavy drinking bout.” OED (1989) further posits that the origins of the term lie in the English dialect term binge which means to soak (a wooden vessel) and traces the first recorded use of the term to 1854: Miss Anne E. Baker Glossary of Northamptonshire words and phrases “A man goes to the alehouse to get a good binge, or to binge himself” (OED, 1989).

World Health Organization (2015) has defined binge drinking as a pattern of heavy drinking that occurs in an extended period set aside for the purpose. In population surveys, the period is usually defined as more than one day of drinking at a time. The terms "bout drinking" and "spree drinking" are also used for the activity, and "drinking bout" for the occasion. A binge drinker or bout drinker is one who drinks predominantly in this fashion, often with intervening periods of abstinence. It is worth noting that in this definition of binge drinking is synonymous to the terms ‘bout drinking’ and ‘spree drinking’ and is characterized by periods of abstinence between bouts.

Secondly, binge drinking is clinically defined as a kind of drinking that occurs when a person follows a pattern of drinking alcohol that brings blood alcohol concentration (BAC) to 0.08-gram percent or above. For the typical adult, this pattern corresponds to consuming five or more drinks (male), or four or more drinks (female), in about two hours (NIAA, 2004). Women tend to reach higher blood alcohol levels than men at the same consumption level even after taking into account differences in body

size, food consumption, and other factors (Frezza, et al, 1990). In summary, Gmel, Rehm, and Kuntsche (2003) identifies two main definitions in line with the two above: (a) a pattern of heavy drinking that occurs over an extended period of time set aside for this purpose and (b) a drinking occasion leading to intoxication, often measured as having more than x number of drinks on one occasion.

Other characteristics of binge drinking include being episodic, intentional and motivational. Several scholars describe binge drinking as an episodic kind which involves episodes of heavy drinking followed by periods of abstinence or low consumption (Korhonen, 2004; Cranford, et al, 2006; WHO, 2011). The episodes may include special and regular events such parties and during weekends when people meet friends, peers and significant others for entertainment. It is during these moments when people, usually in their social networks, may apparently drink heavily more than recommendable units of alcohol. Repeated episodic drinking may lead to “habituation”; a concept that refers to a psychological kind of dependence in which people develop the habit of drinking to reduce stress or drinking heavily when out with certain friends. (Korhonen, 2004). Korhonen (2004) uses the term habit under the psychological theories of alcohol problems, to show that heavy drinking is a learned habit that can be hard to change because it is a routine that people develop without thinking about and apparently becomes an automatic reaction.

In summary of the definitions, it is cardinal to note that the concept of binge drinking is broad and its definition can be hinged on several indices that include frequency, quantity and intensity of drinking. All in all, the definition by Kokavec and Crowe (1999), ‘consuming of large amounts of alcohol on an irregular basis’ seems to be practical for developing countries like Zambia where the consumption of non-quantified alcoholic beverages is commonplace.

Apart from definitional characteristics, binge drinking in females is characterised by membership of a particular age group, social class, level of education. Age group is another important feature that has to be mentioned. For instance, in Norway there is a high rate of binge drinking among young adults: 57% “usually” drink 5–6 units or more. Among males, almost one in four “usually” drinks 10+ units (Pedersen & von

Soest, 2013). In 2011, a study done in USA found that the overall prevalence of binge drinking among women aged ≥ 18 years was 12.5% (<http://www.cdc.gov/mmwr>). Among women who binge drank, the frequency of binge drinking was 3.2 episodes per month and the intensity was 5.7 drinks on occasion. Binge drinking was most prevalent among women aged 18–24 years (24.2%) and 25–34 years (19.9%), and then gradually decreased with increasing age. Women aged 18–24 years reported the highest frequency (3.6 episodes) and intensity (6.4 drinks) of binge drinking.

Women with household incomes of more than US \$75,000 had the highest binge drinking prevalence (Kanny, 2013). By contrast, an earlier research by Hellberg (2010) found that individuals who came from higher parental social class tend to form healthier behaviours such as moderate alcohol consumption while individuals who are from lower parental social class with adverse socioeconomic conditions tend to acquire less healthy behaviours, such as alcohol abuse. The contradiction here warrants further study because this seems unlikely as most research suggests that binge drinking occurs in more deprived populations and binge drinking is already a major problem in many lower income countries especially in Africa (Culley, et al, 2013). Developing countries like Zambia and others in the Sub-Saharan region that are not affluent, would not likely to experience any bingeing among its citizens if binge drinking is for wealthier individuals.

Dowdall et al. (1998) in Oei and Morawska (2004) found that the strongest predictors of binge drinking amongst college students were residence in a fraternity or sorority, engagement in a party-centred lifestyle, and participation in other risky activities, such as use of cigarettes or marijuana and several sex partners. Their findings further show that binge drinkers tended to be younger and male. Caldwell, Kivel, Smith, and Hayes (1998) indicated that adolescents and young adults who were lesbian, gay, or bisexual were more likely to binge drink than those who were heterosexual.

Oei and Morawska (2004) in a study of health behaviours amongst women, those who were smokers, dieting, leading a sedentary lifestyle and those with higher levels of interpersonal stress were more likely to binge drink (Bradstock et. al., 1988). Tyssen, Vaglum, Aasland, Gronvold, and Ekberg (1998) showed that the use of alcohol to cope with tension was associated with binge drinking. Psychiatric disorders (having

depression or anxiety) and on showing early signs of antisocial behaviour often considered generic risk factors for various problems in addition to being difficult to treat.

2.4 Psychomotor Skills

Psychomotor skills are functions that involve precise movement of muscles with the intent to perform a specific act (<http://www.educlime.com/wharemosk.html>). They are important indicators and predictors of cognitive and physical functionality, and are among the key determinants of individual wellbeing (Austin, et al, 2011). The primary motor cortex, supplemental motor area and premotor cortex in the prefrontal lobe of the brain are responsible for motor skills (Becker, et al., 2008). Further, the primary motor cortex, located in the precentral gyrus, is often visualised as the motor homunculus. Penfield found that hands are parts of the body that have a bigger representation on the motor homunculus because of having complex movements (Schott, 1994).

Neuropsychologists assess two types of motor skills; gross and fine motor skills. Loretta (1973) states that gross motor skills are the ones that require the use of large muscle groups to perform activities such as walking, balancing, crawling, etc. On the other hand, fine motor skills require use of small muscle groups to perform tasks that are precise in nature (Loretta, 1973). These include activities such as playing piano and video games.

In assessing motor skills, neuropsychologists measure grip strength and motor speed by using standardised tests from the Halstead Reitan Neuropsychological Battery (Reitan & Wolfson, 2009). Strength of grip test measures a person's ability to squeeze a hand dynamometer as hard as possible. The Grooved Pegboard and Purdue Pegboard tests are the two neuropsychological tests that are used to measure motor speed coordination (Reitan & Wolfson, 2009).

The use of both gross motor and fine motor skills is vital in every person's life regardless of their sex or gender. However, there are gender differences in the use of these skills indicating that men are better at gross motor skills than women are while on other hand, women have better fine motor skills than men do. It is important to note that

having better fine motor skills makes it possible for women to manage day-to-day activities such as childcare giving and many house chores. Nonetheless, a number of movement disorders such as, apraxia, akinesia, dyskinesia, chorea, hemiplegia, motor perseveration and tremors, may occur due to damage to the primary motor cortex in the prefrontal lobe (Zillmer, Spiers & Culbertson, 2008).

2.5 Binge Drinking and Psychomotor Skills in Female Drinkers

Alcohol abuse in both chronic and binge drinkers have many striking social, economic and health consequences. There is overwhelming evidence from several studies done abroad that binge drinking can cause structural and functional damage to the brain resulting in many cognitive deficits that include motor skills (Leonard & Blane, 1999; Strauss, et al., 2009; Ward, Lallemand & de Witte, 2009; and Miller, 2013).

Binge drinking causes damage to the central nervous system particularly because of neurotoxicity. According to Zeigler, et al (2005) periods of binge drinking followed by abstinence may trigger a cycle of responses that lead to increased neurotoxicity and cognitive deficits. Neurotoxicity occurs when exposure to natural or artificial substances, which are called neurotoxins, alters the normal activity of the nervous system in such a way as to cause damage to the nervous system (NIH, 2007). Practically, neurotoxicity in binge drinking is caused by periods of repeated bouts of intoxication followed by withdrawal periods. The repeated alterations between periods of intoxication and abstinence in particular cause neurotoxicity due to decrease of GABA and an increase of glutamate in the brain (Miller, 2013). Glutamate, an excitatory brain neurotransmitter, is said to be lethal to surrounding neurons when it is in high concentration (Choi & Rothman, 1990). For instance, Lopez-Caneda, et al. (2013) in a matched study design, recruited 57 students (26 BDs, 31 controls) at the University of Santiago de Compostela and found that binge drinking caused anomalies in neural activity involved in attention and working memory.

Motor skills are among the most important neurocognitive domains that have been found to be affected by neurotoxicity due binge drinking and alcohol abuse.

According to Zillmer, Spiers and Culbertson (2008) deterioration of motor skills can be through direct loss of muscle control and indirectly through the deterioration of other capacities or cognitive domains. However, there are few studies that have specifically looked at binge drinking and motor skills. Therefore, the review has also included studies that have covered all the neuropsychological domains (Kabuba, et al, 2011; Acker, 1985) and also just a few other domains.

Acker (1985) carried out a matched study where female alcoholics were compared to non-drinking counterparts. These females performed significantly less well on a range of neuropsychological tests than their matched non-alcoholic controls. The range of their performance deficits was similar to that previously reported for male alcoholics despite significantly shorter drinking history.

A study that was conducted by Parada, et al (2011) to examine the association between binge drinking and declarative memory in male and female students showed that binge drinking is associated with poorer verbal declarative memory regardless of sex. Of the 122 participants recruited, 59 were female students (30 binge drinkers, 29 non-drinkers) aged between 18 and 20 years of age.

Brumback, Cao and King (2007) looked at a study similar in some ways to the present research as it looked at effects of alcohol on psychomotor performance and its perceived impairment in binge drinkers. Using an alcohol challenge paradigm, the study compared 77 hard drinkers (males and females) to 55 light drinkers (males and females) and found that habitual binge social drinkers show comparable alcohol induced behavioural impairment but less self-rated perception of impairment than their light social counterparts. The implication of poor perception of alcohol induced impairments is that habitual binge drinkers are at high risk of accidents due to alcohol intoxication.

Female binge drinkers and alcoholics are more likely to be affected by neurotoxicity than their male counterparts. Because of having a higher concentration of fat in body tissue, females tend to reach a higher blood alcohol concentration than men (De Bellis et al., 2005; Medina et al., 2008; and WHO, 2014). This in turn makes it possible for female drinkers to metabolise alcohol much faster than males (Tapert &

Baratta, 2013), implying that female binge drinkers are at a higher risk of damage to the central nervous system due to alcohol neurotoxicity than male drinkers. In addition, a study done by Corral, Holguin and Cadaveira (2011) found that adolescent brains are more vulnerable to the neurotoxicity of alcohol than adults. It is cardinal to note that a combination of the female gender and adolescence age factors can be more devastating to youngest female drinkers and should therefore constitute a bigger ratio of study participants.

There is need for increased recognition of the problem of women drinkers primarily because they are child bearers, key caregivers and are increasingly becoming heads of households. Besides the many health problems that alcohol abuse has, in female is more likely to have serious social consequences especially failure in everyday life roles. Many studies show that alcohol abuse in females are responsible for failure in everyday life roles and high costs to families and society for disability and health expenditure (APA, 1994; NIAAA, 1997 and Oscar-Berman, 2007).

The chapter highlighted works that have been done by many other scholars on alcohol misuse and binge drinking in particular. Though there are differences in many of these findings, the general view is that binge alcohol misuse has devastating impacts on the central nervous system which in turn affects the alcohol abuser's daily living.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter will focus on the methods that were used in collecting, interpreting and analysing data. Included here is the research design, study setting, population or target group, sample, sampling procedure (recruitment), instruments for data collection, the procedure for data collection, data analysis and ethical issues.

3.1 Research design

The study utilised a matched pairs design to assess the relationship between binge drinking and psychomotor performance. The matching was based on the fact that participants shared similar variables such as age, gender, education level, socio-economic status and physical health.

3.2 Study setting

The study site was Kalingalinga, a township area within Lusaka town whose inhabitants are ethnically and socioeconomically diverse. This area has several liquor outlets and a few recreational facilities. Because Kalingalinga is a big township, it was segmented into four areas- south, east, west and north; with a view to necessitate snowball sampling in all the sections and achieve representative data.

3.3 Study population

The target population included all females of Kalingalinga Township aged between 20 and 39, which is about 7553 (CSO, 2013). Literature shows that this age range is most likely to involve in active alcohol drinking (Castro, et al 2012). Kalingalinga Township has a population size of over 39,139 people consisting of 18,945 males and 20,194 females (CSO, 2013). It has 8714 households implying that there are on average five members per household, as per 2010 census. However, there is no data on the number of female alcohol drinkers. WHO (2014) shows that about 83.2% of Zambian women are abstainers. This indicates that about 1268 females (16.8% of the 7553 females) in Kalingalinga are potential alcohol drinkers and therefore constituted the study population.

3.4 Study sample

The study enrolled 60 non-clinical female participants; 30 binge drinkers and 30 non-drinkers as shown in the distribution below. The sample size for this study was calculated using the following formula.

$$\text{Using Formula; } n = \frac{Z^2 P(1-P)}{E^2}$$

Where; n = Sample Size

Z^2 = Level of Confidence, 1.96 which is 95% confidence interval

E = Margin of Error (precision), 0.05 which is 5% precision

P = Expected proportion of binge drinkers, 0.02 which is 2% prevalence of binge drinkers in the general population of Zambia (WHO, 2014).

$$\text{Therefore, } n = \frac{1.96^2 \times 0.02(1-0.02)}{0.05^2}$$

$n = 30.118144$, which can be rounded off to **30 female binge drinkers** that were recruited.

In addition to the above calculated number of participants, 30 more female-non-drinkers were recruited as a control group, thereby bringing the total number to 60 participants. However, the results from the AUDIT questionnaires showed that there were 53 potential binge drinkers but only 30 were selected as per plan.

The distribution of the study sample according to age groups has been summarized in table 1 that follow. Participants of the present study were put in four age groups; 20-24, 25-29, 30-34 and ≥ 35 . Those that were 20-24 were 24 representing 40% of the whole sample. This group was followed by 17 participants (representing 28% of the sample) in the age group 25-29 and 12 participants in the age group 30-34 (representing 20%). The least age group constituted participants above 35 years and which had 7 participants only representing about 12% of the whole study sample.

Table 1: Distribution of participants by age group

Age Group	Number of Participants	Percentage
20-24	24	40%
25-29	17	28%
30-34	12	20%
≥35	7	12%
Total	60	100%

3.5 Recruitment

The study used snowball-sampling procedure so as to have easy access to female alcohol drinkers who, like illegal drug users, may be hidden and difficult to find. Morgan (2008) describes snowball sampling as a method that uses a small pool of initial participants to nominate, through their social networks, other participants who meet the eligibility criteria and could potentially contribute to a specific study. Because binge drinking occurs in social networks (Leonard and Blane, 1999, Korehonen, 2004 and Pedersen & Soest, 2013), snowballing was best suited to the recruitment of the study participants by initially identifying some few participants that were likely to know others with the same drinking characteristics that make them eligible for inclusion. In order to have data that can be generalised, snowballing was preceded by segmenting Kalingalinga Township into four areas (north, east, west and south) and then carried out the snowballing in each of the segmented areas. The sampling procedure produced a selected group rather than a random group of participants implying that the results of the present study may not be generalised to all the women in Zambia. Potential participants provided their mobile phone numbers at the end of the AUDIT questionnaire so that they could be contacted by phone and be invited for neuropsychological testing of motor skills.

The study recruited more adolescents and young adults because many scholars have shown that binge drinking is significantly high among these age groups (15-25 years), especially university students (Hibell et al, 2004; Anderson, 2007 and Kypri et al,

2009). The study site, Kalingalinga, is the nearest township to Zambia's biggest university, the University of Zambia, and is home to many students, whose social lives, including drinking habits, can influence many young people in the area.

3.6 Inclusion-exclusion criteria

Inclusion criteria were based on being a female resident of Kalingalinga and at least drinks alcohol. Age was limited to those females aged between 20 and 39 years for two reasons. On one hand, persons less than 18 years of age are considered to be under age in Zambia and were not included in this study (Zambian Government, 2013). In addition, the recent Bill enacted by the Zambian Parliament in 2013 has put the age of consent for medical research at 18 years and above (Zambia Government, 2013). Several studies, on the other hand, have shown that most women that are above 39 years of age do not engage in binge drinking (Kuntsche, Rehm & Gmel, 2004; Miller, et al, 2007; and Pedersen & Soest, 2013). The only non-drinkers included were the 30 females that were identified for the control group. It should be reported, with regard to age restriction, that there were as many as 54 under-age binge drinkers who were turned down despite being willing to take part in the study.

Individuals deemed to be potentially eligible but not willing to participate were excluded from the study. Males, whether old or young, were also not recruited because the study targeted females only. Harmful drinkers were not included in the study but those identified under the AUDIT screening test, information about support groups such as alcoholic anonymous (AA) and the available therapeutic services, was given to them.

Those that reported to be sick, pregnant, had any impairment in the upper limbs, had neurological disorders (e.g. epilepsy, cerebral palsy), had some psychiatric conditions (e.g. depression and anxiety), were drunk or had a hangover, were all not allowed to participate in the study because the stated conditions could have affected participation in neuropsychological testing in one way or another. The Brief Psychiatry Rating scale was used to assess any form of psychiatric conditions in all the participants.

3.7 Procedure for Data Collection

The study employed a two-phase data collection procedure over a period of 14 days. The first phase, which took 6 days involved identification of binge drinkers through the AUDIT questionnaire. The questionnaires that took between 5 to 10 minutes to answer, were hand-delivered by the researcher and four assistants. The AUDIT was the main tool that was used to collect information pertaining to binge drinking because it has three questions that capture the frequency of drinking and the number of standard drinks that one takes on a single occasion. It is a well-validated tool that is specifically designed for international use (WHO, 2001). Participants were classified as binge drinkers based on three indices: frequency, quantity and the intensity of alcohol drinking. From the AUDIT questionnaire the **frequency** of drinking is determined by question 1 “How often do you have a drink containing alcohol? (Never/ Monthly or less/2 to 4 times a month/2 to 3 times a week/4 or more times a week).” Second, third and fourth responses (Monthly or less, 2 to 4 times a month, 2 to 3 times a week) are characteristic of binge drinking because of the episodes per month or week (Korhonen, 2004; Cranford, et al, 2006; WHO, 2011). Those that drink daily or almost daily for example, were disqualified because they fall under the category of chronic drinkers.

The **quantity** of drinking was determined by question 2 from the questionnaire; “How many drinks containing alcohol do you have on a typical day when you are drinking? (1 or 2, 3 or 4, 5 or 6, 7, 8, or 9, 10 or more).” Finally, the **intensity** of alcohol drinking was determined by question 3. “How often do you have 6 or more drinks on a single occasion? (Never /Less than monthly /Weekly /Daily or almost daily). Both quantity and intensity are significant in identifying binge drinking as echoed in several definitions by different scholars (Gmel, Rehm, and Kuntsche ,2003; NIAA, 2004; BRFSS & YRBS, 2011) because it is by taking 4 or more standard alcoholic drinks that can lead to serious intoxication and also raise blood alcohol concentration to 0.008grams in female drinkers.

Phase two of data collection took 8 days and involved motor skills testing using the Grooved Pegboard Test (TB31)-dominant/non-dominant hand test and Finger tapping exercises, taking at least 10 and 5 minutes respectively. Grooved Pegboard (25

holes, 5 x 5 array) is a dexterity test administered to all participants aged 6-85 years. Participants are instructed to place pegs in 25 holes with randomly positioned slots, picking up one at a time and using just one hand. Test is completed first with dominant hand then non-dominant hand (Lafayette Instruments, 2002). Time of test completion, number of pegs placed and number of dropped pegs are recorded for both hands.

The finger-tapping test (FFT), on the other hand, is ranked sixth among the top 20 tests used by neuropsychologists and sixth with regard to predicting an individual’s ability to return to work (Strauss, et al., 2006). It is a simple test that assesses motor speed and control, and is used in neuropsychology as a sensitive test for brain damage. It involves three important features: time, spatial amplitude and frequency. Using an index finger, a participant is requested to make as many taps as they can on a manual key in ten seconds for three intervals. The average number of taps per ten seconds is recorded for both dominant and non-dominant hands.

The control group was recruited independently by requesting interested female non-drinkers aged between 20 and 39 to participate in the study. Only those that agreed to participate were recruited in the control group. Therefore, the length of involvement by participants was about 35 minutes for both phase one (10minutes) and two (25 minutes).

Table 2: Summary of Procedure for Data Collection

PHASE	ACTIVITIES	OBJECTIVES	TIME FOR PARTICIPANT INVOLVEMENT
PHASE I	Answering the AUDIT questionnaire	To identify characteristics of binge drinking in female social drinkers	10 minutes
PHASE II	Motor skills testing using; (a) Grooved Pegboard (TB31) (b) Finger Tapping Test (FTT)	To test psychomotor performance in terms of speed and dexterity for both binge drinkers and non-drinkers	25 minutes (TB31=15 minutes, FTT=10 minutes)

3.8 Independent and Dependent Variables

The main independent variable in the present study is binge drinking which was measured by the first three questions of the AUDIT questionnaire. The questions are; 1. How often do you have four or more drinks on one occasion? 2. How many drinks containing alcohol do you have on a typical day when you are drinking? 3. How often do you have a drink containing alcohol? It should be noted that the phrase “six or more drinks” in question 1 has been changed to “four or more drinks” because this is what has been widely used in defining female alcohol binge drinking (Gmel, Rehm, and Kuntsche, 2003; NIAA, 2004; Korhonen, 2004; Cranford, et al, 2006; WHO, 2011). The three questions focus on frequency, quantity and intensity of drinking which are key in determining whether one is a binge drinker or not. To be more specific, therefore, there are three independent variables; (a) *frequency of drinking* (represented by question 1), (b) *quantity of drinking* (represented by question 2) and (c) *intensity of drinking* (represented by question 3).

Psychomotor performance was the main dependent variable in the present study. This included the measure of speed and dexterity using the Grooved Pegboard (TB31) and Finger tapping test (FTT). The scores from the pegboard included time taken (in seconds) with both the dominant and non-dominant hands, and the number of dropped pegs with both dominant and non-dominant hands. FTT scores included number of taps per 10 seconds with both dominant and non-dominant hands.

Table 3: Summary of variables used in the present study

<i>Variable</i>	<i>Variable Type</i>	<i>Tool</i>
<i>Binge drinking;</i>		AUDIT Questionnaire
<ul style="list-style-type: none"> • <i>Frequency of drinking (Q1)</i> • <i>Quantity of alcohol (Q2)</i> • <i>Intensity of drinking (Q3)</i> 	Independent	
<i>Motor skills;</i>	Dependent	
<ul style="list-style-type: none"> • <i>Average time taken to complete a task</i> • <i>Average number of dropped pegs</i> • <i>Average number of taps per 10 seconds</i> 		Grooved Pegboard Test (TB31) Grooved Pegboard Test (TB31) Finger Tapping Test (FTT)

3.9 Data analysis

Data collected in this study was statistically analysed using SPSS version 20. The version is well-suited to this study because it is one of the latest versions of the time and could, therefore, perform a variety of data analyses and presentation of functions. Participant demographic characteristics were compared between binge drinkers and non-drinkers using Pearson's Chi-square test which revealed that the data was normally distributed. Data normality was further tested by Shapiro Wilk's test and the test for skewness and kurtosis, which also proved that data was normally distributed. Normality of data warranted the use of parametric tests and that is how the independent samples student-t test and regression analysis were arrived at. The student-t test compared the psychomotor performance between binge drinkers and non-drinkers. Three multiple regression analyses were carried to predict the dependent variables based on the values of the independent variables. The regression essentially involved creating models to estimate the dependent variables and this has helped in making strong causal inferences based on the observed relationships between predictors (dependent) and outcome (independent) variables.

3.10 Ethical Considerations

The research was submitted to the University of Zambia Biomedical Research Ethics Committee (UNZABREC) for approval. The ethics committee was informed that the participants for inclusion in the study were aged between 20 and 39 years of age.

The participants were informed of the study objectives so that they could make an informed decision regarding their participation. They did not materially or financially benefit from it, but there were long-term benefits mainly because the study findings will be used to inform policy makers on how to improve patient care.

Participants were also informed that they had the right to withdraw at any time and that no punitive action would be taken against them such as withdrawal of medical services and that, they were not coerced into participating in the study. They were required to sign a consent form which the researcher counter signed. Participants were informed that confidentiality would be maintained regarding the data collected to avoid

stigma which would consequently lead to emotional stress. The names and codes used during the study were kept separately from the data to avoid it being linked to the participants. All the collected data was kept in a locked cabinet and key kept by the researcher.

3.11 Study Limitations

Zambian culture does not approve of women drinking alcohol to intoxication. Thus, stigma attached to female alcohol drinking affected recruitment, especially for females above 35 years. Most women above 35 refused to participate in the study stating that it would be disappointing for them because of their roles as wives and parents in their homes. However, this was reduced by having a control group of non-drinkers that participated. In addition, it was feared that the refusal rates for the second phase (neuropsychological testing) would be high. The provision of K50.00 transport refund for the participants as recommended by UNZABREC, improved the turn up.

The cut-off point of binge drinking for females (4) was reduced by one unit as compared with males (5). This was so because the AUDIT (Alcohol Use Disorders Identification Test) is said to be less sensitive at identifying risk drinking in females (Freeborn, et al, 2000). The AUDIT is currently the only instrument specifically designed to identify hazardous and harmful drinking and is valid for detecting heavy drinking also in a general population sample.

Defining binge drinking was another limitation that cannot go without mention. There is currently no standard definition for the concept of binge drinking and the many western definitions available had significant differences that required adjustments in order to be used in the Zambian situation. The present study therefore considered the definition by Kokavec and Crowe (1999) 'consuming large amounts of alcohol on irregular basis' as this seemed to be more inclusive of all important indices (frequency, quantity, intensity) and could be practically useful where the drinking of non-quantified alcoholic beverages is commonplace.

Validity and reliability could have been compromised due to the fact that much of the demographic data collected (including data on alcoholic beverages) were mainly

based on participants' self-reports that could have been biased. To reduce on this biasness participants were strongly advised to provide correct information about themselves and their drinking habits because the results could give some reflection of their cognitive wellbeing.

The chapter focused on research methodology for the present study. The study used a matched-pairs design and recruited 60 female participants aged 20 to 39 from Kalingalinga in Lusaka through snowball sampling. Recruitment was through AUDIT questionnaires which were followed by psychological tests of Grooved Pegboard and Finger tapping tests. Student t-test and regression analyses from SPSS version 20 were used to analyze the collected data. The research was conducted following approval from UNZABREC.

CHAPTER FOUR

RESULTS

This chapter outlines the results that were obtained in the study on binge drinking and motor skills performance in female social drinkers of Kalingalinga, Lusaka. It shows the various statistical analyses that were carried out. The results will be presented in relation to the themes derived from the research question. The main research question was; ‘Is there a significant difference in psychomotor performance between female binge drinkers and their non-drinking female counterparts?’

4.1 Response Rate

The study captured 60 female participants as proposed, comprising of 30 binge drinkers and 30 non-drinkers. It should also be reported that 54 under-age binge drinkers were turned down due ethical considerations of the eligible age group.

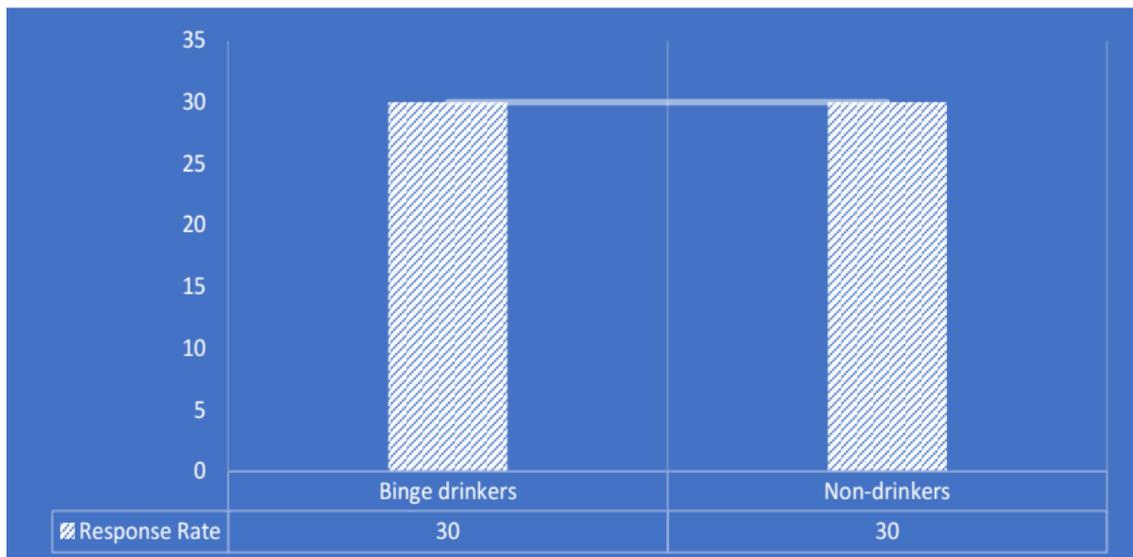


Figure 1: Participant Response Rate

4.2 Demographic Data of Participants

The main characteristics considered were age, years of education, presence/absence of impairments and alcohol drinking (for binge drinkers only), as reflected in the table 4 that follow. The ages for the 60 female participants that were recruited in the study ranged from 20 to 39 years. The mean age was 27 and the SD was 5.456. About 39 participants were aged between 20 and 29 years accounting for 65%. 12 participants were aged between 30 and 34 years accounting for 20% and only 9 participants were above 35 years giving 15%. The years of education ranged from 7 to 15 years with about 28.3 % (17) attaining primary school certificates. 32 participants reported that they had secondary education representing 53.3% of the total sample. About 28.3% of the 60 participants (17) reported to have attained primary education only. Only 11 participants had gone up to tertiary level of education translating into 18.3% of the total sample. Since there was no statistically significant difference between binge drinkers and non-drinkers, the sample was comparable.

Table 4: Demographic data

<i>Variable</i>	<i>Binge Drinkers</i>	<i>Non-drinkers</i>	<i>Percentage</i>
<i>Age (N=60, Mean=27.00, SD=5.456)</i>			
<i>(a) 20-24</i>	12	10	40
<i>(b) 25-29</i>	8	9	28.3
<i>(c) 30-34</i>	6	6	20
<i>(d) ≥35</i>	4	5	11.7
<i>Education (in years)</i>			
<i>(a) Primary (1≤7)</i>	10	9	28.3
<i>(b) Secondary (8≤12)</i>	13	14	53.3
<i>(c) Tertiary (≥12)</i>	7	7	18.3
<i>Alcohol Drinking</i>			
<i>a) Days/Week</i>	1 day	-	
<i>b) Number of drinks/Occasion</i>	6 drinks	-	
<i>c) ≥Four drinks/Occasion</i>	Weekly	-	
<i>Impairment</i>	0	0	0
<i>No Impairment</i>	30	30	100

A Pearson's chi-square test for association was run for the demographic data in table 4 above to determine whether there were significant differences in the selected demographic characteristics between the experimental group and the controls. The p-values for the Respondent type*Education level (in Years) and Respondent type*Age (in Years) were .915 and .889 respectively. This indicates that there were no statistically significant differences in the demographic characteristics between binge drinkers and

non-drinkers. This is further confirmed by the bar charts below. Only two variables, presence/absence of impairment and alcohol drinking, could not be computed because they were constants.

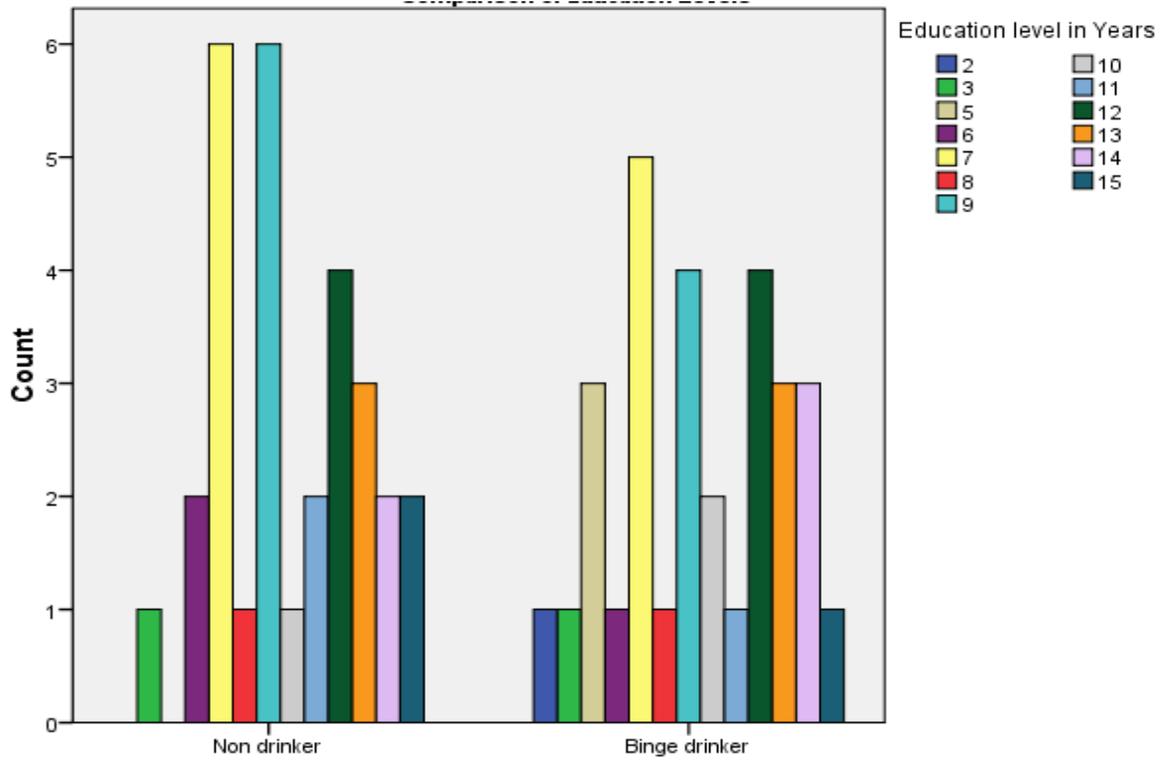


Figure 2: *Comparison of Participants' Level of Education between the Two Groups*

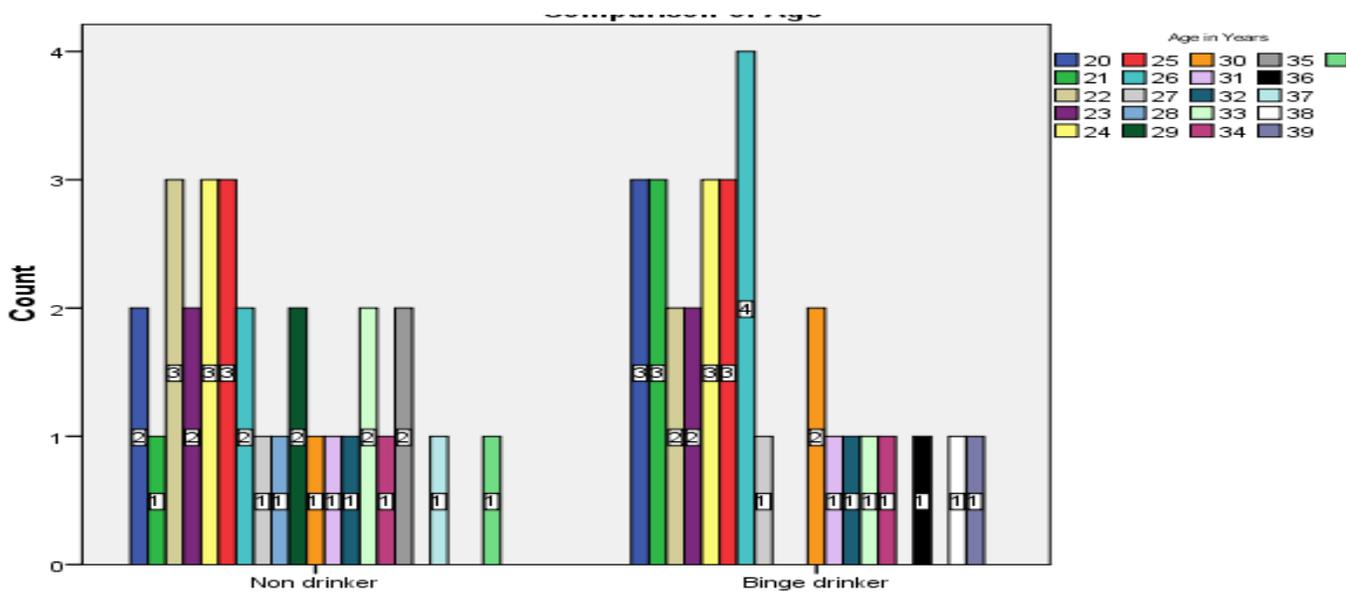


Figure 3: Comparison of Participants' Age Differences between the Two Groups

4.3 Test for Normality

A test was done to check the normality of data collected and determine whether a parametric test is appropriate for analysing the data. The following two tables show z-values calculated for skewness and kurtosis and also the Shapiro-Wilks test p-values.

Table 5: Normality Testing using Skewness and Kurtosis z-values

	Skewness z-values		Kurtosis z-values	
	Non-drinkers	Binge drinkers	Non-drinkers	Binge drinkers
Average Time taken to complete task	0.001	0.90	-0.0002	-1.054
Average number of dropped pegs	2.531	0.002	0.4502	0.4502
Average number of taps per 10 seconds	0.0094	0.248	0.054	-1.611

Regarding skewness and kurtosis, our data for all the three categories are a little skewed and kurtotic but do not differ significantly from normality. Since the z-values for both skewness and kurtosis from the table are all between -1.96 and +1.96, we can,

therefore, assume that our data are approximately normally distributed, in terms of skewness and kurtosis.

Table 6: Normality Testing using Shapiro-Wilk's Test

	Tests of Normality						
	Respondent Type	Kolmogorov-Smirnov ^a Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Average time taken to complete task	Non-Drinker	.104	30	.200*	.963	30	.372
	Binge Drinker	.116	30	.200*	.952	30	.191
Average number of dropped pegs	Non-Drinker	.263	30	.000	.798	30	.000
	Binge Drinker	.196	30	.005	.911	30	.016
Average number of taps per 10 seconds	Non-Drinker	.123	30	.200*	.979	30	.785
	Binge Drinker	.160	30	.048	.932	30	.055

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

In terms of Shapiro-Wilk test, we can assume that our data are approximately normally distributed, because four of the six p-values (.372, .191, .785 and .055) are greater than 0.05. The conclusion is that the data is significantly normally distributed; hence use of the student t-test was appropriate for use.

4.3 Common Alcoholic Beverages Cited by Participants

Participants were also requested to mention the common alcoholic beverages that they take and the table that follows shows their responses.

Table 7: Alcoholic Beverages Cited by Participants

Category	Alcoholic content (%)	Cost	Tallies (Sum=302, N=19, Mean=15.9, SD=6.4)
Lagers	4.5≤5.5	K7.00≤K10	11
Mosi	4.5	K7.00	11
Castle	5.5	K7.00	9
Black Label	5.5	K8.00/K10.00	14
Eagle	5.0		11
Ciders	4.5≤7.0		20
Heineken	4.5	K15.00	19
Hunter's Gold	4.5	K15.00	24
Hunter's Dry	5.0	K15.00	25
Savanna	5.0	K20.00	20
Sminoff Storm	5.0	K10.00	15
Sminoff Spin	7.0	K10.00	19
Castle Lite	4.5	K10.00	16
Opaque Beer			7
Chibuku	6.0	K3.00/K3.5	4
Shake-shake	4.5	K3.00/K3.5	7
Lusaka Beer	4.5	K3.00/K3.5	9
Wines			15
Autumn Harvest	11.0	K28.00	17
Cellar Cask	11.0	K55.00	13
Spirits		(K35≤)	23
Brandies	43.0	K72≤K175	20
Gins	12≤43.0	K29≤K169	26
Whisks	43.0	K45≤K90	23
Un-Quantified Alcoholic Beverages	-	-	-

Table 7 above shows the favourite alcoholic beverages that were cited by the 30 binge drinkers. The 19 types of alcoholic beverages mentioned by participants were classified into five categories; lagers (7types), opaque beer (3 types), wines (2 types) and spirits (3 types). It should be noted that there was no single drinker among the 30 that takes one type of alcoholic drink, hence the tallies went up to 302 because on average each beverage was mentioned 15.9 times with SD=6.4. The percentages of alcohol in these alcoholic beverages ranged from 4.5% (ciders/opaque) to about 43% (spirits). On average 11 participants took lagers, 20 took ciders, 7 took opaque beer, 15 took wines, 23 took spirits and no one stated of taking beverages that are not quantified. Despite being the most expensive (K35≤K180), spirits were the favourites followed by ciders (K10≤K20) and the least were opaque beers despite being very cheap (K3≤K3.5). The prices shown were just averages collected from different liquor outlets within Kalingalinga.

4.4 Independent Variables

The main independent variable that was measured in the study is binge drinking. Three questions from the AUDIT questionnaire were used to identify characteristics of binge drinking as reflected in the table below. These questions are, therefore, the specific independent variables that were used.

Table 8: Mean scores from the AUDIT Questionnaire

	Respondent Type	N	Mean	Std. Deviations	p-values
Frequency of drinking	Non-Drinker	30	.00	.000	.000
	Binge Drinker	30	2.17	.834	.000
Quantity of drinking	Non-Drinker	30	.00	.000	.000
	Binge Drinker	30	3.03	.964	.000
Intensity of drinking	Non-Drinker	30	.00	.000	.000
	Binge Drinker	30	2.53	.507	.000

Table 8 shows the mean scores on binge drinking depicting the frequency of drinking and the number of alcoholic drinks taken per occasion. A mean of 2.17 with SD of 0.834

represents frequency of alcohol drinking (represented by Q1 on the AUDIT). This shows that on average participants chose response 2 on the AUDIT questionnaire which corresponds to “2 to 4 times a month.” The second variable (quantity of drinking) in the table had a mean of 3.03 with SD of 0.964. This mean represents response 3 of question 2, meaning that on average participants take 7, 8 or 9 alcoholic drinks per each drinking occasion. Intensity of alcohol drinking (represented by Q3) had a mean of 2.53 with SD of 0.507, representing response 3 (i.e. weekly) on the questionnaire.

4.5 Dependent Variables

The main dependent variable was psychomotor performance that was obtained through two performance tests; the Grooved Pegboard and Finger Tapping tests. Six specific variables were listed under psychomotor skills and tested using the two mentioned performance tests. The variables tested using Grooved pegboard were; time taken to complete task with dominant hand, time taken to complete a task with non-dominant hand, number of dropped pegs with dominant and number of dropped pegs with non-dominant hands. The fifth and sixth variables were; the number of taps per 10 seconds with dominant hand and number of taps per 10 seconds with non-dominant hand, measured by the Finger tapping test. Three different variables were transformed from the averages of the six original variables- average time taken to complete a task, average number of pegs dropped and number of taps per ten seconds.

4.5.1 Grooved Pegboard Scores

Table 9 that follow has descriptive statistics (grouped statistics) for Grooved pegboard scores from two variables; average time taken to complete a task and the number of dropped pegs with both dominant and non-dominant hands.

Table 9: T-test scores for the Grooved Pegboard and Finger Tapping Test

	Respondent Type	N	t-values	Mean	Std. Deviations	p-values
Average time taken to complete task	Non-Drinker	30	-7.048	66.77	8.295	.000
	Binge Drinker	30	-7.048	84.07	10.581	.000
Average number of dropped pegs	Non-Drinker	30	-3.537	.5167	5.050	.001
	Binge Drinker	30	-3.537	1.2167	7.260	.001
Average number of taps per 10 seconds	Non-Drinker	30	5.130	50.45	.62261	.000
	Binge Drinker	30	5.130	42.17	.88749	.000

4.6 Relationship between Binge Drinking and Motor skills

An independent samples student t-test was conducted to compare psychomotor performance between female binge drinkers and their non-drinking counterparts. The assumptions of homogeneity of variances for all the three dependent variables were tested and satisfied through the Levene's test; $F=2.525$, $p<.118$, $F=10.241$, $p<.002$ and $F=2.887$, $p=.095$. From these results, it is clear that two variables (time taken to complete task, number of taps per 10 seconds) had significantly equal variance distribution because their p-values (.118, .095) are greater than .05.

The independent samples t-test run to compare female binge drinkers and their non-drinking counterparts show that non- drinkers performed better ($M=66.77$, $SD=8.295$; $M=.5167$, $SD=5.050$ and $M=50.45$, $SD=.62261$) than binge drinkers ($M=84.07$, $SD=10.581$; $M=1.2167$, $SD=7.260$ and $M=42.17$, $SD=.88749$). These results were significant at $t(58)=7.048$, $p<.000$; $t(58)=3.537$, $p<.001$ and $t(51.74)=5.130$, $p<.000$.

4.7 Multiple Regression Analysis

The multiple regression analyses were run separately for the three outcome variables. The figures show graphs representing the normal curves depicting normal distribution of data, which is a prerequisite for regression analysis.

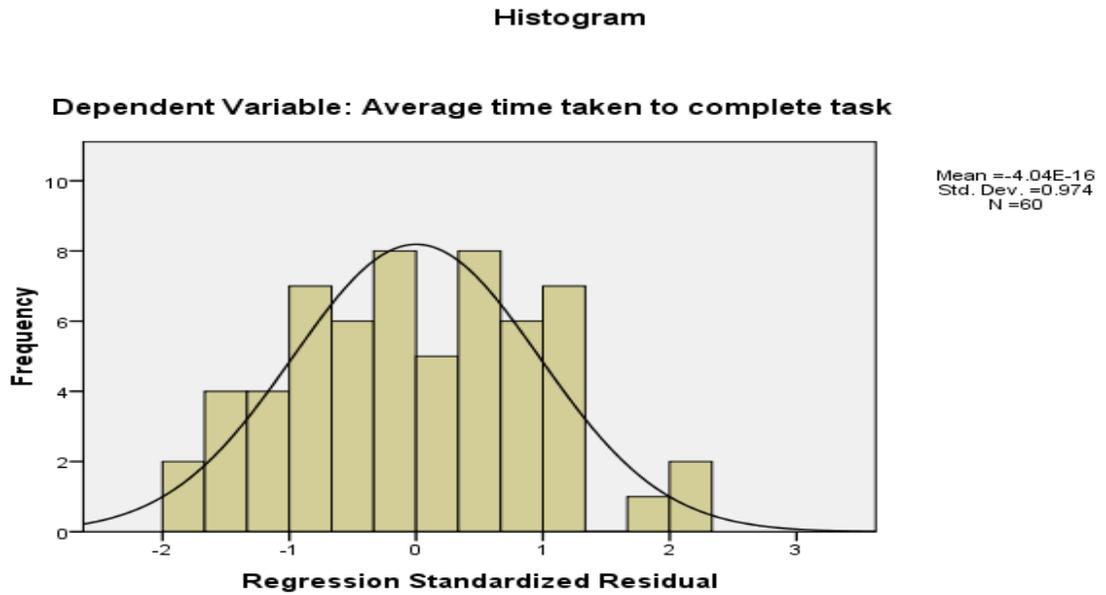


Figure 4: *Normal Curve for Average time taken to complete a task*

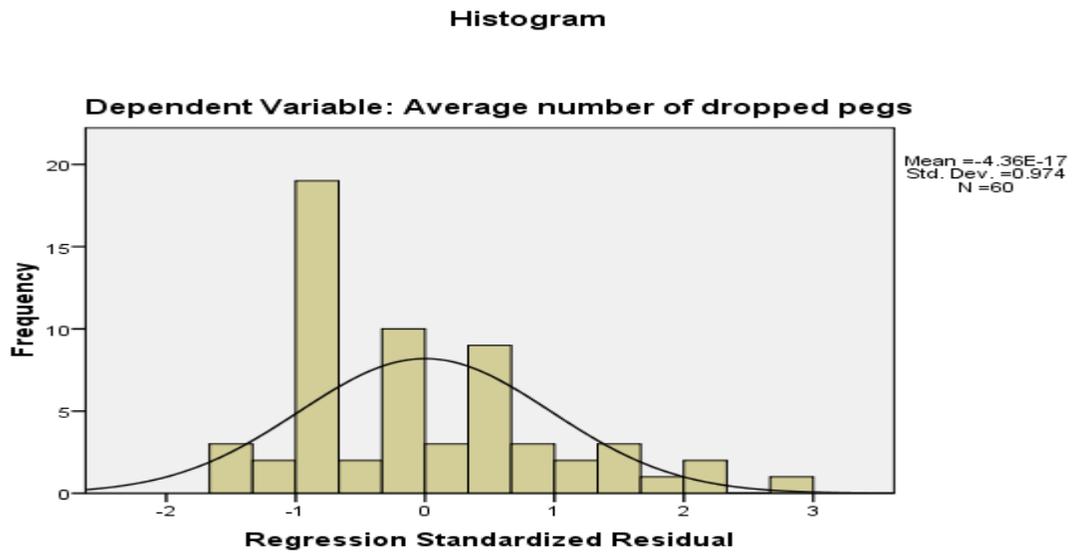


Figure 5: *Normal Curve for the average number of dropped pegs*

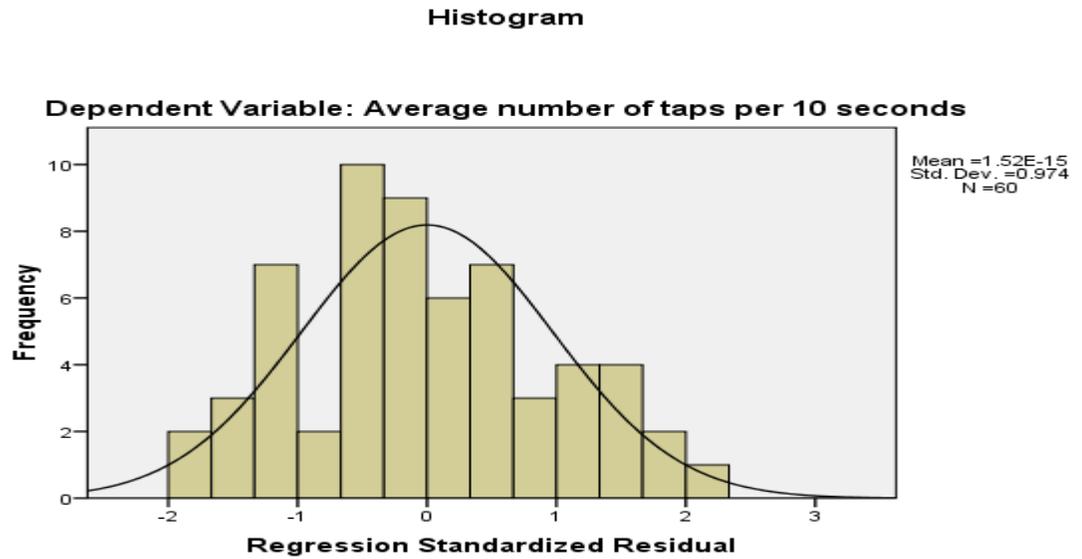


Figure 6: *Normal Curve for average number of taps per 10 seconds*

Figures 4, 5 and 6 represent the normal distribution curves which were arrived so as to demonstrate that the data for the three dependent variables was normally distributed and henceforth allowed the use of regression analysis to show the strength of the relationship between each of the predictor variables with the outcome variables.

Table 10 below gives a summary of the beta and p-values of the multiple regression analysis that was done to show which of the three independent variables (frequency, quantity, intensity) had a stronger relationship with the dependent variables. The beta values indicate that two of the predictor variables had a strong relationship with the three outcome variables. Summary below shows the beta values of the three predictor variables in order of importance.

Table 10: Summary of Beta and p-values of Multiple Regression Analyses

Variables	Average time taken to complete a task		Average number of dropped pegs		Average number of taps per 10 seconds	
	β -values	Significance	β -values	Significance	β -values	Significance
Intensity of drinking	.970	.001	.848	.016	.934	.004
Quantity of drinking	.230	.296	.219	.429	.240	.345
Frequency of drinking	.552	.003	.700	0.003	.699	.001

From the summary in table 10, two of the three predictor variables had significantly strong relationships with the all the outcome variables. In order of importance they are: intensity of drinking (β < .970, .848, .934 and p < .001, .007, .004), frequency of drinking (β < .552, .700, .699 and p < .003, .003, .001) and quantity of drinking (β < .970, .848, .934 and p < .296, .429, .345). Although these results are just about statistical correlation between predictor and outcome variables, they are showing which specific independent variables have a stronger relationship with the dependent variables. Two of the predictor variables, the intensity and frequency of drinking alcohol have a very strong relationship with the outcome variables. With p -values .001, .007, .004 for intensity and .003, .003, .001 for frequency, it shows that there is a statistically significant relationship between binge drinking and psychomotor performance.

Chapter four covered the results of the present study and this covered response rates, demographic data used for matching, testing for normally, and presentation of results from independent samples t-test and a summary of regression analysis.

CHAPTER FIVE

DISCUSSION

This chapter discusses the results presented in chapter four. This is done in line with the study objectives; to identify characteristics of binge drinking among female social drinkers, and to compare psychomotor performance between female binge drinkers and their non-drinking female counterparts. The discussion starts with a summary of the findings which give a general view on the significance of the relationship between binge drinking and psychomotor performance among Zambian female social drinkers.

5.1 Summary of Findings

The findings from this study reveal that there is a statistically significant relationship between binge drinking and psychomotor performance in a population of female social drinkers in Kalingalinga township of Lusaka, Zambia. There are statistically significant differences that were observed in the two neuropsychological tests; Grooved Pegboard and Finger Tapping tests. Female binge drinkers performed significantly less well ($M=66.77$, $SD=8.295$; $M=.5167$, $SD=5.050$ and $M=50.45$, $SD=.62261$) on both tests than their non-drinking female counterparts ($M=84.07$, $SD=10.581$; $M=1.2167$, $SD=7.260$ and $M=42.17$, $SD=.88749$) as revealed by an independent samples t-test whose results were significant at $t(58)=7.048$, $p<.000$; $t(58)=3.537$, $p<.001$ and $t(51.74)=5.130$, $p<.000$. Further, regression analyses were run and revealed that two of the three predictor variables (intensity and frequency) had significantly strong relationships with all the outcome variables.

It should, however, be noted that although these results seem to be statistically significant, they are not clinically significant as they were not clinically proven. Therefore, the results in the present study may not be fully suggestive of any causation but rather make some causal inferences that can grant further scientific investigation.

5.2 Characteristics of Binge Drinking

Binge drinking as the independent variable in the study was determined by three indices; frequency, quantity and intensity of drinking, determined by the AUDIT questionnaire (question 1-frequency, question 2-quantity, question 3-intensity). The scores for these variables were: frequency ($M=2.17$, $SD=.834$, $p=.000$), quantity ($M=3.03$, $SD=.964$, $p=.000$) and intensity ($M=2.53$, $SD=.507$, $p=.000$) as outlined in Table 8.

The mean of 2.17 represents response (2) on the questionnaire implying that an average female took an alcoholic drink '2 to 4 times per month.' This does not represent regular drinking but irregular type of drinking a characteristic of binge drinking. Further, quantity is represented by a mean score of 3.03 translating into '7, 8 or 9 drinks' per occasion, implying consumption of large amounts of alcohol on one sitting. Besides, the intensity of drinking was represented by an average of 2.53 which meant that taking of six or more alcoholic drinks was almost on a weekly basis.

These results therefore show that on average participants took 7, 8 or 9 alcoholic drinks 2 to 4 times monthly and that the taking of 4 or more drinks was almost on weekly basis. Similarly, these results match other studies which gave the same definition of binge drinking. Kokavec and Crowe (1999) gave a similar definitional characteristic of binge drinking when they described it as 'consuming large amounts of alcohol on irregular basis.' Further, NIAAA (2004) gave a clinical definition of binge drinking as 'drinking alcohol that brings blood alcohol concentration (BAC) to 0.08-gram percent or above.' This definition too matches the results of the present study because blood alcohol level of 0.08-gram percent or above is only reached by taking 5 or more drinks or more drinks (in males) or 4 or more drinks (in females) on an occasion' (Brumback, T., Cao, D. & King, 2007).

5.3 Comparison of Psychomotor Performance between Female Binge Drinkers and Non-drinkers

In order to compare psychomotor performance between female binge drinkers and their non-drinking counterparts, independent samples analyses were run for both Grooved Pegboard and finger Tapping test results.

Results from the Grooved Pegboard reveal that female binge drinkers performed less well ($M=84.07$, $SD=10.581$, $p=.000$; $M=1.2167$, $SD=7.260$, $p=.001$) than their non-drinking counterparts ($M=66.77$, $SD=8.295$, $p=.000$; $M=.5167$, $SD=5.050$, $p=.001$). The results here represent two categories of scores; average time taken to complete a task of putting pegs in some slots on the pegboard, and also the average number of pegs dropped during the first activity. On average non-drinkers were faster by taking 66.77 seconds to complete the pegboard tasks than the binge drinkers who took 84.07 seconds on the same tasks. Generally, a non-drinker was 17.3 seconds faster than a binge drinker in completing the Grooved Pegboard task. In addition, the number of dropped pegs was on average higher among the binge drinking females (1.22) than their non-drinking counterparts (0.52). It implies that an average binge drinking participant dropped more than one peg by the time they complete an activity on the pegboard as compared to a non-drinking participant whose rate of dropping pegs was almost 0.

In the same way, results from the second neuropsychological test, Finger Tapping test, revealed that there are significant differences in psychomotor performance between female binge drinkers ($M=42.17$, $SD=.88749$, $p=.000$) and the non-drinking females ($M=50.45$, $SD=.62261$, $p=.000$). These results show that on average a non-drinking female participant made 50 taps per 10 seconds as compared to binge drinking females who on average made 42 taps per 10 seconds. It implies that a non-drinking female made about 8 taps faster than their drinking female counterparts.

In order to show which of the independent variables make a strong relationship with the dependent variables, regression analyses were run and two of the variables seemed to have strong relationship with the dependent variables. As shown in Table 10, their order of importance is; intensity of drinking ($\beta<.970$, $.848$, $.934$ and $p<.001$, $.007$,

.004), frequency of drinking ($\beta < .552, .700, .699$ and $p < .003, .003, .001$) and quantity of drinking ($\beta < .970, .848, .934$ and $p < .296, .429, .345$). From these analyses, we can deduce that the intensity of drinking, represented by taking four or more alcoholic drinks in females seem to make the strongest relationship with the outcome variables and therefore makes the best prediction of the psychomotor performance of binge drinkers. This is followed by the frequency of drinking which was on weekly basis. Although quantity seems to be the least of the three predictor variables, it plays a significant role in the relationship as it helps in determining how intense one's drinking is. It can be concluded that taking 7, 8 or 9 alcoholic drinks in one sitting on a weekly basis seem to predict the poor psychomotor performance of female binge drinkers on both the Grooved Pegboard and Finger Tapping tests.

These results of the present study seem to be consistent with many other study findings that overwhelmingly show that binge drinking can cause structural and functional damage to the brain resulting in many cognitive deficits that include motor skills (Acker, 1985; Leonard & Blane, 1999; Zeigler, et al, 2005; Strauss, et al., 2009; Ward, Lallemand & de Witte, 2009; and Miller, 2013). These studies have shown that binge drinking causes damage to the central nervous system particularly because of neurotoxicity. Zeigler, et al (2005) states that periods of binge drinking followed by abstinence may trigger a cycle of responses that lead to increased neurotoxicity and cognitive deficits. The pattern of drinking shown in the present study; 'taking 7, 8 or 9 alcoholic drinks per occasion on a weekly basis,' shows a pattern that can cause some form of neurotoxicity because there is heavy consumption of alcohol (7,8 or 9 drinks) once or twice in a week that is followed by some days of not drinking (withdrawal or abstinence) until the following week.

Acker (1985) found that female alcoholics performed significantly less well on a range of neuropsychological tests than their matched non-alcoholic female counter parts. Similarly, Kabuba, Hestad and Menon (2012) carried out a study that looked all the neuropsychological domains and found that female moderate drinkers seemed to perform less well on a range of neuropsychological tests than the non-drinking controls. Interestingly, this study revealed that male moderate drinkers performed better on most

neuropsychological tasks than the non-drinking males. The implication is that male alcohol drinkers benefit from moderate drinking than female social drinkers.

To sum up, there are very few studies that have been done to specifically compare neuropsychological performance of female binge drinkers to the non-drinking females. The few that have been reviewed in this study are all consistent with the results of this study as they all show that female binge drinkers perform less well on neuropsychological tasks than their non-drinking controls.

This chapter focused on discussing the study results as presented in chapter four. The results show that female binge drinkers statistically significantly showed slower psychomotor performance on both Grooved Pegboard and Finger Tapping tests than the non-drinking females based on independent samples t-test analyses that were run. Regression analyses that were run further revealed that the intensity and frequency of drinking alcohol seemed to have strong relationship with the outcome variables.

CHAPTER SIX

CONCLUSION

This chapter presents the conclusion and recommendations emanating from the research findings and discussions in the two preceding chapters. The discussions in this chapter answer the research question; “Is there a significant difference in psychomotor performance between female binge drinkers and their non-drinking female counterparts?”

6.1 Conclusion

The aim of this study was to investigate the relationship between binge drinking and psychomotor performance in a population of female social drinkers in Kalingalinga township of Lusaka, Zambia. To do this, the study identified characteristics of binge drinking among female social drinkers and then compared the psychomotor performance between these binge alcohol drinkers and non-drinking females of the same age group (20-39), education levels, social status, among other things.

Using a matched pairs design and snowball sampling method, 60 female participants (30 drinkers and 30 non-drinkers) were enrolled in the study. A two-phase data collection approach was employed involving recruitment/identification of binge drinking characteristics using AUDIT questionnaires in the first phase and neuropsychological testing of psychomotor performance using the Grooved Pegboard and Finger Tapping tests in the second.

Matching of the participants was based on the results of the Pearson’s Chi-square test which revealed that there were no statistically significant differences in the demographic characteristics of the two groups of the participants. Normality of data was determined by the Shapiro-Wilks’s test for normality and Skewdness and Kurtosis test which both revealed that the data collected was normally distributed.

Overall, results got from the independence samples t-test revealed that there is a statistically significant relationship between binge drinking and psychomotor performance among female social drinkers. The findings showed that female binge

drinkers performed much slower than the controls on both Grooved Pegboard and Finger Tapping test activities. On average, a non-drinking female participant took 17.3 seconds faster than a binge drinker in completing the Grooved Pegboard task, and dropped almost no peg as compared to the binge drinkers who dropped more than one peg. In a similar way, results from the Finger tapping test revealed slower performance among binge drinkers who made an average of 42 taps per 10 seconds than non-drinkers who on average made 50 taps per 10 seconds.

Further, regression analyses that were run showed a stronger relationship between two predictor variables (frequency and intensity of drinking) and the three outcome variables. The results revealed that on average a female binge drinker in Kalingalinga consumed 7, 8 or 9 alcoholic drinks on one occasion on a weekly basis. This form of drinking which has been predicted by regression analysis is typical of binge drinking because the intensity is above four drinks per occasion for females (as defined by the WHO AUDIT questionnaire) and the frequency is characterised by some days of withdrawal or abstinence.

The implication is that the irregular consumption of large amounts of alcohol may appear to be safe to many drinkers but the periods of withdrawal causes neurotoxicity which put their brains at risk of structural and functional damage. In more precise terms, it implies that these women may be at risk of home and/or road accidents and that binge drinking may impinge on their multitask-taking skills which in turn affect their families and society. Further, the drinking pattern reported by participants in the present study should be a source of worry because this can increase the country's disease burden in the next few years if no measures are put in place to check this.

6.2 Recommendations

Following the conclusion that there is a significant relationship between binge alcohol drinking and psychomotor performance among social drinkers, the study makes the following recommendations:

6.2.1 In the field of research:

- There is need to expand this research to incorporate all the other cognitive domains so that the Zambia neuropsychological test battery can be used to explore all the domains in female binge drinkers other than psychomotor performance only.
- There is need to include clinical testing of such factors as blood alcohol concentration, nutrition and other clinical factors which could have confounded on the results of this study
- Qualitative studies are required to investigate factors that are behind excessive drinking among underage girls who turned up in good numbers but were excluded from participation due ethical considerations

6.2.2 In the Area of Policy Making and Better Health Service Delivery:

- Measures should be put in place because the intensity of alcohol consumption reported by participants in the present study can increase the country's disease burden if not checked in good time
- Service providers such as psychologists, counsellors and other therapists that engage in all forms of psychosocial therapy, need to direct much of their efforts on how to reduce on both the intensity and frequency of drinking as predicted in the study's regression analyses.

REFERENCES

- Ahuja, N. (2006). *A short Textbook of Psychiatry*. New Delhi: Jaypee Brothers.
- Anderson, P. (2007). *Binge Drinking and Europe*. Institute of Alcohol Studies.
- Acker, C. (1985). "Performance of Female Alcoholics on Neuropsychological Testing," *Alcohol and Alcoholism*. 20(4): 379-386. Available @ <https://doi.org/10.1093/oxfordjournals.alcalc.a044560>
- Andersson, C., Sundh, V., Waern, M., Jakobson, A., Lissner, L., and Spak, F. (2013). "Drinking context and problematic alcohol consumption in young Swedish women," *Addiction Research & Theory*. 21(6): 457-468.
- Austin, D., Jimison, H., Hayes, T., Mattek, N., Kaye, J. and Pavel, M. (2011). "Measuring Motor Speed Through Typing: A Surrogate for the Finger Tapping Test." *Behaviour research Methods*. 43. Potland: Springer International Publishing AG.
- Bartoli, F., Martinotti, G., Crocamo, C., Carretta, D., Sachivalocchi, A., Clerici, M., and Carra, G. "Prevalence and Correlates of Binge Drinking Among Young Adults Using Alcohol: A Cross-sectional Survey," *BioMed Research International*. 2014(2014):10.1155
- Becker, J., Berkley, K., Geary, N., Hampson, E., Herman, J., and Young, E. (2008). *Sex Differences in the Brain: From Genes to Behaviour*. (p. 156). New York, NY: Oxford
- Black, K. (2004). *Business Statistics for Contemporary Decision Making* (Fourth Ed.). Wiley Student Edition for India
- Berridge, V., Thom, B. and Herring, R. (2007). *The Normalisation of Binge Drinking? A Historical and Cross-cultural Investigation with Implications for Action*.
- Brion, M., Pitel, A. L., Beaunieux, H. and Muraige, P. (2014). *Revisiting the Continuum Hypothesis: Toward an in-depth exploration of executive functions in Korsakoff's Syndrome*. *Frontiers in Human Neuroscience*, 8 (2014), pp. 1-7. Available @ www.frontiersin.org
- Beral, V., Bull, D., Doll R., Peto, R. and Reeves, G. (2002). "Collaborative Group on Hormonal factors in Breast cancer, Alcohol, tobacco and breast cancer – collaborative reanalysis of individual data from 53 epidemiological

- studies, including 58,515 women with breast cancer and 95,067 women without the disease.” *British Journal of Cancer*. 87: 1234-1245
- Brumback, T., Cao, D. & King, A.; (2007). “Effects of Alcohol on Psychomotor Performance and Perceived Impairment in Heavy Binge Social Drinkers.” *Drug Alcohol Depend.* 91(1): 10-17. NIH Public Access
- Burden, M. J., Westerlund, A., Muckle, G., Dodge, N., Dewailly, E., Nelson, C. A., Jacobson, S. W. and Jacobson, J. L. (2011). *The Effects of Maternal Binge Drinking During Pregnancy on Neural Correlates of Response Inhibition and Memory in Childhood*. Detroit: Wayne State University School of Medicine.
- Central Statistics Office (2013). *2010 Census of Population and Housing Descriptive Tables: Lusaka Province*. Lusaka: CSO
- Cherpitel, C. J. (1993). “Alcohol and injuries: a review of international emergency room studies.” *Addiction*. 88: 923-937
- Choi, D. W., and Rotham, S. M. (1990). “The Role of Glutamate Neurotoxicity in Hypoxic_Ischemic Neuronal Death.” *Annual Review of Neuroscience*, 13(1):171-82
- Culley, C. L., Ramsey, T. D., Mugenyi, G., Kiwanuka, G. N., Ngonzi, J., MacLeod, S., Koren, G., Grunau, B. E. and Wiens, M. O. (2013). “Alcohol Exposure Among Pregnant Women in Sub-Saharan Africa: A Systematic Review.” *J Popul Ther Pharmacol*. 20(3):321-333.
- Esser, M. B., Hedden, S. L., Kanny, D., Brewer, R. D., Gfroerer, J. C., and Naimi, T. S. (2014). *Prevalence of Alcohol Dependence among US Adult Drinkers, 2009-2011*. Atlanta: Centre for Disease Control and Prevention
- Frezza M, di Padova C, Pozzato G, Terpin M, Baraona E, Lieber CS (1990). *High Blood Alcohol Levels in Women: The Role of Decreased Gastric Alcohol Dehydrogenase and First-Pass Metabolism*. *N Engl J Med* 1990; 322:95
- Gmel, G., Rehm, J., & Kuntsche, E. N. (2003). Binge drinking in Europe: Definitions, Epidemiology, and consequences. *Sucht*, 49(2), 105–116.
- Grucza, R. A., Bucholz, K. K., Rice, J. P. and Bierut, L. J. (2008). “Secular Trends in the Lifetime Prevalence of Alcohol Dependence in the United States: A Re-evaluation.” *Alcoholism: Clinical and Experimental Research*, 32:7 63-770. Doi:10.1111/j.1530-0277.2008.00635.x

- Hellberg, K. S. (2010). Intelligence and substance use. *Review of General Psychology*. JEEU14: 382–396. doi: 10.1037/a0021526
- Hibell B, Andersson B, Bjarnason T, Ahlstrom S, Balakireva O, Koklevi A, Morgan M. (2004) *The ESPAD Report 2003, Alcohol and Other Drugs use Among Students in 35 European Countries*. The Swedish council for information on alcohol and other drugs (CAN) and the Pompidou Group at the council of Europe, Stockholm.
- Institute of Alcohol Studies (2007). *Binge Drinking: Medical and Social Consequences*. St. Ives, Cambs., PE27 5AR
- Kabuba, N., Menon, A. J. and Hestad, K. (2011). “Moderate Alcohol Consumption and Cognitive Functioning in a Zambian Population.” *Medical Journal of Zambia*. 38. 2.
- Knight, R.G. and Longmore, B.E. (1994). *Clinical Neuropsychology of Alcoholism*. East Sussex: Lawrence Erlbaum Associates Publishers.
- Kokavec, A. and Crowe, S. F. (1999). *A Comparison of Cognitive Performance in Binge Versus Regular Chronic Alcohol Misusers*. La Trobe University, Bundoora.
- Korhonen, M. (2004). *Alcohol Problems and Approaches: Theories, Evidence and Northern Practice*. Ottawa: National Aboriginal Health Organisation (NAHO)
- Kuntsche, E. N, Rehm, J. & Gmel, G. (2004). *Characteristics of Binge Drinking in Europe*. Toronto: Elsevier
- Kypri, K., Paschall, M. J., Langley, J., Baxter J., Cashel-Smith, M. and Bourdeau, B. (2009) *Drinking and alcohol-related harm among New Zealand university students: Findings from a National Web-based survey*. *Alcohol Clin Exp Res* 33:307–314.
- Leonard, K, E. and Blane, H, T. (1999). *Psychological Theories of Drinking and Alcoholism*. New York: The Guilford Press
London.
- Lopez-Caneda, E., Cadaveira, F., Crego, A., Doallo, S., Corral, M., Gomez-Suarez, A. and Holguin, S. R. (2013). *Effects of a Persistent Binge Drinking Pattern*

of Alcohol Consumption in Young People: A Follow-Up Study Using Event Related Potentials. Oxford University Press, Oxford.

Loretta, S. (1973). *Motor Skills: Development and Learning.* Boston: McGraw-Hill

Marques-Vidal P., Arveiler D., Evans A., Amouyel P., Ferrieres J., Ducimetiere P. (2001). *Different Alcohol Drinking and Blood Pressure Relationships in France and Northern Ireland.* The PRIME Study, Hypertension. 38: 1361-1366

Miller, J. W., Naimi, T. S., Brewer, R. D. and Jones, S. E (2007). *Binge Drinking and Associated Health Risk Behaviours Among High School Students.* Georgia: Pediatrics

Miller, M. P. (2013). *Biological Research on Addiction: Comprehensive Addictive Behaviours and Disorders.* Available @ <https://www.elsevier.com>

Morgan, D. L. (2008). *The SAGE Encyclopaedia of Qualitative Methods.* SAGE Publications, Inc. pp. 816-817. ISBN 9781412941631.

Muula A. S, Kazembe L. N, Rudatsikira E, Siziya S (2007). Suicidal ideation and associated factors among in-school adolescents in Zambia. *Tanzan Health Res Bull.* 9:202-6.

Mwale S. (2014). "Zambian Women Lead in Alcohol Consumption." *Times of Zambia,* May 3rd.

National Institute on Alcohol Abuse and Alcoholism. (2004). *NIAA Newsletter, Winter2004 Number 3. NIAA Council Approves Definitions of Binge Drinking. (PDF).* Retrieved May 19th, 2013 from <http://pubs.niaa.nih.gov/publications/Newsletter/winter2004/Newsletter-Number 3. pdf>

OED (Oxford English Dictionary) (1989) (2nd Ed.) 'Binge' entry from Oxford English Dictionary Online, 2006. Available @ http://bbcwords.oed.com/cgi/entry/50022250?query_type=word&queryword=binge&drinking.

Parada, M., Corral, M., Holguin, S. R. and Cadaveira, F. (2011). "Binge Drinking and Declarative Memory in University Students." *Alcoholism Clinical and Experimental Research.* 35 (8): 1475-84

- Pedersen, W. and von Soest, T. (2013). *Socialisation to Binge Drinking: A Population-based, Longitudinal Study with Emphasis on Parental Influence*. Oslo: NOVA
- Reitan, R.M. and Wolfson, D. (2009). The Halstead–Reitan Neuropsychological Test Battery for Adults—Theoretical, Methodological, and Validational Bases. *Neuropsychological assessment of neuropsychiatric and neuromedical disorders, 1*.
- Motsoeneng, T. (2012). “Addiction.” *Binge Drinking in Africa a crisis*. Johannesburg: Reuters Health, 8th August.
- Schott, G. (1993). "Penfield's homunculus: a note on cerebral cartography". *Journal of Neurology, Neurosurgery, and Psychiatry* 56 (4): 329–333. doi:10.1136/jnnp.56.4.329
- Snel, J. and Lorist, M. M. (1998). *Nicotine, Caffeine and Social Drinking: Behaviour and Brain Function*. New York: Routledge
- Strauss, E., Sherman, E. M.S. and Spreen, O. (2009). *A Compendium of Neuropsychological Tests: Administration, Norms and Commentary*. New York: University of Oxford Press.
- Thomson, A. D. and Marshall, E. J. (2006). “The natural history and pathophysiology of Wernicke’s Encephalopathy and Korsakoff’s Psychosis.” *Alcohol and Alcoholism*. 41 (2): 151-8. PMID
- United Nations (2005). *Designing Household Survey Samples: Practical Guidelines*. New York: Department of Economic and Social Affairs; Statistics Division.
- VandeVoort, C. A, Grimsrud KN, Midic U, Mtango N and Latham KE (2015). “Fertility and Sterility.” *Transgenerational Effects of Binge Drinking in a Primate Model: Implications for Human Health*. 103(2): 560-569. California National Primate Research Centre: UCDAVIS. Available @ ScienceDirect.
- Wang, Y. C., Magasi, S. R., Bohannon, R. W., Reuben, D. B., McCreath, H. E., Bubela, D. J., Gershon, R. C. and Rymer, W. Z. (2011). “Assessing Dexterity Function: A Comparison of Two Alternatives for the NIH Toolbox.” 24(4): 313-20. Pubmed

- Ward, R. J., Lallemand, F. and De Witte, P. (2009). "Biochemical and neurotransmitter changes in alcohol-induced brain damage in chronic or 'binge drinking' alcohol abuse." *Alcohol and Alcoholism*. 44(2): 128-135
- World Health Organisation (2011). *Global Status Report on Alcohol and Health-2011* Ed. Geneva: WHO
- World Health Organisation (2014). *Global Status Report on Alcohol and Health – 2014* ed. Geneva: WHO
- World Health Organization (2001). *The Alcohol Use Disorders Identification Test (AUDIT): Guidelines for Use in Primary Care*. Geneva: WHO, Department of Mental Health and Substance Dependency.
- Zambian Government (2013). *The National Health Research Act No. 2*. Zambia
- Zeigler, D. W. (2005). *The Neurocognitive Effects of Alcohol on Adolescents And College Students*. *Preventive Medicine* 40(1):23-32. Available @ <http://www.elsevier.com/locate/ypmed>
- Zillmer, E. A., Spiers, M. V. and Culbertson, W.C. (2008). *Principles of Neuropsychology*. Belmont, Thomson Wadsworth.
- <http://www.educlime.com/wharemosk.html> Retrieved: January 09, 2016

APPENDICES

Appendix A: Information sheet.

University of Zambia

School of Medicine

Department of Psychiatry

PLEASE READ THIS DOCUMENT CAREFULLY. SIGN YOUR NAME BELOW ONLY IF YOU AGREE TO PARTICIPATE AND YOU FULLY UNDERSTAND YOUR RIGHTS. YOUR SIGNATURE IS REQUIRED FOR PARTICIPATION. FOR THIS PROJECT, YOU MUST BE A FEMALE OF 20 YEARS TO 39 TO PARTICIPATE. YOU MUST BE A RESIDENT OF KALINGALINGA. IF YOU DESIRE A COPY OF THIS CONSENT FORM, YOU MAY REQUEST ONE AND WE WILL PROVIDE IT.

Introduction:

This study is entitled binge drinking and motor skills in a population of female social drinkers of Kalingalinga in Lusaka, Zambia. This research is directed by a Masters Student in Clinical Neuropsychology at the University of Zambia. This document defines the terms and conditions for consenting to participate in this study. A total number 60 female participant (30 drinkers and 30 non-drinkers) will be recruited in this study.

Description of the Study:

You are being invited to take part in the study of ‘binge drinking and motor skills in female social drinkers of Kalingalinga in Lusaka, Zambia.’ The purpose of this study is to investigate the relationship between binge drinking and motor skills in female social drinkers aged between 20 and 39. Your participation in this study is to help identify features of binge drinking and whether or not binge drinkers are affected by this form of alcohol misuse. You are, therefore, requested to give responses to a 10 minutes questionnaire and later participate in a 25 minutes neuropsychological testing of your motor skills.

Confidentiality

All the information you will give shall be confidential and shall be security stored in health service facilities. No one can identify you from the reports we will generate from the project. Only the research team will have access to your questionnaire.

Risks and Benefits:

- There are no risks in participating in this study beyond normal risks associated with everyday life.

- We cannot guarantee that you will receive any direct benefits from this study though you will have an opportunity to contribute to help Zambians have a better understanding on the relationship between binge drinking and motor skills in female social drinkers in Kalingalinga, Lusaka.
- The other benefit is that, for those participants identified as having some form of harmful or hazardous alcohol use, it will be an opportunity to seek clinical advice from any nearby clinic or health centre.

Time Involvement

The questionnaire has ten questions and may take between 5 to 10 minutes to answer whereas the neuropsychological testing for motor skills will take between 15 and 25 minutes.

Participation Rights:

- Participation in this study is purely voluntary so that if you decide to withdraw at any point, there will be no consequences to you.
- All personal identifying information will be kept confidential and the data sheets will be kept in secured lockers in accordance with the standards of the University of Zambia Biomedical Ethics Committee. If the results of this study are required for publication as we hope, your identity will still be kept private.

Transport Refund and Refreshments

You will be entitled to some transport refund of K30 and K20 for refreshments not as a form of payment but rather a gesture for your time and involvement.

Contacts

If you have any further questions about this research, please contact:

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Appendix B: Consent Form

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

Signature of Research Participant:

Date.....

(Thumb Print)



Name and Signature of Witness:/.....Date.....

(Thumb Print)



Name and Signature of Researcher:...../.....Date.....

Appendix C: Audit Questionnaire

The Alcohol Use Disorders Identification Test: Interview Version	
<p>Read questions as written. Record answers carefully. Begin the AUDIT by saying “Now I am going to ask you some questions about your use of alcoholic beverages during this past year.” Explain what “alcoholic beverages” mean by using local examples of beer, wine, vodka, etc. Code answers in terms of “standard drinks”. Place the correct answer number in the box at the right.</p>	
<p>1. How often do you have a drink containing alcohol?</p> <p>(0) Never [Skip to Qs 9-10]</p> <p>(1) Monthly or less</p> <p>(2) 2 to 4 times a month</p> <p>(3) 2 to 3 times a week</p> <p>(4) 4 or more times a week</p> <p style="text-align: right;"><input type="text"/></p>	<p>6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?</p> <p>(0) Never</p> <p>(1) Less than monthly</p> <p>(2) Monthly</p> <p>(3) Weekly</p> <p>(4) Daily or almost daily</p> <p style="text-align: right;"><input type="text"/></p>
<p>2. How many drinks containing alcohol do you have on a typical day when you are drinking?</p> <p>(0) 1 or 2</p> <p>(1) 3 or 4</p> <p>(2) 5 or 6</p> <p>(3) 7, 8, or 9</p> <p>(4) 10 or more</p> <p style="text-align: right;"><input type="text"/></p>	<p>7. How often during the last year have you had a feeling of guilt or remorse after drinking?</p> <p>(0) Never</p> <p>(1) Less than monthly</p> <p>(2) Monthly</p> <p>(3) Weekly</p> <p>(4) Daily or almost daily</p> <p style="text-align: right;"><input type="text"/></p>
<p>3. How often do you have six or more drinks on one occasion?</p> <p>(0) Never</p> <p>(1) Less than monthly</p> <p>(2) Monthly</p>	<p>8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?</p> <p>(0) Never</p> <p>(1) Less than monthly</p>

<p>(3) Weekly</p> <p>(4) Daily or almost daily</p> <p>Skip to Questions 9 and 10 if Total Score for Questions 2 and 3 = 0 <input type="text"/></p>	<p>(2) Monthly</p> <p>(3) Weekly</p> <p>(4) Daily or almost daily</p> <p><input type="text"/></p>
<p>4. How often during the last year have you found that you were not able to stop drinking once you had started?</p> <p>(0) Never</p> <p>(1) Less than monthly</p> <p>(2) Monthly</p> <p>(3) Weekly</p> <p>(4) Daily or almost daily <input type="text"/></p>	<p>9. Have you or someone else been injured as a result of your drinking?</p> <p>(0) No</p> <p>(2) Yes, but not in the last year</p> <p>(4) Yes, during the last year</p> <p><input type="text"/></p>
<p>5. How often during the last year have you failed to do what was normally expected from you because of drinking?</p> <p>(0) Never</p> <p>(1) Less than monthly</p> <p>(2) Monthly</p> <p>(3) Weekly</p> <p>(4) Daily or almost daily <input type="text"/></p>	<p>10. Has a relative, friend, a doctor, or another health worker been concerned about your drinking or suggested you cut down?</p> <p>(0) No</p> <p>(2) Yes, but not in the last year</p> <p>(4) Yes, during the last year</p> <p><input type="text"/></p>
<p>Write your mobile phone number here if you want to continue to the next stage of this study:</p> <p>.....</p>	