

ORIGINAL ARTICLE

Moderate Alcohol Consumption and Cognitive Functioning in a Zambian Population

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ABSTRACT

Objectives: To investigate the relationship between moderate alcohol consumption and cognitive functioning.

Design: A cross-sectional study comprising a sample of 157 (48.5%) males and 167 (51.5%) females, with an age range of between 20 and 50 years. All the participants were conversant with the English language. Their educational range was between 5-19 years of schooling.

Measures: The Zambia Neurobehavioural Test Battery was used to measure cognitive functioning. Self-reported alcohol consumption was obtained by means of the Chinese Substance Use Form.

Results: Male moderate drinkers have performed better on the Stroop Colour and Word Test, t-score (M=52.78; SD=8.4) than the non-drinking males, (M=48; SD= 10.2). The drinking females however, seemed to perform less well (M= 47.36; SD= 8.2) when compared to the non-drinking females (M=50.68; SD= 9.2) in the area of Verbal Episodic Memory.

Conclusion: The male participants seem to benefit from moderate alcohol consumption whereas a

seemingly negative outcome in terms of cognitive functioning was observed in the female moderate alcohol consumers. It should be noted, however, that these differences observed though statistically significant are not clinically significant. Therefore, both the drinking and non-drinking groups with similar demographic characteristics are more or less expected to fall with the normal range of performance.

INTRODUCTION

There are about 2 billion people worldwide who consume alcoholic beverages and 76.3 million with diagnosable alcohol use disorders¹. It is reported² that 90% of all United States residents have consumed an alcoholic beverage at least once in their lives and 51% are still currently consuming alcohol. They further note that 90% of the adults allege they occasionally consume alcohol.

It is further noted² that statistics indicate that persons who are involved in automobile accidents do not always meet the diagnostic criteria for an alcohol disorder, showing that the majority of the population falls in the social or moderate drinking category. Similar statistics are reported for Zambia, it is estimated that road fatalities involved 50% of drinking drivers, 33.3% cyclists and 31.1%

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pedestrians. Furthermore, it has been observed that in Zambia, social drinking is widely accepted and has been incorporated into many important ceremonies. Zambia is said to be amongst the nations with the highest levels of drinking in Africa^{3,4}. It has also been noted that alcohol is not thought of as a drug because of its use for cultural and social purposes. This could explain why despite efforts by the Drug Enforcement Commission to reduce the demand for substance abuse it has nevertheless, been observed that alcohol use is on the increase suppressing all other drugs⁵.

Moderate or social drinking, is understood to mean consuming an average of one drink per day or consuming alcohol on special occasions such as at parties⁶ and Cognitive functioning refers to mental processes such as thinking, knowing and memory. Cognition allows us to engage ourselves in selective attention, perception and decision making⁷.

While the adverse effects of excessive alcohol intake on cognitive functioning have been recognized and replicated across different cultures indicating deficits in cognitive efficiency, problem solving, verbal and non-verbal abstraction, visual spatial ability, learning and memory^(8,9), the effects of moderate alcohol consumption on cognition remain uncertain, previous studies have reported a mixture of negative and positive effects on cognition.

The Northern Manhattan study (NOMAS)¹⁰ carried out in 2006 yielded a positive relationship between reported moderate alcohol intake and cognition. Another study¹¹ on the nature of the relationship between moderate alcohol use and cognitive functioning in abstract reasoning tests such as the Wechsler Adult Intelligence Scale, results obtained showed that moderate alcohol consumption was more favourable for women in terms of cognitive functioning but not for men. A different study¹² investigated the relationship between self-reported alcohol consumption and cognition, results obtained showed that moderate alcohol consumption in men

was associated with a slower decline in memory, while psychomotor decline was associated with moderate alcohol consumption in women. On the other hand, it has been observed that typically, the beneficial effects of light to moderate drinking on various aspects of cognitive functioning are found in older persons in the majority of studies. The mean age of the subjects in whom improvement of cognition is detected is in the above 65 year olds¹³.

Realising that moderate alcohol consumption is a relatively common practice, recommendations on what has been termed as 'sensible drinking' have been established by public health bodies, medical associations and Non-governmental Organisations such as the World Health Organisation (WHO). Official standard drinks or units generally contain 8 and 14 grams of pure ethanol although the measure may vary among countries. Notwithstanding, it is still a useful tool because although strengths of different types of alcohol vary significantly, using the standard measure allows for uniformity. Thus in terms of the alcohol content, a standard drink/unit will be more less the same regardless of whether it contains beer, distilled spirits, wine or a mix of the beverages¹.

It has been recommended¹ that the acceptable measures for moderate alcohol consumption are; 21 units for males and 14 units for females per week, and 4 units for males and 3 units for females per day.

It would be important for health practitioners to have knowledge about the effects of alcohol consumption as excessive alcohol consumption can have various health consequences especially neurological problems, notably Wernicke's encephalopathy and Korsakoff syndrome². It is well established that alcohol-induced cognitive impairments for heavy drinkers' ranges from mild to moderate deficits in neuropsychological test performance¹⁴.

As has been outlined above, moderate alcohol consumption or social drinking in Zambia is a relatively widespread^{1,5}. In the advent of Zambia

making strides towards attaining more holistic and better medical services, it is imperative that all aspects that have a bearing on better service delivery be understood. Neuropsychological testing is one such step toward better health service delivery. Furthermore, the current study is unprecedented as no study to this effect has previously been carried out in Zambia.

Considering that cognitive function is one of the key components measured in neuropsychological test, there is need to understand the various factors that are associated with cognition more fully. Findings in this area will indeed be beneficial to neuropsychologists as they seek to analyse and interpret test results from the neuropsychological tests and ultimately improving health service delivery. This study set out to determine whether there is a difference in the cognitive functioning of moderate alcohol consumers and non-drinkers and to ascertain whether there are gender differences in the way alcohol is related to cognitive functioning.

METHODOLOGY

Sampling

The study comprised 324 HIV negative participants, all English speaking. The distribution was as follows, 157 (48.5%) were male and 167 (51.5%) were female. A total of 152 (46.9%) were from a rural setting and 172 (53.1%) were from an urban setting. Their education level ranged from 5 to 19 years of schooling. Mean years of education was 11.02 with a standard deviation of 2.6. Their age range was between 20 and 65 years, with a mean age of 38.48 years with a standard deviation of 12.8.

The sample comprised 237 (73.1%) non-drinkers and 87 (26.9%) moderate alcohol consumers. Gender distribution amongst the drinkers was 55 (63.2%) males and 32 (36.8%) females.

Testing

The sample was drawn from the rural and urban areas of Zambia. Recruitment of participants from the urban population was done from the clinics under Ministry of Health at The University of Zambia, Kalingalinga, Chelston, Mutendere, and Chilenje. The rural clinics included were Chongwe, Chibombo and Kafue Clinic. Recruitment was done by the clinic staff, they identified HIV negative individuals through the VCT services and informed the prospective participants about the present study and sought their consent to give their contact details to the research team for possible enrollment in the study.

Nine trained graduate students tested the 324 participants in single testing sessions which took an average of 2 hours 30 minutes to complete for each participant.

Prior the neuropsychology tests administration, participants were administered questionnaires with sections on demographic characteristics, educational, medical and psychiatric information. They were also asked about their drinking practices in terms of frequency of consumption as well as the typical amounts consumed per drinking occasion. This information was obtained by means of the structured Chinese Substance Use History Form. This measure was used because it captures the key components that are commonly used in quantifying alcohol such as allowing for the computation of an average daily, weekly and monthly statistic based on responses to questions about frequency of drinking and usual amount consumed¹⁵.

Administration of the Zambia Neurobehavioural Test Battery was carried out in the same order, with the aid of standardized instructions using the Neurobehavioural Testing Booklet.

Measures

Table 1: Summary of instruments used

1. Measuring cognition	
Executive functioning	Wisconsin Card Sorting Test Colour Trails Test 2 Stroop Colour and Word Test Halstead Category Test
Working memory	Paced Auditory Serial Addition Test (PASAT) Wechsler Memory Scale (WSM)-III
Speed of information processing	Wechsler Adult Intelligence Scale (WAIS) - III Digit Symbol Wechsler Adult Intelligence Scale (WAIS) -III Symbol search Trail making Test-A Colour Trails Test (CTT) Trails 1 Stroop Colour and Word Test
Verbal fluency	Controlled Oral Word Association (FAS)/ Word Sound Fluency Category Fluency (Animals, Actions)
Learning and delayed recall	Brief Visual-Spatial Test-Revised Hopkins Verbal Test, Revised -II
Motor speed	The Grooved Pegboard (Dominant and Non -dominant hand Test)
2. Measuring Alcohol consumption	Chinese substance use form
3. Psychiatric screening and health history	The Beck Depression Inventory (BDI) Activities of Daily Living Scale Neurobehavioural Screening form
4. Demographics and reading levels	Demographic Questionnaire Wide Range Achievement Test (WRAT)

Ethical consideration

At all stages of the study from data collection, data analysis and presentation of findings, ethical issues such as confidentiality were followed. Participants gave consent after reading the study conditions, and were not coerced to participate in the study. Measures were taken to ensure that no physical or psychological harm was inflicted on the participants. They were allowed to take breaks during the testing sessions if they felt fatigued.

All the data obtained from the study was handled by the researcher and coded. No names were used. The study was approved by The University of Zambia Biomedical Ethics Committee.

Approval to carry out the research in various clinics was also obtained from the Ministry of Health.

Data analysis and management

All analyses were conducted using the Statistical Package of Social Sciences (SPSS; Version 15.0). The raw data obtained from the study was converted into T- Scores were also generated. T-Score have a mean of 50 and a standard deviation of 10. The scores were corrected for Age, Education, Gender, rural or urban background and reading level as assessed by ZAT. This was done in an effort to rule out the likelihood of any possible differences observed

between the drinking and non- drinking individuals being due to either age, education, reading level, gender, rural or urban background.

Independent t-tests were carried out comparing the cognitive performance of both the drinking males and the non- drinking males as well as that of the drinking females and the non-drinking females.

RESULTS

Response rate

The study managed to capture a total of 324 participants as was anticipated. The response rate was thus 100%.

Background characteristics of participants

Table 2: Age and education of the drinkers and non-drinkers.

DEMOGRAPHICS	MODERATE DRINKERS n=87 MEAN (SD)	NON-DRINKERS n=237 MEAN (SD)	p- Value
Age	37.60 (12.77)	38.81 (12.02)	.452
Education	11.08 (2.62)	11.02 (2.56)	.804

*P α <.05

There was no statistically significant difference between the drinkers and non- drinkers in terms of mean age and education. Thus the sample was comparable.

Gender differences in cognitive functioning in relation to cognitive functioning

Although various cognitive tests were carried out, significant differences in the cognitive functioning of the drinking and non-drinking groups were only apparent in the tests of Stroop Colour and Word test and the Verbal Episodic Memory test as outlined below.

Table 3: Cognitive functioning of male drinkers compared to male non-drinkers

VARIABLES	MODERATE DRINKERS n=55 Mean (SD)	NON-DRINKERS n=102 Mean (SD)	t	P -value
Stroop C/W	52.78 (8.42)	48.43 (10.24)	-2.662	.009*
T3				

*P α <.05

T-test results for Stroop Colour Word T3 seem to show that males who consume alcohol in moderation perform better (M =52.78, SD= 8.42) than non-drinking males (M= 48.43, SD=10.24) t (150) = -2.662 p<.05, effect size=0.05

Table 4: Cognitive functioning of female drinkers compared to female non-drinkers

VARIABLE	MODERATE DRINKERS n=32 Mean (SD)	NON-DRINKERS n=135 Mean (SD)	t	P- Value
Verbal Epis	47.36 (8.24)	50.68 (9.20)	1.868	.032*
Mean T3				

*P α <.05

A t-test run to compare female moderate alcohol consumers and female non- alcohol consumers seem to show that non -alcohol consumers performed better (M= 50.68, SD=9.20) than moderate alcohol consumers (M=47.36, SD=8.24) the results were significant at t (165) =1.868, p<.05, effect size= 0.02

DISCUSSION

Cognitive functioning, moderate alcohol consumption and gender

In general, results obtained from this study seem to indicate that there appear to be marginal differences in the performance of male moderate alcohol consumers when they are compared to male non-drinkers. Results yielded from this study, (Table 3) appeared to show better executive functioning in the stroop colour and word test (Stroop c/w) in the

drinking males (M=52.78; SD= 8.4) than the non-drinking males (M= 48; SD= 10.2). Differences in cognitive functioning were also observed when female moderate alcohol consumers were compared to female non-drinkers. Table 4 shows that the female drinking group appears to have performed less well on the Verbal Episodic Memory test (M=47.36; SD=8.2) when compared with the non-drinking female group (M=50.68; SD=9.2)

Previous studies have yielded similar results especially with regard the male gender,^{16,11} showing that better cognitive functioning was apparent in the male moderate drinkers than the non-drinking males.

However, contradicting results have also been reported by other studies⁹ showing that moderate alcohol consumption in women seemed to be beneficial for cognitive functioning. On the other hand, other studies¹² report that moderate alcohol consumption in men was associated with a slower decline in memory, while psychomotor decline was associated with moderate alcohol consumption in women.

The aforementioned gender differences could be attributed to biological sex differences in alcohol metabolism involving differences pertaining to body weight, tissue saturation, stomach enzymes and proportion of fat to water in the body¹⁷. Therefore, although there may exist a measure of statistically significant differences within gender between the drinking and non-drinking groups however, it is unlikely that drastic differences will be observed because in both the male and female groups, performance is within the normal range.

These findings show that in the administration of the Zambia Neurobehavioural Test Battery it would be expected that individuals who consume alcohol in moderation and those who do not consume alcohol are likely to perform at more or less the same level provided they possess similar demographic and health status characteristics.

One limitation of the study was the use of self-report basis of alcohol consumption increasing the possibility of inaccurate responses. However, the use of the Chinese Substance Use form strengthened the study because it meets the DSM-IV and ICD-9 criteria of diagnosis. Another limitation is the possibility that moderate alcohol consumers are most likely to have favorable health characteristics which may have had an influence on their cognitive functioning. For instance, hypertension which is known to adversely affect cognitive functioning is said to be more prevalent in abstainers than those who drink alcohol in moderation¹⁸.

This study had the strength of having corrected for educational attainment which was lacking in some previous studies. Additionally it had a more embracing age distribution unlike previous studies that focused on older participants.

CONCLUSION

The objective of this study was to examine the relationship between moderate alcohol consumption and cognitive functioning in a population based sample. Results obtained seem to indicate that there are marginal differences in the cognitive performance of drinkers and non-drinkers in terms of cognitive functioning. The male drinking group performed better (M=52.78), than the non-drinking males (M=48.43), while the drinking females performed less well (M=47.36) than the non-drinking females (M=50.68) although results obtained are statistically significant both moderate alcohol consumers and non- moderate alcohol consumers fall within the normal range of cognitive performance. Therefore, in the administration of the Zambia Neurobehavioural Test Battery it would be expected that individuals from either group are likely to perform at more or less the same level.

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