African Journal of Drug & Alcohol Studies, 15(1), 2016

TEMPERAMENT AND THE RISK OF ALCOHOL, TOBACCO, AND CANNABIS USE AMONG UNIVERSITY STUDENTS IN BOTSWANA

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ABSTRACT

Substance use is rising among young people in developing countries, especially in schools and universities. Empirical studies on factors associated with substance abuse are required to identify protective and risk factors and to inform interventions. We report on the extent to which temperament and other demographic and background characteristics predict substance use among young adults pursuing university education in Botswana. Information on demographic characteristics and substance use (alcohol, tobacco, and cannabis) and temperament was obtained by questionnaire in a cross-faculty sample of 211 university students (41% male, n=87) at a university in Botswana. The Tridimensional Personality Questionnaire (Cloninger, 1987) was used to assess temperament with only the subscales on novelty seeking and harm avoidance included. Questionnaires were administered during scheduled lecture hours. Twelve per cent (12%) of the students used tobacco, 19% used cannabis weekly, daily, or almost daily, and 45% reported using alcohol. Cannabis use is more common among male than female participants but there were no sex differences in using alcohol. Compared to those who were brought up in urban areas, students who were raised in rural settings were less likely to use substances. Similarly, students who attended public schools were less likely to use substances compared to their counterparts who attended private schools. The temperamental typology of novelty seeking significantly predicted tobacco (β=.32 (95% CI: .28, .37)), cannabis (β=.35 (95% CI: .28, .42)), and alcohol (β=.22 (95% CI: .16, .28)) use while harm avoidance significantly predicted only alcohol use (β=.18 (95% CI: .12, .24)). Background information and knowledge of temperament are essential for designing interventions to reduce substance use among young adults in tertiary education. Such interventions may include better education on substance use in secondary schools, tertiary institutions, and communities.

Keywords: Alcohol and tobacco, cannabis use, temperament, university studnets, Botswana

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INTRODUCTION

Globally, substance use among young people, especially those in high school or tertiary education, is common and is a public health concern (Adams, Blanken, Ferguson, et al., 1990; Hawkins, Catalano, & Miller, 1992). It has been shown to be associated with high failure rates (Arria, Caldeira, Bugbee, et al., 2013) and adverse health problems (Xie, Rehm, Single, & Robson, 1992). Although students in high school or at tertiary education associate the use of alcohol, tobacco, and cannabis with leisure, (Pearson, Kite, & Henson, 2013; Peltzer, Ramlagan, & Satekge, 2012; Seloilwe, 2005) these behaviours have been linked to risky sexual activities, (Weiser, Leiter, Heisler, et al 2006) drunk driving, (Bingham, Raymond, & Zhu, 2008) crime, (Dawkins, 1997) truancy, and poor academic outcomes (Wicki & Kuntsche, Gmel, 2010). Many factors are associated with initiating substance use such as parental substance use, (Clark & Kirisci, 2008) poor self-regulation and control, (Friese & Hofmann, 2009; Morutwa & Plattner, 2014) pressure from peers, (Slater, 2003) poor social and emotional support, (Dokkin, Civita, Paraherakis, et al., 2002), stressful life events (Moitlakgola & Amone-P'Olak, 2015), and other factors such as access to substances and limited enforcement of social sanctions to limit their use, (Heath, 2001) and temperament (Wills, Sandy, Yaeger, et al., 2001; Walters, 2013).

In order to explain the phenomenon of substance use, Huba and Bentler (1982) developed the *Domain Model* in which they hypothesised that four different domains explain initiating substance use among young people. These domains include: biological, socio-cultural, interpersonal, and intrapersonal influences. The biological influences encompass genetic predisposition and vulnerability to the addictive effects of substances (Huba & Bentler, 1982). For example, parental substance use, emotional distress, inadequate coping skills, all have biological origins (Sher, Bartholow, Wood, 2000) and are risk factors for substance use among young people. The second domain is the socio-cultural influences such as social sanctions, media portrayals, and access to drugs and substances (Heath, 2001). The third domain is the interpersonal characteristics such as the presence or lack of social support and emotional attachment that predispose or act as a buffer against substance use (Dokkin, Civita, Paraherakis, et al., 2002). For example, young people from highly stressful backgrounds with little social support may find solace in using drugs and substances to cope with life stressors (Elliot & Lowman, 2015; Moitlakgola & Amone-P'Olak, 2015). The final domain is the intrapersonal influences that include variables such as beliefs (e.g. happiness derived from using drugs and substances), personal values (e.g. achievement motivation, independence, etc.), and personality characteristics such as novelty seeking, (Cloninger, 1986; Cloninger, 1987) self-efficacy, (Bandura, 1986) and self-control, (Morutwa & Plattner, 2014; Tangney, Baumeister, & Boone, 2004) all of which have been associated with substance use.

The current study focuses on intrapersonal domain, especially temperamental typologies of novelty seeking and harm avoidance. For example, novelty seekers tend to be impulsive and excitable, which leads to a predisposition towards novel and exploratory behaviours, (Cloninger, 1986; Cloninger, 1987; Pfohl, Black,

Noyes, Kelley, Blum, 1990) which, in turn, put them at risk of substance abuse.

"Temperament consists of relatively consistent, basic dispositions inherent in the person that underlie and modulate the expression of activity, reactivity, emotionality, and sociability" (Goldsmith, et al. 1987, p. 524). The current study is based on Cloninger's Tridimensional theory of personality (Cloninger, 1986) which examines three heritable temperamental typologies: novelty seeking, harm avoidance, and reward dependence. For example, novelty seeking is postulated to be an innate disposition towards frequent exploration of external environmental stimuli while harm avoidance is intensely responding to aversive stimuli to avoid punishment or novelty. On the other hand, reward dependence is a tendency to respond intensely to reward and maintain rewarded behaviour. Individual differences based on these typologies are a result of the interaction of environmental and genetic influences (Cloninger, 1986). Furthermore, characteristics such as being impulsive, excitable, extravagant, and disorderly, which initially predispose to substance abuse, may further increase the use of alcohol, tobacco, and cannabis use as the ability to control oneself is diminished (Morutwa & Plattner, 2014; Tangney, Baumeister, & Boone, 2004). Novelty seekers are also more susceptible to peer influence (Slater, 2003) consequently making them easily swayed by peers who abuse substances (Slater, 2003). Harm avoiders, on the other hand, are characterized by anticipatory worry, fear of uncertainty, and shyness, (Cloninger, 1986; Cloninger, 1987; Pfohl, Black, Noyes, Kelley, Blum, 1990) which put harm avoiders at reduced risk of substance abuse. Due to fear and worry in anticipation of the likely negative consequences of indulging in substance use, harm avoiders are more likely to escape the undesirable effects of substance use. Temperament influences

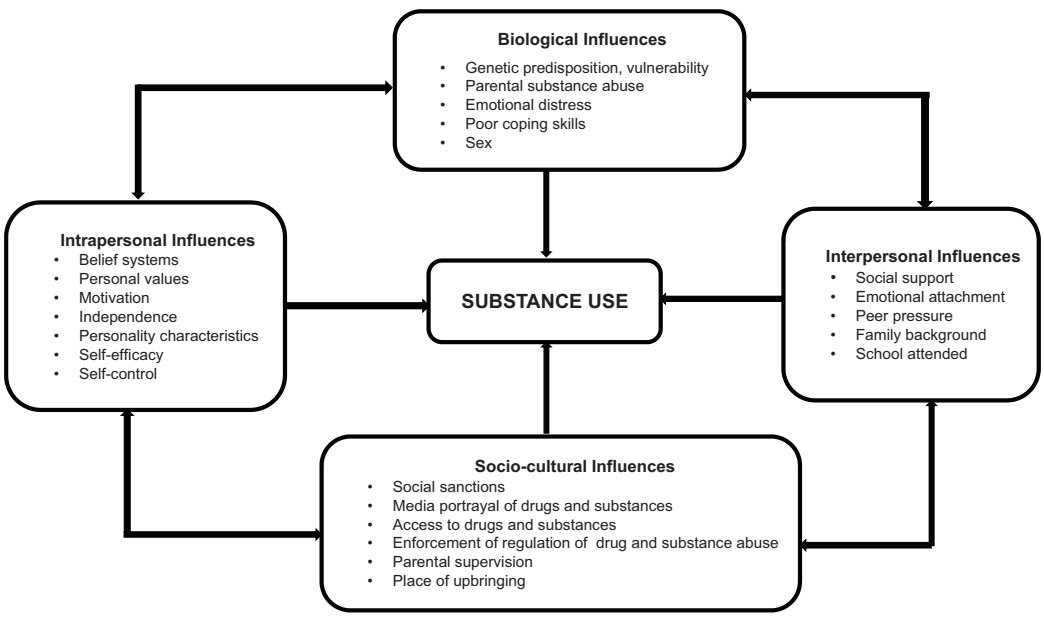

Figure 1. Conceptual framework of factors associated with substance use

early conduct and predisposes an individual to the risks of various problematic behaviours such as alcohol, tobacco, and cannabis use that can ultimately lead to later abuse (Wills, Sandy, Yaeger, et al., 2001; Rothbart, 2007; Wennberg & Bohman, 2002). Studying temperament can inform intervention to prevent substance use by identifying those most at risk.

Previous studies have indicated that different temperamental typologies may be associated with different risky behaviours. For example, Pokhrel and colleagues (Pokhrel, Sussman, & Stacy, 2014) found that novelty-seeking was closely associated with sensation-seeking, which, in turn, was a predictor of future tobacco use. Other studies among young adults pursuing tertiary education suggest that they are particularly vulnerable to substance abuse (Weiser, Leiter, Heisler, et al 2006; Dawkins, 1997; O'Connor, Colder. 2005). In addition, both sensation seeking and impulsiveness, closely associated with the temperamental typology of novelty seeking were strongly related to tobacco use. Thus, impulsivity has been shown to be a predictor of problem behaviours. Regarding alcohol, Cloninger's longitudinal study showed that high novelty seeking and low harm avoidance lead to "early onset alcohol misuse" (Cloninger, Sigvardsson, & Bohman, 1988).

Nevertheless, past studies have been limited in a number of ways. First, many studies were conducted among clinical samples (e.g. drug addicts) and rarely with population samples (Evren, Evren, Yancar, et al., 2007). Second, most previous studies used samples of early adolescents, when studying the influence of temperament on substance use, thus neglecting young adults in which the problem of substance abuse may be more serious as they are more exposed to numerous life stressors such as choosing life partners, making decisions that will affect their future careers, heavy demands of academic work, etc. (Pokhrel, Sussman, & Stacy. 2014; Agolla & Ongori. 2009). Furthermore, substance abuse may lower academic performance, thus limiting upward social mobility, crime, and later burden of disease (Wicki, Kuntsche, & Gmel, 2010; Dave & Saffer, 2008). Third, the majority of the studies on temperament and substance use have been conducted in Western countries, yet the problem of substance abuse is now known to be common and rising in developing countries such as Botswana (Wicki, Kuntsche, & Gmel, 2010; Pokhrel, Sussman, & Stacy, 2014; Dawe, Gullo, &, Loxton, 2004).

The current study aims to explore the associations between novelty seeking and harms avoidance on the one hand and the use of three common substances among young adults pursuing tertiary education in a university in Botswana: alcohol, tobacco, and cannabis. Our aim in this study was threefold: a) investigate the use of alcohol, tobacco, and cannabis use among young adults pursuing university education, b) investigate whether the use of alcohol, tobacco, and cannabis among young adults pursuing university education was independent of place of upbringing or types of secondary school previously attended, and c) assess the extent to which novelty seeking and harm avoidance predicted the use of alcohol, tobacco, and cannabis among university students. We hypothesised that higher scores on novelty seeking would be associated with increased use of alcohol, tobacco, and cannabis and that the reverse would be true for harm avoidance.

Additionally, sex differences in the use of drugs and substance use have been suggested in previous studies with male participants suggested using more alcohol, tobacco, and cannabis than their female counterparts (Weiser, Leiter, Heisler, et al 2006; Tangney, Baumeister, & Boone, 2004). For this reason, we studied sex differences in our sample.

METHOD

Design and sample

The current study employed a cross-sectional design using convenient sampling method to collect data. The students were selected from various departments within the University of Botswana to achieve a more representative sample within the convenient sampling strategy. In total, 211 students (59% female, n=124) mean age of 21.62 (SD= 3.37, range=18-25) enrolled in various undergraduate degree programmes at the University of Botswana participated in the study.

Procedure and data collection

Lecturers from the following faculties: Social Sciences, Engineering and Technology, Humanities, Business, Health Sciences, Medicine, and Education were approached for permission to use some of their lecture time to collect data from students in the courses they teach. This study was approved by the Institutional Review Board (IRB) of the University of Botswana. Before distributing the questionnaires to students in the various lecture rooms, the purpose of the study was explained and informed consent sought. Only participants who consented and were willing to take part in the study were handed a questionnaire to complete. Similarly, the students were requested not to put any identifying information about themselves on the questionnaire to guarantee anonymity and were also informed that the information obtained would be treated with utmost confidentiality. The students took between 15 – 20 minutes to fill in the questionnaire as the research assistant was always on standby to help the students to clarify any item on the questionnaire. Immediately after all the students had completed filling in the questionnaire, they were debriefed on available support or counselling services at or outside the university if they needed any.

In total, 230 students participated in the study. Nine students were excluded from the study because they were over the age of 25 and were deemed unrepresentative of the average age of the students (mean age of 21.62, SD= 3.37, range=18-25). Similarly, 10 participants were removed from the analysis for failure to complete the questionnaire adequately. In the end, 211 students, representing a 92 per cent response rate, participated in the study.

Measures

The instrument for this study comprised three parts: an inventory of demographic characteristics, two scales of temperamental typologies (novelty seeking and harm avoidance), and substance use (alcohol, tobacco, and cannabis).

Socio-demographic variables: Participants were asked to report their sex, year of study, family setting, place of upbringing, type of secondary school attended, and age.

Temperament: The Tridimensional Personality Questionnaire was used to assess temperament (Cloninger, 1987). For the current study, only the subscales on

novelty seeking or harm avoidance (both consisting of 59 items) were used. The items were binary coded as '0' for 'false' and '1' for 'true'. The harm avoidance scale of the current study yielded a Kuder-Richardson 20 (KR-20) coefficient of .87 and the novelty seeking scale a KR-20 coefficient of .73, both satisfactory. The Tridimensional Personality Questionnaire is a universal questionnaire with consistently high psychometric properties. Previous studies with British samples (Stewart, Ebmeier, & Deary, 2004) and with Taiwanese samples yielded a reliability of between .90 and .72 respectively (Chen, Chen, Chen, et al., 2002).

Substance use: participants were asked to report on their use of alcohol, tobacco, and cannabis. The section of the questionnaire on substance use specifically designed for this study. Examples of the questions asked were: Do you smoke cigarettes? Have you ever tried smoking cannabis? Do you know anyone who uses cannabis? Do you drink alcohol? For these questions, the participants responded "yes" coded as "1" and "no" coded as "0". For frequency of use of these substances, the following questions were asked: How often have you smoked cigarettes in the past month? How often have you smoked cannabis in the past month? How often have you consumed alcoholic drinks in the past month? Responses for these questions were categorized as "never" = 0, "once or twice" =1, "weekly"= 2, and "daily or almost daily"=3.

Data analysis

Descriptive statistics (mean, standard deviation, and range) were run on the variables age, sex, year of study, type of school attended, and place of up-bringing and the results tabulated. Relations among variables in the study such as age, sex, alcohol, tobacco, and cannabis use were computed using bivariate correlation analysis. To assess whether there were sex differences regarding substance use and differences based on rural and urban upbringing and on private and public school attendance, a Chi-square test of independence was used and the results tabulated. T-tests were used to study the difference between those who reported the use of various drugs and substances and those who did not. Finally, multiple linear regression models were fitted to quantify the extent to which the different temperamental typologies predicted the use of the drugs and substances. The temperamental typologies of novelty seeking and harm avoidance were adjusted for each other to assess their unique effects on drug and substance use. In addition, the analyses were adjusted for age and sex. All statistical analyses were carried out using IBM SPSS statistical software, version 23.0 (IBM Corp. Released 2015). Associations with a p value less than 0.05 were considered statistically significant.

RESULTS

Descriptive statistics

The descriptive statistics of the variables in the study were computed and presented in Table 1. Information was obtained from 211 participants, 124 (59%) of whom were females. Participants were mostly in their first, second, and third years of study with only 34 students (16%) in their fourth and fifth years of study (Table 1). Chi-square test of independence yielded statistically significant sex differences for all types of drugs and substances except tobacco and alcohol

(Table 1). Overall, male participants used alcohol, tobacco and cannabis more than their female counterparts (Table 1). Similarly, male participants scored higher on novelty seeking but lower on harm avoidance than female participants. Male participants were generally older than female participants (Table 1). For participants who reported using cannabis, 19% used cannabis weekly, daily, or almost daily. Similarly, of those who reported using alcohol (*n*=95, 45%), 36% (n=34) of whom were regular users (those who use alcohol weekly, daily or almost daily).

Correlations

In general, substance use in the study (alcohol, tobacco, and cannabis)

Table 1. Descriptive characteristics and sex differences of the variables in the study

Variable name	Total	Male	Female	
	M (SD)	M (SD)	M (SD)	χ^2 (df, N) value, *p* value
Age	21.62 (3.37)	20.11 (1.64)	19.93 (1.42)	
Novelty seeking	16.09 (6.54)	12.61 (4.33)	11.04 (4.22)	
Harm avoidance	11.52 (4.26)	14.90 (6.36)	16.79 (6.78)	
	N (%)	N (%)	N (%)	
Participants	191 (100)	87 (41)	124 (59)	
Year 1	77 (37)	32 (37)	45 (36)	
Year 2	49 (23)	18 (21)	31 (25)	
Year 3	51 (24)	14 (16)	37 (30)	
Year 4	19 (9)	15 17)	4 (30)	
Year 5	15 (7)	8 (9)	7 (6)	
Tobacco use				
No	185 (88)	73 (84)	112 (90)	χ^2 (1, *N*=210) = .83, *ns*
Yes	26 (12)	14 (16)	12 (10)	
Knowledge - cannabis use				χ^2 (1, *N*=210) = 4.01, $p < .04$
No	159 (74)	59 (66)	100 (81)	
Yes	54 (26)	30 (34)	24 (19)	
Tried using cannabis				χ^2 (1, *N*=210) = 1.20, ns
No	173 (82)	73 (84)	100 (81)	
Yes	38 (18)	24 (19)	14 (16)	
Used cannabis				χ^2 (1, *N*=210) = 3.98, $p < .05$
Never	159 (75)	59 (68)	100 (81)	
Once or twice	33 (16)	13 (15)	20 (16)	
Weekly	8 (4)	4 (5)	4 (3)	
Daily or almost daily	11 (5)	11 (12)	0 (0)	
Used alcohol				χ^2 (1, *N*=210) = 2.15, *ns*
Never	116 (55)	42 (48)	74 (60)	
Once or twice	61 (29)	25 (29)	36 (29)	
Weekly	31 (15)	18 (21)	13 (10)	
Daily or almost daily	3 (1)	2 (2)	1 (10)	

Key: M=mean, SD=Standard deviation, min=minimum score, max=maximum score

correlated significantly between themselves and with novelty seeking (Table 2). On the contrary, the correlations between harm avoidance and substance use measures were not significant and harm avoidance correlated negatively with the use of all substances although the correlations did not reach significant levels (Table 2).

Subpopulation differences

For substance use, sex differences were only significant for cannabis use (Table 1). There were also statistically significant differences in scores on novelty seeking between those who use tobacco (t (209) = -4.79, $p < 0.001$), knew someone who use cannabis (t (209) = -2.16, $p < 0.03$), tried using cannabis (t (209) = -4.29, $p < 0.001$), actually used cannabis (t (209) = -5.36, $p < 0.001$), and used alcohol (t (209) = -3.29, $p < 0.001$) from those who did not.

Substance use: place of upbringing and school attended

A chi-square test of independence was performed to compare the frequency of substance use in students who were brought up in rural and urban areas and in students were attended private and public schools. Significant differences were found between rural and urban backgrounds in using all drugs and substances except for tobacco use (Table 3). Students who were brought up in rural settings were less likely to use substances than students who indicated that they were brought up in urban areas. Likewise, significant differences were found between students who attended urban and rural schools for all types of substances except tobacco. Students who attended private secondary schools used substances more frequently than their counterparts who attended public secondary schools (Table 3).

The results of multiple linear regression analyses to assess the extent to which novelty seeking and harm avoidance predict substance use are presented in table 3. Novelty seeking, controlled for age, sex, and harm avoidance, significantly predicted the use of all types of drugs and substances in the study (Table 4). Novelty seeking explained about 32% of the variance in tobacco use, 17% of the variance in knowledge of cannabis users, 35% of the variance in actually using cannabis, and 27% of the variance in using alcohol (Table 4). On the contrary, harm avoidance, adjusted for age, sex, and novelty seeking, significantly predicted only alcohol use (Table 4).

Table 2. Bivariate correlations between variables in the study

Variables	1	2	3	4	5	6	7
1. Tobacco use	-	0.12	**.42****	**.63****	**.52****	-0.01	**.33****
2. Knowledge of cannabis users		-	**.36****	**.21****	**.28****	-0.11	**.16****
3. Tried cannabis			-	**.59****	**.55****	-0.03	**.30****
4. Used cannabis				-	**.46****	-0.09	**.27****
5. Alcohol use					-	-0.11	**.45****
6. Harm avoidance						-	-0.11
7. Novelty seeking							-

Key: Significant correlations are in **bold**; ** Significant at $p < .05$

Table 3. Differences in substance use based on place of upbringing and schools attended (N=211)

Substance use	Differences by school attended (private/public)	Differences by place of upbringing (rural/urban)
	χ^2 (*df*, N) value, *p* value	**χ^2 (*df*, N) value, *p* value**
Tobacco use	χ^2 (1, *N*=210) = 0.67, *ns*	χ^2 (1, *N*=210) = 3.20, *ns*
Knowledge of cannabis use	χ^2 (1, *N*=210) = 9.65, $p < .05$	χ^2 (1, *N*=210) = 5.80, $p < .02$
Tried using cannabis	χ^2 (1, *N*=210) = 15.51, $p < .05$	χ^2 (1, *N*=210) = 4.55, $p < .03$
Used cannabis	χ^2 (1, *N*=210) = 7.37, $p < .05$	χ^2 (1, *N*=210) = 6.16, $p < .01$
Alcohol use	χ^2 (1, *N*=210) =5.56, $p < .05$	χ^2 (1, *N*=210) = 3.46, *ns*

Key: **χ^2** = Chi-square, N=sample size, df= degrees of freedom

Table 4. Multiple regression analyses with temperament typologies as predictors and different drugs and substances as outcomes adjusted for sex and age (*N*=211)

Predictors	R-Square	Adjusted R-Square	β (95% CI)	*F*	*df*	*p* value
Tobacco use	0.32	0.31		21.82	2, 209	0.05
Novelty seeking			0.32 (95% CI: 0.28, 0.37)			0.05
Harm avoidance			0.03 (95% CI: -0.01, 0.08)			ns
Knowledge of cannabis users	0.17	0.17		21.82	2, 209	0.05
Novelty seeking			0.14 (95% CI: 0.08, 0.19)			0.05
Harm avoidance			-0.09 (95% CI: -0.04, -0.14)			ns
Tried using cannabis	0.29	0.28		15.72	2, 209	0.05
Novelty seeking			0.28 (95% CI: 0.22, 0.35)			0.05
Harm avoidance			0.07 (95% CI: 0.00, 0.14)			ns
Cannabis use	0.35	0.34		26.37	2, 209	0.05
Novelty seeking			0.35 (95% CI: 0.28, 0.42)			0.05
Harm avoidance			0.01 (95% CI: -0.06, 0.07)			ns
Alcohol use	0.27	0.26		8.74	2, 209	0.05
Novelty seeking			0.22 (95% CI: 0.16, 0.28)			0.05
Harm avoidance			0.18 (95% CI: 0.12, 0.24)			0.05

Key: CI=Confidence Intervals, F= F-ratio, df = degrees of freedom

DISCUSSION

Recap of main findings

The current study aimed to assess the extent to which temperamental typologies of novelty seeking and harm avoidance and other demographic characteristics predicted substance use among young adult undergraduate students at the University of Botswana. Specifically, the aim of this study was threefold: a) investigate the use of alcohol, tobacco, and cannabis among young adults pursuing university education, b) investigate whether the use of alcohol, tobacco, and cannabis among young adults pursuing university education is independent of place of upbringing or types of secondary school previously attended, and c) assess the extent to which novelty seeking and harm avoidance predicted the use of alcohol, tobacco, and cannabis among university students.

The findings showed that there were sex differences with respect to knowledge of cannabis users, having tried using cannabis, and actually using cannabis with male participants using cannabis more than their female counterparts. Substance use were more common among those who attended private secondary schools than public schools and more among those who were brought up in urban than rural settings. Finally, novelty seeking significantly predicted use of all types of drugs and substances. Similarly, there were significant differences in scores on novelty seeking between those who did and did not report using drugs and substances. There were no sex differences in using alcohol and tobacco. Harm avoidance on the other hand, did not significantly predict all the other substances in the study except alcohol (Table 4). However, harm avoidance negatively correlated with all the substances but the correlations did not reach significance.

Agreement with previous studies

The finding in this study that females in general use less drugs and substances than men is in consonance with previous studies (Moitlakgola & Amone-P'Olak, 2015; Morutwa &Plattner, 2014; Nolen-Hoeksema, 2004; Becker & Hu, 2008; Brady & Randall, 1999). However, there were no significant sex differences in alcohol use in this study. Although substance use rates are generally different in both sexes, the number of women abusing drugs and substances is on the increase with the current sex differences being attributed to opportunity rather than vulnerability (Etten & Anthony, 2001; Etten, Neumark, & Anthony, 1999). Similarly, drug and substance use was more common among students who went through private than public secondary schools and among those with an urban than rural upbringing. These findings corroborate previous findings in neighbouring Zimbabwe (Acuda & Eide, 1994; Eide & Acuda, 1995). It is possible that drugs and substances are more readily available in urban than in rural areas due to high socio-economic status and more disposable incomes in urban than in rural areas. In the same way, more private schools are boarding schools where there is no supervision by parents and teachers are overwhelmed by the number of students in the schools (Acuda &, Eide, 1994). A possible explanation could also be that most private secondary schools are in urban areas and those who attend private schools are from higher socio-economic background (Unicef, 2013) or the information on substance use is not adequately captured in rural areas in countries such as Botswana (WHO, 2011). Similarly, most public schools are located in rural areas where students who attend such schools live with their parents. Moreover, previous studies also indicate that parental supervision prevents or delays drug and substance use (Velleman, Templeton, & Copello, 2005). The finding that drug and substance use is more prevalent among those raised in urban than rural settings is interesting as studies in other countries such as Australia suggest high levels of substance use in rural areas instead (Miller, Coomber, Staiger, et al., 2010).

Finally, the finding that the temperamental typology of novelty seeking significantly predicted all types of drug and substances in the current study agrees with previous studies (Evren, Evren, Yancar, et al., 2007; Wills, Windle, & Cleary, 1998). For example, a previous study found that sensation seeking and impulsiveness,

both associated with novelty seeking was associated with tobacco use (Pokhrel, Sussman, & Stacy, 2014). It is possible that novelty seeking, indeed, predicts substance use because it is a characteristic of people who seek out new and thrilling experiences (Wills, Windle, & Cleary, 1998). In addition, the socio-cultural factors such as lack of or poorly enforced sanctions against underage drinking; easy access to drugs and substances, all contribute to increased risk for substance use among young adults. Similarly, previous studies also suggest that harm avoidance is associated more with alcohol consumption than other drugs and substances (Evren, Evren, Yancar, et al., 2007). Therefore, young adults with the temperamental typology of novelty seeking characteristics such as beliefs in deriving happiness and pleasure from using drugs and substances to stimulate them (Wills, Windle, & Cleary, 1998), poor self-control, (Morutwa & Plattner, 2014; Tangney, Baumeister, & Boone, 2004), and experience of more life stressors (Moitlakgola & Amone-P'Olak, 2015), are more vulnerable to drug and substance use. Other previous studies have also indicated that peer pressure and perceived peer cannabis use greatly influences sensation seekers. (Slater, 2003) All this goes to confirm and reiterate the *Domain Model* in which a confluence of biological, interpersonal, intrapersonal, and socio-cultural factors contribute to substance use (Huba & Bentler, 1982).

In this study, sex differences were found for knowledge of and actually using cannabis but not alcohol use. This is in agreement with previous studies with the same population (Morutwa & Plattner, 2014; Moitlakgola & Amone-P'Olak, 2015). Although other previous studies suggested sex differences (Weiser, Leiter, Heisler, et al. 2006; Tangney, Baumeister, & Boone, 2004), the findings in this study is an indication that, given an opportunity and the right environment such as those available to girls in a university, girls are just as likely to drink like their male counterparts, therefore confirming the notion of opportunity rather than vulnerability (Etten & Anthony, 2001; Etten, Neumark, & Anthony, 1999). Nevertheless, men are still known to consume larger quantities of alcohol than females (Moitlakgola & Amone-P'Olak, 2015; Morutwa & Plattner, 2014; Larsen, Engels, Wiers, et al., 2012; Teesson, Hall, Slade, et al. 2010).

Limitations

A number of limitations need to be considered when interpreting the findings of the current study. First, the self-report measure used in the current study might have led to under-reporting of substance use. However, there were statistically significant differences between those who reported using all categories of drugs and substances in this study with respect to novelty seeking temperament. Consequently, those who used and do not use drugs and substances were significantly different. Second, the use of a convenient sample drawn from only one setting, that is, the University of Botswana, limits generalisability of the findings beyond the University of Botswana. Nevertheless, the findings generally agree with previous studies, thus indicating a general trend of substance use among young adults pursuing tertiary or college education. Further studies are required to confirm the results. Third, the cross-sectional design limited causal inference. Future studies should focus on longitudinal design from which causality can be inferred.

In spite of the limitations outlined above, this study helps to lay a foundation for research on the confluence of different factors, especially intrapersonal factors coming together to influence the use of drugs and substances among young adults.

CONCLUSION

Novelty seeking remains a strong predictor of substance use. Differences with respect to sex, place of upbringing, and types of previous schools attended may provide the context in which novelty seeking thrives to influence substance use. Information on temperament, place of upbringing, and types of previous schools attended is important for designing effective interventions to reduce substance use not only among university students but also students in high school. Such interventions may include better education on substance use.

ACKNOWLEDGEMENTS

We would like to thank every student who completed the survey forms for volunteering their time and the lecturers for allowing data collection during their lecture hours.

Conflict of interest: None

Authors' contributions

WKL and KAP designed the study and WKL implemented the survey. WKL had the original idea for the manuscript, conducted the analyses, and wrote the manuscript. All authors provide input into interpreting results, critically revised the manuscript for important intellectual content and approved the final version of the manuscript.

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