The Influence of Gender, Anxiety and Food Cravings on Alcohol Use within a University Population

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The present study aimed to investigate the effect of gender, anxiety and food cravings on alcohol use within a university population. University students (N = 150) completed a survey containing a demographic questionnaire, the Alcohol Use Disorders Identification Test, the State Trait Anxiety Inventory and the Food Cravings Inventory. Results revealed gender was a significant predictor of alcohol use in university students, with males reporting greater levels of alcohol consumption than females. Food cravings were also observed to be a significant predictor of alcohol use in university students, independent of gender. Unexpectedly, state and trait anxiety failed to significantly predict alcohol use in the current sample. Results of the study are in line with empirical literature, social incentive and expectancy theories of alcohol use. Overall, our findings tentatively suggest a link between alcohol use and food cravings, which may assist in the development of more effective treatments for alcohol use disorders and eating disorders in university students.

Keywords: alcohol use, student, gender, food cravings, anxiety

Increasing levels of alcohol consumption and the subsequent manifestation of alcohol-related disorders are common features in university settings (Karam, Maalouf, & Ghandour, 2004; Norberg, Norton, Olivier & Zvolensky, 2010; Wicki, Kuntsche, & Gmel, 2010). According to the Substance Abuse and Mental Health Services Administration (2012), 60.8% of university students reported alcohol use within the past month, with 61.5% reporting intoxication at least once in the past year and 42.4% reporting intoxication in the previous month (Johnson, O'Malley, Bachman, & Schulenberg, 2010). University students have been shown to consume dangerous quantities of alcohol in comparison to other community populations, often resulting in excessive consumption and alcohol-related problems irrespective of socio-cultural consequences, in addition to alcohol dependence which involves a physiological reliance on the substance leading to tolerance and withdrawal symptoms in the absence of the substance (Nolen-Hoeksema, 2004; Wicki et al., 2010). Previous research has indicated approximately 37 to 44% of university/college students reported engagement in binge drinking at least once in the past two weeks to a month (defined as more than 7 standard drinks a night for men and more than 5 standard drinks for women; Hingson, Heeren, Winter, & Wechsler, 2005; Johnson et al., 2010; Wechsler et al., 2002).

Excessive alcohol consumption and binge drinking create numerous adverse health and personal consequences (e.g., involvement in risky sexual situations, dangerous driving, unpleasant physiological and psychological aftereffects, violence, and aggression) and has been reported as a primary cause of injury and death among university students (Wicki et al., 2010). Alcohol consumption increases risk of accidental and violent injury (National Health and Medical Research Council, 2009), and young adults with poor mental health are more likely to initiate alcohol use in adolescence, report drinking frequently and drink with the intent to get drunk (Weitzman & Nelson , 2004; Windle & Windle, 2004). By examining patterns of alcohol use and predictors of heightened alcohol consumption in a university setting and the subsequent factors that promote and maintain drinking behaviors, it may be possible to educate members of this sub-group about safer alcohol-related practices, and develop early interventions (Wicki et al., 2010).

Theories of alcohol use

Several models explaining alcohol consumption are present within the literature, focusing on cognitive, biological and motivational factors (Skinner & Aubin, 2010); however, no single model has the ability to adequately explain alcohol use, therefore multiple viewpoints must be considered to provide a comprehensive understanding of the behavior. Three models that are particularly relevant in understanding alcohol use behaviors include incentive theory (which stems from classical conditioning; Skinner & Aubin, 2010), motivational theory (Skinner & Aubin, 2010), and outcome expectancy theory (derived from cognitive origins; Jones, Corbin & Fromme, 2001). According to incentive theory, alcohol use becomes an automatic behavior for some individuals with paired associations to particular stimuli related to drinking (e.g., a bar). A key component of this theory is the individual's memory of the pleasure gained from alcohol use (positive reinforcement, which occurs when an event or stimulus is presented as a consequence of a behavior and the behavior increases), which may contribute to physiological and psychological urges that encourage them to engage in the desired behavior in order to reap the benefits. Exploring alcohol use from a classical conditioning perspective will aid in understanding how individuals develop associations between alcohol-related stimuli and behaviors, and how reward and reinforcement are key instigators of drinking (Skinner & Aubin, 2010).

According to the motivational model, an individual's motivations are driving factors in alcohol consumption, which is often triggered by expectations, physiological needs, and memories or reinforcement that alcohol may have provided previously. In particular, an individual's desired emotional state is believed to influence his/her motivation to consume alcohol, and consumption occurs when the perceived benefit of a positive emotional state (created by alcohol) outweighs the outcomes associated with abstinence, motivating the individual to engage in alcohol use.

Similar to the motivational model of alcohol use, expectancy theory proposes expectations of behavioral outcomes to influence the performance of such behaviors. In relation to alcohol, it is suggested an individual may possess expectations about the consequences of alcohol consumption (positive or negative). Positive expectations (e.g., pleasure or relaxation) serve to reinforce an individual's desire to consume alcohol, whereas negative expectations (e.g., anticipation of unpleasant physiological aftereffects) may motivate the individual to abstain from drinking (Skinner & Aubin, 2010). These alcohol expectancies are subsequently retained in long-term memory and recalled during future alcohol consumption situations (Jones et al., 2001). However, unlike the motivational model, which suggests the individual is actively involved in the decision-making process surrounding alcohol consumption, incentive theory proposes alcohol use is essentially an unconscious reaction to environmental stimuli (Skinner & Aubin, 2010).

Gender and alcohol use

Alcohol use prevalence rates differ significantly between men and women in the general community (Wicki et al., 2010). It has consistently been demonstrated males consume more alcohol, and at more hazardous and harmful levels, than their female counterparts, when controlling for body size and weight (Schulte et al., 2009; Wicki et al., 2010). Schulte, Ramo and Brown (2009) report that despite the equal distribution of risk factors for both genders, men are more likely to possess vulnerabilities that lead to the development of an alcohol-related disorder, including abuse and/or dependence. However, in recent times, the gender gap in alcohol consumption and alcohol-related problems has decreased (Nolen-Hoeksema, 2004). Heavy alcohol use and binge drinking have become increasingly commonplace in women. Yet, despite the narrowing proportions, women continue to consume significantly lower quantities and experience less alcohol-related harm than their male counterparts (Bongers et al., 1998; Nolen-Hoeksema, 2004).

Anxiety and alcohol use

Emerging research has demonstrated anxiety, particularly social anxiety, is associated with a heightened risk of experiencing alcohol-related problems; however, existing research on alcohol use and social anxiety in university students reveals inconsistent findings. Literature has suggested that

individuals experiencing anxiety (particularly related to social situations) may use substances to avoid potential criticism from substance-using peers. They may also engage in alcohol use due to perceptions or beliefs that alcohol is a common and socially acceptable means of reducing anxiety in social situations (Buckner, 2011).

Research has indicated social anxiety disorder (SAD) and alcohol use disorders (AUDs) are frequently cormorbid (see Morris, Stewart, & Ham, 2005 for a full review), with approximately 13% of adults with SAD meeting criteria for AUD, and 48.2% of adults with a lifetime history of SAD meeting criteria for an AUD (Grant et al., 2005). Both retrospective and longitudinal research have indicated when SAD and AUD co-occur, SAD typically precedes the onset of the AUD (Buckner et al., 2008a; Buckner et al., 2008b; Buckner & Turner, 2009; Falk, Yi, & Hilton, 2008). Consistent with the findings of adult samples, research has revealed that 43% of college freshmen with SAD fulfilled the diagnostic criteria for an AUD, while only 26% of college freshmen without SAD met criteria for an AUD (Kushner & Sher, 1993). However, overall, the relationship between social anxiety and alcohol use in university/college student populations has yielded mixed and inconsistent findings, according to a recent meta-analysis (Schry & White, 2013).

For example, some research has demonstrated that individuals with SAD consume significantly greater amounts of alcohol in anticipation of social interactions (Higgins & Marlatt, 1975), whereas other studies have found these individuals to consume significantly less alcohol than peers without SAD during simulated 'get-togethers' (Holroyd, 1978). Survey-based research has either failed to observe a relationship between social anxiety and alcohol consumption, or found an inverse relationship (Buckner, Schmidt, & Eggleston, 2006). Several explanations have been proposed for the lack of positive relationship between social anxiety and alcohol use in research, most notably the suggestion that socially anxious students are likely to avoid social situations and utilize alcohol only to cope with anxiety in situations that are unavoidable (Norberg, Norton, & Olivier, 2009). Similarly, despite the negative relationship (or absence of a relationship)

between social anxiety and alcohol use, numerous studies have indicated anxiety is positively associated with alcohol-related problems (Buckner, Ecker, & Proctor, 2011). This relationship between anxiety and alcohol-related problems is particularly important as AUDs are defined by the social and occupational problems resulting from alcohol use, as opposed to just the frequency and intensity of use (Buckner et al., 2006).

Food cravings and alcohol use

The term 'craving' is typically used to describe an intense desire for foods and a range of substances (both legal and illicit; Gendall, Sullivan, Joyce, Fear, & Bulik, 1997; Lafay et al., 2001; Pelchat, 2002). There is strong evidence suggesting food and drugs exhibit their effects on similar or shared neurological pathways related to pleasure and reward. Research indicates many of the same neurotransmitters are implicated in both foods cravings and cravings for various substances of abuse such as alcohol (see Pelchat, 2002, for a review).

Abstinent opiate and alcohol addicts exhibit a heightened preference for and intake of sweets and report cravings for sweet foods (Morabia et al., 1989; Weiss, 1982). Individuals suffering from alcohol dependence (where an individual is physically or psychologically dependent upon drinking alcohol) have also exhibited preference for greater concentrations of sweeteners than non-dependent individuals (Gomberg, 1995). Similarly, peak-preferred concentrations of sucrose have been shown to be significantly higher in individuals with a family history of alcohol use disorders, compared to individuals with no family history of alcohol dependence concerns (Kampov-Polevoy, Garbutt, & Janowsky, 1999), possibly suggesting a genetic basis for sweet preference and alcohol-related concerns.

Research has indicated that individuals who consume alcohol excessively and experience food cravings (defined as an intense urge to eat a specific food type, in the absence of physiological hunger) exhibit similar personality traits (Gendall, Sullivan, Joyce, Fear & Bulik, 1997; Lafay et al., 2001). A study by Gendall et al. (1997) explored the personality traits of 100 women who were experiencing food cravings. Participants were required to complete a

newly established measure of food cravings and were divided into a non-craving, mild craving, or strong craving group based on responses (Gendall et al., 1997). Results indicated women in the mild and strong craving groups scored significantly higher on novelty seeking than non-cravers. Characteristics such as sensation seeking and impulsivity have been repeatedly linked to engagement in risky behaviors, and these tendencies have also been strongly correlated with alcohol abuse (Gendall et al., 1997; Nolen-Hoeksema, 2004; Schulte et al., 2009). As both food cravings and alcohol use have been shown to originate from similar personality traits, it would be reasonable to assume individuals who report food cravings would also have a greater likelihood of problematic alcohol consumption (Nolen-Hoeksema, 2004; Schulte et al., 2009).

Literature examining links between food cravings and alcohol use in humans is scarce, revealing only a minute amount of empirical studies investigating the phenomenon. Gendall et al. (1997) examined whether women with food cravings are more prone to substance abuse than women who do not experience food cravings. Participants were asked if they had ever experienced food cravings, which were defined as "an uncontrollable desire to eat a certain food or type of food" and "a strong urge to eat a specific food" (p. 547). Those who responded negatively to all of these initial three questions were considered non-cravers. They found that those in the craving category were at increased risk of alcohol abuse/dependence, with 6% of the non-cravers, 13% of the mild cravers and 21% of the strong cravers reporting alcohol use at concerning levels (Gendall et al., 1997). More recent research examining eating disordered behaviors and substance use in female university students revealed a significant relationship between binge eating (the consumption of large quantities of food in a short period of time, typically as part of an eating disorder) and high levels of alcohol consumption. Participants in the binge only category consumed severe levels of alcohol, compared to dieting only (restricting calorie) or control (no dieting) groups (Piran & Robinson, 2006). An investigation of the relationship between food cravings and alcohol use may reveal important information in understanding alcohol use in university students. It is paramount to predict heightened alcohol consumption in order to develop early interventions for those at risk.

Study Aims

The current study aims to expand upon previous research by testing specific associations between gender, anxiety, food cravings, and the use of alcohol in university-aged individuals. Overall, the study aims to determine whether gender, anxiety and food cravings resulted in a predictive relationship with alcohol use in university students. It is hypothesised that:

1. Gender is a significant predictor of alcohol use in university students, with males reporting higher scores on the Alcohol Use Disorders Identification Test (designed to measure the severity of alcohol consumption and be an early identifier of dependence issues than females).

2. Anxiety is a significant predictor of alcohol use in university students. Specifically, higher scores on the State-Trait Anxiety Inventory (an inventory of two forms of anxiety, including the degree of anxiety one experiences at the current time, known as state anxiety, and the degree of anxiety one experiences in general terms, known as trait anxiety) would be associated with higher scores on the Alcohol Use Disorders Identification Test.

3. Food cravings are a significant predictor of alcohol use in university students. That is, higher scores on the Food Craving Inventory (designed to distinguish between actual food cravings and general consumption) should be associated with higher scores on the Alcohol Use Disorders Identification Test.

Method

Participants

A convenience sample of 164 individuals currently enrolled in tertiary education was recruited from three Australian universities. Of the 164 participants, 14 were excluded due to missing data. Participants were recruited through various sources including an information sheet on a university research board and announcements on social media websites. Potential participants were then contacted via email and provided a link to the online questionnaire.

Compensation in the form of half a course credit was offered to first and second year psychology students. All participants provided informed consent and the research was approved by the human research ethics committee at the authors' institution.

Procedure

After reading a brief explanatory statement and providing informed consent, participants were asked to complete a series of questionnaires (Alcohol Use Disorders Identification Test, State Trait Anxiety Inventory, and the Food Craving Questionnaire) designed to assess alcohol use, anxiety, and food cravings. Completion of the questionnaire took approximately 20 minutes.

Materials

Demographic questionnaire. Participants were asked to indicate their age, gender, and marital status for the purpose of describing the sample.

Alcohol Use Disorders Identification Test. The Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) is a 10-item self-report instrument that provides information regarding an individual's alcohol consumption across three domains: frequency of alcohol consumption, symptoms of dependence, and severity (Babor et al., 2001; Fleming, 1996). Questions within the instrument fall across three alcohol-related domains, including frequency of alcohol consumption (items 1-3, e.g., "How often do you have six or more drinks on one occasion?"), symptoms of dependence (items 4-6, e.g., "How often during the last year have you failed to do what was normally expected from you because of drinking?") and harmful alcohol use (items 7-10, e.g., "Have you or someone else been injured as a result of your drinking?"; Babor et al., 2001; Fleming, 1996). For items 1-8, subjects are required to indicate their response on a five point Likert scale ranging from zero to four, each with different indicators, and for items 9 and 10, on a three point Likert scale (0 = no; 2 = yes, but not in the last year; and 4 = yes, during the last year; Babor et al., 2001). Each response is calculated based on the corresponding number, which is then summed to form a total score with a maximum

of 40 points (Babor et al., 2001). Scores of 8 to 15 represent moderate alcohol problems, scores of 16 to 19 represent significant alcohol issues, and scores of 20 to 40 indicate dependence on the substance (Babor et al., 2001; Fleming, 1996). The psychometric properties of the AUDIT have been confirmed across multiple studies, and reliability and validity is present across genders, age categories, cultures, and both clinical and non-clinical populations (Babor et al., 2001). In the current study, the Cronbach's alpha for the AUDIT was .81, which is consistent with the alpha level found in previous studies. Test-retest reliability is also high, with a study on low-risk drinkers and alcoholics demonstrating a correlation of r = .86 from the original test to re-test (Babor et al., 2001).

State Trait Anxiety Inventory. The State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Luschens, 1970) is a 40-item self-report inventory assessing two forms of anxiety (20 items each): state anxiety, defined as situation specific anxiety that is fluctuating in nature, and trait anxiety, or dispositional anxiety (Bieling, Antony & Swinson, 1998; Kabacoff, Segal, Hersen, & Van Hasselt, 1997). Participants were asked to respond to each item on either a four-point Likert scale, in the case of the state anxiety scale, or a four-point intensity scale, in the case of trait anxiety. The psychometric properties of the STAI have been evaluated throughout the literature, with evidenced support for the instrument's validity and reliability (Kabacoff et al., 1997; Vitasari et al., 2011). In the current study, the Cronbach's alpha for the STAI was .96 across all 40 items, .94 for the state subscale and .92 for the trait subscale, indicating a very high level of internal consistency, which is in line with previous studies.

Food Craving Inventory. The Food Craving Inventory (FCI; White, Whisenhut, Williamson, Greenway, & Netemeyer, 2002) is a 37-item self-report scale, designed to measure cravings for general and specific food types experienced over the past 30 days. Participants were asked to respond to each item on a five- point Likert scale (0 = never to 4 = always/almost every day). The FCI contains four subscales including High Fats (e.g., bacon and fried fish), Sweets (e.g., brownies and ice-cream), Carbohydrates/Starches (e.g., sandwich bread, baked

Table 1

*Summary of intercorrelations, uncentered means, and standard deviations for total AUDIT, total STAI –State, Total STAI –Trait, and Total FCI (*N = 150*).*

Variable	1	2	3	4	*M*	*SD*
1. AUDIT	–				6.25	5.10
2. STAI – State	.06	–			38.93	11.45
3. STAI – Trait	-.04	.82***	–		41.17	11.47
4. FCI	.20*	.17*	.12	–	55.06	14.78

Note. AUDIT = Alcohol Use Disorders Identification Test; STAI = State Trait Anxiety Inventory, FCI = Food Craving Inventory.

*p < .05. **p < .01. ***p < .001

potato, and pasta) and Fast Food Fats (e.g., pizza and french fries). Higher scores on each subscale were indicative of greater intensity of cravings for the particular food type. Adding the scores from all four sub-categories also reveals a total score, which represents general cravings, with higher scores indicating more severe cravings (Martin et al., 2006; Martin et al., 2008; White & Grilo, 2005; White et al., 2002).

Design

The present study utilised a correlational design. Gender, food cravings (measured via the FCI), and anxiety (measured via the STAI) served as the predictor variables for the study, while alcohol use (measured via the AUDIT) served as the outcome/ criterion variable.

Results

The data were analysed using SPSS version 20. An alpha level of .05 was utilized to determine the statistical significance of all results.

Data cleaning

Data cleaning revealed 14 cases of extensive missing data, therefore these cases were removed from the data set. The final sample consisted of 150 university students, which exceeded G*Power requirements (a tool to compute statistical power analyses for many different tests) of at least 89 participants to detect a medium effect (Faul, Erdfelder, Buchner, & Lang, 2009).

Participant Data

The final sample consisted of 150 university students aged 18 to 60 years, with 40.7% (*n* = 61) in the 18 to 25 age category, 28% (*n* = 42) in the 26 to 35 age category, 19.3% (*n* = 29) in the 36 to 45 age category, 8.7% (*n* = 13) in the 46 to 55 age category, and 3.3% (*n* = 5) in the 56 to 60 age category. Males accounted for 24% of the total sample (*n* = 36), and females accounted for the remaining 76% of the sample (*n* = 114). Participants also varied in relation to marital status, with 61.3% (*n* = 92) having never married, 26.7% (*n* = 40) being married, 8% (*n* = 12) being divorced, 2.7% (*n* = 4) being separated and 1.3% (*n* = 2) being widowed.

Preliminary analyses

An independent samples t-test was conducted to determine whether significant differences on the AUDIT were observed between genders. Results revealed a significant difference between males and females, with males (*M* = 8.36, *SD* = 5.91) obtaining higher scores on the AUDIT than females (*M* = 5.58, *SD* = 4.64), *t*(148) = 2.93, *p* = .004.

Pearson product-moment correlations were also performed to examine the simple relationships between the variables of interest. Table 1 demonstrates the correlations amongst the key variables of interest. In line with expectations, a significant positive correlation existed between the FCI and AUDIT, indicating higher scores on the FCI were related to higher scores on the AUDIT. Contrary to expectations, the correlations between state and trait anxiety (STAI) with the AUDIT were both non-significant.

Main analysis

A hierarchical multiple regression analysis was performed to determine whether alcohol use could be predicted by gender, anxiety and food cravings. Age was statistically controlled via first entry into the model, with the predictor variables for subsequent blocks being entered according to theoretical importance (Tabachnick & Fidell, 2007). Age was entered on Step 1, Gender was entered on Step 2, STAI State and Trait Anxiety were entered on Step 3, and food cravings (FCI) was entered on Step 4. STAI (state and trait) and FCI were mean centred prior to entry in the regression equation. Table 2 highlights the results from the hierarchical multiple regression analysis.

As can be seen in Table 2, approximately 24% of the variance in alcohol use was accounted for after all variables were entered into the regression equation $F(8, 141) = 5.45, p < .001$. On Step 1, age accounted for a significant 12% of the variance in alcohol use scores $R^2 = .12, F_{change} (4, 145) = 4.85, p = .001$. Therefore, age was a significant predictor of alcohol use. Alcohol use scores were 3.48 points lower ($p < .001$) in the 26 to 35 years age bracket compared to 18 to 25 year olds (reference group), 3.25 points lower ($p = .004$) in the 36 to 45 years age bracket compared to 18 to 25 year olds, 2.32 points lower ($p = .119$) in the 46 to 55 years age bracket compared to 18 to 25 year olds, and 5.85 points lower ($p = .011$) in the 56 to 60 years age bracket compared to 18 to 25 year olds.

After controlling for the effect of age, gender was entered on Step 2 and accounted for an additional 8% of the variance in alcohol use scores $\Delta R^2 = .08, F(1, 144) = 13.90, p < .001$. Therefore, at its point of entry into the model, gender was a significant predictor of alcohol use, with total AUDIT scores 3.38 points lower ($p < .001$) in females compared to males (reference group). On Step 3 of the analysis, state and trait anxiety account for a non-significant 2% of the variance in alcohol use $\Delta R^2 = .02, F = (2, 142) = 1.64, p = .198$. Therefore, at their point of entry into the model, state anxiety and trait anxiety were not significant predictors of alcohol use.

When Total FCI Score was entered on Step 4, an additional 2.3% of the variance in alcohol use was accounted for by food cravings, over and above the variance accounted for by age, gender and state and trait anxiety. This increase in variance was significant, $F = (1, 141) = 4.16, p = .043$, meaning that at its point of entry, food cravings were a significant predictor of alcohol use, with higher scores on food cravings related to higher scores on alcohol use. After all variables were entered into the regression equation on Step 4, only age (excluding 46-55 years), gender, and food cravings were significant predictors of alcohol use. With regards to unique variance, age contributed a total of 15.8% unique variance to alcohol use, gender contributed 8.4% unique variance to alcohol use, whilst food cravings contributed 2.3% unique variance to alcohol use.

Discussion

The present study contributes to the growing body of literature investigating factors associated with alcohol use in university populations. The results, which partially supported hypotheses, indicated age and gender were significant predictors of alcohol use in university students, with males reporting significantly higher scores on the AUDIT than females, and all age groups (excluding the 46-55 age bracket) reporting significantly greater alcohol use than 18 to 25 year olds. This finding is consistent with previous empirical literature, which has repeatedly highlighted increased alcohol consumption and alcohol-related problems including abuse and dependence in males (Schulte et al., 2009; Wicki et al., 2010). Although previous research has noted a decreasing gender gap in alcohol consumption and alcohol-related problems (Nolen-Hoeksema, 2004), our findings support the notion that females continue to consume significantly lower quantities of alcohol and are at lower risk of alcohol-related harm than males (Bongers et al., 1998; Nolen-Hoeksema, 2004). Similarly, our findings echo results of previous research, which has demonstrated a greater consumption of alcohol in young adults (18 to 24 years), decreasing as individual's age, with lowest consumption in individuals over 60 years of age (Eigenbrodt et al., 2001).

Results diverged from expectations when considering the predictive relationship of anxiety on alcohol use. In the current study, both state and trait anxiety failed to significantly predict alcohol use in university students. These results are not entirely surprising since the literature has demonstrated

Table 2

Hierarchical multiple regression analyses predicting alcohol use from gender, state, and trait anxiety and food cravings in a university population.

Predictor	ΔR^2	β	B	$SE\ B$	95% CI for B	sr^2
Step 1	.12**					
Constant			8.25	.62	[7.07, 9.47]	
Age (26–35)		-.31***	-3.48	.97	[-5.41, -1.56]	-.28
Age (36–45)		-.26**	-3.25	1.10	[5.41, -1.08]	-.23
Age (46–55)		-.13	-2.32	1.48	[-5.25, .61]	-.12
Age (56–60)		-.21*	-5.84	2.26	[-10.31, -1.38]	-.20
Step 2	.08***					
Constant			10.96	.94	[9.10, 12.82]	
Gender (female)		-.28***	-3.38	.91	[-5.17, -1.59]	-.28
Step 3	.02					
Constant			10.14	1.61	[6.96, 13.32]	
State Anxiety		-.23	.10	.06	[-.01, .22]	.13
Trait Anxiety		-.18	-.08	.06	[-.19, .04]	-.10
Step 4	.02*					
Constant			7.42	2.07	[3.34, 11.52]	
Food Cravings		.16*	.05	.03	[.01, .11]	.15
Total R^2 = .24***						

Note. N =150. CI = confidence interval. *p < .05. **p < .01. ***p < .001.

inconsistent and mixed findings across studies. Numerous explanations for these mixed findings have been proposed, mostly related to suggesting individuals with anxiety should only consume alcohol in social situations they cannot avoid. However, it is also likely that anxious individuals, particularly those with social anxiety, consume just enough alcohol to reduce their anxiety, but may consciously decide to moderate consumption, knowing alcohol may negatively affect their social performance. It is also likely that the results were affected by the context of measurement. That is, even though individuals with anxiety may consume alcohol to reduce their anxiety (representing a coping mechanism), the quantity consumed may not appear elevated compared to the respective sample (university students), where heavy alcohol use is common and considered normal.

Results of the current study also revealed food cravings predicted alcohol use in a university population, with post hoc analyses demonstrating higher food craving scores were related to higher scores on the AUDIT. These results represent a novel contribution to research, given the paucity of literature investigating food cravings and alcohol use in any population (community or university students). These results are, however, consistent with suggestions that the association between food craving and alcohol use could be due to shared personality traits (e.g., impulsive tendencies and sensation seeking) that exist within individuals and are, in part, causes for both the cravings of food and alcohol (Gendall et al., 1997; Nolen-Hoeksema, 2004; Schulte et al., 2009). This relationship is also supported by the small body of empirical literature available, which indicates individuals who engage in binge eating behaviors consume elevated levels of alcohol and are at greater risk of alcohol-related abuse in comparison to those without disordered eating patterns (Gendall et al., 1997; Piran & Robinson, 2006).

These findings are also consistent with previous theoretical models (e.g., expectancy theory and social incentive theory) that have been applied in understanding alcohol use. Our results suggest food craving mechanisms can be explained using these

models, particularly the role of positive reinforcement and memory of pleasurable consequences, increasing the likelihood of consuming or craving a particular food type in future situations. Similar to the conditioning effects of alcohol use, due to opponent processes and incentive salience, food cravings have also been shown to occur in the absence of homeostatic disturbance (i.e., nutritional deficit) and can be triggered by salient environmental stimuli (Pelchat, 2002). Food cravings can be triggered by the sight, smell, or imagery of the craved food; however they can also be triggered by associated stimuli (e.g., visual images of bakeries, similar to bars).

Although outside the context of the current study, it is also possible our findings provide support for the shared pathways and similar mechanisms of action between food cravings and drug cravings hypothesised in research. However, as in any correlation design, the causative relationship of food cravings in alcohol use cannot be determined and future research utilizing experimental studies is required to clarify the nature of the relationship.

Limitations and Direction for Future Research

Although the current study has several strengths, including the novel association between food cravings and alcohol use observed, certain limitations are noted. First, a main limitation of the current study was the use of university students, primarily from a single university, which limited the generalizability of results to other populations and samples of university students (Mitchell & Jolley, 2010). However, given the high prevalence of alcohol use in university populations, findings of the current study are nonetheless relevant to understanding alcohol-related behaviors (Wicki et al., 2010). Second, as a result of uneven gender composition (114 females vs. 36 males), it is likely males were underrepresented in the sample and a true understanding of male alcohol use in university students was not obtained. Despite this limitation, significant results were still revealed. Future research should attempt to rectify these sampling limitations by employing a more gender-balanced sample, utilizing random sampling from a range of universities.

As in any research that utilizes self-report measures, it is possibly results were influenced by social desirability concerns. Therefore future research would benefit from including a social desirability scale, particularly given the sensitivity of topics studied (e.g., anxiety, frequency of alcohol use, presence of food cravings). Similarly, although the majority of research investigating anxiety and alcohol use in university students has focused on social anxiety, the anxiety measure employed in the current study did not measure constructs of social anxiety, which may explain some of the non-significant findings. Future research would benefit from employing a psychometric instrument sensitive to social anxiety. It would also be of use for future research to examine specific types of food cravings (e.g., sweet versus savory) to provide a greater understanding of the association between food cravings and alcohol use, particularly given previous research has indicated a preference for sweet tastes in individuals with alcohol use disorders. Inclusion of a diagnostic instrument to measure binge eating (and potentially identify binge eating disorder) would also be useful to examine the relationships between food cravings, binge eating disorder, and alcohol use.

Concluding Remarks

Overall, the current research has contributed to the growing body of literature surrounding alcohol use in university students by examining the specific impact of gender, anxiety, and food cravings on alcohol use in a community, as opposed to a clinical, sample. While certain limitations are noted, both gender and food cravings were shown to significantly predict alcohol use in a sample of university students. The predictive relationship of food cravings on alcohol use represents a novel contribution to research and is in line with previous theoretical models (e.g., social incentive theory and expectancy theory), which highlight the motivational process of positive reinforcement and environmental stimuli as craving triggers.

While future research is required, our findings tentatively suggest a link between alcohol and food cravings, which may assist in the development of more effective treatments for AUDs and eating disorders in university students. Educational institutions and policy makers should educate university students about the factors that potentially promote and maintain drinking behaviors, and better educate

them on safer alcohol-related practices in order to reduce excessive alcohol consumption and the occurrence of alcohol-related disorders (Wicki et al., 2010). Clinicians should be mindful of the potential comorbidity between alcohol use and food cravings when treating university students, and monitor eating-related and exercise behaviors to prevent progression to an eating disorder or use of food as a pathological coping strategy.

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