

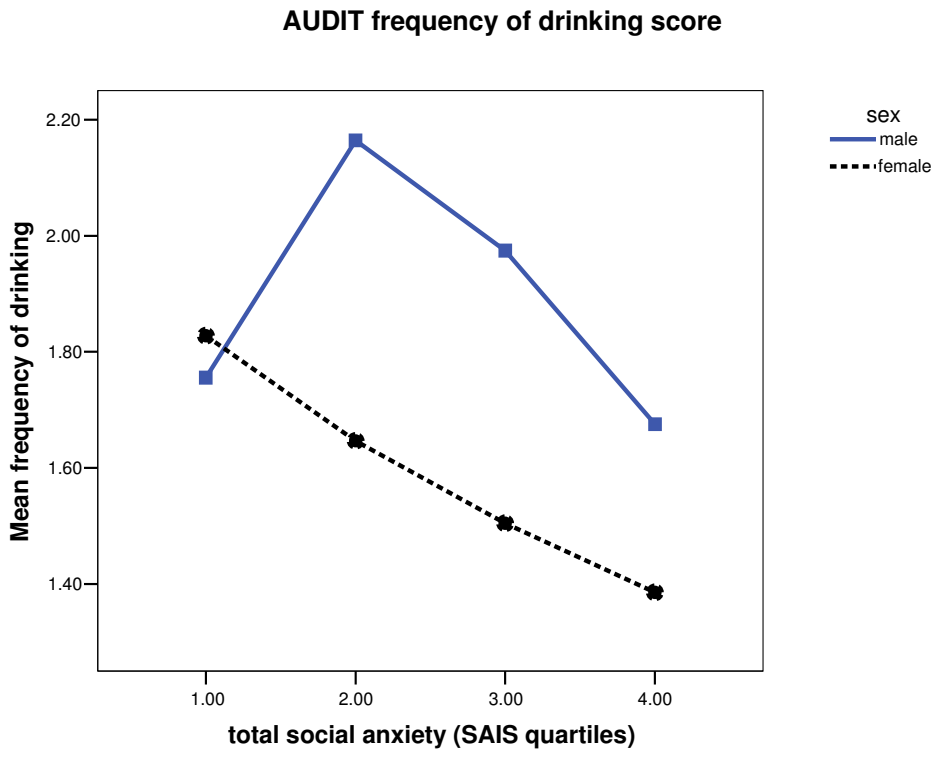


**Beer, wine, and social anxiety: Testing the "self-medication hypothesis" in the US and Cyprus**

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Review Only

Running head: ANXIETY AND ALCOHOL USE IN CYPRUS AND U.S.

For Peer Review Only

Beer, wine, and social anxiety:

Testing the “self-medication hypothesis” in the US and Cyprus

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## Abstract

The social anxiety literature often cites the self-medication hypothesis (SMH) to explain why socially phobic clients often present with alcohol problems. Based on some earlier hints that social anxiety and drinking might be related in a curvilinear way, we sought to examine the SMH to assess for possible non-linear relationships, and to examine whether cultural differences affect these relationships.

We surveyed self-reported social anxiety, alcohol expectancies, and alcohol use in college students from Cyprus (n=127) and the United States (US) (n=697). Participants were college students with a mean age of 19.8. Results revealed that positive and negative expectations about alcohol use were predictive of drinking for students from both cultures. Cypriot students endorsed fewer positive and more negative expectancies regarding alcohol use than their US counterparts, and engaged in less binge drinking. Social anxiety in men was related to drinking via a curvilinear relationship, in which drinking peaks at moderate levels of social anxiety. Among men, those with highest levels of social anxiety in both cultures drink the least. For women, there was no relationship between social anxiety level and drinking behavior.

These findings demonstrate the complexity of the relationship between social anxiety and alcohol use. Far from being a linear relationship, these two variables are related in a curvilinear fashion, for men. This should inform future research on the SMH.

### *College Drinking and Social Anxiety Patterns*

Society tends to see alcohol as a reliever of tension, and clinical anecdotes of clients who drink to lessen their shyness abound. The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; APA, 2004) defines social anxiety disorder/social phobia (it uses the terms interchangeably) as “a marked and persistent fear of social or performance situations in which embarrassment may occur,” (p. 450) and that sufferers “usually fear both public performance situations and social interactional situations,” (p. 451)<sup>1</sup>. Literature from both US and European studies demonstrates that social anxiety disorder is a major disorder that affects a great many college students. For example, Beidel, Turner, Stanley, and Dancu (1989) found that 19% of undergraduates in their sample met the criteria for a diagnosis of social phobia, while Strahan (2003) using the same cutoff, found that 22% of undergraduates in a university sample suffered from social phobia.

Alcohol use is also a concern on US college campuses, constituting a significant and enduring problem for college administrators, faculty and staff, non-drinking peers of heavy drinkers, and the drinkers themselves (National Institute on Alcohol Abuse and Alcoholism, 2002a, 2002b). In one study (Clements, 1999), over a third of men (36.4%) and a fifth of women (20.5%) in the sample met the DSM-IV criteria for alcohol abuse or alcohol dependence at some point in their lives.

### *Alcohol and Social Anxiety*

The notion that substance-dependent individuals use drugs for the purpose of alleviating psychological distress is widely accepted. Based largely on clinical findings, Khantzian proposed the Self-Medication Hypothesis (SMH), suggesting that substance users “are attempting to

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<sup>1</sup> In this manuscript we will use both terms, since groups of researchers show a preference for one or the other term and the literature currently contains both terms.

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3 medicate themselves for a range of psychiatric problems and painful emotional states,” (1985; p.  
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5 1263), and that their drug of choice reflects the type of distress they are experiencing. Others  
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7 have applied similar theories specifically to the relationship between alcohol use and anxiety.  
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9 The fundamental tenets of the SMH (see Carrigan & Randall, 2003 for a review) are described  
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11 by Chutuape and de Wit (1995), and include: a) individuals with anxiety feel distress, b) distress  
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13 is relieved by the use of alcohol, and c) the resulting negative reinforcement leads to excessive  
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15 use of the alcohol. In this study we elected to examine the SMH as it pertains to college  
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17 campuses, in part because of the high prevalence of both drinking and social anxiety among  
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19 students.  
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25 Support for the SMH is provided by the many epidemiological studies that demonstrate a  
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27 link between pre-existing social anxiety and alcohol use. For example, in the large National  
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29 Comorbidity Study (NCS), authors report lifetime prevalence rates of alcoholism to be 24% for  
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31 those with a diagnosis of social phobia (Magee et al., 1996), while epidemiological findings in  
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33 Europe and North America reveal that those suffering from social phobia have approximately 2.2  
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35 to 3.5 times the risk of developing alcohol abuse or dependence than those who do not (Lépine &  
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37 Pélissolo, 1998). While there is consistent support for the notion that social anxiety precedes the  
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39 development of problems with alcohol (e.g. Schneier et al., 1992; Lecrubier et al., 2000; Lampe,  
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41 Slade, Issakidis, & Andrews, 2003), other research is less supportive of the SMH. For example,  
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43 Naftolowitz, Vaughn, Ranc, and Tancer (1994) found no decrease in anxiety in their socially  
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45 anxious group after these participants ingested alcohol. Similarly, Himle et al. (1999) concluded  
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47 that, “...alcohol rarely, if ever, reduces social anxiety” (p. 1243). Further, studies using non-  
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49 clinical socially anxious individuals have often found, contrary to the predictions of the SMH,  
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51 that highly socially anxious participants actually consumed *less* alcohol than did their non-  
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3 socially-anxious peers, even when under stressful conditions (e.g. Holroyd, 1978; Holle,  
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5 Heimberg, Sweet, & Holt, 1995). Additionally, Strahan (2002) found that female students with  
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7 high social anxiety reported drinking significantly lower amounts of alcohol and engaging less  
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9 frequently in binge drinking than did female students without social anxiety, while male students  
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11 with social anxiety drank at the same levels as did their non-anxious counterparts.  
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15 Other findings regarding the SMH have been mixed. Crum and Pratt (2001) examined the  
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17 likelihood of developing heavy drinking and/or alcohol use or dependence among community  
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19 members who either met criteria for a diagnosis of social phobia or who had subclinical social  
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21 phobia. They found that those diagnosed with social phobia were *less likely* to develop a pattern  
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23 of heavy drinking than the control group (no social phobia), while the subclinical group was  
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25 *more likely* to develop heavy drinking than were controls. Thus, in a community sample, having  
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27 higher levels of social anxiety seems to reduce one's risk of developing alcohol-related  
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29 problems. This may be due to complete avoidance of social drinking situations as compared to  
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31 the subclinical group, who would presumably experience distress, but still participate in such  
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33 drinking situations.  
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### 38 *Alcohol Expectancies and the Self-Medication Hypothesis*

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41 It is clear that the relationship between anxiety and alcohol consumption is moderated by  
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43 alcohol expectancies, as borne out in many studies (e.g. Burke & Stephens, 1999; Bruch, Rivet,  
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45 Heimberg, & Levin, 1997; Tran, Haaga, & Chambless, 1997; Himle et. al, 1999). Schippers, de  
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47 Boer, and van der Staak (1997) found that alcohol intake decreased levels of self-disclosure in  
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49 drinkers, contradicting the "social lubricant" expectation of some drinkers, and in some cases  
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51 found that alcohol expectancies *increased* anxiety.. However, a more recent study by Ham,  
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53 Carrigan, Moak, and Randall (2005) found increased positive social expectancies among  
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3 members of a community client sample with social phobia. Among those socially anxious  
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5 individuals who do not hold positive alcohol expectancies, drinking is less than when compared  
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7 to non-anxious controls (e.g. Tran et al., 1997).  
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### 10 *Cultural Considerations and the Self-Medication Hypothesis*

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12 Research on the SMH originates primarily from North America and Northern Europe,  
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14 therefore little is known about the influence of cultural factors on the relationship between  
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16 anxiety and alcohol use. There is data to suggest, however, that there are differences between the  
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18 US and Cyprus not only in amounts of alcohol consumed (the World Health Organization Global  
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20 Status Report on Alcohol reports that “countries in the European Region... have the highest adult  
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22 prevalence of drinking in the world...”; WHO, June 2001) but also in patterns of drinking. In this  
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24 case, the pattern of drinking in the southern regions of Europe resembles the Jellinek “Beta  
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26 Drinker” as described by Babor (1992), in which wine is consumed in moderation, and children  
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28 are introduced to alcohol gradually.  
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34 This pattern is in sharp contrast to that of North America, where Jessor, Young, Young  
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36 and Tesi (1970) report that familiarization with alcohol occurs later and more suddenly, and is  
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38 viewed as a rite of passage rather than as an everyday part of life. This difference is reflected in  
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40 the current legal drinking age in the US and Cyprus, which is 21- and 18-years-old, respectively.  
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42 Also, the fact that US youngsters are typically in college and living either alone or with peers  
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44 when they reach the legal drinking age, while their Cypriot counterparts often continue to live  
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46 with their parents, due to the short traveling distances, may also make it easier for the former to  
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48 consume larger quantities of alcohol more frequently without having to face disapproval from  
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50 their families. Most importantly, in their comparison of Italian and American youths, Jessor et al.  
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52 found that drinking served mainly as a coping strategy in the American sample, whereas the  
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3 Italian sample appeared to consume alcohol primarily for dietary reasons. Thus, we were  
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5 interested in possible related cultural differences regarding the SMH.  
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### 8 *Goals of the Current Study*

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10 The present study examines primarily the relationship between levels of social anxiety  
11 and patterns of alcohol consumption in a student sample. While support for the SMH has been  
12 mixed, the findings of Crum and Pratt (2001) suggest that the relationship between social anxiety  
13 and alcohol consumption may be non-linear, and that it may depend on clinicity of the sample  
14 and exposure to drinking situations, while the findings of Holle et al. (1995), and Strahan (2002)  
15 point to the need to take gender of participants into consideration. Therefore, it was predicted  
16 that the association between anxiety and alcohol consumption would be curvilinear, with those at  
17 moderate levels of social anxiety drinking the most. It was also expected that this effect would be  
18 affected by gender (with men drinking more).  
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31 The present study provides a cross-cultural test of this posited relationship by  
32 representing data from two different cultures, as well as providing information on the patterns of  
33 alcohol consumption among North US and Cypriot students, degrees of social phobia in the two  
34 nationalities of students, and on the relationship between alcohol expectancies and alcohol  
35 consumption. Specifically, based on WHO data, we predicted that total consumption of alcohol  
36 would be greater in students from Cyprus than in students from the US, with more problematic  
37 drinking occurring in US students. We also predicted that drinking would be predicted by  
38 alcohol expectancies, such that positive expectancies would predict greater drinking and negative  
39 expectancies would predict less drinking.  
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### 52 Method

#### 53 *Participants*

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3 Participants were 824 college students from two college campuses in the US and one  
4 university campus in Cyprus (N=127). Of the US campuses, one was a medium sized  
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Participants were 824 college students from two college campuses in the US and one university campus in Cyprus (N=127). Of the US campuses, one was a medium sized Midwestern university (N=535; 319 female, 216 male), and the other a small Midwestern liberal arts college (N=162; 82 female, 80 male). When the two US campuses were collapsed together, their distribution of male vs females students was significantly different as compared to the Cyprus campus where female students were over-represented,  $\chi^2(1, 819) = 24.35, p < .001$ . Students in the overall sample ranged in age from 17-27, with a mean age of 19.8 (SD =2.09). Most (73.5%) were in their first or second year of college. Students from Cyprus were somewhat older ( $M_{age} = 20.60$ , vs  $M_{age}=19.60$  in the USA),  $F(1, 821) = 22.34, p \leq .001$ .

The majority of students from Cyprus were in their second or fourth year of college (57%), 19 to 21 years old (68%), and lived either with parents or alone/with roommates (98%). Students from the Midwestern university were primarily in their first and second year of college (88%), 18 to 20 years old (87%), and lived either in dormitories, or alone/with roommates (86%). The majority of those from the small liberal arts college were in their first or fourth year of college (64%), 18 to 21 years old (74%), and lived either in dormitories or alone/with roommates (86%). When data from the two US campuses were collapsed, the proportion of their students living with parents vs dormitories/alone or with roommates was significantly different from the students from Cyprus,  $\chi^2(1, 819) = 98.52, p < .001$ , where proportionally more students lived with their parents. Mean high school GPA for Cypriot students and students from the small liberal arts college was 3.6 and 3.4, respectively. GPA data was not collected at the Midwestern university. Table 1 shows the means of basic demographic variables.

### *Measures*

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Table 2 shows the means, standard deviations, and Cronbach's alpha values of the distribution of scores on the questionnaires used in this study. All measures showed good internal consistency. For the sample in Cyprus, all measures were translated into Greek using front and back translation for purposes of this study.

- The Alcohol Use Disorders Identification Test (AUDIT; Babor, De la Fuente, Saunders, & Grant, 1989) is a widely used, ten-item measure of quantity and frequency of alcohol consumption, frequency of binge drinking, and negative consequences experienced as a result of alcohol consumption. The measure, developed for international use and available in several different languages, was found to have good discriminant validity, with sensitivities of individual items near or around .95, and adequate reliability coefficient values. Additionally, the AUDIT has been found to accurately detect alcohol dependence in the college population (Fleming, Barry, & MacDonald, 1991; O'Hare & Sherrer, 1999).
- The Alcohol Outcome Expectancies Questionnaire (AOEQ; Leigh & Stacy, 1993) is a measure of positive and negative expectancies regarding the consequences of alcohol consumption. It consists of 34 items answered in a six-point Likert-type scale ranging from "1=completely unlikely to happen" to "6=surely happens." There are two global factors, positive and negative, with each of these having four subscales. The Positive Expectancies factor has the following four subscales: Social Facilitation, Sex, Fun, and Negative Reinforcement (or tension reduction). The Negative Expectancies factor has the following subscales: Negative Social, Negative Emotions, Physical, and Cognitive/Performance. The authors found the measure to have a test-retest reliability of .87, and concluded it to have good discriminant and convergent validity. It was developed using a college student population. However, the measure does not appear to have been validated in a foreign

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3 language population, to date. To support the use of the instrument in Cyprus, Cronbach's  $\alpha$   
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5 reliability was calculated for this sample, which was high,  $r = .92$ .  
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- 8 ■ Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) is a 20-item measure of  
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10 social anxiety offering Likert-type scale responses ranging from 0, "not at all descriptive of  
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12 me" to 4, "entirely descriptive of me." Sample items include "I have difficulty making eye  
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14 contact with others." Mattick and Clark found Cronbach's alphas for the SIAS to range from  
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16 .88-.93, with test-retest correlation coefficients falling above .90. Brown, Turovsky,  
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18 Heimberg, Juster, Brown, & Barlow (1997) found the SIAS to not only detect those with  
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20 social phobia, but to also discriminate between different anxiety disorder diagnoses. Mattick  
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22 and Clark also found that the SIAS was able to distinguish between clinical groups and non-  
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24 clinical controls. Although the measure has been validated in the college population, it is  
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26 only available in English. The version used in the Cyprus portion of our study was translated  
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28 into Greek, but not validated in a separate study. Internal reliability for the current Cyprus  
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30 sample was  $r = .90$ .  
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36 ■ Along with these instruments, the present study collected demographic data such as student's  
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38 high school grade point average (GPA), place of residence (with parents, alone or with a  
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40 roommate, or in dorms), age, and year in college. Students were also asked to report their  
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42 frequency of alcohol exposure and acceptance of drinking in their social environment. The  
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44 former was measured on a 1- ("never") to 5- ("four or more times per week") point scale by  
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46 having students rate how many times they go to an establishment where alcohol is served.  
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48 Students were also asked to rate how often they go to these establishments as compared to  
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50 their peers on a 1- ("much less") to 5- ("much more") point scale. Likewise, acceptance of  
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52 drinking in the social environment was measured by two questions addressing parents' and  
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3 peers' degree of approval if they knew the student consumed beverages frequently, on a 1-  
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5 ("completely disapprove") to 5- ("strongly approve") point scale.  
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### 8 *Procedures*

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10 Participants completed packets of questionnaires anonymously after giving informed  
11 consent. Due to the differing natures of the three campuses involved, somewhat different  
12 recruitment methods were used at each institution. At the US college, students were recruited  
13 from a variety of classes, and were offered extra credit for participation in this study or other  
14 experiences. At the Cypriot university, students were given extra credit both for their own  
15 participation, and for recruiting other students to take part in the study. At the US university,  
16 students were recruited from the existing subject pool for Introductory Psychology, using  
17 standard procedures. Proper IRB approval was obtained at each college or university prior to  
18 recruitment.  
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### 31 *Statistical Analyses*

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34 Given the demographic similarities and lack of differences in key variables by site within  
35 the US, data from the students at the two American colleges were collapsed and compared to  
36 those from the students in Cyprus in order to examine cross-cultural factors that may contribute  
37 to differences in alcohol use. With regard to alcohol use, four aspects of the AUDIT were used as  
38 dependent measures in the analyses: the Total AUDIT Score, and the individual items measuring  
39 Frequency, Quantity, and Binging. Multiple regression analyses were conducted on Total  
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51 We also examined differences in alcohol use between individuals falling at different  
52 anxiety levels. A MANOVA was conducted with total AUDIT, frequency of drinking, quantity,  
53 and binging as the dependent measures, and with 4 levels of anxiety as the independent variable,  
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3 based on a quartile split of scores on the SIAS (cutoff scores for the 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup>  
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5 percentiles were 17, 24, and 32, respectively, in a range of 0-67). Frequencies for the quartiles  
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7 varied by site, with Cyprus having 38, 25, 26, and 36 subjects, the Midwestern University having  
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9 155, 142, 125, and 112 subjects, and the Midwestern liberal arts college having 43, 23, 45, and  
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11 51 subjects in quartiles 1 through 4, respectively. There was no difference between likelihood of  
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13 a student being in a quartile based on nationality  $\chi^2(3, 821)=2.62, p=.45$ . Sex and site of data  
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15 collection (US, Cyprus) were also added as additional independent variables. Hence, the analysis  
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17 involved a 4 (anxiety levels) x 2 (sex) x 2 (countries) design.  
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22 Multiple regression analyses were then conducted to predict alcohol use using total  
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24 AUDIT score as the dependent variable. First an analysis was run for the whole sample. Social  
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26 anxiety, positive and negative alcohol expectancies, alcohol exposure, and social acceptance of  
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28 alcohol use were entered as predictors, as well as demographic characteristics, namely sex, high  
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30 school GPA and current living situation (whether students lived in independent housing,  
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32 dormitories, or with their family). The same analysis was then conducted in order to predict  
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34 alcohol use in each culture.  
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## 38 Results

### 39 *Cross-Cultural Differences*

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41 Students from Cyprus had significantly higher high school GPAs than the students at the  
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43 US site,  $F(1, 811) = 54.03, p < .0001$ . They also reported significantly more frequent exposure  
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45 to alcoholic beverages than their US counterparts,  $F(1, 822) = 44.33, p < .0001$ , but there were  
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47 no significant cross-cultural differences in acceptance of drinking by the social environment.  
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50 With regard to social anxiety, there were no significant differences between the three sites on the  
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SIAS.

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Students at the two US sites reported significantly higher use of alcohol on the AUDIT compared to their Cypriot counterparts: Specifically they had higher total AUDIT scores,  $F(1, 815) = 22.79$   $p < .0001$ , and indicated higher quantity and more bingeing,  $F(1, 822) = 81.04$   $p < .0001$ , and  $F(1, 822) = 36.59$   $p < .0001$  than their Cypriot counterparts. There were no significant differences in frequency of consumption between the two cultures. Students from the two cultures also differed significantly in their expectations regarding the consequences of alcohol consumption as measured by the AOEQ. Overall, when examining total positive and total negative expectancies, Cypriot students reported significantly fewer global positive and significantly more global negative expectancies regarding alcohol use than their US counterparts,  $F(1, 821) = 6.99$   $p < .01$  and  $F(1, 789) = 103.71$   $p < .0001$  respectively. American students reported significantly higher positive expectancies than their Cyprus counterparts regarding social facilitation and increased fun through the use of alcohol,  $F(1, 822) = 18.03$   $p < .0001$  and  $F(1, 822) = 19.51$ ,  $p < .0001$ , respectively. Students in Cyprus had significantly more negative expectations on all subscales of the measure, specifically for social behavior,  $F(1, 817) = 60.35$ ,  $p < .0001$ , negative emotions,  $F(1, 814) = 28.82$   $p < .0001$ , negative physical effects,  $F(1, 809) = 110.36$   $p < .0001$ , and deteriorated cognitive performance,  $F(1, 809) = 46.34$   $p < .0001$ . The Cyprus results may be affected to some degree by gender, as women tend to hold fewer positive expectancies, and the Cyprus sample was more female in compositions.

#### 46 *Correlations between anxiety and alcohol expectancies*

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Although all correlations were modest, those expectancies most related to social anxiety are improved social interactions through the use of alcohol, negative emotions, and negative physical symptoms. Socially anxious individuals in this study tend to endorse more negative

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3 alcohol expectancies. Table 3 shows bivariate correlations between positive and negative  
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5 alcohol expectancies and social anxiety.  
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#### 8 *Correlations between alcohol use and anxiety*

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10 In initial examination of alcohol use measure and anxiety, there were significant negative  
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12 correlations between anxiety, frequency and quantity of drinking, although the size of the  
13  
14 correlations was generally small. Because the results indicate that anxiety is mostly related to  
15  
16 frequency of drinking, it was hypothesized that the observed correlations may be partially due to  
17  
18 social anxiety affecting frequency of socializing at places where alcohol is served, which was  
19  
20 measured through the alcohol exposure index. To assess this hypothesis, post-hoc partial  
21  
22 correlation analyses were conducted between anxiety and AUDIT variables, with alcohol  
23  
24 exposure controlled. As anticipated, correlations became non-significant, indicating that the  
25  
26 negative correlation observed between social anxiety and alcohol use may be largely due to the  
27  
28 effect of social anxiety on the frequency of social outings (social anxiety was found to be  
29  
30 negatively related to frequency of alcohol exposure,  $r = -.12, p < .001$ ). With exposure removed,  
31  
32 the correlation between social anxiety and total AUDIT score became positive and significant,  
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34  $r = .19, p < .001$ . See Table 4 for these partial correlations.  
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#### 40 *Correlations between alcohol use and expectancies*

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43 As expected, there were significant positive correlations between total AUDIT and  
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45 Alcohol Exposure,  $r = .63, p < .01$ , Alcohol Acceptance,  $r = .29, p < .01$ , Positive Alcohol  
46  
47 Expectancies,  $r = .43, p < .01$ , and significant negative correlations between the AUDIT and  
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49 Negative Alcohol Expectancies,  $r = -.15, p < .01$ , as well as GPA,  $r = -.22, p < .01$ .  
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### *Main Hypotheses: Alcohol use in relation to anxiety level and sex of participants*

Based on the Crum and Pratt (2001) findings, and the Strahan (2002) results, we were expecting to find a non-linear relationship between social anxiety and drinking. This analysis found significant main effects for sex on drinking frequency,  $F(1, 794) = 8.32, p < .001$ , quantity,  $F(1, 794) = 4.57, p < .05$ , bingeing,  $F(1, 794) = 15.48, p < .0001$ , and total AUDIT,  $F(1, 794) = 9.09, p < .01$  respectively. In all cases, males had higher scores than females. A main effect of social anxiety appeared for frequency of drinking,  $F(3, 794) = 5.49, p < .001$ . Post-hoc comparisons indicated that the two lowest quartiles of social anxiety reported significantly more frequent drinking than the top quartile, with the most frequent drinking reported by those in the 2<sup>nd</sup> lowest quartile. Means and standard deviations of frequency of drinking by quartiles are reported in Table 5. No significant interactions were observed between social anxiety level and site or sex.

Figure 1 demonstrates the relationship between social anxiety quartiles and drinking Frequency score on the AUDIT, with cultures combined. To test for curvilinearity, we used a regression analysis testing for curve fit using quadratic and cubic functions (see Cohen & Cohen, 1983, pp. 225-227). For men, the quadratic curve provided the best fit,  $F(2, 309) = 4.382, p = 0.013$ . The obtained curve is of the “inverted-U” variety, with highest levels of alcohol consumption occurring at moderate levels of social anxiety. For women, as anticipated, no curvilinear relationship was obtained. The obtained estimate for women was  $F(2, 491) = 1.289, p = .276$ .

### *Prediction of alcohol use in total sample*

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Table 6 shows the variables that emerged as significant predictors of drinking. The model was significant and predicted 69% of the variance. It can be seen that high GPA and being

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3 female were negative predictors, whereas being in school longer, and having more frequent  
4 exposure to alcohol were positive predictors of drinking. Also, being a US college student was a  
5 strongly significant predictor of alcohol use, compared to being a student in Cyprus. Increased  
6 social anxiety also predicted increased alcohol use, as did having expectancies that alcohol  
7 would increase fun, and surprisingly, expecting that it impairs social relationships.  
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#### 10 11 12 13 14 15 *Prediction of alcohol use in each culture*

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17 Table 7 shows significant predictors for students in Cyprus and the US. In Cyprus as in  
18 the total sample, being female and having a good high school GPA were negative predictors of  
19 alcohol use, whereas being in college longer and being frequently exposed to alcohol were  
20 positive predictors. No other variables predicted use in this culture (total variance explained,  
21 75%). For American students the model explained 70% of the variance. Significant predictors for  
22 US students replicate those described above for the entire sample, since this group represents the  
23 majority of the total sample.  
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### 33 34 Discussion

#### 35 36 37 *Self-Medication Hypothesis Findings*

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39 The basic finding of this study was of a significant curvilinear relationship between social  
40 anxiety and alcohol use for men: this may help explain the mixed results for the SMH, as  
41 previous research has generally focused on finding linear relationships. As described earlier,  
42 there were hints from Crum & Pratt (2001) and Strahan (2002) that had suggested a curvilinear  
43 relationship would more accurately portray this relationship. Gender was shown to be an  
44 important moderator of the relationship, since women did not show a significant relationship,  
45 linear or otherwise, between self-reported social anxiety and total drinking. Men, on the other  
46 hand, showed an “inverted-U” relationship, with highest drinking occurring at moderate levels of  
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3 social anxiety. This pattern may mostly be attributed to the effect of the US sample since the  
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5 number of Cypriot males was small.  
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### 8 *Cultural Differences*

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10 As expected from the literature on cross-cultural drinking patterns, the Cypriot students  
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12 demonstrated fewer problematic types of drinking, reported more negative expectancies  
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14 associated with drinking alcohol, and reported fewer positive alcohol expectancies. This is also  
15  
16 not surprising given the legal drinking age in each country. By the time students turn 21, Cypriot  
17  
18 students have had several years more experience with alcohol than students in the US.  
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20 Additionally, Cypriots reach drinking age while likely still under the care of their parents, unlike  
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22 US students who reach this milestone well after leaving home.  
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27 We did not find the expected greater total consumption of alcohol for students in Cyprus  
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29 in this study. In fact, a main effect of site showed that students at the small US college drank  
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31 significantly more than those in Cyprus. Though annual per capita consumption of alcohol is  
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33 higher in Cyprus overall than in the US (Institute of Alcohol Studies, 2002), this pattern  
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35 evidently does not manifest itself in the college years, perhaps because this is a time when US  
36  
37 students often immerse themselves in a culture of drinking. An additional explanation for the  
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39 absence of this finding may have to do with the high representation of females on the Cyprus  
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41 sample, who generally tend to drink less than males, who were over-represented in the US  
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43 sample. Moreover, the US group had not been in school as long, on average, and it could be  
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45 predicted that their drinking would increase even more relative to the Cypriot group, with  
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47 additional exposure to the college environment.  
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### 52 *Role of expectancies in predicting drinking*

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3 This study confirms the important role of alcohol expectancies in predicting levels of  
4 drinking, which has been a robust finding in the literature. The positive expectancy that most  
5 predicted alcohol use was the belief that alcohol would lead to increased fun. Expectancies held  
6 by students varied between cultures, with US students reporting significantly more positive  
7 expectancies and fewer negative expectancies than did Cypriot students.  
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#### 10 11 12 *Correlations between anxiety and dimensions of alcohol expectancies*

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15 Albeit weak, there were positive correlations between social anxiety and negative  
16 expectations about alcohol, which should support a lesser tendency to drink among socially  
17 anxious individuals. However, there was also a significant positive correlation between social  
18 anxiety and expecting that alcohol is a social facilitator. Thus, the tension between opposing  
19 cognitions be a primary factor in determining whether socially anxious students choose to drink  
20 alcohol or avoid drinking as a response to their anxiety. These cognitive elements indicate a clear  
21 prime target for future investigation into the predictors of alcohol abuse, as well as a focus of  
22 clinical intervention.  
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#### 36 37 *Alcohol Use, Gender, and Social Anxiety*

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39 Though social anxiety did emerge as a significant predictor of greater drinking in college  
40 *males* when addressed via a multiple regression analysis, the results of the current study do not  
41 support a simplistic view of the SMH in which high levels of social anxiety lead to higher  
42 alcohol intake. Instead, they point to a more complex relationship. Specifically, for male  
43 students, the relationship between drinking and anxiety replicates the curvilinear relationship  
44 reported by Crum and Pratt (2001), in which highest levels of drinking occur at moderate levels  
45 of social anxiety. We found the lowest level of social anxiety was associated with the highest  
46 frequency of drinking in our male participants, and those in the second quartile of social anxiety  
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3 tended to report the greatest amount of total drinking. In both countries, the most anxious  
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5 students drank the least, which would not have been predicted by the SHM. Given that the highly  
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7 socially anxious are characterized by a fear of negative evaluation, it may be that they avoid  
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9 heavy drinking because of anxiety about what they will do if they become inebriated. The effect  
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11 may also be explained by the significant negative correlation between social anxiety and alcohol  
12  
13 exposure, since very high levels of social anxiety may prohibit these individuals from  
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15 participating in social activities that involve alcohol, such as going to bars or clubs. Women  
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17 students did not show an effect of social anxiety on drinking, and so for them, the present study  
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19 does not provide support for the SMH. As expected, our results indicate a main effect for gender,  
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21 with men scoring significantly higher than women on all measures of drinking. These results  
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23 may be explained by a number of factors. For example, many studies have found that women  
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25 drink less than men because the social repercussions for doing so are greater, or because drinking  
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27 alcohol does not mesh with the traditional view of the female gender role. Additionally, men are  
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29 more likely to drink alcohol to cope with distress, and have been show to have more positive  
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31 expectancies regarding the effects of alcohol (particularly that alcohol will reduce tension), than  
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33 women (Nolen-Hoeksema, 2004).  
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#### 40 41 *Implications for Intervention*

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43 Because of their demonstrated importance, targeting positive and negative expectancies  
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45 regarding the impact of alcohol on social anxiety could be a very useful intervention. It is also  
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47 clear that women and men have different patterns of alcohol use, suggesting that gender-specific  
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49 interventions would be useful. It is an important point to keep in mind that the majority of the  
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51 students in the current study were of “traditional” college age, with a mean age of 19.8 years. In  
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53 retrospective studies of individuals with comorbid alcoholism and social phobia, individuals  
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3 typically report that social phobia preceded their alcohol problems (Schneier et al, 1992; Lépine  
4 and Pélissolo, 1998). Thus, it could be that the highly socially anxious individuals in the current  
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8 study may be at more risk for developing alcoholism as they leave college and are placed in  
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10 more interpersonally demanding environments. This would make the college years a prime  
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12 window of opportunity for treatment of social anxiety disorders. Further research on the  
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14 developmental paths of social phobia and alcoholism would be invaluable in better  
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16 understanding these phenomena and how best to respond to them.  
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20 In sum, this study sheds some light into the SMH and the association between social  
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22 anxiety and alcohol consumption. It points to a curvilinear relationship between the two variables  
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24 for men. Most importantly, it demonstrates the significance of keeping in mind for this type of  
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26 research the severity of the social anxiety, the gender of the participants, their expectations, and  
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28 the cultural context in which the research takes place.  
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### 31 *Limitations to the Study*

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34 Drawbacks of this study may be found in several areas. First, sample sizes of the  
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36 countries are unbalanced, with substantially more subjects in the US sample than the Cypriot  
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38 sample. Differences in the recruitment methods may have also somewhat influenced results since  
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40 USA students were selected through standard research participation requirements, while students  
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42 in Cyprus were recruited through a snowball method. It may be claimed that Cyprus students  
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44 may have been more motivated to participated on a purely voluntary basis and therefore exhibit  
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46 more conscientiousness, compliance or other similar traits. It's unlikely that these traits could  
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48 have been avoided, however, since the University where the research took place is rather  
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50 selective in its entry requirements (hence the higher GPAs). Additionally, the US sample was  
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52 composed strictly of students in the Midwest, which is not a representative US sample. Secondly,  
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3 GPA among Cypriot students was significantly higher than US students, which potentially skews  
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5 the finding that high GPA negatively predicts drinking. Furthermore, differences in  
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7 demographics between the two countries, which were small in magnitude but reached  
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9 significance, may have somewhat skewed results as well. Cypriot students were slightly older,  
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11 and hence exposed to alcohol for much longer, which may have caused them to habituate to its  
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13 novelty as a “promising” way of coping with unwanted emotions. They were also predominantly  
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15 female and living with their parents, which may have reduced their likelihood of consuming  
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17 large amounts of alcohol, frequently. All of these factors could attenuate any findings via  
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19 restriction of range for the Cyprus group. Another drawback is that our sample scored relatively  
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21 low on the SIAS, indicating only mild levels of social anxiety. Thus, our study may not be a true  
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23 test of the SMH, as the theory holds that individuals use substances in order to alleviate distress  
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25 or discomfort. Similarly, given the “restriction of range” problem in the social anxiety scores  
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27 within our sample, we were only able to gain limited insight into the relationship between  
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29 anxiety, alcohol use, and the SMH. Thus, testing the SMH and looking for curvilinear  
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31 relationships between drinking and social anxiety in a more “clinical” sample would be  
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33 preferable. Additionally, in future studies it may be helpful to include measures that address  
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35 reasons and situations for drinking, as well as perceived drinking norms, in order to shed more  
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37 light on the SMH.  
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#### 42 Figure Legend

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45 *Figure 1.* Mean AUDIT Frequency of drinking score (on the Y-axis), as a function of SIAS  
46 anxiety quartile, collapsed across cultures.  
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Table 1

*Demographic variables by site*

	Cyprus	US university	US small college	Total	Significant Differences Between Sites
Sex					$\chi^2 (2, 819)$ =28.59, $p < .001$
Male	23	216	80	319	
Female	99	319	82	500	
Living Situation					$\chi^2 (2, 819)$ =98.55, $p < .001$
Parents	65	73	21	159	
Apt. or dorm	61	460	139	660	
Age ranges					$\chi^2 (4, 823)$ =117.85, $p < .001$
17-18	11	153	35	199	
19-20	65	314	49	428	
21-27	50	68	78	196	

Note: Significant differences are based on comparisons among the 3 sites for sample sex composition, living situation and age ranges. When the two US campuses were collapsed and compared to the Cyprus campus, demographics were significantly different for all three variables. Cyprus students were predominantly female, somewhat older, and more likely to live with their parents.

Table 2

*Scale psychometric properties and internal reliabilities*

Scales and Subscales	Mean	SD	Alpha
AUDIT (total)	6.23	5.87	0.85
Alcohol Expectancies/ Positive	75.13	16.72	0.94
Alcohol Expectancies/ Negative	47.90	13.08	0.91
SIAS	26.19	11.33	0.86

Table 3

*Correlations between social anxiety and alcohol expectancies*

Alcohol Expectancies	Social Anxiety
Total Positive Expectancies	.089*
Social Facilitation	.178**
Sex	.055
Fun	-.001
Tension reduction	.087*
Total Negative Expectancies	.166**
Negative Social	.079*
Negative Emotions	.217**
Physical Effects	.128**
Cognitive Effects	.115**

\*\* Correlation is significant at the  $p \leq 0.01$  level. \*Correlation is significant at the  $p \leq 0.05$  level.

Table 4

*Bivariate correlations between anxiety measures and drinking; post-hoc partial correlations, controlling for alcohol exposure*

	Social Anxiety	SIAS partial correlation
AUDIT Frequency	-.12**	-.05
AUDIT Quantity	-.07*	-.00
AUDIT Binge	-.06	.08
AUDIT Total	.01	.19**

Note: \*\* Correlation is significant at the 0.01 level; \* Correlation is significant at the 0.05 level.

All other correlations are non-significant.



Table 5

*Means and standard deviations of frequency of drinking by quartiles among students with social anxiety*

	Mean alcohol frequency of use	SD
First Quartile of Anxiety	1.80	1.11
Second Quartile of Anxiety	1.86	1.19
Third Quartile of Anxiety	1.69	1.13
Fourth Quartile of Anxiety	1.50	1.11

Note: For male students, these differences yield a significant curvilinear relationship,  $p=0.013$ .

There was no significant difference between the frequency of US and Cyprus students being in each of the quartiles,  $p=.45$

Table 6

*Multiple regression (method enter) on total sample: Variables that significantly predict total score on the AUDIT*

	B	Std. Error	Beta	<i>p</i> <
sex*	-1.18	.300	-.100	.001
year in college**	.41	.117	.081	.001
GPA	-.48	.132	-.080	.001
site***	4.71	.525	.287	.001
social anxiety	.048	.014	.093	.001
frequency of alcohol exposure	2.79	.163	.489	.001
Alcohol Expectancies				
positive expectancies fun	.16	.030	.176	.001
negative expectancies social performance	.18	.046	.064	.05

Note:  $R^2 = .69$ . \*sex: (females tend to drink less) \*\*year in school (drinking increases with increased years in school), \*\*\*US students indicate more drinking than Cypriot students.

Table 7

Multiple regression (method enter) on samples at each site. Variables that significantly predict total AUDIT score

	B	Std. Error	Beta	p<
Cyprus: R <sup>2</sup> =.75				
sex*	-2.21	.674	-.27	.01
year in college*	.43	.179	.15	.05
GPA	-1.15	.383	-.21	.01
frequency of alcohol exposure	1.04	.268	.30	.001
US: R <sup>2</sup> =.70				
sex*	-1.22	.332	-.101	.001
year in college*	.41	.135	.074	.01
GPA	-.40	.141	-.067	.01
social anxiety	.04	.017	.072	.05
frequency of alcohol exposure	3.09	.185	.514	.001
Alcohol Expectancies				
positive expectancies fun	.17	.035	.174	.001
negative expectancies social	.13	.055	.063	.05

Note: \*sex: (females tend to drink less) \*year in school (drinking increases with increased years in school).