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# THE SITUATIONAL SPECIFICITY OF ALCOHOL USE AMONG HIGH ANXIETY SENSITIVE YOUNG ADULTS

by

Sarah Barton Samoluk

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

at

Dalhousie University
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**DALHOUSIE UNIVERSITY**

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The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "The Situational Specificity of Alcohol Use Among High Anxiety Sensitive Young Adults"

by Sarah Samoluk

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Research Supervisor

Examining Committee

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## Dedication

This work is dedicated to my late father. I know he would have been proud to hear his Sarah ***Elizabeth*** referred to as Dr. Barton Samoluk.

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**Abstract**

This series of studies was designed to examine the situations in which high anxiety sensitive (AS) young adults are most likely to drink. The objective was to advance understanding of the heightened risk for alcohol abuse in high AS individuals. In the first study, participants rated their frequency of drinking in various situations using the 42-item Inventory of Drinking Situations. AS levels were found to be more highly predictive of drinking in negatively-reinforcing situations and temptation drinking situations than drinking in positively reinforcing situations. This study suggests a link between AS and the use of alcohol in situations involving coping with negative affect and testing personal control. In two ad-lib alcohol consumptions studies, high and low AS young adults participated in a bogus taste-rating task following various manipulations designed to induce social-affiliation and negative affect, respectively. Consistent with hypotheses, only high AS individuals drank more alcohol in a solitary drinking context where they self-reported more negative affect than in a social context. In the other study, high AS individuals unexpectedly did not experience greater negative affect as designed and failed to drink more alcohol when anticipating questions about anxiety, relative to control questions. Instead, high AS individuals drank more alcohol only when anticipating control questions about their food and leisure preferences. It is possible that the food question primed high AS individuals to attend to physical discomfort arising from hunger, which prompted their greater alcohol use. In a final study, participants were required to colour-name alcohol and food cues on the modified Stroop following a physical discomfort induction. AS levels were positively correlated with an attentional bias for alcohol cues only under the physical discomfort condition. Results are discussed in terms of implications for prevention and treatment of alcohol disorders in high AS individuals.

## List of Abbreviations

| | |
|---|---|
| A.A. | Alcoholics Anonymous |
| AEQ | Alcohol Expectancies Questionnaire |
| ANOVA | analysis of variance |
| APA | American Psychiatric Association |
| AS | anxiety sensitivity |
| ASI | Anxiety Sensitivity Index |
| AVE | Abstinence Violation Effect |
| BAL | blood alcohol level |
| BDI | Beck Depression Inventory |
| DMQ | Drinking Motives Questionnaire |
| DSM-IV | Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition |
| FNE | Fear of Negative Evaluation Questionnaire |
| HAS | High anxiety sensitive |
| IDS-42 | 42-item Inventory of Drinking Situations |
| IDS-100 | 100-item Inventory of Drinking Situations |
| IDTS | Inventory of Drug-Taking Situations |
| LAS | Low anxiety sensitive |
| MAST | Michigan Alcoholism Screening Test |
| PAQ | Panic Attack Questionnaire |
| STAI-T | Trait form of the State-Trait Anxiety Inventory |
| TRH | Tension Reduction Hypothesis of alcohol use |

## Publication Citation

Portions of the research presented in this thesis have appeared in published form and/or presented at conferences:

(1) Study 1 has been accepted for publication in the *Journal of Anxiety Disorders* pending approval of revisions.

(2) Study 2 has been published in abridged form in the *Psychology of Addictive Behaviours*, 1996, Vol. 10(1), 45-54. An abstract of this same work can be found in *Canadian Psychology*, Vol. 36, No. 2a, 64.

(3) Study 3 was presented at the Association for Advancement of Behavior Therapy. An abstract of this work can be found in the *Proceedings of the 29th Annual Meeting of the Association for Advancement of Behavior Therapy*, Vol. 2, 246.

(4) Study 4 has been prepared for invited submission to *Behavior Therapy*. An abstract of this work appears in the *Proceedings of the 30th Annual Meeting of the Association for Advancement of Behavior Therapy*, Vol. 3, 396.

I share authorship on other published manuscripts which are reviewed in this thesis:

(1) Psychometric evaluation, including confirmatory factor analysis, of the 42-item Inventory of Drinking Situations (IDS-42) in a nonclinical sample is reviewed in Study 1. This research can be found in: Carrigan, G., Samoluk, S. B., & Stewart, S. H. (in press). Examination of the short form of the Inventory of Drinking Situations (IDS-42) in a young adult university sample. *Behaviour*

*Research and Therapy*. Tables 2 and 4 from Carrigan, Samoluk, & Stewart (in press) have been reproduced as Appendices A and B, respectively, and have been reprinted with permission from Elsevier Science.

(2) Chapter Two of this manuscript reviews the tension-reduction hypothesis of alcohol use/abuse and the relationship between anxiety sensitivity (AS) and alcohol use/abuse in clinical and nonclinical samples. A similar review of the relationships between AS and other substances in addition to alcohol is currently in press for publication as a book chapter: Stewart, S. H., Samoluk, S. B., & MacDonald, A. B. (in press). Anxiety Sensitivity and Substance Use/Abuse. In S. Taylor (Ed.), *Anxiety Sensitivity: Theory, Research, and Treatment of the Fear of Anxiety*. Mahwah, NJ: Erlbaum.

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# CHAPTER ONE:

## The Concept of Anxiety Sensitivity

Anxiety sensitivity (AS) is a personality variable that refers to individual differences in beliefs about the consequences of anxiety (Peterson & Reiss, 1992). An individual who is high in AS believes that anxiety has devastating personal consequences such as mental or physical illness, embarrassment, or loss of control (Peterson & Reiss). In contrast, a low AS individual might find an experience of anxiety bothersome but otherwise harmless (Peterson & Reiss, 1992). Succinctly, AS is a fear of anxiety sensations: a fear of fear.

The concept of AS is based on Reiss' expectancy theory of fear (1991; see also Reiss & McNally, 1985). This theory makes a distinction between fundamental and ordinary fears. Reiss argues that there are three fundamental fears (or sensitivities): the fear of illness/injury, the fear of anxiety (AS), and the fear of negative evaluation. The motivation to avoid feared situations or objects is a function of one or more of these *sensitivities* in combination with *expectancies*. Expectancies refer to what a person believes will happen when confronted with the feared situation or object. A person's expectation (e.g. "The plane will crash," "I will be shaky when I give my presentation," "I will not be able to hit the baseball") interacts with that person's sensitivity (e.g., "I'm afraid

of dying if the plane should crash," "It scares me when I feel shaky," "I'll be embarrassed when I strike out") to motivate avoidance of illness/injury, anxiety sensations, and negative evaluation, respectively (Reiss, 1991).

Ordinary fears refer to fears that are common to most people such as fears of heights, spiders, and public speaking. While one ordinary fear is not necessarily related to another, every ordinary fear can be reduced to its fundamental fear. One individual might fear public speaking because he/she fears shaking while speaking, while another individual might fear public speaking because he/she fears being negatively evaluated by others while speaking in public. Both examples include the ordinary fear of public speaking. However, the first example refers to an individual with a sensitivity to anxiety (high AS), while the latter example refers to an individual with a sensitivity to negative evaluation. The underlying fundamental fear not only explains ordinary fears but *amplifies* their aversiveness. As an "amplifying" factor, AS causes additional anxiety whenever anxiety is experienced or anticipated (e.g., worry and bodily arousal when anticipating speaking in front of class, escalates into even greater bodily arousal due to the fear of the anxiety-related bodily sensations the student is currently experiencing). Thus, AS should predict the number and intensity of ordinary fears (McNally, 1996). For example, a high AS individual may fear heights, spiders, and public

speaking because all three stimuli are inherently aversive to that individual, but even more, because of the feared possibility of experiencing anxiety sensations when confronted with these stimuli or any other ordinary stimuli.

*The Measurement of Anxiety Sensitivity*

Reiss, Peterson, Gursky, and McNally (1986) constructed the Anxiety Sensitivity Index (ASI) as a measure of the theoretical construct of AS as defined by Reiss (see review by Taylor, 1995). The ASI is a 16-item self-report questionnaire that assesses subjective *fears* of anxiety sensations (e.g., "It scares me when I feel faint;" "It embarrasses me when my stomach growls.") and *beliefs* about why those sensations are harmful (e.g., "When my stomach is upset, I worry that I might be seriously ill;" "When I notice that my heart is beating rapidly, I worry that I might have a heard attack.") (Taylor, 1995). Respondents simply indicate the extent to which they agree with each item on a 5-point Likert scale, ranging from "very little" (scored as 0) to "very much" (scored as 4). The total ASI score is the sum of points for all sixteen items. Totals scores range from 0 to 64. The higher the score, the higher the level of AS.

Total ASI scores are compared to published clinical and nonclinical norms found in Peterson and Reiss (1992). Peterson and Reiss report that the average total ASI score was 19.01, with a standard deviation of 9.11, across 12 studies with 4,517 nonclinical subjects. They also report a

reliable but small gender effect: Women tend to have a higher ASI mean than men (19.75 vs. 17.62).[1] Clinical norms for various types of anxiety disorder patients range from about 0.5 to 2.0 standard deviations above the ASI nonclinical norm (Peterson & Reiss, 1992) as more fully reviewed below under Criterion Validity.

Reliability. The data reviewed in Peterson and Reiss (1992) show that the ASI has satisfactory internal consistency and test-retest reliability. Reiss et al. (1986) found as many as 74% of the ASI interitem correlations were significant. Peterson and Reiss (1992) reviewed repeated replications of internal consistency which have found alpha coefficients in the range of .80 to .90. More recently in the Stewart lab, the ASI has been found to have an alpha coefficient of .88 in a large sample of university students (Watt, Stewart, & Cox, in press). Peterson and Reiss (1992) also review test-retest data in which a reliability coefficient of .71 was found after three years. This research suggests that the ASI measures a stable and internally consistent personality trait (Reiss, 1991).

Criterion Validity. The ASI clinical norms are consistent with Reiss' expectancy theory (1991; Reiss & McNally, 1985) in which the concept of AS is embedded. Reiss theorized that individuals with sensitivity to anxiety

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[1]A review of gender differences in AS can be found in Stewart, Taylor, and Baker (1997).

should develop fears of multiple situations in which there is even a remote possibility of becoming anxious or experiencing a panic attack.[2] In fact, Peterson and Reiss (1992) reviewed means and standard deviations for 1,821 anxiety patients across 21 studies and reported that patients with panic disorder and agoraphobia score highest on the ASI -- about two standard deviations above the ASI nonclinical norm of 19.01. The next highest scores were obtained by patients with posttraumatic stress disorder, who scored 1.3 standard deviations above the norm (Peterson & Reiss, 1992). Persons with other anxiety disorders (specific phobia, social phobia, generalized anxiety disorder, obsessive-compulsive disorder) also have elevated ASI scores 0.5 to 1.0 standard deviations above the ASI norm, but not as high as patients with agoraphobia, panic disorder, or posttraumatic stress disorder (Peterson & Reiss).

Panic disorder and social phobia have distinct clinical features which explain the higher levels of AS in patients with panic disorder as compared to patients with social phobia. The essential feature of panic disorder is the fear of experiencing a panic attack (i.e., a fear of fear: AS;

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[2]According to the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV: American Psychiatric Association), a panic attack is a discrete period of intense fear or discomfort which is accompanied by multiple symptoms of anxiety. These symptoms may include, for example, shortness of breath, dizziness, rapid heart rate, shaking, sweating, choking, abdominal distress, hot flashes, chest pain, fear of dying, and fear of going crazy.

DSM-IV, APA, 1994). The essential feature of social phobia is a more focused fear of experiencing embarrassment or humiliation in front of others (DSM-IV, APA, 1994). However, contrary to the clinical findings reported by Peterson and Reiss (1992), a more recent study found that ASI scores did not differentiate patients with social phobia from patients with panic disorder as expected (Ball, Otto, Pollack, Uccello, & Rosenbaum, 1995). This inconsistency has been satisfactorily resolved by Zinbarg, Barlow, and Brown (1997) who investigated the factor structure of the ASI. They found evidence supporting three moderately intercorrelated AS factors corresponding to physical concerns ("Unusual body sensations scare me"), mental incapacitation concerns ("When I cannot keep my mind on a task, I worry that I might be going crazy"), and social concerns ("It is important to me not to appear nervous"). Patients with social phobia had significantly higher scores on the AS-Social Concerns subscale than patients with panic disorder, and patients with panic disorder had significantly higher scores on the AS-Physical Concerns and AS-Mental Incapacitation subscales as compared to patients with social phobia (Zinbarg et al., 1997). These findings suggest that the essential difference between panic disorder and social phobia is not the level of AS overall, but the specific feared consequence of anxiety experiences.

Clearly AS and the anxiety disorders are highly associated, particularly AS and panic disorder. Elevated

levels of AS have also been found in individuals without a diagnosis of anxiety disorder. Nonclinical anxious college students tend to score higher on the ASI than nonanxious university students but not as high as clinically anxious patients (Peterson & Reiss, 1992). Elevated ASI scores have also been found in college students with a history of panic attacks (Dorward, 1990). Also, Donnell and McNally (1990) found that high AS subjects more often reported a personal and family history of panic attacks than medium or low AS subjects. While this research suggests that AS and anxiety are clearly related, it does not assist in the determination of causation, which requires longitudinal investigations.

Three possible causal relationships exist to explain the association between AS and anxiety. First, AS may be a risk factor for panic attacks and the development of anxiety disorders (see Reiss, 1991; Reiss & McNally, 1985). Second, AS may be a consequence of the experience of panic attacks and/or an anxiety disorder (see Stewart, Knize, & Pihl, 1992). Or there may be some third variable, perhaps quite remote, that causes both AS and anxiety disorders, with no direct causal connection between AS and anxiety disorders. This suggests that AS can be acquired in ways other than through prior personal experience with panic attacks. Indeed, Donnell and McNally (1990) reported that up to two-thirds of a group of high AS subjects had never experienced a spontaneous panic attack.

Maller and Reiss (1992) used a longitudinal study and demonstrated that AS can precede and increase the relative risk for the later development of an anxiety disorder. They invited subjects who had tested high and low for AS in 1984 to be retested in 1987. In 1987, subjects completed the ASI a second time, the Panic Attack Questionnaire (PAQ: Norton, Dorward, & Cox, 1986), and a structured anxiety disorders interview. They found that subjects who tested as high AS in 1984 were five times more likely to have had an anxiety disorder when retested in 1987 as compared to subjects who tested as low AS in 1984. They also found that high AS in 1984 was strongly associated with the frequency and intensity of panic attacks which developed during the period of 1984 to 1987.

In a more recent study on the genesis of anxiety pathology, Schmidt, Lerew, and Jackson (1997) hypothesized that AS would predict the development of spontaneous panic and other anxiety symptoms in large sample of young (*M* age = 18 years) nonclinical participants who were military recruits undergoing basic training. Given that basic cadet training involves extreme psychosocial and physical stress, the initial five weeks of this training was used as a natural stressor. Consistent with their hypothesis, Schmidt et al. (1997) found that AS levels predicted the development of spontaneous panic attacks during basic training even after controlling for a history of spontaneous panic attacks and trait anxiety. Moreover, despite the low initial ASI

scores of the total sample of cadets ($M$ $ASI_{overall}$ = 4.0), participants in the highest quarter of ASI scores for this sample showed almost twice the risk for developing panic compared to all other participants (Schmidt et al.).

Factor Structure. Peterson and Reiss (1992) review several studies which examined the factor structure of the ASI. They concluded that a single factor best accounts for the structure of the ASI and recommended the use of the total ASI score. However, theoretical predictions (see review by Lilienfeld, 1996) and empirical evidence (see review by Taylor, 1995) suggest the possibility of a hierarchical factor structure consisting of lower-order AS factors and one higher order factor of global AS.

Stewart, Taylor, and Baker (1997) found modest support for three-lower order factors corresponding to the feared *physical* (e.g., anxiety sensations portend a heart attack), *psychological* (e.g., anxiety sensations portend mental illness), and *social* (e.g., anxiety sensations portend public embarrassment or social rejection) consequences of anxiety in a nonclinical sample. The factor structure is largely equivalent to that found by Zinbarg et al. (1997) using a clinical sample, as reviewed earlier. Similar to Zinbarg et al., Stewart, Taylor, and Baker (1997) found that the three lower-order factors tended to be moderately intercorrelated, and that a global, higher-order factor of AS accounted for most of the variance in ASI scores. These clinical (Zinbarg et al., 1997) and nonclinical results

(Stewart, Taylor, & Baker) support the notion that the AS construct, as measured by the ASI, assesses fears of the physical, social, and psychological consequences of anxiety as originally proposed by Reiss (1991).

Discriminant Validity. The distinction between the AS construct and other constructs of anxiety, especially trait anxiety, has been an ongoing issue in the anxiety literature. Trait anxiety represents a general tendency to respond anxiously (an anxiety proneness). Trait anxiety is commonly measured by the Trait form of the State-Trait Anxiety Inventory (STAI-T; also known as the Self-Evaluation Questionnaire; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Shared variance between the ASI and STAI-T tends to range between 0 to 36% (Peterson & Reiss, 1992). This range of common variance suggests that the ASI and STAI-T are not measuring identical constructs.

Lilienfeld, Jacob, and Turner (1989) began the heuristic debate about whether AS was related to, if not identical to, trait anxiety. Emerging evidence suggests that the ASI is often a better predictor of anxiety-related phenomena than trait anxiety (see review by Peterson & Reiss, 1992). For example, the ASI was a better discriminator than the STAI-T of differences between patients with panic disorder and patients with some other anxiety disorder (Taylor, Koch, & Crockett, 1991). Also, Maller and Reiss (1992) found that ASI scores in 1987 were more strongly associated than trait anxiety scores with

measures of panic attacks during the preceding year. Rapee and Medoro (1994) demonstrated that AS levels were a better predictor of responses to feared anxiety sensations (i.e., sensations experienced during hyperventilation) than trait anxiety levels.

Lilienfeld (1996) later conceded that the ASI has often explained phenomena that could not be accounted for by trait anxiety. It now appears that the speculation about the similarity of AS and trait anxiety put forth by Lilienfeld and colleagues (1989, 1993, 1996) has been tempered. Lilienfeld, Turner, and Jacob (1993) have more recently suggested that Reiss' (1991) fundamental fears (or sensitivities) -- fear of illness/injury, anxiety sensitivity, and fear of negative evaluation -- are nested within the higher-order factor of trait anxiety. In his revised argument, Lilienfeld (1996) draws an analogy between the higher-order general intelligence factor g and trait anxiety. Spatial visualization and clerical speed/accuracy both possess unique variance from g and yet both load highly on the higher-order factor g. In the same vein, it is possible that AS and the other fundamental sensitivities (fear of illness/injury, and fear of negative evaluation) possess unique variance from trait anxiety and yet all load on the higher-order factor of trait anxiety (Lilienfeld, 1996). Lilienfeld (1996) further suggests that trait anxiety covaries with other similar traits to form a still higher-order negative temperament factor. The latent factor

of negative temperament includes such varied manifest constructs as trait anxiety, depression, hostility, and physical complaints (Watson, Clark, & Carey, 1988).

I agree with Lilienfeld's (1996) position that his hierarchical model is statistically compatible with consistent findings of shared variance of ASI and STAI-T scores. Furthermore, this model does not negate the possibility that ASI is a better predictor of certain anxiety-related phenomena than a more global trait anxiety factor. Preliminary research has provided some support for this structural model (Taylor, 1996) but has failed to include a sufficiently wide range of measures to test the entire model. Confirmatory factor analysis (Long, 1983) would be necessary to establish the validity of the entire model. Confirmatory factor analysis of this magnitude would necessitate a large number of subjects, multiple measures of each manifest factor (i.e., AS, fear of illness/injury, fear of negative evaluation, trait anxiety, depression, hostility, etc.) and identification of multiple models to assess relative degrees of parsimony and goodness-of-fit. This may not be feasible. In any event, the issue of the distinction of AS and trait anxiety highlights the importance of including measures of potential higher-order constructs, such as trait anxiety and dysphoria, when investigating any new phenomenon in relation to AS.

Experimental Validity. Several studies have demonstrated that AS is associated with increased affective,

cognitive, and/or physiological responses to anxiety-related stimuli in a laboratory setting. For example, Maller and Reiss (1987) provided behavioral evidence that greater levels of AS are associated with increased affective responses to anxiety. They had high and low AS individuals respond to questions about their personal experiences with anxiety (an "anxiety-relevant" question set) and questions about their leisure activities and favourite foods (an "anxiety-irrelevant" question set). Compared to the low AS subjects, high AS subjects showed greater levels of anxiety on a behavioral index of speech dysfluencies (Mahl, 1956) when responding to the anxiety-relevant questions. This finding provided behavioral validation of the ASI in that high AS individuals showed more anxiety than low AS individuals when confronted with anxiety-related stimuli (Maller & Reiss, 1987).

Rather than having high AS individuals speak about their personal experiences with anxiety (Maller & Reiss, 1987), other researchers have used "biological challenge" tests to provoke anxiety in a laboratory setting. In a biological challenge test subjects are voluntarily exposed to procedures such as hyperventilation and carbon dioxide inhalation that induce symptoms of bodily arousal (e.g., dizziness, breathlessness, rapid heart rate) which are, by definition, feared by individuals with AS (see review by McNally, 1996). In fact, Rapee, Brown, Antony, and Barlow (1992) found that patients diagnosed with panic disorder (a

clinical group of patients with the highest levels of AS; Peterson & Reiss, 1992) reported more fear in response to hyperventilation and carbon dioxide challenge than patients with other anxiety disorders (i.e., simple phobia, social phobia, generalized anxiety disorders, and obsessive compulsive disorder), who have AS levels only somewhat higher than nonclinical high AS persons (Peterson & Reiss). As expected, patients with these other anxiety disorders reported more fear in response to hyperventilation than healthy controls. Also, Rapee and colleagues (1992) found that ASI scores were the only significant predictor of fear in response to both types of challenge.

Consistent with research using anxiety disorder patients, nonclinical high AS subjects are more reactive to biological challenge tests than low AS subjects. Holloway and McNally (1987) had nonclinical high and low AS subjects voluntarily hyperventilate for five minutes. Their high AS subjects reported more intense physical sensations and subjective anxiety in response to hyperventilation than the low AS subjects. In a replication and extension of this research, Donnell and McNally (1989) found that high AS subjects responded more intensely to hyperventilation whether or not they had a history of panic attacks. Most importantly, anxiety in response to hyperventilation was not related to prior panic experiences in the absence of elevated AS (see also review by McNally, 1996).

The greater response of high AS individuals to biological challenge tests may arise from their greater interoceptive acuity (i.e., high AS persons may simply be more aware of their bodily sensations; e.g., Sturges & Goetsch, 1996) and/or biological differences in reactivity. In any event, high AS individuals tend to catastrophize about the physical sensations they experience which serves to amplify their arousal even further (Rapee & Medoro, 1994).

*Chapter Summary*

In summary, AS refers most succinctly to the fear of anxiety (fear of fear). AS can be assessed using the Anxiety Sensitivity Index (Peterson & Reiss, 1992) which has been demonstrated to have good reliability and validity. AS has consistently been found to be associated with panic attacks and the anxiety disorders, particularly panic disorder and agoraphobia (e.g., Donnell & McNally, 1990; Taylor, Koch, & McNally, 1992). Some research suggests that elevated levels of AS can precede and increase the risk for panic attacks and/or anxiety disorders (e.g., Maller & Reiss, 1992; Schmidt et al., 1997). This suggests that a pre-existing tendency to catastrophize about anxiety sensations (i.e., high AS) may predispose an individual to develop certain anxiety disorders (McNally & Lorenz, 1987).

## CHAPTER TWO

## Anxiety Sensitivity and Alcohol Use

### *A Review of the Tension-Reduction Hypothesis*

It is now recognized that alcoholism is a heterogenous disorder with a variety of distinct etiological pathways (Fingarette, 1988). This chapter attempts to explain the development of alcohol use and abuse specifically in individuals who are sensitive to anxiety. The genesis of research on the relationship between AS and alcohol use is the tension-reduction hypothesis (TRH) of alcohol use (Conger, 1956).

The TRH of alcohol use came to prominence in the behaviourist era. Consistent with other behavioral models, drinking alcohol was understood as simply one of many other possible learned behaviours in response to "tension" (see review of the TRH by Cappell & Greeley, 1987). Tension has been used to refer to an aversive emotional state, such as fear, nervousness, anxiety, and restlessness, which can motivate behaviour (Cappell & Greeley, 1987). The TRH has two principal tenets. The first is that alcohol reduces tension. The second tenet is that people learn to drink alcohol by way of operant conditioning (negative reinforcement) as they learn that their drinking reduces tension. In other words, alcohol-induced tension reduction motivates future alcohol consumption.

The TRH has received inconsistent support in the animal and human literature (see review by Cappell & Herman, 1972). Criticisms levelled against the TRH have included a lack of attention to personality and individual differences, a relatively narrow definition of "tension," the need for greater consideration of the situations in which drinking occurs, and the failure to consider alternative motivations for drinking (see review by Stewart, Samoluk, & MacDonald, in press). In their review of the TRH literature, Cappell and Greeley (1987; p. 46) recommended a clever solution to clarify whether the TRH is a useful model in understanding the etiology of alcohol abuse: "The issue for research is to determine the conditions in which what *can* happen actually *will* happen." Some individuals will cope with tension using alternatives to alcohol, and tension-reduction is only one of many motives for alcohol consumption. Some researchers turned their attention to the identification of which *individuals* might be at risk for using alcohol for its tension-reducing properties.

Early researchers attempted to identify the "addictive personality" which was believed to predispose an individual to the development of alcohol problems (Cox, 1987). This search proved largely unsuccessful. Consistent with the recognition of alcoholism as a heterogeneous disorder (Fingarette, 1988), more recent research has focused on identification of specific personality risk factors for certain subtypes of alcohol abuse (e.g., Cloninger, 1987),

rather than identification of one global addictive personality type. It has been argued that the TRH may be most applicable in explaining the development of alcohol use disorders in individuals with (a) certain anxiety-related traits (McNally, 1996; Welte, 1985), (b) certain anxiety disorders (Cappell & Greeley, 1987; Stockwell & Bolderston, 1987), or (c) a strong sensitivity to alcohol's ability to dampen responses to stress (e.g., a sensitivity to alcohol's "stress-response dampening" properties; Sher, 1991). Trait anxiety and AS are relevant to this particular line of investigation.

A model of alcohol abuse based on trait anxiety as a personality risk factor (e.g., Welte, 1985) is slightly different than a model of alcohol abuse based on AS. As described in Chapter One, trait anxiety refers to a general propensity to respond anxiously to a variety of potentially threatening stimuli (Spielberger et al., 1983). A trait anxiety model of alcohol abuse predicts that individuals who experience frequent anxiety symptoms are more likely to abuse alcohol to control such experiences than individuals who have lower levels of trait anxiety. In contrast, Reiss' (1991) expectancy model maintains that anxiety sensations are not inherently aversive, and that individual differences in AS determine the extent to which an individual will be motivated to avoid anxiety-related sensations because of the fear of the consequences of these sensations. To the extent that alcohol helps in avoidance of anxiety-related

sensations (e.g., through reductions in physiological arousal to stress and/or reductions in the tendency to catastrophize about physical sensations), it is high AS persons, not high trait anxious persons, who should be most motivated to consume alcohol. McNally (1996) suggests that the interaction of trait anxiety and AS best explains an increased risk for alcohol misuse. That is, a person who rarely experiences anxiety (low trait anxiety) and who fears anxiety (high AS) may rarely have the opportunity to use alcohol to dampen anxiety; similarly, a person who experiences much anxiety (high trait anxiety) and does not fear anxiety (low AS) may not need to use alcohol to dampen anxiety sensations that are not feared. But a high AS person who frequently experiences anxiety (high trait anxiety) has ample need to use alcohol to dampen feared anxiety sensations.

Emerging evidence from clinical and nonclinical samples, self-report studies, alcohol administration research, and ad-lib alcohol consumption research confirms a potentially important link between AS and alcohol abuse.

*Anxiety Sensitivity and Alcohol in Clinical Samples*

Pathological Alcohol Use. Results on the relationships between AS and alcohol consumption in clinical samples support McNally's (1996) speculation of a relationship between AS and the use/misuse of drugs (e.g., alcohol and benzodiazepines) which have anxiolytic properties. Individuals diagnosed with DSM-III-R (Diagnostic and

Statistical Manual of Mental Disorders, Third Edition, Revised: American Psychiatric Association, 1987) alcohol abuse/dependence have significantly higher ASI scores when compared with nonclinical norms, whether or not the patients are diagnosed with a co-morbid anxiety disorder (McNally, 1996; Karp, 1993; Zack, Toneatto, & MacLeod, 1997). Norton, Rockman, Ediger, Pepe, Cox, and Asmundson (1997) have found that high AS substance abusers are more likely to indicate depressant drugs (e.g., alcohol) as their drug of choice (52%) as compared to low AS substance abusers (32%). Also, in male patients diagnosed with panic disorder with agoraphobia, ASI scores were significantly positively correlated with weekly alcohol consumption and with ratings of the efficacy of alcohol use to cope with anxiety (Cox, Swinson, Shulman, Kuch, & Reichman, 1993).

Clinical Implications. A review of the comorbidity of rates of alcohol and anxiety problems provides indirect evidence of a link between AS and alcohol problems. The anxiety disorders that are most represented in alcohol-dependent groups are panic-related anxiety disorders, post-traumatic stress disorder, and social phobia (Cox, Norton, Swinson, & Endler, 1990; Kushner, Sher, & Beitman, 1990; and Stewart, 1996). All of these anxiety disorders are associated with elevated levels of AS (Peterson & Reiss, 1992). The excessive use of alcohol by anxiety-disordered patients appears to follow attempts at self-medication of anxiety symptoms based on the belief that alcohol will

reduce anxiety (Stewart, 1996). But the use of alcohol in this way is potentially problematic. Cognitive-behavior strategies for the treatment of anxiety disorders rely upon successful graduated exposure to feared situations and sensations (e.g., Barlow & Craske, 1989). An individual who is consistently self-medicating with alcohol to relieve feared sensations of anxiety is more likely to attribute successful exposure to their use of alcohol rather than their personal ability to manage anxiety effectively. This external attribution can ultimately reduce the effectiveness of cognitive-behavioral treatment (Westra & Stewart, in press). Also, research suggests that the use of alcohol to cope with anxiety can result in more pathological use of alcohol over time (see review by Stewart, 1996; see also Stockwell, Hodgson, & Rankin, 1982). Increasing tolerance combined with the effects of intoxication and withdrawal from continued alcohol use can heighten anxiety in the long-term, potentially resulting in clinical levels of anxiety with even greater alcohol use to relieve symptoms.

The potential spiral into addiction and anxiety highlights the problem of causality: Does an anxiety disorder precede alcohol abuse, or does alcohol abuse precede the development of clinical anxiety? This question remains to be answered. However, there is evidence that, not only is alcohol used to cope with anxiety (i.e., for anxiolysis; Cox et al., 1993), but alcohol abuse can actually worsen fearfulness and potentially result in an

anxiety disorder (see review by Stockwell & Bolderston, 1987).

Summary of Clinical Studies. The relationship between alcohol abuse and anxiety appears to be reciprocal and complex. The high comorbidity of alcohol abuse and certain subtypes of anxiety disorders suggests that AS might be a premorbid risk factor for the development of alcohol abuse/ dependence. Alternatively, it might be argued that heightened sensitivity to anxiety does not precede alcohol abuse, but arises as consequence of alcohol abuse. Greater levels of autonomic reactivity are presumed to be one of the origins of AS (Reiss & McNally, 1985). Thus, the autonomic reactivity associated with heavy drinking (e.g., elevated heart rate; Stewart, Finn, & Pihl, 1992) and/or alcohol withdrawal symptoms (e.g., tremulousness; Stockwell et al., 1982) following a heavy drinking bout are potentially aversive and similar to the arousal sensations experienced during anxiety. The aversiveness of these sensations could thus provide the opportunity for the genesis of AS.

This interpretative impasse can be resolved by studying the use of alcohol in high versus low AS young adults to identify potentially maladaptive patterns of drinking that may prove to be associated with an increased risk for the development of alcohol disorders. Self-report studies on drinking levels, drinking motives, and drinking problems in nonclinical young adults support an association between high AS and the development of a maladaptive pattern of drinking.

*AS and Alcohol Use/Misuse in Nonclinical Samples: Self-Report Studies*

Drinking Levels. The relationship between AS and potentially maladaptive patterns of alcohol consumption found in clinical samples (Cox, Swinson, Shulman, Kuch, & Reichman, 1993) has also been found in nonclinical young adults. Stewart, Peterson, and Pihl (1995) divided young adult women into high, moderate, and low AS groups based on their ASI scores. These researchers found that high AS women reported drinking significantly more alcoholic beverages per week than low AS women (7.4 versus 2.2 alcoholic beverages per week). Also, high AS women obtained higher scores on a novel measure of "excessive" drinking[3] (Conrod, Stewart, & Pihl, 1997) than low AS women (77.0 versus 16.2 excessive drinking occasions per year). The means of the moderate AS level group fell between those of the low and high AS groups on both drinking measures. Overall, ASI scores were significantly positively correlated with self-reported weekly drinking rates and frequency of drinking to "excess" (Stewart, Peterson, & Pihl, 1995).

Another study failed to replicate these results in a nonclinical sample of young adults. Novak, Burgess, Clark,

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[3]This new measure of excessive drinking combines estimates of quantity (number of drinks per occasion) and frequency (number of drinking occasions per month), with body weight and the use of a standard blood alcohol level (BAL) chart for males and females in order to determine the frequency per year at which a subject reaches a BAL of at least 0.08%, which is the legal limit for intoxication in the Provinces of Nova Scotia and Quebec.

and Brown (1997) found that ASI scores failed to predict alcohol consumption after significant demographic variables of income, gender, and age at first drink were entered into a regression equation. Age differences, the range of ASI scores, and data analytic strategies may explain the inconsistent findings (Stewart et al., in press). Novak et al. (1997) used slightly younger subjects and a more restricted range of ASI scores than Stewart, Peterson, and Pihl (1995). Moreover, Novak and colleagues examined whether ASI scores added any additional information in predicting drinking rates beyond that predicted by significant demographic variables. A stepwise multiple regression approach could be used in future research to assess the relative contributions of ASI scores and other variables in predicting levels of drinking across a range of ASI scores and age groups (Stewart et al., in press). Nevertheless, there is some evidence linking AS levels to drinking levels in both clinical (e.g., Cox et al., 1993) and nonclinical (Stewart, Peterson, & Pihl, 1995) samples.

Drinking Motives. Individuals report using alcohol for several distinct reasons or "motives" (cf., Cooper, 1994; Cooper, Russell, Skinner, & Windle, 1992; Farber, Khavari, & Douglass, 1980; Stewart, Karp, Pihl, & Peterson, 1997; Stewart, Zeitlin, & Samoluk, 1996). Three such motives are coping, social-affiliative, and enhancement. "Coping motives" refers to drinking to reduce or avoid negative affect (e.g., to cope with a stressful day). "Social-

affiliative motives" refers to drinking for recreational and social reasons (e.g., to celebrate a family event). "Enhancement motives" refer to drinking to increase positive affect (e.g., to get "high").

The Drinking Motives Questionnaire (DMQ: Cooper et al., 1992) includes three subscales of five items each which measure alcohol use for coping, social, and enhancement motives. Subjects who indicate a history of alcohol use estimate their relative frequency of alcohol use for each of 15 reasons on a scale of 1 (almost never/never) to 4 (almost always). Subscale scores are computed as the mean of the frequency ratings (Cooper et al., 1992). The DMQ is a psychometrically sound instrument that has been normed on middle-aged adults (Cooper et al., 1992), adolescents (Cooper et al., 1994), and university students (Stewart et al., 1996).

Alcohol-related problems are differentially predicted by the DMQ subscales (Cooper et al., 1992). Cooper and colleagues found that coping-motivated drinking was the most highly predictive of alcohol problems, including pathological use (e.g., needing a drink at breakfast), occupational and social impairment, and evidence of tolerance and withdrawal, even after controlling for typical levels of alcohol consumption. They also found that coping motives were associated with drinking alone and excessive levels of alcohol use. In contrast, social-affiliative motives for drinking alcohol appear to be the most normative

across genders, racial groups, and age groups (Cooper, 1994; Cooper et al., 1992; Stewart et al., 1996). Also, social motives for alcohol use were associated with drinking with others, lower levels of alcohol consumption, and lower risk for alcohol-related problems than coping motives (Cooper et al., 1992). Like coping motives, enhancement motives were associated with heavy consumption. But, enhancement motives were less strongly associated with abusive drinking than coping motives (Cooper et al., 1992).

Prior to the availability of the Drinking Motives Questionnaire (Cooper et al., 1992), Stewart, Karp, et al. (1997) investigated motives for use of alcohol and other drugs, using an author-compiled list of reasons for substance use. As a first step, these researchers investigated whether coping-related reasons for the use of alcohol and other drugs among high AS individuals included both anxiety-related (e.g., to avoid feeling afraid; to reduce feeling tense) and depression-related (e.g., to avoid feeling lonely; to reduce feeling sad) reasons. They predicted that their results would be most consistent with a traditional notion of alcohol/drug use for tension-reduction in which tension is defined as fear, nervousness, and restlessness, rather than other negative affective states such as depression. However, AS levels were equally positively correlated with both the number of anxiety- and depression-related reasons for alcohol/drug use. These researchers concluded that their findings warranted a

"modified" TRH to describe the drinking and drug use of high AS individuals to include the use of alcohol/drugs to reduce or avoid any negative affect (Stewart, Karp, et al., 1997).

As a second step, Stewart, Karp, et al. (1997) investigated social affiliative (e.g., substance use "for social-recreational purposes") and enhancement (e.g., substance use "to perk me up or get me going") reasons for the use of alcohol (and other drugs) in addition to coping-related reasons. Unlike in their first study, they assessed reasons for drug use separately for each drug. Stewart, Karp, et al. (1997) predicted that AS levels would be positively associated with the use of alcohol primarily for coping reasons and negatively associated with the use of alcohol primarily for enhancement reasons. Consistent with their hypothesis, they found that ASI scores were positively correlated with the use of alcohol primarily to cope. However, ASI scores were unrelated to the use of alcohol for enhancement-related reasons. Social-affiliative reasons were the most commonly endorsed primary reason for alcohol use. ASI scores were negatively correlated with the use of alcohol primarily to affiliate suggesting that high AS individuals are less likely to drink for normative social purposes (Stewart, Karp, et al., 1997).

Stewart and Zeitlin (1995) extended the work of Stewart, Karp, et al. (1997) by having nonclinical subjects complete the validated DMQ (Cooper et al., 1992). Again, affiliative reasons were found to be the most normative

reason for alcohol use (see Stewart et al., 1996). Stewart and Zeitlin (1995) found that high AS subjects reported a higher frequency of self-reported drinking for any of the indicated drinking motives than low AS subjects. They also found that ASI scores were significantly positively correlated with scores on the coping motives subscale, but were not associated with scores on the social or enhancement subscales of the DMQ. The significant positive relationship between ASI scores and frequency of drinking to cope on the DMQ was recently replicated by Conrod, Pihl, and Vassileva (in press) and Novak et al. (1997).

Stewart and Zeitlin (1995) reanalysed their data by classifying their subjects as either primarily social, coping, or enhancement drinkers, using a comparison of relative scores across the three subscales of drinking motives. They found that a greater proportion of high (50%) than low (5%) AS subjects reported drinking primarily for coping motives. Also, a greater proportion of low (80%) than high (20%) AS subjects reported drinking primarily for social motives (Stewart & Zeitlin, 1995). Consistent with the results of Stewart, Karp, et al., 1997), Stewart and Zeitlin found no difference between the proportions of high and low AS groups that reported drinking primarily for enhancement motives.

In sum, the data on AS and drinking motives suggests that high AS individuals are more likely to drink to cope with negative affect than low AS individuals. Also, high AS

individuals appear to be less likely to drink primarily for the most normative reason of social-affiliation. Alcohol use for coping motives is associated with a greater risk of alcohol problems than is alcohol use for social-affiliative or enhancement motives, even after controlling for typical levels of alcohol consumption (Cooper et al., 1992). Thus, the research on AS and drinking motives suggests that high AS individuals may be at greater risk for alcohol-related problems.

Drinking Problems. The brief version of the Michigan Alcoholism Screening Test (brief MAST: Pokorny, Miller, & Kaplan, 1972) contains 10 questions describing common signs and symptoms of alcoholism. Conrod et al. (in press) compared the brief MAST scores of high and low AS young adult males with no family history of alcoholism. Only non-alcoholic subjects (i.e., those who had brief-MAST scores of 10 or less) were selected to form the high and low AS groups. Conrod and colleagues found that a greater proportion of high (55%) than low (15%) AS males indicated at least one drinking-related problem on the brief MAST. This suggests that, even at a relatively young age, high AS individuals are more likely to demonstrate the emergence of problems related to alcohol use (Conrod et al., in press).

Summary of Self-Report Studies. These self-report studies of drinking levels, motives, and problems suggest that high AS subjects are more likely to drink to excess, drink for reasons which place them at greater risk for

alcohol problems, and show the emergence of alcohol problems even at a relatively young age. Unfortunately, these self-report studies may not accurately reflect the actual extent to which alcohol is used in general and/or to cope with aversive situations in particular.

There are several limitations of self-report research. Individuals are not always aware of the motives for their behaviours (McClelland, 1985; Nisbett & Wilson, 1977). Second, self-report is inherently dependent on memory, which is susceptible to lapses and prone to falsification (Roediger, 1995). Lastly, high AS individuals may simply highly endorse any item related to anxiety, using a response set known as acquiescence (Anastasi, 1988). For example, an individual who has elevated AS might more highly endorse any self-report item on a drinking motives subscale that pertains to fear or tension because of their sensitivity to anxiety, rather than their actual motivations for drinking. Given these limitations, lab-based alcohol research provides a necessary complement to self-report studies.

*AS and Alcohol in Nonclinical Samples: Lab-Based Studies*

Lab-based studies control for limitations inherent in self-report methods and allow for direct examination of predictions made by the tension-reduction hypothesis of alcohol use as applied to high AS individuals (Stewart et al., in press). Alcohol administration or "alcohol challenge" studies can be used to assess whether alcohol is capable of reducing tension, the first tenet of the TRH, and

whether high AS persons are particularly sensitive to alcohol's tension-reduction effects. Ad-lib alcohol consumption studies can also be used to assess the second tenet of the TRH, that alcohol's tension-reducing properties motivate the alcohol consumption of high AS persons through negative reinforcement. Both alcohol administration and ad-lib alcohol consumption studies are reviewed below.

Alcohol Administration Studies. Lab-based studies have been used to compare the responses to alcohol of nonclinical high and low AS subjects. These studies provided an opportunity to assess whether the self-reported differences in the levels of alcohol use, alcohol motives, and alcohol problems among high AS individuals might be explained by their unique response to alcohol. Consistently, lab-based alcohol administration studies have shown that high AS subjects are more sensitive to certain negatively-reinforcing consequences of alcohol use than low AS subjects.

Moderately high doses of alcohol have been shown to reduce the magnitude of autonomic and subjective responses (i.e., self-ratings of pain and discomfort) to unavoidable aversive stimulation in men determined to be at high risk for alcohol problems because of an extensive family history of alcoholism (Stewart, Finn, & Pihl, 1992, 1995). Stewart and Pihl (1994) replicated and extended this line of research in their study of the responses of high AS women to aversive stimulation. High, moderate, and low AS women were

exposed to aversive stimuli in the form of three successive unavoidable loud noise bursts. Subjects rated their degree of subjective-emotional arousal (i.e., combined ratings of tension, anxiety, worry, fear, and anger) experienced in anticipation of the noise bursts. Stewart and Pihl (1994) also included several measures of autonomic reactivity: two cardiovascular measures (e.g., heart rate) and a measure of electrodermal reactivity (i.e., skin conductance level).

Stewart and Pihl (1994) found that sober high AS women had higher ratings of subjective-emotional arousal and displayed greater electrodermal reactivity when anticipating the aversive stimulation as compared to low AS controls. This result is consistent with previous findings that AS is associated with increased emotional reactivity in response to stress (e.g., Donnell & McNally, 1989; Holloway & McNally, 1987; Telch & Harrington, 1994). The administration of a moderately intoxicating dose of alcohol was found to significantly lower ratings of emotional arousal and electrodermal reactivity, particularly for the high AS women. In contrast to their electrodermal reactivity, Stewart and Pihl (1994) found that ASI scores were not related to sober cardiovascular reactivity to the noise bursts, and all three AS groups were equally sensitive to the effects of alcohol on measures of cardiovascular

reactivity to the noise bursts.[4] These authors concluded that a moderately intoxicating dose of alcohol can dampen the anticipatory emotional arousal and electrodermal hyperreactivity to threat of high AS women. Hence, high AS women may learn to use alcohol to normalize their emotional reactivity to stress (Stewart & Pihl, 1994).

There are three primary limitations to Stewart and Pihl's (1994) alcohol administration study which are reviewed in Stewart et al. (in press). First, Stewart and Pihl used a within-subjects design in which each subject was tested before and after alcohol consumption. So it is possible that the reductions in emotional arousal and electrodermal reactivity to the noise bursts found in the high AS women after alcohol consumption may be a result of habituation to the stressor rather than stress-response dampening from alcohol consumption. The use of a placebo control group and between-groups design could address this limitation. A placebo group could also be used to control for potential expectations about the effects of alcohol. Second, Stewart and Pihl (1994) used a moderately intoxicating dose of alcohol (*M* BAL = .13%). It remains to be determined whether a relatively lower dose of alcohol would also result in stress-response dampening in high AS

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[4]According to Fowles (1980), electrodermal reactivity is a better autonomic measure of fear than cardiovascular reactivity. While heart rate could increase for a variety of reasons, increased skin conductance is more specific to states of fear.

subjects. Lastly, the use of loud noise bursts appears to lack appropriate theoretical relevance to the types of stimuli most feared by high AS individuals. Expcsure to a loud noise burst is an external stressor that only indirectly increases the type of anxiety-related sensations feared by high AS individuals (Stewart & Pihl, 1994). Other stressors such as hyperventilation and carbon dioxide inhalation are more direct methods of inducing those feared sensations.

As reviewed in Chapter 1, biological challenge tests, such as voluntary hyperventilation and carbon dioxide inhalation, may be more relevant stressors than noise bursts in AS research (see review by McNally, 1996). Such challenge tests directly provoke those sensations most feared by high AS subjects under controlled laboratory settings, regardless of panic history or trait anxiety levels (e.g., Donnell & McNally, 1989; Holloway & McNally, 1987; Rapee & Medoro, 1994).

One recent alcohol administration study used a carbon dioxide challenge as a stressor with subjects diagnosed with panic disorder (Kushner, MacKenzie, Fiszdon, Valentiner, Foa, Anderson, & Wangsteen, 1996). Kushner and colleagues (1996) found that a moderately intoxicating dose of alcohol (targeting a BAL of .085%) reduced the intensity of anxiety and panic in response to the challenge in these patients relative to a placebo control. Kushner, Massie, Gaskel, Mackenzie, Fiszdon, and Anderson (1997) further found that

alcohol even dampens facial manifestations of fear/distress among panic disorder patients -- a clinical high AS group.

Baker, MacDonald, Stewart, and Skinner (1997) extended the work of Kushner et al. (1996) to a nonclinical sample of high and low AS individuals and addressed the earlier limitations found in Stewart and Pihl (1994). Specifically, they included a placebo control group and a low AS control group, used a between-subjects design, used a more theoretically relevant stressor, and used more than one dose of alcohol. They exposed high and low AS subjects to a voluntary hyperventilation challenge following consumption of either a placebo, a mildly intoxicating dose of alcohol, or a moderately intoxicating dose of alcohol resulting in BALs in the legally intoxicating range. Consistent with the results of previous challenge studies in sober nonclinical samples (e.g., Donnell & McNally, 1989; Holloway & McNally, 1987), high AS subjects who received the placebo reported significantly greater affective (i.e., increased fear) and cognitive (i.e., increased catastrophization about the induced physical sensations) reactivity to the challenge than low AS placebo subjects. Most importantly, only the moderate dose of alcohol (i.e., a dose that is legally intoxicating) resulted in a large magnitude of alcohol dampening on both affective and cognitive reactivity of high AS subjects compared to high AS placebo subjects. Both doses of alcohol, however, reduced the somatic reactivity in high and low AS subjects relative to placebo subjects.

The results of Baker et al. (1997) have important implications for nonclinical high AS individuals. Like panic disorder patients, nonclinical high AS individuals display greater fear, catastrophization, and possibly physiological reactivity (i.e., electrodermal responses; see Stewart & Pihl, 1994) to anxiety-related sensations (see review by McNally, 1996). Moreover, similar to panic disorder patients (Kushner et al., 1996), this affective, cognitive, and somatic hyperreactivity were significantly dampened by alcohol consumption in nonclinical high AS individuals. Thus, the results of Baker et al. (1997) support the first tenet of the TRH for alcohol use in high AS individuals exposed to a relevant stressor. However, this conclusion must be qualified.

First, alcohol administration strongly reduced the somatic reactivity to the hyperventilation in both high and low AS subjects relative to subjects who drank the placebo. Second, Stewart and Pihl (1994) demonstrated that ASI scores were more strongly related to affective reactivity to the stressor than somatic reactivity to the stressor. Third, Baker et al. (1997) demonstrated that alcohol consumption is most effective at reducing both the affective (fear) and cognitive (catastrophization about anxiety sensations) reactivity when consumed in quantities that result in legal intoxication. In sum, these findings suggest that alcohol's reduction of fear and catastrophization, rather than reduction in somatic reactivity, may be a better explanation

for alcohol's tension reducing properties in high AS individuals. Also, it appears that alcohol is most negatively reinforcing for high AS individuals when consumed in a legally intoxicating dose (BAL = .08). This may explain why high AS individuals are more likely than low AS individuals to drink to excess (Stewart, Peterson, & Pihl, 1995).

The studies reviewed above investigated the effect of alcohol administration on responses to a biological challenge task (e.g., hyperventilation or carbon dioxide inhalation) as a test of the first tenet of the TRH that alcohol reduces tension among high AS individuals. In a novel study, Stewart, Achille, Dubois-Nguyen, and Pihl (1992) investigated the effect of alcohol administration on the attention to threat. Attention to threat served as a cognitive measure of the degree of "tension." Appreciation of this study necessitates a review of the importance of investigating selective attention to threat in anxiety research.

A central feature of anxiety disorders is a sensitivity to and preoccupation with feared stimuli which is presumed to cause and/or maintain anxiety disorders (cf., Reiss, 1991; see review by Williams, Mathews, & MacLeod, 1996). For example, an individual with panic disorder selectively attends to threatening information (e.g., an upcoming class presentation) which increases physiological arousal (e.g., racing heart, dizziness, sweating, restlessness). The

increase in physiological arousal further increases worry and arousal (e.g., maybe I'll forget everything I know when I give the presentation; I'm having trouble breathing and my heart is racing, maybe I'm having a heart attack) in an individual with AS, since AS amplifies anxiety sensations (Reiss, 1991). Thus, the individual experiences even greater arousal with an inability to perform even simple tasks such as reading to distract him/herself (see also Barlow & Craske, 1989). The end result of this vicious cycle of selective attention to threatening information and greater bodily arousal may be a panic attack. This selective attention to threat (i.e., hypervigilance) may be reinforced by the need to know when to use alcohol and/or to use medication (benzodiazepines) to avoid feared panic attacks (Westra & Stewart, in press).

The Stroop task (1935) measures attentional biases and can thus provide an index of the above process. Stewart, Conrod, Gignac, and Pihl (1998), using the modified Stroop task, found evidence of such a selective processing bias for threatening information in high AS individuals. On the modified Stroop task, individuals are required to perform the relatively simple cognitive task of identifying the colour of ink in which a word is printed. When patients with anxiety disorders perform the Stroop task, the semantic meaning of threat words attracts and holds their attention, resulting in interference with the relatively simple cognitive task of naming the ink colour. This interference

is demonstrated by a slowed reaction time (see review of the Stroop by Williams et al., 1996).[5] As an example of anxiety-related interference, patients with panic disorder have been shown to selectively process words pertaining to physical threat (e.g., FATAL, DISEASE), Vietnam veterans with post-traumatic stress disorder have been shown to selectively process trauma words (e.g., BODYBAGS, FIREFIGHT), and patients with social phobia have been shown to selectively process social threat words (e.g., STUPID, FAILURE) (cf., Hope, Rapee, Heimberg, & Dombeck, 1990; McNally, English, & Lipke, 1993; McNally, Riemann, & Kim, 1990). Similarly, Stewart et al. (1998) found that nonclinical high AS individuals selectively processed both physical threat (e.g., CONONARY, SUFFOCATED) and social/psychological threat (e.g., EMBARRASS, CRAZY) words as compared to low AS persons.

Stewart, Achille, et al. (1992) combined the alcohol administration research paradigm with a alternative selective attention paradigm similar in rationale to that of the Stroop. They required nonclinical high and low AS women to identify, as quickly and accurately as possible, the location of threat words (e.g., INJURY, EMBARRASSED) versus nonthreatening control words using a key press to indicate

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[5]An interference index can be calculated by subtracting the mean latency for naming the colour of ink in which the control words are printed from the mean latency for colour-naming the threatening words to show evidence of a selective processing bias (e.g., Francis, Stewart, & Hounsell, 1997).

whether the cue was located above or below a central fixation point. Attention to the threat content interfered with word location such that sober high AS women had significantly longer reaction times than sober low AS women in response to threatening words as opposed to control words. Following consumption of a moderate dose of alcohol, however, high AS women were no slower than low AS women in locating threat words. This study suggests that alcohol may be negatively reinforcing for high AS women because it eliminates their tendency to be hypervigilant toward threatening information. This study warrants a modification of the TRH of alcohol use to include hypervigilance as a cognitive aspect of tension in high AS individuals.

In sum, alcohol administration studies confirm that high AS persons appear to be particularly sensitive to certain dampening properties of alcohol. The use of alcohol to dampen fear and catastrophization appears to be particularly important in relation to AS. The dose of alcohol used to achieve dampening also warrants consideration because only relatively larger doses of alcohol have (in the legal intoxication range) produced the largest dampening effects in high AS individuals (Baker et al., 1997). This may explain why high AS individuals tend to drink heavily (Stewart, Peterson, & Pihl, 1995).

Ad Libitum Alcohol Consumption Studies. The use of the stress-induced drinking paradigm (e.g., Higgins & Marlatt, 1973, 1975) provides an additional opportunity to assess the

validity of self-report studies of alcohol use for tension-reduction in a laboratory setting. It also provides a test of the second tenet of TRH when applied to the drinking behaviour of high AS individuals. The ad-lib alcohol consumption paradigm involves the use of a bogus taste-rating task as an unobtrusive measure of alcohol consumption. For the taste-rating task, subjects are required to taste a variety of beverages and to rate their taste perceptions across a series of adjectives (e.g., sweet, dry, satisfying, refreshing). Subjects are not made aware that the primary dependent variable is the amount of alcohol consumed during the taste-rating taste in response to an experimental manipulation (Higgins & Marlatt, 1973). The reasoning behind the use of this paradigm is that if alcohol is consumed to cope with negative affect (i.e., for reasons of tension-reduction), then induction of negative affect should prompt increased drinking on the taste-test (Pihl & Smith, 1983).

The validity of the taste-rating task as an analogue measure of actual drinking levels has been established. George, Phillips, and Skinner (1988) compared ad-lib drinking in a tavern-like laboratory setting to drinking in the same setting using the taste-rating task, and compared both to subjects' self-reported estimates of their typical drinking levels. They found that taste-rating subjects took more frequent, smaller sips and that their sipping declined more steeply over the 15 minute ad-lib alcohol consumption

period as compared to the drinking style of subjects who were asked to evaluate the "tavern" while drinking. This suggested that demand characteristics acted on the taste-rating subjects such that their style of drinking matched stereotypic notions of how best to sample wine (e.g., sniffing, swirling and sipping) and that less sampling was required to evaluate the wines over time to determine taste differences (George et al.). Nevertheless, there was no significant difference with respect to the amount consumed between the two groups over the 15 minute ad-lib consumption period. Moreover, taste-rating consumption was more highly and significantly correlated with self-reported estimates of typical drinking levels than tavern-like drinking. George et al. (1988) concluded that, while the taste-rating task may convey demand characteristics about how to sip, this does not alter subjects' typical drinking levels: Those who drink most heavily outside the lab also drink most heavily during the taste-test.

A variety of means have been used to induce negative affect prior to measuring alcohol consumption during the bogus taste-rating task. For example, Marlatt, Kosturn, and Lang (1975) studied the effect of experimentally induced anger and the opportunity for retaliation[6] on alcohol consumption in male and female university students

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[6]Their subjects were led to believe they were delivering a painful but harmless electric shock to the confederate who had previously insulted them (Marlatt, Kosturn, & Lang, 1975).

identified as heavy drinkers. They found that subjects who were provoked to anger without the opportunity to retaliate consumed significantly more alcohol than those who were provoked and allowed to retaliate against the confederate (Marlatt et al., 1975). Higgins and Marlatt (1975) investigated the effects of threat of negative evaluation on drinking behaviour in male heavy social drinkers. They found that male subjects who anticipated being evaluated by a group of women drank significantly more alcohol than those who were not expecting to be evaluated. However, in an earlier study, Higgins and Marlatt (1973) investigated the effects of fear of a painful electric shock in male alcoholic and male social drinking subjects. Male alcoholics drank more alcohol than social drinkers during the bogus taste-rating taste as expected, but both male alcoholics and social drinkers failed to drink significantly more alcohol when anticipating a painful electric shock (Higgins & Marlatt, 1973). Higgins and Marlatt (1975) suggested that differences in the type of stressor might clarify these inconsistent findings. Specifically, alcohol might be used to reduce some types of tension (e.g., anger, insult, or fear of interpersonal evaluation) but not others (e.g., fear of physical pain).

Other means of manipulating affect have also failed to support the use of alcohol for reduction of some forms of tension. Holroyd (1978) placed socially anxious male students in an informal party-like situation where beer was

available as a refreshment. Threat of negative social-evaluation was manipulated prior to the "party". Socially anxious subjects and those who were led to believe they had poor social skills drank significantly less beer than did subjects who were not socially-anxious and who received a positive evaluation of their social skills (Holroyd, 1978). Holroyd concluded that this study did not support the use of alcohol for tension-reduction. Gabel, Noel, Keane, and Lisman (1980) exposed male subjects who were sensitive to bodily injury to slides of sexual activity, mutilated accident victims (anxiety arousal), or neutral scenes. Subjects who viewed the sexual arousal slides drank significantly more alcohol than subjects who viewed the anxiety arousal slides even though the latter subjects had elevated ratings of fear during the taste-test (Gabel et al., 1980). Pihl and Yankofsky's (1979) manipulation of negative affect (depression and anxiety) following an intelligence test also failed to support the use of alcohol for tension-reduction in male social drinkers. They found that subjects with increases in negative affect following "poor" performance on the intelligence test consumed significantly less alcohol than those subjects who were led to believe they performed exceedingly well on the intelligence task.

Still other manipulations have resulted in increased alcohol consumption and suggest some support for the TRH of alcohol use. In contrast to the results of Pihl and

Yankofsky (1979), Hull and Young (1983) found that male subjects drank significantly more wine following failure feedback on a cognitive task. This effect, however, was true only for highly self-conscious subjects and suggests the importance of this personality variable. Noel and Lisman (1980) similarly manipulated performance on a cognitive task. Women undergraduate students who were given unsolvable problems had increased depressive and hostile affect and drank more beer relative to controls (Noel & Lisman, 1980). Miller, Hersen, Eisler, and Hilsman (1974) found that male alcoholics significantly increased their operant responding to obtain alcohol following a personally relevant stressful interaction as compared to a nonstressful interaction in which they discussed their leisure activities. In comparison, the majority of social drinkers actually decreased their operant responding following the stressful interaction (Miller et al., 1974). Thus, like Higgins and Marlatt (1975), this study suggests that the heavy drinker has learned to respond to interpersonal stress with increased alcohol use, whereas social drinkers have developed alternative coping strategies (Miller et al.). Indeed, Strickler, Tomaszewski, Maxwell, and Suib (1979) found that male heavy social drinkers who were trained in relaxation strategies prior to public speaking consumed significantly less alcohol in anticipation of public speaking than male heavy social drinkers who were not trained in relaxation.

To date, only one study of ad-lib alcohol consumption exists which is relevant to the relationship between AS and alcohol use/misuse. Kushner, Rossovsky, Abrams, Whaley, Schwarze, Kruckeberg, and Mackenzie (1997) made an innovative use of the biological challenge paradigm preceding and following ad-lib alcohol consumption. In this study, panic-disordered patients (who likely have high AS given the clinical norms reported by Peterson & Reiss, 1992) were given the opportunity to consume alcohol between two inhalations of carbon dioxide (panic challenge) or room air (control challenge). Subjects were presented with the opportunity to drink one of four beverage options which were clearly and accurately labelled as no-alcohol, low-alcohol, medium-alcohol, or high-alcohol once every three minutes during a 30-minute interval between challenge exposure time 1 and challenge exposure time 2. Kushner, Rossovsky, et al. (1997) predicted that recovery from and anticipation of a laboratory-induced panic attack would increase drinking in the carbon dioxide inhalation group versus the control challenge group. They found no differences in beverage choice between individuals who panicked in response to challenge at time 1 and those who did not panic. However, subjects who expected to panic at challenge time 2 tended to choose drinks with a higher concentration of alcohol, but only as the second challenge approached (i.e., towards the end of the 30-minute interval between challenges). Kushner, Rossovsky, et al. concluded that *anticipation* of panic,

rather than recovery from panic, enhanced the motivation to consume alcohol. This type of coping-related drinking may increase the risk for alcohol problems in clinical high AS individuals (Kushner, Rossovsky, et al., 1997). Given the results of Kushner, Rossovsky, et al. in a clinical sample of high AS subjects, it would be interesting to examine the ad-lib alcohol consumption in a relatively young group of high AS individuals who are anticipating anxiety.

*Summary of Lab-Based Studies*

Alcohol administration studies conducted to date are largely consistent with self-report research of the use of alcohol among high AS individuals. Relatively large doses of alcohol appear to dampen the affective, cognitive, and somatic reactivity to aversive stimuli in high AS individuals. This supports the notion that alcohol can reduce tension in high AS individuals, the first tenet of the TRH, and that high AS individuals are more sensitive to these effects of drinking than low AS individuals.

The review of ad-lib alcohol consumption research suggests mixed support for the second tenet of the TRH of alcohol use. As in other areas of alcohol research, the use of relatively more homogeneous research samples may dispel the confusion arising from this line of research (Pihl & Smith, 1983). Given that some situations are more highly associated with problematic alcohol use than others (Annis, Graham, & Davis, 1987; Cooper, 1994; Cooper et al., 1992), the importance of the situational contexts in which drinking

is most likely to occur for tension-reduction warrants investigation. To date, only one ad-lib alcohol consumption study has been conducted in a clinical sample of high AS anxiety disorder patients (Kushner, Rossovsky, et al., 1997). Ad lib alcohol consumption research in nonclinical high AS subjects would provide an opportunity to validate self-report studies of typical drinking levels (cf., Novak et al., 1997, vs. Stewart, Peterson, & Pihl, 1995) and motives for drinking behaviour (Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1995) in high versus low AS individuals. Specifically, manipulations of affect and drinking situations followed by the bogus taste-rating task would afford an opportunity to more objectively study the motivational bases for alcohol use in high AS persons.

*Focus of the Present Series of Studies*

The body of research contained in this thesis was designed to extend the results of earlier studies which suggest an important relationship between AS and a more risky style of alcohol use (see reviews by McNally, 1996; Stewart et al., in press). In Study 1 the relationship between AS and the situational antecedents of typical drinking among a large sample of university students was assessed. Students rated their relative frequency of drinking in various situations. Hence, Study 1 was designed to identify those situations associated with more frequent drinking among high AS than low AS individuals.

Two analogue studies were designed to advance the results of Study 1 and Kushner, Rossovsky, et al. (1997) by means of experimental manipulation of the situational antecedents to voluntary alcohol consumption in a laboratory setting. In both analogue studies, voluntary alcohol consumption was encouraged by the use of a bogus taste-rating task (e.g., Higgins & Marlatt, 1973, 1975). In the first analogue study (Study 2), high and low AS participants were exposed to a stress-induction manipulation in which they anticipated responding to an anxiety-relevant question set or a neutral, anxiety-irrelevant question set. While in these states of anticipation, they completed a mock taste-rating task. In the second analogue study (Study 4), high and low AS participants were exposed to a social-affiliative drinking context manipulation in which they played the same game alone (solitary context) or with two confederates (social context), followed by the mock taste-rating task. In both analogue studies participants were not informed that the primary dependent variable was the quantity of alcoholic beverage consumed.

An additional study (Study 3) was designed to determine whether the experience of anxiety-related physical sensations leads to the selective processing of alcohol cues in high AS individuals. This question was addressed using an experimental manipulation of hunger to induce physical discomfort in high AS individuals as a biological challenge relevant to the construct of AS. Students who were matched

for AS status were assigned to either the physical discomfort condition (due to hunger from food-deprivation) or a control condition in which subjects were not food-deprived. It was hypothesized that ASI scores would be significantly positively correlated with an attentional bias for alcohol-related cues but only in the induced physical discomfort condition. It was further hypothesized that this effect would be specific to alcohol-related cues, not food-related cues, which were included as an appetitive control. These hypotheses were tested using the modified Stroop paradigm described previously (see page 39) to measure attentional biases for alcohol cues versus food cues. A leisure word set was included as a baseline for assessing the relative degree of attentional interference for the alcohol versus food cues.

In summary, this series of studies was designed to examine the situational specificity of drinking among high AS young adults in order to further understand their risk for alcohol misuse.

## CHAPTER THREE: Study 1

## Anxiety Sensitivity and Situation-Specific Drinking

The relationship between AS and heavier alcohol consumption is partially clarified by exploration of self-perceived motives for alcohol use. AS was found to be significantly correlated with the frequency of self-reported use of alcohol to "cope" (i.e., to reduce/avoid negative affect such as anxiety or depression) among a university sample (Stewart & Zeitlin, 1995) using the Drinking Motives Questionnaire--a validated measure of drinking motives (DMQ: Cooper et al., 1992; Stewart et al., 1996). Also, high AS students were more likely to report drinking primarily for coping motives, and less likely to report drinking primarily for social motives, compared to low AS students (see also Stewart, Karp, et al., 1997). People with elevated AS may more often use alcohol to cope (i.e., for negative reinforcement) because of their enhanced sensitivity to alcohol's reactivity-dampening effects (see Sher, 1987; 1991) that has been found in high AS students using the alcohol challenge paradigm (Baker et al., 1997; Stewart & Pihl, 1994).

Different drinking motives have been found to be associated with different drinking antecedents and consequences of alcohol use (Cooper, 1994; Cooper et al., 1992). People who drink primarily for coping-related motives are more likely to drink heavily, to drink alone, to

drink at home, and to experience alcohol-related problems, compared to those who drink primarily for social motives. In contrast, those who drink primarily to socialize and affiliate with others are more likely to drink at parties and with mixed-sex friends, and they are at lower risk for alcohol-related problems than primarily coping-motivated drinkers (Cooper, 1994; Cooper et al., 1992).

Behaviorally-oriented research has focused on developing measures to assess situational antecedents of alcohol consumption. The 100-item Inventory of Drinking Situations and its shorter 42-item version (IDS and IDS-42: Annis, Graham, & Davis, 1987) are examples of such measures. In a large sample of university student drinkers, the IDS-42 was found to possess eight first-order factors (Carrigan, Samoluk, & Stewart, in press). These factors were consistent with Marlatt's work (e.g., Marlatt & Gordon, 1980) on the situational antecedents to drinking relapse among treated alcoholics from which the original eight IDS subscales were derived. Carrigan et al. (in press) also found that the covariance among the eight lower-order IDS-42 factors (i.e., situations involving Conflict with Others, Unpleasant Emotions, Physical Discomfort, Pleasant Times with Others, Social Pressure to Drink, Pleasant Emotions, Testing Personal Control, and Urges and Temptations) was best explained by a set of three higher-order latent factors. The Conflict with Others, Unpleasant Emotions, and Physical Discomfort subscales loaded on a higher-order

factor of negatively-reinforcing drinking situations. The Pleasant Times with Others, Social Pressure to Drink, and Pleasant Emotions subscales loaded on a higher-order factor of positively-reinforcing drinking situations. The Testing Personal Control and Urges and Temptations subscales loaded on a third higher-order factor which was labelled temptation drinking situations. This label was used to refer to situations involving a cognitive preoccupation with alcohol, rather than situations involving drinking for negative or positive reinforcement as measured by the first two higher-order factors (Carrigan et al., in press). Turner, Annis, and Sklar (1997) used a parallel instrument to the IDS[7] in a sample of clients receiving addiction treatment. They similarly identified a hierarchical structure involving eight first-order factors corresponding to the eight IDS subscales, and three second-order factors of negative situations, positive situations, and temptation situations.

Researchers are beginning to examine whether drinking in specific situations is related to particular individual difference variables. For example, in a sample of clients receiving treatment for alcohol dependence, Annis and colleagues (1987) found that frequent heavy drinking in

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[7]Turner, Annis, and Sklar (1997) explored situational antecedents to the use of alcohol and other drugs using the Inventory of Drug-Taking Situations (IDTS). The IDTS consists of 8 subscales and 50 items derived from the 100-item version of the Inventory of Drinking Situations, that has been extended to include other drugs of abuse in addition to alcohol.

situations involving negative personal states (specifically, relative peaks on the IDS subscales of Physical Discomfort, Unpleasant Emotions, and Conflict with Others) was reported more often by women, and by individuals who tend to drink alone and have more years of problem drinking. In the general population, as well as in problem drinkers, a tendency to drink in negative affective states correlates with increasing levels of alcohol dependence, whereas drinking in positive affective states is associated with less risky social drinking (Cunningham, Sobell, Sobell, Gavin, & Annis, 1995). Another study showed a significant positive association between levels of negative temperament (i.e., anxiety, depression, boredom, anger) and frequency of drinking on a "negative" factor of the IDS in a sample of alcoholics and cocaine addicts (Cannon, Rubin, Keefe, Black, Leeka, & Phillips, 1992). This negative factor consisted of items from the subscales of Unpleasant Emotions and Conflict with Others (Cannon et al., 1992). Moreover, Turner and colleagues (1997) found that scores on the IDTS subscales of Unpleasant Emotions, Conflict with Others, and Physical Discomfort were significantly correlated with measures of negative temperament, including the depression, interpersonal sensitivity, and somatization subscales of the Hopkins Symptom Checklist (SCL-90: Derogatis, 1979), in a sample of clients receiving addiction treatment.

The present study was designed to explore the relationship between AS as measured by the Anxiety

Sensitivity Index (ASI: Peterson & Reiss, 1992) and situational antecedents to alcohol consumption using the IDS-42 with a nonclinical sample of university students. Given the generally greater levels of alcohol consumption reported by high versus low AS individuals (e.g., Stewart, Peterson, & Pihl, 1995), the self-report of drinking more frequently across a variety of drinking motives (Stewart & Zeitlin, 1995), as well as the significant positive correlation between AS levels and coping-motivated drinking (Stewart & Zeitlin, 1995), several hypotheses were made. First, it was hypothesized that high AS participants would report drinking more frequently overall on the IDS-42. Second, it was hypothesized that high AS participants would have higher scores than low AS participants on the IDS-42 negatively-reinforcing drinking situations factor and its lower-order subscales (Unpleasant Emotions, Physical Discomfort, and Conflict with Others). Lastly, no AS group differences were predicted for the IDS-42 positively-reinforcing drinking situations factor or its subscales (Pleasant Emotions, Social Pressure to Drink, and Pleasant Times with Others) or the IDS-42 temptation drinking situations factor or its subscales (Testing Personal Control, and Urges and Temptations).

Data were also examined across the entire sample of student drinkers using correlational analyses. Parallel to the results of the planned comparisons hypothesized above, a significant positive correlation was predicted between ASI

scores and overall drinking frequency. A significant positive correlation was predicted between ASI scores and scores on the higher-order factor of negatively-reinforcing drinking situations. No significant relationships were predicted between ASI scores and scores on the higher-order positively-reinforcing drinking situations factor or the temptation drinking situations factors. It was also predicted that the degree of relationship would be stronger for ASI scores with negatively-reinforcing drinking situations factor scores than for ASI scores with either positively-reinforcing drinking situations factor scores or temptation drinking situations factor scores.

At the lower-order level, significant positive correlations were predicted between ASI scores and the lower-order IDS-42 factor scores of Conflict with Others, Unpleasant Emotions, and Physical Discomfort. It was predicted that the correlations between ASI scores and the lower-order IDS-42 factor scores of Pleasant Times with Others, Social Pressure to Drink, Pleasant Emotions, Testing Personal Control, and Urges and Temptations would not be significant.

## Method

### *Participants*

Participants were 473 undergraduate students (338 F, 133 M, 2 gender unspecified), whose average age was 21.72 (*SD* = 4.22) years. All participants were enrolled in

undergraduate psychology courses at Dalhousie University or the University of Toronto, Canada.

*Materials*

Inventory of Drinking Situations. The shortened, 42-item version of the Inventory of Drinking Situations (IDS-42; Annis et al., 1987) was used to assess frequency of drinking across specific situations. The IDS-42 contains eight subscales: The Conflict with Others subscale has 12 items, the Pleasant Times with Others subscale has 6 items, and the remaining subscales have 4 items each. For the present study, the IDS-42 instructions were modified from "frequency of heavy drinking" to "frequency of drinking" in order to more aptly assess situational antecedents of students' customary drinking behaviour and to allow completion of the IDS-42 by student drinkers who may never drink heavily (Bruce & Pihl, 1997; Carrigan et al., in press). Participants rated their frequency of drinking over the past year in each specified situation on a scale from 1 (never drank in that situation) to 4 (always drank in that situation). This rating scale was then recoded to range from 0 to 3 (Annis et al., 1987).

The original IDS-42 has been shown to possess good psychometric properties in clinical samples of alcohol abusers (Annis et al., 1987). Also, the present version of the IDS-42, using the modified instructional set noted above, has been shown to possess good psychometric

properties in a large nonclinical sample of university students (Carrigan et al., in press).

For the present study, the data were analyzed across the three higher-order IDS-42 factors of negatively-reinforcing drinking situations, positively-reinforcing drinking situations, and temptation drinking situations, and across all eight lower-order factors (equivalent to the eight IDS-42 subscales). Lower-order factor scores were computed as weighted mean factor scores using maximum likelihood factor loadings for the 42 items of the eight lower-order factors as weights (Carrigan et al., in press). Higher-order factor scores were likewise computed as weighted mean factor scores using the eight maximum likelihood factor loadings corresponding to the higher-order factors as weights (Carrigan et al., in press). Higher scores indicated relatively more frequent drinking in the particular situation. Maximum likelihood factor loadings for 42 items of the eight lower-order IDS-42 factors and for the eight higher-order IDS-42 factors can be found in Appendices A and B, respectively.

The negatively-reinforcing drinking situations factor includes situational antecedents to alcohol use that pertain to negative affect and unpleasant associations with others which might be assuaged via alcohol consumption (Carrigan et al., in press). "When other people didn't seem to like me," "When I felt that I had let myself down," and "When my stomach felt like it was tied in knots" are representative

items from the Conflict with Others, Unpleasant Emotions, and Physical Discomfort subscales, respectively, which are subsumed under the negatively-reinforcing higher-order drinking situations factor.

The positively-reinforcing drinking situations factor includes situational antecedents to alcohol use that pertain to positive affect and pleasant associations with others which might be heightened via alcohol consumption (Carrigan et al., in press). "When I wanted to celebrate with a friend," "When I was at a party and other people were drinking," and "When something good happened and I felt like celebrating," are representative items from the Pleasant Times with Others, Social Pressure to Drink,[8] and Pleasant Emotions subscales, respectively, which are subsumed under the positively-reinforcing higher-order drinking situations factor.

The temptation drinking situations factor appears to tap a cognitive preoccupation with alcohol (Cannon, Leeka, Patterson, & Baker, 1990). "When I wanted to prove to myself that I could take a few drinks without becoming

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[8]Items from this subscale have consistently been found to load on a factor reflecting drinking in pleasant social situations (Annis et al., 1987, Cannon, Leeka, Patterson, & Baker, 1990). This indicates drinking for positive reinforcement rather than the drinking for negative reinforcement implied in social conformity drinking (Cooper, 1994). Thus, the label "Social Cues to Drink" (Carrigan et al., in press) may more aptly represent the content of the items forming the IDS-42 "Social Pressure to Drink" subscale (e.g., "When I was in a restaurant and the people with me ordered drinks").

drunk," and "When I remembered how good it tasted" are representative items from the Testing Personal Control and Urges and Temptations subscales, respectively, which are subsumed under the temptation higher-order drinking situations factor.

Anxiety Sensitivity Index. AS levels were measured using the 16-item Anxiety Sensitivity Index (Peterson & Reiss, 1992), which is described in detail in Chapter One. As previously noted, the ASI has been shown to possess excellent psychometric properties in both clinical and nonclinical university student samples (see also review by Peterson & Reiss, 1992). In our lab, the ASI has been found to have an alpha coefficient of .88 in a large sample of 551 university students (Watt et al., in press), which is within the range of reliabilities for the ASI reported by Peterson and Reiss (1992).

*Procedure*

Participants provided their informed consent and basic demographic information of age and gender. Those participants who indicated that they had consumed alcohol within the last year were identified as "drinkers" for the present study and asked to complete the IDS-42. All participants completed the demographic measures and ASI. All questionnaires were completed anonymously during class time.

## Results

*Demographic Variables*

The mean ASI score for the entire sample was 20.10 (*SD* = 9.22) which is consistent with previously established norms on this measure (Peterson & Reiss, 1992). Of the total sample, 83.7% (*n* = 396: 283 F, 111 M, 2 gender unspecified) reported alcohol consumption during the past year.

The drinkers (*n* = 395, 1 age unspecified) were slightly older than the nondrinkers (*n* = 77) (*M* age (and *SD*) = 21.89 (4.27) vs. 20.81 (3.82) years, respectively, $F(1, 470) = 4.33$, $p < .05$). However, the drinkers (n = 394, 2 gender unspecified) (*n* = 77) did not differ significantly from the nondrinkers in gender composition (71.4% vs. 71.8% female, respectively, $X^2 = .005$, ns). All subsequent analyses were conducted using data from the subsample of 396 self-reported drinkers.

*Reliability of the IDS-42 Subscales*

The internal consistency of each of the eight IDS-42 subscales separately and combined as higher-order factors was calculated using Cronbach's coefficient alpha in order to determine if reliabilities differ markedly across subscales and factors. The majority of subscales (Conflict with Others, Unpleasant Emotions, Pleasant Times with Others, Social Pressure to Drink, and Pleasant Emotions) had alphas of .83 or better, indicating substantial internal consistency. The Testing Personal Control and Urges and

Temptations subscales had relatively modest alphas of .72 and .63, respectively. Physical Discomfort was the least reliable subscale with an alpha of .32. The alphas for the higher-order factors varied from .72 (temptation drinking situations) to .93 (positively-reinforcing drinking situations), indicating moderate to substantial internal consistency. Cronbach's coefficient alphas for the IDS-42 lower- and higher-order factors are presented in Table 1.

*Planned Comparisons*

Participants scoring one or more standard deviations above (ASI scores ≥ 29) and below (ASI scores ≤ 10) the mean ASI scores for self-reported drinkers (i.e., $M$ = 19.50, $SD$ = 9.26) were selected to form the high AS and low AS groups. This resulted in 66 high AS participants and 66 low AS participants (mean ASI (and $SD$) = 35.02 (4.81) vs. 7.46 (2.42), respectively). A one-way analysis of variance (ANOVA) revealed that the low versus high AS groups did not differ significantly in age ($M$s (and $SD$s) = 22.38 (4.72) vs. 21.46 (3.11) years, respectively, $F(1, 129) = 1.72$, ns.). A chi-square analysis revealed that the two AS groups did not differ significantly in gender composition (high AS = 46 F, 20 M; low AS = 50 F, 16 M; $X^2(1) = 0.61$, ns.).

The IDS-42 mean higher-order factor scores were examined with relation to the hypotheses by partitioning the 2 x 3 (AS Group x IDS-42 Higher-Order Factors) matrix into a series of planned comparisons (Tabachnick & Fidell, 1989). Similarly, the IDS-42 mean lower-order factor scores were

examined with relation to the hypotheses by partitioning the 2 x 8 (AS Group x IDS-42 Lower-Order Factors) matrix into a series of planned comparisons as more fully described below.

Higher-Order Factor Comparisons. The hypothesis that high AS participants would report a higher overall drinking frequency was evaluated by examining the effect of AS group collapsed across drinking situations. As predicted, high AS participants reported more frequent drinking overall, as compared to low AS participants (*M* (and *SD*) = .36 (.34) vs. .25 (.42), respectively; $F(1, 130) = 12.58$, $p < .001$, $eta^2 = .09$). Examination of the effects of AS Group in each of the three high-order drinking situations revealed that, as predicted, high AS participants reported a much higher drinking frequency on the negatively-reinforcing drinking situation factor ($F(1, 130) = 13.46$, $p < .001$, $eta^2 = .09$; see Figure 1). However, high AS participants also had higher scores on the higher-order factor of temptation drinking situations ($F(1, 130) = 12.43$, $p < .001$, $eta^2 = .09$), and somewhat higher scores on the higher-order factor of positively-reinforcing drinking situations ($F(1, 130) = 6.07$, $p < .05$, $eta^2 = .04$). The mean higher-order factor scores are illustrated in Figure 1 as a function of AS group.[9]

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[9]The distribution of multiple IDS-42 subscales was nonnormal which was expected in a nonclinical sample because many subjects endorsed a zero ("never") response to multiple items. Hence, the higher-order hypotheses were also analyzed using Mann Whitney U, and the pattern of results for the higher-order comparisons remained unchanged.

Lower-Order Comparisons. The mean lower-order factor scores are illustrated in Figure 2 as a function of AS group by the eight IDS-42 lower-order factors. As predicted, high AS participants reported much more frequent drinking in situations involving Unpleasant Emotions ($F(1, 130) < 11.48$, $p < .001$, $eta^2 = .08$) and Conflict with Others ($F(1, 130) = 12.23$, $p < .001$, $eta^2 = .09$), as compared to low AS participants. Also as predicted, high AS participants drank somewhat more often in situations involving Physical Discomfort ($F(1, 130) = 7.73$, $p < .01$, $eta^2 = .06$). However, contrary to hypothesis, high AS participants also drank much more often in situations involving Testing Personal Control ($F(1, 130) = 17.12$, $p < .001$, $eta^2 = .12$), and somewhat more often in situations involving Pleasant Times with Others ($F(1, 130) = 5.90$, $p < .05$, $eta^2 = .04$), Social Pressure to Drink ($F(1, 130) = 4.59$, $p < .05$, $eta^2 = .03$), Urges and Temptations ($F(1, 130) = 4.29$, $p < .05$, $eta^2 = .03$), and Pleasant Emotions ($F(1, 130) = 4.12$, $p < .05$, $eta^2 = .03$), as compared to low AS participants.[10]

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[10]Again due to deviation from normality, the lower-order hypotheses were also analyzed using nonparametric statistics. The pattern of results remained the same using Mann Whitney U with one exception. There was only a marginal trend for high AS participants to report drinking more frequently than low AS participants in situations involving urges and temptations ($z = 1.68$, $p < .10$).

Figure 1. Mean higher-order factor scores (+SD) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS); n = 66) and the IDS-42 higher-order factors of negatively-reinforcing drinking situations (Negative), positively-reinforcing drinking situations (Positive), and temptation drinking situations (Temptation).
***$p < .001$. *$p < .05$.

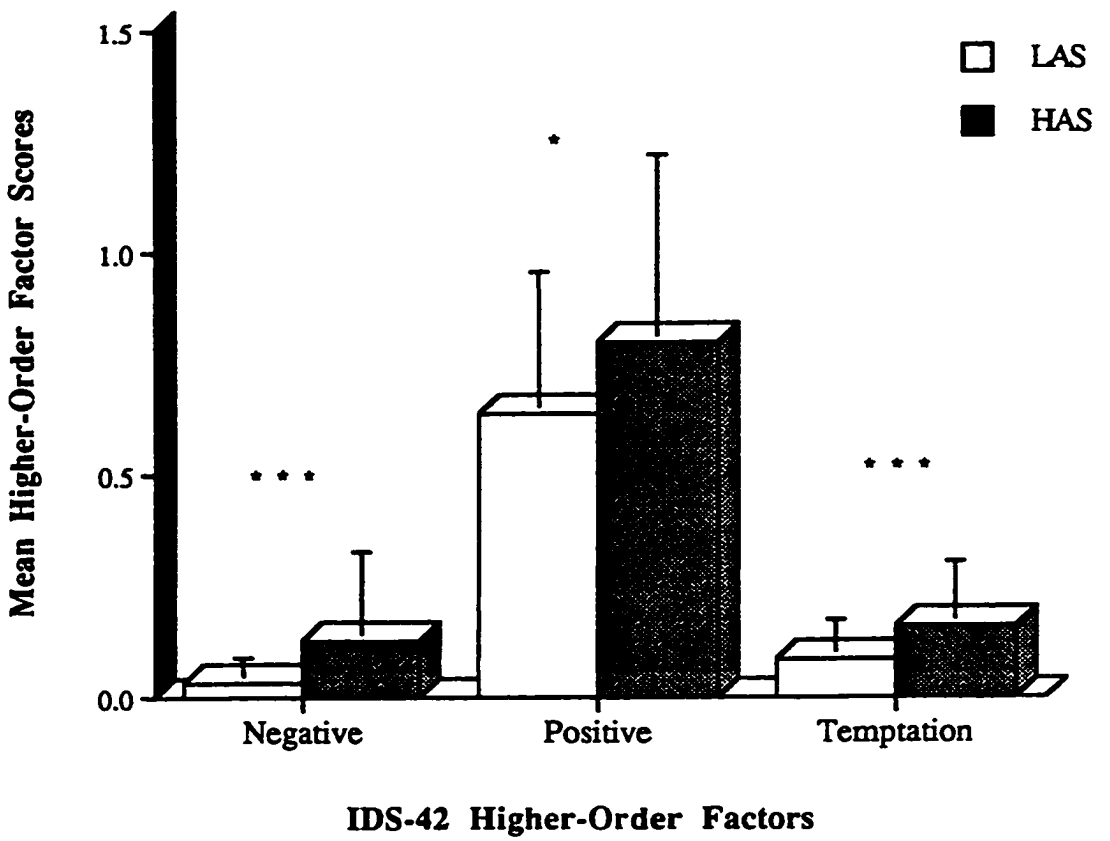
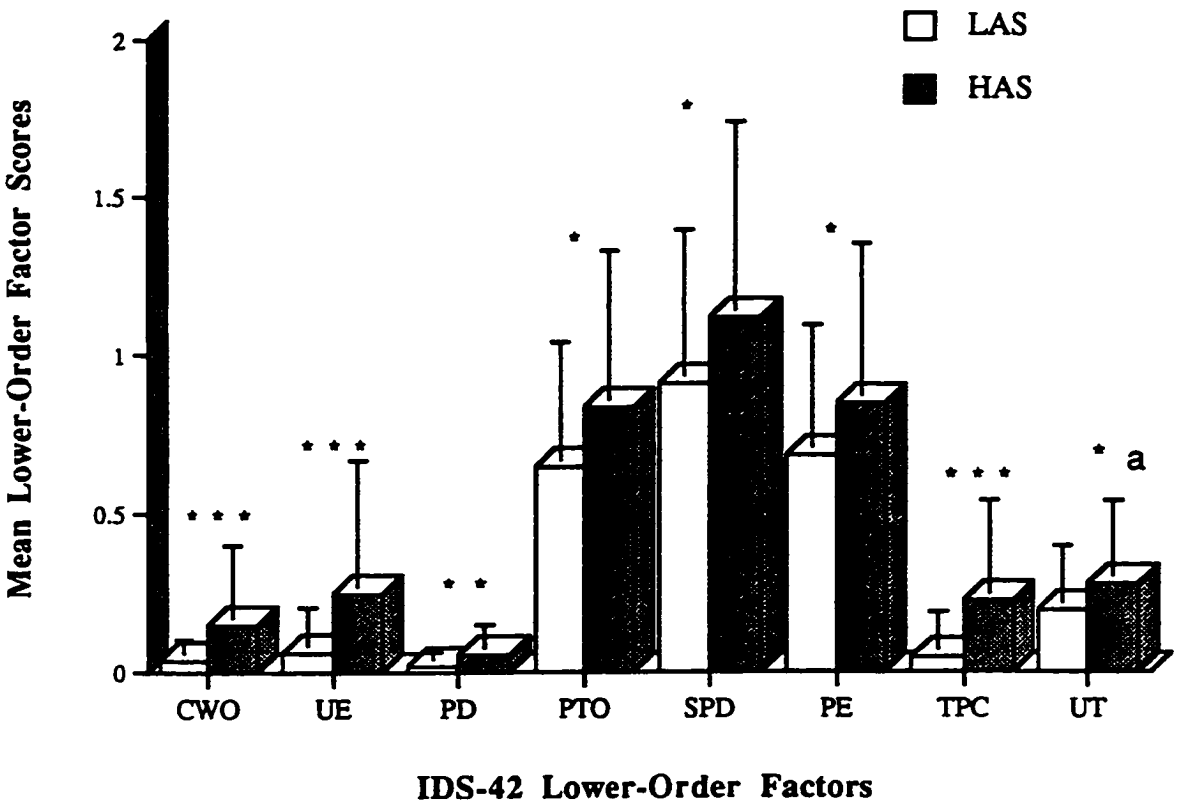


Figure 2. Mean lower-order factor scores (+SD) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS); n = 66) and the IDS-42 lower-order factors.
aThis effect was only marginal using Mann Whitney U.
***$p < .001$. **$p < .01$. *$p < .05$.




Negatively-Reinforcing Drinking Situations:
- CWO = Conflict with Others
- UE = Unpleasant Emotions
- PD = Physical Discomfort

Positively-Reinforcing Drinking Situations:
- PTO = Pleasant Times with Others
- SPD = Social Pressure to Drink
- PE = Pleasant Emotions

Temptation Drinking Situations:
- TPC = Testing Personal Control
- UT = Urges and Temptations

*Correlational Analyses*

Lilienfeld et al. (1993) recommended that continuous analyses be used to supplement "extreme groups" analyses in AS research. Hence, relationships between AS levels and frequency of situation-specific drinking were also examined in a continuous fashion for the entire sample of 396 university student drinkers using correlational analyses.[11]

Correlations between ASI scores and overall reported drinking frequency, and correlations between ASI scores and drinking frequency for each higher-order factor of negatively-reinforcing drinking situations, positively-reinforcing drinking situations, and temptation drinking situations, and separately for each of the eight IDS-42 lower-order factors were calculated using a Bonferroni-adjusted alpha of .004 (.05/12 comparisons) for determining statistical significance. Given the variability in reliabilities across subscales and factors (see Table 1), correlations are presented with and without correction for attenuation in Table 1. In the text, the correlations are presented corrected for attenuation.[12]

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[11]Correlational analyses allow for correction for attenuation due to variable reliabilities. This is particularly important in the present study due to the relatively poor reliability of the Physical Discomfort Subscale ($\alpha$ = .32). The results of both planned comparisons and correlational analyses are informative and both are presented throughout this thesis.

[12]Correlations were corrected for attenuation using the following formula: $r_{xy}$ / square root of $\alpha_x$ * $\alpha_y$, where $r_{xy}$ is the uncorrected correlation between X and Y, and $\alpha_x$ and $\alpha_y$ are the X and Y reliabilities, respectively (e.g., Block, 1963).

As predicted, ASI scores were significantly correlated with overall drinking frequency and with scores on the negatively-reinforcing factor (*p*s < .001, 1-tailed). Also as predicted, ASI scores were not significantly correlated with scores on the positively-reinforcing factor. But unexpectedly, ASI scores were significantly correlated with the temptation factor ($p < .001$, 2-tailed). The pattern of results remained the same without correction for attenuation (see Table 1).

ASI scores showed significant associations with all three of the negatively reinforcing situations: Conflict with Others, Unpleasant Emotions, and Physical Discomfort (all *p*'s ≤ .001, 1-tailed) as predicted, and with one of the two temptation situations, that involving Testing Personal Control ($p < .001$, 2-tailed). As predicted, ASI scores were not significantly associated with frequency of drinking in situations involving Pleasant Times with Others, Social Pressure to Drink, Pleasant Emotions, or Urges and Temptations (all *p*'s > .004, 2-tailed) in the total sample. The pattern of results remained the same prior to correction for attenuation (see Table 1).

*Tests of Difference between Dependent Correlations*

A t equation was used to test the difference among the three higher-order, nonindependent, disattenuated correlations

of the IDS-42 mean higher-order factor scores with ASI scores.[13] An intercorrelation matrix of these higher-order factor scores (i.e., negatively-reinforcing drinking situations, positively-reinforcing drinking situations, and temptation drinking situations) with ASI scores is presented in Table 2. The t equation revealed that, as predicted, negatively-reinforcing drinking situations factor scores were more highly correlated with ASI scores than were positively-reinforcing drinking situations factor scores ($t(393) = 1.66$, $p < .05$, 1-tailed). However, negatively-reinforcing drinking situations factor scores were not more highly correlated with ASI scores than were temptation drinking situation factor scores ($t(393) = -0.24$, ns). Temptation drinking situations factor scores were more highly correlated with ASI scores than were positively-reinforcing drinking situations factor scores ($t(393) = 2.75$, $p < .01$, 2-tailed). In sum, these findings suggest that ASI scores are more highly predictive of drinking in negatively-reinforcing and temptation situations than of drinking in positively-reinforcing situations (see Table 2).

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[13]The t equation was devised by Williams (1959) and endorsed by Steiger (1980). It consists of a ratio distributed as t with N - 3 df, which takes into account the degree to which two dependent tests are correlated. A simple explanation of the use of this formula can be found in Howell (1987).

Table 1

Correlations between ASI Scores and IDS-42 Higher- and Lower-Order Factor Scores

| IDS-42 Higher-Order Factors and Subscales | Coefficient Alpha | Correlation Coefficients | Disattenuated Correlations |
|---|---|---|---|
| **Negatively-Reinforcing Situations**[a] | **.91** | **.20*** | **.22*** |
| Conflict with Others | .88 | .22* | .25* |
| Unpleasant Emotions | .83 | .17* | .19* |
| Physical Discomfort | .32 | .16* | .29* |
| **Positively-Reinforcing Situations** | **.93** | **.12** | **.13** |
| Pleasant Times with Others | .85 | .13 | .14 |
| Social Pressure to Drink | .86 | .10 | .11 |
| Pleasant Emotions | .83 | .10 | .11 |
| **Temptation Situations** | **.72** | **.19*** | **.23*** |
| Testing Personal Control | .72 | .27* | .34* |
| Urges and Temptations | .63 | .10 | .14 |
| Overall Drinking Frequency[a] | **.93** | **.18*** | **.20*** |

Note. The IDS-42 higher-order factors, indicated in bold type, were found using confirmatory factor analysis (Carrigan et al., in press).

[a]Probability levels for overall drinking frequency, the negatively-reinforcing situations higher-order factor and its subscales are one-tailed in keeping with the hypotheses. All remaining probability levels are two-tailed.

*$p \leq .001$.

Table 2

Correlation Matrix of IDS-42 Higher-Order Factors and ASI Scores

| | IDS-42 Higher-Order Factors | | | |
|---|---|---|---|---|
| | Negative | Positive | Temptation | ASI Scores |
| Negatively-Reinforcing Drinking Situations | ----- | | | |
| Positively-Reinforcing Drinking Situations | .37 | ----- | | |
| Temptation Drinking Situations | .48 | .70 | ----- | |
| ASI Scores | .22[a] | .13[ab] | .23[b] | ----- |

Note. All correlations coefficients are corrected for attenuation. A t ratio (see Footnote No. 6) was used to test the difference between these nonindependent correlations: Correlation coefficients with the same subscripts differ significantly: [a]$p < .05$, 1-tailed; and [b]$p < .01$, 2-tailed.

## Discussion

Situational specificity of drinking was anticipated among high AS individuals in the present study. That is, it was predicted that high AS levels would be associated with reports of more frequent drinking in negatively-reinforcing situations but not in positively-reinforcing situations or temptation situations. The overall pattern of results lends support to the speculation of drinking specificity among high AS individuals: AS levels were more highly predictive of negatively-reinforcing drinking situations factor scores and of temptation drinking situations factor scores than of positively-reinforcing situations factor scores. Also, as predicted, correlational analyses between ASI scores and the mean lower-order factor scores of conflict with others, physical discomfort, and unpleasant emotions were highly significant, while correlational analyses between ASI scores and the lower-order factors scores of pleasant times with others, social cues to drink, and pleasant emotions were not significant.

These results suggest that, like individuals high in negative temperament in general (Cannon et al., 1992), individuals with elevated AS levels appear especially motivated to drink in aversive situations (e.g., when experiencing interpersonal conflict, unpleasant emotions, or physical discomfort), and when cognitively preoccupied with alcohol (i.e., drinking in situations involving testing personal control). However, high and low AS individuals

appear to differ little in their likelihood of drinking in pleasant social situations.

In addition to the correlational analyses, this study was also analyzed using extreme groups planned comparisons. Planned comparisons of AS group effects revealed that, as predicted, high AS individuals self-reported drinking more frequently, collapsed across all drinking situations, as compared to low AS individuals (see Figure 1). Examination of the AS group effects at each higher-order drinking situation revealed that high AS individuals reported drinking much more frequently than low AS individuals in negatively-reinforcing drinking situations and temptation drinking situations, and only somewhat but significantly more frequently than low AS individuals in positively-reinforcing situations. These results are consonant with previous studies in which AS levels were found to be associated with higher overall drinking across a variety of drinking motives (Stewart & Zeitlin, 1995).

Planned comparisons of the IDS-42 mean lower-order factor scores were consistent with analysis of the IDS-42 mean higher-order factor scores. As hypothesized, high AS participants reported much more drinking in situations involving Unpleasant Emotions and Conflict with Others and somewhat more drinking in situations involving Physical Discomfort, compared to low AS participants. However, high AS individuals also reported much drinking in Testing Personal Control situations and somewhat more drinking in

situations involving Pleasant Times with Others, Urges and Temptations, Social Pressure to Drink, and Pleasant Emotions.

The present findings suggest that situational specificity of drinking in negative reinforcement contexts may be evident even in relatively young high AS university students. Problem drinkers tend to report more frequent heavy drinking in negative affect situations over time (Annis & Davis, 1989). Thus, it is reasonable that high AS individuals' heightened sensitivity to alcohol's negative emotional reactivity-dampening properties (e.g., Baker et al., 1997; Stewart & Pihl, 1994) could result in increased drinking in negatively-reinforcing situations over time. This could be tested empirically by way of longitudinal research in which the drinking situations of high and low AS individuals are repeatedly assessed over several years. Such research could determine whether greater situational specificity of drinking among high AS individuals is partly a function of the number of years spent drinking heavily.

The significant disattenuated correlation between ASI scores and frequency of drinking in situations involving Physical Discomfort is noteworthy. It has recently been questioned whether AS represents only a fear of arousal-related sensations or, more broadly, a fear of any bodily sensation (heart palpitations versus feverish; see Asmundson, Cox, Longman, & Norton, 1995; Watt et al., in press). Two of the four items included in this Physical

Discomfort IDS-42 subscale (Item No. 2: "When I had trouble sleeping;" and Item No. 22: "When I felt drowsy and wanted to stay alert") do not appear to reflect the particular arousal-related bodily sensations, such as nausea and racing heartbeat, that are by definition feared by high AS individuals. The other two IDS-42 physical discomfort items more clearly pertain to the arousal-related bodily sensations which tend to be feared by high AS individuals (Item No. 42: "When I felt nauseous;" and Item No. 62: "When my stomach felt like it was tied in knots"). The heterogeneity of this subscale may partially explain the low reliability of the Physical Discomfort Subscale and the improvement in the correlation with ASI scores when corrected for attenuation. Future research should examine high and low AS individuals' drinking in response to arousal versus non-arousal-related bodily sensations as two distinct subscales with a larger number of items than possible using the IDS-42 in order to clarify the relationship between AS and drinking in response to symptoms of physical discomfort.[14] Some of these items could come directly from the longer Physical Discomfort Subscale included on the IDS-100: Item Nos. 72 ("When I felt jumpy and physically tense") and 82 ("When I felt shaky and sick") as arousal-

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[14]Post-hoc analysis provided some support for this speculation that AS levels are more likely related to arousal items rather than nonarousal items in that ASI scores were significantly correlated with the IDS-42 Item No. 62 ($r = .16$, $p < .001$), but not the other three items.

related sensations feared by high AS individuals, versus Item Nos. 12 ("When I was tired") and 52 ("When I felt exhausted") as nonarousal items representing sensations that are not typically feared by high AS individuals.

The results of this study are generally consistent with research which has explored the relationship between AS levels and self-reported "motives," or reasons, for alcohol use. One measure of alcohol use motives is the Drinking Motives Questionnaire (DMQ: Cooper et al., 1992), which is reviewed in Chapter Two (see page 25). The DMQ was found to be a valid and reliable measure of drinking motives in both middle-aged adults (Cooper et al., 1992) and young adult university students (Stewart et al., 1996). The DMQ assesses the relative frequency of drinking for coping motives (to reduce/avoid negative affect), social motives (to increase affiliation with others), and enhancement motives (to increase pleasurable affect). Stewart and Zeitlin (1995) found a significant correlation ($r$ = .40) between AS and the coping motives subscale of the DMQ. Furthermore, they found that more high than low AS students reported drinking primarily to cope, and more low than high AS students reported drinking primarily to socialize.[15] Others have also demonstrated a significant positive relationship between AS and coping-related drinking (Conrod

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[15]Subjects were classified as "primarily" social, coping, or enhancement drinkers based on a relative comparison of their scores across the three DMQ subscales of social motives, coping motives, and enhancement motives.

et al., in press; Novak et al., 1997; Stewart, Karp, et al., 1997).

Contrary to hypothesis, ASI scores were equally effective in predicting both negatively-reinforcing drinking situations factor scores and temptation drinking situations factor scores. These results suggest that individuals with elevated AS are more likely to report drinking for negative reinforcement (i.e., to attenuate negative affect) and for the temptation to rationalize continued alcohol use (e.g., "When I wanted to prove to myself that I could take a few drinks without becoming drunk"). Drinking in Testing Personal Control situations appears inconsistent with either socially-motivated or enhancement-motivated drinking, that is, drinking to provide positive reinforcement (i.e., to increase affiliation or enhance positive mood states; Cooper, 1994; Cooper et al., 1992). Furthermore, the Testing Personal Control items appear to be conceptually distinct from other situations which clearly implicate the use of alcohol for its negative reinforcement properties (cf., "When I felt confused about what I should do" and "When I felt under a lot of pressure from family members"). Indeed, among university drinkers, the Testing Personal Control items loaded on a separate and distinct factor from the factors of negatively-reinforcing drinking situations and positively-reinforcing drinking situations (Carrigan et al., in press).

The cognitive preoccupation with drinking reflected in the Testing Personal Control items appears to be conceptually analogous to the construct of restrained drinking (Collins, 1993) in that both pertain to a cognitive preoccupation with controlling alcohol intake.[16] It has been theorized that failed attempts to regulate alcohol intake among restrained drinkers may actually promote binge drinking when restrained drinkers blame themselves for yielding to the temptation to drink (Collins & Lapp, 1992). This self-attribution is known as a limit violation effect (Collins, Lapp & Izzo, 1991). Restriction of alcohol intake, followed by a perceived loss of control or limit violation, may then foster the experience of a negative affective reaction to this self-attribution, followed by overindulgence in order to assuage the resultant negative mood (Collins, 1993). Thus restrained drinkers may experience a continuous cycle of restraint, violation, negative affect, and excessive drinking (cf., Marlatt, 1985).

It might be reasoned that, given their increased cognitive preoccupation with drinking, individuals with elevated AS would likely score relatively high on a measure

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[16]The concept of drinking restraint was adapted from the literature on dietary restraint (Collins & Lapp, 1992). The restraint construct refers to a cognitive and behavioral preoccupation with controlling intake of food, in the case of dietary restrictors, or alcohol, in the case of restrained drinkers. For both dietary restrictors and restrained drinkers, the failure to regulate intake may subsequently result in excessive consumption (Collins, 1993).

of restrained drinking (i.e., tending to more highly endorse such items as "Do you find that once you start drinking it is difficult for you to stop?"; Ruderman & McKirnan, 1984).[17] However, research has failed to provide consistent support for the limit violation effect in the laboratory (see review by Collins, 1993).

Future research on restrained drinking might benefit from inclusion of high and low AS subjects in order to demonstrate the limit violation effect. The paradigm used by Collins and Lapp (1993) and the bogus taste-rating task (cf., Higgins & Marlatt, 1975) could be used with high and low AS individuals and restrained and unrestrained drinkers. Participants could be exposed to a voluntary amount of "preload"[18] of alcohol in a tavern-like setting in the laboratory prior to participation in the bogus taste-rating task. I would predict that high AS subjects exposed to the preload would report increased negative affect as the result of a perceived drinking limit violation, and subsequently

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[17]See Collins and Lapp (1992) for a review of the psychometric properties of their Temptation and Restraint Inventory and of the Restrained Drinking Scale (Ruderman & McKirnan, 1984).

[18]The "preload" paradigm is borrowed from the literature on restrained eating. In the preload paradigm subjects are required to consume an amount of food as part of the experimental manipulation of a violation of the excessive control over eating found in chronic dieters. This violation is often followed by excessive eating on a later taste-test (see review by Herman & Polivy, 1980). The preload in drinking restraint research similarly represents a slip in perceived control over drinking, which theoretically can precipitate an alcohol binge.

consume more alcohol during the taste-rating task, as compared to low AS subjects.

A limitation of the present study is that higher-order personality constructs related to AS, such as measures of trait anxiety or negative temperament (see reviews by Lilienfeld, 1996; Peterson & Reiss, 1992) were not measured. Consequently, this study cannot identify the degree to which the results are due specifically to AS and/or to other higher-order personality characteristics. One might speculate, however, that given high AS individuals' specific fear of anxiety-related sensations (Peterson & Reiss, 1992), AS should be most strongly associated with drinking frequency in negatively-reinforcing situations involving anxious emotions and physical discomfort. In contrast, the relationship between negative temperament and the reported frequency of drinking should be less situation specific, including significant relationships between negative temperament and drinking frequency in a variety of negatively-reinforcing situations (e.g., anxiety, depression, anger, etc.).

The structure of the IDS-42 would not permit testing of the above speculations in that, for example, the Unpleasant Emotions subscale examines drinking in response to a variety of negative emotions (i.e., anxiety, depression, and anger situations) rather than separately assessing drinking in response to each type of unpleasant emotion. However, in a study on drinking motives, Stewart, Karp, et al. (1997)

obtained equally strong relationships between AS and anxiety-related reasons for alcohol use as they did for AS and depression-related reasons for alcohol use, thus failing to support a specific association between AS and anxiety-motivated drinking. While negative temperament constructs (e.g., trait anxiety, depression, AS) are difficult to disentangle in that they share considerable overlapping variance (Watson et al., 1988), future research could seek to clarify the degree to which the present results are due specifically to AS and/or to other higher-order personality constructs by including the ASI and measures of additional negative temperament constructs. This could be accomplished by including the ASI and measures of additional negative temperament constructs in a multiple regression design.

The IDS-42 relies on self-report to assess the frequency of drinking across various situations. Unfortunately, as noted earlier exclusive reliance on such self-report research may not accurately reflect the actual extent to which alcohol is used by high AS individuals in negatively-reinforcing and temptation drinking situations.

Another limitation of the present study involves the distinction between frequency and quantity measures of alcohol consumption (see Conrod, Stewart, & Pihl, 1997). Extant research using the IDS-42 (and the DMQ) assesses self-reported frequency of drinking, not the actual quantity of alcohol consumed. Both frequency and quantity measures are necessary to reflect different facets of drinking

behaviour (Vogel-Sprott, 1983). For example, one individual may drink frequently (e.g., a glass of red wine with each evening meal), while another may drink heavily on one occasion per week (a 6-pack binge every Friday night). Both individuals would obtain similar quantity x frequency scores of 6 to 7 drinks per week. But this similarity of quantity x frequency scores does not reflect the greater health risks associated with the latter style of episodic drinking in which a large quantity of alcohol is ingested over one or a few occasions (i.e., "binge drinking;" e.g., Sobell, Cellucci, Nirenberg, & Sobell, 1982). Thus, it remains important to investigate situations that elicit a greater quantity of alcohol consumption. The ad libitum alcohol consumption studies presented in Chapters Four and Six provide an opportunity to assess the validity of high AS individuals' self-reported drinking situations as well as to measure how much they drink in specific contexts.

# CHAPTER FOUR: Study 2

## Anxiety Sensitivity and Anticipation of a Self-Disclosing Interview as Determinants of Alcohol Consumption

### Introduction

Study 1 demonstrated that AS is more highly associated with self-reported drinking frequency in negatively-reinforcing drinking situations (i.e., unpleasant emotions, physical discomfort, and conflict with others) than with self-reported drinking frequency in positively-reinforcing drinking situations (i.e., pleasant times with other, social "cues" to drink, and pleasant emotions).[19] Thus, like individuals high in negative temperament in general (Cannon et al., 1992), individuals with high AS appear more motivated than low AS individuals to drink in aversive situations (e.g., when experiencing unpleasant emotions and physical discomfort). Drinking in negatively-reinforcing drinking situations is strongly associated with coping-related reasons for alcohol use (Carrigan et al., in press). Indeed, high AS young adults are more likely to report that they drink primarily to cope with negative affect compared to low AS young adults (Stewart & Zeitlin, 1995; Stewart, Karp, et al., 1997).

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[19]As stated previously (see Footnote 2, Study 1), the label "Social Cues to Drink" (Carrigan et al., in press) may more aptly represent the content of the items forming the IDS-42 "Social Pressure to Drink" subscale.

As reviewed in Chapter Two (see page 31-41), the unique responses of high AS subjects to alcohol administration suggest that alcohol may be extremely reinforcing for high AS individuals. For example, Stewart and Pihl (1994) found that sober high AS women demonstrated significantly more subjective-emotional arousal and electrodermal reactivity when anticipating aversive stimulation than sober low AS women. The reactivity of high AS women was significantly attenuated following the consumption of a moderately intoxicating dose of alcohol (Stewart & Pihl, 1994). Additionally, high AS women displayed a sober selective attentional bias for the processing of threatening words (e.g., "INJURY"), which was significantly attenuated following the consumption of a moderately intoxicating dose of alcohol (Stewart, Achille, et al., 1992). Baker et al. (1997) similarly found that high AS university students were more sensitive to alcohol's dampening effects on their emotional and cognitive reactivity to arousal induced by hyperventilation than low AS students.

In sum, high AS individuals drink more often in negatively-reinforcing drinking situations, drink more often for coping-related motives, and appear more sensitive to alcohol's emotional reactivity dampening effects as compared to low AS individuals. But as reviewed in Chapters One and Two, much of this research is based on self-report. Ad-lib alcohol consumption studies may provide an opportunity to assess the validity of these self-report findings.

A variety of means have been used in previous research to manipulate affect prior to alcohol consumption. Drinking is often encouraged in this type of research by the use of a bogus taste-rating task in which participants are asked to compare alcoholic beverages on a variety of attributes (e.g., Higgins & Marlatt, 1973, 1975). The real dependent variable of interest is the amount of alcohol consumed in response to the manipulation. Anticipation of social evaluation (Higgins & Marlatt, 1975), provocation to anger with a lack of retaliation (Marlatt et al., 1975), social stress during a conversation (Miller et al., 1974), failure on cognitive tasks (Hull & Young, 1983; Noel & Lisman, 1980; Tucker et al., 1980), and anticipation of public speaking (Strickler et al., 1979) have resulted in increased alcohol consumption in a laboratory setting. However, several attempts to produce negative affect have not increased alcohol consumption (cf., Gabel et al., 1980; Higgins & Marlatt, 1973; Holroyd, 1978; Pihl & Yankofsky, 1979). These latter studies have left in doubt the conditions in which alcohol is used to cope with negative affect.

The inconsistencies in human ad-lib alcohol consumption studies may arise from a number of factors. The type of stressor chosen may be important. Higgins and Marlatt (1975) proposed that alcohol may be used to reduce interpersonal stress (e.g., anticipation of social evaluation; Higgins & Marlatt, 1975), but not impersonal stress (e.g., threat of electric shock; Higgins & Marlatt,

1973). However, Sher (1987) asserted that this distinction is not tenable because some researchers have since found increased alcohol consumption following impersonal stress manipulations (e.g., exposure to unsolvable problems: Noel & Lisman, 1980).

Efficacy of the affect manipulation also explains some inconsistencies in this literature. For example, Pihl and Smith (1983) argued that, in the Higgins and Marlatt (1973) study, effectiveness of the manipulation was questionable because no differences emerged between groups (high versus low threat of electric shock) on a measure of self-reported anxiety.

Pihl and Smith (1983) have also suggested that not all people may be motivated to use alcohol for tension reduction. Hence, it may be useful to study those populations which seem most likely to use alcohol to cope with negative affect. The literature reviewed herein and the results of Study 1 suggest research on individuals with elevated AS may add clarity to the inconsistencies in ad-lib alcohol consumption research which tests the tension-reduction hypothesis of alcohol consumption.

The purpose of Study 2 was to assess the validity of high AS subjects' self-reported increased drinking in negatively-reinforcing situations and for coping motives using the ad-lib alcohol consumption paradigm. The present study incorporated a modification of a manipulation developed by Maller and Reiss (1987) in order to cause

anxiety. As reviewed in Chapter One (page 13), these researchers found that high AS individuals exhibited more anxiety in response to anxiety-relevant questions about their experiences with anxiety than low AS individuals. In contrast, anxiety-irrelevant questions about preferences in food and leisure activities revealed no significant differences in anxiety between high and low AS groups.

Anticipation of these anxiety-relevant versus anxiety-irrelevant questions (Maller & Reiss, 1987) was selected as a theoretically-relevant stressor in the present study. High and low AS individuals anticipated and responded to one set of questions in a 2 x 2 (AS Group x Question Set) between-groups design.

Given the generally greater levels of alcohol consumption reported by high AS individuals (e.g., Stewart, Peterson, & Pihl, 1995), and the significant positive correlation between AS levels and coping-motivated drinking (Stewart & Zeitlin, 1995), it was predicted that high AS participants would report greater anxiety and subsequently consume more alcohol than low AS participants, particularly when anticipating the anxiety-relevant questions.

Lilienfeld (1996) has suggested that phenomena explained by AS may be better explained by related higher-order constructs such as dysphoria (i.e., a higher-order negative temperament construct). This suggestion was explored in the present study with respect to drinking behaviour by the use of stepwise multiple regression. It

was hypothesized that ASI scores would be a better predictor of drinking behaviour (e.g., mean alcoholic beverage consumption) than a measure of dysphoria, particularly in the anxiety-relevant question set condition.

## Method

### *Participants*

A total of 582 undergraduate students (425 F, 157 M) enrolled in psychology courses at Dalhousie University were screened with the Anxiety Sensitivity Index (ASI: Peterson & Reiss, 1992) during class time. Participants were recruited on the basis of their ASI scores in order to obtain high and low AS groups based on ASI norms (Peterson & Reiss, 1992). High and low AS individuals were randomly assigned to either the anxiety-relevant or anxiety-irrelevant condition so that each cell in the 2 x 2 (AS group x Question Set) design contained 7 men and 7 women for a total of 56 participants.

Eligibility criteria included verbal acknowledgement by participants that there was no reason why they could not consume alcohol, such as alcohol problems, concurrent medication use, allergies, or pregnancy. Participants were required to abstain from alcohol for 24 hours prior to testing and to fast for a 4-hour period before coming into the laboratory. Participants were paid $10.00 as compensation for their time.

*Materials*

Self-Report Measures of Negative Affectivity. Two self-report inventories, the Anxiety Sensitivity Index (ASI: Peterson & Reiss, 1992) and the Beck Depression Inventory (BDI: Beck & Steer, 1990), were administered to all participants in the present study. Description of the psychometric properties of the ASI has been previously reviewed in Chapter One.

The original Beck Depression Inventory (Beck, Ward, Mendelson, Mock & Erbaugh, 1961) was introduced in 1961 (Beck & Steer, 1990) to measure symptoms and attitudes representative of depression (e.g., pessimism, guilt, suicidal ideas, social withdrawal, irritability). The modified BDI (Beck, Rush, Shaw & Emery, 1979) was found to be comparable to the original BDI in psychiatric patients (Beck & Steer, 1990). The original and modified BDI are essentially identical with the exception of a few wording changes and the use of three graded responses (coded 0 to 3) to 21 items in the modified version rather than four or five in the original BDI (Beck & Steer, 1990).

The BDI can be self-administered. Respondents simply select among the graded statements the one which *best describes* the way they have been feeling *over the past week, including today*. Each series of graded statements is scored on a 4-point scale, with a possible maximum score of 63. According to Beck et al. (1988), a range of scores represents no or minimal depression (0 to 9), mild to

moderate depression (10 to 18), moderate to severe depression (19 to 29), and extremely severe depression (30 to 63) for those patients diagnosed as having an affective disorder. This classification of depression symptoms corresponds to means (and *SD*s) of 10.9 (8.1), 18.7 (10.2), 25.4 (9.6) and 30.0 (10.4), respectively (Beck & Steer, 1990).

The BDI was designed to assess the severity of depression symptoms in adolescents and adults diagnosed as depressed. The BDI has adequate psychometric properties for both clinical and research purposes (Gallagher, 1986; Beck & Steer, 1990). However, its validity for assessing depression in normal adolescent and adult populations is questionable (Coyne, 1994). As a screening tool, the BDI scores of university students may represent dysphoria or overall distress rather than clinical depression (Coyne, 1994). A higher BDI cutoff score of 15 may be appropriate for a university sample in order to reduce the number of false positives (Beck & Steer, 1990). There is some evidence that elevated AS is associated with a diagnosis of major depression (Otto, Pollack, Fava, Uccello, & Rosenbaum, 1995; Taylor, Koch, Woody, & McLean, 1996). So it is possible that nonclinical high AS subjects may have higher dysphoria levels (i.e., BDI scores) than low AS subjects.

Demographic Variables. Participants provided basic demographic information, including age, gender, year of university enrollment, and salary of family of origin.

Women also indicated whether or not they were using oral contraceptives and the starting date of their last menstrual period (to calculate days since onset of last menses).

Participants also completed the brief version of the Michigan Alcoholism Screening Test (the Brief MAST: Pokorny, Miller, & Kaplan, 1972). In comparison to the full 25-question Michigan Alcoholism Screening Test (Selzer, 1971), the Brief MAST (Pokorny et al., 1972) contains only 10 questions describing common signs and symptoms of alcoholism to which respondents answer *yes* or *no* (e.g., "Have you ever been in a hospital because of drinking?; "Have you ever attended a meeting of Alcoholics Anonymous?"). Pokorny and colleagues (1972) found high concurrent validity between the Brief MAST and 25-item MAST, and concluded that both measures are equally effective in discriminating between alcoholics and nonalcoholics.

The MAST has high levels of concurrent and discriminant validity and reliability (Jacobson, 1989). However, Jacobson (1989) reported concerns that the MAST had high face validity, obvious biases, and oversensitivity (i.e., a tendency to over identify individuals as abusing alcohol). Changes in the way items were worded and the use of scoring weights have addressed some of these limitations. It is also recommended that clinicians select an appropriate cutoff that reflects a compromise between high sensitivity (many false positives) and high specificity (many false negatives) (Jacobson, 1989). For example, Jacobson reported

that a cutoff score of 5 has very high sensitivity (.96) but poor specificity (.57), while a cutoff score of 10 reduces sensitivity (.92) but increases specificity (.90). Another scoring guideline uses a range of scores where 0 to 4 indicates no problem, 5 to 9 indicates a possible problem, 10 to 11 indicates a probable problem, and 12 indicates a likely problem (Jacobson, 1989). A cutoff of 10 was used as an exclusionary criterion in the present research to balance sensitivity (.92) and specificity (.90).

Problem drinkers and alcoholics were excluded in the present study for two reasons. First, this study was designed to study the risk for alcohol abuse rather than the consequences of alcohol abuse. The second reason pertains to ethics. The guidelines of the National Institute on Alcoholism and Alcohol Abuse (1989) for alcohol administration in a laboratory state that, in most circumstances, alcohol should not be administered to those with known alcohol problems/disorders.

Interview Questions. Based on the previous work of Maller & Reiss (1987), the anxiety-relevant condition involved anticipation of the following two questions designed to invoke anxiety in high AS individuals: "What kinds of thoughts and physical sensations do you experience when tense or anxious?" and "How can those around you tell when you are tense or nervous and how do they seem to react?" The anxiety-irrelevant condition involved anticipation of two neutral questions: "What activities do

you enjoy in your spare time?" and "What kinds of food do you like to eat?"

Taste-Rating Task. The mock beverage taste-rating task included 400 ml each of three alcoholic beverages (rum and coke, vodka and orange juice, rye and ginger; mixed 1 part alcohol to 4 parts mixer) and 400 ml of one non-alcoholic beverage (orange juice) presented in half-litre decanters. Each decanter had a separate plastic cup placed in front of it and was randomly numbered one to four. A decanter containing water was also presented as a mouth rinse that could be used between tastes.

Participants were instructed to rank the four numbered beverages according to 15 adjectives on a taste-rating form (e.g., tingling, bland, satisfying; Conrod, Stewart, & Pihl, 1997) using a 4-point scale (4 = the beverage containing the most of an attribute; 1 = the beverage containing the least of that same attribute).

Adjective Checklist. An adjective checklist was adapted from the anxiety and positive affect subscales of the Multiple Affect Adjective Check List and its revision (Zuckerman, 1960; Zuckerman & Lubin, 1985) to provide a test of the efficacy of the manipulation. Participants rated their anxiety and positive affect according to 10 anxiety items (afraid, fearful, frightened, impatient, nervous, panicky, shaky, tense, timid, and worrying) and 10 positive affect items (calm, cheerful, contented, happy, joyful, loving, pleasant, secure, steady, and thoughtful). The sum

of checked adjectives provided measures of self-reported anxiety (0 to 10) and positive affect (0 to 10), respectively.

*Procedure*

Participants were tested individually during a single afternoon session. Upon arrival at the lab, the fasting requirement was verified verbally and written informed consent was obtained. Participants then provided basic demographic data and completed the brief MAST. They also provided a baseline blood alcohol level (BAL) sample using an Alco-Sensor III (Intoximeters, Inc.) to ensure compliance with the abstinence criteria.

The cover story was similar to that presented by Maller and Reiss (1987). The participants were advised that the experiment was about the relationship between attitudes and fears, that they would be presented with a few questions, given an opportunity to think about their responses, and then audiotaped during a short discussion of the questions. The questions were read aloud to the participant and then presented on an index card to maintain their saliency during the drinking portion of the experiment.

A second cover story was then presented in order to provide a rationale for participant alcohol consumption. They were advised that the researchers needed help in selecting a suitable beverage for an upcoming study. So while they were thinking about how they would like to respond to the questions on the index card, they could be of

assistance to the researchers by participating in a taste-rating task which would involve tasting a variety of beverages, some of which might include alcohol, and rating them on various dimensions of taste.

Following presentation of the questions, participants were given 15 minutes alone to complete the taste-rating form. Ad-lib alcohol consumption was encouraged with the following statement: "Drink as much as is necessary for you to rate the beverages precisely, and then you're welcome to drink as much as you like after that" (Conrod, Stewart, & Pihl, 1997).

Participants rested alone for 8 minutes following the taste-test and were advised to review the questions and consider their response. Participants then completed the adjective checklist. The adjective checklist was not administered prior to the taste-test to avoid the perception by the participants that the experiment involved the effect of anxiety on drinking. Next a 10-minute audiotaped interview pertaining to the question set was conducted. Analysis of the content of the interview is presented elsewhere (Samoluk & Stewart, 1996). After the interview, participants completed the adjective checklist a second time and provided a post-drinking BAL sample. Participants were required to remain in the lab until their BAL was equal to or less than half the legal limit (0.04%). Participants were fully debriefed following completion of the study.

## Results

*Independent Variables*

ASI scores (Peterson & Reiss, 1992) were analyzed using a 2 x 2 (AS Group x Question Set) analysis of variance. The ANOVA revealed a significant main effect of AS Group as planned: High AS individuals had significantly higher ASI scores than low AS individuals (*M*s (and *SD*s) = 35.25 (7.59) and 7.71 (1.98), respectively ($F(1, 48) = 353.69$, $p < .001$). There were no other significant effects. The overall sample mean was 21.42 (*SD* = 14.94) which is similar to the norm of 19.01 (*SD* = 9.11) found for nonclinical samples (Peterson & Reiss, 1992).

Conventional BDI cutoffs are not appropriate for nonclinical samples because of oversensitivity and a highly skewed distribution in nonclinical samples (Coyne, 1994). Indeed, in the present sample, a large proportion of subjects indicated no or minimal dysphoria with a sample mean of 5.02 (*Mdn* = 4.0). Only 2 participants (both high AS) reported BDI scores greater than 15 which may be suggestive of dysphoria in a normal population (Beck & Steer, 1990). The distribution of BDI scores had a skewness of 1.53 and a kurtosis of 3.91. Hence, a median split at 4.0 was used to recode participants' BDI scores as 0 (no dysphoria) or 1 (minimal to moderate dysphoria).

A 2 x 2 (Dysphoria x AS Group) chi-square analysis of the recoded BDI scores revealed that a greater proportion of high than low AS participants indicated the presence of

dysphoria, $X^2(1) = 8.65$, $p < .01$.[20] This was not unexpected given the conceptual overlap between AS and negative affectivity (see Lilienfeld, 1996). A 2 x 2 (Dysphoria x Question Set) chi-square analysis of the recoded BDI scores revealed that the presence or absence of dysphoria did not vary as a function of question set, $X^2(1) = 0.64$, ns.

*Demographic Variables*

The participants were all Caucasian between the ages of 18 and 32 ($M$ = 21 years). Most of the participants were in the 3rd to 4th year of university, with a median family of origin annual salary range of $51 to $60 thousand Cdn. A series of 2 x 2 (AS Group x Question Set) ANOVAs on all of these variables revealed no significant main effects or interactions. Thus the experimental groups can be considered equivalent on these demographic variables.

No participant was identified as alcoholic on the Brief MAST (Pokorny, Miller, & Kaplan, 1972) using a cutoff value of 10 (Jacobson, 1989).[21] The overall mean ($N$ = 56) on the Brief MAST was 0.52 ($SD$ = 1.40; $Mdn$ = 0); and no participants obtained a score greater than 7. Participants' MAST scores were then recoded: Scores of 0 were coded as 0 indicating no alcohol problems ($n$ = 47); and scores greater

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[20]The means (and *SD*s) of the BDI scores for high versus low AS individuals prior to recoding were 7.29 (5.45) and 2.75 (2.80), respectively.

[21]Even if the more sensitive cutoff of 5 had been used, only one subject scored greater than this cutoff (one high AS individual received a score of 7) which suggests merely the possibility of a problem with alcohol (Jacobson, 1989).

than or equal to 1 were coded as 1 indicating minimal alcohol problems ($n$ = 9). A 2 x 2 (Alcohol Problems x AS Group) chi-square analysis of the recoded MAST scores revealed the presence or absence of alcohol problems did not vary as a function of AS status ($X^2(1) = 0.13$, ns). A 2 x 2 (Alcohol Problems x Question Set) chi-square analysis of the recoded MAST scores revealed that the presence or absence of alcohol problems did not vary as a function of question set ($X^2(1) = 0.13$, ns).

Given evidence that the rate of alcohol absorption varies as a function of levels of female reproductive hormones (e.g., Jones & Jones, 1976), females also provided information on the number of days since the onset of their last menstrual cycle and the use of oral contraceptives. An ANOVA on the number of days since onset of last menses was nonsignificant (overall $M$ (and $SD$) = 14.61 (9.22) days). Chi-square analyses revealed no relationships between oral contraceptive usage and AS or Question Set (overall, 64.3% reported using oral contraceptives).

*Analyses of Affect Rating Scale*

The first adjective checklist was administered following the taste-test, immediately preceding the interview. The participants completed the checklist a second time immediately following the interview. Self-reported anxiety and positive affect were analyzed in 2 x 2 (AS group x question set) ANOVAs for both the pre- and post-interview adjective checklists. Results of both analyses

are depicted in Figures 3 and 4, respectively. For the pre-interview analyses, there were no significant main effects or interactions of AS group or question set for either self-reported anxiety or positive affect (see Figure 3). Hence, anticipation of the interview seemed to be an ineffective way to induce anxiety in high versus low AS participants.

However, as in Maller and Reiss (1987), participation in the interview altered anxiety levels as predicted. For the post-interview analysis, a significant main effect of AS group emerged ($F(1, 52) = 4.48$, $p < .05$, $eta^2 = .08$): High AS participants reported greater overall anxiety than the low AS participants following the interview. The main effect of AS group was not significant for positive affect. The question set significantly affected self-reported anxiety ($F(1, 52) = 6.89$, $p = .01$, $eta^2 = .12$) as well as positive affect ($F(1, 52) = 5.15$, $p < .05$, $eta^2 = .09$): Participants who responded to the anxiety-relevant question set reported significantly greater anxiety and less positive affect than participants who responded to the anxiety-irrelevant question set. As expected, the most anxiety and the least positive affect were reported by high AS participants in the anxiety-relevant condition, although the interactions failed to reach significance in either

analysis.[22] Figure 4 depicts the significant effects for post-interview self-reported anxiety and positive affect.

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[22]The pre- and post-interview affect self-ratings were obtained following the taste-test and therefore were potentially influenced by alcohol consumption. Correlational analyses revealed significant relationships only for the post-interview anxiety and positive affect ratings with measures of alcohol consumption. No significant relationships emerged for the pre-interview ratings. When BAL was selected as a covariate in a 2 x 2 analysis of covariance (ANCOVA) for the post-interview analyses, the pattern of results remained the same: The most anxiety and least positive affect were reported by the high AS participants in anxiety-relevant condition. For clarity, the post-interview affect ratings are presented in Figure 4 without the covariate.

Figure 3. Pre-interview self-reported anxiety and positive affect (+SDs) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; *n* = 28) and question set (anxiety-relevant vs. anxiety-irrelevant).

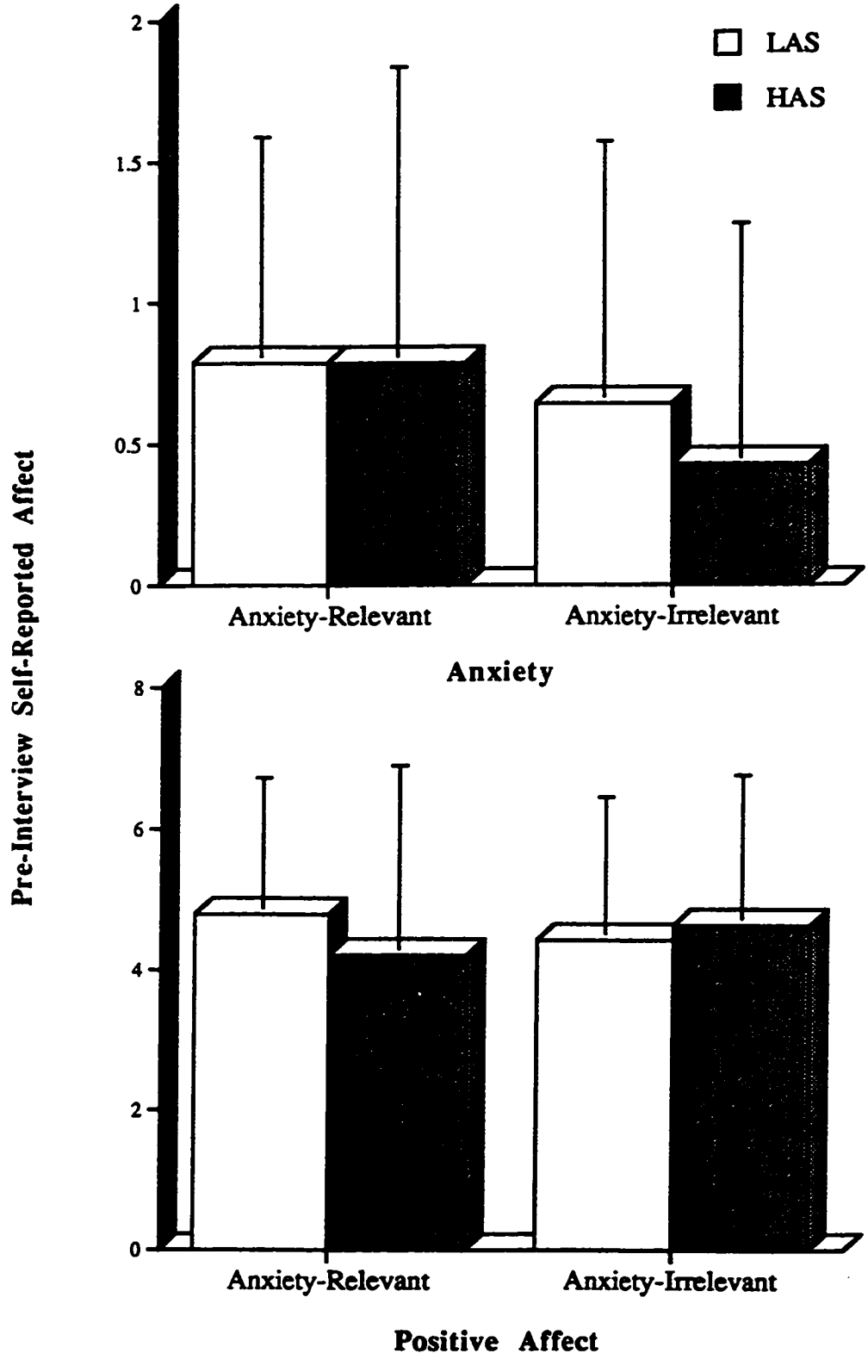
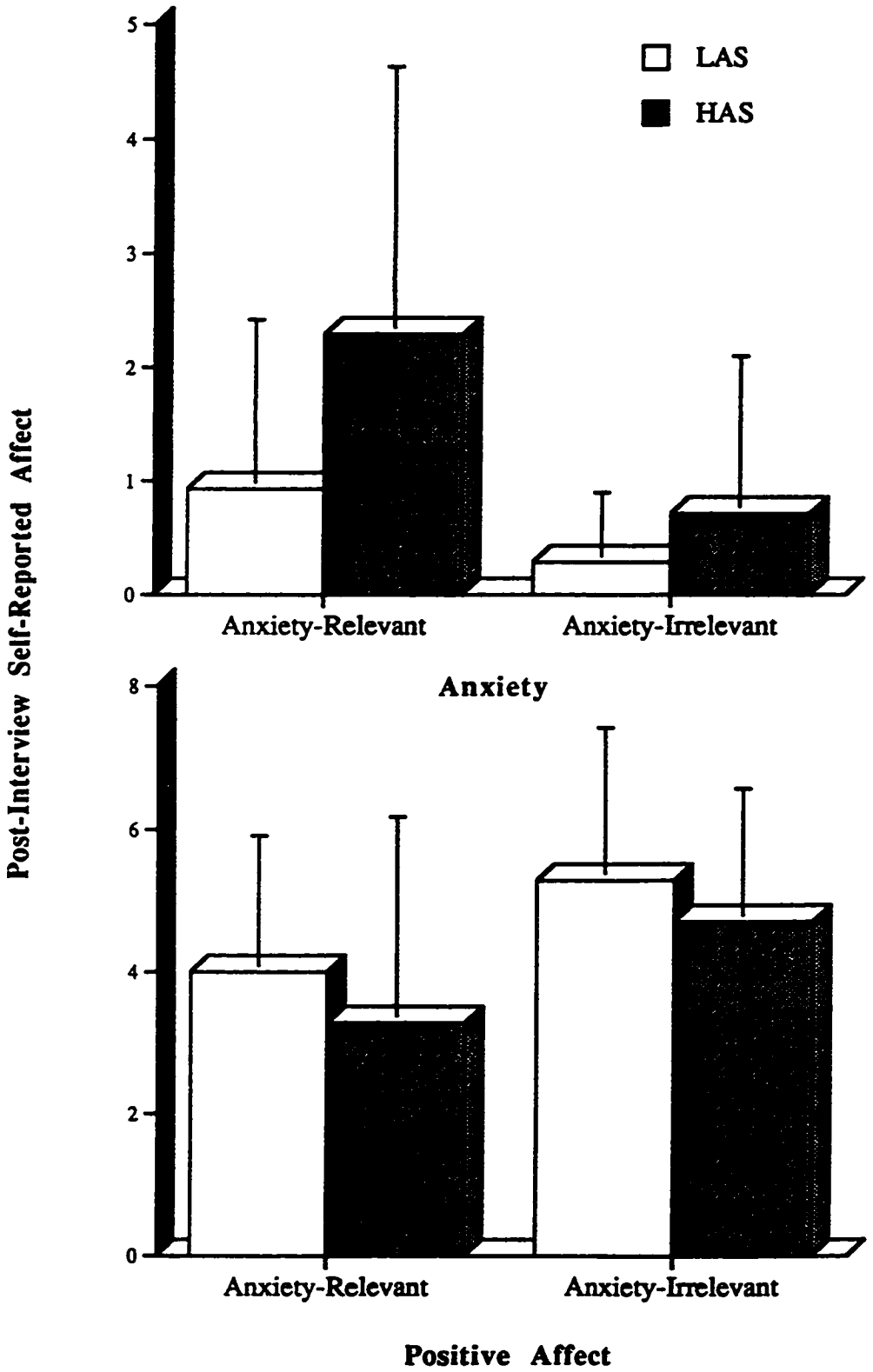


Figure 4. Post-interview self-reported anxiety and positive affect (+*SD*s) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; *n* = 28) and question set (anxiety-relevant vs. anxiety-irrelevant).



*Dependent Measures: Beverage Consumption Data*

Dependent measures of beverage consumption were mean alcoholic beverage consumption, nonalcoholic beverage consumption, and a BAL sample. The total amount of alcoholic beverage consumed (alcohol plus mixer, in ml) during the taste-rating task was calculated by subtracting the remaining beverage from the original 400 ml of each of the three alcoholic beverages provided to participants. This sum was divided by three to obtain a mean alcoholic beverage consumption for each participant. Nonalcoholic beverage consumption was calculated simply by subtracting the remaining orange juice from 400 ml. Use of a mean for the alcoholic beverage consumption measure permitted a relative comparison of alcoholic and nonalcoholic beverage consumption as both were thus placed on a 0 to 400 ml scale. Each measure of beverage consumption was subjected to a 2 x 2 (AS Group x Question Set) analysis of variance.[23]

*Beverage Consumption Analyses of Variance*

Alcoholic Beverage Consumption. The 2 x 2 (AS Group x Question Set) ANOVA for mean alcoholic beverage consumption (in ml) resulted in a significant interaction ($F(1, 52) = 4.26$, $p < .05$, $eta^2 = .08$), which is depicted in Figure 5.

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[23]The distribution of mean alcoholic beverage consumption, nonalcoholic beverage consumption, and BAL samples had skew and kurtosis values below 3.00, with the exception of nonalcoholic beverage consumption which had a kurtosis of 5.11. Given some deviation from normality and the heterogeneity of variances, significant drinking behaviour results were also analyzed using Mann Whitney U.

Given the significant interaction, simple main effects analyses were conducted. Simple main effects of AS group at each level of question set revealed that high AS participants consumed significantly more alcohol than low AS participants only when preparing to answer the anxiety-irrelevant questions ($F(1, 52) = 7.39$, $p < .01$, $eta^2 = .12$). The simple main effect of AS group failed to reach significance for the anxiety-relevant questions.[24] Simple main effects analysis of question set at each level of AS group revealed that high AS participants consumed significantly more alcohol when preparing to answer the anxiety-irrelevant versus anxiety-relevant questions ($F(1, 52) = 5.75$, $p = .01$, $eta^2 = .10$).[25] The simple main effect of question set failed to reach significance for low AS participants.

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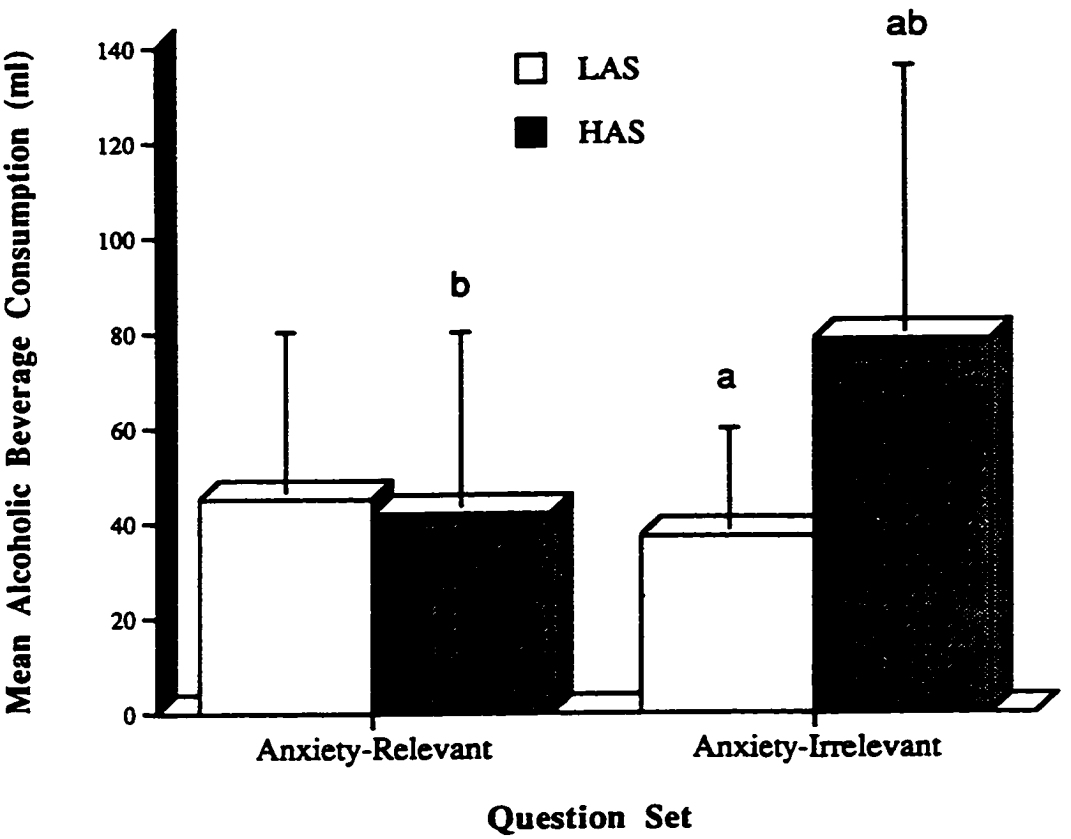
[24]Consistent with the parametric results, nonparametric analyses revealed that high AS participants consumed significantly more mean alcoholic beverage than low AS participants ($z = 2.18$, $p < .05$, 2-tailed), but only when anticipating the anxiety-irrelevant questions.

[25]Mann Whitney U results revealed only a marginal effect ($z = 1.91$, $p = .06$, 2-tailed).

Figure 5. Mean alcoholic beverage consumption (+SD) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; *n* = 28) and question set (anxiety-relevant vs. anxiety-irrelevant).




[a] $p < .01$

[b] $p = .01$

Blood Alcohol Level. The 2 x 2 (AS Group x Question Set) ANOVA of BAL samples revealed a marginally significant interaction ($F(1, 52) = 2.79$, $p = .10$, $eta^2 = .05$), and no significant main effects. The marginal interaction for BAL samples is depicted in Figure 6. Given the similarity of these results to those of mean alcoholic beverage consumption, simple main effects were analyzed. Simple main effects of AS group at each level of question set revealed that high AS participants had significantly higher BALs than low AS participants only under the anxiety-irrelevant condition ($F(1, 52) = 4.55$, $p < .05$, $eta^2 = .08$).[26] There were no other significant simple main effects.

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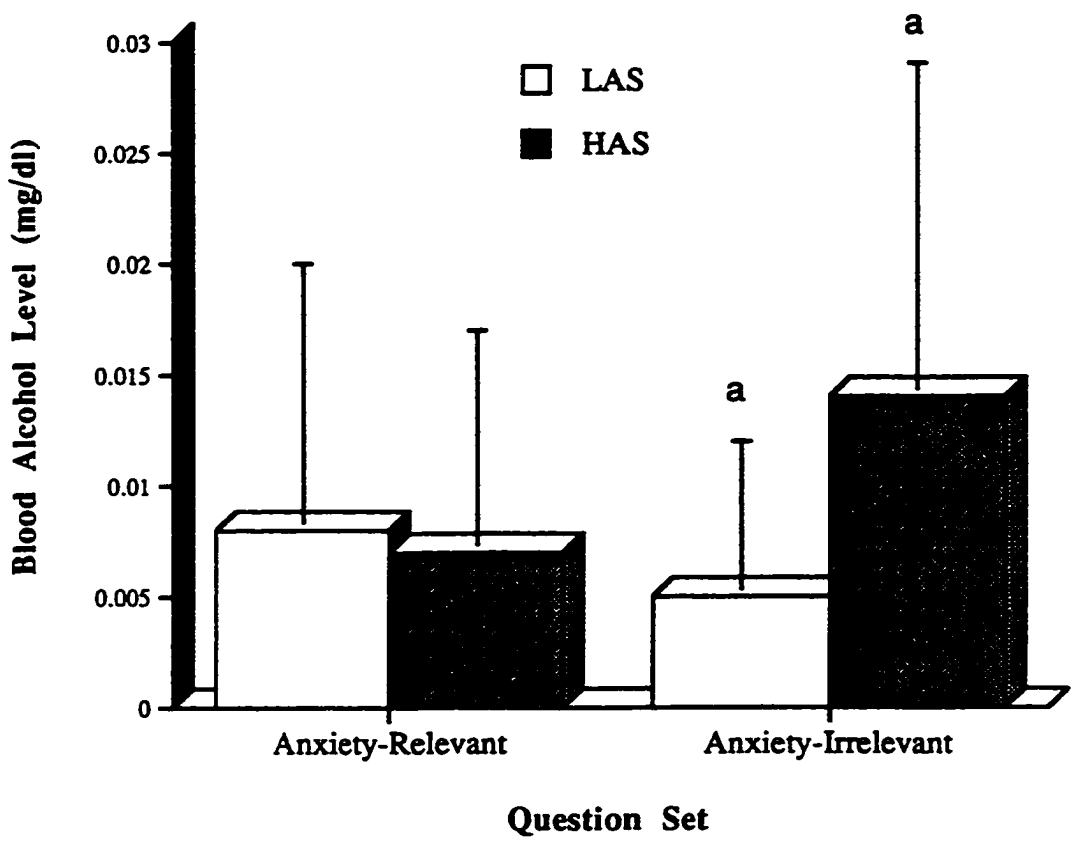
[26]Mann Whitney U revealed only a marginal result in which high AS participants tended to achieve significantly higher BALs than low AS participants ($z = 1.65$, $p < .10$, 2-tailed), but only when anticipating the anxiety-irrelevant questions.

Figure 6. Blood alcohol level (+SD) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; $n$ = 28) and question set (anxiety-relevant vs. anxiety-irrelevant).




a $p < .05$

Nonalcoholic Beverage Consumption. The interaction and AS group main effect in the 2 x 2 (AS Group x Question Set) ANOVA of nonalcoholic beverage consumption (in ml) failed to reach significance.[27] Means (and *SD*s) for the low AS versus high AS groups were 68.86 ml (65.59) and 86.55 ml (87.77), respectively. That these effects were not significant suggests that the effects of AS group on beverage consumption were specific to beverages containing alcohol. The main effect of question set was marginally significant ($F(1, 52) = 3.01$, $p < .10$, $eta^2 = .05$): Participants who responded to the anxiety-irrelevant question set tended to consume more orange juice than participants who responded to the anxiety-relevant question set (*M*s (and *SD*s) = 95.30 ml (95.20) vs. 60.12 ml (49.63).[28]

*Beverage Consumption Correlational Analyses*

Lilienfeld et al. (1993) suggested that dichotomization of the ASI for purposes of ANOVA markedly reduces statistical power (see also Cohen, 1983). Hence, Pearson correlations were used to examine, in a continuous fashion, the relationship between ASI scores and the dependent measures of beverage consumption for each question set.

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[27]Consistent with the parametric analyses, there were no significant differences between AS groups for either question set using Mann Whitney U.

[28]The main effect of question set failed to reach even marginal significance using Mann Whitney U ($z = 1.22$, $p = .22$, 2-tailed). More weight should be placed on the results using Mann Whitney U for nonalcoholic beverages since this was the variable with the distribution that deviated most markedly from normality.

Correlational matrices of ASI scores with the dependent variables of beverage consumption for each question set are presented in Tables 3a and 3b. A significant correlation emerged between ASI scores and mean alcoholic beverage consumption ($r$ = .46, $p$ < .05) but only in the anxiety-irrelevant condition (see Table 3b). The correlation between ASI scores and BAL samples was marginally significant for the anxiety-irrelevant condition. Correlations between ASI scores and nonalcoholic beverage consumption (orange juice consumption) were not significant in either the anxiety-relevant or anxiety-irrelevant condition. These results were consistent with those found using analysis of variance.

*Multiple Regression Analyses*

A series of stepwise multiple regressions were used to test whether AS was a better predictor of each measure of drinking behaviour than dysphoria (as measured using the BDI). The predictors of ASI scores and BDI scores were entered in a forward stepwise fashion. While ASI and BDI scores shared considerable variance in this study ($r$ = .62, $p$ < .001, for the total sample), BDI scores were not significantly correlated with beverage consumption measures for either experimental condition (see Tables 3a and 3b). Moreover, BDI scores failed to add significantly to the prediction of beverage consumption or BAL samples over that predicted by ASI scores and thus failed to enter the regression equations. Only ASI scores significantly

predicted mean alcoholic beverage consumption ($R^2$ = .21) and BAL samples ($R^2$ = .13), but only for participants in the anxiety-irrelevant condition. Neither ASI scores nor BDI scores significantly predicted nonalcoholic beverage consumption. Table 4 contains a summary of stepwise regression analyses for variables predicting drinking behaviour for the anxiety-irrelevant condition.

Table 3a

Correlational Matrix of Negative Temperament Measures and Beverage Consumption Variables in the Anxiety-Relevant Condition

| | Anxiety-Relevant Question Set ($n$ = 28) | | | | |
|---|---|---|---|---|---|
| | ASI | BDI | Alcohol | BAL | Nonalcohol |
| ASI Scores | --- | | | | |
| BDI Scores | .71*** | --- | | | |
| Mean Alcoholic Beverage Consumption | -.13 | -.12 | --- | | |
| BAL Samples | -.07 | -.00 | .92*** | --- | |
| Nonalcoholic Beverage Consumption | -.15 | -.03 | .67*** | .56** | --- |

*** $p < .001$. ** $p < .01$.

Table 3b

Correlational Matrix of Negative Temperament Measures and Beverage Consumption Variables in the Anxiety-Irrelevant Condition

| | Anxiety-Irrelevant Question Set ($n$ = 28) | | | | |
|---|---|---|---|---|---|
| | ASI | BDI | Alcohol | BAL | Nonalcohol |
| ASI Scores | --- | | | | |
| BDI Scores | .46* | --- | | | |
| Mean Alcoholic Beverage Consumption | .46* | .27 | --- | | |
| BAL Samples | .36† | .13 | .88*** | --- | |
| Nonalcoholic Beverage Consumption | .20 | .05 | .44* | .20 | --- |

*** $p < .001$. * $p < .05$. †$p < .10$.

Table 4

Summary of Statistical Stepwise Multiple Regression Analyses for Variables Predicting Drinking Behaviour for the Anxiety-Irrelevant Question Set

| | Step | B | SE B | $\beta$ | t | p |
|---|---|---|---|---|---|---|
| **Mean Alcoholic Beverage Consumption** | | | | | | |
| Constant | -- | 24.63 | 15.07 | | 1.63 | |
| ASI Scores | 1 | 1.63 | .62 | .46 | 2.62 | .01 |
| BDI Scores | -- | .08 | | | .40 | .69 |
| **BAL Samples** | | | | | | |
| Constant | -- | .00 | .00 | | .64 | |
| ASI Scores | 1 | .0003 | .0001 | .36 | 1.97 | .06 |
| BDI Scores | -- | -.04 | | | -.19 | .85 |
| **Nonalcoholic Beverage Consumption** | | | | | | |
| No variables entered for this block. | | | | | | |

## Discussion

Contrary to hypothesis, high AS participants did not consume more alcohol than low AS participants when anticipating questions about their experiences with anxiety. These results appear to contradict the primary findings of Study 1 in which AS levels were found to be positively associated with scores on the IDS-42 higher-order factor of negatively-reinforcing drinking situations and its lower-order factor of Unpleasant Emotions. These results also appear to contradict the findings of previous stress-induced drinking research which support the notion of alcohol use for tension-reduction (e.g., Miller et al., 1974), as well as the self-report findings which show coping with negative emotions to be a primary motive for drinking among high AS subjects (Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1996).

But these results must be considered in the context of the efficacy of the manipulation. Specifically, anticipation of the question sets failed to induce more anxiety in the high than in the low AS group, as depicted in Figure 3.[29] Based on the failure of the manipulation,

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[29]Alcohol consumption may have eliminated group differences in the anticipatory anxiety self-ratings due to placement of the anxiety checklist after rather than before the taste-rating task. But correlations between the pre-interview anxiety ratings and mean alcoholic beverage consumption ($r$ = -.03, ns) and between pre-interview anxiety ratings and BAL samples ($r$ = -.09, ns), as well as the pattern of alcohol consumption depicted in Figure 5, do not support this speculation.

differential ad-lib alcohol consumption on the subsequent taste-test would not be predicted. Hence, these results do not necessarily contradict previous self-report evidence in support of a positive relationship between high AS and alcohol consumption in potentially negatively-reinforcing drinking situations.

Research has shown that anticipatory stress measured by increased autonomic arousal is associated with increased alcohol consumption (Strickler et al., 1979), and high AS individuals have demonstrated increased autonomic arousal (i.e., electrodermal reactivity) to aversive stimulation when sober (Stewart & Pihl, 1994). It is possible that the anticipatory anxiety manipulation used in the present investigation may have been less intense or salient than manipulations such as carbon dioxide inhalation (Kushner, Rossovsky, et al., 1997) used in other investigations.

The inconsistent findings in human ad-lib alcohol research are partially attributable to variable efficacy of manipulations of negative affect (see review by Pihl & Smith, 1983). Participation in the anxiety-relevant interview has previously proven to be an effective differential stress-induction manipulation among high versus low AS participants (Maller & Reiss, 1987). Even within this study, analysis of post-interview anxiety ratings revealed that high AS participants who responded to the anxiety-relevant questions reported greater overall anxiety than their low AS counterparts. This suggests that

placement of the taste-test *after* the interview might be a more effective strategy for motivating increased alcohol consumption among high AS individuals. Indeed, this strategy would provide a test of the applicability of Volpicelli's (1987) endorphin-compensation theory to the drinking behaviour of high AS individuals. According to this theory, diminished stores of endogenous endorphins, which are naturally depleted after exposure to stress, can be compensated for via alcohol ingestion. Endorphin compensation thereby contributes to the reinforcing properties of alcohol consumption following stress (Volpicelli, 1987). Thus, in the present study, high AS individuals might have consumed more alcohol *following* rather than *anticipating* exposure to the stressful event of the anxiety-relevant interview (see also Pihl & Smith, 1983). This speculation remains to be tested in future research.

In direct opposition to our hypothesis, high AS individuals consumed significantly more alcohol than low AS individuals when anticipating the anxiety-irrelevant (control) questions. Since anticipation of the question sets was an ineffective "anxiety" manipulation, something other than subjective emotional arousal must account for these results. Perhaps the high AS, anxiety-irrelevant participants were simply characterized by a heavier drinking history. This is unlikely due to random assignment of high and low AS participants to question set conditions, as well

as the lack of a relationship between brief-MAST scores and AS status or experiment condition. Nevertheless, future research could further control for this possibility by including a drinking history questionnaire (e.g., Calahan & Cissin, 1968; Stewart, Peterson, & Pihl, 1995) as a control measure.

According to Lilienfeld's (1996) hierarchical model, AS is subsumed within a higher-order construct of negative temperament, which includes the constructs of trait anxiety and dysphoria. Only the additional construct of dysphoria as measured by the BDI was included as a control in the present study. The correlations among ASI and BDI scores (see Tables 3a and 3b) empirically support Lilienfeld's position regarding the conceptual similarity of these constructs (21% to 50% shared variance). This is consistent with findings that AS is elevated in major depression (Otto et al., 1995; Taylor et al., 1996). However, stepwise regression analyses indicated that only ASI scores significantly predicted alcohol consumption in the anxiety-irrelevant condition; BDI scores failed to add any additional information to the prediction of alcohol consumption in this condition. Hence, AS appears to be a better predictor of drinking behaviour than dysphoria.

Social-evaluative concerns specific to the feared social consequences of displaying anxiety are part of the AS construct, and AS overlaps with social anxiety (see Chapter One). A fear of being evaluated in a situation of reduced

control over self-presentation because of inebriation may be relevant to the present findings. One could speculate that high AS participants who are anticipating conversing about their experiences with anxiety would be more highly concerned with social evaluation than high AS participants who are anticipating conversing about the relatively neutral topics of their favourite foods and leisure activities. While social-evaluative concerns, per se, were not measured in this study, it might be argued that greater social-evaluation concerns (i.e., concerns over losing control in front of others) contributed to the suppression of high AS individuals' normally higher alcoholic beverage consumption when anticipating the emotionally-charged anxiety-relevant question set.[30]

This suppression explanation has precedence. Kushner, Rossovsky, et al. (1997) similarly argued that social-evaluative concerns of clinical high AS subjects (i.e., patients with panic disorder) may have suppressed their alcohol consumption when anticipating a carbon dioxide inhalation challenge task. This procedure commonly induces feared arousal-related sensations among high AS individuals (e.g., Holloway & McNally, 1987). In the present study, the suppression explanation could also account for the failure

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[30]Social-evaluative concerns can be measured directly using the Fear of Negative Evaluation Questionnaire (FNE: Watson & Friend, 1969) which includes such items as "I worry about what people will think of me even when I know it doesn't make any difference" and "I often worry that I will say or do the wrong things."

to find significantly greater alcohol consumption overall by the high AS participants, which was anticipated based on previous self-report research (e.g., Stewart, Peterson, & Pihl, 1995; Stewart & Zeitlin, 1995).

Another explanation for the unexpected results is that the anxiety-irrelevant question set may not have been a neutral or control condition as originally conceptualized. High AS individuals (e.g., panickers) differ from controls on certain aspects of interoceptive acuity (Barlow, 1988; Ehlers, 1993). For example, high AS individuals tend to focus attention towards bodily sensations (e.g., Holloway & McNally, 1987; Stewart, Achille, et al., 1992; Stewart, Achille, & Pihl, 1993; Stewart et al., 1998) and have an enhanced ability to detect internal bodily sensations related to anxiety (e.g., Ehlers, 1993; Sturges & Goetsch, 1996). Any factor influencing somatic perception may result in an attentional shift towards bodily symptoms in high AS individuals (Ehlers, 1993). Given the 4-hour period of food deprivation requirement for participation in this research, the anxiety-irrelevant question about favourite foods may have primed the more interoceptively aware high AS participants to attend to their hunger-related physical discomfort sensations. This speculation gives rise to two possible explanations for increased alcohol consumption by the high AS participants in the anxiety-irrelevant condition -- an appetitive argument and a modified tension-reduction argument.

According to an appetitive explanation, the high AS participants may have consumed more alcohol in the anxiety-irrelevant condition in order to assuage their hunger. But then the high AS individuals should have consumed greater quantities of both alcoholic and nonalcoholic beverages, as both forms of beverage could have contributed calories to reduce hunger. Moreover, this argument of the use of alcohol to assuage hunger is not consistent with animal research: Alcohol preference has been found to be unrelated to food availability in rats (Volpicelli & Ulm, 1989). Moreover, calories contributed by alcohol are not involved in human energy intake regulation. That is, individuals who are not alcoholic may choose to supplement their daily caloric intake with calories due to alcohol, but they do not tend to replace food with alcohol (De Castro & Orozco, 1990)

An alternative modified tension-reduction argument appears more likely. According to this argument, the high AS participants, who were primed to attend to uncomfortable hunger sensations when anticipating the "neutral" question about their favourite foods, may have increased their alcohol consumption because of their expectation of alcohol's physical discomfort-reducing properties.

There is conceptual and empirical support for this speculation. The AS construct includes distress about gastrointestinal sensations (Peterson & Reiss, 1992). Notably, 3 of the 16 ASI items reflect such concerns: "It embarrasses me when my stomach growls," "It scares me when I

am nauseous," and "When my stomach is upset, I worry that I might be seriously ill." Also, previous research has shown that alcohol consumption leads to greater endurance of discomfort (e.g., Petrie, 1978) and decreased ratings of discomfort (e.g., Stewart, Finn, & Pihl, 1995). Moreover, the results of Study 1 revealed that high AS individuals report drinking more frequently in situations involving physical discomfort than low AS individuals (see Table 1).

In the present study, the manipulation check for induced "tension" was restricted to the assessment of subjective emotional arousal as measured by way of anxiety ratings. The modified tension-reduction speculation provided above necessitates a more generic definition and measurement of tension as encompassing any unpleasant motivational state (Cappell & Greeley, 1987), including physical sensations arising from hunger. Perhaps scores on a measure of tension that includes subjective ratings of hunger and uncomfortable bodily sensations (cf., Grand, 1968; Stewart & Samoluk, 1995) would have been positively associated with alcohol consumption in the present study. Such a measure of subjective hunger ratings, following a manipulation of physical discomfort, is presented in Study 3 which was designed, in part, to clarify the unexpected findings of Study 2.

# CHAPTER FIVE: Study 3

## An Attentional Bias for Appetitive-Related Cues as a Function of Food Deprivation and Anxiety Sensitivity

### Introduction

In Study 2, high AS participants, who were food-deprived and anticipating an interview about their favourite foods and leisure activities (i.e., the anxiety-irrelevant condition) voluntarily consumed more alcohol than low AS participants anticipating the same interview. One possible explanation of this unexpected result is that, due to their enhanced awareness of their physical hunger symptoms, high AS participants anticipating questions about food preferences used the alcohol to assuage their experiences of physical discomfort arising from hunger.

This explanation is consonant with converging findings. First, high AS individuals tend to focus attention towards arousal-related bodily sensations (e.g., Holloway & McNally, 1987; Stewart, Achille, et al., 1992; Stewart, Achille, & Pihl, 1993; Stewart et al., 1998) and have an enhanced ability to perceive their own internal bodily sensations (e.g., Antony, Brown, Craske, Barlow, Mitchell, & Meadows, 1995; Ehlers, 1993; Ehlers & Breuer, 1992; Sturges & Goetsch, 1996). Second, fear of gastrointestinal sensations is characteristic of the construct of AS (e.g., ASI Item No. 7: "It embarrasses me when my stomach growls"). Third, alcohol is capable of reducing physical discomfort (Stewart,

Finn, & Pihl, 1995); indeed, alcohol was one of the first anesthetics (Petrie, 1978). Lastly, the results of Study 1 revealed that AS levels are positively associated with the reported frequency of drinking in response to situations involving physical discomfort (see Table 1).

The purpose of the present study was to explore further the link between experiences of physical discomfort and alcohol-related behaviour among high AS individuals. It was reasoned that, if high AS individuals use alcohol to cope with physical discomfort, then physical discomfort and alcohol consumption may be reliably associated in the memory networks of high AS individuals. Repeated use of alcohol in a particular situation (e.g., physical discomfort) can give rise to an association between that situation and alcohol use through classical conditioning (Ludwig, Wikler, & Stark, 1974). As a result, the experience of the conditioned antecedent state (physical discomfort) may evoke an expectation that alcohol is forthcoming (Ludwig, 1986). Thus, when cues of physical discomfort and alcohol have been repeatedly paired over time, then the experience of physical discomfort could lead to enhanced processing of alcohol cues (cf., Baker, Morse, & Sherman, 1987; Tiffany, 1990).

The hypothesized existence of a memory network linking physical discomfort and alcohol cues in high AS individuals arises from the spreading activation theory of semantic processing put forth by Collins and Loftus (1975). According to this theory, subjects will more readily name

"apple" rather than "red" when the category "fruit" is specified because apple and fruit are more closely associated in memory than red and fruit (Collins & Loftus, 1975). In the same vein, it is possible that physical discomfort and alcohol are closely associated in the memory networks of high AS individuals.

"Lexical priming" in support of the spreading activation theory (Collins & Loftus, 1975) has been demonstrated between alcohol and distress words among anxious alcoholics, who have a history of drinking in response to distress (Zack, Toneatto, & MacLeod, 1997). Zack and colleagues predicted that anxious problem drinkers should have a close memory association between alcohol and distress words, such that presentation of either type of stimulus readily primes the memory association for the other. Priming was measured as a faster speeded lexical decision of the target as a word or nonword following presentation of the associated stimuli, versus neutral stimuli, as a "prime." Zack et al. predicted that nonanxious problem drinkers would not display this priming effect. Consistent with the spreading activation theory and their hypotheses, Zack and colleagues found significant priming of distress targets (e.g., WORRY) when preceded by alcohol primes (e.g., DRINK), and of alcohol targets when preceded by distress primes, but only for anxious problem drinkers. This suggests that, because of frequent pairing of acute distress with alcohol consumption, anxious problem

drinkers have a reliable, closely linked memory association between alcohol and distress cues that is absent in nonanxious problem drinkers. In other words, exposure to distress cues leads to enhanced processing of alcohol cues in anxious problem drinkers, which in turn may facilitate their drinking in situations involving negative affect.

The modified version of the original Stroop (1935) task can be used as an alternative to the semantic priming task employed by Zack and colleagues (1997) in order to test for memory associations between alcohol and distress stimuli (McNally, 1995). On the modified Stroop task, a participant is slower to name the colour of ink in which a word is printed when that word is associated with concerns of particular relevance for that participant (Williams et al., 1996). For example, Mathews and MacLeod (1985) found that subjects with generalized anxiety disorder were slower to colour-name threatening words (e.g., *disease* and *injury*) than nonthreatening words (e.g., *relaxed* and *holiday*). Control participants showed no difference in colour-naming latency between the threatening versus nonthreatening words. Similarly, Stewart et al. (1998) found that, consistent with their anxiety-related concerns, high AS subjects were slower to name social and physical threat words (e.g., EMBARRASS, CRAZY, SUFFOCATED) relative to no-threat control words, as compared to low AS subjects.

Interference (i.e., slower colour-naming for experimental versus control stimuli) to certain types of

information on the modified Stroop task is specific to particular clinical conditions (Williams et al., 1996; also see General Introduction, page. 36). For example, combat veterans with posttraumatic stress disorder took significantly longer to colour-name trauma words (e.g., BODYBAGS, FIREFIGHT, and CHARLIE) than normal controls (McNally, Kaspi, Riemann, & Zeitlin, 1990). Similarly, Hope et al. (1990) found that individuals with social phobia showed Stroop interference only for social threat words (e.g., EMBARRASSED, CRITICIZED), whereas individuals with panic disorder showed Stroop interference only for physical threat words (e.g., AMBULANCE, COFFIN).

A few researchers have also studied attentional bias for alcohol-related cues in alcoholic males. For example, Cox and Blount (1995) found that inpatient alcohol-dependent males were significantly slower to colour-name alcohol-related words (e.g., LIQUOR, VODKA, and PINT) than control subjects. Johnsen, Laberg, and Thayer (1995) also found a selective processing of alcohol words by current alcoholics on the modified Stroop.

In studies of spreading activation, the prime is a word used to activate the associative network (e.g., Zack et al., 1997). When using the modified Stroop paradigm, the associative memory network can be primed experimentally through exposure to the conditioned antecedent state, such as physical discomfort, that is theoretically an aspect of the associative network. For example, McNally, Riemann,

Louro, Lukach, and Kim (1992) attempted to prime the threat networks of panic disorder patients by requiring them to pedal a stationary bike at a set speed for five minutes to induce physical arousal. Subjects in the nonarousal control group simply sat on the bike for five minutes. McNally et al. (1992) predicted that, if representations of physiological arousal and threat are linked in memory for panic disorder patients, then physical exercise should increase Stroop interference for threat words in panic disorder patients. Panic disorder patients showed selective processing of threat cues relative to controls. Unexpectedly, arousal did not enhance interference for threat words. The authors attributed this finding, in part, to the use of an obvious source of arousal.

In the present study, the modified Stroop task was used to test the speculation that high AS participants may have developed a strong association in memory between physical discomfort and alcohol consumption due to their situation-specific drinking history (see Study 1). Food deprivation was used to induce physical discomfort, specifically the anxiety-related sensations (such as gastrointestinal distress) feared by high AS individuals. This biological challenge was designed to be less obvious than having subjects ride a stationary bike as used in McNally et al. (1992).

Participants were randomly assigned to a condition of induced physical discomfort (operationalized as food

deprivation) or a control condition, such that the two groups were matched for ASI scores. To explain the results of Study 2, it was speculated that an awareness of physical discomfort arising from hunger was primed via anticipation of the food preferences question.[31] This may have activated high AS individuals' memory association between physical discomfort and alcohol, which in turn prompted high AS participants to drink more alcohol in Study 2. Given this speculation, it was hypothesized that in the present study ASI scores would be positively correlated with the degree of alcohol-related interference on the modified Stroop task but only under the condition of induced physical discomfort as provoked by six hours of food deprivation. It was also hypothesized that the association with ASI scores would be specific to alcohol-related cues, not food-related cues, which were included as an appetitive control.

According to Lilienfeld's (1996) hierarchical model, AS and trait anxiety are subsumed under the broader latent construct of negative temperament. Trait anxiety refers to a general tendency to respond anxiously to a wide range of stressors. In comparison, AS is more narrowly defined as a fear of anxious sensations and behaviours (Reiss, 1997), including distress about one's stomach growling (Peterson & Reiss, 1992). Thus, it was predicted that ASI and trait

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[31]Prior to participation in the ad-lib alcohol consumption studies, all subjects were required to fast for a 4-hour period before coming into the lab (see Study 2).

anxiety scores would be significantly positively correlated, but that ASI scores would be a better predictor than trait anxiety scores of an attentional bias for alcohol cues under conditions of induced physical discomfort.

## Method

### *Participants*

Thirty-two students enrolled in a third year undergraduate research methods course served as research participants to complete 2% of their total course requirements.[32] Participants were randomly assigned to either an induced physical discomfort condition or the alternative control condition of non-food-deprivation such that the two groups were matched for AS levels.

Participants were provided with written instructions detailing how much and when they were to eat on the day of testing. The induced physical-discomfort group ($n$ = 17) was instructed to eat a small breakfast defined by example as a plain bagel or a small bowl of cereal and some coffee, and they were asked to refrain from eating anything else until after testing. The control group ($n$ = 15) was instructed to eat an average size breakfast defined by example as a bagel with cream cheese or a bowl of cereal with a banana and

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[32]Students enrolled in this course were given the option of writing a two-page paper on the topic of the use of the modified Stoop paradigm in clinical psychology in order to meet the 2% course requirement. In this way, the paper was intended as an equitable alternative activity in order to prevent coercion of the students to participate in this study. All those invited to participate did so; none chose the alternative activity.

toast with coffee, and they were also asked to eat an average size lunch, defined by example as a sub and pop, one hour prior to testing. All participants were instructed to eat their assigned breakfast 5-1/2 hours prior to the scheduled lab time.

*Materials*

Anxiety-Related Variables. AS levels were measured using the Anxiety Sensitivity Index (Peterson & Reiss, 1992). Trait anxiety was measured using the trait subscale of the State-Trait Anxiety Inventory (STAI-T: Spielberger et al., 1983) which is also known as the Self-Evaluation Questionnaire.

Trait anxiety is measured on the STAI-T by 20 short descriptive statements (e.g., "I feel nervous and restless;" "I lack self-confidence") to which respondents indicate the intensity of how they *generally feel* using a 4-point Likert rating scale of *almost never* to *almost always* (Spielberger et al., 1983). Trait anxiety refers to an enduring individual difference variable of anxiety-proneness such that a high trait-anxious individual frequently experiences anxiety in response to a wide range of potentially stressful situations (Spielberger et al.). While conceptually similar, trait anxiety differs from AS. Trait anxiety refers to a propensity to respond fearfully to stressors in general; AS refers to a propensity to respond fearfully to anxiety symptoms specifically (McNally, 1990; see also Chapter One for further elaboration of this distinction).

The STAI-T has excellent psychometric properties (see Anastasi, 1988, for a review).

Demographic and Control Variables. Participants provided the same demographic information as obtained in the previous studies (i.e., age, gender, year of university enrollment, salary of family of origin, and for women, usage of oral contraceptives, and starting date since last menstrual period) with the addition of a drinking history questionnaire, which is presented in Appendix C. To assess drinking history, participants indicated their typical frequency of drinking occasions per week, and their typical quantity of alcohol (in drink equivalents) consumed per drinking occasion (cf., Calahan & Cisin, 1968; Stewart, Peterson, & Pihl, 1995). These quantity and frequency measures were multiplied to yield typical number of alcoholic beverages consumed per week for each subject (Stewart, Peterson, & Pihl, 1995).

Participants also completed several indices of hunger and the Shipley (1940) vocabulary scale. First, participants were required to list the foods they had eaten and when the foods were consumed on the day of testing. This was designed to ensure that participants in the induced physical discomfort and control conditions had adhered to their respective set of written instructions detailing when and how much to eat prior to the experiment. Second, participants also completed a composite hunger measure which

included the following three indices adapted from Grand (1968):

1. Current time, and time since respondent last ate, were estimated to the nearest 15 minutes.

2. Subjective hunger was self-rated on a scale from 1 (not at all hungry) to 7 (extremely hungry).

3. The estimated amount of a favourite food that the participant would be able to eat, *right now at this moment*, was self-rated from 1 (none at all) to 7 (as much as I could get).

The composite hunger measure also included an author-compiled self-rating of the following hunger sensations on a scale of 1 (not at all) to 7 (extremely): nauseous, stomach growling, fatigued, burning in stomach, lightheaded, irritable, and stomach pains/stomach cramps. The sum of the seven ratings provided a index of intensity of hunger sensations; the higher the score, the greater the intensity of hunger. An evaluation of the psychometric properties of the composite hunger measure can be found in Stewart and Samoluk (1995; also see Samoluk & Stewart, 1996).

The Shipley (1940) vocabulary scale is a 40-item multiple-choice vocabulary test. Respondents simply choose one of four words which means the *same thing*, or *most nearly the same thing*, as the base word. This measure was included as an estimate of verbal knowledge which is common practice in Stroop studies (e.g., Hope et al., 1990).

The Modified Stroop. The colour-naming task consisted of alcohol (e.g., VODKA, CHAMPAGNE, RUM), food (e.g., HONEY, PASTRIES, PRETZELS), and leisure (e.g., SKIING, CHECKERS, MONOPOLY) word sets. Each set contained 20 words and, sets were matched for word length and frequency using Carroll, Davies, and Richman's (1971) norms. The food words were drawn from a list of high-calorie foods (Knight & Boland, 1989) to approximately match the alcohol cue list for caloric content. The alcohol and leisure word sets were author complied. The neutral category of leisure words consisted of words from a single sematic category as recommended by Green and Rogers (1993) and Francis et al. (1997). All three word sets were pre-tested by 6 young adult independent judges (all of whom had experience in alcohol misuse and/or eating disorders research) who rated the words on 0 to 5 point scales for relevancy to food, alcohol, and leisure categories, respectively. A word was considered to be an appropriate stimulus if its mean relevancy rating was 3 or greater for its pre-selected category, with a relevancy rating of less than 3 for the remaining two categories. Words that were rated as relevant to more than one category were eliminated and replaced.

A practice word set for use in the Stroop task consisted of five neutral words (once, interval, often, heavy, and desk; Hope et al., 1990). All five practice words were rated as not relevant to either the food, alcohol, or leisure categories.

The food, alcohol, and leisure word sets were presented on separate 8 1/2 x 11 inch sheets of white paper. Each sheet contained 100 items formed by 1/8 in. capital letters and arranged in 20 rows of 5 items each. Each item was presented five times for each word set, once in each colour of pink, blue, black, brown, and green. The stimuli were presented randomly on the sheet of paper, with the exceptions that the same word or colour did not appear in succession either vertically or horizontally and no word or colour appeared more than twice on the same row. The practice set was identical to the other sets except each of the 5 practice words was presented only 10 times (twice in each colour) for a total of 50 words.

*Procedure*

Prior to the day of testing, the experimenter advised the participants that the purpose of the study was to assess the effects of food deprivation on information processing. The volunteers then provided their written informed consent. Participants were unaware that physical discomfort in the form of food-deprivation was being used as a biological challenge with theoretical relevance to AS. The ASI (Peterson & Reiss, 1992) was completed approximately one month prior to testing in order to match the two groups for ASI scores. Written instructions were provided to both groups of students detailing how much and when they were to eat on the day of testing in accord with their assigned condition.

Upon arrival in the lab on the day of testing all participants provided demographic information. They also completed the STAI-T (Spielberger et al., 1983), the Shipley (1939) vocabulary scale, and the composite hunger measure described previously.

On the day of testing, the course instructor introduced the colour-naming task simultaneously to all participants by presenting the practice word set on an overhead. The participants were instructed to name out loud, from left to right, and as quickly and as accurately as possible, the colour of ink in which each word was printed, while ignoring the meaning of the word. Subsequently, each student was tested individually, by one of four examiners, using the same instruction set.[33] The presentation order of the food, alcohol, and leisure categories was counterbalanced across subjects to control for differential order effects.

Following completion of the colour-naming task, the participants were briefly excused to get something to eat. Then participants were fully debriefed regarding the purpose, design, and hypotheses of this study for pedagogical and ethical purposes.

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[33]The four examiners were pretrained simultaneously with one subject in order to establish acceptable levels of interrater reliability.

## Results

### *Demographic/Control Variables*

Participants averaged 21.78 years of age, ranging from 20 to 29 years. They had completed an average of 3.5 years of university and the mean income of their family of origin was approximately $55 thousand Canadian per year. They reported drinking an average of 2.36 (*SD* = 2.06) drinks a week. The overall sample had a mean Shipley (1939) vocabulary score of 32.62 (*SD* = 3.24). Sample ASI (Peterson & Reiss, 1992) and trait anxiety scores (Spielberger et al., 1983) are similar to university student norms, with a mean ASI score of 17.06 (*SD* = 7.83) and a mean trait anxiety score of 39.06 (*SD* = 9.56). A series of one-way ANOVAs performed on these demographic and control variables indicated that the induced physical discomfort and the control conditions were statistically matched for age, education, family salary, drinking history, vocabulary, ASI scores, and trait anxiety scores.

The induced physical discomfort group consisted of 14 women and 3 men; the control group consisted of 11 women and 4 men. This slight imbalance in gender across groups was not statistically significant using chi-square analysis.

### *Interrater Reliability*

Four examiners were trained in administration of the Stroop prior to their testing of the research participants. To check on their reliability, the examiners recorded the speed of colour naming on six practice trials. None of the

intercorrelations among the examiners was less than .99 (all *ps* < .0001) showing excellent interrater reliability.

*Manipulation Check*

When questioned about what they had eaten and when, all but two of the participants confirmed that they had adhered to their assigned eating instructions. The two had followed the opposite instructions by mistake, and their data were subsequently assigned to the appropriate condition.

The composite hunger measure provided an additional manipulation check. A series of one-way ANOVAs showed that, as planned, participants in the induced physical discomfort group were experiencing more physical discomfort overall. These participants reported greater subjective hunger ratings ($F(1, 30) = 57.47$, $p < .001$, $eta^2 = .66$), desire for a greater amount of their favourite food ($F(1, 30) = 16.95$, $p < .001$, $eta^2 = .36$), more time having elapsed since their last meal ($F(1, 30) = 460.88$, $p < .001$, $eta^2 = .94$), and a greater intensity of physical hunger sensations ($F(1, 30) = 13.16$, $p = .001$, $eta^2 = .30$). Table 5 contains the means and standard deviations for these hunger indices as a function of experimental condition.

Table 5

Hunger Indices for the Induced Physical Discomfort and Control Groups

| Hunger Indices | Induced Physical Discomfort Participants (n = 17) | | Control Group (*n* = 15) | |
|---|---|---|---|---|
| | M | SD | M | SD |
| Subjective Hunger Rating | 4.47 | 1.23 | 1.73 | 0.70 |
| Amount of Favourite Food Desired | 4.41 | 0.87 | 3.00 | 1.07 |
| Time Elapsed (in min) Since Last Meal | 356.47 | 24.98 | 115.33 | 37.96 |
| Rating of Intensity of Hunger Sensations | 17.88 | 6.65 | 10.53 | 4.42 |

*Note.* The two groups are significantly different across all food indices at $p \leq .001$.

*Colour-Naming Speed*

A one-way ANOVA was used to examine differences in baseline colour-naming speed of the leisure control words across the physical discomfort and control groups. Analysis of colour-naming speed resulted in no significant effects: Induced physical discomfort participants were no slower or faster in overall baseline colour-naming speed ($F(1, 30) = 1.98$, ns) than control participants (*M*s (and *SD*s) = 78.76 (10.92) vs. 72.47 (14.34) seconds, respectively). The amount of short-term food deprivation required of the physical discomfort participants was no more likely to result in an attentional bias for alcohol or food words relative to control condition participants (Stewart & Samoluk, 1997).[34]

*Correlational Analyses*

An interference index was calculated for both the alcohol and food words. For each participant the colour-naming speed for the leisure control card was subtracted from that for the alcohol card, and the colour-naming speed for the leisure control card was subtracted from that for the food card (cf., McNally, English, & Lipke, 1993; Stewart et al., 1998). Larger interference index scores indicate greater degrees of selective processing of alcohol and food cues relative to the leisure control words.

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[34]This main effect of food deprivation condition was not central to the current study and is thus discussed in detail only elsewhere (Stewart & Samoluk, 1997).

The interference indices were correlated with ASI and STAI-T scores for each experimental condition (see Table 6). For the induced physical discomfort condition, ASI scores were significantly positively correlated with the degree of selective processing of alcohol cues as expected ($r$ = .43, $p$ < .05, 1-tailed). When the intensity of physical hunger sensations was controlled, this same correlation was only marginally significant ($r$ = .38, $p$ < .10, 1-tailed). This suggests that perceived symptoms of physical discomfort partially mediated the association between ASI scores and selective processing of alcohol cues on the modified Stroop task in the physical discomfort condition. Trait anxiety (STAI-T) scores were not significantly related to the degree of selective processing of alcohol cues for the induced physical discomfort condition although the relationship tended to be positive (see Table 6).

Unexpectedly, ASI scores were similarly positively correlated with the degree of selective processing of food cues in the induced physical discomfort condition ($r$ = .46, $p$ < .10, 2-tailed). Although the correlation was only marginally significant using a two-tailed test (consistent with the hypotheses), the magnitudes of association between ASI scores and food-related interference and ASI scores and alcohol-related interference were similar. The correlation of ASI scores with food-related interference was reduced to nonsignificance ($r$ = .40, ns, 2-tailed) when the intensity of physical hunger sensations was controlled. This suggests

that perceived symptoms of physical discomfort partially explains the covariance between ASI scores and food-related interference in the physical discomfort condition. STAI-T scores were not significantly correlated with food-related interference for the induced physical discomfort group (see Table 6).

For the control group, ASI scores and STAI-T scores were not significantly correlated with the selective processing of either alcohol or food cues on the Stroop task (see Table 6). However, the magnitudes of the correlations between trait anxiety scores and alcohol-related interference scores for both the control and physical discomfort groups were similar to the magnitudes of the correlations obtained between ASI scores and alcohol- and food-related interference scores in the induced physical discomfort group.

*Multiple Regression*

ASI and STAI-T scores were not significantly correlated for the overall sample. However, their correlation of .12 falls within the range of shared variance between AS and trait anxiety of 0 to 36% reported by Peterson & Reiss (1992). ASI and STAI-T scores were used as predictors of alcohol- and food-related interference scores, and were entered in a forward stepwise fashion in a set of multiple regressions. Only ASI scores significantly predicted alcohol-related interference scores for the physical discomfort group using multiple regression ($R^2$ = .18).

STAI-T scores did not enhance prediction of alcohol-related interference for the physical discomfort condition, and thus failed to enter the regression equation. Consistent with the correlational analyses presented in Table 5, ASI scores also tended to predict food-related interference ($R^2$ = .21). However, once again, STAI-T scores did not enhance prediction of food-related interference for the physical discomfort condition, and thus failed to enter the regression equation. As expected, neither ASI nor STAI-T scores significantly predicted alcohol- or food-related interference scores for the control group. Table 7 illustrates the results of the regression analyses for the physical discomfort group.

Table 6

Correlational Matrix of Anxiety Scores with Interference Indices

| | Induced Physical Discomfort Participants ($n$ = 17) | | Control Group ($n$ = 15) | |
|---|---|---|---|---|
| Interference Indices | ASI Scores | Trait Scores | ASI Scores | Trait Scores |
| Alcohol-Related | .43** | .32 | .08 | .43 |
| Food-Related | .46* | .24 | .33 | .12 |

Note. Consistent with the hypotheses, all other correlations were nonsignificant at $p \geq .10$, 2-tailed, with the exception of the correlation between ASI scores and alcohol-related interference scores.

** $p < .05$, 1-tailed.

* $p < .10$, 2-tailed.

Table 7

Summary of Statistical Stepwise Regression Analyses for Variables Predicting Stroop Interference for the Induced Physical Discomfort Group

| | Step | B | SE B | $\beta$ | t | p |
|---|---|---|---|---|---|---|
| **Alcohol-Related Interference Scores** | | | | | | |
| Constant | | -3.37 | 3.49 | | -.97 | |
| ASI Scores | 1 | .37 | .20 | .43 | 1.83 | .04[a] |
| Trait Anxiety Score | -- | .35 | | | 1.54 | .15 |
| **Food-Related Interference Scores** | | | | | | |
| Constant | | -2.45 | 2.66 | | -.92 | |
| ASI Scores | 1 | .31 | .15 | .46 | 2.01 | .06 |
| Trait Anxiety Scores | -- | .27 | | | 1.20 | .25 |

Note. Trait Anxiety Scores did not contribute significant independent variance to the prediction of alcohol- or food-related interferences scores.

[a]Consistent with the hypothesis, this probability level is one-tailed.

## Discussion

AS levels were significantly positively correlated with the selective processing of alcohol cues only for the physical discomfort participants. This result provides preliminary evidence that the experience of physical discomfort (in the form of six hours of food deprivation) may prime high AS individuals to selectively attend to alcohol cues. This selective attention suggests that physical discomfort cues may be an internal stimulus which, when experienced, activates alcohol cues in the memory of high AS individuals. The activation of memories related to alcohol could then arguably promote alcohol seeking and consumption behaviour among high AS individuals (Baker et al., 1987; Tiffany, 1990). This would occur when alcohol consumption and anxiety-related physical sensations have been repeatedly paired, such that activation of memory for anxiety-related physical discomfort (e.g., distress due to hunger sensations) activates a memory network for alcohol (e.g., bar, scotch, rum & coke), which in turn promotes alcohol consumption (Baker et al., 1987; Tiffany, 1990).

The results of Study 1 provide additional evidence of an association between physical discomfort and alcohol-related behaviour for high AS individuals: High AS subjects self-reported drinking more frequently in situations involving physical discomfort as measured using the IDS-42 (see Study 1). Thus, the association in memory between physical discomfort and alcohol might explain the results of

Study 2 in which high AS individuals voluntarily consumed more alcohol when anticipating the anxiety-irrelevant question set (i.e., including questions about favourite foods) as compared to the anxiety-relevant question set. Specifically, memory for physical discomfort might have been inadvertently activated by way of the four-hour fasting requirement and thinking about favourite foods. Then because of repeated pairing of alcohol and physical discomfort in high AS individuals, priming of memories related to physical discomfort led to activation of memories for alcohol in high AS individuals which in turn resulted in greater alcohol consumption (Tiffany, 1990).

Contrary to more traditional urge models (e.g., Baker et al., 1987), Tiffany (1990) would assert that the greater alcohol consumption of the high AS subjects in Study 2 could have occurred as an "automatized" behaviour (i.e., a behaviour occurring without the necessity of conscious thoughts). As an analogy, after eating, an experienced smoker might *efficiently, absentmindedly, effortlessly, and without awareness* light up a cigarette in a nonsmoking section because of an automatic memory connection between the end of a meal and smoking. In the same way, physical discomfort might prime alcohol seeking and consumption as automatized behaviours in experienced high AS drinkers (Tiffany, 1990). According to Tiffany's (1990) theory, a conscious urge or craving for alcohol would not be necessary for the use of alcohol to follow from the experience of

physical discomfort among high AS individuals. Alternatively, Baker et al. (1987) would argue that activation of memories for alcohol triggered by physical discomfort would result in a perceived urge for alcohol among high AS individuals which in turn would initiate alcohol use. This would occur by way of classical conditioning: Physical discomfort repeatedly paired with alcohol begins to elicit urges, such that an urge for alcohol becomes a conditioned response to physical discomfort (i.e., a "cue-elicited urge to drink"; Baker et al.).

Study 2 did not include a measure of self-reported urges and cravings (see Rankin, Hodgson, & Stockwell, 1979) which would allow for relative evaluation of these two theories as applied to the present findings. However, given that the Stroop reflects relatively automatic processing (see McNally, 1995), the present findings appear to be most consistent with Tiffany's (1990) cognitive theory of drug use and misuse as applied to the drinking of high AS individuals. It might be interesting, however, to compare the present supraliminal emotional Stroop task results to those obtained using a subliminal version of the same task

(e.g., Mogg, Bradley, Williams, & Mathews, 1993).[35] If the same results were obtained when the subjects were unaware of the semantic content of the alcohol words, this would provide additional support for an automatic processing bias for alcohol cues following from the experience of physical discomfort in high AS subjects.

Unexpectedly, the association between AS levels and a selective processing bias under conditions of physical discomfort was not specific to alcohol-related cues. Although the correlation between ASI scores and food-related interference (the appetitive control condition) was marginal given the nondirectional hypothesis, it was of the same magnitude as the significant correlation between ASI scores and alcohol-related interference. This result suggests the possibility that AS may serve as a motivational factor to engage in any appetitive behaviour (whether food or alcohol consumption) to provide relief from physical discomfort arising specifically from hunger.

The significant correlations between AS levels and the attentional biases was reduced to marginal for alcohol cues and nonsignificance for food-cues when the self-reported intensity of hunger sensations was partialled out. Even

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[35]In the subliminal Stroop task, the stimulus word and colour background are presented for approximately 1 ms. Then a mask is presented of white, uppercase letters over the stimulus word, but with the colour background remaining. In this way, subjects' preattentive processing of the stimulus word is tested while they are still able to perform the colour-naming task (Mogg et al., 1993).

though the magnitudes of the decreases were relatively small (.43 to .38 for alcohol, and .46 to .40 for food), these relationships between AS and selective attention to alcohol and food, when experiencing physical discomfort, appear to be at least partially mediated by the perceived intensity of physical discomfort. The greater perceived physical discomfort of high AS individuals when experiencing hunger could arise from their greater interoceptive acuity of bodily sensations (i.e., they are simply more aware of their hunger), catastrophizing about relatively low levels of physical discomfort, and/or biological differences in reactivity to hunger. In any event, clearly factors other than physical discomfort mediated these relationships with ASI because there was only a relatively small decrease in the correlations with ASI when the intensity of physical hunger sensations was controlled. In addition to physical discomfort due to hunger, perhaps other factors, such as negative affect (e.g., worry about having missed lunch) mediated the relationship between AS and the attentional biases for alcohol and food cues in the physical discomfort condition. There is some support for this speculation given that high AS individuals report drinking more frequently in negative affect situations (see Study 1). Unfortunately, this speculation cannot be tested because mood was not assessed in the present study. This alternative interpretation highlights the need to include measures of

affect, cognition (e.g., catastrophization), and physical sensations in AS research.

The magnitude of the correlation between trait anxiety scores and alcohol-related interference scores deserves mention. It appears that trait anxiety was marginally related to an attentional bias for alcohol cues. This is consistent with McNally's (1996) speculation that anxiety-proneness should be related to the use of alcohol. It should be noted, however, that trait anxiety did not add to the prediction of alcohol- or food-related interference over and above that provided by ASI scores in the stepwise multiple regressions. This result is strengthened by the fact that AS levels, measured one month prior to the experiment, were a better predictor of attentional biases to alcohol cues than trait anxiety levels measured on the day of testing. Notably, STAI-T scores lacked the situational specificity of ASI scores in that the magnitude of the correlations between STAI-T scores and alcohol-related interference was similar in both the physical discomfort group and control group.

This study was conducted on a relatively small sample. Hence, the conclusion that AS may serve as a motivator to attend to alcohol cues and ultimately consume alcohol, when primed by way of physical discomfort (i.e., a small period of food-deprivation), should be considered preliminary and remains to be replicated. Also, future researchers may wish to explore whether the above findings generalize to other

arousal-related bodily sensations feared by high AS individuals. Feared sensations which have been induced in the lab among high AS individuals include dizziness caused by hyperventilation (Baker et al., 1997; Rapee & Medoro, 1994), racing heart caused by riding a stationary exercise bike (McNally et al., 1992), and breathlessness caused by the inhalation of carbon dioxide (McNally & Eke, 1996). For example, the results of this study might be compared to another investigation in which physical discomfort was engendered by dizziness rather than food-deprivation. In this manipulation, subjects in the induced physical discomfort group would be required to hyperventilate. Then both physical discomfort and control subjects would be required to participate in the modified Stroop task. In this experiment, I would predict that ASI scores would be related to an attentional bias for alcohol words, but not food words, because food would not be an effective strategy for dampening physical discomfort induced by dizziness in high AS subjects. In contrast, alcohol does dampen dizziness in response to hyperventilation (Baker et al., 1997).

# CHAPTER SIX: Study 4

# Anxiety Sensitivity and Social Affiliation as Determinants of Alcohol Consumption

## Introduction

The results of Study 1 revealed that AS levels were significantly correlated with reports of drinking more in negatively-reinforcing drinking situations and temptations drinking situations. AS levels were not significantly correlated with drinking in positively-reinforcing situations. These findings are consonant with emerging evidence that demonstrates an important link between AS and a risky style of drinking (see review by Stewart et al., in press). Drinking in aversive situations (e.g., unpleasant emotions, physical discomfort) does not necessitate the presence of others. Solitary drinking is considered to be problematic because it is more highly associated with excessive alcohol use and alcohol-related problems than social drinking (Cooper et al., 1992).

Coping and social-affiliative reasons for alcohol consumption have been investigated using the validated Drinking Motives Questionnaire (DMQ: Cooper et al., 1992; Stewart et al., 1996). Coping-motivated drinking refers to the use of alcohol for negative reinforcement, that is, to avoid or reduce negative emotional states such as anxiety and depression (Cooper, 1994; Cooper et al., 1992). In contrast, socially-motivated drinking refers to the use of

alcohol for positive reinforcement (e.g., to increase social affiliation; Cooper, 1994; Cooper et al., 1992) and arises from situations involving other people (Cox & Klinger, 1988). Social-affiliative drinking is the most frequently-endorsed drinking motive reported by middle-aged (Cooper et al., 1992), young adult (Stewart et al., 1996), and adolescent (Cooper, 1994) samples, as measured using the DMQ.

Drinking motives are associated with distinct drinking contexts and outcomes. Coping-motivated drinking is more likely to occur alone or, to a lesser extent, with one's partner (Cooper et al., 1992). Coping-motivated drinking is predicted by drinking in negatively-reinforcing situations, as measured using the IDS-42 (Carrigan et al., in press). In contrast, social-affiliative drinking is more likely to occur in convivial contexts such as at parties, at social gatherings, and with friends. Unlike coping-motivated drinking, social drinking is not related to heavy or problem drinking (see Cooper, 1994; Cooper et al., 1992). Social-affiliative drinking is significantly predicted by scores on the IDS-42 subscales of Social Cues to Drink and Pleasant Times with Others (Carrigan et al., in press).[36]

The above review suggests that high AS individuals may be more likely to drink alone and have a greater potential

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[36]As previously indicated in Footnote No. 5, the word "cues" has been substituted for "pressure" to denote drinking for positive reinforcement reflected in the label of Social Cues to Drink (Carrigan et al., in press).

to develop problems related to their alcohol use. But much of the research on the relationships between AS levels and drinking motives, drinking contexts, and alcohol consumption levels has been limited by its reliance on self-report methodology. Accordingly, the present lab analogue study was designed to further assess the validity of differences between high and low AS individuals in their self-reported drinking behaviour. While Study 2 investigated drinking under a potentially negatively-reinforcing situation, the present lab analogue study allowed for voluntary alcohol consumption in a solitary versus social drinking context.

High and low AS participants were randomly assigned to a solitary or social drinking context, in which they played the same game alone (solitary context) or with two confederates (social context). This was followed by a bogus taste-rating which served as an unobtrusive measure of alcohol consumption (e.g., Higgins & Marlatt, 1975).

Several hypotheses were tested based on the pattern of drinking motives and contexts reported by high AS versus low AS subjects (see also review by Stewart et al., in press). Given that the majority of high AS individuals report drinking primarily for coping-related motives (Stewart & Zeitlin, 1995) and that existing research on drinking situations suggests that high AS individuals may be relatively solitary drinkers (see Study 1), it was hypothesized that high AS participants would consume more alcohol when drinking alone than when drinking with others.

Second, given that the majority of low AS individuals report drinking primarily for social-affiliative motives (Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1995), it was hypothesized that low AS participants would consume more alcohol when socializing with others than when drinking alone. It was also predicted that high AS participants would consume more alcohol than low AS participants, but only in the solitary drinking context.

This study also included the Trait form of the State-Trait Anxiety Inventory (STAI-T: Spielberger et al., 1983) as a measure of trait anxiety. It was hypothesized that ASI scores would be a better predictor of solitary drinking behaviour (e.g., mean alcoholic beverage consumption in the solitary condition) than STAI-T scores.

## Method

*Participants*

A total of 851 undergraduate students (576 females, 275 males) enrolled in undergraduate psychology courses at Dalhousie University were screened with the Anxiety Sensitivity Index (ASI: Peterson & Reiss, 1992) during class time several months prior to this study. Participants were recruited on the basis of their ASI scores in order to obtain high and low AS groups based on ASI college student norms (Peterson & Reiss, 1992). Those high and low AS individuals who indicated their willingness to participate and who also met eligibility criteria were randomly assigned to either the social or solitary drinking context such that

each cell in the 2 x 2 (AS Group x Drinking Context) matrix contained 6 men and 7 women for a total of 52 participants.

Eligibility criteria were minimum age of 19 years,[37] a self-report of consuming at least one alcoholic "drink" per month,[38] and verbal acknowledgement by participants that there was no reason why they could not consume alcohol, such as concurrent medication use, allergies, or pregnancy. Participants were required to abstain from alcohol for 24 hours prior to testing and to fast for a 4-hour period before coming into the laboratory. Participants were paid $10.00 as compensation for their time.

*Materials*

Independent Variables. Two self-report inventories of negative temperament -- the Anxiety Sensitivity Index (ASI: Peterson & Reiss, 1992) and the Trait form of the State-Trait Anxiety Inventory (STAI-T: Spielberger et al., 1983) -- were included in this study. Description of the psychometric properties of the ASI can be found in Chapter One. Review of the STAI-T can be found in Study 3.

Demographic Variables. Participants provided the same demographic information as in Study 2. This included age, gender, year of university enrolment, salary of family of

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[37]The legal age limit for alcohol consumption in the Province of Nova Scotia, Canada, is 19 years.

[38]One alcoholic "drink" was defined as one 12-oz (355 ml) bottle or can of beer, one 4-oz (118 ml) glass of wine, or one 1-oz (29.6 ml) shot of hard liquor, either straight or with a mixer (Kidorf, Lang, & Pelham, 1990).

origin, and for women, usage of oral contraceptives (yes or no) and starting date of last menstrual period. The participants also completed the Brief MAST (Pokorny et al., 1972) to assess for alcohol problems using a cutoff of 10 as an exclusionary criterion which balances sensitivity and specificity with both values at .90 or greater (Jacobson, 1989). Problem drinkers and alcoholics were excluded to meet ethical requirements for the treatment of persons with alcohol problems,[39] and also because this study was designed to study the risk for alcohol abuse rather than the consequences of alcohol abuse.

Tower Building Game. Jenga Ultimate (Irwin) is a widely available commercial game in which players build a tower from coloured component blocks which are selected, one at a time, based on the roll of a die of similarly coloured sides. This game was utilized in the present study as a nonevaluative activity which could be played alone or in a group and was presented under the pretence of a *creativity task*. Participants in the social context played the game with two confederates. The confederates were trained to set in motion a semi-standardized pleasant social interaction in order to create a lab-based simulation of a socially-motivated drinking context. Participants in the solitary context played the same game alone.

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[39]The guidelines of the National Institute on Alcoholism and Alcohol Abuse (1989) for alcohol administration in a laboratory state that, in most circumstances, alcohol should not be administered to those with known alcohol problems.

Taste-rating task. The mock beverage taste-rating task included two beverages containing 80-proof commercial distilled spirits mixed 1 part alcohol to 4 parts mixer (rum and coke, and vodka and orange juice) and two non-alcoholic beverages (coke and orange juice).[40] Similar to Study 2, 400 ml of each beverage were randomly presented in numbered, half-litre decanters placed on a tray, with a glass placed in front of each decanter. A decanter containing water was also provided as a mouth rinse. The beverage tray was placed on a coffee table in front of the participant. In the social condition, confederates were provided with their own trays, but no alcohol was added to their drinks. Participants were provided with an Alcohol Taste Rating Form containing 15 taste qualities (e.g., tingling, bland; Conrod, Stewart, & Pihl, 1997), and they were instructed to rank each of four beverages on these attributes in descending order.

Creativity Task. The Science Research Temperament Scale, Revised (SRT: Kosinar, 1960) was introduced as a measure of creativity to lend face validity to the cover story about the purpose of this study. This scale includes 42 pairs of traits (e.g., reliable/imaginative;

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[40]In this study there were two selections of alcoholic and two selections of nonalcoholic beverages; in Study 2, participants rated three alcoholic beverages and only one nonalcoholic beverage. To provide equal amounts of alcoholic and nonalcoholic beverages, the selection of rye & ginger provided in Study 2 was eliminated from the present study and replaced with a nonalcoholic beverage, coke.

constructive/original). Respondents simply place a check mark beside the one term of each pair which best describes themselves.

Affect Rating Scale. A 35-item Affect Rating Scale was developed to assess the efficacy of the manipulation of drinking context (solitary vs. social) in changing affective antecedents to drinking behaviour. This measure consists of four 5-item subscales (Anxious, Angry, Depressed, and Energetic) and one 15-item subscale (Sociable) as presented in Table 8. The Sociable subscale was expanded to 15 items, rather than 5, to allow greater variability in the measurement of the principal affect that this study was designed to manipulate. The majority of the items in these subscales were selected by choosing the items with the highest factor loadings on the Anxiety, Hostility, Depression, Positive Affect, and Sensation Seeking Subscales of the Multiple Affect Adjective Check List Revised (Zuckerman & Lubin, 1985). The remainder of the items were author-compiled and are identified as such in Table 8. Participants were instructed to rate the extent to which each of the 35 adjectives described how they felt *at that moment* on a 7-point scale from 0 (not at all) to 6 (extremely).

Table 8

Subscale Items of the Affect Rating Scale

| Anxious[a] | Angry[a] | Depressed[a] | Sociable | Energetic |
|---|---|---|---|---|
| nervous | annoyed | alone | affectionate | active |
| shaky | complaining | discouraged | affiliative† | bored[b] |
| tense | cross | lonely | agreeable† | energetic |
| timid | disagreeable | rejected | amicable† | enthusiastic |
| worrying | irritated | sad | caring† | quiet[b] |
| | | | contributing† | |
| | | | cooperative† | |
| | | | friendly | |
| | | | helpful† | |
| | | | good-natured | |
| | | | interested | |
| | | | sharing† | |
| | | | sociable† | |
| | | | understanding | |
| | | | warmhearted† | |

[a]Based on subscale intercorrelations and Cronbach alpha of all 15 items, these subscales were combined to form a 15-item Negative Affect Subscale.

[b]These items were reverse scored.

†These additional items were author-compiled to complete the 15-item Sociable Subscale.

*Procedure*

During the initial telephone contact, minimum age and health-related exclusion criteria for eligibility were verified. Participants were led to believe that we were assessing the relationship between creativity and taste discrimination, and that they would be required to play a game designed to enhance creativity followed by a taste test. They were also informed that the taste test would involve tasting a variety of beverages, some of which could contain alcohol, and rating them on dimensions of taste. This cover story provided a rationale for drinking in the laboratory.

In the social drinking context, the participants were advised upon arrival that they would simultaneously be tested with two other student volunteers. The other "volunteers" were student confederates, one female and one male, who were blind as to participants' AS status. The participant and confederates sat on a sofa behind a long coffee table with the participant always seated between the two confederates. In the solitary context, participants sat alone on the same sofa.

After the participants were seated, the fasting requirement was verbally verified and written informed consent was obtained. Participants were tested on an Intoximeters Alco-Sensor III Breathalyser to verify the abstinence requirement and completed the baseline Affect Rating Scale. The experimenter then introduced the

"creativity task" (Jenga Ultimate). In addition to the regular instructions provided to all participants, social context participants were instructed to take turns and cooperate with the other players in constructing the block tower. The confederates initiated a semi-standardized friendly conversation during the game-playing, designed to increase social affiliation. Participants were given 15 minutes to play the game in both conditions.

Immediately following the game, participants completed the Affect Rating Scale a second time as a manipulation check of the effectiveness of the presence (social context) or absence (solitary context) of others in eliciting feelings of sociability. The taste-rating task was then introduced, and participants were given 15 minutes to complete the Alcohol Taste Rating Form. In the social context, the participant and confederates were given their own beverage trays and were instructed to not to interact during the taste-test in order to avoid influencing each others' ratings. The confederates had previously been trained to consume a fixed amount of the beverages in order to control for differential modelling effects across subjects (Caudill & Marlatt, 1975).[41] Ad-lib alcohol consumption of the beverages was encouraged by the following

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[41]The confederates' glasses were inconspicuously marked so as to ensure they would consume 65 ml of each of the rated beverages during the taste-rating task. This quantity was determined through review of mean consumption data obtained in Study 2 using the taste-test paradigm.

experimenter statement: "Drink as much as is necessary for you to rate the beverages precisely, and then you're welcome to drink as much as you like after, as any leftovers will be thrown out" (Conrod, Stewart, & Pihl, 1997).[42]

The taste-test was followed by a 15-minute alcohol absorption period. During this time, participants provided demographic data, and they completed the creativity measure (the SRT: Kosinar, 1960) to enhance the validity of the cover story about the purpose of the study. Following alcohol absorption, participants provided a post-drinking blood alcohol level (BAL) and were required to remain in the lab until their BAL was no greater than half the legal limit, namely, a BAL sample ≤ 0.04%. Participants were fully debriefed prior to their departure.

## Results

### *Independent Variables*

The independent variables of ASI scores (Peterson & Reiss, 1992) and trait anxiety scores (Spielberger et al., 1983) were analyzed using analysis of variance. A 2 x 2 (AS Group x Drinking Context) ANOVA on ASI scores revealed a significant main effect of AS Group as planned: High AS individuals had significantly higher ASI scores than low AS individuals (*M*s (and *SD*s) = 32.31 (4.73) and 7.73 (1.78),

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[42]"As any leftovers will be thrown out" was a minor addition to the introduction of the bogus taste-test from that used in Study 2. Overall drinking levels remained the same across these two ad-lib alcohol consumption studies (Studies 2 and 4) despite this relatively small wording change.

respectively ($F(1, 48) = 353.69$, $p < .001$). There were no other significant effects. The overall sample mean was 20.02 ($SD = 12.90$) which is similar to the mean found in nonclinical samples (Peterson & Reiss, 1992).

The 2 x 2 (AS Group x Drinking Context) ANOVA on trait anxiety scores resulted in a significant main effect of AS Group: High AS individuals obtained significant higher trait anxiety scores than low AS individuals (*M*s (and *SD*s) = 44.58 (8.47) and 36.77 (9.39), respectively ($F(1, 44) = 9.52$, $p < .01$). There were no other significant effects. The overall sample mean ($N = 52$) was 40.67 ($SD = 9.69$), which is similar to the college student norm (Spielberger et al., 1983).

*Demographic Variables*

Participants averaged 20.3 years of age, ranging from 19 to 28 years, and had completed an average of 1.8 years of university. With the exception of one Afro-American male, participants were Caucasian, with a mean family of origin annual salary of approximately $55 thousand Canadian. A series of 2 x 2 (AS Group x Drinking Context) ANOVAs on these variables revealed no significant main effects or interactions. Thus the experimental groups can be considered equivalent on these demographic variables.

No participant was identified as alcoholic on the Brief MAST (Pokorny et al., 1972) using a cutoff value of 10 (Jacobson, 1989). The overall mean ($N = 52$) on the Brief MAST was 0.40 ($SD = 1.05$; $Mdn = 0$); and no participant

obtained a score greater than 5. Participants' MAST scores were then recoded: Scores of 0 were coded as 0 indicating no alcohol problems ($n$ = 44); and scores greater than or equal to 1 were coded as 1 indicating minimal alcohol problems ($n$ = 8). A 2 x 2 (Alcohol Problems x AS Group) chi-square analysis of the recoded MAST scores revealed that the presence or absence of alcohol problems did not vary as a function of AS status ($X^2(1) = 0$, ns). A 2 x 2 (Alcohol Problems x Drinking Context) chi-square analysis of the recoded MAST scores indicated that the presence or absence of alcohol problems did not vary as a function of drinking context ($X^2(1) = 2.36$, ns).

Given evidence that the rate of alcohol absorption varies as a function of levels of female reproductive hormones (e.g., Jones & Jones, 1976), females also provided information on the number of days since the onset of their last menstrual cycle and their use of oral contraceptives. A 2 x 2 (AS Group x Drinking Context) ANOVA on the number of days since onset of last menses was nonsignificant ($M$ (and $SD$) = 19.50 (16.84) days). Chi-square analysis revealed no relationship of oral contraceptive usage with AS or Drinking Context (overall 66.7% reported using oral contraceptives).

*Analyses of Affect Rating Scale*

Reliability. Cronbach's coefficient alphas were used to estimate the internal consistency of the five subscales of the Affect Rating Scale at baseline. The Anxious, Angry, and Sociable Subscales had alphas of .80 or better,

indicating substantial internal consistency (.90, .80, and .93, respectively). The Depressed Subscale had an acceptable alpha of .77, but the Energetic Subscale had an alpha of only .68. Due to low internal consistency and a lack of theoretical relevance to the present study, analyses of the Energetic Subscale were not included in any tests of hypotheses. A composite Negative Affect subscale (combining the anxious, angry, and depressed items) had substantial internal consistency of .90. Across all reliability analyses (with the exception of the Energetic Subscale), all items were positively correlated with their subscale total, and there were no items that would have resulted in a substantially higher reliability if excluded.

Validity. The intercorrelations among the subscales of the Affect Rating Scale were used to examine its construct validity. The three negative affect subscales were moderately intercorrelated ($r$ = .51 to .57, $p < .001$, one-tailed), which suggests good convergent validity. A composite Negative Affect Subscale, consisting of all anxious, angry, and depressed items, was not significantly correlated with either the Sociable Subscale ($r$ = .21, ns) or Energetic Subscale ($r$ = -.16, ns). This suggests good discriminant validity in that the Negative Affect Subscale appears to measure a separate, unrelated affect dimension from that measured by the positive affect subscales of Sociability and Energetic (see Watson et al., 1988). The two positive affect subscales were significantly correlated

($r$ = .58, $p$ < .001, one-tailed).[43] An intercorrelations matrix is presented in Table 9.

Manipulation Check. As a test of the efficacy of the experimental manipulation, the sum across all 15 items forming the Sociable Subscale was analyzed in a set of 2 x 2 (AS Group x Drinking Context) ANOVAs at baseline and post-manipulation (see Table 10a). There were no significant effects for baseline Sociable Subscale scores. But participation in the social context altered the sociable scores as expected in that a main effect of drinking context emerged ($F(1,48) = 7.15$, $p = .01$, $eta^2 = .13$): Participants in the social drinking context reported higher sociability than solitary context participants following the manipulation (see Table 10a). There were no other significant effects.

The sum across all 15 items forming the composite Negative Affect Subscale was also analyzed in a set of 2 x 2 (AS Group x Drinking Context) ANOVAs at baseline and post-manipulation (see Table 10b). A main effect of AS group emerged at baseline: High AS participants reported significantly greater negative affect at baseline ($F(1, 48)$

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[43]The Sociable Subscale items appear to tap an interpersonal positive affect dimension versus a more intrapersonal positive affect dimension (Cox & Klinger, 1988) reflected in the Energetic items. This intrapersonal positive affect was not of direct interest in this study. Nevertheless, the pre- and post-manipulation Energetic Subscale scores were analyzed using a 2 x 2 (AS Group x Drinking Context) ANOVA. No significant effects emerged.

= 4.79, $p < .05$, $eta^2 = .09$). There were no other significant effects at baseline. Analysis of post-manipulation negative affect resulted in two significant main effects. As expected, participants in the social context reported significantly less negative affect than those in the solitary context ($F(1, 48) = 7.69$, $p < .01$, $eta^2 = .14$); and high AS participants continued to report significantly greater negative affect than low AS participants at post-manipulation ($F(1, 48) = 12.72$, $p = .001$, $eta^2 = .21$).[44] The greatest negative affect at post-manipulation was reported by high AS participants in the solitary drinking context, but the interaction failed to reach significance (see Table 10b).

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[44]An analysis of covariance (ANCOVA) of post-manipulation negative affect, using baseline negative affect as a covariate, resulted in the same significant effects. For clarity, this data are presented without covariate-adjustment in Table 9b.

Table 9

Intercorrelations Among Subscales of the Affect Rating Scale

| Subscale | Anxious | Angry | Depressed | Negative Affect[a] | Sociable | Energetic |
|---|---|---|---|---|---|---|
| Anxious | --- | .51*** | .57*** | .91*** | .16 | -.16 |
| Angry | | --- | .57*** | .76*** | .21 | -.05 |
| Depressed | | | --- | .80*** | .18 | -.17 |
| Negative Affect[a] | | | | --- | .21 | -.16 |
| Sociable | | | | | --- | .58*** |
| Energetic | | | | | | --- |

Note. $N = 52$

[a]This subscale consists of a combination of all items which comprise the Anxious, Angry, and Depressed Subscales.

***$p < .001$, one-tailed. All other correlations were nonsignificant.

Table 10a

Sociable Subscale Means (+SDs) and Marginals at Baseline and Post-Manipulation for each Anxiety Sensitivity (AS) Group and Drinking Context

| | Baseline | | | Post-Manipulation | | |
|---|---|---|---|---|---|---|
| AS Group | Solitary | Social | **Marginals** | Solitary | Social | **Marginals** |
| Low AS | 48.85<br>(16.56) | 54.54<br>(13.52) | 51.69<br>(15.09) | 47.54<br>(18.03) | 62.08<br>(14.80) | 54.81<br>(17.78) |
| High AS | 51.92<br>(12.07) | 49.69<br>(15.11) | 50.81<br>(13.45) | 47.38<br>(13.09) | 55.62<br>(15.10) | 51.50<br>(14.46) |
| **Marginals** | 50.38<br>(14.28) | 52.12<br>(14.26) | 51.25<br>(14.16) | 47.46[a]<br>(15.43) | 58.85[a]<br>(15.01) | 53.15<br>(16.13) |

[a] $p = .01$.

Table 10b

Negative Affect Subscale Means (+SDs) and Marginals at Baseline and Post-Manipulation for each Anxiety Sensitivity (AS) Group and Drinking Context

| | Baseline | | | Post-Manipulation | | |
|---|---|---|---|---|---|---|
| AS Group | Solitary | Social | **Marginals** | Solitary | Social | **Marginals** |
| Low AS | 4.85<br>(4.70) | 7.46<br>(5.25) | 6.15[a]<br>(5.07) | 3.54<br>(3.84) | 1.77<br>(1.42) | 2.65[c]<br>(2.98) |
| High AS | 12.54<br>(14.36) | 10.69<br>(8.26) | 11.62[a]<br>(11.51) | 9.15<br>(5.96) | 4.46<br>(4.27) | 6.81[c]<br>(5.61) |
| **Marginals** | 8.69<br>(11.18) | 9.08<br>(6.98) | 8.88<br>(9.23) | 6.35[b]<br>(5.68) | 3.12[b]<br>(3.41) | 4.73<br>(4.92) |

[a]$p < .05$. [b]$p < .01$. [c]$p = .001$.

*Dependent Measures: Beverage Consumption Data*

Dependent measures of beverage consumption were mean alcoholic beverage consumption, mean nonalcoholic beverage consumption, and a BAL sample. The total amount of alcoholic beverage consumed (alcohol plus mixer, in ml) during the taste-rating task was calculated by subtracting the remaining beverage from the original 400 ml of each of the two alcoholic beverages provided to participants. This sum was divided by two to obtain a mean alcoholic beverage (in ml) consumption for each participant. Similarly, the total amount of nonalcoholic beverage consumed was calculated by subtracting the remaining orange juice and coke from the original 400 ml of each beverage. This sum was also divided by two to obtain a mean nonalcoholic beverage consumption (in ml) for each participant.[45] The beverage consumption measures were analyzed in separate 2 x 2 (AS Group x Drinking Context) ANOVAs.[46]

*Beverage Consumption Analyses of Variance*

Alcoholic Beverage Consumption. The ANOVA for mean alcoholic beverage consumption (in ml) resulted in a

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[45]A mean was calculated for both alcoholic and nonalcoholic beverage consumption to allow for direct comparison with the results of Study 2. In all cases the possible range of scores for each variable was 0 to 400 ml.

[46]The distribution of mean alcoholic beverage consumption, mean nonalcoholic beverage consumption, and BAL samples had skew and kurtosis values below 2.00, with the exception of nonalcoholic beverage consumption which had a kurtosis value of 4.35. Given some deviation from normality, significant drinking behaviour results were also analyzed using Mann Whitney U.

significant interaction ($F(1, 48) = 6.93$, $p < .05$, $eta^2 = .13$), which is illustrated in Figure 7. Simple main effects analyses of drinking context for each AS group revealed that, as predicted, high AS participants consumed significantly more alcohol in the solitary versus social drinking context ($F(1, 48) = 8.82$, $p < .01$, $eta^2 = .16$).[47] Contrary to hypothesis, there were no significant simple main effects of drinking context for low AS participants. Additional simple main effects analyses of AS group for each drinking context revealed that, as predicted, high AS participants consumed significantly more alcohol than low AS participants in the solitary context ($F(1, 48) = 8.10$, $p < .01$, $eta^2 = .14$).[48] There were no significant simple main effects of AS group for the social context.

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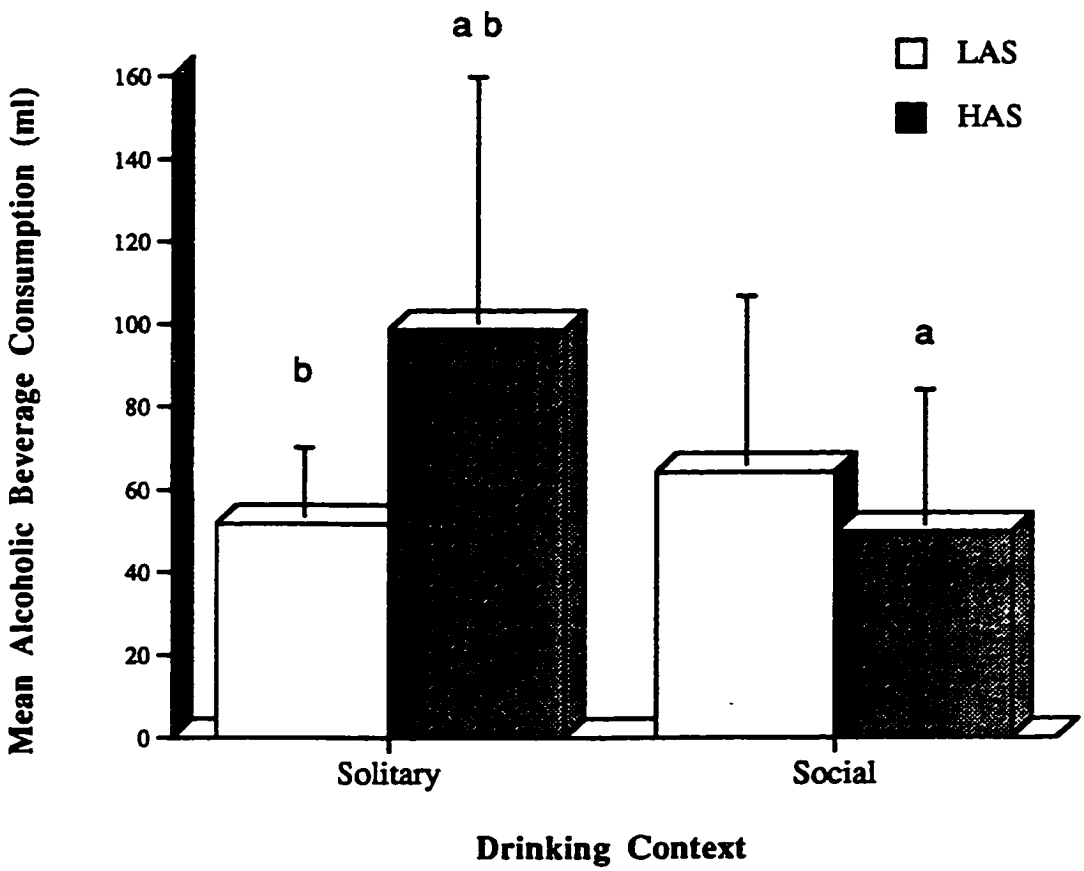
[47]Consistent with the parametric results, the results of Mann Whitney U revealed that high AS participants drank significantly more of the alcoholic beverages in the solitary versus social drinking context ($z = 2.28$, $p < .05$, 1-tailed).

[48]This finding remained significant using Mann Whitney U ($z = 2.08$, $p < .05$, 1-tailed).

Figure 7. Mean alcoholic beverage consumption (+*SD*s) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; *n* = 26) and drinking context (solitary vs. social).




a $p < .01$
b $p < .01$

Blood Alcohol Level. ANOVA for BAL samples were consistent with the alcoholic beverage consumption analyses in that only a significant interaction emerged ($F(1, 48) = 9.76$, $p < .01$, $eta^2 = .17$), as depicted in Figure 8. Simple main effects analyses of drinking context revealed that, as hypothesized, significantly higher BALs were achieved in the solitary versus social context by high AS participants ($F(1, 48) = 11.68$, $p = .001$, $eta^2 = .20$).[49] Contrary to hypothesis, there were no significant simple main effects of drinking context for low AS participants. Simple main effects of AS group revealed that high AS participants achieved significantly higher BALs than low AS participants only in the solitary context ($F(1, 48) = 10.50$, $p < .01$, $eta^2 = .18$).[50]

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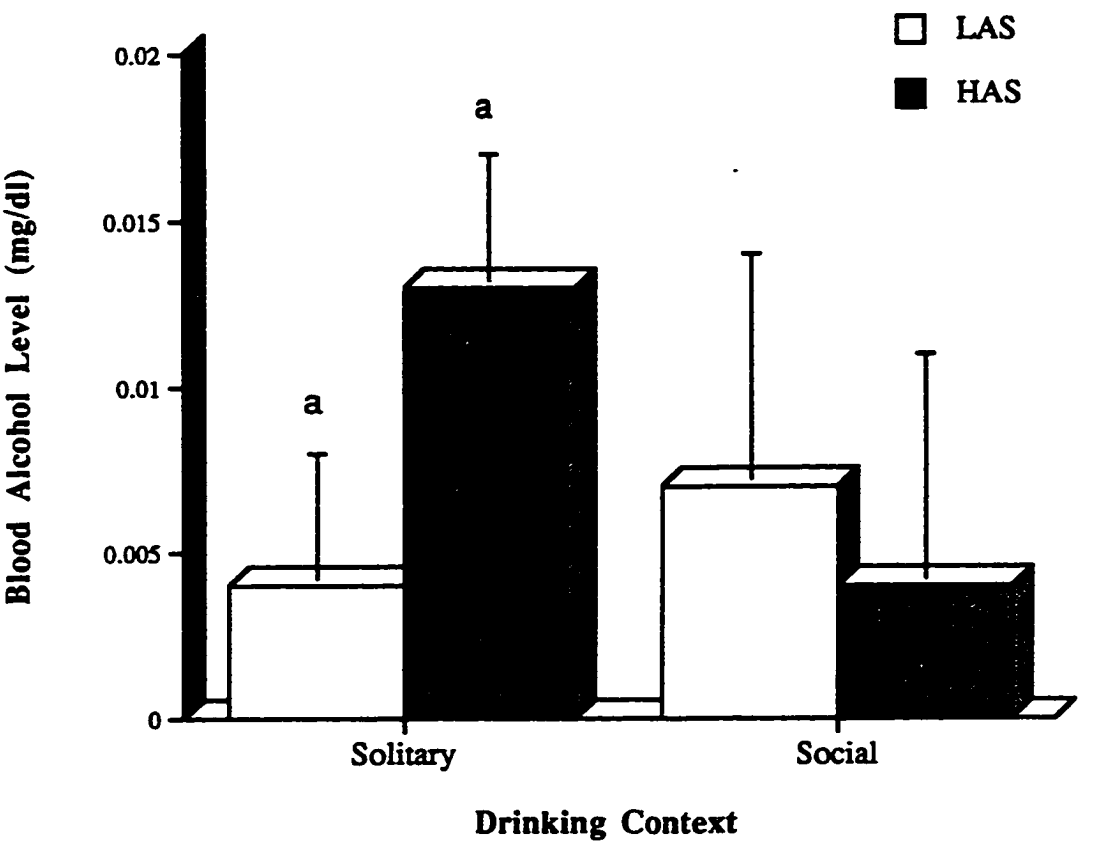
[49]Consistent with the parametric results, results of Mann Whitney U revealed that high AS participants achieved significantly higher BALs in the solitary versus social drinking context ($z = 2.43$, $p < .05$, 1-tailed).

[50]This result remained significant using Mann Whitney U ($z = 2.19$, $p < .05$, 1-tailed).

Figure 8. Blood alcohol level (+*SD*s) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; *n* = 26) and drinking context (solitary vs. social).




a $p < .01$

Nonalcoholic Beverage Consumption. Analysis of mean nonalcoholic beverage consumption (in ml) also resulted in a significant interaction ($F(1, 48) = 7.18$, $p = .01$, $eta^2 = .13$), as depicted in Figure 9. Simple main effects analyses of AS group for each drinking context showed that low AS participants tended to consume more nonalcoholic beverages than high AS in the social drinking context ($F(1, 48) = 3.79$, $p < .10$, $eta^2 = .07$),[51] but less than high AS participants in the solitary context ($F(1, 48) = 3.39$, $p < .10$, $eta^2 = .07$).[52] Simple main effects analyses of drinking context for each AS group revealed that high AS participants consumed significantly more nonalcoholic beverages in the solitary versus social context ($F(1, 48) = 5.63$, $p < .05$, $eta^2 = .10$).[53] Simple main effects of drinking context for low AS participants were not significant.

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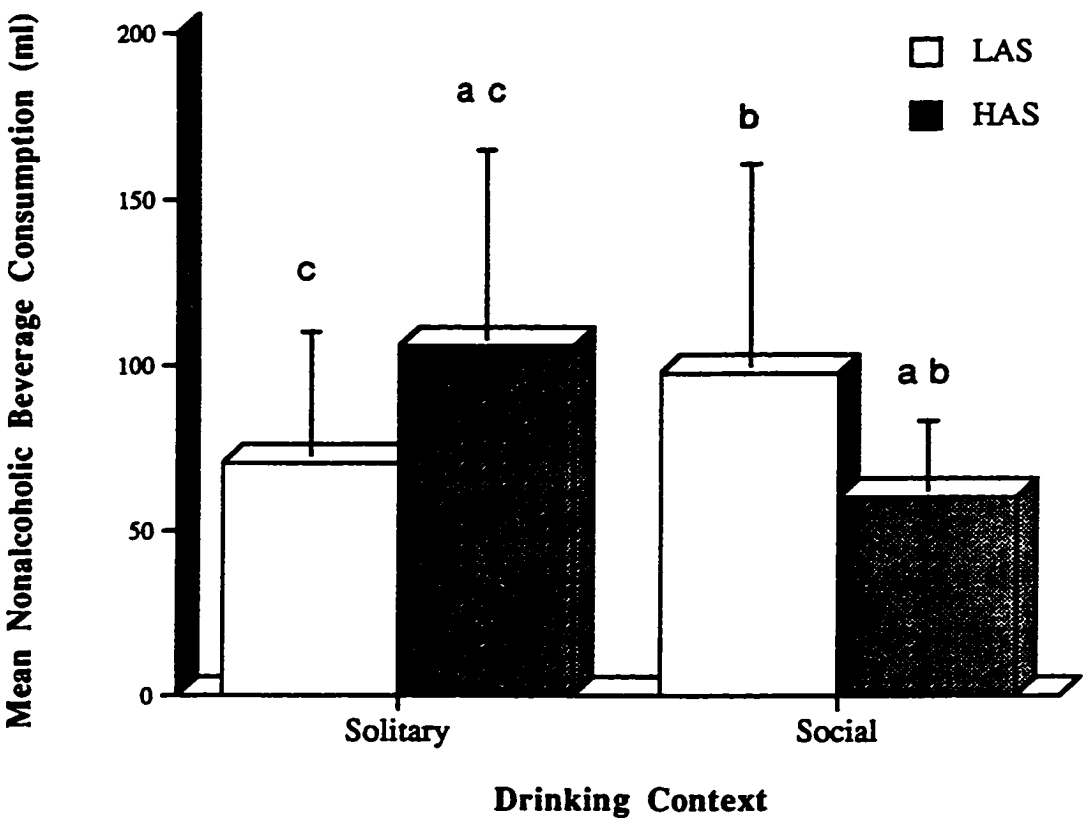
[51]This same effect reached significance using Mann Whitney U ($z = 2.12$, $p < .05$) indicating that low AS participants drank significantly more nonalcoholic beverages than high AS participants in the social drinking context.

[52]Consistent with the parametric analysis, this result remained marginal using Mann Whitney U ($z = -1.64$, $p < .10$).

[53]This finding remained significant using Mann Whitney U ($z = 2.23$, $p < .05$).

Figure 9. Mean nonalcoholic beverage consumption (+*SD*s) as a function of anxiety sensitivity group (low (LAS) vs. high (HAS) AS; *n* = 26) and drinking context (solitary vs. social).




a $p < .05$
bc $p < .10$

*Beverage Consumption Correlational Analyses*

Beverage Consumption and ASI Scores. Consistent with Study 2, Pearson correlations were used to examine the relationship between ASI scores and the dependent measures of beverage consumption in a continuous fashion for each drinking context (see Tables 11a and 11b). Significant correlations emerged between ASI scores and mean alcoholic beverage consumption ($r$ = .38, $p$ < .05, 1-tailed) and between ASI scores and BAL samples ($r$ = .43, $p$ < .05, 1-tailed), but only in the solitary drinking context. Two-tailed correlations between ASI scores and nonalcoholic beverage consumption were not significant in either drinking context.

Beverage Consumption and Affect Ratings. Disattenuated Pearson correlation coefficients were also used to examine, in a continuous fashion, the relationship between affect self-ratings and the dependent measures of alcoholic and nonalcoholic beverage consumption for each AS group.[54] For low AS participants, mean alcoholic beverage consumption was significantly negatively correlated with the composite negative affect subscales scores ($r$ = -.42, $p$ < .05) and

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[54]Correlations were corrected for attenuation using the reliability coefficients of .90 for the composite Negative Affect subscale and .93 for the Sociable Subscale. Reliability coefficients of .23 for alcoholic beverage consumption and of .38 for nonalcoholic beverage consumption were obtained as measures of internal consistency across the alcoholic beverages (rum & coke, and vodka & orange juice) and nonalcoholic beverages (coke and orange juice) consumed by participants.

sociability subscale scores ($r$ = -.62, $p$ < .001). For high AS participants, mean alcoholic beverage consumption was significantly positively correlated with the composite negative affect subscale scores ($r$ = .65, $p$ < .001) and significantly negatively correlated with sociability subscale scores ($r$ = -.56, $p$ < .01).

For low AS participants, mean nonalcoholic beverage consumption was not significantly correlated with either the composite negative affect subscales scores ($r$ = -.11, ns) or sociability subscale scores ($r$ = .22, ns). For high AS participants, mean nonalcoholic beverage consumption was not significantly correlated with the composite negative affect subscale scores ($r$ = .26, ns), but was significantly negatively correlated with sociability subscale scores ($r$ = -.65, $p$ < .001). Thus, in an inverse relationship, the more sociable they felt, the less high AS individuals engaged in any consummatory behaviour (see Figures 7 to 9).

*Multiple Regression Analyses*

A series of stepwise multiple regressions were used to test whether AS was a better predictor of each measure of drinking behaviour than trait anxiety scores (measured using the STAI-T). The predictors of ASI scores and STAI-T scores were entered in a forward stepwise fashion. ASI and STAI-T scores were significantly correlated in the solitary and social drinking contexts, and both were significantly correlated with measures of drinking consumption in the solitary drinking context (see Tables 11a and 11b). In the

multiple regressions, only ASI scores served as a significant predictor of drinking behaviour and only for the solitary drinking context in which ASI scores significantly predicted mean alcoholic beverage consumption ($R^2$ = .14) and BAL samples ($R^2$ = .18) as presented in Table 12a. ASI scores also served as a marginal negative predictor of nonalcoholic beverage consumption but only in the social drinking context ($R^2$ = .11) as presented in Table 12b. STAI-T scores failed to enter into any of the regression equations. Thus, trait anxiety failed to add any additional predictive power over and above the variance in these dependent measures explained by AS.

Table 11a

Correlational Matrix of Negative Affectivity and Beverage Consumption Variables for the Solitary Drinking Context

| | Solitary Drinking Context ($n$ = 26) | | | | |
|---|---|---|---|---|---|
| | ASI | Trait | Alcohol | BAL | Nonalcohol |
| ASI Scores | ---- | | | | |
| Trait Anxiety | .43* | ---- | | | |
| Mean Alcoholic Beverage Consumption | .38* | .35* | ---- | | |
| BAL Samples | .43* | .39* | .84*** | ---- | |
| Mean Nonalcoholic Beverage Consumption | .27 | -.10 | .28 | .14 | ---- |

*** $p < .001$, 1-tailed. * $p < .05$, 1-tailed.

Table 11b

Correlational Matrix of Negative Affectivity and Beverage Consumption Variables for the Social Drinking Context

| | Social Drinking Context ($n$ = 26) | | | | |
|---|---|---|---|---|---|
| | ASI | Trait | Alcohol | BAL | Nonalcohol |
| ASI Scores | ---- | | | | |
| Trait Anxiety | .53** | ---- | | | |
| Mean Alcoholic Beverage Consumption | -.21 | -.15 | ---- | | |
| BAL Samples | -.29 | -.23 | .80*** | ---- | |
| Nonalcoholic Beverage Consumption | -.34 | -.22 | .26 | .16 | ---- |

*** $p < .001$, 1-tailed. ** $p < .01$, 1-tailed. * $p < .05$, 1-tailed.

Table 12a

Summary of Statistical Stepwise Regression Analyses for Variables Predicting Drinking Behaviour for the Solitary Drinking Context

| | Step | B | SE B | β | t | p |
|---|---|---|---|---|---|---|
| **Mean Alcoholic Beverage Consumption** | | | | | | |
| Constant | | 43.94 | 18.07 | | 2.43 | |
| ASI Scores | 1 | 1.60 | .80 | .38 | 2.01 | .03[a] |
| Trait Anxiety Scores | -- | .23 | | | 1.11 | .28 |
| **BAL Samples** | | | | | | |
| Constant | | .003 | .003 | | .88 | |
| ASI Scores | 1 | .0003 | .0001 | .43 | 2.33 | .01[a] |
| Trait Anxiety Scores | -- | .25 | | | 1.26 | .22 |
| **Mean Nonalcoholic Beverage Consumption** | | | | | | |
| No variables entered for this block. | | | | | | |

[a]Consistent with the hypotheses, these probability levels are one-tailed.

Table 12b

Summary of Statistical Stepwise Regression Analyses for Variables Predicting Drinking Behaviour for the Social Drinking Context

| | Step | B | SE B | $\beta$ | t | p |
|---|---|---|---|---|---|---|
| **Mean Alcoholic Beverage Consumption** | | | | | | |
| No variables entered for this block. | | | | | | |
| **BAL Samples** | | | | | | |
| No variables entered for this block. | | | | | | |
| **Mean Nonalcoholic Beverage Consumption** | | | | | | |
| Constant | | 103.73 | 17.05 | | 6.08 | |
| ASI Scores | 1 | -1.21 | .69 | -.34 | -1.75 | .09 |
| Trait Anxiety Scores | | -0.05 | | | -0.23 | .82 |

## Discussion

As hypothesized, high AS participants voluntarily consumed significantly more alcoholic beverages than low AS participants when drinking alone (solitary drinking context). Also, as predicted, high AS participants voluntarily consumed more alcoholic beverages when drinking alone than when drinking with others (social drinking context). AS has been shown to be significantly associated with increased self-reported drinking primarily to cope and decreased drinking primarily to socialize (Stewart & Zeitlin, 1995; Stewart, Karp, et al., 1997). Consistent with their self-reports that socializing is not a primary motivator for their alcohol use, high AS participants drank less alcoholic beverages in a relatively pleasant social context than in a solitary context.

The solitary context appears to have selectively prompted increased alcohol consumption among high AS participants. While the solitary condition was not specifically designed to provoke negative affect, a significant and strong positive relationship emerged between negative affect and the amount of alcohol consumed, but only for high AS participants. Also, the highest negative affect ratings at post-manipulation were obtained by high AS participants assigned to the solitary drinking context. This result is consistent with self-report studies showing that high AS individuals drink more frequently to cope with negative affect (anxiety and depression; Stewart & Zeitlin,

1995; Stewart, Karp, et al., 1997) and drink more frequently in situations involving unpleasant emotions (see Study 1), when compared to low AS individuals. This result is also consistent with emerging experimental data showing high AS individuals to be more sensitive than low AS individuals to the negative emotion reactivity-dampening effects of alcohol (Stewart & Pihl, 1994; Baker, et al., 1997).

Coping-motivated drinking is associated with a "risky" pattern of alcohol use characterized by heavy consumption, problematic alcohol use (i.e., symptoms of social and occupational impairment, pathological consumption, and tolerance and withdrawal) and drinking alone (Cooper, 1994; Cooper et al., 1992). In contrast, socially-motivated drinking appears to be "protective" due to its association with low levels of alcohol consumption and low risk for problematic alcohol use (Cooper, 1994; Cooper et al., 1992). Cooper and her colleagues (1992) have suggested that social-normative constraints present when drinking with others provide social feedback which may temper drinking behaviour relative to solitary drinking where no such social referents are available. This may partially explain why solitary drinking is so highly associated with problematic alcohol use (Cooper et al., 1992). In the present study high AS-solitary participants consumed significantly more alcohol when socially isolated, under a condition in which they reported greater negative affect, relative to low AS-solitary and high AS-social participants. These findings

support the conclusion that high AS individuals are more likely than low AS individuals to be characterized by "risky" patterns of context-dependent, coping-motivated, solitary alcohol use.

Contrary to hypothesis, low AS participants did not consume significantly more alcoholic beverages in the social versus solitary context. Moreover, a significant and strong negative relationship emerged between sociability affect scores and alcohol consumption levels for both low and high AS participants alike. This result appears to be inconsistent with previous research in which a greater percentage of low AS than high AS individuals were found to report drinking primarily for social-affiliative motives (Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1995). This finding also appears inconsistent with a number of laboratory studies in which control subjects exposed to pleasant social and positive affective manipulations unexpectedly consumed more alcohol compared to subjects exposed to unpleasant and negative affective manipulations (Gabel et al., 1980; Holroyd, 1978; Pihl & Yankofsky, 1979; see also Pihl & Smith, 1983, for review).

At least three potential explanations exist for these inconsistencies. First, the low AS participants drank approximately the same amount of alcoholic beverages as the confederates were trained to drink, which was 65 ml of any rated beverage. It is possible that the low AS-social participants reduced their alcoholic beverage consumption

relative to their normal drinking levels in social situations due to social-normative constraints present when drinking with their new companions (Cooper et al., 1992). The influence of models could be empirically evaluated by exposing high and low AS individuals to heavy- and light-consumption confederates (cf., Caudill & Marlatt, 1975).

Another possible explanation for the unexpected finding that low AS participants did not consume significantly more alcoholic beverages in the social versus solitary context involves differences in the aspects of drinking behaviour being assessed across self-report and lab-based studies. Self-report questionnaires of drinking motives (e.g., DMQ; Cooper et al., 1992) assess the frequency, not quantity, of alcohol consumption. While low AS individuals report drinking most *frequently* for social-affiliative motives (SM; Stewart & Zeitlin, 1995), this does not mean that low AS individuals drink more *heavily* in social contexts. In fact, low AS individuals are characterized by relatively light self-reported alcohol consumption levels overall (Stewart, Peterson, & Pihl, 1995) and across various drinking situations as shown in Study 1.

One final possible explanation for this unexpected finding involves reference to a third drinking motive -- enhancement motives. Like socially-motivated drinking, enhancement-motivated drinking is learned through positive reinforcement (e.g., to increase feelings of excitement). But like coping-motivated drinking, enhancement-motivated

drinking arises from internal (personal states) as opposed to external (other people) sources of motivation (Cooper, 1994; Cooper et al., 1992; Cox & Klinger, 1988). Previous studies which found that control subjects unexpectedly drank more alcohol following certain positive affective manipulations (e.g., sexual arousal; Gabel et al., 1980) may more accurately reflect levels of drinking for enhancement motives rather than the social motives theoretically tapped in the social context of the present study. Enhancement-motivated drinking appears more strongly related to heavy alcohol use than social drinking (see Cooper et al., 1992). Although AS levels are not related to drinking for enhancement motives (Stewart & Zeitlin, 1995), other personality variables might be related this other risky style of drinking. The same design used in the present lab-based analogue study could be used to explore potential relationships between enhancement-motivated alcohol use and other personality variables. For example, high sensation seekers might be more likely than low sensation seekers to report more frequent enhancement-motivated alcohol use (Zuckerman, 1979, 1984), and they might drink more alcohol in response to certain positive affective manipulations in the lab (cf., Gabel et al., 1980).

Some of the above findings were not specific to alcohol. High AS-solitary participants also consumed significantly more nonalcoholic beverages than the high AS-social participants. However, this latter finding must be

balanced against other results. First, high AS-solitary participants consumed a sufficient quantity of the alcoholic beverages so as to achieve significantly higher BALs than either the high AS-social or low AS-solitary participants, regardless of their nonalcoholic beverage consumption. Second, ASI scores were not significantly correlated with nonalcoholic beverage consumption in either drinking context.

Some interpretations of why high AS-solitary participants drank more of both alcoholic and nonalcoholic beverages (see Figures 7 and 9) are worthy of mention. Perhaps the high AS-solitary participants drank more nonalcoholic beverages as a "chaser" to mask the relatively strong taste of the alcoholic drinks. This is an empirical question which might be tested by using more pleasant tasting, and/or subjects' preferred, alcoholic beverages (e.g., beer or wine as opposed to hard liquor; see Kidorf et al., 1990) or by observing the pattern of alcoholic and non-alcoholic beverage consumption.[55]

A second explanation is that high AS individuals, under conditions of negative affect and/or social deprivation, may be more likely to engage in any appetitive behaviour which includes alcoholic and nonalcoholic beverage consumption. The participants were required to fast for four hours prior

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[55]If the notion of a chaser has any merit, a sip of an alcoholic beverage should be followed quickly by a sip of a nonalcoholic beverage to mask the taste of the former among high AS-solitary participants.

to participation in this study. Given that high AS individuals are characterized by greater interoceptive acuity (e.g., Ehlers, 1983; Ehlers & Breuer, 1992), then the present results may be partially attributable to an enhanced awareness of physical discomfort arising from hunger. This awareness could have resulted in increased consumption of both types of beverage. This explanation is most relevant for high AS-solitary participants who lacked the social distraction present for high AS-social participants. Presumably, a lack of distractions would afford greater opportunity to focus on bodily sensations of hunger. Moreover, as suggested in Study 3, AS may serve as a motivational factor to engage in any appetitive behaviour to provide relief from physical discomfort arising specifically from hunger.

It could be argued that social influences on alcoholic beverage consumption would be particularly relevant for high AS social condition participants given demonstrated associations between AS and social anxiety (Ball et al., 1995).[56] Specifically, the high AS-social subjects may have felt anxious in the presence of others, and this social anxiety may have influenced them to suppress their drinking in the social context so as not to be judged negatively by others about their level of alcohol consumption. Indeed,

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[56]For example, the ASI and Social Anxiety Subscale of the revised Self-Consciousness Scale (Scheier & Carver, 1985) are significantly correlated at .24 in an alcoholic sample (Karp, 1993).

the high AS-social participants tended to drink slightly less than the confederates were trained to drink, which was 65 ml (see Figure 7). But the negative affect ratings do not support this interpretation since the highest negative affect ratings were reported by the *high AS-solitary* participants, not the *high AS-social* participants.

There are limits to the generalizability of the above findings arising from the experimental control exacted from the use of confederates, a mock taste-rating task, and the availability of only one type of alcoholic beverage (hard liquor). Obviously, a truly social drinking context would involve friends, not confederates, who are consuming their preferred alcoholic beverage in a setting other than a psychology lab. The generalizability of the present results could be extended by using naturalistic observation as a supplement to the present analogue observation methods. Nevertheless, such limitations do not detract from the consistency with which high AS has been shown to be related to heavier alcohol consumption, greater drinking in negative reinforcement versus positive reinforcement contexts, and greater coping-motivated drinking, across studies using both self-report methodology and experimental manipulations of drinking context (see Studies 1 and 2; see also review by Stewart et al., in press).

# CHAPTER SEVEN: General Discussion

*The Objective of this Line of Research*

The primary objective of this line of research was to advance knowledge of the risk for alcohol abuse among high AS individuals. The situations in which high AS young adults are most likely to drink alcohol were investigated across four studies. Several research methods were used: retrospective self-report, direct observation using an analogue ad-lib alcohol consumption paradigm following manipulations of mood and drinking context, and a cognitive paradigm (the modified Stroop test) following a "biological challenge" to induce physical discomfort.

Study 1 was designed to identify those situations in which high AS individuals report drinking more often than low AS individuals using the 42-item Inventory of Drinking Situations (IDS-42; Annis et al., 1987). In this study, any student who identified him/herself as having consumed alcohol within the past year completed the ASI and the IDS-42. The structure of the IDS-42 was previously found to consist of three higher-order factors of negatively-reinforcing drinking situations (unpleasant emotions, conflict with others, and physical discomfort), positively-reinforcing drinking situations (pleasant times with others, social pressure to drink, and pleasant emotions), and temptation drinking situations (testing personal control, and urges and temptations), and eight lower-order factors

which correspond to the eight IDS-42 subscales among university student drinkers (Carrigan et al., in press). It was hypothesized that ASI scores would be positively correlated with the frequency of drinking in negatively-reinforcing drinking situations, but not with the frequency of drinking in positively reinforcing drinking situations or temptations drinking situations.

Manipulations of situational contexts in Studies 2 and 4 were followed by voluntary alcohol consumption on a bogus taste-rating task. Alcohol consumption on this taste-rating task provided the opportunity to evaluate the presumed motivational bases for alcohol use in high AS individuals compared to low AS individuals. In the first analogue study (Study 2), high and low AS individuals were required to anticipate an interview about their personal experiences with anxiety (the anxiety-relevant condition) or a "control" interview about their leisure activities and favourite foods (the anxiety-irrelevant condition). It was predicted that high AS individuals would voluntarily consume more alcohol than low AS individuals but only when anticipating the anxiety-relevant questions in order to dampen their anxious emotions. In the second analogue study (Study 4), high and low AS individuals participated in a social context designed to elicit feelings of social affiliation, or in a solitary control condition, both followed by the bogus taste-rating task. It was predicted that high AS individuals would drink more in the solitary versus social setting, and that high

AS-solitary participants would drink more alcohol than low AS-solitary participants.

Study 3 was designed to determine whether the experience of anxiety-related physical sensations can prime high AS individuals to selectively attend to alcohol cues on the modified Stroop paradigm. Numerous studies have shown that clinical and nonclinical samples of high AS individuals are characterized by a selective attentional bias for stimuli of particular concern to them (e.g., Hope et al., 1990; McNally et al., 1993; McNally, Riemann, & Kim, 1990; Stewart et al., 1998). It was predicted that ASI scores would be correlated with the degree of attentional bias for alcohol cues, but not for food cues, under the condition of induced physical discomfort.

*Evaluation Criteria*

Before reviewing the main findings in this line of research, it is important to consider several criteria for evaluation of the results. First, correlational analyses and extreme groups comparisons are presented in three of the studies. The extreme groups comparisons allow for statistical inference about a population, which is not possible using descriptive statistics. But dichotomization of scores on the ASI may markedly reduce statistical power (Cohen, 1983; Lilienfeld et al., 1993). Moreover, differences in reliabilities across measures can be taken into account by using disattenuated correlations (Block, 1963). This correction is not possible with analysis of

variance. Disattenuated correlations were used in Studies 1 and 4. For example, in Study 1, it was particularly important to take into consideration the relatively low reliability of the Physical Discomfort Subscale, which differed markedly from that of the other IDS-42 subscales. Correlational research can also answer the question of whether other related negative temperament constructs (dysphoria and trait anxiety) add to the prediction of relevant phenomena over and above that predicted by ASI scores (cf., Lilienfeld et al., 1993). I would suggest then that relatively more weight be given to the results of correlational analyses when the data have been analyzed using both correlations and analysis of variance.

Much of the AS research has relied on self-report (Stewart & Zeitlin, 1995; Stewart, Karp, et al., 1997) which has known limitations. For example, the IDS-42 relies on the self-report of the respondents who may not accurately represent the situations in which they drink more frequently perhaps due to lapses in memory or simply a lack of awareness of the situations surrounding their typical drinking behaviour (McClelland, 1985; Nisbett & Wilson, 1977; Roediger, 1995). Moreover, a high AS individual may simply endorse any item related to anxiety on the IDS-42, a response bias known as acquiescence (Anastasi, 1988). In recognition of the limitations of reliance on self-report (Study 1), various factors were directly manipulated in the subsequent lab-based experimental studies. Study 2 was

designed to manipulate anticipatory anxiety. Study 4 was designed to manipulate feelings of sociability.

The distinction between frequency and quantity measures of alcohol consumption is also central to this line of research (see Conrod, Stewart, & Pihl, 1997). The IDS-42 assesses the frequency of alcohol use (Study 1), while the ad-lib alcohol studies (Studies 2 and 4) assess the quantity of alcohol consumed. One individual may drink frequently (one glass of wine with dinner each night), while another may drink heavily (a 6-pack of beer every Friday night). Both persons would obtain a similar quantity x frequency score of 6 to 7 drinks per week. But this quantity x frequency estimate does not reflect the greater health risks associated with "binge" drinking (Sobell, Cellucci, Nirenberg, & Sobell, 1982) and does not permit detection of irregular patterns of alcohol use which may be associated with specific drinking situations (Vogel-Sprott, 1983). Hence, measures of both frequency (Study 1) and quantity (Studies 2 and 4) are important in alcohol research (see also Conrod, Stewart, & Pihl, 1997).

The major findings of this research should be evaluated with regard to whether they are specific to drinking alcohol or whether they generalize to other appetitive behaviours. In Studies 2 and 4 alcoholic and nonalcoholic beverages were presented to assess whether high AS individuals specifically use alcohol under certain situations or whether they engage in any consummatory behaviour. In Study 3, alcohol cues and

food cues were presented to assess whether the correlation of attentional bias with ASI scores was specific to alcohol cues under a condition of induced physical discomfort.

*The Major Findings of this Research*

In Study 1, high AS individuals reported drinking more frequently overall (see Figures 1 and 2). Relative to low AS individuals, high AS individuals reported a much higher drinking frequency on the negatively-reinforcing drinking situations higher-order factor. Unexpectedly, high AS individuals also reported a much higher drinking frequency on the temptations drinking situations higher-order factor and a somewhat higher drinking frequency on the positively-reinforcing drinking situations higher-order factor relative to low AS participants.

Whereas the planned comparisons illustrate that high AS individuals drink more across all drinking situations, the correlational analyses in Study 1 provided support for the expected situational specificity. The correlational analysis should be weighed more heavily as explained previously. As predicted, AS levels were positively correlated with the frequency of drinking in negatively-reinforcing drinking situations (conflict with others, unpleasant emotions, and physical discomfort) but ASI scores were not significantly correlated with drinking frequency in positively-reinforcing drinking situations (pleasant times with others, social *cues* to drink, and pleasant emotions). AS levels were unexpectedly positively correlated with

drinking frequency in testing personal control situations (see Table 1). A tendency to drink in negative affective states is correlated with increasing levels of alcohol dependence (Cunningham et al., 1995). These findings suggest then that, even at a relatively young age, situational specificity of drinking in potentially risky contexts has already been established in high AS individuals. To the extent that this pattern persists, alcohol problems could develop.

Studies 2 and 4 suggest that the reported greater frequency of alcohol use in negative affect situations (Study 1) translates into a greater quantity of alcohol use relative to low AS persons in such potentially risky situations. The results of Study 4, the second analogue study, provide the most clear support for the TRH of alcohol use in high AS individuals, namely, that alcohol's tension-reduction properties motivate increased alcohol use in high AS young adults.

In Study 4, participants in the social context reported significantly less negative affect (a combination of depression, anxiety, and anger scores) and greater sociability than those in the solitary context as expected. Consistent with the hypotheses, high AS individuals drank more alcohol in the solitary drinking context than low AS-solitary individuals or high AS-social individuals. Given that self-reported negative affect was highest among high AS persons in the solitary context, and that increased negative

affect was significantly correlated with mean alcoholic beverage consumption only for high AS persons, then these findings support the notion of increased coping-related drinking in high AS young adults.

These results are consistent with self-reports that coping, rather than social-affiliation, is a primary motive for alcohol use in high AS young adults (e.g., Novak et al., 1997; Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1995). More alcohol consumption in the solitary context by high AS participants is also consistent with the results of Study 1. In Study 1, ASI scores were only significantly correlated with situations that do not necessitate the presence of others: unpleasant emotions ("When I felt that I had let myself down"), physical discomfort ("When my stomach felt like it was tied in knots"), conflict with others ("When other people treated me unfairly"), and testing personal control ("When I wondered about my self-control over alcohol and felt like having a drink to try it out"). Situations involving conflict with others are included in this list because solitary drinking can occur following conflict as a way to cope with the resultant negative affect. In contrast, ASI scores were not significantly correlated with situations which require the presence of others: pleasant times with others ("When I wanted to celebrate with a friend"), and social cues to drink ("When I met a friend and he/she suggested that we have a drink together"). Combined, the results of Studies 1 and 4 suggest that high AS persons

are more likely to be solitary drinkers. Solitary drinking is more highly associated with excessive alcohol use and alcohol-related problems than social-affiliative drinking (Cooper et al., 1992).

The Study 4 findings do not appear to be consistent with the self-report of low AS individuals that social-affiliation is their primary motive for alcohol use (Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1995). Low AS-social and low AS-solitary participants consumed similar amounts of alcoholic beverages. Perhaps the social context failed to sufficiently mimic the types of social situations in which low AS individuals drink alcohol. However, sociability ratings were increased as expected for both high and low AS participants assigned to the social context. This suggests that the manipulation was effective in mimicking a real-life social-affiliative drinking situation.

The alcoholic beverage consumption of low AS persons is relatively light in comparison to high AS persons (Stewart, Peterson, & Pihl, 1995). Their relatively light consumption is evident in Studies 2 and 4 in that the BALs of the low AS participants remained below .01% in all conditions across both studies (see Figures 6 and 8). Thus, even though low AS individuals may drink more frequently in social versus solitary contexts (e.g., Stewart & Zeitlin, 1995), their social-affiliative drinking is not necessarily *heavier* than their solitary drinking. It is also possible in Study 4 that the low AS-social participants were influenced by the

alcohol consumption of their new companions (the two confederates) and that they matched their consumption to that of the confederates, thereby dampening their usual heavier levels of consumption in social situations relative to solitary situations. The influence of models (e.g., light versus heavy drinkers; Caudill & Marlatt, 1975) in low versus high AS subjects was not investigated in the present thesis and remains to be investigated in future research.[57]

In Study 2, high AS individuals consumed more alcohol than low AS participants, but only when anticipating the *anxiety-irrelevant* questions *not the anxiety-relevant* questions, contrary to hypotheses. Moreover, ASI scores were significantly correlated with mean alcoholic beverage consumption but only in the anxiety-irrelevant condition. At first glance, this result suggests that alcohol's tension-reducing properties did not motivate the alcohol consumption of high AS participants. But this result must be interpreted with regard to the efficacy of the affect manipulation.

There were no differences in anticipatory anxiety between the AS groups for either question set. Because the anxiety-induction manipulation was not successful, the results cannot be considered evidence against the TRH of alcohol use in high AS individuals. Given the failure of

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[57]Modelling influences were controlled in Study 4 by training the confederates to drink 65 ml of each of the alcoholic and nonalcoholic beverages. This amount is the average consumption of beverages consumed in Study 2.

this anticipatory manipulation, as contrasted against the success of actual involvement in the interview in differentially altering anxiety (cf., Maller & Reiss, 1992), future researchers might wish to present the taste-test following participation in the interview. In this way, participation in the anxiety-relevant interview could be used to induce greater anxiety in high AS versus low AS subjects to provide a better test of anxiety-induced drinking among high AS individuals.

Alternatively, other types of primes to induce *anticipatory* anxiety might be more effective in motivating increased alcohol consumption among high AS individuals. For example, Kushner, Rossovsky, et al. (1997) exposed panic disorder patients to the biological challenge of carbon dioxide inhalation. Immediately after their first carbon dioxide exposure and preceding a second exposure, participants were presented with the opportunity to consume one of four beverages, clearly labelled as containing various levels of alcohol, once every three minutes. This beverage choice task provides an interesting alternative to the traditional taste-rating test. Kushner, Rossovsky, et al. found that clinical high AS subjects (panic disorder patients) who expected to panic during their second exposure to carbon dioxide, chose to consume beverages containing relatively more alcohol as the time for the second exposure neared. This is a successful example of an *anticipatory* anxiety induction as a motivation for alcohol use in high AS

individuals. It would be interesting to attempt to replicate the results of Kushner, Rossovsky, et al. (1997) using the prime of carbon dioxide with nonclinical high AS young adults without a history of panic disorder.

The saliency of the manipulation in Study 2 may have been weaker in comparison to the manipulation used by Kushner, Rossovsky, et al. (1997). Subjects in Study 2 were simply told to consider the anxiety-relevant or anxiety-irrelevant questions, which were presented on an index card, as they participated in the taste-rating test. Involvement in the taste-test and lack of familiarity with the interview may have allowed Study 2 participants to direct their attention away from the upcoming stressors. Borrowing from the design of Kushner, Rossovsky, et al. (1997), the Study 2 manipulation might be made more salient in the future by presenting one anxiety or "neutral" question at exposure time 1, followed by the taste-test, followed by presentation of the second anxiety or "neutral" question at exposure time 2. In this way, the anxiety-relevant stimuli would be more salient throughout the experiment, with the high AS, anxiety-relevant subjects anticipating the aversiveness of the impending second anxiety question.

The combined results of the two analogue drinking studies provide mixed support for the second tenet of the TRH. High AS individuals drank more alcohol in a solitary-drinking context than in a social-affiliative context, but they unexpectedly failed to drink more alcohol when

anticipating questions designed to prime anxiety in high AS persons. In the only other ad-lib alcohol consumption study with high AS subjects to date, Kushner, Rossovsky, et al. (1997) found that panic patients who expected to panic when exposed to carbon dioxide voluntarily consumed beverages with higher alcohol content presumably to cope with their anticipated anxiety sensations. The results of Kushner, Rossovsky, et al. and Study 4 appear to support the second tenet of the TRH as applied to the drinking behaviour of high AS individuals, but the results of Study 2 appear to be in conflict with TRH predictions. How can these seemingly divergent findings be reconciled?

It is quite conceivable that, for high AS participants who were preparing to answer questions about their personal experience with anxiety, alcohol consumption was not perceived to be a viable option for coping. In addition to the physical and psychological consequences of anxiety, the ASI also taps fear of the social consequences of anxiety (e.g., ASI Item No. 5: "It is important for me to stay in control of my emotions") (cf., Stewart, Taylor, & Baker, 1997; Zinbarg et al., 1997). Also, AS levels are significantly correlated with more general social-evaluation/social anxiety concerns (e.g., Karp, 1993). Perhaps the normally higher levels of alcohol use the among high AS, anxiety-relevant participants in Study 2 were reduced by these subjects' fear of losing control in front of another person after consuming alcohol and when about to

speak on a topic of such importance to them. This speculation might be tested by splitting the two anxiety questions into two exposure times, as described previously and similar to the design used by Kushner, Rossovsky, et al. (1997). Then beverage choice and consumption (of alcoholic beverages clearly labelled as none, low, moderate, and high alcohol content) could be measured every three minutes to determine whether the proximity of the pending anxiety-relevant interview thwarts or encourages alcoholic beverage consumption among nonclinical high AS participants. Such a study would need to include a measure of social anxiety, such as the Fear of Negative Evaluation questionnaire (FNE: Watson & Friend, 1969) to determine whether it is AS and/or social evaluation concerns that best predict drinking behaviour under such situations. This design would also allow for assessment of whether or not drinking is perceived to be an effective coping strategy by high AS individuals who are anticipating speaking about their anxiety experiences.

The results of Studies 2 and 4 highlight the need for additional research to further advance our understanding of the propensity of high AS subjects to drink more heavily than their low AS counterparts in response to potentially risky antecedents (i.e., when alone and/or when in negative affect situations). More specifically, future research could help define the precise nature of situations that will and will not lead to increased drinking among high AS

individuals. This research would help answer the following remaining question: When does AS promote drinking, and when does AS interfere with drinking?

If anticipation of questions failed to differentially alter anxiety across the AS groups and conditions, then something other than subjective emotional arousal must account for the Study 2 results. The preliminary results found in Study 3 suggest one possible explanation. In Study 3, ASI scores were found to be significantly positively correlated with an attentional bias for alcohol cues, only in the induced physical discomfort condition but not in the control condition. This result suggests that the priming of physical discomfort is sufficient to result in an attentional bias for alcohol (measured as longer colour-naming latencies for alcohol versus control words on the modified Stroop) among high AS individuals. An attentional bias for alcohol primed by physical discomfort could explain the greater alcohol consumption of the Study 2 high AS participants in the supposedly neutral/control condition in which participants anticipated speaking about their favourite foods. Indeed, the results of Studies 2 and 3 suggest that "tension" in AS research might be more generically defined as any uncomfortable bodily sensation of arousal, including gastrointestinal distress, in order to use the TRH to better characterize the drinking situations of high AS individuals. This interpretation would be consistent with the positive correlation between AS levels

and the self-reported use of alcohol on the IDS-42 in situations involving physical discomfort in Study 1 (e.g., "When my stomach felt like it was tied in knots").

It appears then that, in addition to negative affect (Study 4), the experience of physical discomfort might motivate alcohol consumption among high AS individuals (Studies 2 and 3). This could occur by way of spreading activation (Collins & Loftus, 1975) when physical discomfort and alcohol use have been repeatedly paired in the drinking history of high AS individuals, such that activation of the memory network for physical discomfort activates the memory network for alcohol by way of classical conditioning. This activation could in turn elicit alcohol seeking and use (cf., Baker et al., 1987; Tiffany, 1990).

*Evaluation, Limitations, and Criticism*

Response Specificity. In three of the studies, appetitive controls were included -- nonalcoholic beverages in Studies 2 and 4, and food cues in Study 3. In Study 2, AS effects were specific to alcohol, and there were no significant effects for nonalcoholic beverage consumption. Moreover, ASI scores were not significantly correlated with nonalcoholic beverage consumption in either condition. Hence, it appears that high and low AS participants were no more or less likely to consume a nonalcoholic beverage (orange juice) when anticipating either question set. In Study 4 high AS participants drank significantly more alcoholic and nonalcoholic beverages in the solitary context

relative to the social context. This finding suggests the possibility that, in solitary contexts and when experiencing negative affect, high AS individuals may engage in any consummatory behaviour. In Study 3, the correlation between ASI scores and the predicted attentional bias for alcohol cues under a condition of induced physical discomfort does not appear to be restricted to alcohol cues. While only marginally significant,[58] the magnitude of the correlation between ASI scores and food-related interference was as large as it was between ASI scores and alcohol-related interference (see Table 7). This suggests the possibility that AS may motivate any behaviour (drinking, eating, etc.) to reduce physical discomfort.

It is notable in Study 4, however, that high AS-solitary participants consumed a sufficient quantity of the alcoholic beverages so as to achieve significantly higher BALs than either the high AS-social or low AS-solitary participants. Moreover, ASI scores accounted for 14% of the variance in mean alcoholic beverage consumption and 18% of the variance in BAL samples in the solitary drinking context. In contrast, ASI scores were not significantly correlated with nonalcoholic beverage consumption in either drinking context. In Study 3, ASI scores accounted for 18%

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[58]ASI scores were significantly positively correlated with alcohol-related interference ($r = .43$, $p < .05$, 1-tailed), but only marginally significantly correlated with food-related interference ($r = .46$, $p < .10$, 2-tailed) because of the second nondirectional hypothesis regarding the relationship of AS and food bias.

of the variance in alcohol-related interference. Moreover, it is unlikely that the trend for an attentional bias for food cues would be found if an alternative manipulation were used to induce physical discomfort such as hyperventilation. With this alternative manipulation, food consumption would not be an effective strategy for dampening the induced physical symptoms such as dizziness, whereas alcohol consumption does dampen dizziness in response to hyperventilation (Baker et al., 1997). In Study 2 the AS effects were specific to alcohol, with ASI scores accounting for 21% of the variance in alcoholic beverage consumption in the anxiety-irrelevant condition. Combined then, the results of these studies suggest that AS may specifically motivate the use of alcohol (as opposed to consummatory behaviors in general) to reduce uncomfortable negative affect and physical discomfort.

Effect Size. Across all four studies, effect sizes tended to be medium to large (see Cohen, 1988, for the calculation of *f* based on $eta^2$), while the proportion of variance in situation-specific drinking accounted for by ASI scores was significant yet small. This is most true for the self-report study (Study 1) in which ASI scores accounted for only 4% of the variance in IDS-42 scores for situations involving Unpleasant Emotions, 8% for situations involving Physical Discomfort, and up to 12% for situations involving Testing Personal Control. Notably, the results of the lab-based research were much more satisfactory: up to 21% of

the variance in mean alcoholic beverage consumption was accounted for by ASI scores, with effect sizes (*f* based on $eta^2$) as high as .44 for alcoholic beverage consumption (see Cohen, 1988). It appears then that the IDS-42 may underrepresent the frequency of situation-specific alcohol use of high AS young adults. The IDS-42 was developed for alcoholic populations (Annis et al., 1987) so it is possible that this measure fails to tap the typical negative affect drinking situations of high AS young adults (e.g., exam stress, classroom presentations). In addition, given the relatively small proportion of variance accounted for by ASI scores across studies, other unmeasured variables (e.g., a family history of alcoholism, a history of panic attacks) likely contribute to my findings.

Other Negative Temperament Constructs. McNally (1996) speculated that both trait anxiety and AS are important in predicting the risk for alcohol abuse. According to McNally's speculations, persons are most likely to abuse substances that dampen arousal if they are relatively high in both trait anxiety and AS. That is, the individual who frequently experiences anxiety (an anxiety-proneness or trait anxiety) and also has a fear of the sensations of anxiety (AS) is most likely to abuse arousal-dampening substances (e.g., alcohol, benzodiazepines; McNally, 1996). According to McNally (1996), AS without anxiety-proneness, and anxiety-proneness without AS are not sufficient to significantly increase the risk for alcohol abuse: A high

AS individual who rarely experiences anxiety would not often have the need to use alcohol to cope with anxiety. Similarly, an individual who frequently experiences anxiety (high trait anxiety) but who does not fear the consequences of anxiety (low AS) would not have much motivation to reduce or control their anxiety experiences through arousal-dampening drug use.

Studies 3 and 4 included a measure of anxiety-proneness (i.e., trait anxiety; STAI-T scores) and thus permitted a test of McNally's (1996) speculation about the importance of both AS and trait anxiety in understanding the drinking behaviour of high AS persons. In these studies, ASI scores were found to be a better predictor of alcohol-related phenomena than STAI-T scores. In Study 3, only ASI scores significantly predicted alcohol-related interference scores in the induced physical discomfort condition. STAI-T scores did not add to the prediction of interference in this condition and thus failed to enter the regression equation. In Study 4, only ASI scores served as a significant predictor of drinking behaviour (i.e., mean alcoholic beverage consumption and BAL samples) and only for the solitary drinking context. STAI-T scores again failed to enter any regression equations. Combined, these results show that anxiety-proneness did not contribute significantly to the prediction of situation-specific drinking. It appears then that, contrary to McNally's speculations (1996), elevated AS contributes significantly to the

prediction of alcohol abuse even in the absence of elevated trait anxiety.

Studies 2, 3, and 4 allowed for assessment of Lilienfeld's (1996) notion that phenomena explained by AS may be better explained by related higher-order constructs such as dysphoria (BDI scores) and anxiety-proneness (STAI-T scores). In Study 2, BDI scores were not significantly correlated with beverage consumption measures for either experimental condition. Moreover, BDI scores failed to add significantly to the prediction of beverage consumption or BAL samples over that predicted by ASI scores, and thus failed to enter the regression equations. As mentioned above, STAI-T scores failed to enter regression equations after ASI scores had entered, in either Study 3 or 4.

In sum, of the negative temperament measures included in this thesis, ASI scores appear to be the best predictor of drinking behaviour (Studies 2 and 4) and of selective attention toward alcohol cues (Study 3) among young adults. Notably, despite significant shared variance between ASI and BDI scores, and between ASI and STAI-T scores, ASI scores were always the best predictor of these alcohol-related phenomena. This was true even though in all three studies ASI scores were measured often several months prior to the experiment during prescreening whereas the other related constructs were measured on the day of testing. The relative importance of AS versus other negative temperament constructs in understanding the self-report drinking

situations of young adults remains to be determined in the case of the Study 1 results on the IDS-42.

These findings are in no way inconsistent with the possibility that AS is related to these other higher-order negative temperament constructs, and that these constructs all serve as manifest variables measuring the latent global factor of negative temperament (Lilienfeld, 1996). Indeed, ASI scores were significantly correlated with BDI and STAI-T scores in Studies 2 and 4, respectively, and tended to be positively correlated with STAI-T scores in Study 3. Also, I did not test the notion put forth by Lilienfeld et al. (1989) that the ASI should predict relevant phenomena over and above those predicted by *established* constructs like trait anxiety. Rather than addressing this question of incremental validity, I assessed which negative temperament constructs serve as the best predictor, whether or not such constructs are well established, using stepwise multiple regression. At present, my combined results suggest that, AS is the best predictor of alcohol-related phenomena relative to the other negative temperament constructs included in this research. Thus, it is AS that appears to motivate alcohol use to reduce negative affect and physical discomfort, not trait anxiety or dysphoria.

Contribution of Panic Attack History. Subjects were not screened for a history of panic attacks or panic disorder in the present work. Thus, it is possible that differences attributed to AS may be attributable to a

history of panic attacks or panic disorder. Research has demonstrated an association between AS and nonclinical panic (e.g., Asmundson & Norton, 1993; Norton et al., 1986) and between AS and panic disorder (e.g., McNally & Lorenz, 1987; Taylor et al., 1991). Also, there is a high comorbidity between alcohol abuse and panic disorder (e.g., Cox et al., 1990). To assess the relative contribution of panic attacks and/or panic disorder relative to AS, it would be necessary to include information on the frequency and severity of panic symptoms in future research. This could be obtained using the Panic Attack Questionnaire (PAQ: Norton et al., 1986).

Contributions of Drinking History and Problem Drinking. By design, problem drinkers were not included in Studies 2 and 4. In these studies, no participants scored higher than 7 on the brief MAST, suggesting the absence of alcohol problems. In contrast, neither drinking problems nor drinking history were assessed in Study 1; and in Study 3, only drinking history was assessed. Given that alcohol problems tend to be associated with elevated AS levels (Conrod et al., in press), it is possible that some of the high AS participants in Studies 1 and 3 could have been problem drinkers. Ideally, measures of both drinking history (for example see Appendix C; Stewart, Peterson & Pihl, 1995) and drinking problems (e.g., brief MAST) would have been included in every study.

This thesis was designed to explore situation-specific drinking in a sample of young adults *at risk* for problem drinking. Thus, the extent to which the results of this thesis generalize to high AS problem drinkers (e.g., brief MAST scores ≥ 10) remains to be investigated in future research.

Other Beverages. The alcoholic beverages used in the present ad-lib studies (Studies 2 and 4) contained hard liquor, but beer and wine have also been used in ad-lib alcohol consumption studies (e.g., George, Phillips, & Skinner, 1988; Higgins & Marlatt, 1973; Strickler et al., 1979). In Studies 2 and 4, subjects were presented with two types of alcoholic beverages (rum & coke, and vodka & orange juice), which were not necessarily their preferred alcoholic beverages. Naturally the generalizability of the results is limited to the extent that the participants disliked the taste of the beverages, with the connotation that the taste-test may have failed to accurately reflect their true drinking levels in the specific context being tested. Hence, a lack of support for the hypothesis that the low AS participants would consume more alcohol in the social drinking context, relative to the solitary context, may have occurred for several reasons. First, low AS individuals are characterized by relatively light self-reported alcohol consumption levels (Stewart, Peterson, & Pihl, 1995). Second, the consumption of the low AS individuals in Study 4

may also have been tempered by the lack of availability of their preferred alcoholic beverage.

There is a limited amount of research on the relationship between beverage types and alcohol problems, and no research on the preferred beverages of high AS versus low AS persons. Smart and Walsh (1995) studied groups of high school students who drank only beer, only wine, or only hard liquor, and those students who drank two or three types of alcoholic beverages. They predicted that young drinkers of more than one type of alcoholic beverage would be heavier drinkers. They also predicted that those high school students who drank only beer or hard liquor would have higher rates of drinking problems than those who drank only wine. Smart and Walsh (1995) found that very few students restricted themselves to only one beverage type (9% beer only, 1% wine only, 7% hard liquor only), and that young men were more likely than young women to drink beer only or beer and hard liquor. They found that drinkers of beer and hard liquor, and drinkers of all three beverage types were more likely to drink heavily (i.e., consuming 5 or more drinks in a single sitting), have drinking related problems (e.g., having seen a doctor because of alcohol use), and engage in delinquent acts (e.g., causing damage to others' property) relative to wine only drinkers. Smart (1996) reviewed literature on the effects of beer, wine, and hard liquor consumption, and concluded that drinkers of hard liquor have the highest level of consumption, and that drinkers of beer,

or of both beer and hard liquor have more serious alcohol-related problems than wine drinkers.

Smart and Walsh (1995) and Smart (1996) suggest that hard liquor and beer are the most relevant alcoholic beverages for studying risk for alcohol problems among young adults given the association of these beverages with heavier consumption and greater alcohol-related problems. Hence, it seems appropriate to have included hard liquor in the present line of research (Studies 2 and 4). Future researchers may wish to assess: (a) differences in beverage preference between high and low AS men and women; and (b) whether the present results generalize to other alcoholic beverages. For example, it would be interesting to determine whether high AS young adults are more likely than low AS young adults to prefer hard liquor and beer over wine.

Other Arousal-Dampening Drugs. McNally (1996) speculated that AS would be related to the use/misuse of any drugs which have the potential to dampen arousal or physical discomfort (e.g., alcohol, benzodiazepines, analgesics). In support of this speculation, Telch, Lucas, and Nelson (1989) found that high AS young adults were more likely to report using medications for stress (including benzodiazepines) than low AS young adults. Support for McNally's hypothesis has also been found in clinical samples. Norton et al. (1997) found that high AS substance abusers were more likely to indicate alcohol and benzodiazepines as their drugs of

choice (52%) as compared to low AS substance abusers (32%). Also, Cox et al. (1993) found that, in male panic disorder patients, ASI scores were associated with alcohol intake and the perceived efficacy of self-medication (alcohol and benzodiazepine use) to cope with anxiety.

The use of benzodiazepines has been found to interfere with the effectiveness of cognitive-behavioral treatment for anxiety disorders (Westra & Stewart, in press). Similar to alcohol, attribution of successful exposure to feared stimuli may be perceived to be more a function of the anxiolytic properties of the substance than a personal ability to effectively manage anxiety. Moreover, dependence on alcohol and benzodiazepines may readily develop following initial use to cope, because both substances have similar arousal-related withdrawal effects which are likely to be feared by high AS persons. The motivation for a high AS individual to continue alcohol or benzodiazepine use could evolve from the avoidance of such uncomfortable withdrawal sensations (see review by Stewart, 1996). Indeed, benzodiazepine dependence has been shown to be a major problem in patients with anxiety disorders characterized by high levels of AS (see reviews in Bruce, Speigel, Gregg, & Nuzzarello, 1995; and Otto, Pollack, Meltzer-Brody, & Rosenbaum, 1992). Also, panic disorder patients who maintain high levels of AS after cognitive-behavioral therapy are more vulnerable to relapse to benzodiazepine use if their feared anxiety symptoms return (Bruce, 1996). The

fast-acting benzodiazepines (e.g., Xanax) may be especially problematic given their rapid progress through the blood stream and subsequent rebound anxiety (Westra & Stewart, in press). Future research might investigate whether high AS young adults choose to self-administer benzodiazepines in situations involving negative affect, physical discomfort, and/or conflict with others given the demonstrated use of alcohol in these situations among high AS individuals as found in this thesis.

AS levels are not only associated with the use of alcohol and benzodiazepines (Norton et al., 1997), but also with the use of analgesic medications (Asmundson & Norton, 1995). In addition to the anxiolytic properties of alcohol, alcohol also has analgesic effects at certain doses (Stewart, Finn, & Pihl, 1995). Indeed, alcohol was one of the first drugs used to reduce pain (Petrie, 1978). It not surprising then that researchers have begun to explore the relationship between AS levels and the use of analgesic medications. Asmundson and Norton (1995) found that AS levels were related to the use of analgesics in a sample of patients with unexplained chronic back pain. In a second study, Asmundson and Taylor (1996) found that high levels of AS promote pain-related escape and avoidance behaviours, such as analgesic medication use, by way of their influence on the fear of pain.

In the present line of research, AS was positively related to frequency of drinking in situations involving

physical discomfort (see Study 1) and AS was related to an attentional bias for alcohol under a condition of physical discomfort (Study 3). Hence, future researchers might investigate whether AS levels predict, not only the use of prescription analgesic medication, but the use of alcohol to dampen pain among chronic pain patients. Also, future research could use a similar methodology to that of Study 3 to assess whether chronic pain patients with high AS selectively attend to alcohol cues when experiencing physical discomfort due to pain.

Gender Differences. There have been inconsistent findings on the relationship of gender to understanding the link between AS and alcohol use/abuse (cf., Norton et al., 1997; Cox et al., 1993; Stewart, Karp, et al., 1997; Stewart & Zeitlin, 1995). Examination of the contribution of gender was not an a priori objective of the present line of research. Moreover, the sample sizes utilized in the studies were generally insufficient to permit post hoc analyses of gender differences. Every effort was made to obtain equal numbers of high and low AS male and female participants in the lab analogue studies in order to control for gender. This was no small task. The majority of students in Dalhousie undergraduate psychology classes (the screening pool) are women. This makes it relatively more difficult to find men with high ASI scores. Also, the mean ASI score for men tends to be lower than that for women (Peterson & Reiss, 1992). One proposed alternative then is

to choose high and low AS research subjects based on gender norms (Peterson & Reiss, 1992). However, men and women were matched for AS levels in the present lab-based studies (Studies 2 and 4) because the research focus was AS, not the AS by gender interaction.

Some research on gender differences may be applicable to the present findings. Research from the Stewart lab suggests that women may be more concerned with the physical consequences of anxiety (e.g., heart attack, shortness of breath) while men may be more concerned with the anticipated social and psychological consequences of anxiety (e.g., embarrassment, loss of control). This has important implications for Study 2 in which social-evaluative concerns may have influenced the results, and for Study 3 in which fear of physical arousal sensations appears to have influenced the results. Stewart, Taylor, and Baker (1997) found three lower-order, correlated ASI factors which were consistent across gender. These ASI factors corresponded to fears about the anticipated physical (e.g., ASI Item No. 6: "It scares me when my heart beats rapidly"), psychological (e.g., ASI Item No. 15: "When I cannot keep my mind on a task, I worry that I might be going crazy"), and social (e.g., ASI Item No. 1: "It is important for me not to appear nervous") consequences of anxiety. Stewart, Taylor, and Baker (1997) found that women and men were equivalent in terms of the degree of anxiety-related psychological and social concerns, but women scored significantly higher than

men on the physical concerns factor. Moreover, men's scores on the physical concerns factor were significantly lower than their scores on either the psychological or social concerns factors. Using the modified Stroop paradigm, Stewart et al. (1998) found that high AS men displayed greater interference only for social/psychological threat words (e.g., EMBARRASS; CRAZY) relative to low AS men. Conversely, high AS women displayed the opposite pattern showing greater interference only for physical threat words (e.g., CORONARY; SUFFOCATED) relative to low AS women. Stewart, Taylor, and Baker (1997) speculated that these gender difference in the intensity of feared consequences of anxiety symptoms may be related to differences in sex role socialization of boys versus girls. For example, given that boys learn at an early age that it is important not to lose control or display their anxiety, the concerns of high AS males may be focused in the social/psychological domain.

In Study 2 it was speculated that social-evaluative concerns may have suppressed the alcoholic beverage consumption of high AS participants who were anticipating having to answer questions about their personal experiences with anxiety (Study 2). This speculation might be most true for high AS men given their greater fear of the social and psychological consequences of anxiety relative to high AS women. Thus, high AS levels (particularly among men) could lead to suppressed alcohol consumption in situations where being intoxicated could prove embarrassing, for example.

The evidence of an attention bias for alcohol cues when experiencing physical discomfort in Study 3 might be stronger for high AS women than high AS men given their greater fear of the physical aspects of anxiety (e.g., shortness of breath) relative to high AS men. Replication and extension of the present studies, including a priori gender hypotheses, would afford an opportunity to test these speculations.

Alcohol Expectancies. Research on alcohol expectancies also supports an important relationship between AS levels and the use of alcohol for tension reduction (Karp, 1993). "Expectancies" refer to beliefs about the effects of alcohol (Goldman, Brown, & Christiansen, 1987). Research has shown that alcohol expectancies arise from an individual's learning history early in life, prior to personal experiences with alcohol (Goldman et al.). Positive alcohol expectancies include the belief that moderate doses of alcohol lead to relaxation and tension reduction. Positive alcohol expectancies in general, and relaxation and tension-reduction expectancies in particular, strongly predict drinking levels, risk for alcohol problems, and relative recovery from alcohol disorders (Goldman et al).

Using the Alcohol Expectancy Questionnaire (AEQ: Brown, Christiansen, & Goldman, 1987), Karp (1993) found that AS levels were significantly related to higher levels of positive AEQ alcohol expectancies in a large sample of subjects diagnosed with DSM-III-R alcohol abuse/dependence.

AS was the best predictor of tension-reduction expectancies relative to trait anxiety and dysphoria (Karp, 1993). The relationship between AS and alcohol expectancies remains to be explored in nonclinical samples. For example, given that alcohol expectancies arise in part from personal experiences with alcohol (Goldman et al., 1987) and given the results found in this thesis, I would predict that AS levels would be most strongly and positively correlated with tension reduction expectancies in nonclinical young adults.

*Clinical Implications*

This line of research may have important clinical implications. Prevention could be started at a young age (i.e., early 20's) to assist high AS individuals to develop alternatives to alcohol use in the potentially risky situations involving negative affect and physical discomfort. Moreover, if this pattern of situation-specific drinking found for nonclinical high AS individuals withstands replication in a sample of high AS problem drinkers, then my prescriptions for the prevention of alcohol problems in young adult high AS persons also apply to the treatment of a subgroup of alcohol dependent drinkers.

Among alcoholics, the information provided by the IDS is useful for harm reduction (Marlatt & Gordon, 1980) and relapse prevention in alcohol misuse/abuse programs (Marlatt, 1985; Marlatt & Gordon, 1986; Sobell & Sobell, 1993). For high AS young adults, the negatively-reinforcing

drinking situations on the IDS-42 can become the focus of alcohol abuse prevention efforts. These situations can be targeted for cue exposure and response prevention treatment (Annis & Davis, 1989) to prevent alcohol misuse. This would involve exposure of high AS individuals to the situational antecedents associated with more frequent drinking (e.g., physical discomfort) followed by prevention of the use of alcohol. Graduated exposure to cues of increasing magnitude in eliciting drinking is currently tailored to the individual by establishing those situations in which he/she most frequently uses alcohol on the IDS (Annis & Davis, 1989). In this way, the individual learns through exposure that the experience of craving for alcohol in response to various cues diminishes/habituates with time (Stockwell & Town, 1989).

"Counter conditioning" is an alternative behavioral strategy that might be appropriate for preventing/treating alcohol abuse among high AS individuals. This treatment approach would involve substitution of drinking with healthy, alternative anxiety and stress management strategies (e.g., mindfulness meditation, diaphragmatic breathing, and/or progressive muscle relaxation) in response to negative affect and physical discomfort (Stockwell & Town, 1989).

A cognitive preoccupation with alcohol is reflected in the testing personal control items (e.g., "When I started to think that just one drink could cause no harm"). The

significant positive correlation between ASI scores and drinking frequency in testing personal control situations was unexpected and warrants further research. Restrained drinking refers to a cognitive preoccupation with alcohol intake (Collins, 1993). It would be interesting to examine the relationship between elevated levels of AS and restrained drinking. In the interim, however, I would like to propose several speculations which could become the focus of future research.

The correlation with drinking frequency in testing personal control situations suggests that high AS drinkers might be poor candidates for treatment in Alcoholics Anonymous (A.A.; Alcoholics Anonymous, 1955). According to the disease model of alcoholism promoted by A.A., alcoholics have no control over their intake of alcohol because of the disease of alcoholism. This is captured by the popular A.A. notion of "one drink away from a drunk" (Alcoholics Anonymous, 1955). The only recourse according to A.A. is total abstinence. Exposure to this model could potentially provoke a high AS person to attempt abstinence. Given that high AS individuals tend to drink more often in testing personal control situations, this attempt at abstinence could end with failure, self-deprecation, anxiety, and guilt. Such negative emotions could in turn prompt even further alcohol use in the absence of more effective coping strategies to manage the resultant negative affect.

My speculation that high AS individuals who misuse/abuse alcohol would respond poorly to A.A. treatment arises from the notion of the abstinence violation effect (AVE: Collins, 1993; Marlatt & Gordon, 1986; Sobell & Sobell, 1993). According to the AVE, a loss of perceived control over drinking can result in negative emotions, which set the stage for overindulgence in alcohol (Marlatt & Gordon, 1980). Hence, the high AS person who "slips" could blame him/herself for the loss of control (e.g., "I'm a total failure"; "I have this horrible disease of alcoholism"), which fosters even more negative affect, followed by even more indulgence in alcohol given that alcohol is used often by high AS individuals in negative affect situations as found in Study 1. This example emphasizes the need to educate high AS individuals about the difference between a "lapse" and a "relapse" to minimize the harmful consequences of excessive alcohol use. This might take the form of cognitive restructuring to reduce the likelihood of their catastrophizing about a slip from a goal of abstinence or moderation (e.g., "I had one drink already, so I might as well get drunk because I've already blown it") which could result in excessive drinking.

This entire cycle of restraint, temptation, indulgence, negative affect, and overindulgence has the potential to be exacerbated for high AS persons because of the bodily arousal which accompanies alcohol withdrawal. Study 1 demonstrated that high AS individuals report drinking more

often when experiencing physical discomfort. Alcohol could be used to dampen those uncomfortable arousal-related bodily sensations (e.g., IDS-42 Physical Discomfort Item No. 42: "When I felt nauseous") which can accompany a "hangover" and which are by definition feared by high AS persons. This has the potential to result in even more pathological alcohol use over time among high AS individuals to avoid withdrawal symptoms (Stockwell et al., 1982).

This hypothetical example is presented to emphasize the need to tailor the treatment to the characteristics of the individual who is misusing/abusing alcohol. This necessitates empirical examination of individual differences such as AS interacting with various treatment modalities to identify those approaches to alcohol treatment (e.g., A.A. versus controlled drinking) which might be most effective for which individuals.

Alcoholism treatment research has begun to move in the direction of tailoring interventions to specific individuals. Project MATCH (Project MATCH Research Group, 1993) has proposed that drinking treatment outcome will be a function of an interaction between individual differences and treatment type. At present little support for the matching hypotheses has been found. One criticism, which may explain the lack of support for matching, is Project MATCH's use of a "hindsight matching design" (see Conrod, Pihl, Stewart, Côté, & Dongier, 1997; Miller & Cooney, 1994). In "hindsight matching" individuals are randomly assigned to

treatment groups. Only through posthoc analysis of therapy outcome is an attempt made to determine which individual difference variables predict responsiveness to which treatment type(s). An alternative "foresight matching design" may have more promise (Conrod, Pihl, et al., 1997). In the "foresight matching design," individuals are assigned to matched treatment based on theory-driven individual differences that are presumed to predict responsiveness to a specific treatment type. Using "foresight" matching, Conrod, Pihl, et al. (1997) matched substance abusing women to a brief cognitive-behavioral intervention which matched the woman's specific motivation for substance use (AS; hopelessness; impulsivity; or sensation seeking). For example, treatment consisted of providing cognitive restructuring and anxiety management training to the AS substance abusing women. Conrod, Pihl, et al. (1997) found support for the clinical efficacy of motivation-matched intervention; 50% of substance abusing/dependent women no longer met criteria for substance abuse or dependence six months following the matched intervention. This stands in contrast to remission rates of 27% (motivation-mismatched) and 22% (educational film) in two control groups.

My speculation that high AS individuals who misuse/ abuse alcohol would respond poorly to A.A. lends itself to a "foresight matching design" for alcohol treatment outcome evaluation. High and low AS problem drinkers could be randomly assigned to participate in a Twelve Step,

abstinence-based program (e.g., A.A.; Alcoholics Anonymous, 1955) or a controlled drinking, cognitive-behavioral program (e.g., Sobell & Sobell, 1993). Given their use of alcohol in negative affect situations and when testing control over alcohol (Study 1), I would predict that high AS individuals would have higher remission rates following a controlled drinking model relative to participation in a Twelve Step, abstinence program. I would predict this treatment specificity only for high AS persons.

Presumably it is their fear of anxiety that motivates high AS individuals to drink more frequently in risky negative affect situations. This suggests an alternative approach to alcohol misuse/abuse prevention in nonclinical high AS young adults; namely, reduce their motivation to drink by reducing their levels of AS. Harrington, Telch, Abplanalp, and Hamilton (1995) found that AS levels in nonclinical high AS individuals can be lowered using group cognitive-behavioral treatment consisting of anxiety education, interoceptive exposure (i.e., exposure to sensations of bodily arousal), and breathing retraining. A non-specific treatment condition simply consisted of a therapist spending the same amount of time with the subjects as spent during AS reduction treatment, but with no specific therapeutic techniques. Harrington and colleagues found that the number of high AS subjects experiencing a panic attack in response to carbon dioxide inhalation decreased significantly in the AS-reduction treatment condition. They

also found a significant difference in the post-training ASI scores of subjects receiving non-specific treatment (*M* = 23.38) versus subjects receiving the AS reduction training (*M* = 18.58) at the .01 level. Also, for the subjects undergoing AS reduction training, ASI levels decreased from 27.95 (*SD* = 7.52) at pretraining to the nonclinical normative level of 18.58 (*SD* = 7.63) at posttraining. This type of AS reduction training might also be used with high AS persons to reduce the need to use alcohol to cope with anxiety sensations.

*Concluding Remarks*

The demonstrated associations between AS and the use of alcohol in solitary drinking situations, when experiencing negative affect and physical discomfort, and to test personal control over alcohol use provide several important future research directions. Research on the mechanisms underlying the misuse of alcohol among high AS young adults can lead to the development and evaluation of interventions for them to reduce risky drinking. The motivation-matching treatment used by Conrod, Pihl, et al. (1997) provides some preliminary evidence that short-term cognitive-behavioral treatment targeted to specific motivations for alcohol use (e.g., anxiolysis) has promise. This type of treatment approach might be adapted for the prevention of alcohol abuse for high AS individuals given their use of alcohol to cope with negative affect. Given their more frequent drinking in testing personal control situations, a high AS

individual might benefit more from controlled drinking than attempts at complete abstinence as advocated by Twelve Step programs. In addition, work by Harrington et al. (1995) suggests promising cognitive-behavioral strategies to reduce levels of AS in nonclinical individuals. If their fear of anxiety is reduced, high AS individuals may have less motivation to misuse alcohol to cope with anxiety.

Appendix A

Maximum Likelihood (ML) and Standard Errors (SE) for the Lower-Order IDS-42 Factors

| IDS-42 Item Number | Unpleasant Emotions | | Physical Discomfort | | Pleasant Emotions | | Testing Personal Control | | Urges and Temptations | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ML | SE | ML | SE | ML | SE | ML | SE | ML | SE |
| 01 | .56 | .05 | | | | | | | | |
| 21 | .81 | .04 | | | | | | | | |
| 41 | .79 | .04 | | | | | | | | |
| 61 | .74 | .04 | | | | | | | | |
| 02 | | | .33 | .05 | | | | | | |
| 22 | | | .08 | .05 | | | | | | |
| 42 | | | .35 | .05 | | | | | | |
| 62 | | | .52 | .06 | | | | | | |
| 03 | | | | | .64 | .05 | | | | |
| 23 | | | | | .72 | .05 | | | | |
| 43 | | | | | .71 | .05 | | | | |
| 63 | | | | | .83 | .04 | | | | |
| 05 | | | | | | | .49 | .05 | | |
| 25 | | | | | | | .60 | .05 | | |
| 45 | | | | | | | .64 | .05 | | |
| 65 | | | | | | | .72 | .05 | | |
| 06 | | | | | | | | | .53 | .05 |
| 26 | | | | | | | | | .58 | .05 |
| 46 | | | | | | | | | .48 | .05 |
| 66 | | | | | | | | | .71 | .05 |

Appendix A continued

| IDS-42 Item Number | Conflict with Others ML | SE | Social Pressure to Drink ML | SE | Pleasant Times with Others ML | SE |
|---|---|---|---|---|---|---|
| 07 | .51 | .05 | | | | |
| 10 | .53 | .05 | | | | |
| 17 | .62 | .05 | | | | |
| 27 | .56 | .05 | | | | |
| 30 | .60 | .05 | | | | |
| 37 | .67 | .05 | | | | |
| 47 | .66 | .05 | | | | |
| 50 | .71 | .05 | | | | |
| 67 | .67 | .05 | | | | |
| 70 | .68 | .05 | | | | |
| 87 | .73 | .04 | | | | |
| 90 | .71 | .05 | | | | |
| 08 | | | .80 | .04 | | |
| 28 | | | .81 | .04 | | |
| 48 | | | .67 | .05 | | |
| 68 | | | .83 | .04 | | |
| 09 | | | | | .41 | .05 |
| 19 | | | | | .79 | .04 |
| 29 | | | | | .51 | .05 |
| 49 | | | | | .81 | .04 |
| 69 | | | | | .82 | .04 |
| 89 | | | | | .79 | .04 |

Notes. Item numbers correspond to those of the 100-item Inventory of Drinking Situations. From "Examination of the Short Form of the Inventory of Drinking Situations (IDS-42) in a Young Adult University Sample," by G. Carrigan, S. Barton Samoluk, and S. H. Stewart, in press, *Behaviour Research and Therapy*. 

Appendix B

Maximum Likelihood (ML) and Standard Errors (SE) for Higher-Order IDS-42 Factors

| Lower-Order Factor | Negatively-Reinforcing Drinking Situations | | Positively-Reinforcing Drinking Situations | | Temptation Drinking Situations | |
|---|---|---|---|---|---|---|
| | ML | SE | ML | SE | ML | SE |
| UE | .85 | .04 | | | | |
| PD | .65 | .05 | | | | |
| CWO | .91 | .04 | | | | |
| PE | | | .80 | .04 | | |
| SPD | | | .83 | .04 | | |
| PTO | | | .95 | .04 | | |
| TPC | | | | | .46 | .06 |
| UT | | | | | .78 | .06 |

Notes. UE = Unpleasant Emotions; PD = Physical Discomfort; CWO = Conflict with Others; PE = Pleasant Emotions; SPD = Social Pressure to Drinking; PTO = Pleasant Times with Others; TPC = Testing Personal Control; and UT = Urges & Temptations. From "Examination of the Short Form of the Inventory of Drinking Situations (IDS-42) in a Young Adult University Sample," by G. Carrigan, S. Barton Samoluk, and S. H. Stewart, in press, *Behaviour Research and Therapy*. 

Appendix C

Drinking History

(1) Answer one of the following questions:

How many occasions per week do you normally consume alcohol?

_____

If less than one occasion per week, how many occasions per month?

_____

If less than once per month, how many occasions per year?

_____

(2) How many alcoholic beverages do you normally consume per drinking occasion? (Note that one alcoholic beverage = one 12-oz (355 ml) bottle/can of beer, or one small 4-oz (118 ml) glass of wine, or one 1-oz (29.6 ml) shot of hard liquor, either straight or with a mixer.)

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# IMAGE EVALUATION
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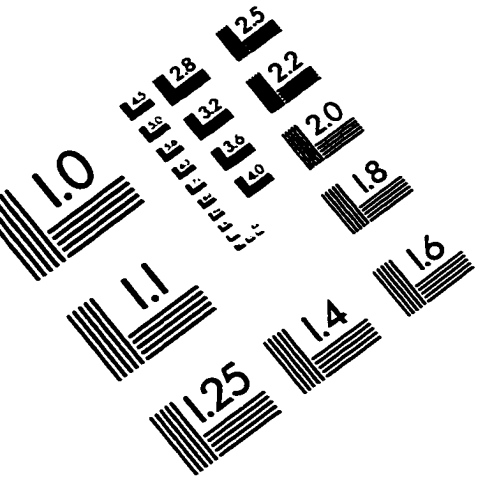


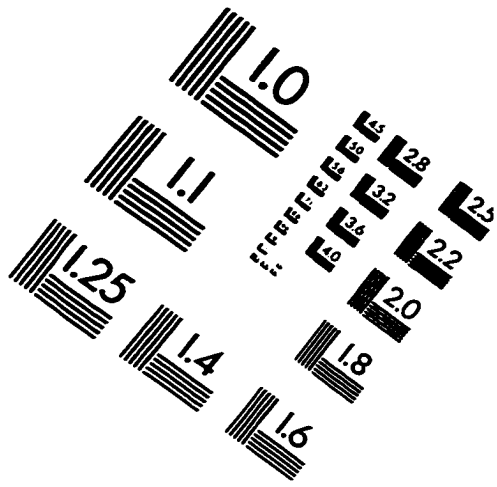


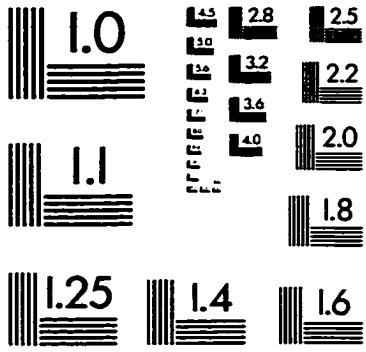


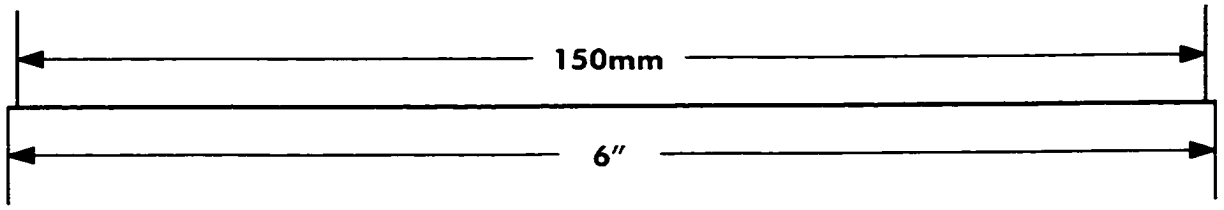


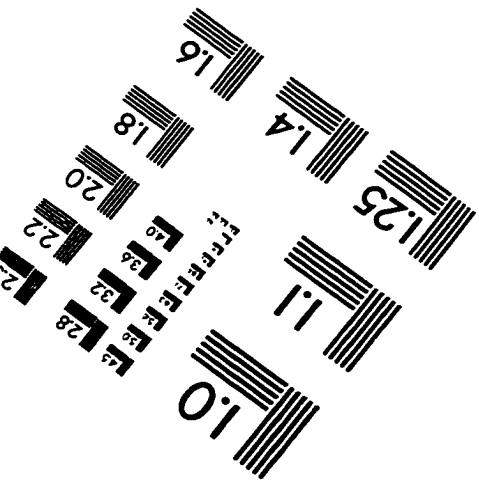


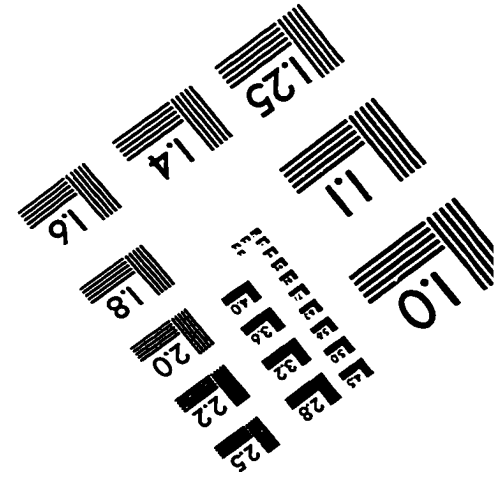


APPLIED IMAGE, Inc
1653 East Main Street
Rochester, NY 14609 USA
Phone: 716/482-0300
Fax: 716/288-5989