

IMPLICIT ATTITUDE AS A MODERATOR OF THE RELATIONSHIP BETWEEN SELF-
AWARENESS AND ALCOHOL CONSUMPTION

A Thesis

Presented to

The Faculty of the Department

of Psychology

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In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

By

Dawn W. Foster

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ABSTRACT

Despite prevention and intervention efforts, almost 20 percent of college students meet DSM-IV criteria for alcohol dependence/abuse (NIAAA, 2007) and alcohol related consequences remain prevalent. Because many of the processes that influence behavior occur in the absence of awareness, indirect measures of implicit attitude such as the implicit association test (IAT) may be useful tools in predicting behavior. Results show that IAT performance (*D* scores) correlates with behaviors including alcohol use. Applications of objective self-awareness theory and the self-awareness model of alcohol consumption have demonstrated support for the view that self-awareness, and components thereof, may be associated with drinking. The literature on the relationship between self-awareness and drinking has reported inconsistent findings. The present study was designed to address the mixed literature by proposing alcohol-related implicit attitude as a moderator of the relationship between self-awareness and drinking. Self-awareness was expected to be positively associated with drinking, but only among those who have more positive (or less negative) implicit associations with drinking. Multiple hierarchical regression analyses revealed that gender was significantly related to drinking such that women reported drinking less than men, which reiterates the importance of considering gender differences in drinking. Furthermore, there was a main effect for IAT performance such that heavier drinkers had more positive (or less negative) *D* scores. Results further revealed that, consistent with theoretical predictions, self-consciousness (trait self-awareness), was positively associated with alcohol-related problems but not alcohol consumption. There was no evidence to support the hypothesis that implicit attitude would moderate the effect of self-awareness on drinking. This study contributes to the growing social cognitive literature that seeks to

understand and identify individual differences in drinking and determine if automatic processes represent a target for treatment and prevention efforts for maladaptive behaviors.

Keywords: implicit association test; self-awareness; alcohol

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Implicit attitude as a moderator of the relationship between self-awareness and alcohol
consumption

This paper begins with a brief discussion on college drinking, followed by a discussion of self-awareness theory and developments that have expanded the theory since its initial proposal in 1972 by Duval and Wicklund. Applications of self-awareness theory in the study of alcohol consumption are presented, as well as a review of implicit association tests (Greenwald, McGhee, & Schwartz, 1998) and their format, followed by a discussion of their application in alcohol research. The current study is then presented, followed by findings and associated discussion.

College Drinking

Despite prevention and intervention efforts, alcohol use among undergraduate students continues to be problematic and prevalent. Two college drinking reports (NIAAA, 2002, 2007) examining the trends in magnitude of the mortality and the morbidity related to college drinking show that less than five percent of college students seek treatment or counseling for alcohol abuse and nearly 20 percent meet DSM-IV criteria for alcohol dependence or abuse (NIAAA, 2007). Research shows that young adults engage in heavy drinking and experience undesired alcohol-related problems that range in severity including trouble with authorities, hangovers, poor class attendance, injuries, risky sexual behavior, sexual assault, and fatalities (Hingson et al., 2005; Hingson, 2010; Wechsler et al., 2000; Wechsler et al., 1994). Additionally, there is evidence for links between risky sexual behavior, sexual assault, and college drinking (Abbey et al., 2003; Kaysen et al., 2006; Koss & Gaines, 1993; Larimer et al., 1999), depression (Geisner, Larimer, & Neighbors, 2004), and eating disorders (Dunn et al., 2002). Prevalence estimates

show that four out of five college students drink, two-thirds of students drink at least monthly, and two out of five students frequently consume several drinks on a given occasion (Johnston et al., 2006). Furthermore, compared to 38.4% of non-college peers, 43.6% of undergraduate students report heavy episodic drinking (five or more drinks in a row during the past two weeks; SAMHSA, 2008). Recent decades have seen an expansion of the knowledge base and scientific literature regarding ways in which to reduce drinking and harm among at-risk populations such as college students, however, additional research is needed to understand how to further translate this knowledge into a reduction of behaviors associated with alcohol abuse and correlating harmful problems. Research areas and strategies worth pursuing include brief interventions, internet screening/feedback, and routine health service encounters. One promising avenue of research that addresses the problem of college drinking pertains to self-awareness, a trait that may hold important implications with respect to efficacy of alcohol interventions.

Self-Awareness

Objective self-awareness theory. Duval and Wicklund (1972) proposed the theory of objective self-awareness, one of the relatively early self theories in social psychology, which suggests that self-awareness involves attention being inwardly focused toward the self rather than outwardly focused toward the environment. Objective self-awareness theory is concerned with the consciousness's self-reflective quality and proposes that individuals evaluate and compare the actual self and ideal self (Duval & Wicklund, 1972). Unfavorable comparisons, such as situations in which the ideal self is better than the actual self, might cause an individual to experience negative affect, which may in turn motivate the individual to engage in behaviors in attempts to avoid the uncomfortable state of self-awareness or engage in behaviors to reduce the discrepancy between the real and ideal self (Duval & Wicklund, 1972). The self is the object

of one's consciousness when attention is directed inward, hence 'objective' self-awareness, and this is distinct from the state in which a person's attention is directed away from the self (Duval & Wicklund, 1972). Self-awareness is invoked by stimuli that focus attention toward the self (Duval & Wicklund, 1972). The theory suggests that a self-aware person is likely to attend to behavioral standards that are contextually appropriate and regulate own behaviors such that they are consistent with salient normative standards (Duval & Wicklund, 1972). Thus, Duval and Wicklund (1972) proposed a practical paradigm within which to investigate self-awareness.

Applications of objective self-awareness theory. Studies applying self-awareness theory have examined relationships between self-awareness and self-regulation (Beaman, Klentz, Diener, & Svanum, 1979). Studies have induced self-awareness with the use of video tape cameras, recordings of one's voice, and the use of mirrors to focus attention inward toward the self (Hull, 1981). Private and public self-consciousness have been used as an individual trait measure of self-awareness (e.g., LaBrie, Pedersen, Neighbors, & Hummer, 2008) and are defined as the selective encoding process of information that is self-relevant (Niaura, Wilson, & Westrick, 1988). The self-consciousness scale was developed by Fenigstein, Scheier, and Buss (1975) and measures the components of self-consciousness; private self-consciousness, public self-consciousness, and social anxiety. Private self-consciousness is cognitive and related to attendance to inner reflections, and public self-consciousness is related to the self as a social object that is influenced by others. Both private and public self-consciousness are also related to social anxiety, which is a reaction of discomfort in the presence of others by self-focused attention (Fenigstein et al., 1975; Fenigstein, 2009; Klonsky, Dutton, & Liebel, 1990). In a study applying this scale as a way of indirectly measuring self-awareness, Bartholow, Sher, and Stratham (2000) investigated private self-consciousness as a moderator of the relationship

between alcohol-related outcome expectancies and drinking. These expectancies can be thought of as predictions or beliefs regarding the likely positive or negative consequences of consuming alcohol (Bartholow et al., 2000). Findings revealed that for participants of legal drinking age, high private self-consciousness was associated with a stronger link between outcome expectancies and drinking behavior compared to low private self-consciousness (Bartholow et al., 2000). Moreover, private self-consciousness was associated with underage drinking when controlling for outcome expectancies (Bartholow et al., 2000). In another study applying the self-consciousness scale as a way of indirectly measuring self-awareness, Park, Sher, and Krull (2006) evaluated Greek membership as a moderator of drunkenness frequency and found that alcohol consumption increased with private self-consciousness for sorority members, whereas alcohol consumption was negatively correlated with private and public self-consciousness for fraternity members (2006).

A self-awareness model of alcohol consumption. Extensions have been made to the theory of objective self-awareness since its conception. The self-awareness model of alcohol consumption, proposed by Hull in 1981, suggests that rather than directly reducing tension, alcohol reduces awareness of potential sources of tension. The model is based on the assertion that alcohol decreases self-awareness by interfering with processes fundamental to a self-aware state, therefore, the effects of alcohol are more cognitive than affective-motivational (Hull, 1981). This perspective suggests that the sensitivity necessary for the appropriate adapting of behaviors to situational contexts decreases, leading to a corresponding decrease in appropriate behaviors (Hull, 1981). Hull and Levy (1979) proposed that contrary to the Duval and Wicklund model (1972), it is only in situations when the individual is challenged with evaluative information about their behaviors that self-awareness leads to self-evaluation. Thus, self-

awareness is not related to self-critical reactions unless performance feedback is present (Hull & Levy, 1979). The model further suggests that although alcohol inhibits higher order processes leading to self-awareness, drinking provides psychological relief from negative affect (Hull, 1981). In summary, the self-awareness model of alcohol consumption posits that encoding processes important in self-awareness are impeded by alcohol, drinking results in disinhibition of inappropriate behaviors, alcohol consumption is related to decreases in failure-induced negative self-evaluation, and that this source of psychological relief reinforces alcohol use (Hull, 1981).

Since objective self-awareness theory was first proposed by Duval and Wicklund (1982), the theory has undergone fundamental changes (Gibbons, 1990; Silvia & Duval, 2001). The original theory did not address how dealing with the discrepancy between the actual and ideal self would take place, as there are many coping possibilities from which to choose (Silvia & Duval, 2001). Alcohol use is one of the possible pathways, and it is important to consider factors that identify individuals who are more likely to choose this pathway. Developments in the theory include the suggestion that the rate of progress toward the ideal self compared to the size of discrepancy between the ideal and actual self, and the attributions for the cause of discrepancy are moderators of ways in which people cope with the discrepancy between the real and ideal self (Silvia & Duval, 2001). Thus, developments in the theory better equip it to help researchers understand why actions following awareness of discrepancy follow one path over another (Silvia & Duval, 2001). The following sections provide a discussion of findings that show support for the model, findings that do not show support for the model, and recent findings with respect to the self-awareness model of alcohol consumption.

Support for the self-awareness model of alcohol consumption. Hull, Levenson, Young, and Sher (1983) examined drinking effects on the self-aware state and hypothesized that within

the paradigm of the self-awareness model of alcohol consumption (Hull 1981), drinking would decrease self-awareness. Hull and colleagues (1983) found support for this hypothesis in that drinking was related to a decrease in the relative frequency of self-focused statements and an increase in the relative frequency of statements that were not focused on the self. Moreover, by reducing self-awareness, alcohol may be associated with a reduction in adherence to appropriate conduct standards in both internal and external contexts, and thus result in personally or socially inappropriate behavior (Hull et al., 1983). Self-awareness is related to individual responses to implications of behavior, and individuals may drink as a response to personal success (to enhance or prolong happiness) or personal failure (to avoid or decrease awareness; Hull et al., 1983). Furthermore, as alcohol decreases self-awareness and self-awareness is related to responses to both positive and negative implications of behavior, individuals who are self-aware may drink on the basis of failures and successes (Hull et al., 1983). The behavioral and emotional consequences of drinking take on new meaning given the implication that alcohol reduces self-awareness (Hull et al., 1983).

To assess the real world applicability of the self-awareness model of alcohol consumption and compare the model to other alcohol use models, Hull, Young, and Jouriles (1986) conducted two experiments outside the laboratory. Drinking was predicted to be a function of both private self-consciousness and personal failure or success, and life events were expected to be more strongly associated with drinking among individuals high in private self-consciousness compared to individuals low in private self-consciousness (Hull, Young, & Jouriles, 1986). Additionally, drinking motives were expected to be contingent on attempts to control sensitivity to awareness of implications of personal success (to enhance or prolong happiness) or personal failure (to avoid or decrease awareness; Hull et al., 1983, 1986). The self-awareness model of alcohol

consumption was assessed with regard to relapse after alcohol detoxification and adolescent drinking (Hull et al., 1986). Findings revealed that drinking was a joint function of the level of self-consciousness and personal failure or success across differing populations, varying patterns of drinking behavior, and different life experiences (Hull et al., 1986). Specifically, individuals drink in order to reduce self-awareness, and drinking is related to self-relevant feedback for those high in self-consciousness, but not for those low in self-consciousness (Hull et al., 1986). This is consistent with the premise that drinking is a function of self-relevant feedback for individuals high in private self-consciousness, and results support the generalizability of the self-awareness model of alcohol consumption to contexts outside of the laboratory (Hull et al., 1986).

Lack of support for the self-awareness model of consumption To further study drinking in non-laboratory environments, Chassin, Mann, and Sher (1988) designed two studies to assess the ability of the self-awareness model of consumption to account for the clinical importance of adolescent drinking. Although findings indicate that adolescent alcohol consumption was predicted from interacting variables including personal failure feedback, family history of alcoholism, and self-awareness, these results did not support self-awareness theory (Chassin et al., 1988). Among adolescents low in self-awareness, a family history of alcoholism was related to alcohol-related negative consequences, whereas among adolescents high in self-awareness, this interaction was not significant (Chassin et al., 1988). Additionally, for adolescents low in self-awareness, a family history of alcoholism was associated with increased quantity and frequency of drinking and alcohol-related consequences (Chassin et al., 1988). This relationship was not found among adolescents high in self-awareness. These findings are contrary to the suggestion that self-awareness motivates drinking to regulate the uncomfortable self-aware state

(Hull, 1981). Further research is needed to understand the possible protective effects of self-awareness.

Niaura, Wilson, and Westrick (1988) evaluated private self-consciousness as a measure of individual attendance to the self in a study assessing sensitivity to alcohol effects, cardiovascular reactivity, and the relation of coronary heart disease to alcohol consumption. Participants included 72 healthy males and findings revealed that private self-consciousness and behavior type interacted to diminish the effect of alcohol on systolic blood pressure, and these results did not support the hypothesis that individuals high in self-consciousness would be most sensitive to alcohol effects and have more physiological response to stress (Niaura et al., 1988). Rather, while performing the speech stressor task, individuals low in private self-consciousness had the most sensitivity to alcohol effects and greatest systolic blood pressure increases (Niaura et al., 1988). This is contrary to theoretical predictions made by the self-awareness model of alcohol consumption (Hull, 1981). Taken together, the discrepant findings of these studies indicate that further research is needed to understand the individual differences of self-awareness and how they relate to drinking and associated problems or responses (Chassin et al., 1988; Niaura et al., 1988).

Recent research. The moderating effect of self-consciousness on alcohol use was examined in the context of Greek affiliation (Park et al., 2006). Although Greek organization members generally drink more than non-members, not all members are vulnerable to the influences of Greek involvement on drinking (Park et al., 2006). Some members seem to be strongly influenced, while others seem unaffected by Greek environments, and thus a study was designed to identify factors that insulate individuals from Greek influence on drinking (Park et al., 2006). Self-consciousness was expected to moderate the influence of Greek involvement on

problematic alcohol use (Park et al., 2006). Findings revealed that Greek influence on risky drinking was moderated by public and private self-consciousness and gender (Park et al., 2006). High public and private self-consciousness was a protective factor against drunkenness for fraternity members, and they were less likely to engage in risky drinking (Park et al., 2006). Fraternity members high in self-consciousness tended to evaluate themselves according to external or internal standards, and this comparison of the self with a standard of correctness inhibits counter-normative and impulsive behaviors. Private self-consciousness had a protective effect against drinking for sorority members (Park et al., 2006). Further research on intrapersonal variables is needed to understand how to interpret these differences in gender.

In a similar study evaluating the role of self-consciousness in the experience of alcohol-related consequences, the relationship between gender and public and private self-consciousness, and social anxiety was assessed, as well as effects on drinking and alcohol-related consequences (LaBrie, Pedersen, Neighbors, & Hummer, 2008). Findings supported the hypothesis that high private self-consciousness and social anxiety were related to less drinking (LaBrie et al., 2008). Results revealed that being male was associated with heavier drinking, however gender was not a moderator of the relationships between private self-consciousness and drinking, public self-consciousness and drinking, or social anxiety and drinking (LaBrie et al., 2008). Social anxiety and gender both moderated the relationship between alcohol-related consequences and drinking (LaBrie et al., 2008). Public self-consciousness was an important predictor beyond the drinking-explained variance in alcohol-related consequences (LaBrie et al., 2008). These findings are consistent with previous studies (e.g., Park et al., 2006) that demonstrated that high private self-consciousness and social anxiety were associated with less drinking (LaBrie et al., 2008).

Conclusions. Drinking and alcohol-related problems present a significant public health issue, and it is crucial that research address both prevention and harm reduction (Hingson, 2010; NIAAA, 2002; NIAAA, 2007). Objective self-awareness theory (Duval & Wicklund, 1982) and the self-awareness model of alcohol consumption (Hull, 1981) provide a foundation on which to study drinking behaviors and associated problems. Scientific research has supported the self-awareness model of alcohol consumption's view that alcohol reduces self-awareness both in the laboratory (Hull et al., 1983) and outside of it (Hull et al., 1986). Some recent research suggests that self-awareness or self-consciousness is associated with more drinking and other studies suggest that it is associated with less. These mixed findings suggest the probability of key moderators yet to be identified. One possible moderator of the relationship between self-awareness and drinking is alcohol-related implicit attitude.

Implicit Association Tests

Implicit attitudes may help us understand the mixed findings related to self-awareness theory. Many of the processes that affect behavior and influence perception are cognitive and unconscious to the individual (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). These implicit attitudes are manifested as actions and behaviors and this can occur without the individual's awareness of the causation, which presents difficulties in measuring attitudes using self-report methods (Greenwald et al., 2009; Thush et al., 2007). Thus, in some cases, implicit attitude may be more effective in predicting behavior than self-reported measures (Greenwald et al., 2009). There are various methods by which to measure implicit attitudes (Thush et al., 2007), one of which is the Implicit Association Test (IAT; Greenwald et al., 2009). The IAT is an experimental method introduced by Anthony Greenwald, Debbie McGhee, and Jordan Schwartz in 1998 to study automatic processes through the measurement of timed reactions between word pairings,

and it has since been applied to a variety of research studies (Greenwald, McGhee, & Schwartz, 1998; Nosek, Greenwald, & Banaji, 2007).

IAT literature. The IAT is an indirect measure of association strength among concepts and involves a rapid classification task to assess the associations of two target concepts, such as *Coke* versus *Pepsi* with an attribute, such as *pleasant* versus *unpleasant*, and necessitates rapid categorization of the word pairings (Greenwald et al., 1998). A person favoring *Coke* over *Pepsi* would likely have longer reaction times, which correlate with weaker associations, when less associated categories appear (e.g., *Pepsi* + *pleasant* or *Coke* + *unpleasant*). This person would also have shorter reaction times, which correlate with stronger, more compatible associations, when highly associated categories appear (e.g., *Coke* + *pleasant* or *Pepsi* + *unpleasant*). Differential association of the concepts with the valence of the attribute is implicitly measured by this difference (Greenwald et al., 1998). Thus, the IAT seeks to measure the underlying implicit attitudes that may play a role in people's behaviors (Greenwald et al., 2009). The IAT has been shown to be a useful predictor of behavior, and its predictive value increases when used jointly with explicit self-report measures (Greenwald et al., 2009).

IAT form. The general form of an IAT consists of seven blocks (Nosek et al., 2007). These seven blocks include the practice phase (three blocks) to orient participants with the sorting rules and the stimulus items, and the critical phase (four blocks) that involves the sorting of stimulus items that represent four concepts, such as *Coke*, *Pepsi*, *pleasant*, and *unpleasant*, with response options (Nosek et al., 2007). Each concept is contrasted, such as *Coke* versus *Pepsi*, and each is assigned to a specific response key on a computer keyboard, such as A for *Coke* and L for *Pepsi*. Next, a second pair of concepts are contrasted; positive or negative valence attributes, such as *pleasant* versus *unpleasant*, and these are also assigned to a specific

response key such as *A* for *pleasant* and *L* for *unpleasant*. Subsequently, a combined task is presented during which pairings from the concept categories are classified and allotted to specific response keys, such as *Coke* and *pleasant* to the key *A* and *Pepsi* and *unpleasant* to the key *L*. Lastly, a combined task is presented during which pairings are complementary, such as *Coke* and *unpleasant* assigned to the key *L* and *Pepsi* and *pleasant* assigned to the key *A*.

IAT scoring. A scoring algorithm (*D*) is recommended by the creators of the IAT (Greenwald, Nosek, & Banaji, 2003) and is arrived at by dividing the difference between test block means by the standard deviation of all of the latencies in the test blocks. This is similar to the effect-size measure, Cohen's *d* (Cohen, 1977). It is important to note that evaluations with respect to IATs have often focused on two main aspects; valence and association with constructs. The *D*-score of an IAT indicates attitude, and this can be positive or negative valence (represented by a positive or negative *D*-score). If the *D*-score is significantly different from zero, this indicates a preference for one category over the other. For example, contrasting Caucasian faces with African American faces can provide an index of racial preferences which is evident in a *D*-score that is significantly different from zero. Similarly, the valence of an alcohol-related IAT indicates attitudes towards drinking. Research using alcohol-related IATs shows that overall, most people have negative attitudes towards drinking, and this is only slightly less so among drinkers. An independent question from valence is the extent to which the degree of preference for one category over another is associated with the construct. Using the example of an IAT contrasting Caucasian faces and African American faces, the degree of preference for one category over the other is associated with discrimination. Alcohol-related IATs show that the same holds true for drinking in that IAT scores are positively associated with alcohol use.

Criticisms. While the majority of the relevant literature is in support of the IAT, critics of the IAT have raised concerns regarding its limitations (Blanton, Jaccard, Gonzales, & Christie, 2006; Blanton et al., 2009). Critics contend that the IAT has limited predictive validity (Blanton et al., 2009), the IAT measurement and causal assumptions are questionable, and disagree with the scoring method proposed by Greenwald and colleagues, asserting that the way in which the *D* score is computed may be problematic as it relies on differential response latencies to positive and negative concepts. Blanton and colleagues (2006) have stated concerns with the scoring algorithm for the IAT, stating that there is a possibility that the IAT reflects the awareness of social stigma rather than own attitude. For example, a participant who is aware of the negative societal stigma attached to alcohol abuse may easily associate alcohol with negative valence attributes, therefore, the individual would have shorter reaction times when alcohol is paired with negative valence words. Having an awareness of the stigma that is associated with alcohol abuse might contribute to the speed with which an individual categorizes alcohol as negative when taking the IAT, and this raises the question of whether the IAT is measuring awareness of associations, own implicit associations, or a combination of both. This may be an explanation for why heavy drinkers have negative *D* scores when taking the “good” vs. “bad” IAT (indicating negative alcohol-related associations).

Another concern that critics of the IAT have voiced is related to the positive correlation or lack of correlation of response latencies for the positive and negative concept (Blanton et al., 2006). For example, an alcohol-related self-report measure’s response of ‘I drink a lot’ would not be expected to positively correlate with responses such as ‘I do not drink a lot.’ One possible explanation for why the IAT response latencies correlate is an individual’s reaction time. A participant with shorter overall reaction times will likely respond quickly to strongly associated

word pairings, and only slightly less quickly to less associated word pairings than a participant with longer overall reaction times. In other words, someone with faster reactions will likely respond faster to any word pairings (whether strongly or weakly associated) than someone with slower reactions. Taking this into consideration, response latencies for each individual are expected to positively correlate.

Despite these concerns, the IAT has been used in hundreds of studies and generally displays reasonable internal consistency, is not influenced by the familiarity of the participant to the concepts used in the test, remains insensitive to variations of procedure, and is by and large resistant to faking (Greenwald et al., 2009). While the predictive validity of implicit and explicit measures vary across domains, when implicit measures are used in conjunction with explicit measures, there is typically a small but significant gain in predictive validity, and the predictive validity of implicit measures tends to be higher for socially sensitive topics for which the predictive value of explicit measures such as self-report is low (Greenwald et al., 2009). Thus, as many of the processes associated with behavior are beyond the individual's awareness presenting difficulties in measuring the processes that affect behavior, researchers can at least partially address this issue by using measures of implicit attitudes to predict explicit behavior (Thush et al., 2007).

Alcohol and IAT

One area in which the IAT may be a useful predictor of behavior is problematic alcohol use. Researchers have used IATs to study alcohol consumption in attempts to study implicit cognitions and to predict drinking behaviors from implicit associations (e.g., Houben, & Wiers, 2008b; Houben & Wiers, 2008a; Houben & Wiers, 2007b; Houben, & Wiers, 2007a; Houben, &

Wiers, 2006b; Houben, & Wiers, 2006a; Jajodia, & Earleywine, 2003; Lindgren, Neighbors, Ostafin, Mullins, & George, 2009; Ostafin, & Marlatt, 2008; Ostafin, Marlatt, & Greenwald, 2008; Ostafin, & Palfai, 2006; Palfai, & Ostafin, 2003; Van Beckers, Van Lambaart, Conrod, & Wiers, 2006; Wiers, Van Woerden, Smulders, & De Jong, 2002).

One study examining alcohol-related dispositions and implicit responses found that IAT approach scores were correlated with various appetitive responses to alcohol (Palfai & Ostafin, 2003). Participants with higher alcohol-approach scores had stronger drinking urges, stronger arousal responses with respect to affect in anticipation of drinking, and stronger positive expectations. Furthermore, self-report measures were correlated with IAT scores, indicating that the IAT may be a useful tool in the index of drinking motivation (Palfai & Ostafin, 2003). This study was replicated using IAT stimuli that more closely corresponded with real-life drinking contexts and found that as the picture stimuli more closely matched drinking contexts, the external validity of the IAT increased (Ostafin & Palfai, 2006). Despite the reduction in the number of trials included in the IAT, the internal consistency and validity of the IAT remained high. Findings were consistent with their previous study, indicating that IAT performance correlates with heavy drinking episodes, even when controlling for self-reported alcohol motivation (Ostafin & Palfai, 2006). These studies support the perspective that automatic processes are important in drinking behavior and suggest that self-awareness might be a moderator of the relationship (Ostafin & Marlatt, 2008).

In an attempt to evaluate why people drink despite not wanting to, Ostafin, Marlatt, and Greenwald (2008) conducted a study to examine the role of automatic alcohol motivation and self-control resources in self-regulative behavior regarding alcohol use. After completing an IAT and a self-control depletion task, alcohol-related self-regulation was assessed. Results indicated

that drinking increased when self-control resources were depleted (Ostafin, Marlatt, & Greenwald, 2008). Moreover, when self-control resources were depleted, implicit alcohol motivation was more closely related to drinking in spite of intent to refrain from alcohol (Ostafin, Marlatt, & Greenwald, 2008).

In an extension of prior research on automatic processes, a study was conducted using an adapted IAT measuring alcohol-approach versus alcohol-avoid tendencies and their relationship with drinking (Lindgren, Neighbors, Ostafin, Mullins, & George, 2009). Findings revealed that situational factors such as having a successful or unsuccessful date in a coffee shop affected alcohol-related associations even though the context did not include alcohol. Moreover, when the context did include alcohol cues, such as a successful or unsuccessful date in a bar, there was a weakening of alcohol-avoid associations and a strengthening of alcohol-approach associations (Lindgren et al., 2009). Consistent with previous studies (e.g., Ostafin & Palfai, 2006; Palfai & Ostafin, 2003), these results support the perspective that desire and motivation to drink are influenced by automatic processes. Taken together, these studies suggest that overall, associations between IAT and drinking are small but positive, which suggests positive associations with alcohol.

Valence. Wiers and colleagues (2002) found that drinkers had shorter reaction times when the alcohol concept (relative to soda) was paired with negative valence attributes, indicating the counter-intuitive notion that drinkers have negative associations with alcohol despite their drinking behavior. In a later study, Houben and Wiers (2006a) used the IAT to assess alcohol-related implicit associations and found that alcohol drinkers, relative to soda drinkers, had associations between alcohol and the negative valence attribute. This suggests that on average, implicit associations with alcohol are less favorable than other beverages (Houben &

Wiers, 2006a). These studies suggest that overall, the valence of alcohol-related IATs are negative (negative *D*-scores), which suggests negative attitudes towards alcohol. The framing of previous research implied positive associations with alcohol without providing means of the *D*-score (e.g., Ostafin, Marlatt, & Greenwald, 2008). These findings indicate that although extrapersonal knowledge related to alcohol may reflect negative valence, implicit alcohol associations are less negative (or more positive) for heavy drinkers (Houben & Wiers, 2007a). Thus, it is important to consider individual differences that may account for the variations in alcohol associations.

Salience. Rothermund and Wentura proposed that one potential limitation of the IAT is salience asymmetry, termed “Figure-Ground” (FG), because when one category or concept in an IAT has greater salience than the other, the salient category acts as a figure and the category with lesser salience acts as the background (2004). Therefore, it was proposed that FG asymmetries affect the strength of associations such that resulting IAT effects are independent from underlying implicit associations (Rothermund & Wentura, 2004). Houben and Weirs (2006b) investigated this effect further by evaluating the effect of salience asymmetry. Specifically, if alcohol was the more salient figure and soft drinks were the less salient background, FG theory would predict stronger association for alcohol and negative attributes than for alcohol and positive attributes regardless of actual implicit attitude (Houben & Wiers, 2006b; Rothermund & Wentura, 2004). Findings from this study support the validity of the IAT, showing that contrary to FG theory, the familiarity/salience manipulation is not sufficient in reversing the IAT effect of alcohol association with negative words and that FG asymmetries do not wholly account for the IAT effect (Houben & Wiers, 2006b). It may be that on average, people have negative implicit

associations with alcohol but as Houben and Wiers (2007a) have found, these associations are less negative among heavier drinkers.

Implicit alcohol-related associations may have important public health implications for at risk populations. For example, in a public health study investigating whether alcohol-induced cardiac change was correlated with IAT score, alcohol-related expectancies were found to be related to quantity consumed. Furthermore, findings showed that implicit arousal associations positively correlated with alcohol induced cardiac change, and alcohol-induced heart rate increase was an indicator of sensitivity to alcohol's stimulating effects (Van den Wildenberg, Beckers, Lambaart, Conrod, & Wiers, 2006).

Conclusions. The IAT provides a way of circumventing measurement issues due to the absence of awareness of processes that influence behavior (Greenwald et al., 2009).

Furthermore, the IAT facilitates behavior prediction (Thush et al., 2007) and has predictive validity for socially sensitive topics such as alcohol consumption, about which people tend to feel ambivalence (Houben & Wiers, 2006a; Miller & Rollnick, 2002), beyond self-reported measures (Houben & Wiers, 2007a). Moreover, results show that IAT performance correlates with drinking behavior (Ostafin & Palfai, 2006; Palfai & Ostafin, 2003). Alcohol-related and non-alcohol-related contextual cues in the social environment can affect alcohol-related automatic associations (Lindgren et al., 2009). Findings from alcohol-related IAT studies have implications in predicting drinking behavior, which in turn has implications in interventions that seek to prevent or treat alcohol problems (Ostafin & Palfai, 2006).

Present Research

The present research seeks to evaluate alcohol-related implicit attitude as a moderator of the relationship between self-awareness and drinking behavior. The central hypothesis is that alcohol-related implicit attitude will interact with self-awareness in predicting drinking. More specifically, self-awareness is expected to positively correlate with drinking, but only among those who have more positive (or less negative) implicit associations with drinking. That is, positive alcohol-related implicit associations are expected to be more strongly related to drinking among those who are high in self-awareness (measured via the private self-consciousness scale) compared to those low in self-awareness because they may be more in tune with and aware of their implicit cognitions. Previous research using alcohol-related IATs show that overall, attitudes towards drinking are slightly negative. Additionally, research indicates that IAT scores are positively associated with drinking. The present research seeks to consider individual differences that may account for variations in alcohol associations. No one has yet considered implicit attitude as a potential explanation for the mixed findings regarding the relationship between self-awareness and drinking, thus, this research examines implicit attitude as a moderator of the associations between self-awareness/self-consciousness and drinking. The association between self-awareness and drinking is expected to be more positive among those with more positive (or less negative) implicit attitudes about alcohol. In other words, high self-awareness and drinking will be more strongly correlated among individuals who obtain higher (e.g. more positive or less negative) *D* scores among three alcohol-related IAT's. Specifically, these scores will reflect attitudes indicating approach versus avoid motivations toward alcohol, coping versus ignoring strategies towards alcohol, and self-identification as a drinker (me) versus

not a drinker (not me). Further details regarding the three alcohol-related IATs can be found in the *measures* section.

Method

Participants and procedure

Participants included 218 undergraduate students from a large Southwestern university. Eligible participants completed a computer based assessment including measures of alcohol use, self-consciousness, and three separate alcohol-related implicit association tests. Demographics of the sample for the present study included mean age 22.93 ($SD = 6.29$), 82% women, 33.75% Caucasian, 30.17% Hispanic/Latino, 18.75% Black/African American, 20.42% Asian/Pacific Islander, 6% Multi-Ethnic, 0.42% Native American/American Indian, and 20.42% Other. Means, standard deviations, and correlations for all of the variables are presented in Table 1. Recruitment procedures involved the placement of flyers containing study information on campus. Participants had to be at least 18 years old in order to be eligible for participation and completed study-related materials on a laboratory computer in a private assessment room. The order of the three alcohol-related IATs was counterbalanced to reduce potential practice and order effects. Additionally, the order of self-report and implicit measures was counterbalanced to reduce the effect of priming. After completing study-related materials, participants were debriefed regarding the nature and intent of the study. The total time commitment from each participant was no more than one hour (60 minutes).

Measures

Demographics. Participants completed a demographics survey, providing information such as age (participants were sent out of the survey if they are not at least 18 years of age), gender, weight (for blood alcohol content), racial background, and student status. Participants received course extra credit in exchange for participation in this research study.

Alcohol measures. Alcohol consumption was measured using the Quantity/Frequency Scale (Baer, 1993; Marlatt et al., 1995), a 5 item scale assessing the number of drinks and the number of hours spent drinking on a peak drinking event within the last month, as well as the number of days out of the month that the individual consumed alcohol (0 = I do not drink at all, 1 = about once per month, 2 = two to three times a month, 3 = once or twice per week, 4 = three to four times per week, 5 = almost every day, 6 = I drink once daily or more). The Daily Drinking Questionnaire (Collins et al., 1985; Kivlahan et al., 1990) measures the number of standard drinks consumed on each day of a normal week (Monday-Sunday) within the last 3 months. Scores represent the average number of drinks that are consumed over the course of each week during the previous month. Relative to other drinking indices, weekly drinking has been shown to be a reliable index of problems related to alcohol among college students (Borsari, Neal, Collins, & Carey, 2001). Both the Quantity/Frequency Scale and the Daily Drinking Questionnaire included standard drink definitions. The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) is a 23 item measure that assesses alcohol-related negative consequences in the last month, and responses range from never (0) to 10 times or more (4). Items were rated based on how many times each problem occurred while consuming alcohol, such as “went to work or school high or drunk” and total summed scores for the RAPI will range

from 0 to 92 (White & Labouvie, 1989). Two items were added about drinking and driving. The reliability coefficient (Cronbach's alpha) for these items was .86.

Self-consciousness scale. Participants completed the 23 item self-consciousness measure (Fenigstein et al., 1975) which is comprised of items that measure private self-consciousness (e.g., "I'm always trying to figure myself out,") public self-consciousness (e.g., "I'm concerned about what other people think of me") and social anxiety (e.g., "It takes me time to overcome my shyness in new situations"). Participant responses were based on a 5-point Likert scale ranging from extremely uncharacteristic (0) to extremely characteristic (4). Participants also completed two separate scales; a self-reflectiveness factor and factor of internal state awareness (Mittal & Balasubramanian, 1987). The reliability coefficient (Cronbach's alpha) was .69 for the private self-consciousness subscale, .81 for the public self-consciousness subscale, and .80 for the social anxiety subscale. The reliability coefficient for all these items was .87.

IAT. The IAT was used to examine automatic associations with alcohol using pictures and words as stimuli (Lindgren et al., 2009; Ostafin & Palfai, 2006). The IAT was presented using Inquisit software (Draine, 2004). The IAT score was calculated in accordance with the *D*-measure algorithm (Greenwald et al., 2003). Further details regarding the IAT form and block trials can be found above and in Greenwald et al. (1998). Three IATs were used to assess implicit attitude: motivations towards alcohol ("approach" versus "avoid," or AIAT), coping with respect to alcohol use ("cope" versus "ignore," or CIAT), and the self-identification as a drinker ("me" versus "not me," DIAT). A schematic of, for example, the AIAT involves the assessment of the strength of association between categories of "approach" and categories of "avoid." The seven phases of the IAT include practice tasks to orient participants with the sorting rules and stimulus materials (Nosek, Greenwald, & Banaji, 2007). The critical phases involved

sorting the stimulus items that represent the four concepts (*approach*, *avoid*, *good*, and *bad*) with two options of response. One critical phase, such as “*approach + good*” and “*avoid + bad*,” items that represent “*avoid + good*” will receive one response and items that represent “*approach + bad*” will receive the alternate response. In the second critical phase, such as “*avoid + good*” and “*approach + bad*,” items that represent “*approach + good*” will receive one response and items that represent “*avoid + bad*” will receive the alternate response. Participants with stronger positive associations with “*approach*” compared to “*avoid*” will have shorter reaction times when categorizing word pairings during the first phase than the second phase because the pairings are more strongly associated (see Appendix for pictures and words for each of the IATs).

Analysis plan.

IAT scoring. IAT scores were calculated using procedures detailed above and in Greenwald et al., 2003. A negative *D* score indicates negative association towards alcohol. A positive *D* score indicates positive association towards alcohol. A *D* score of 0 indicates equal preference for both concepts (no preference for one concept relative to the other). Larger positive scores are related to stronger associations with alcohol, and higher negative scores (e.g., -0.5 versus -0.2) are related to weaker associations with alcohol (Greenwald et al., 2003).

Preliminary analyses. Means and standard deviations of the quantity and frequency of alcohol use were computed in accordance with gender. Bivariate correlation coefficients of alcohol use with gender and self-awareness were computed.

Primary analyses. A series of hierarchical regression analyses were used to evaluate the hypotheses that alcohol-related implicit attitude might moderate the association between self-

awareness and alcohol use. The three components of self-consciousness; private self-consciousness, public self-consciousness, and social anxiety were evaluated. Within each self-consciousness category were three categories containing the IATs; the approach versus avoid IAT (AIAT), cope versus ignore IAT (CIAT), and drinking identity IAT (DIAT). Within each IAT category were four models of drinking outcomes as a function of IAT; peak drinks, drinking frequency, drinks per week, and alcohol-related problems. Within each regression model, analyses were conducted in two steps. Self-consciousness (e.g., private or public) and IAT (AIAT, CIAT, or DIAT) were included in Step 1, and two-way interactions were added at Step 2. Analyses were conducted with and without gender and presentation order of measures as covariates. Thus, 72 regressions were conducted (*3 self-consciousness categories X 3 IAT categories X 4 drinking outcomes = 36. These 36 regressions were repeated, controlling for gender and presentation order of measures, 36 X 2 = 72*). The independent variables included in separate regression models were: private self-consciousness, public self-consciousness, AIAT, CIAT, and DIAT. Regressions were conducted using SAS. Outcomes included drinking frequency, peak drinks, drinks per week, and alcohol-related negative consequences. Separate analyses were conducted for each IAT.

Additional analyses. The *D* score is derived by dividing the difference between the means of the test blocks by the standard deviation of all the response latencies in the test blocks. Previous research suggests that contrary to theoretical predictions, the compatible and incompatible components of the IAT do not equally influence the criterion, and the two components failed to load on single dimension of relative attitude (Blanton et al., 2006). That is, response latencies to compatible and incompatible pairings not only do not covary in the expected direction, they are also not significantly correlated in the anticipated direction (Blanton

et al., 2006). By hypothesis, alcohol concepts paired with the “negative” attribute and water concepts paired with the “positive” attribute are assumed as compatible pairings. Concurrently, alcohol concepts paired with the “positive” attribute and water concepts paired with the “negative” attribute are assumed as incompatible pairings. The difference in reaction latency between incompatible and compatible pairings is known as the IAT effect (Greenwald, McGhee, & Schwartz, 1998). Thus, additional analyses evaluated the relationship between compatible and incompatible pairings with respect to the AIAT, CIAT, and DIAT. Compatible pairings, incompatible pairings, and self-consciousness (e.g., private or public) were entered into the model as independent variables in Step 1, and two-way interactions were added at Step 2. Dependent variables included drink-related outcomes. These regressions were conducted for each category of self-consciousness (private and public self-consciousness and social anxiety) and IAT (AIAT, CIAT, and DIAT). Thus, 72 additional regressions were conducted (*3 self-consciousness categories X 3 IAT categories X 4 drinking outcomes = 36. These 36 regressions were repeated, controlling for gender and presentation order of measures, 36 X 2 = 72*).

Results

Data reduction. Using procedures detailed in Nosek and colleagues (2007), all IAT data were screened for exclusion such that responses to 10% or more of the trials in less than 300 milliseconds were discarded. Exclusion rates were as follows: 10 scores for the AIAT, 10 scores for the CIAT, and 11 scores for the DIAT. Additionally, data were screened for overly slow responders such that responses to more than 10% of trials in greater than 10,000 milliseconds were discarded. No participants met that criterion. Therefore, less than 5% percent of the scores for each IAT were discarded.

Descriptives. The three IATs (AIAT, CIAT, and DIAT) were significantly and positively associated with each other (see Table 1). The drinking variables (peak drinks, drinking frequency, drinks per week, and alcohol-related problems) were significantly and positively correlated with each other and with the three IATs with the exception of the association between the AIAT and alcohol-related problems, which was marginal.

Overview of findings

Consistent with previous research, results revealed that gender was associated with all drinking variables such that females reported drinking less than males with respect to peak drinks, drinks per week, and females also reported fewer alcohol-related problems. Also consistent with previous research, hierarchical regression analyses revealed that for the three self-consciousness sub-categories, there were significant main effects for the AIAT, CIAT, and DIAT in predicting all drinking outcomes such that IAT scores were positively associated with drinking. Presentation order was not found to have significant relationships with any variable. Analyses did not reveal significant associations between private or public self-consciousness and the drinking variables for the AIAT, CIAT, or DIAT. In analyses where gender and presentation order of measures were added as covariates, the associations between both private and public self-consciousness and the three IATs remained nonsignificant in predicting drinking, thus, gender was not found to moderate the predicted interactions. There was no evidence to suggest that self-awareness moderates the relationship between alcohol-related attitude and drinking behavior. Gender was dummy coded (female = 1), therefore negative coefficients indicate that females drink less or have fewer alcohol-related problems. Specific results are elaborated below.

Specific results

Private self-consciousness

Approach versus avoid IAT. Regression analyses predicting drinking variables from private self-consciousness and the AIAT are presented in Table 5. The AIAT significantly predicted peak drinks, drinking frequency, and drinks per week, and was marginally significant in predicting alcohol-related problems. Private self-consciousness was positively associated with alcohol-related problems for the AIAT. The interaction between the AIAT and private self-consciousness in predicting drinking and related problems was not significant.

Cope versus ignore IAT. Similar analyses are presented in Table 6 for the CIAT, which significantly predicted peak drinks, drinking frequency, drinks per week, and alcohol-related problems. Private self-consciousness was positively associated with alcohol-related problems for the CIAT. There was no significant interaction between the CIAT and private self-consciousness in predicting drinking or alcohol-related problems.

Drinking identity IAT. Table 7 presents analogous results for the DIAT which significantly predicted all four drinking variables. Private self-consciousness was positively associated with alcohol-related problems for the DIAT, however there was no significant interaction at Step 2.

Public self-consciousness

Approach versus avoid IAT. Analyses predicting drinking and associated problems from public self-consciousness and the AIAT are presented in Table 8. The AIAT was significantly and positively associated with all drinking variables except alcohol-related problems, which was positively associated with public self-consciousness. The interaction between the AIAT and public self-consciousness in predicting drinking and related problems was not significant.

Cope versus ignore IAT. Similar analyses are presented in Table 9 for the CIAT, which significantly predicted all four drinking variables. Public self-consciousness was positively associated with alcohol-related problems. There was no significant interaction between the CIAT and public self-consciousness in predicting drinking and drinking-related problems.

Drinking identity IAT. Table 10 presents regression analyses for the DIAT, which was significantly and positively associated with all four drinking variables. Public self-consciousness was associated with alcohol-related problems for the DIAT. The interaction at Step 2 was not significant.

Social anxiety

Approach versus avoid IAT. Regression analyses predicting drinking and related problems from social anxiety and the AIAT are presented in Table 11. The AIAT was negatively associated with peak drinks but positively associated with drinking frequency and drinks per week. Social anxiety significantly predicted peak drinks and drinking frequency. The interaction between social anxiety and the AIAT was not significant in predicting drinking or related problems.

Cope versus ignore IAT. Table 12 presents similar analyses for the CIAT, which was positively related to all four drinking variables. Social anxiety was marginally negatively associated with peak drinks and drinking frequency. The interaction between social anxiety and the CIAT was not significant in predicting the drinking variables.

Drinking identity IAT. Analyses predicting drinking and associated problems from the DIAT are presented in Table 13. The DIAT was positively associated with all four drinking variables. Social anxiety was marginally and negatively associated with peak drinks and drinking

frequency. There was no significant interaction between the DIAT and social anxiety in predicting drinking.

Additional analyses

Means, standard deviations, and correlations among variables for the AIAT, CIAT, and DIAT are presented in Table 2, 3, and 4 respectively. The following results emerged for all three IATs; 1) the compatible and incompatible pairings were significantly and positively correlated; 2) compatible pairings were positively correlated with the overall *D* score; 3) incompatible pairings were negatively correlated with the overall *D* score; 4) the *D* computed from the test blocks was significantly and positively correlated with the overall *D* score; 5) neither compatible nor incompatible pairings were significantly associated with self-awareness; and 6) in general, drinking variables were negatively associated with the overall *D* and test block *D*, but not significantly associated with either compatible or incompatible pairings. 72 additional regressions were conducted using compatible and incompatible pairings as predictors. Compatible and incompatible pairings were entered into the regression model as the independent variable, along with self-consciousness. Drinking-related variables were dependent variables. For all three IATs, compatible pairings were a better predictor of drinking outcomes relative to incompatible pairings (incompatible pairings did not predict drinking outcomes for any of the IATs). However, the traditional *D*-score was more consistently associated with drinking relative to either pairing alone.

Discussion

The present research sought to evaluate the role of alcohol-related implicit attitude in the relationship between self-awareness and drinking behavior. Consistent with previous research

(e.g., Johnston, O'Malley, Bachman, & Schulenberg, 2008), there was a main effect for gender such that females reported drinking less than males with respect to peak drinks and drinks per week, and females also reported fewer alcohol-related problems than males. This reiterates the importance of considering gender differences in drinking, which may have potential implications for prevention and treatment programs. It is worth noting that interventions that are not accordingly tailored may have differential impact on males and females.

Findings further revealed that overall, *D*-scores were slightly negative, which is consistent with previous research (e.g., Wiers et al., 2002). This suggests that participants had slightly negative associations with alcohol. Moreover, there were significant and positive associations between *D* scores computed from each of the three IATs and drinking outcomes, which is also consistent with previous research (e.g., Houben & Wiers, 2007a; Ostafin & Palfai, 2006; Palfai & Ostafin, 2003) and suggests that IAT scores correlate with reported alcohol consumption and related problems. These findings support the perspective that the IAT and self-report measures evaluate corresponding constructs and suggest that there may be possible parameters wherein implicit measures such as the IAT are useful in predicting drinking. Further research is needed to better understand the bounds of these parameters, for whom implicit measures are most useful, and under what circumstances they are best applied. Additional research is also needed to better understand nuances of the relationship between the IAT and behavior, which may be affected or moderated by interpersonal and intrapersonal attitude features such as evaluative strength or self-presentation.

Additional analyses were conducted to address the concern raised by Blanton and colleagues (2006) regarding how the *D* score is derived (by dividing the difference between the means of the test blocks by the standard deviation of all the response latencies in the test blocks).

Theoretically, if compatible and incompatible pairings are unidimensional, compatible pairings should be significantly and negatively correlated with incompatible pairings. A simplified example of this refers to the items “I am very confident in myself” and “I am not at all confident in myself,” both of which measure self-confidence and are expected to be negatively correlated. In the same way, compatible and incompatible IAT pairings theoretically measure associations with concepts and should be negatively correlated. Blanton and colleagues (2006) suggest that contrary to theoretical predictions, the compatible and incompatible components of the IAT do not equally influence the criterion and fail to load on a single dimension of relative attitude. In other words, response latencies to compatible and incompatible pairings are not significantly correlated and do not even covary in the expected direction (Blanton et al., 2006). Findings from the present study revealed that the compatible and incompatible pairings were indeed significantly and positively correlated for all three IATs, which supports theoretical predictions that compatible and incompatible pairings are unidimensional. Regression analyses revealed that compared to incompatible pairings, compatible pairings were a better predictor of drinking (in the same direction as the overall *D* score), even when controlling for incompatible pairings. These findings suggest that relative to the *D* score outlined by Greenwald (2003), compatible pairings provide an alternative and useful way of predicting drinking from the IAT, and provide roughly comparable predictive utility relative to the traditional *D*-score. However, the traditional *D*-score, which incorporates both compatible and incompatible pairings, was more consistently associated with drinking relative to either pairing alone.

Findings from the present study revealed that self-consciousness was significantly associated with alcohol-related problems. Objective self-awareness theory suggests that self-awareness induces an uncomfortable state wherein comparisons between the actual and ideal self

are made (Duval & Wicklund, 1982), and the self-awareness model of alcohol consumption suggests that alcohol reduces awareness of sources of tension by interfering with processes important to the self-aware state and this provides psychological relief (Hull, 1981). Findings from the present study support this perspective and suggest that people who are high in self-awareness report experiencing more alcohol-related problems. Interestingly, alcohol consumption variables (e.g., drinks per week) were not significantly associated with self-consciousness, which may suggest that people who are self-aware may be more aware of or have greater sensitivity to the experience of alcohol-related problems, even though actual drinking levels were not significantly different from people low in self-awareness.

Self-awareness theory suggests that self-awareness is an uncomfortable state wherein individuals are aware of the discrepancy between the actual and the ideal self (e.g., the gap between behaviors and inner values; Duval & Wicklund, 1972). The self-awareness model of alcohol consumption suggests that alcohol reduces awareness of tension sources (Hull, 1981). Thus, it was expected that individuals high in self-awareness would report consuming more alcohol than individuals low in self-awareness. In other words, self-awareness and drinking were expected to positively correlate. However, results did not support this (see Table 1). One potential explanation for the lack of significant correlation between self-awareness and drinking in this sample is that perhaps, for college populations, self-awareness may not be as useful a predictor of drinking as social influence (e.g., Neighbors, Lee, Lewis, Fossos, & Larimer, 2007). It is possible that for undergraduate students, alcohol-related social influence, such as perceiving that classmates drink or approve of drinking, is a more powerful predictor of alcohol use than self-awareness induced tension. A second and related potential explanation for the lack of correlation between self-awareness and drinking is that perhaps college students are not as in

tune with their inner values compared to older populations. It is possible that alcohol-related awareness of the self has not developed to the point that it induces significant tension during college years. Moreover, it is possible that as individuals age, they become more sensitive to the uncomfortable awareness that the actual self is discrepant from the ideal self. Perhaps the aging process and associated discomfoting awareness of the steadily decreasing amount of available time during which to close the gap between the real and ideal self might increase the likelihood of drinking to reduce self-awareness induced stress, particularly among older populations. Thus, it is possible that predictors of drinking change over the lifespan, and self-awareness could be among possible predictors of drinking later in life.

Related to the above, automatic alcohol-related associations are thought to develop through exposure and experience, and are thought to affect automatic tendencies to turn to (or not to turn to) alcohol during times of stress. For example, having exposure to or experience with alcohol may lead to the development of alcohol-related implicit attitudes. Individuals with higher scores on the IAT are thought to have stronger alcohol associations compared to individuals with lower scores on the IAT. Self-awareness was expected to be more strongly related to drinking for those with higher IAT scores because participants with higher IAT scores were expected to have stronger automatic alcohol associations, and thus were expected to be more likely to turn to alcohol during times of stress (e.g., self-awareness induced stress) relative to individuals with weaker alcohol-related associations. In other words, self-awareness and implicit attitude were expected to interact in predicting drinking. Findings from the present research were not consistent with this perspective. Therefore, findings did not support the hypothesis that implicit attitude moderates the relationship between self-awareness and drinking. One potential explanation for these findings is that having implicit alcohol attitudes may not necessarily

translate to a tendency to turn to alcohol during times of stress. Individuals with exposure to or experience with negative alcohol-related experiences (e.g., parental alcoholism) may not be likely to turn to alcohol during times of stress, regardless of their level of self-awareness. Thus, it may be important to consider the type of previous alcohol-related exposure and experience, and how these influence the formation of alcohol-related implicit attitudes so as to consider how implicit attitudes in turn affect behaviors.

A second potential explanation for these findings is that although self-awareness induced tension is thought to drive people to drink, it is possible that drinking levels for individuals who aim to reduce tension through drinking are similar to drinking levels for people who drink for social reasons. Stated differently, a highly self-aware student who drinks to reduce stress might consume the same quantity of alcohol as a lower self-aware student who drinks to fit in or have fun. If drinking quantity/frequency for affective reasons is comparable to drinking quantity/frequency for social reasons, any effect may wash out. For example, it is possible that self-awareness is associated with drinking among individuals with stronger alcohol-related implicit attitudes, but only if they are drinking to regulate affect. This is essentially a three-way interaction between self-awareness, IAT, and drinking motives in predicting drinking. Cooper (1994) suggests four common drinking motives; enhancement motives (drinking to increase or maintain positive affect), social motives (drinking to make social events more enjoyable), conformity motives (drinking in response to social pressure), and coping motives (drinking to regulate or reduce negative affect). Previous research shows that conformity drinking motives mediate the relationship between social anxiety and alcohol-related consequences (Lewis et al., 2008). Additional analyses were conducted to test whether a three-way interaction existed between self-awareness, IAT, and each of the four common drinking motives in predicting

drinking. Results revealed significant three-way interactions when each of the four drinking motives were included in the model, suggesting that it may be useful to consider the influence of drinking motives on the relationship between self-awareness and drinking.

Limitations and future directions. The strengths of the study must be considered in light of several limitations. First, it is important to note the nature of the IAT. It is a relative measure that assesses the strength of one association relative to the strength of another (e.g., strength of *alcohol + cope* and *water + ignore* versus *alcohol + ignore* and *water + cope*). Thus, if a participant were to re-take the same IAT and their *D*-score changes, it is not possible to determine which association has changed relative to the other (other measures must be used for this, such as the Brief IAT; Sriram & Greenwald, 2010). Related to this limitation is the interpretation of the *D*-score. Findings with respect to the three alcohol-related IATs are consistent with previous research in that *D*-scores were slightly negative, which theoretically reflects that attitudes toward alcohol relative to water were slightly negative. Because the IAT is a relative measure, this finding may be due to the awareness of negative societal stigma associated with alcohol use. For most people, excessive alcohol consumption and alcoholism is viewed negatively, and awareness of this may have contributed to longer response latencies when viewing alcohol-related stimuli. Concurrently, water is generally associated with positive phenomena such as life, health, hygiene, and nature. Thus, it is possible that the negative *D*-scores resulting from the three alcohol-related IATs may be a reflection of societal and cultural stigma associated with alcohol consumption relative to water consumption. Related to this, baseline reaction times were not controlled in this study.

The second limitation is the cross-sectional design of the study. A stronger design would use an experimental design and a randomized control group. Future research might address this

limitation as well as include multiple time points of assessment to evaluate changes in alcohol-related implicit attitudes and drinking.

The third limitation relates to the sample. This study did not exclude participants based on drinking criteria, thus, the sample in the present study included abstainers, light drinkers, moderate drinkers, and heavy drinkers. Expected effects may have been washed out based on the drinking heterogeneity of the sample. Specifically, it is possible that the central hypothesis is supported only when considering heavy drinkers. That is, it is possible that self-awareness interacts with alcohol-related implicit attitude in predicting drinking, but this is only true for females/males who consume 4/5 drinks on an occasion. Partialing out these data from the current sample for analyses was not helpful due to low sample size (not enough heavy drinkers were included in the sample) and ensuing low power to detect effects. Additionally, this sample was comprised of college students, which may limit generalizability of findings. Moreover, the sample was relatively homogeneous with respect to age (young adults), race/ethnicity (mostly Caucasian), and occupation (full-time university students). While this is a group for whom alcohol and associated problems are of concern, it is not clear whether these findings would generalize to other groups. These findings should be replicated in more diverse samples.

The fourth limitation concerns the method of measurement of drinking variables. The alcohol consumption measures were limited to self-report. Observational and biometric data, while more costly than self-reported measures to collect and analyze, may provide additional and important information.

Future directions for research include the use of experimentally designed studies to identify individual differences in drinking patterns and trajectory. Additionally, to address

positive societal associations with water relative to alcohol, IAT researchers should consider creating IATs that include other beverages such as soda, coffee, energy drinks, or fruit juice. Moreover, further research is needed to understand the implicit associations specifically of heavy drinkers and how these associations are similar or different from those of abstainers or light drinkers. This will help to inform interventions and treatment programs targeting heavy drinkers. Furthermore, future research might increase external validity through the inclusion of community-based or clinical samples, and including a more representative distribution of age. Finally, further directions may include measures that are not self-reported, such as observational or biometric methods.

Conclusion. The present study examined alcohol-related implicit attitude as a moderator of the relationship between self-awareness and drinking behavior. Findings were consistent with previous research in that there was a significant main effect for the implicit association test (IAT) when predicting drinking outcomes, females reported drinking less than males, and attitudes towards alcohol relative to water were negative. Results did not support the hypothesis that alcohol-related implicit attitude would interact with self-awareness in predicting alcohol consumption. This study contributes to the growing social cognitive literature that seeks to understand and identify individual differences in drinking and determine if automatic processes represent a target for treatment and prevention efforts for maladaptive behaviors.

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Table 1
Means, Standard Deviations, and Correlations among Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Approach avoid IAT	--										
2. Cope ignore IAT	4.78***	--									
3. Drinking identity IAT	0.20**	0.22***	--								
4. Peak drinks	0.15*	0.17*	0.28***	--							
5. Drinking frequency	0.16*	0.17*	0.29***	0.71***	--						
6. Drinks per week	0.16*	0.17*	0.29***	0.80***	0.78***	--					
7. Alcohol-related problems	0.11†	0.14*	0.24**	0.55***	0.64***	0.64***	--				
8. Gender	-0.05	-0.12†	-0.15*	-0.26***	-0.11†	-0.15*	-0.14*	--			
9. Private self-consciousness	0.004	0.01	0.06	0.03	0.07	0.08	0.16*	-0.11†	--		
10. Public self-consciousness	0.37	-0.62	-0.008	-0.03	0.04	0.06	0.16*	-0.06	0.60***	--	
11. Social anxiety	0.07	0.02	-0.02	-0.13†	-0.11†	-0.08	0.03	0.02	0.39***	0.53***	--
Mean	-0.28	-0.40	-0.10	4.21	2.81	3.91	27.80	0.82	2.38	2.21	1.77
Standard Deviation	0.42	0.44	0.44	5.41	2.61	5.68	4.41	0.39	0.64	0.91	0.98

Note. N=218 *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$

Table 2

Means, Standard Deviations, and Correlations among Variables for the Approach Avoid IAT

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. <i>D</i> Score	--											
2. Test Blocks <i>D</i> Score	0.88***	--										
3. Compatible Pairings	0.46***	0.50***	--									
4. Incompatible Pairings	-0.19**	-0.24***	0.65***	--								
5. Peak drinks	-0.16*	-0.14*	-0.05	0.03	--							
6. Drinking frequency	-0.17*	-0.14*	-0.10	0.003	0.71***	--						
7. Drinks per week	-0.16*	-0.14*	-0.09	0.007	0.80***	0.78***	--					
8. Alcohol-related problems	-0.11	-0.08	-0.06	-0.007	0.55***	0.63***	0.63***	--				
9. Gender	0.05	-0.003	-0.06	-0.06	-0.29***	-0.13†	-0.18**	-0.17**	--			
10. Private self- consciousness	0.005	0.04	-0.007	-0.08	0.06	0.08	0.11	0.18**	-0.07	--		
11. Public self- consciousness	-0.03	0.003	0.008	-0.03	-0.02	0.02	0.07	0.15*	-0.04	0.58***	--	
12. Social anxiety	-0.67	-0.09	-0.04	0.03	-0.12†	-0.13†	-0.09	0.03	0.02	0.37***	0.50***	--
Mean	0.29	0.22	818.76	727.79	4.29	2.81	3.90	27.72	0.82	2.35	2.18	1.69
Standard Deviation	0.41	0.45	234.76	172.93	5.39	2.56	5.59	4.32	0.38	0.64	0.91	0.97

Note. N=218 *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$

Table 3
Means, Standard Deviations, and Correlations among Variables for the Cope Ignore IAT

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. <i>D</i> Score	--											
2. Test Blocks <i>D</i> Score	0.88***	--										
3. Compatible Pairings	0.43***	0.49***	--									
4. Incompatible Pairings	-0.31***	-0.34***	0.54***	--								
5. Peak drinks	-0.16*	-0.19**	-0.06	0.06	--							
6. Drinking frequency	-0.15*	-0.15*	-0.11†	-0.009	0.71***	--						
7. Drinks per week	0.17*	-0.18**	-0.13†	0.002	0.80***	0.89***	--					
8. Alcohol-related problems	-0.14*	-0.16*	-0.14*	-0.007	0.55***	0.63***	0.63***	--				
9. Gender	0.12†	0.16*	0.004	-0.12†	-0.29***	-0.13*	-0.18**	-0.18**	--			
10. Private self- consciousness	-0.03	-0.05	-0.03	0.01	0.06	0.08	0.11	0.18**	-0.07	--		
11. Public self- consciousness	0.02	0.02	-0.01	-0.02	-0.02	0.02	0.07	0.15*	-0.04	0.58***	--	
12. Social anxiety	-0.02	-0.03	-0.04	0.05	-0.12†	-0.13†	0.09	0.03	0.02	0.37***	0.50***	--
Mean	0.40	0.35	802.70	682.71	4.28	2.80	3.89	27.71	0.82	2.35	2.18	1.70
Standard Deviation	0.44	0.48	216.52	154.16	5.38	2.56	5.58	4.32	0.38	0.64	0.91	0.97

Note. N=218 *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$

Table 4
Means, Standard Deviations, and Correlations among Variables for the Drinking Identity IAT

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. <i>D</i> Score	--											
2. Test Blocks <i>D</i> Score	0.84***	--										
3. Compatible Pairings	0.40***	0.42***	--									
4. Incompatible Pairings	-0.23***	-0.31***	0.66***	--								
5. Peak drinks	-0.28***	0.25***	-0.08	0.10	--							
6. Drinking frequency	-0.28***	-0.22***	-0.13†	0.03	0.72***	--						
7. Drinks per week	-0.29***	-0.22**	-0.12†	0.03	0.80***	0.78***	--					
8. Alcohol-related problems	-0.24***	-0.25***	-0.11	0.10	0.55***	0.63***	0.63***	--				
9. Gender	0.16*	0.17*	-0.05	-0.18**	-0.30***	-0.13*	-0.18**	-0.18**	--			
10. Private self- consciousness	-0.07	-0.03	-0.06	-0.02	0.05	0.08	0.11	0.17*	-0.07	--		
11. Public self- consciousness	-0.01	0.02	-0.007	-0.004	-0.02	0.02	0.07	0.15*	-0.04	0.28***	--	
12. Social anxiety	0.02	0.04	0.02	0.02	-0.12†	-0.13†	-0.09	0.03	0.02	0.37***	0.50***	--
Mean	0.10	0.10	783.19	743.13	4.25	2.81	3.89	27.69	0.82	2.35	2.18	1.70
Standard Deviation	0.44	0.43	210.66	179.43	5.36	2.57	5.60	4.31	0.39	0.64	0.91	0.97

Note. N=218 *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$

Table 5

Hierarchical regression analysis for variables predicting drinking from private self-consciousness (PC) and the approach avoid IAT (AIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	PC	0.50	0.57	0.06	0.38
		AIAT	1.99	0.87	0.15*	0.02
	Step 2	PC * AIAT	1.83	1.39	0.35	0.19
Drinking frequency	Step 1	PC	0.33	0.27	0.08	0.22
		AIAT	0.98	0.41	0.16*	0.02
	Step 2	PC * AIAT	-0.20	0.66	-0.08	0.76
Drinks per week	Step 1	PC	0.95	0.59	0.11	0.11
		AIAT	2.13	0.90	0.16*	0.02
	Step 2	PC * AIAT	0.76	1.43	0.14	0.59
Alcohol-related problems	Step 1	PC	1.19	0.45	0.18***	0.009
		AIAT	1.17	0.70	0.11†	0.10
	Step 2	PC * AIAT	0.19	1.11	0.05	0.86

Note. N=218 *** $p < .001$ * $p < .05$. † $p < .1$

Table 6

Hierarchical regression analysis for variables predicting drinking from private self-consciousness (PC) and the cope/ignore IAT (CIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	PC	0.49	0.57	0.06	0.39
		CIAT	2.02	0.81	0.17*	0.01
	Step 2	PC * CIAT	0.82	1.22	0.18	0.50
Drinking frequency	Step 1	PC	0.33	0.27	0.08	0.22
		CIAT	0.93	0.39	0.16*	0.02
	Step 2	PC * CIAT	-0.78	0.58	-0.36	0.18
Drinks per week	Step 1	PC	0.94	0.58	0.11	0.11
		CIAT	2.13	0.84	0.17*	0.01
	Step 2	PC * CIAT	-0.87	1.25	-0.18	0.49
Alcohol-related problems	Step 1	PC	1.19	0.45	0.17**	0.009
		CIAT	1.35	0.64	0.14*	0.04
	Step 2	PC * CIAT	-0.42	0.97	-0.11	0.67

Note. N=218 ** $p < .01$ * $p < .05$.

Table 7

Hierarchical regression analysis for variables predicting drinking from private self-consciousness (PC) and the drinking identity IAT (DIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	PC	0.29	0.55	0.03	0.60
		DIAT	3.43	0.81	0.28***	<0.0001
	Step 2	PC * DIAT	1.59	1.40	0.32	0.26
Drinking frequency	Step 1	PC	0.26	0.26	0.07	0.32
		DIAT	1.67	0.39	0.28***	<0.0001
	Step 2	PC * DIAT	0.04	0.67	0.02	0.95
Drinks per week	Step 1	PC	0.80	0.57	0.09	0.16
		DIAT	3.68	0.84	0.29***	<0.0001
	Step 2	PC * DIAT	0.04	1.45	0.008	0.98
Alcohol-related problems	Step 1	PC	1.06	0.44	0.16*	0.02
		DIAT	2.31	0.65	0.23***	0.0005
	Step 2	PC * DIAT	0.13	1.13	0.03	0.91

Note. N=218 *** $p < .001$ * $p < .05$.

Table 8

Hierarchical regression analysis for variables predicting drinking from public self-consciousness (PUC) and the approach avoid IAT (AIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	PUC	-0.15	0.40	-0.03	0.71
		AIAT	2.01	0.88	0.15*	0.02
	Step 2	PUC * AIAT	-0.56	0.94	-0.10	0.55
Drinking frequency	Step 1	PUC	0.06	0.19	0.02	0.77
		AIAT	0.98	0.42	0.16*	0.02
	Step 2	PUC * AIAT	0.20	0.45	0.08	0.65
Drinks per week	Step 1	PUC	0.40	0.41	0.06	0.34
		AIAT	2.11	0.91	0.16*	0.02
	Step 2	PUC * AIAT	0.23	0.97	0.04	0.81
Alcohol-related problems	Step 1	PUC	0.68	0.32	0.14*	0.03
		AIAT	1.12	0.70	0.11	0.11
	Step 2	PUC * AIAT	0.24	0.75	0.05	0.75

Note. N=218 * $p < .05$.

Table 9

Hierarchical regression analysis for variables predicting drinking from public self-consciousness (PUC) and the cope/ignore IAT (CIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	PUC	-0.08	0.40	-0.01	0.84
		CIAT	2.03	0.81	0.17*	0.01
	Step 2	PUC * CIAT	-0.44	0.86	-0.10	0.61
Drinking frequency	Step 1	PUC	0.09	0.19	0.03	0.63
		CIAT	0.94	0.39	0.16*	0.02
	Step 2	PUC * CIAT	-0.33	0.41	-0.15	0.42
Drinks per week	Step 1	PUC	0.47	0.41	0.08	0.25
		CIAT	2.18	0.84	0.17*	0.01
	Step 2	PUC * CIAT	-0.41	0.88	-0.09	0.64
Alcohol-related problems	Step 1	PUC	0.73	0.32	0.15*	0.02
		CIAT	1.43	0.65	0.15*	0.03
	Step 2	PUC * CIAT	0.41	0.68	0.11	0.55

Note. N=218 * $p < .05$.

Table 10

Hierarchical regression analysis for variables predicting drinking from public self-consciousness (PUC) and the drinking identity IAT (DIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	PUC	-0.12	0.38	-0.02	0.76
		DIAT	3.49	0.81	0.29***	<0.0001
	Step 2	PUC *	5.07	2.24	-0.14	0.44
		DIAT				
Drinking frequency	Step 1	PUC	0.08	0.18	0.03	0.68
		DIAT	1.70	0.39	0.29***	<0.0001
	Step 2	PUC *	-0.39	0.46	-0.16	0.39
		DIAT				
Drinks per week	Step 1	PUC	0.44	0.40	0.07	0.27
		DIAT	3.75	0.84	0.29***	<0.0001
	Step 2	PUC *	-0.81	1.00	-0.15	0.41
		DIAT				
Alcohol-related problems	Step 1	PUC	0.70	0.31	0.15*	0.02
		DIAT	2.41	0.65	0.24***	0.0003
	Step 2	PUC *	0.15	0.77	0.04	0.85
		DIAT				

Note. N=218 *** $p < .001$ * $p < .05$.

Table 11

Hierarchical regression analysis for variables predicting drinking from social anxiety (SOCANX) and the approach avoid IAT (AIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	SOCANX	-0.75	0.37	-0.14*	0.04
		AIAT	2.11	0.87	0.16*	0.02
	Step 2	SOCANX *	-0.67	0.90	-0.10	0.46
		AIAT				
Drinking frequency	Step 1	SOCANX	-0.36	0.18	-0.14*	0.04
		AIAT	1.04	0.41	0.17*	0.01
	Step 2	SOCANX *	-0.37	0.43	-0.12	0.38
		AIAT				
Drinks per week	Step 1	SOCANX	-0.58	0.38	-0.10	0.13
		AIAT	2.23	0.90	0.17*	0.01
	Step 2	SOCANX *	-0.59	0.93	-0.09	0.53
		AIAT				
Alcohol-related problems	Step 1	SOCANX	0.08	0.30	0.02	0.79
		AIAT	1.16	0.71	0.11	0.10
	Step 2	SOCANX *	-0.19	0.73	-0.04	0.79
		AIAT				

Note. N=218 * $p < .05$.

Table 12

Hierarchical regression analysis for variables predicting drinking from social anxiety (SOCANX) and the cope/ignore IAT (AIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	SOCANX	-0.71	0.37	-0.13 [†]	0.06
		CIAT	2.06	0.81	0.17*	0.01
	Step 2	SOCANX *	-0.64	0.73	-0.13	0.38
		CIAT				
Drinking frequency	Step 1	SOCANX	-0.34	0.18	-0.13 [†]	0.06
		CIAT	0.95	0.38	0.16*	0.01
	Step 2	SOCANX *	-0.11	0.35	-0.05	0.75
		CIAT				
Drinks per week	Step 1	SOCANX	-0.54	0.38	-0.09	0.16
		CIAT	2.17	0.34	0.17*	0.01
	Step 2	SOCANX *	-0.56	0.76	-0.11	0.46
		CIAT				
Alcohol-related problems	Step 1	SOCANX	0.10	0.30	0.02	0.74
		CIAT	1.38	0.65	0.14*	0.04
	Step 2	SOCANX *	-0.19	0.60	-0.05	0.75
		CIAT				

Note. N=218 * $p < .05$. [†] $p < .1$













Table 13

Hierarchical regression analysis for variables predicting drinking from social anxiety (SOCANX) and the drinking identity IAT (DIAT)

Criterion		Predictor	B	SE B	β	p
Peak drinks	Step 1	SOCANX	-0.63	0.36	-0.12†	0.08
		DIAT	3.43	0.80	0.28***	<0.0001
	Step 2	SOCANX * DIAT	-0.98	0.83	-0.16	0.24
Drinking frequency	Step 1	SOCANX	-0.31	0.17	-0.12†	0.07
		DIAT	1.68	0.38	0.28***	<0.0001
	Step 2	SOCANX * DIAT	-0.21	0.40	-0.07	0.60
Drinks per week	Step 1	SOCANX	-0.47	0.37	-0.08	0.21
		DIAT	3.72	0.86	0.29***	<0.0001
	Step 2	SOCANX * DIAT	-1.53	0.87	-0.25†	0.08
Alcohol-related problems	Step 1	SOCANX	0.15	0.29	0.03	0.62
		DIAT	2.41	0.66	0.24***	0.0003
	Step 2	SOCANX * DIAT	-0.48	0.69	-0.10	0.49

Note. N=218 *** $p < .001$ † $p < .1$

Appendix

<i>IAT</i>	<i>Concepts (1 vs 2)</i>	<i>Attributes (1 vs 2)</i>	<i>Concept Items 1</i>	<i>Concept Items 2</i>	<i>Attribute Items 1</i>	<i>Attribute Items 2</i>
<i>Drinking Identity</i>	Me vs Not Me	Drinker vs Non- Drinker	Me My Mine Self	They Them Theirs Other	Drinker Partier Drunk Drink	Non-drinker Abstainer Sober Abstain
<i>Approach Avoid</i>	Alcohol vs Water	Approach vs Avoid	  	  	Approach Closer Advance Forward Toward	Avoid Away Leave Withdraw Escape
<i>Coping</i>	Alcohol vs Water	Coping vs Ignore	  	  	Cope Help Manage Deal	Ignore Dismiss Disregard Neglect

Demographics

Instructions: Please read each question carefully and select the most accurate response.

1. Are you at least 18 years of age?

- ☐ Yes
☐ No (If participant marks "No," they will be sent out of the survey as they do not meet participation requirements)

2. Age: _____ years

3. Height: _____ ft. _____ in

4. Sex: ☐ Male ☐ Female

5. Weight: (for Blood Alcohol Content):

_____ lbs.

6. Ethnic Background:

☐ Hispanic/Latino ☐ Nonhispanic

7. Racial Background:

- ☐ White/Caucasian
☐ Native American/American Indian
☐ Black/African American
☐ Asian
☐ Native Hawaiian/ Pacific Islander
☐ Multi-Ethnic
☐ Other

8. What is your year in school?

☐ 1st year ☐ 2nd year ☐ 3rd year
☐ 4th year ☐ 5th year ☐ 6th year
☐ 7th year ☐ more

9. Class Standing:

- ☐ Freshman
☐ Sophomore
☐ Junior
☐ Senior

10. Student Status:

- ☐ Part-time (1-11 credits)
☐ Full-time (12+ credits)

11. Most recent Semester's GPA (Write N/A if this does not apply to you): _____

12. Where you are living this semester:

- ☐ Residence Halls/Dorm Room
☐ Fraternity/Sorority House
☐ Off-Campus Housing/Apartment/House
☐ With Parents

13. Are you currently a Fraternity or Sorority Member? ☐ Yes ☐ No

14. Work Status:

- ☐ I do not work
☐ Working part-time
☐ Working full-time

15. Religious Affiliation?

- ☐ Christian
☐ Jewish
☐ Hindu
☐ Buddhist
☐ Muslim/Islam
☐ Agnostic
☐ Atheist
☐ Non-religious/secular
☐ Other (specify) _____

16. Christian Denomination?

- ☐ Catholic
☐ Baptist
☐ Methodist
☐ Lutheran
☐ Presbyterian
☐ Episcopal
☐ Other (specify) _____
☐ Not applicable

17. Relationship Status?

- ☐ Single, not dating
☐ Single, casual dating
☐ Single, exclusively dating
☐ Engaged
☐ Married/Life partner

18. If you are currently in a relationship, do you live with your partner?

☐ Yes ☐ No ☐ Not applicable

Daily Drinking Questionnaire (DDQ)

This section asks you to report on **your** drinking over the **past three months**.

For all questions, **one drink equals:**

- 5oz. wine
- 12oz. wine cooler
- 12oz. beer (10oz. of Microbrew; 8-9 oz. Malt Liquor, Canadian beer or Ice beer)
- 6oz. Ice Malt Liquor
- 1 Cocktail with 1 oz. of 100 proof liquor or 1 ½ oz. (single jigger) of 80 proof liquor.

1. Consider a typical week during the **last three months**. How much alcohol, on average (measured in number of drinks), do **you** drink on each day of a typical week?

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

2. Consider a typical week during the **last three months**. Over how many **hours** do **you** drink the above number of drinks?

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

3. On average, during **the last three months**, how **often** have **you** consumed alcohol?

- | | | |
|---|--|--|
| <input type="checkbox"/> Never | <input type="checkbox"/> Three times a month | <input type="checkbox"/> Four times a week |
| <input type="checkbox"/> Less than once per month | <input type="checkbox"/> Once a week | <input type="checkbox"/> Five times a week |
| <input type="checkbox"/> Once a month | <input type="checkbox"/> Twice a week | <input type="checkbox"/> Six times a week |
| <input type="checkbox"/> Two times a month | <input type="checkbox"/> Three times a week | <input type="checkbox"/> Every day |

4. During **the last three months**, when you have consumed alcohol, how many drinks on average did you typically consume on a given occasion?

- | | | |
|-----------------------------------|------------------------------------|--|
| <input type="checkbox"/> 0 drinks | <input type="checkbox"/> 9 drinks | <input type="checkbox"/> 18 drinks |
| <input type="checkbox"/> 1 drink | <input type="checkbox"/> 10 drinks | <input type="checkbox"/> 19 drinks |
| <input type="checkbox"/> 2 drinks | <input type="checkbox"/> 11 drinks | <input type="checkbox"/> 20 drinks |
| <input type="checkbox"/> 3 drinks | <input type="checkbox"/> 12 drinks | <input type="checkbox"/> 21 drinks |
| <input type="checkbox"/> 4 drinks | <input type="checkbox"/> 13 drinks | <input type="checkbox"/> 22 drinks |
| <input type="checkbox"/> 5 drinks | <input type="checkbox"/> 14 drinks | <input type="checkbox"/> 23 drinks |
| <input type="checkbox"/> 6 drinks | <input type="checkbox"/> 15 drinks | <input type="checkbox"/> 24 drinks |
| <input type="checkbox"/> 7 drinks | <input type="checkbox"/> 16 drinks | <input type="checkbox"/> 25 or more drinks |
| <input type="checkbox"/> 8 drinks | <input type="checkbox"/> 17 drinks | |

Quantity/Frequency/Peak Alcohol Use Index

For all questions, **one drink equals:**

- 5oz. wine
- 12oz. wine cooler
- 12oz. beer (10oz. of Microbrew; 8-9 oz. Malt Liquor, Canadian beer or Ice beer)
- 6oz. Ice Malt Liquor
- 1 Cocktail with 1 oz. of 100 proof liquor or 1 ½ oz. (single jigger) of 80 proof liquor.

1. Think of the **occasion you drank the most** this **past month**. How **much** did you drink?

- | | | | | |
|-----------------------------------|-----------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| <input type="checkbox"/> 0 drinks | <input type="checkbox"/> 5 drinks | <input type="checkbox"/> 10 drinks | <input type="checkbox"/> 15 drinks | <input type="checkbox"/> 20 drinks |
| <input type="checkbox"/> 1 drink | <input type="checkbox"/> 6 drinks | <input type="checkbox"/> 11 drinks | <input type="checkbox"/> 16 drinks | <input type="checkbox"/> 21 drinks |
| <input type="checkbox"/> 2 drinks | <input type="checkbox"/> 7 drinks | <input type="checkbox"/> 12 drinks | <input type="checkbox"/> 17 drinks | <input type="checkbox"/> 22 drinks |
| <input type="checkbox"/> 3 drinks | <input type="checkbox"/> 8 drinks | <input type="checkbox"/> 13 drinks | <input type="checkbox"/> 18 drinks | <input type="checkbox"/> 23 drinks |
| <input type="checkbox"/> 4 drinks | <input type="checkbox"/> 9 drinks | <input type="checkbox"/> 14 drinks | <input type="checkbox"/> 19 drinks | <input type="checkbox"/> 24 drinks |
| | | | | <input type="checkbox"/> 25+ drinks |

2. Think of the **occasion you drank the most** this **past month**. How **many HOURS** did you spend drinking on that occasion?

- | | | | |
|------------------------------|------------------------------|------------------------------|-------------------------------|
| <input type="checkbox"/> 0-1 | <input type="checkbox"/> 3-4 | <input type="checkbox"/> 6-7 | <input type="checkbox"/> 9-10 |
| <input type="checkbox"/> 1-2 | <input type="checkbox"/> 4-5 | <input type="checkbox"/> 7-8 | <input type="checkbox"/> 10+ |
| <input type="checkbox"/> 2-3 | <input type="checkbox"/> 5-6 | <input type="checkbox"/> 8-9 | |

3. On a given **weekend evening** during the **past month**, how **much** alcohol did you typically drink? Estimate for the past month.

- | | | | | |
|-----------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| <input type="checkbox"/> 0 drinks | <input type="checkbox"/> 5 drinks | <input type="checkbox"/> 10 drinks | <input type="checkbox"/> 15 drinks | <input type="checkbox"/> 20 drinks |
| <input type="checkbox"/> 1 drink | <input type="checkbox"/> 6 drinks | <input type="checkbox"/> 11 drinks | <input type="checkbox"/> 16 drinks | <input type="checkbox"/> 21 drinks |
| <input type="checkbox"/> 2 drinks | <input type="checkbox"/> 7 drinks | <input type="checkbox"/> 12 drinks | <input type="checkbox"/> 17 drinks | <input type="checkbox"/> 22 drinks |
| <input type="checkbox"/> 3 drinks | <input type="checkbox"/> 8 drinks | <input type="checkbox"/> 13 drinks | <input type="checkbox"/> 18 drinks | <input type="checkbox"/> 23 drinks |
| <input type="checkbox"/> 4 drinks | <input type="checkbox"/> 9 drinks | <input type="checkbox"/> 14 drinks | <input type="checkbox"/> 19 drinks | <input type="checkbox"/> 24 drinks |
| | | | | <input type="checkbox"/> 25+ drink |

4. On a given **weekend evening** during the **past month**, how **many HOURS** did you spend drinking? Estimate for the past month.

- | | | | |
|------------------------------|------------------------------|------------------------------|-------------------------------|
| <input type="checkbox"/> 0-1 | <input type="checkbox"/> 3-4 | <input type="checkbox"/> 6-7 | <input type="checkbox"/> 9-10 |
| <input type="checkbox"/> 1-2 | <input type="checkbox"/> 4-5 | <input type="checkbox"/> 7-8 | <input type="checkbox"/> 10+ |
| <input type="checkbox"/> 2-3 | <input type="checkbox"/> 5-6 | <input type="checkbox"/> 8-9 | |

5. How many days of the week did you drink alcohol during the **past month**?

- | | |
|--|---|
| <input type="checkbox"/> I do not drink at all | <input type="checkbox"/> Twice a week |
| <input type="checkbox"/> About once a month | <input type="checkbox"/> Three times a week |
| <input type="checkbox"/> Once a month | <input type="checkbox"/> Four times a week |
| <input type="checkbox"/> Two times a month | <input type="checkbox"/> Five times a week |
| <input type="checkbox"/> Three times a month | <input type="checkbox"/> Six times a week |
| <input type="checkbox"/> Once a week | <input type="checkbox"/> Every day |

					<p><u>Directions:</u></p> <p>How many times did the following things happen to you <u>while</u> you were drinking or <u>because of</u> your alcohol use during the last 3 months?</p> <p>Circle the number corresponding to your answer.</p>
NEVER	1 TO 2 TIMES	3 TO 5 TIMES	6 TO 10 TIMES	MORE THAN 10 TIMES	
1	2	3	4	5	1. Not able to do your homework or study for a test?
1	2	3	4	5	2. Got into fights, acted bad, or did mean things?
1	2	3	4	5	3. Missed out on other things because you spent too much money on alcohol?
1	2	3	4	5	4. Went to work or school high or drunk?
1	2	3	4	5	5. Caused shame or embarrassment to someone?
1	2	3	4	5	6. Neglected your responsibilities?
1	2	3	4	5	7. Relative avoided you?
1	2	3	4	5	8. Felt that you needed more alcohol than you used to use in order to get the same effect?
1	2	3	4	5	9. Tried to control your drinking by trying to drink only at certain times of the day or in certain places?
1	2	3	4	5	10. Had withdrawal symptoms, that is, felt sick because you stopped or cut down on drinking?
1	2	3	4	5	11. Noticed a change in your personality?
1	2	3	4	5	12. Felt that you had a problem with alcohol?
1	2	3	4	5	13. Missed a day (or part of a day) of school or work?
1	2	3	4	5	14. Tried to cut down or quit drinking?
1	2	3	4	5	15. Suddenly found yourself in a place that you could not remember getting to?
1	2	3	4	5	16. Passed out or fainted suddenly?
1	2	3	4	5	17. Had a fight, argument or bad feelings with a friend?
1	2	3	4	5	18. Had a fight, argument or bad feelings with a family member?
1	2	3	4	5	19. Kept drinking when you promised yourself not to?
1	2	3	4	5	20. Felt you were going crazy?
1	2	3	4	5	21. Had a bad time?
1	2	3	4	5	22. Felt physically or psychologically dependent?
1	2	3	4	5	23. Was told by a friend or neighbor to stop or cut down drinking?
1	2	3	4	5	24. Drove shortly after having more than two drinks?
1	2	3	4	5	25. Drove shortly after having more than four drinks?

Self-Consciousness Questionnaire

Please read each item carefully and rate each item on a scale of 0 to 4, where 0 is extremely uncharacteristic and 4 is extremely characteristic.

- _____ 1. I'm always trying to figure myself out.
- _____ 2. I'm concerned about my style of doing things.
- _____ 3. Generally, I'm not very aware of myself.
- _____ 4. It takes me time to overcome my shyness in new situations.
- _____ 5. I reflect about myself a lot.
- _____ 6. I'm concerned about the way I present myself.
- _____ 7. I'm often the subject of my own fantasies.
- _____ 8. I have trouble working when someone is watching me.
- _____ 9. I never scrutinize myself.
- _____ 10. I get embarrassed very easily.
- _____ 11. I'm self-conscious about the way I look.
- _____ 12. I don't find it hard to talk to strangers.
- _____ 13. I'm generally attentive to my inner feelings.
- _____ 14. I usually worry about making a good impression.
- _____ 15. I'm constantly examining my motives.
- _____ 16. I feel anxious when I speak in front of a group.
- _____ 17. One of the last things I do before I leave my house is look in the mirror.
- _____ 18. I sometimes have the feeling that I'm off somewhere watching myself.
- _____ 19. I'm concerned about what other people think of me.
- _____ 20. I'm alert to changes in my mood.
- _____ 21. I'm usually aware of my appearance.
- _____ 22. I'm aware of the way my mind works when I work through a problem.
- _____ 23. Large groups make me nervous.