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THE RELATIONSHIP BETWEEN TRAIT IMPULSIVITY AND ALCOHOL-RELTATED ATTENTIONAL BIASES

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ABSTRACT

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Harmful alcohol use is a global concern, which has made research in this area a prime public health interest. Previous research has identified alcohol-related attentional biases (Cox et al., 2002, 2007; Marissen et al., 2006; Streeter et al., 2008) and impulsivity (*see* Acton, 2003; Dick et al., 2010; Mulder, 2002) as two important predictors that affect alcohol use, seeking, and relapse (Cox et al., 2002; Robbins & Ehrman, 2004). Recent review of the literature has also revealed that there is a significant relationship between these two constructs (Coskunpinar & Cyders, 2013). The current study used college undergraduate social drinkers (at least 3 drinks per week) (n = 42, mean age = 23.27 (SD = 5.21), female: 69.2%) to examine the relationship between specific trait impulsivity facets and alcohol-related attentional biases and to examine how this relationship is affected by measurement type (eye movement, reaction time measures), attentional bias constructs (initial orientation, delayed disengagement), and environmental cues (specifically mood and alcohol olfactory cues). Participants had alcohol-related attentional bias as measured by reaction time (areas of interest: $p < .05$) and eye-movement data (areas of interest: $p < .05$), which was not affected by mood, odor, or urgency.

INTRODUCTION

Harmful alcohol use accounts for 4% of all deaths in the general population (2.5 million deaths each year), 9% of which are among young individuals between the ages of 15-29 (World Health Organization, 2012). Therefore, it is a prime public health interest to understand predictors that lead to alcohol use among young adults. Two of these predictors affecting alcohol seeking, use, and relapse (Cox et al., 2002; Robbins & Ehrman, 2004) are attentional biases toward alcohol stimuli (Cox, Hogan, Kristian, & Race, 2002; Cox, Pothos, & Hosier, 2007; Marissen et al., 2006; Streeter et al., 2008) and impulsivity (*see* Acton, 2003; Dick et al., 2010; Mulder, 2002). There is a plethora of research supporting the relationship between these predictors and alcohol related outcomes, however, research to date has yet to clearly establish how these two constructs relate to one another. Although a recent meta-analysis has shown a significant relationship between impulsivity and substance-related attentional bias (Coskunpinar & Cyders, 2013), the scope of this literature is limited. In particular, no studies have addressed the direct relationship between specific facets of trait impulsivity and attentional bias, so previous results are likely watered down, and thus underestimate more specific relationships with unidimensional impulsivity aspects (Smith, Fischer, & Fister, 2003). Therefore, the current study empirically examined how specific trait impulsivity facets relate to alcohol-related attentional bias and how this relationship differs by attentional bias construct, measurement type and how it is affected by certain environmental cues. Understanding how impulsivity is related to alcohol-related attentional bias and how it is affected by environmental cues will lead to a better understanding of factors that lead to alcohol use, seeking and relapse risk, which should

be considered in treatment strategies. Below I will discuss current research on attentional bias, impulsivity, how they relate to alcohol-related outcomes, and possibly impact one another.

Attentional Bias

Attentional bias is defined as one's likelihood to direct attention toward stimuli-related cues in the environment (e.g., alcohol images or odors). It has two related, though separate, components: *initial orientation* to stimuli and difficulty of *disengaging attention* from the stimuli (Cisler, Bacon, & Williams, 2009). These components share approximately 25% of their variance (e.g., Field, Mogg, & Bradley, 2006; Schoenmakers, Wiers, & Field, 2008) and have been shown to differentially relate to substance use outcomes (e.g., Field, Mogg, & Bradley, 2004; Noel et al., 2006). According to Field and Cox (2008), both components of attentional bias can be measured with eye movement and reaction time measures. In reaction time measures (e.g., Addiction-Stroop, visual probe task), attentional bias is inferred through participants' timed performance (reaction time) on a primary task (e.g., color-naming) when a substance-related stimulus is presented (e.g., substance-related words) as compared to when a control stimulus is presented. Results are thought to reflect automatic initial orientation when stimuli are presented for a short time interval (e.g., < 200 ms), whereas results are thought to reflect more conscious maintenance of or disengagement from the stimuli when stimuli are presented for a longer time interval (e.g., at least 500 ms, but more appropriately > 1000 ms) (Field and Cox, 2008). Eye movement methods of attentional bias measure visuospatial selective attention in the presence of substance cues through eye-movement monitoring. Delayed disengagement is measured through participants' gaze duration on substance-related stimuli as compared to control stimuli, whereas initial orientation is assessed as the proportion of initial eye movements directed toward substance-related stimuli as compared to control stimuli (Field, Mogg, & Bradley, 2005; Mogg, Bradley, Field, & De Houwer, 2003). Previous research has shown eye-movement measures of attentional bias to have significantly larger relationships with craving than reaction time

measures (Field, Munafo, & Franken, 2009), suggesting that these two measures of attentional biases might be differentially related to alcohol related outcomes. However, a recent meta-analysis, based on the limited literature to date on this subject, reported no significant difference in the relationship between substance-related attentional bias and impulsivity when using reaction time and eye-movement methods of measurement (Coskunpinar & Cyders, 2013). As such, more research is needed to clarify the predictive utility of these different attentional bias measures. See Table 1 for a list of common attentional bias measures, as well as a comparison of the pros and cons associated with these measures.

Impulsivity

Impulsivity is a multidimensional trait that includes tendencies such as acting without thinking, seeking out exciting experiences and inability to complete tasks (Depue and Collins, 1999; Petry, 2001). Impulsivity is generally measured through two separate methods: self-report measures and behavioral lab tasks. Self-report measures, such as the UPPS-P Impulsive Behavior Scale (Lynam, Smith, Cyders, Fischer, & Whiteside, 2007) and the Sensation Seeking Scale (Zuckerman, 1994), generally assess *trait impulsivity*. Five separate impulsivity-related traits have been found across the literature, which fall into three domains (*see* Cyders and Smith, 2007; Whiteside and Lynam, 2001): (1) *sensation seeking*, which is the tendency to being open to try new experiences and enjoying exciting activities; (2) *deficits in conscientiousness*, including both *lack of deliberation* and *lack of perseverance*, which are defined as the engagement in behavior without regarding the consequences and the inability to stay focused on a task, respectively; and (3) *emotion-based impulsivity*, including both *negative urgency* and *positive urgency*, which are the tendency to act rashly while experiencing negative and positive affect, respectively. These separate traits differentially relate to and predict substance use outcomes (*see* Coskunpinar, Dir, & Cyders, 2013, for a review of how these traits differentially relate to alcohol outcomes and Fischer, Smith, & Cyders, 2008, for a review of how these traits differentially relate to binge eating behaviors).

Lab task measures of impulsivity, such as the stop-signal task (Eriksen and Eriksen, 1974), are thought to measure more state-like, in-the-moment *behavioral impulsivity*. Behavioral impulsivity usually assesses impulsive disinhibition (prepotent response inhibition from Dick et al., 2010: ability to suppress dominant or automatic responses) and impulsive decision-making (delay response from Dick et al., 2010: inability to delay responding in the face of a larger reward, also known as delay discounting) (*see* Christiansen, Cole & Field, 2012; Reynolds, Ortengren, Richards, & de Wit, 2006). Although both trait and behavioral measures are thought to assess impulsivity, recent research suggests that they are largely assessing different aspects of impulsivity and have very little overlap (Cyders and Coskunpinar, 2011a, 2011b; Reynolds et al., 2006), sharing only approximately 5% of their variance (Cyders and Coskunpinar, 2011a).

Alcohol Use, Attentional Bias, and Impulsivity

Attentional bias has been associated with ongoing alcohol use, increased craving, alcohol seeking and relapse risk following treatment (Cox et al., 2002; Field et al., 2009; Field & Cox, 2008; Robbins & Ehrman, 2004). It is theorized that attentional biases affect the risk of substance use and abuse partly through increasing one's cravings for the substance by signaling the availability of that substance, which in turn increases the likelihood of substance-seeking behaviors (Field et al., 2009). Majority of the research on alcohol-related attentional bias has examined how delayed disengagement from alcohol cues relates to alcohol use outcomes. Some of this research shows that people who have more experience with alcohol tend to have stronger alcohol-related attentional biases than those with less alcohol experience. For example, alcohol-dependent individuals display a greater interference in color naming alcohol-related words and pictures than neutral stimuli on the Stroop task, as compared to light drinkers (Bruce & Jones, 2004; Cox, Blount, & Rozak, 2000; Cox, Brown, & Rowlands, 2003; Cox, Yeates, & Regan, 1999; Jones, Bruce, Livingstone, & Reed, 2006; Lusher, Chandler, & Ball, 2004; Sharma, Albery, & Cook, 2001; Stetter, Ackerman, Bizer, Straube, & Mann, 1995; Stormark.

Laberg, Nordby, & Hugdahl, 2000). Heavy drinkers also exhibit faster reaction times to alcohol-related pictures versus neutral stimuli on a visual probe task, as compared to light drinkers (Field et al., 2004; Townshend & Duka, 2001). Moreover, alcohol related attentional bias also influences one's treatment outcomes and future relapse risk. Research has shown that, alcohol abusers with stronger delayed disengagement from alcohol stimuli tend to have unsuccessful treatment outcomes (Cox et al., 2002), higher relapse risk (Cox et al., 2002, 2007) and fewer long-term reductions in their drinking (Cox et al., 2007).

Impulsivity also has a well-established role in alcohol use and abuse (*see* Acton, 2003; Dick et al., 2010; Mulder, 2002), which has been replicated across clinical and nonclinical samples of young adults (Balodis, Potenza, & Olmstead, 2009; Dom, De Wilde, Hulstijn, & Sabbe, 2007; Gunnarsson, Gustavsson, Tengstrom, Franck, & Fahlke, 2008; Woicik, Stewart, Pihl, & Conrod, 2009). The relationship between impulsivity and alcohol use has been in the medium range ($r = 0.28$, Coskunpinar et al., 2013); however, the magnitude of the relationships between impulsivity traits and alcohol use outcomes has varied considerably across studies (r's from -0.05 to 1.02 across 96 studies; Coskunpinar et al., 2013). One potential explanation for the variability in the effect size of these relationships is the vast differences in how impulsivity is defined and measured across studies. Most studies that examine relationships using multidimensional traits average across relationships of differing magnitudes, which leads to small or non-significant relationships (Smith et al., 2003). In particular, research has demonstrated more robust relationships between impulsivity and alcohol use outcomes when distinct impulsivity traits and alcohol use outcomes are assessed (*see* Coskunpinar et al., 2013 for a review).

Although research has extensively demonstrated the predictive role of attentional bias and impulsivity on alcohol related outcomes, current data on the relationship between impulsivity and attentional bias are still few and far between and inconsistent. For example, delayed disengagement from cocaine (Liu, Lane, Schmitz, Waters, Cunningham, & Moeller, 2011) and food (Hou, Mogg, Bradley, Moss-Morris, Peveler, & Roefs, 2011; Loeber et al., 2011) cues is associated with behavioral impulsivity.

However, Field and colleagues (2007) found no relationship between delayed disengagement from smoking cues and impulsivity. A recent meta-analysis (Coskunpinar & Cyders, 2013) found a significant relationship between impulsivity and substance-related attentional bias (r = .20), which was moderated by type of impulsivity assessed (Q_b = 5.91, df = 1): There was a stronger relationship between behavioral impulsivity and substance-related attentional bias (r = 0.22) than between trait impulsivity and substance-related attentional bias (r = 0.10), although the majority of the research included in this meta-analysis focused on behavioral impulsivity, thus limiting findings with trait impulsivity (Coskunpinar & Cyders, 2013).

How Might Impulsivity Affect Attentional Bias Development?

There are three main theories for how attentional biases are developed that could be affected by impulsivity: *Classical Conditioning Theory* (Pavlov, 1927), *Incentive-Sensitization Theory* (Franken, 2003; Robinson & Berridge, 1993), and *Person-Environment Transaction Theory* (Caspi, 1993; Caspi & Roberts, 2001). It is important to acknowledge that the classical conditioning theory and the incentive-sensitization theory are not mutually exclusive and that current research on attentional bias seems to integrate these two theories (Field & Cox, 2008).

Adaptation of the *Classical Conditioning Theory* (Pavlov, 1927) suggests that ethanol functions as the unconditioned stimulus (UCS) that elicits an unconditioned response (UCR), such as dizziness and pleasure (Franken, 2003; Siegel & Ramos, 2002; Stewart, 1984). Through conditioning, alcohol becomes associated with an environmental stimulus (conditioned stimulus, CS; e.g., smell of alcohol, a bottle opener, the alcohol bottle/glass, a particular mood state), which then elicits a conditioned response (CR) (*see* Siegel & Ramos, 2002 for a review). When this occurs, individuals allocate their attention toward the CS because it has been associated with the rewarding properties of the substance and because it elicits conscious expectations that alcohol will be available to consume (Field & Cox, 2008).

The *Incentive-Sensitization Theory* of addiction suggests that addictive behaviors are largely due to neuroadaptations caused by repeated substance use, which manifest themselves as changes in dopamine neurotransmission (Robinson & Berridge, 1993). This theory proposes that dopaminergic responses are produced following administration of a substance, which becomes sensitized through repeated administration (Robinson & Berridge, 1993). This sensitization in turn results in greater stimulation of the neurobehavioral systems following drug administration, leading to increased levels of wanting. These dopaminergic responses are thought to cause the substance to be perceived as more salient, making initial orientation toward and delayed disengagement from substance related stimuli more likely (Field et al., 2009). Moreover, dopaminergic responses can become associated with substance-related stimuli through classical conditioning mechanisms. Through these mechanisms, substance-related stimuli elicit a desire/wanting response (as encoded in ventral striatal dopamine transmission) in the substance-user, which ensures repetition of substance-use. As a result of this conditioning, substance-related stimuli become more attractive and attention grabbing through repeated substance use, which then leads to the development of substance-related attentional biases (Duvauchelle, Ikegami, & Castaneda, 2000; Gratton & Wise, 1994; Katner & Weiss, 1999; Kiyatkin & Stein, 1996; Kiyatkin, Wise, & Gratton, 1993; Robinson & Berridge, 1993; Schiff, 1982).

The *Person-Environment Transaction Theory* posits that learning about the environment differs from person to person based on their disposition (Caspi, 1993; Caspi & Roberts, 2001). An extension of the person-environment transaction theory is the *Acquired-Preparedness (AP) Model of Risk*, which suggests that two people experiencing the same event can learn different things as a function of their trait impulsivity (Smith & Anderson, 2001; Smith, Williams, Cyders, & Kelley, 2006). Research has supported the AP model for different substances such as food, marijuana and alcohol (Combs, Smith, Flory, Simmons, & Hill, 2010; Corbin, Iwamoto, & Fromme, 2011; Settles, Cyders, & Smith, 2010; Vangness et al., 2004). Moreover, there is evidence that impulsivity can cause one to differentially attend to and learn positive outcomes associated with substance use, which then creates expectancies that lead to increased risk for substance

use (Corbin et al., 2011; Settles et al., 2010; Smith et al., 2006). All of this evidence suggests that impulsivity impacts the learning process, therefore making it a viable hypothesis that impulsivity might also affect the classical conditioning/incentive-sensitization process, possibly even leading to stronger dopaminergic responses to substance-related stimuli. This could increase the likelihood of developing attentional biases and in turn increase substance craving and use.

In addition to the three theories discussed above, another plausible way in which impulsivity might affect substance-related attentional bias is through shared underlying neurobiological systems and functioning. Dopamine is thought to be related to both motivational processes and selective attention (Ahveninen et al., 2000; Kahkonen et al., 2001; Shelley et al., 1997), and it is also hypothesized to draw a person's attention to events that predict rewards, such as substance related stimuli (Schultz, 1998). Research has shown a decrease in attentional bias following decreased levels of dopamine after aD2 antagonist administration (Floresco & Tse, 2007; Franken, 2003; Winstanley, Theobald, Cardinal, & Robbins, 2004). Repeated use of drugs cause dopamine release in the mesocorticolimbic circuitry, which includes the ventral tegmental area neurons and their projections to the nucleus accumbens, prefrontal cortex and other regions of the forebrain (Di Chiara, 1999; Di Chiara et al., 1999) and become sensitized (progressively larger) through repeated administration (Robinson & Berridge, 1993). Relatedly, dopamine, particularly involving the D2 receptors, is also thought to play a role in rash action, and it is heavily implicated in impulse control disorders (Cormier, 2008; Fleckenstein, Volz, Riddle, Gibb, & Hanson, 2007; Floresco & Tse, 2007; Winstanley et al., 2004). Increased dopamine, especially in the orbitofrontal, dorsolateral frontal, ventromedial frontal, and anterior cingulate cortices, are related to impulsivity, substance cues, and increased attentional biases (Franken, 2003; George et al., 2001; Jentsch & Taylor, 1999). Moreover, both the anterior cingulate cortex and nucleus accumbens are crucial in selective attention and impulsivity as well as stimulus-reward learning (Bush, Luu, & Posner, 2000; MacLeod & MacDonald, 2000; Parkinson, Willoughby, Robbins, & Everitt, 2000; Winstanely, Theobald, Dalley, & Robbins, 2005; Zeeb, Floresco, & Winstanley, 2010). Additionally, research suggests that decreased activity in the

prefrontal cortex (increased impulsivity) may increase subcortical dopamine system activity (Carlsson, Waters, Holm-Waters, Tedroff, Nilsson, & Carlsson, 2001; Jackson, Frost, & Moghaddam, 2001), further supporting the possibility that frontocortical dysfunction, in addition to affecting impulsivity, could also exacerbate incentive-sensitization.

Additional Considerations: The Importance of Cues

Olfactory (Cox et al., 2003; Field & Eastwood, 2005) and mood cues (Field & Powell, 2007; Field & Quigley, 2009) have been shown to increase attentional biases to alcohol stimuli. Moreover, these cues have also been associated with certain impulsivity traits and substance related outcomes. Specifically, negative urgency has been shown to relate to increased alcohol cravings and brain reactivity in the ventromedial prefrontal cortex in response to alcohol olfactory cues, with a trend towards greater reactivity in negative mood states (Cyders, Dzemidzic, Eiler, Coskunpinar, Karyadi, & Kareken, 2014a). Recent research has also shown that negative urgency is related to activation in the right lateral orbitofrontal cortex and left amygdala under negative mood and mediates the relationship between activation in these regions during negative mood and general-risk taking (Cyders, Dzemidzic, Eiler, Coskunpinar, Karyadi, & Kareken, 2014b). Therefore, given the importance of mood and alcohol odor cues for impulsivity, attentional bias, and substance related outcomes, the current study will examine how these factors relate to urgency and affect alcohol-related attentional bias.

The Current Study

The main goal of the current study is to empirically examine the relationship between trait impulsivity and alcohol-related attentional bias. Given that a recent meta-analysis found a paucity of research concerning the relationship between trait impulsivity and attentional biases, the current study focuses on trait rather than behavioral impulsivity (*see* Coskunpinar & Cyders, 2013). More specifically, the study examines

how specific impulsivity traits (via the UPPS-P Model of Impulsive Behaviors: sensation seeking, negative urgency, positive urgency, lack of perseverance and lack of deliberation) relate to both initial orientation and delayed disengagement attentional biases, through reaction time and eye-movement measures of attentional biases, as discussed above. Additionally, the current study examines the effect of mood (negative, positive and neutral mood induction conditions) and alcohol olfactory cues (participant's self-reported most frequently consumed alcoholic beverage – beer, white wine, or red wine) on alcohol-related attentional bias in relation to positive and negative urgency.

Primary Research Hypothesis

There will be a significant positive relationship between trait impulsivity and alcohol-related attentional bias.

Specific trait impulsivity objective: Previous research has shown that facets of impulsivity relate to alcohol use behaviors differently (*see* Coskunpinar et al., 2013). Therefore, the current study examines the relationship between trait impulsivity and alcohol-related attentional bias to examine how each impulsivity trait relates to alcohol-related attentional bias. However, due to lack of previous literature, I do not have specific hypotheses about the differences in the magnitudes of these relationships based on impulsivity traits.

Specific attentional bias measurement type objective: There have been contradictory findings on the relationship between different measures of attentional bias (i.e., reaction time, eye movement) and how they relate to impulsivity. Field and colleagues (2009) have shown a stronger relationship between eye movement measures of attentional bias and substance craving, whereas Coskunpinar and Cyders (2013) did not find a significant difference between eye movement versus reaction time substance-related attentional bias and impulsivity. Due to previous contradictory research, I do not have specific hypotheses about the differences in the magnitudes of these relationships based on reaction time versus eye-movement measurements of attentional bias. Therefore, the current study examines the relationship between trait impulsivity and

alcohol-related attentional bias as measured by reaction time versus eye-movement measurement of alcohol-related attentional bias.

Specific attentional bias component objective: Previous research has demonstrated that delayed disengagement attentional bias is stronger than initial orientation attentional bias for social drinkers (Field et al., 2004; Noel et al., 2006). However, previous research on the relationship between attentional bias and impulsivity does not address different components of attentional bias. Therefore, the current study examines the relationship between impulsivity and different components of attentional bias: initial orientation vs. delayed disengagement.

Supplemental Cue Hypotheses

I will examine the effect of olfactory cues and mood on alcohol-related attentional bias and how they relate to impulsivity traits.

Specific cue hypothesis 1: There will be a significant relationship between positive and negative urgency and alcohol-related attentional bias in the presence of alcohol odor cues versus the absence of such cues (e.g., Cyders et al., 2014a; Karyadi & Cyders, in press).

Specific cue hypothesis 2: Mood condition (positive, negative, neutral) will differentially relate to alcohol-related attentional bias, such that there will be a significant relationship between urgency and alcohol-related attentional bias during positive and negative mood conditions but not during neutral mood condition.

METHOD

Design

The data for the current study were part of a larger data set that was collected to fulfill the second aim of the HRSA-10-175 American Recovery and Reinvestment Act of 2009 (ARRA) Equipment to Enhance Training for Health Professionals (EETHP) – Graduate Psychology Education, awarded to the Clinical Psychology department at IUPUI in 2010. This second aim intended to examine the relationship between mood and attentional biases toward alcohol. For the second aim, it was hypothesized that alcohol-related biases would be stronger in those who expect alcohol to alleviate negative affect and that olfactory alcohol cues would increase attentional biases toward alcohol and lead to increased alcohol consumption for those individuals. The research questions that pertain to the current study were fundamentally different and more specific than the original aims of the HRSA grant. However, the HRSA data were well suited to address and feasibly examine my research questions for this dissertation project.

Recruitment

Participants were students enrolled in B104/105 classes at IUPUI seeking required research credit for their class. Students in these classes had a requirement to complete research as part of their course grade and were asked to log into the Experimetrix website to see a list of eligible studies. The current study was listed on this page and students self-volunteered to participate in this study.

Eligibility Criteria and Participants

A sample of undergraduate students ($N = 42$, mean age = 23.27, female: 69.2 %), who were at least social drinkers (more than 3 drinks per week) (AUDIT mean = 8.82, SD = 5.52), completed the current study.

Measures and Materials

Demographics

(Appendix A) Demographic information, such as age, sex and other relevant variables, was collected via an online questionnaire administered through Survey Monkey.

Trait Impulsivity

Trait impulsivity was assessed using the UPPS-P Impulsive Behavior Scale (Appendix C) (Lynam et al., 2007), which is a 59 item self-report scale. Items are answered using a 4-point Likert scale, ranging from 1 (agree strongly) to 4 (disagree strongly). The UPPS-P is designed to measure the five facets of trait impulsivity: lack of planning, lack of perseverance, sensation seeking, negative urgency and positive urgency. The UPPS-P scales have adequate convergent and discriminant validity, as well as unique predictive utility for various aspects of risky behavior participation (Cyders & Smith, 2007; Smith, Fischer, Cyders, Annus, Spillane, & McCarthy, 2007). All the scales had good internal consistency in the current study (lack of perseverance = 0.78, lack of deliberation = 0.67, sensation seeking = 0.90, negative urgency = 0.76, and positive urgency = 0.85).

Mood Induction

Mood images were chosen from the International Affective Picture System (IAPS) (Lang, Bradley, & Cuthbert, 1999), using the developmental valence and activation ratings as described by the authors. Images were eligible for inclusion in the neutral group if they had valence ratings between 4 and 6 (mean valence for neutral images = 5.08 (*SD* = 1.27) and mean arousal rating for neutral images = 3.34 (*SD* = 1.99)). Images were eligible for inclusion in the negative group if they had valence ratings ≤ 4 and arousal ratings ≥ 4.5 (mean valence rating for negative images = 2.61 (*SD* = 1.54) and mean arousal ratings for negative images = 5.81 (*SD* = 2.18)). Images were eligible for the positive group if they had valence ratings ≥ 6 and mean arousal ratings ≥ 4.5 (mean valence ratings for positive images = 6.79 (*SD* = 1.69) and mean arousal ratings for positive images = 5.76 (*SD* = 2.20)). Follow-up independent t-test analyses revealed that the valence and arousal ratings for positive, neutral and negative pictures were significantly different than each other with the exception of arousal ratings for positive and negative mood condition (Valence neutral-positive: $t = -31.86$, $p < .001$; valence neutral-negative: $t = 37.05$, $p < .001$; valence positive-negative: $t = 56.42$, $p < .001$; arousal neutral-positive: $t = -23.91$, $p < .001$; arousal neutral-negative: $t = -25.6$, $p < .001$; arousal positive-negative: $t = -0.554$, $p = .58$).

Emotions

The Affect Grid (Appendix D) (Russell, Weiss, & Mendelsohn, 1989) was used to assess participants' emotional states. Affect Grid is a 9 x 9 grid with affect descriptors placed at each corner and the midpoint of each side. Participants check the appropriate cell of the grid that represents how they generally feel emotionally. Studies show that the Affect Grid has good convergent validity with the PANAS (Russell et al., 1989). Paired samples t-test analyses demonstrated that the valence ratings for neutral ($M = 5.4$, $SD = 1.91$) and positive images ($M = 6.2$, $SD = 1.64$) ($t = -2.89$, $p = .01$), neutral and negative images ($M = 4.4$, $SD = 2.16$) ($t = 3.21$, $p = .002$) and positive and negative images ($t = 4.88$, $p < .001$) were significantly different than each other. Moreover, there was also a

significant difference in the arousal ratings between positive (M = 4.92, SD = 2.35) and negative images (M = 4.08, SD = 2.17) (t = 2.003, p = .05).

Alcohol-Related Attentional Bias

This study collected attentional bias data simultaneously through both reaction time and eye-movement measures.

Reaction time attentional bias. The delayed disengagement component of alcohol-related attentional biases was measured via the visual probe task (MacLeod, Mathews, & Tata, 1986). The visual probe task was presented on a computer screen via Eprime software (Psychology Software Tools, Inc.). During multiple trials on this task, participants faced a computer screen on which a pair of alcohol-related and matched control pictures were simultaneously presented for 1000ms. All pictures were 7.00 inches high and 5.06 inches wide. These pictures were matched for content across the two picture sets and were taken from prior studies that used the visual probe task for assessing attentional bias (Field & Eastwood, 2005; *see* Appendix E). After picture offset, a visual probe appeared where one of the pictures had previously been presented and participants had to identify the probe as quickly as possible by pressing either the left or the right mouse button (Appendix E). Faster reaction times to probes that replaced alcohol-related versus control pictures were indicative of alcohol-related attentional biases (see Field et al., 2004). The attentional bias score were calculated by subtracting average time to respond to alcohol stimuli from the average time to respond to non-alcohol stimuli, so that larger values would indicate alcohol-related attentional bias. Following inspection of the reaction time data, no data points were excluded as none of the reaction times were less than 200 ms or greater than 2,000 ms (Bradley, Mogg, Wright, & Field, 2003; Glinder, Beckjord, Kaiser, & Compas, 2007; Mogg, Holmes, Garner, & Bradley, 2008). For each participant, an attentional bias value (e.g., delayed disengagement) was calculated for each mood condition (e.g., positive, negative and neutral) and each odor condition (e.g., alcohol and control). Moreover, an overall attentional bias value was

created for each participant after collapsing across the odor condition. Therefore, each participant had 9 reaction time attentional bias values (*see* Table 2).

Eye-movement attentional bias. Using an Eye-Trac D6 desktop mounted camera (Applied Science Laboratories, Bedford, MA), both initial orientation and delayed disengagement components of alcohol-related attentional biases were measured via the eye movements of each participant while participants were completing the visual probe task. The data from the eye-tracker were recorded digitally on the Eye Tracker Interface PC. The eye tracker recognizes and localizes the pupil and the corneal reflection. The device contains the eye camera, the eye illuminator and an automatic tracking mirror, which moves the camera and illuminator to follow the motion of a subject's eye. *Initial orientation bias* was measured by calculating participants' initial fixation location (alcohol picture or non-alcohol picture). The percentage of first eye-movements toward alcohol pictures was calculated for each participant by considering the number of trials when gaze was directed initially at the alcohol-related picture and the total number of trials in which a fixation was made on either the alcohol-related or control picture (Field et al., 2004; Schoenmakers et al., 2008). Initial orientation alcohol-related attentional bias was defined as significantly more initial fixations on alcohol pictures than on neutral pictures. *Delayed disengagement bias* was measured by Gaze dwell time on alcohol and non-alcohol images. Gaze dwell time on alcohol and control pictures was computed using ASL "Results" software (Applied Science Laboratories, Bedford, MA) by summing the total amount of time that fixations were directed at the regions of the screen occupied by the alcohol pictures and control pictures, respectively. This method has been previously used to assess the duration of eye fixations to specific areas of interest in visual probe tasks and has good concurrent validity with reaction time measures of attentional bias (Field et al., 2004; Mogg et al., 2003). Delayed disengagement alcohol-related attentional bias was defined as significantly longer gaze duration on alcohol pictures than on neutral pictures. Therefore, each participant ended up with a *Fixation Count Percentage* (initial orientation) and *Average Dwell Time* (delayed disengagement) value for when they were focused on the alcohol and control image in all 3 mood conditions.

Unlike the reaction time data, previous research have never created a single value that is indicative of alcohol-related attentional bias with the eye-movement data. However, based on how the attentional bias value is calculated in reaction time data, the difference in fixation count percentage and average dwell time for when participants are focused on the alcohol versus control images should also give us the information as to whether or not individuals have alcohol-related attentional bias. Therefore, in order to have comparable statistical analyses between the eye-movement and the reaction time data and in order to be able to conduct the statistical analyses that are proposed above, I created difference scores for the two dependent variables that were produced by the eye-movement data: *Fixation Count Percentage* and *Average Dwell Time*. These values were created by subtracting the values for when the participant was looking at the control picture from the values for when the participant was looking at the alcohol picture (i.e., alcohol areas of interest (AOI) fixation count percentage – control AOI fixation count percentage; alcohol AOI average dwell time – control AOI average dwell time), so that larger values would indicate alcohol-related attentional bias. More specifically, larger values in *fixation count percentage* suggest that the participant had more fixations on alcohol pictures, as compared to control pictures, and larger values in *average dwell time* suggest that the participant spent more time on the alcohol pictures versus the control pictures; both indicative of alcohol-related attentional bias.

Olfactory Cues

Participants chose their favorite alcoholic beverage (46.94% beer, 30.6% red wine, 22.45% white wine), which was the odorant utilized during the experimental conditions. These olfactory cues were delivered via an 8-chanel air dilution olfactometer (as described in Bragulat, Dzemidzic, Talavage, Davidson, O'Connor, & Kareken, 2008; Kareken et al., 2004). Odor delivery was computer controlled using the Dasylab software (IO-Tech, Inc., Cleveland, OH) and a Personal Daq/56 module (IOTech, Inc., Cleveland, OH). A small polytetrafluoroethylene tube was used to deliver air to the participants' nose at 2.0 liters per minute (lpm). Throughout the procedure, the airstream consisted of a

constant 1.0 lpm stream, a second 1.0 lpm stream of sham (water), or a 1.0 lpm stream of alcohol odor through one of the glass vials containing the odorants. This procedure ensured that the odorants were delivered without any change in flow rate or somatosensory stimulation on the nose. Odorants were delivered, on average, every 39 seconds; this duration changed depending on the reaction time of the participant during the visual probe task as these odors were administered during the visual probe task (Figure 1).

Procedure

Participants completed a two-hour appointment and were compensated 4 credits that went towards their research requirement for the B104/105 course. Each participant completed three conditions for the three mood inductions (positive, negative and neutral). In order to minimize order effects, administration of conditions was randomized using http://www.random.org/lists/.

Before the Participants Arrived

This study was conducted with three computers (Appendix F): (1) *Participant's computer*: The subjects used this computer to complete the study. The eye tracking apparatus was positioned immediately beneath the computer monitor, approximately 24 inches from the participant, which is the optimal distance for pupil detection (Eye Tracker Systems Manual, 2009, p. 5). This computer also held the Eprime software to administer the visual-probe task; (2) *Control computer*: Researchers used this computer to track the participants' eye movements as well as to orchestrate the entire study; (3) *Researcher's laptop*: Researchers used this computer to control the olfactometer; in order to do this, it was both attached to the olfactometer as well as the printer port of the participant computer to establish communication with the Eprime software that held the procedure. Participants completed the whole procedure on the participant computer. Six different programs were built on Eprime, two for each condition (e.g., positive, negative

and neutral). Different mood images were used in the two trials that were created for each mood condition and the order of the visual probe and odorant presentations were different between the two trials (see Figure 1 for a detailed summary of the two trials that were built using Eprime). Therefore, each participant was randomly assigned to either participate in the first or second trial of the program and then the order of the conditions (positive, negative, neutral) within that trial was randomized. These programs included the visual probe task, as well as the presentation of mood induction pictures and alcohol olfactory cues. Test tubes for the olfactometer were prepared according to the favorite drink of the participant. The practice program on the participant computer was opened and prepared with the participants' pre-assigned participation number. The eye tracker on the control computer was turned on and the eye-trac software was uploaded. Target points for eye-calibration (Appendix G) were set so that the eye tracker could be calibrated to the eye of each individual participant. The Dasylab program on the researcher's laptop was opened and connected to the participant computer via the printer port in order to ensure communication with Eprime to administer odors throughout the conditions.

After the Participants Arrived

Recruited participants arrived at their scheduled time and completed the informed consent procedures. Then, they were positioned approximately 24 inches from the eye-tracker camera and their eyes were calibrated on the target points by the researcher. Following successful calibration, each participant completed the training session. During the training session, participants were first exposed to the alcohol odor that they had picked, while seeing a picture of this alcoholic beverage and hearing "ready" "sniff" commands. They were then asked to rate the intensity, pleasantness and representativeness of this odor. Following this, participants were introduced to the Affect Grid, which was used to measure their mood after seeing each IAPS photo during the training session and at the end of each mood condition. After reading through the instructions for the Affect Grid on the computer, they were asked to rate their current

mood and were then shown three mood pictures (positive, negative and neutral) and were asked to rate their mood after each picture. After the training session, participants completed three series of the visual probe tasks that were counterbalanced: (1) a positive mood condition in which trials of the visual probe task were interspersed with positive mood induction images, (2) a negative mood condition in which trials of the visual probe task were interspersed with negative mood induction images and (3) a neutral mood condition in which trials of the visual probe tasks were interspersed with negative mood induction images. A total of 16 odorants (8 alcohol and 8 sham) were randomly administered during each mood condition. During each of these conditions, participants' eyes were calibrated at the beginning of each series. Participants saw a "ready" slide and then heard the "ready" "sniff" command, during which a 2-second odorant (either the preferred alcoholic beverage odor or a neutral water odor) was delivered via an 8-channel air dilution olfactometer and then heard a tone to indicate that they could exhale (as described by Bragulat et al., 2008; Kareken et al., 2004). This was followed by two mood pictures, each presented for 500 ms. Following this, participants went through the visual probe task, in which they saw a pair of alcohol-related and matched control pictures that were simultaneously presented for 1000ms, which was repeated five times with different picture pairs. Following the visual probe task, the "ready" "sniff" tone was presented again with the odorant, followed by two mood pictures and another visual probe task. This entire sequence was repeated, for a total of 16 times during each condition and participants completed the Affect Grid at the end of each condition. As a result, in the span of one condition (e.g., negative, positive, or neutral mood condition), participants were exposed to 80 visual probe tests, 32 mood images and 16 odorants (see *Figure 1* for a detailed figure that outlines the presentation of the visual probe paradigm, as well as the mood and olfactory cues). The order of odorant presentation was randomized by random.org, but was held constant across participants. After their last condition, participants completed a larger set of questionnaires on Survey Monkey, including the ones discussed above: demographics, the UPPS-P and the Affect Grid.

Statistical Analyses and Data Collection

Data Cleaning and Preparation

Due to the different methods that were used to collect data (e.g., Surveymonkey, Eprime, Eye-trac software), there were three types of data files that were cleaned prior to analyses.

(1) All the questionnaires mentioned above were collected through Survey Monkey (e.g., demographics, UPPS). All of this data were exported from Survey Monkey into Excel, and then into SPSS. All of the information below was also uploaded into the same SPSS file after cleaning was complete and the appropriate variables were created to run the necessary statistical analyses.

(2) Eprime generates individual excel files for each participant and for each condition (negative, positive and neutral mood condition). Therefore, each participant had three excel files and each excel file contained information on the odorants that were presented, the mood induction pictures that were presented, the visual probe picture pairs that were presented, the order of the visual probe picture pairs, the side the probe was presented during each visual probe condition and the participants' reaction time each time the probe was presented.

(3) Eye-trac software collected eye-movement data from each participant for each mood condition. Therefore, each participant had three eye-trac files that contain the necessary information for initial orientation and gaze duration calculation. The following steps were completed for each individual file (n = 150). After opening each file with the ASL Results program, I parsed "Events"; these were sections of eye movement data that were pre-set in the software that we wrote. I used values provided by an X-dimensional data analysis tool (XDAT), which marked the data set to determine when the participants were seeing the visual probe pictures, versus anything else that was in the program. Therefore, there were 80 events for each condition per participant that needed to be analyzed for initial orientation and gaze duration. Then I configured two backgrounds, which were used in defining the areas of interest (AOIs). One of the backgrounds had the

alcohol picture on the left and the other had the alcohol picture on the right side. The appropriate backgrounds were configured to the corresponding visual probe condition for each participant. After each *event* was configured with a background, I created the AOIs, which defined the parameters of the alcohol and the neutral picture that the participants saw during the visual probe task. Then the initial orientation and gaze duration attentional bias values were calculated for each mood condition and odor administration, as discussed in more detail above.

RESULTS

Preliminary Analyses

Normality and Missing Data

After all the data were cleaned as mentioned above and imported into SPSS Version 21, the data were examined to ensure that all values were within the appropriate range and to check for missing data. Eight out of 50 people were excluded from further analyses due to missing eye movement information that was collected by the same research assistant, which suggests that the data were not missing at random. Participants who were excluded were significantly older (m = 29.38) than those who were included in the analyses (m = 23.27) ($t(48) = -2.31$, $p = .03$). There were no other significant differences in demographic or study variables between the two groups. The final data set had 42 participants (69.2% Female; 76.9% Caucasian) with a mean age of 23.27 (SD = 5.21). The data were also examined to ensure normality, both in terms of skewness and kurtosis (Kline, 1998) (Table 2). Further examination of the attentional bias values (reaction time, fixation count percentage, dwell duration) revealed the following trends (Table 2): Participants had alcohol-related reaction time attentional bias, as measured by the difference values, when they were exposed to alcohol odors under positive and negative mood conditions. The eye-movement data revealed that participants had more initial fixations to alcohol pictures than to control pictures in all mood conditions. Moreover, their dwell duration to alcohol pictures tended to be longer than to control pictures in neutral and negative mood conditions.

Primary Hypothesis Trait Impulsivity and Alcohol-Related Attentional Bias

In order to examine the relationship between trait impulsivity and alcohol-related attentional bias, I performed several statistical analyses with both the reaction time and the eye-movement data. Bivariate correlations between study variables did not yield any significant relationships (top half of Table 3). However, visual inspection of data showed a trend towards people who are younger, Caucasian, and male to have stronger alcohol-related attentional biases, as measured by both reaction time data and eye-movement data (both fixation count percentage and average dwell time). Based on these correlations, my primary research hypothesis of a significant positive relationship between trait impulsivity and alcohol-related attentional bias, measured by reaction time and eye-movement data, was not supported. Even though there was no significant bivariate correlation between impulsivity and alcohol-related attentional bias, I conducted the proposed hierarchical multiple regression analyses, both with reaction time and eye movement data, to examine the relationships after controlling for possible covariates including sex, race and age (Coskunpinar & Cyders, 2013; Cyders & Coskunpinar, 2011a). Not surprisingly, these analyses did not demonstrate significant relationships between any specific impulsivity traits and alcohol-related attentional bias (Tables 4, 5). Then I performed sensitivity analyses by entering each impulsivity trait individually to the hierarchical multiple regression analyses since the traits were inter-correlated. The pattern of results for the relationship between trait impulsivity facets and alcohol-related attentional bias remained unchanged (Tables 6, 7). Visual inspection of these hierarchical multiple regressions revealed weak, nonsignificant relationships (β values ranged from -.11 to .09) between trait impulsivity facets and attentional bias variables (reaction time, initial orientation and delayed disengagement) (Tables 6, 7). These hierarchical regressions were conducted with difference scores that were created using reaction time, fixation percentage, and dwell time values towards alcohol and control pictures, and these variables were collapsed across mood and odor conditions. Collapsing data across mood and odor conditions, as well as using difference values as indicative of alcohol-related attentional bias could be masking a potential relationship between alcohol-related attentional bias and trait impulsivity facets. The next set of analyses looked at the

relationship between trait impulsivity facets on alcohol-related attentional bias variables with the original values, instead of difference values, and additionally examined the effect of olfactory cues and mood on this relationship.

Supplemental Cue Hypotheses: Effect of Olfactory Cues and Mood

Due to technical malfunction in the eye-movement data, I did not have XDAT values recorded for each odor condition; therefore, I was not able to examine the effect of olfactory cues on alcohol-related attentional bias in the eye-movement data.

In order to examine how alcohol-related attentional bias is affected by olfactory cues (only for reaction time data), mood, and negative and positive urgency, I conducted several linear mixed-effects model analyses using both the reaction time and the eye-movement data. In order to determine which repeated covariance type is the most suitable for each mixed-effects model, I compared the Akaike's information Criterion (AIC) of the 16 covariance types that are available via SPSS for each mixed-effect model, using the Restricted Maximum Likelihood estimation method (REML). After determining the best covariance type, I re-ran the linear mixed-effects models with the appropriate covariance type, using the Maximum Likelihood estimation method.

Reaction Time Data

To address the supplemental specific cue and mood hypotheses, I conducted two linear mixed-effect model analyses, separately for negative urgency and positive urgency due to the high correlation between these two variables ($r = 0.77$, $p < .001$) and limited power related to the relatively small sample size.

Model 1

Alcohol-related reaction time attentional bias was analyzed in a mood (3 levels: positive, negative, neutral) x AOI (2 levels: alcohol, control) x odor (2 levels: alcohol, control) linear mixed-effects model, with negative urgency as a covariate. I ran this analysis using the Ante-Dependence: First Order repeated covariance type, which allows for unequal variances, correlations, and covariance among measured items over time (Wang & Goonewardene, 2004). The significant fixed slope of AOI indicated that participants had faster reaction times to alcohol pictures than to control pictures (p = .003) (Table 8, Figure 2), regardless of mood (p = .91) (Appendix H, Figure a) or odor (p = .35) (Appendix H, Figure b). There were no other significant main effects or interactions. However, visual inspection of the data indicated that participants had faster reaction times (regardless of visual stimuli) as negative urgency increased (Appendix H, Figure c) only when they were under positive and negative mood conditions (Appendix H, Figure d) regardless of odor (Appendix H, Figure e).

Model 2

Alcohol-related reaction time attentional bias was analyzed in a mood (3 levels: positive, negative, neutral) x AOI (2 levels: alcohol, control) x odor (2 levels: alcohol, control) linear mixed-effects model, with positive urgency as a covariate. I ran this analysis using the Ante-Dependence: First Order repeated covariance type. The significant fixed slope of AOI indicated that participants had faster reaction times to alcohol pictures than to control pictures (p = .01) (Table 9, Figure 2), regardless of mood (p = .89) (Appendix H, Figure a) or odor (p = .68) (Appendix H, Figure b). There were no other significant main effects or interactions. However, visual inspection of the data indicated that participants had faster reaction times to both alcohol and control pictures as positive urgency increased (Appendix I, Figure c), regardless of mood (Appendix I, Figure b) or odor (Appendix I, Figure c).

Eye-Movement Data

Next, to address the supplemental mood hypotheses, I conducted four linear mixed-effects model analyses, separately for negative and positive urgency.

Model 3

Alcohol-related initial orientation attentional bias, as measured by fixation count percentage, was analyzed in a mood (3 levels: positive, negative, neutral) x AOI (2 levels: alcohol, control) linear mixed-effects model, with negative urgency as a covariate. I ran this analysis using the Ante-Dependence: First Order repeated covariance type. The significant fixed slope of AOI indicated that participants had more initial fixations to alcohol pictures than to control pictures ($p = .002$) (Table 10, Figure 3). There was a significant mood x AOI interaction ($p = .002$) (Figure 4). The simple slopes for all three mood conditions were significantly different from 0, meaning that participants had significantly more initial fixations to alcohol pictures than to control pictures in all three mood conditions (neutral mood: $\beta = -2.79$, $p = .01$; positive mood: $\beta = -2.26$, $p < .01$; negative mood: $\beta = -1.73$, $p = .05$) and these relationships were not significantly different than each other (comparison of AOI slope in neutral mood to AOI slope in positive mood: $t = 0.45$, $p = .65$; AOI slope in neutral mood to AOI slope in negative mood: $t = 0.79$, $p = 0.43$; AOI slope in positive mood to AOI slope in negative mood: $t = 0.51$, $p = 0.61$), indicating that the difference in fixation count percentage to alcohol versus control pictures did not significantly differ across mood conditions. There was a significant negative urgency x AOI interaction ($p = .01$) (Figure 5). Simple slope analyses showed that these relationships were not significantly different from 0 (alcohol AOI: $\beta = 1.71$, $p = .34$; control AOI: $\beta = 1.13$, $p = .45$), meaning that they did not significantly differ from the horizontal plane, or from each other (comparison of alcohol AOI slope to control AOI slope: $t = 0.25$, $p = .80$), indicating that the relationships between fixation count percentage and negative urgency did not significantly differ across alcohol and control

pictures. There was a significant three-way interaction between negative urgency, AOI, and mood (p = .004) (Figure 6). Simple slope analyses showed that these relationships were not significantly different from 0 (neutral mood and alcohol AOI: β = 5.02, p = .06; neutral mood and control AOI: β = 3.54, p = .09; positive mood and alcohol AOI: β = 1.49, p = .4; positive mood and control AOI: β = 0.83, p = .58; negative mood and alcohol AOI: β = -2.02, p = .48; negative mood and control AOI: β = -1.87, p = .42) or each other (comparison of neutral mood alcohol AOI slope to neutral mood control AOI slope: t = 0.44, p = .66; positive mood alcohol AOI slope to positive mood control AOI slope: t = 0.28, p = .77; negative mood alcohol AOI slope to negative mood control AOI slope: t = 0.04, p = .97), indicating that the relationship between fixation count percentage to alcohol pictures and negative urgency was not significantly different across mood condition.

Model 4

Alcohol-related initial orientation attentional bias, as measured by fixation count percentage, was analyzed in a mood (3 levels: positive, negative, neutral) x AOI (2 levels: alcohol, control) linear mixed-effects model, with positive urgency as a covariate. I ran this analysis using the Ante-Dependence: First Order repeated covariance type. The significant fixed slope of AOI indicated that participants had more initial fixations to alcohol pictures than to control pictures (p = .003) (Table 11, Figure 3). There was a significant positive urgency x AOI interaction (p = .01) (Figure 7). Simple slope analyses of this interaction indicated a significant positive relationship between positive urgency and initial fixations to alcohol pictures (alcohol AOI: β = 3.19, p = .03), but no relationship between positive urgency and fixation to control pictures (control AOI: β = 1.44, p = .25). Simple slope analyses indicated that the relationship between positive urgency and fixation count percentage did not significantly differ across alcohol and control pictures (comparison of alcohol AOI slope to control AOI slope: t = 0.91, p = .36). There was a significant three-way interaction between positive urgency, AOI, and

mood (p = .01) (Figure 8). Simple slope analyses indicated that there was a significant positive relationship between positive urgency and initial fixations to alcohol pictures, but only in the neutral mood condition (neutral mood and alcohol AOI: β = 4.75, p = .02, neutral mood and control AOI: β = 2.50, p = .17; positive mood and alcohol AOI: β = 2.75, p = .06; positive mood and control AOI: β = 0.95, p = .45; negative mood and alcohol AOI: β = 0.75, p = .76; negative mood and control AOI: β = -0.59, p = .76). Simple slope analyses indicated that the relationship between positive urgency and fixation count percentage to both alcohol and control pictures did not differ across mood condition (comparison of neutral mood alcohol AOI slope to neutral mood control AOI slope: t = 0.81, p = .42; positive mood alcohol AOI slope to positive mood control AOI slope: t = 0.92, p = .36; negative mood alcohol AOI slope to negative mood control AOI slope: t = 0.43, p = .67).

Model 5

Alcohol-related gaze duration attentional bias, as measured by average dwell time, was analyzed in a mood (3 levels: positive, negative, neutral) x AOI (2 levels: alcohol, control) linear mixed-effects model, with negative urgency as a covariate. I ran this analysis using the Ante-Dependence: First Order repeated covariance type. The significant fixed slope of AOI indicated that participants had longer gaze duration to alcohol pictures than to control pictures (p = .03) (Table 12, Figure 9). There was a significant mood x AOI interaction (p = .02) (Figure 10). Simple slope analyses for two out of three mood conditions were significantly different from 0, indicating that participants had significantly longer gaze duration to alcohol pictures than to control pictures in the neutral and positive mood condition but not in the negative mood condition (neutral mood: β = -0.02, p < .01; positive mood: β = -0.02, p < .01; negative mood: β = -0.02, p = .12). Simple slope analyses showed that the difference in gaze duration to alcohol versus control pictures did not significantly differ across mood conditions (comparison of AOI slope in neutral mood to AOI slope in positive mood: t =

0.09, p = .93; AOI slope in neutral mood to AOI slope in negative mood: t = 0.02, p = 0.98; AOI slope in positive mood to AOI slope in negative: t = 0.01, p = 0.98). There was a significant negative urgency x AOI interaction (p = .01) (Figure 11). Simple slope analyses indicated that these relationships were not significantly different from 0 (alcohol AOI: β = 0.02, p = .14; control AOI: β = 0.01, p = .33) or from each other (comparison of alcohol AOI slope to control AOI slope: t = 0.59, p = .55), indicating that the relationship between gaze duration and negative urgency did not differ across alcohol and control pictures. There was a significant three-way interaction between negative urgency, AOI, and mood (p = .02) (Figure 12). Simple slope analyses indicated that these relationships were not significantly different from 0 (neutral mood and alcohol AOI: β = 0.02, p = .13; neutral mood and control AOI: β = 0.02, p = .08; positive mood and alcohol AOI: β = 0.1, p = .3; positive mood and control AOI: β = 0.01, p = .42; negative mood and alcohol AOI: β = 0.004, p = .87; negative mood and control AOI: β = -0.01, p = .70) or from each other (comparison of neutral mood alcohol AOI slope to neutral mood control AOI slope: t = 0.14, p = .89; positive mood alcohol AOI slope to positive mood control AOI slope: t = 0.41, p = .68; negative mood alcohol AOI slope to negative mood control AOI slope: t = 0.35, p = .73), indicating that the relationship between negative urgency and gaze duration to both alcohol and control pictures did not differ across mood condition.

Model 6

Alcohol-related gaze duration attentional bias, as measured by average dwell time, was analyzed in a mood (3 levels: positive, negative, neutral) x AOI (2 levels: alcohol, control) linear mixed-effects model, with positive urgency as a covariate. I ran this analysis using the Ante-Dependence: First Order repeated covariance type. The significant fixed slope of AOI indicated that participants had longer gaze duration to alcohol pictures than to control pictures (p = .02) (Table 13, Figure 9). There was a significant positive urgency x AOI interaction (p = .04) (Figure 13). Simple slopes analyses indicated that there was a significant positive relationship between positive

urgency and gaze duration to alcohol pictures (alcohol AOI: $\beta = 0.02$, $p = .03$) but not to control pictures (control AOI: $\beta = 0.01$, $p = .27$). However, simple slope analyses showed that these relationships were not significantly different from each other (comparison of alcohol AOI slope to control AOI slope: $t = 1.01$, $p = .31$), indicating that the relationship between positive urgency and gaze duration did not significantly differ across alcohol and control pictures. There was a significant three-way interaction between positive urgency, AOI and mood ($p = .05$) (Figure 14). Simple slope analyses indicated a significant positive relationship between positive urgency and gaze duration to alcohol pictures, but only in the neutral mood condition (neutral mood and alcohol AOI: $\beta = 0.03$, $p = .05$). All other relationships were not significantly different from 0 (neutral mood and control AOI: $\beta = 0.02$, $p = .09$; positive mood and alcohol AOI: $\beta = 0.02$, $p = .11$; positive mood and control AOI: $\beta = 0.01$, $p = .44$; negative mood and alcohol AOI: $\beta = 0.01$, $p = .65$; negative mood and control AOI: $\beta = -0.004$, $p = .81$). Simple slope analyses indicated that the relationship between positive urgency and gaze duration to both alcohol and control pictures did not differ across mood condition (neutral mood alcohol AOI slope to neutral mood control AOI slope: $t = 0.47$, $p = .64$; positive mood alcohol AOI slope to positive mood control AOI slope: $t = 0.72$, $p = .47$; negative mood alcohol AOI slope to negative mood control AOI slope: $t = 0.51$, $p = .61$).

DISCUSSION

Consistent with previous research (Field, Mogg, Zetteler, & Bradley, 2004; Townshend & Duka, 2001), the current study showed that social drinkers have alcohol-related attentional bias, measured by reaction time and eye-movement data, as they have faster reaction times (Tables 8, 9), more initial fixations (Tables 10, 11) and longer gaze duration (Tables 12, 13) to alcohol versus control pictures. Despite not reaching statistical significance, visual inspection of data suggested that participants who were younger, Caucasian, and male had somewhat stronger alcohol related attentional biases, as measured by reaction time and eye-movement data. Further examination of the data revealed that drinking levels were significantly higher in younger and male participants, consistent with previous findings (Chen, Dufour, & Yi, 2004; Heath, 1995). Though not significant, there was a negative trend between alcohol consumption and race, indicative of higher levels of consumption in Caucasian participants, also consistent with previous findings (NIAAA, 2002). These trends support the theory that alcohol related attentional biases are stronger with greater exposure and experience with alcohol (Bruce & Jones, 2004; Cox et al., 1999, 2000, 2003; Field et al., 2004; Jones et al., 2006; Lusher et al., 2004).

Findings examining the relationship between alcohol-related attentional bias, mood and impulsivity indicated that: (1) Participants had significantly more initial fixations to alcohol pictures than to control pictures across all three mood conditions; (2) they had longer gaze duration to alcohol pictures than to control pictures in neutral and positive mood conditions, the pattern was not significantly different across mood conditions; (3) positive urgency was related to initial fixations and gaze duration towards alcohol pictures only in the neutral mood condition, but this relationship was not significantly different from control pictures and the relationship between positive urgency

and initial fixations and gaze duration did not significantly differ across mood conditions; (4) there was a similar trend in analyses with negative urgency: negative urgency trended to be related to initial fixations and gaze duration towards alcohol and control pictures only in the neutral mood condition.

Facets of trait impulsivity and mood conditions were unrelated to alcohol-related attentional bias as demonstrated by the hierarchical regression analyses (Tables 4, 5), regression sensitivity analyses (Tables 6, 7) and main effect values in linear mixed effect models (Tables 8, 9, 10, 11, 12, 13). Although positive urgency in this population seemed to be related to initial orientation and longer gaze duration to alcohol stimuli in the neutral mood condition, this relationship was not significantly different than the one between positive urgency and initial orientation and gaze duration to control stimuli. The same relationship trend, approaching significance, was seen between negative urgency and eye-movement attentional bias variables. Results showed several significant interactions between study variables, however, not all of these relationships were significantly different from 0 or from each other. Finding significant interactions without significant slope differences upon simple slope analyses is a strong indicator of spurious interactions. Using categorical items in interaction analyses, such as the AOI and mood variables that were used in the current study, is one of the main leading causes of spurious interactions (Kang & Waller, 2005). Therefore, these initially significant interactions are more than likely spurious and the current data do not support the hypothesis that there is a relationship between impulsivity and attentional biases to alcohol stimuli.

I hypothesized that impulsivity impacts the development of attentional biases through a combination of classical conditioning, incentive sensitization, and person-environment transactions. The current results failed to support the theory that impulsivity relates to alcohol-related attentional biases. The existing research on the relationship between impulsivity and attentional bias has been inconsistent and the current results support previous studies that demonstrate no significant relationship between these two variables (Ahern, Field, Yokum, Bohon, & Stice, 2010; Christiansen et al., 2012; Hou et al., 2011). However, there are also other studies, including a recent quantitative review,

that have shown a significant but small relationship between trait impulsivity and substance-related attentional bias (*see* Coskunpinar & Cyders, 2013; Meule, Vogele, & Kubler, 2012; Powell, Dawkins, West, Powell, & Pickering, 2010).

The findings of the current study do not support the theory that impulsivity affects attentional bias development. If this finding is robust, it is likely that impulsivity and attentional biases affect alcohol use through parallel independent trajectories. Therefore, treatments seeking to modify impulsivity to mitigate alcohol use and other risk-taking behaviors are unlikely to affect the risk imparted by attentional biases, and vice versa. Similarly, there might be separate mechanisms mediating the effects of impulsivity and attentional biases on alcohol use and abuse. Thus, the current study suggests that research and interventions on alcohol use outcomes should examine and address these two constructs separately. The inconsistencies with other work showing a relationship between impulsivity and attentional bias (Meule, Vogele, & Kubler, 2012; Powell, Dawkins, West, Powell, & Pickering, 2010) could be driven by spuriousness; however, based on multiple aspects and limitations of the current study and the somewhat well-established literature that has shown a relationship between impulsivity and attentional bias, this conclusion is not recommended. Other explanations should be considered before reaching such conclusions, especially since a recent meta-analytic review of this relationship (Coskunpinar & Cyders, 2013), which can be argued to present a more robust relationship (Furberg & Furberg, 2007) because it is based on more than 13 data sets instead of one, found a small but significant relationship between impulsivity and attentional bias across the current state of this research literature. However, although the clinical utility of both impulsivity and attentional bias in risk for alcohol use and alcohol related outcomes have been well established, the small relationship size between these two constructs, demonstrated by previous research, questions the added clinical utility of this relationship in how these variables relate to and predict alcohol use and related outcomes.

Since more robust findings suggest a small but significant relationship between impulsivity and attentional bias (Coskunpinar & Cyders, 2013), it is likely that there are characteristics about the current study that contributed to the failure to find a relationship

between these variables that might be present in nature. First, mood and odor cue exposure, used in the current study, were not related to alcohol-related attentional bias. These findings are inconsistent with previous research that has demonstrated how mood cues increase alcohol-related attentional bias (Field & Powell, 2007; Field & Quigley, 2009). Even though valence and arousal ratings were significantly different in each mood condition, the inducted moods might not have been strong enough to affect behavior. Previous studies that have shown increased alcohol-related attentional bias had induced increased levels of stress by making their participants believe that they were going to have to give a speech (Field & Powell, 2007; Field & Quigley, 2009). Therefore, it is plausible that inducing neutral, positive, or negative moods through the passive viewing of pictures is not eliciting a strong enough behaviorally motivated response (Cyders, Coskunpinar, & Lehman, 2012). Additionally, the studies by Field and colleagues (2007, 2009) invoked a specific stressful mood in their induction, whereas ours was a more general negative or positive valence.

Current findings are also inconsistent with previous research that has demonstrated odor cues to increase alcohol-related attentional bias (Cox et al., 2003; Field & Eastwood, 2005). It is possible that the odor induction in this study was not strong or externally valid enough to elicit cues attentional bias change. Previous studies that have shown an increase in alcohol-related attentional bias had introduced the alcohol odor by having their participants open a bottle of beer, pour the contents into a glass and smell the beverage (Cox et al., 2003), thus not a pure odor cue per se, but rather a mixture of odor, visual, tactile, and expectancy cues that could have strengthened the attentional bias result through its replication of one's experiences with alcohol as close to real life as possible and through maximization of the external validity of the cue exposure. In contrast, the odor manipulation used in the current study (olfactometer), is far from how one would be exposed to an alcohol odor and is purely an olfactory cue sans other powerful cue domains. Therefore, it is plausible that the method chosen to introduce odor cues in this study was not appropriate and/or strong enough to increase one's alcohol-related attentional bias. Additionally, although participants were asked to choose from odor choices (light beer, dark beer, white wine, red wine), odor choices were

standardized in these categories and might not closely match the participants alcohol learning history. Other studies (e.g., Cyders et al, 2013; Kareken et al., 2010) used the odor of the specific brand and type of the participants' most frequently consumed alcoholic beverage, which increases external validity of the cue exposure.

Another limitation of the current study could be the method that was used to measure impulsivity. Impulsivity can be measures via trait measures or behavioral tasks, which have been shown to have very little overlap and measure different constructs (Cyders & Coskunpinar, 2011). In fact, the relationship between attentional bias and impulsivity is larger with behavioral impulsivity than with trait conceptualizations, although it should be noted that there were more studies that have examined behavioral vs. trait impulsivity's overlap with attentional bias (Coskunpinar & Cyders, 2013). Therefore, using a trait measure of impulsivity, when previous research showed a weaker relationship with attentional bias, could have contributed to the current null results. It is possible that larger overlap would have been seen if impulsivity had been measured by laboratory behavioral task, likely because they measure behavior using similar methods (computer behavior), on a similar time course (snapshot of behavior vs. cumulative review of one's self-reported behavior), and that they might tap into similar cognitive processes (e.g., reaction time, processing of cues, reward responding, etc.) (Cyders & Coskunpinar, 2011).

In fact, measurement of behavior using reaction time tasks is fraught with difficulty, as such tasks confound separate processes into a single measure of behavior. Previous work in this domain has suggested that eye-movement monitoring as a better indicator of attentional processes (Field et al., 2009) as compared to reaction time measures of attentional bias, due to heterogeneity in processes assessed in behavioral tasks. The *Quad Model* suggests that there are four qualitatively distinct cognitive processes that may influence one's responses in behavioral tasks (Conrey, Sherman, Gawronski, Hugenberg, & Groom, 2005). When applied to the current study, the *Quad Model* suggests that one's reaction time on the dot-probe task may be indicative of (1) the pure association that researchers aim to measure with the tasks (*association activation)*, which would be one's pure attentional bias towards alcohol and control stimuli; (2) the

knowledge-based effort one exerts in determining the correct response *(discriminability)*, which could change based on how distracted or motivated one is during a task; (3) the effort one exerts in order to inhibit the activated association to engage in deliberate responding *(overcoming bias)*, which would be the time it takes one to correctly respond *(discriminability)* when the probe appears on the side of the control stimulus when their attention is directed to the side of the alcohol picture; (4) the response bias associated with one's responses, such as one's tendency to respond with their right hand introduces a bias into their responses, which would be accounted for by the *guessing* parameter that is involved in the implicit tasks. Therefore, the application of the *Quad Model* to the reaction time measurement of attentional bias indicates that the values provided by the dot-probe task in this study are representative of more than just one's attention to specific stimuli.

It is surprising that there was, in general, consistency between the findings for attentional biases as assessed by eye movement and reaction time, as this has not always been the case (e.g., Field et al., 2009). Reaction time and eye-movement data both provide useful information about one's attention to certain stimuli. Although not supported by the current results, previous research claims eye-movement monitoring to be a more accurate representation of attentional processes because it is assumed to provide a continuous, more sensitive assessment of one's attention to stimuli as it changes across time, whereas reaction time measures assess a snapshot of one's attention, averaged over time, which is likely to average out or mask differences in attention. Moreover, reaction time measures of attentional bias do not provide detailed information as to the specific attentional bias component being measured (initial orientation vs delayed disengagement), as faster reaction times to probes can be due to either orienting to or maintaining one's attention on a particular stimulus (Koster, Crombez, Verschuere, & De Houwer, 2004) and can consist of multiple fixations during the stimulus presentation (Weierich, Treat, & Hollingworth, 2008). Therefore, a significant attentional bias found with reaction time data can be further clarified as to the type of attentional bias that is important for that stimulus (initial orientation vs. gaze duration) via eye-movement data.

One example of this has been found with research on spider-phobic patients: These patients fail to disengage attention from spiders (gaze duration), but their attention is not initially captured by the spider stimuli (initial orientation), which suggests that fear in spider-phobic patients leads to a failure to disengage one's attention from the feared stimuli, and not necessarily to fast detection of threatening stimuli (Gerdes, Alpers, & Pauli, 2008). This can lead to different tools or treatments to avoid this delayed disengagement; in fact, in theory it might be easier to teach an individual to use cognitive behavioral tools to avoid focus on or to distract oneself from a feared stimulus (Oliver & Page, 2003) rather than to avoid initial orientation to the stimulus, which is likely under less cognitive control. In the current study, social drinkers seem to both initially orient to and dwell more on the alcohol versus control stimuli. Thus, an approach that only addresses disengagement and not initial orientation might not be effective in reducing alcohol craving, seeking, and consumption. However, current research has yet to establish the active components in how attentional biases affect these alcohol outcomes and, as such, more work is needed to determine how these separate attentional aspects might differentially relate to alcohol seeking. Such knowledge is important in understanding the mechanisms that motivate engagement in alcohol-related outcomes and how best to intervene in order to prevent problematic alcohol behaviors. Therefore, it is important for researchers to know what type of information they are interested in and choose the proper tool after weighing through the costs and benefits of each method (see Table 1).

Additionally, the various complex technologies used to gather appropriate data from the participants contributed some difficulties to the study. First, some participants did not have eye-movement data for the entire duration of their participation as the eye-tracker is sensitive to participant movement and pupil recognition was lost during the administration of the visual probe task, which lead to 6.35 percent of missing eye-movement data until the eye-tracker was able to capture the participants' corneal reflection again. This likely happened in circumstances where the participant started to squint, or moved outside of the optimal pupil recognition range (24 inches from the eye-tracker). To minimize this limitation, the current study had the participants place their

head on a chin rest, which was positioned approximately 24 inches from the eye-tracker, while they were participating in the study. Second, due to a computer error, as mentioned above, I did not have XDAT values recorded for each odor condition in the eye-movement data due to technical malfunction. Therefore, odor information was not available for eye-tracking data and I was unable to examine these hypotheses or relationships.

Third, if calibration of the participants' eye is not successful before administering the task, the eye-movement data will not be analyzable. This study minimized this limitation by requiring re-calibration prior to each mood condition. Moreover, calibration can take a long time, which can lead to participant fatigue and questionable data quality, although this was minimized by training all the research assistants in calibrating different eyes and limiting the total calibration time to 15 minutes maximum during the study. Additionally, not every participant's eye can be calibrated successfully. This study had to recruit participants who did not wear glasses, could see well without their glasses, or who were using contact lenses, as there is more difficulty establishing corneal reflection through thick lenses. These selection biases, as well as the use of a convenience sample, as discussed in more detail below, could have created an artificaially homogeneous sample, which possibly limited the current data's ability to demonstrate an effect.

The extent to which the results of this study can be applied to other people and situations outside of the study environment (Kazdin, 2002) is another limitation for the current study. The current study used a convenience sample, which presents the concern of volunteer bias (Kazdin, 2002) and demographic differences as participants were recruited from a university population. Participants were social drinkers and previous research indicates that alcohol-dependent individuals have greater alcohol-related attentional bias than light drinkers (Bruce & Jones, 2004; Cox et al., 1999, 2000, 2003; Field et al., 2004; Jones et al., 2006); therefore, this lower drinking level sample might have limited variability to find effects or might not have a similar pattern of relationships among risk factors as a heavier drinking sample. Importantly the sample was quite small, especially given the expected small relationship between impulsivity and attentional bias

(Coskunpinar & Cyders, 2013). This small sample size and the numerous statistical tests performed on it inflate the rate of type II and type I errors, respectively.

The current results do not clarify the relationship between impulsivity and alcohol-related attentional bias. In light of previous research and quantitative reviews that have shown a small but significant relationship between attentional bias and impulsivity, as well as the study specific characteristics discussed above, that could have influenced the current results, the lack of relationship between attentional bias and impulsivity in this study might not be representative of the true relationship between these two constructs. The study findings can be best thought of as preliminary findings that do not support the role of impulsivity in attentional bias development; however, these findings are strongly limited by study characteristics discussed above. Therefore, before reaching the conclusion that there is no relationship between these constructs based on the current results, other approaches should be implemented in examining the relationship between attentional bias and impulsivity, including but not limited to, using a stronger/more realistic mood and odor manipulation, utilizing a larger and more heterogeneous sample (i.e., clinical sample instead of convenience sample), and examining the relationship using both trait and behavioral measures of impulsivity.

In conclusion, although the current study has several limitations as discussed above that are potentially influencing the current results, one can still examine certain relationship trends from this study to inform future research. For example, the current data suggest that there is a trend towards younger, Caucasian and male individuals to have stronger alcohol-related attentional bias. Future research should examine whether there is a significant difference in attentional bias based on these demographic variables or whether this difference can be explained by individuals' level of experience with a particular substance instead. The current study replicated the finding that social drinkers have alcohol-related attentional bias, which is an important predictor of alcohol seeking, alcohol use, and relapse (Cox et al., 2002; Robbins & Ehrman, 2004), further adding to this literature and suggesting that attentional bias should continue to be integrated into research as well as practice in clinical environments that involve prevention and therapy. Importantly, it appears that attentional bias might not be strongly (or at all) influenced by

mood and impulsivity, thus suggesting parallel risk trajectories that could be used as prime behavioral targets for intervention. The ability to retrain or change attentional biases in order to modify behavior has some limited research support, including attentional retraining towards chocolate, which leads to decreased craving and consumption of chocolate (Kemps et al., 2014). Other studies have shown reductions in attentional bias for alcohol (Fadardi & Cox, 2009; Schoenmakers et al., 2010) and smoking related cues (Field, Duka, Tyler, & Schoenmakers, 2009); however, effects on substance craving and consumption are not well documented. Attentional retraining could potentially be a widely applicable intervention in reducing substance related outcomes.

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TABLES

Table 1

Attentional Bias Measures

	Pros	Cons
Reaction Time • Addiction Stroop Task (Cox et al., 2006) • Dual Task Procedure (Field & Cox, 2008) • Flicker-induced Change Blindness (Field & Cox, 2008) • Visual Probe Task (Ehrman et al., 2002)	• Used widely • Easily administered • Can be adapted to various contexts (e.g., substances, anxiety)	• Do not provide a direct measure of selective attention
Eye-movement monitoring • Gaze time • Initial orientation	• Can be adapted to various contexts (e.g., substances, anxiety) • Can be combined with several of the indirect measures, providing a more accurate representation of attentional bias	• Require equipment that may not be easily available • Expensive equipment • Technical difficulties (e.g., calibration)

Table 2

Normality Data

Variable	Mean	SD	Skewness	Kurtosis
Overall data variables				
LPL	1.97	.44	.34	.44
LPS	1.88	.44	.78	1.23
SS	2.85	.72	-.33	-.75
PUR	1.95	.65	.86	.69
NUR	2.44	.56	.20	.03
Reaction time variables				
Neutral mood				
AB_RT_allodor	3.40	35.84	.47	1.22
AB_RT_alchodor	-2.29	39.22	-.15	.09
AB_RT_controlodor	11.62	54.41	1.34	3.90
Positive mood				
AB_RT_allodor	9.51	43.02	2.86	9.34
AB_RT_alchodor	10.90	43.68	.38	3.04
AB_RT_controlodor	8.79	55.53	2.56	8.44
Negative mood				
AB_RT_allodor	7.42	39.01	1.58	4.73
AB_RT_alchodor	6.09	49.34	.22	1.09
AB_RT_controlodor	7.16	55.77	.57	.86
Eye tracking variables				
Neutral mood				
FixCount%_alcohol AOI	17.41	21.14	1.38	1.36
AvgDwellDur_alcohol AOI	.08	.10	1.24	.62
FixCount%_control AOI	14.09	16.29	1.09	.08
AvgDwellDur_control AOI	.06	.08	1.4	1.23

(continued)

Table 2, continued

Variable	Mean	SD	Skewness	Kurtosis
Positive mood				
FixCount%_alcohol AOI	13.87	16.11	1.74	3.78
AvgDwellDur_alcohol AOI	.06	.08	1.9	3.28
FixCount%_control AOI	13.55	15.29	1.39	2.19
AvgDwellDur_control AOI	.06	.07	2.12	6.33
Negative mood				
FixCount%_alcohol AOI	15.95	17.17	1.13	.48
AvgDwellDur_alcohol AOI	.08	.11	2.54	9.35
FixCount%_control AOI	14.88	16.86	1.38	1.45
AvgDwellDur_control AOI	.07	.09	1.59	2.81

Note. LPL: lack of planning; LPS: lack of perseverance; SS: sensation seeking; PUR: positive urgency; NUR: negative urgency; AB_RT_allodor: alcohol-related attentional bias via reaction time data across all odor conditions; AB_RT_alchodor: alcohol-related attentional bias via reaction time data in alcohol odor condition; AB_RT_controlodor: alcohol-related attentional bias via reaction time data in control odor condition; FixCount%: fixation count percentage; AvgDwellDur: average dwell duration

Table 3
Bivariate Correlations

	Age	Sex	Race	LPL	LPS	SS	PUR	NUR
Reaction time variables								
Neutral mood								
AB_RT_allodor	-.21	-.15	-.02	-.04	.13	.05	-.01	.03
AB_RT_alchodor	-.05	.03	-.08	-.002	-.08	-.003	-.03	-.08
AB_RT_controlodor	-.24	-.25	.03	-.07	.26	-.02	-.04	.07
Positive mood								
AB_RT_allodor	-.06	-.10	-.12	-.05	-.01	-.02	-.09	-.14
AB_RT_alchodor	.12	-.03	-.07	-.08	-.05	.08	-.11	-.15
AB_RT_controlodor	-.19	-.15	-.12	-.01	.02	-.09	-.05	-.11
Negative mood								
AB_RT_allodor	-.06	-.07	.08	.05	.12	.05	-.03	-.03
AB_RT_alchodor	-.02	.09	-.01	.21	.11	.11	.06	.03
AB_RT_controlodor	-.07	-.17	.08	-.16	.03	-.04	-.10	-.06
Eye tracking variables								
Neutral mood								
FixCount%_alcohol AOI	-.19	-.21	.12	.12	.15	-.05	.16	.14
FixCount%_control AOI	-.19	-.18	.18	.13	.17	-.09	.18	.19
FixCount%_difference	.02	.02	-.01	.02	.02	.001	-.003	-.01
AvgDwellDur_alcohol AOI	-.27	-.19	.05	.02	.02	.01	.19	.16
AvgDwellDur_control AOI	-.23	-.08	.07	.09	.10	-.01	.22	.23
AvgDwellDur_difference	-.04	.000	.05	.000	.05	-.06	.01	.02
Positive mood								
FixCount%_alcohol AOI	.09	-.09	.17	-.14	-.07	-.13	.03	.04
FixCount%_control AOI	.01	-.12	.16	-.14	-.11	-.16	.02	-.01
FixCount%_difference	.001	-.001	.000	.05	-.02	.03	.05	.08
AvgDwellDur_alcohol AOI	-.06	-.16	.18	-.12	-.22	-.08	.09	.06
AvgDwellDur_control AOI	-.10	-.19	.18	-.21	-.23	-.10	.04	.00
AvgDwellDur_difference	-.02	.02	.02	.09	-.05	-.02	.08	.09

Table 3, continued

	Age	Sex	Race	LPL	LPS	SS	PUR	NUR
Negative mood								
FixCount%_alcohol AOI	-.22	-.01	.23	.02	.05	.19	.11	-.01
FixCount%_control AOI	-.14	-.07	.19	-.13	-.15	.16	.04	-.05
FixCount%_difference	-.03	.13	-.07	.17	.18	-.11	.06	.03
AvgDwellDur_alcohol AOI	-.15	.04	.28	-.06	.11	.04	.07	.06
AvgDwellDur_control AOI	-.14	-.03	.31	-.18	-.06	.08	.04	.04
AvgDwellDur_difference	-.01	.16	.01	.17	.21	-.16	.08	.06

Note. LPL: lack of planning; LPS: lack of perseverance; SS: sensation seeking; PUR: positive urgency; NUR: negative urgency; AB_RT_allodor: alcohol-related attentional bias via reaction time data across all odor conditions; AB_RT_alchodor: alcohol-related attentional bias via reaction time data in alcohol odor condition; AB_RT_controlodor: alcohol-related attentional bias via reaction time data in control odor condition; FixCount%_difference: fixation count percentage while seeing alcohol pictures minus while seeing control pictures; AvgDwellDur_difference: average dwell duration while seeing alcohol pictures minus while seeing control pictures

Table 4

Hierarchical Multiple Regression in Reaction Time Data

Variable		B	SE B	β	*p*	R2	R2 change
Neutral Mood							
DV: AB_RT_allodor							
Step 1					.39	.08	.08
	Age	-.24	.86	-.05	.77		
	Sex	-19.58	11.84	-.28	.11		
	Race	-5.34	8.19	-.11	.52		
Step2					.88	.11	.03
	LPL	.63	19.51	.01	.97		
	LPS	-2.4	17.91	-.03	.89		
	SS	-5.74	10.69	-.13	.59		
	PUR	.91	17.50	.02	.96		
	NUR	-6.72	17.55	-.13	.71		
DV: AB_RT_alchodor							
Step 1					.97	.08	.08
	Age	-.01	1.08	-.001	.99		
	Sex	-4.51	14.87	-.05	.76		
	Race	-4.49	10.29	-.08	.66		
Step2					.98	.06	.06
	LPL	2.19	24.13	.03	.93		
	LPS	-10.58	22.15	-.13	.64		
	SS	-11.17	13.22	-.20	.41		
	PUR	13.38	21.65	.23	.54		
	NUR	-19.21	21.71	-.31	.38		

(continued)

Table 4, continued

Variable		B	SE B	β	*P*	R2	R2 change
DV: AB_RT_controlodor							
Step 1					.13	.15	.15
	Age	-.49	1.23	-.06	.69		
	Sex	-39.13	16.93	-.38	.06		
	Race	-8.02	11.71	-.11	.49		
Step2					.48	.21	.06
	LPL	-3.64	27.27	-.04	.89		
	LPS	13.43	25.04	.13	.59		
	SS	-4.86	14.94	-.07	.75		
	PUR	-19.56	24.47	-.28	.43		
	NUR	10.18	24.54	.13	.68		
Positive Mood							
DV: AB_RT_allodor							
Step 1					.09	.17	.17
	Age	.34	.79	.07	.66		
	Sex	-27.41	10.85	-.41	.02		
	Race	.57	7.51	.01	.94		
Step2					.32	.25	.09
	LPL	19.42	17.17	.29	.27		
	LPS	-18.44	15.77	-.27	.25		
	SS	-2.08	9.41	-.05	.83		
	PUR	-13.18	15.41	-.29	.39		
	NUR	2.69	15.45	.06	.86		
DV: AB_RT_alchodor							
Step 1					.25	.11	.11
	Age	2.07	1.11	.31	.07		
	Sex	-17.65	15.28	-.19	.26		

(continued)

Table 4, continued

Variable		B	SE B	β	*p*	R2	R2 change
	Race	1.99	10.57	.03	.85		
Step2					.71	.16	.04
	LPL	6.71	24.89	.07	.78		
	LPS	-10.73	22.86	-.12	.64		
	SS	9.23	13.64	.15	.50		
	PUR	-11.38	22.34	-.18	.61		
	NUR	2.70	22.40	.04	.91		
DV: AB_RT_controlodor							
Step 1					.003	.29	.29
	Age	-1.48	.94	-.23	.13		
	Sex	-38.92	12.93	-.45	.01		
	Race	-1.51	8.94	-.03	.87		
Step2					.01	.42	.13
	LPL	35.41	19.51	.40	.08		
	LPS	-24.90	18.01	-.29	.18		
	SS	-13.24	10.75	-.23	.23		
	PUR	-15.01	17.60	-.25	.40		
	NUR	-.03	17.65	.000	.99		
Negative Mood							
DV: AB_RT_allodor							
Step 1					.16	.14	.14
	Age	.57	.84	.11	.51		
	Sex	-12.71	11.85	-.18	.29		
	Race	15.57	9.45	.28	.11		

(continued)

Table 4, continued

Variable		B	SE B	β	*p*	R2	R2 change
Step2					.57	.19	.05
	LPL	.51	18.67	.01	.98		
	LPS	14.29	19.23	.19	.46		
	SS	-.15	10.54	-.003	.99		
	PUR	-9.12	15.57	-.19	.56		
	NUR	8.64	16.40	.17	.60		
DV: AB_RT_alchodor							
Step 1					.69	.04	.04
	Age	.05	1.09	.01	.96		
	Sex	-.55	15.39	-.01	.97		
	Race	13.89	12.27	.20	.27		
Step2					.85	.12	.08
	LPL	13.85	23.93	.16	.57		
	LPS	16.38	24.64	.18	.51		
	SS	-.50	13.51	-.01	.97		
	PUR	3.63	19.96	.06	.86		
	NUR	-4.69	21.02	-.07	.83		
DV: AB_RT_controlodor							
Step 1					.29	.10	.10
	Age	.91	1.31	.12	.49		
	Sex	-25.41	18.39	-.24	.18		
	Race	12.77	14.66	.15	.39		
Step2					.66	.17	.07
	LPL	-17.76	28.72	-.17	.54		
	LPS	8.43	29.58	.07	.78		
	SS	.79	16.21	.01	.96		

(continued)

Table 4, continued

PUR	-24.09	23.95	-.34	.32
NUR	25.21	25.23	.32	.33

Note. LPL: lack of planning; LPS: lack of perseverance; SS: sensation seeking; PUR: positive urgency; NUR: negative urgency; AB_RT_allodor: alcohol-related attentional bias via reaction time data across all odor conditions; AB_RT_alchodor: alcohol-related attentional bias via reaction time data in alcohol odor condition; AB_RT_controlodor: alcohol-related attentional bias via reaction time data in control odor condition

Table 5

Hierarchical Multiple Regression in Eye-Tracking Data

Variable		B	SE B	B	*p*	R2	R2 change
Neutral Mood							
DV: FixCount%_difference							
Step 1					.96	.01	.01
	Age	-.43	1.88	-.04	.82		
	Sex	-5.28	11.26	-.08	.64		
	Race	-1.43	7.07	-.04	.84		
Step2					.98	.06	.05
	LPL	-9.21	17.70	-.14	.61		
	LPS	16.18	17.85	.22	.37		
	SS	13.09	13.80	.30	.35		
	PUR	-21.56	27.87	-.48	.45		
	NUR	18.36	30.60	.34	.55		
DV: AvgDwellDur_difference							
Step 1					.79	.03	.03
	Age	-.01	.01	-.12	.49		
	Sex	-.04	.05	-.14	.44		
	Race	-.01	.03	.00	.99		
Step2					.99	.05	.02
	LPL	-.04	.08	-.12	.67		
	LPS	.05	.09	.15	.54		
	SS	.03	.07	.12	.71		
	PUR	-.03	.13	-.12	.85		
	NUR	.01	.14	.02	.97		

(continued)

Table 5, continued

Variable		B	SE B	B	*p*	R2	R2 change
Positive Mood							
DV: FixCount%_difference							
Step 1		.08	.82	.02	.92	.02	.02
	Age	-.13	6.85	-.004	.93		
	Sex	2.96	4.61	.12	.99		
	Race				.53		
Step2		9.01	14.01	.21	.98	.06	.04
	LPL	-4.65	11.46	-.12	.53		
	LPS	.17	7.18	.01	.69		
	SS	1.66	13.72	.06	.98		
	PUR	1.16	14.46	.04	.91		
	NUR				.94		
DV: AvgDwellDur_difference							
Step 1					.95	.01	.01
	Age	-.001	.004	-.04	.83		
	Sex	.01	.03	.06	.75		
	Race	.01	.02	.10	.57		
Step2					.95	.08	.07
	LPL	.08	.07	.38	.25		
	LPS	-.06	.05	-.32	.28		
	SS	-.01	.03	-.09	.69		
	PUR	.02	.07	.13	.80		
	NUR	-.01	.07	-.07	.89		
Negative Mood							
DV: FixCount%_difference							
Step 1					.92	.02	.02
	Age	-.59	1.38	-.09	.67		

(continued)

Table 5, continued

Variable		B	SE B	β	*p*	R2	R2 change
	Sex	4.60	10.78	.09	.67		
	Race	-.62	6.33	-.02	.92		
Step2					.99	.06	.04
	LPL	-8.58	26.17	-.16	.75		
	LPS	17.43	22.18	.38	.44		
	SS	4.31	13.39	.11	.75		
	PUR	-.53	16.3	-.02	.97		
	NUR	-4.27	16.27	-.11	.79		
DV: AvgDwellDur_difference							
Step 1					.92	.02	.02
	Age	-.003	.01	-.09	.65		
	Sex	.03	.05	.13	.53		
	Race	.01	.03	.07	.74		
Step2					.94	.09	.08
	LPL	-.06	.12	-.25	.61		
	LPS	.10	.10	.48	.32		
	SS	.003	.06	.02	.96		
	PUR	.002	.08	.01	.98		
	NUR	-.02	.08	-.09	.82		

Note. LPL: lack of planning; LPS: lack of perseverance; SS: sensation seeking; PUR: positive urgency; NUR: negative urgency; FixCount%_difference: fixation count percentage while seeing alcohol pictures minus while seeing control pictures; AvgDwellDur_difference: average dwell duration while seeing alcohol pictures minus while seeing control pictures

Table 6

Sensitivity: Hierarchical Multiple Regression in Reaction Time Data

Variable		B	SE B	B	*p*	R2	R2 change
DV: AB_RT_allodor IV: LPL							
Step 1					.25	.03	.03
	Age	-.53	-49	-.09	.28		
	Sex	-12.42	7.96	-.14	.12		
	Race	-4.57	5.72	-.07	.43		
Step 2					.91	.03	.000
	LPL	-.96	8.89	-.01	.91		
DV: AB_RT_allodor IV: LPS							
Step 1					.55	.02	.02
	Age	-.47	.63	-.07	.45		
	Sex	-9.07	7.82	-.10	.25		
	Race	-2.53	5.9	-.04	.67		
Step 2					.34	.02	.01
	LPS	7.74	8.11	.09	.34		
DV: AB_RT_allodor IV: SS							
Step 1					.02	.07	.07
	Age	-.07	.37	-.02	.86		
	Sex	-16.62	5.76	-.25	.01		
	Race	2.28	4.49	.04	.61		
Step 2					.88	.07	.000
	SS	.61	3.99	.01	.88		

(continued)

Table 6, continued

Variable		B	SE B	β	*p*	R2	R2 change
DV: AB_RT_allodor IV: PUR							
Step 1					.07	.05	.05
	Age	-.35	.47	-.07	.46		
	Sex	-17.00	7.64	-.19	.03		
	Race	-8.97	5.59	-.14	.11		
Step 2					.21	.07	.01
	PUR	-7.15	5.72	-.11	.21		
DV: AB_RT_allodor IV: NUR							
Step 1					.34	.03	.03
	Age	-.43	.49	-.08	.39		
	Sex	-11.89	8.24	-.13	.15		
	Race	-4.08	5.72	-.06	.48		
Step 2					.37	.03	.01
	NUR	-5.72	6.37	-.08	.37		

Note. LPL: lack of planning; LPS: lack of perseverance; SS: sensation seeking; PUR: positive urgency; NUR: negative urgency; AB_RT_allodor: alcohol-related attentional bias via reaction time data across all odor conditions; AB_RT_alchodor: alcohol-related attentional bias via reaction time data in alcohol odor condition; AB_RT_controlodor: alcohol-related attentional bias via reaction time data in control odor condition

Table 7

Sensitivity: Hierarchical Multiple Regression in Eye-Tracking Data

Variable		B	SE B	B	*p*	R2	R2 change
DV: FixCount%_difference IV: LPL							
Step 1					.95	.002	.003
	Age	-.28	.63	-.04	.66		
	Sex	-.38	4.64	-.01	.94		
	Race	-.81	2.69	-.03	.77		
Step2					.48	.01	.004
	LPL	3.63	5.17	.07	.48		
DV: FixCount%_difference IV: LPS							
Step 1					.95	.003	.003
	Age	-.08	.66	-.01	.90		
	Sex	.53	4.92	.01	.92		
	Race	-1.46	2.88	-.05	.61		
Step2					.36	.01	.01
	LPS	4.52	4.96	.08	.36		
DV: FixCount%_difference IV: SS							
Step 1					.97	.002	.002
	Age	-.10	.66	-.01	.88		
	Sex	.92	4.87	.02	.85		
	Race	-1.04	2.89	-.03	.72		
Step2					.64	.004	.002
	SS	-1.83	3.89	-.05	.64		

(continued)

Table 7, continued

Variable		B	SE B	β	*p*	R2	R2 change
DV: FixCount%_difference IV: PUR							
Step 1					.96	.002	.002
	Age	-.10	.66	-.01	.88		
	Sex	.98	4.84	.02	.84		
	Race	-1.16	2.83	-.04	.68		
Step2					.89	.003	.000
	PUR	.49	3.49	.01	.89		
DV: FixCount%_difference IV: NUR							
Step 1					.99	.001	.001
	Age	-.03	.70	-.00	.97		
	Sex	.75	5.19	/01	.89		
	Race	-.69	3.18	-.02	.83		
Step2					.98	.001	.000
	NUR	-.14	4.14	-.003	.97		
DV: AvgDwellDur_difference IV: LPL							
Step 1					.88	.01	.01
	Age	-.002	.003	-.07	.42		
	Sex	.001	.02	.01	.95		
	Race	.003	.01	.02	.82		
Step2					.60	.01	.002
	LPL	.01	.02	.05	.60		

(continued)

Table 7, continued

Variable		B	SE B	β	*p*	R2	R2 change
DV: AvgDwellDur_difference IV: LPS							
Step 1					.96	.002	.002
	Age	-.001	.003	-.04	.65		
	Sex	.004	.02	.02	.86		
	Race	-.002	.01	-.01	.90		
Step2					.49	.01	.004
	LPS	.02	.02	.06	.49		
DV: AvgDwellDur_difference IV: SS							
Step 1					.94	.003	.003
	Age	-.002	.003	-.05	.62		
	Sex	.01	.02	.03	.72		
	Race	.001	.01	.01	.92		
Step2					.30	.01	.01
	SS	-.02	.02	-.11	.30		
DV: AvgDwellDur_difference IV: PUR							
Step 1					.94	.003	.003
	Age	-.002	.003	-.05	.61		
	Sex	.01	.02	.03	.71		
	Race	.001	.01	.01	.92		
Step2					.87	.003	.000
	PUR	.003	.02	.02	.87		

(continued)

Table 7, continued

Variable		B	SE B	β	*p*	R2	R2 change
DV: AvgDwellDur_difference							
IV: NUR							
Step 1					.97	.002	.002
	Age	-.001	-.003	-.04	.69		
	Sex	.01	.03	.03	.74		
	Race	.004	.02	.03	.78		
Step2					.93	.002	.000
	NUR	-.002	.02	-.01	.93		

Note. LPL: lack of planning; LPS: lack of perseverance; SS: sensation seeking; PUR: positive urgency; NUR: negative urgency; FixCount%_difference: fixation count percentage while seeing alcohol pictures minus while seeing control pictures; AvgDwellDur_difference: average dwell duration while seeing alcohol pictures minus while seeing control pictures

Table 8

Linear Mixed Effect Model 1: Reaction Time Data with NUR

Fixed Effects	Coefficient	SE	*p*
Intercept	467.66	58.11	<.001
Mood	2.65	9.68	.79
Odor	1.31	4.91	.79
AOI	9.29	3.13	.003
NUR	-21.85	20.86	.29
Mood*AOI	-.55	5.04	.91
Odor*AOI	-21.88	23.25	.35
NUR*AOI	-9.06	6.87	.19
Mood*Odor*AOI	9.22	10.07	.34
Odor*NUR*AOI	10.32	8.58	.23
Mood*Odor*NUR*AOI	-3.99	3.80	.29

Table 9

Linear Mixed Effect Model 2: Reaction Time Data with PUR

Fixed Effects	Coefficient	SE	*p*
Intercept	527.67	45.68	<.001
Mood	1.55	9.61	.87
Odor	.02	4.72	.99
AOI	8.13	2.98	.01
PUR	-47.68	19.73	.23
Mood*AOI	.59	4.68	.89
Odor*AOI	-6.95	17.02	.68
PUR*AOI	-5.64	6.15	.36
Mood*Odor*AOI	1.68	7.37	.82
Odor*PUR*AOI	2.83	7.54	.71
Mood*Odor*PUR*AOI	-1.25	3.36	.71

Table 10

Linear Mixed Effect Model 3: Fixation Count Percentage with NUR

Fixed Effects	Coefficient	SE	*p*
Intercept	18.31	4.57	<.001
Mood	-1.06	.99	.29
AOI	-2.09	.59	.002
NUR	1.13	1.49	.45
Mood*AOI	-.62	.22	.002
NUR*AOI	-.65	.20	.01
Mood*NUR*AOI	-.23	.08	.004

Table 11

Linear Mixed Effect Model 4: Fixation Count Percentage with PUR

Fixed Effects	Coefficient	SE	*p*
Intercept	16.51	3.53	<.001
Mood	-.63	.95	.51
AOI	-1.68	.54	.003
PUR	1.49	1.26	.24
Mood*AOI	-.53	.19	.01
PUR*AOI	-.57	.22	.01
Mood*PUR*AOI	-.22	.08	.01

Table 12

Linear Mixed Effect Model 5: Average Dwell Time with NUR

Fixed Effects	Coefficient	SE	*p*
Intercept	.102	.027	<.001
Mood	-.001	.006	.81
AOI	-.016	.003	.03
NUR	.006	.008	.51
Mood*AOI	-.004	.001	.02
NUR*AOI	-.01	.001	.01
Mood*NUR*AOI	-.002	-.001	.02

Table 13

Linear Mixed Effect Model 6: Average Dwell Time with PUR

Fixed Effects	Coefficient	SE	*p*
Intercept	.106	.021	<.001
Mood	.001	.006	.94
AOI	-.017	.004	.02
PUR	.004	.008	.55
Mood*AOI	-.004	.001	.03
PUR*AOI	-.005	.001	.04
Mood*PUR*AOI	-.002	.001	.05

FIGURES

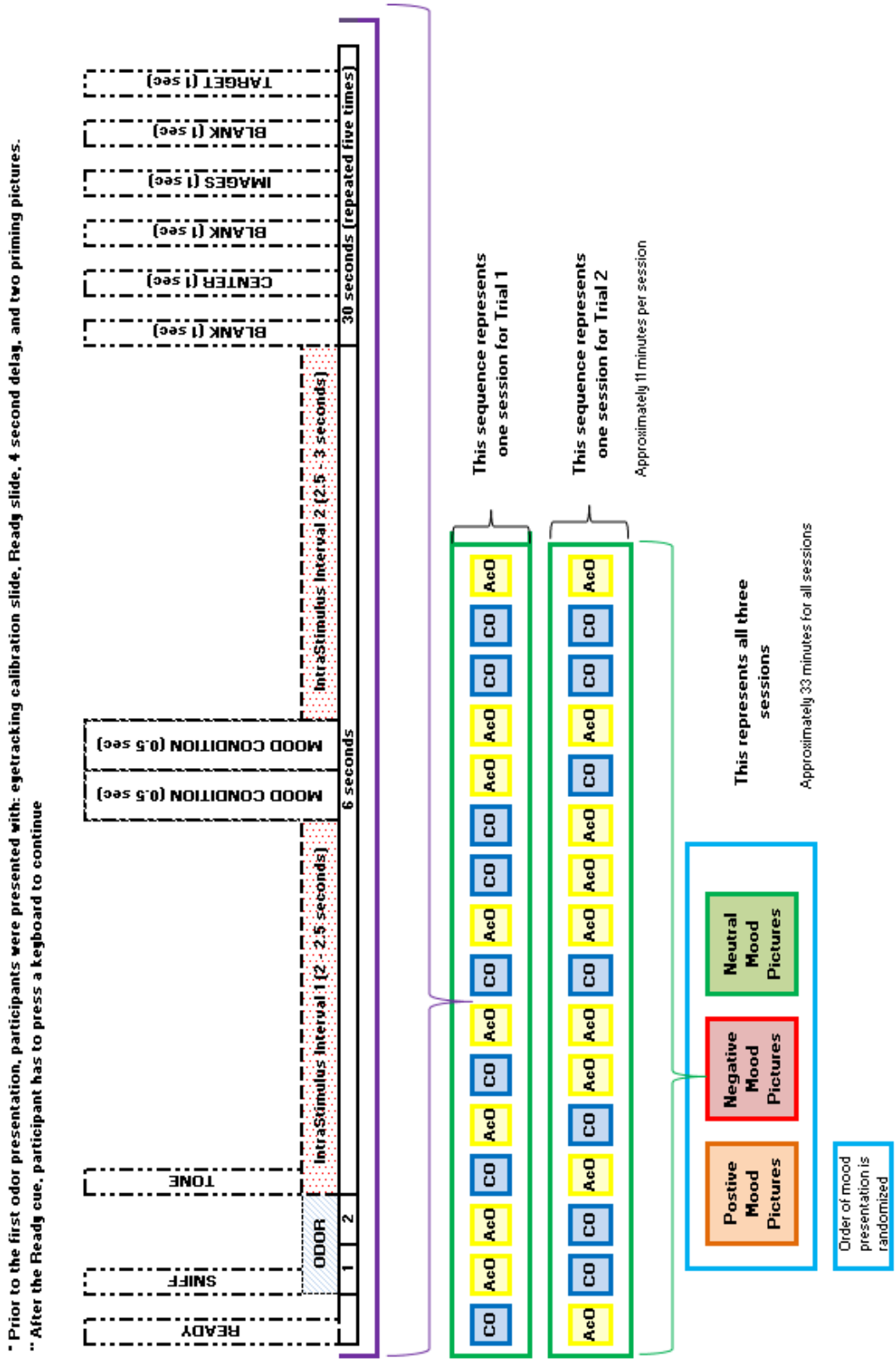


Figure 1. Outline of the visual probe

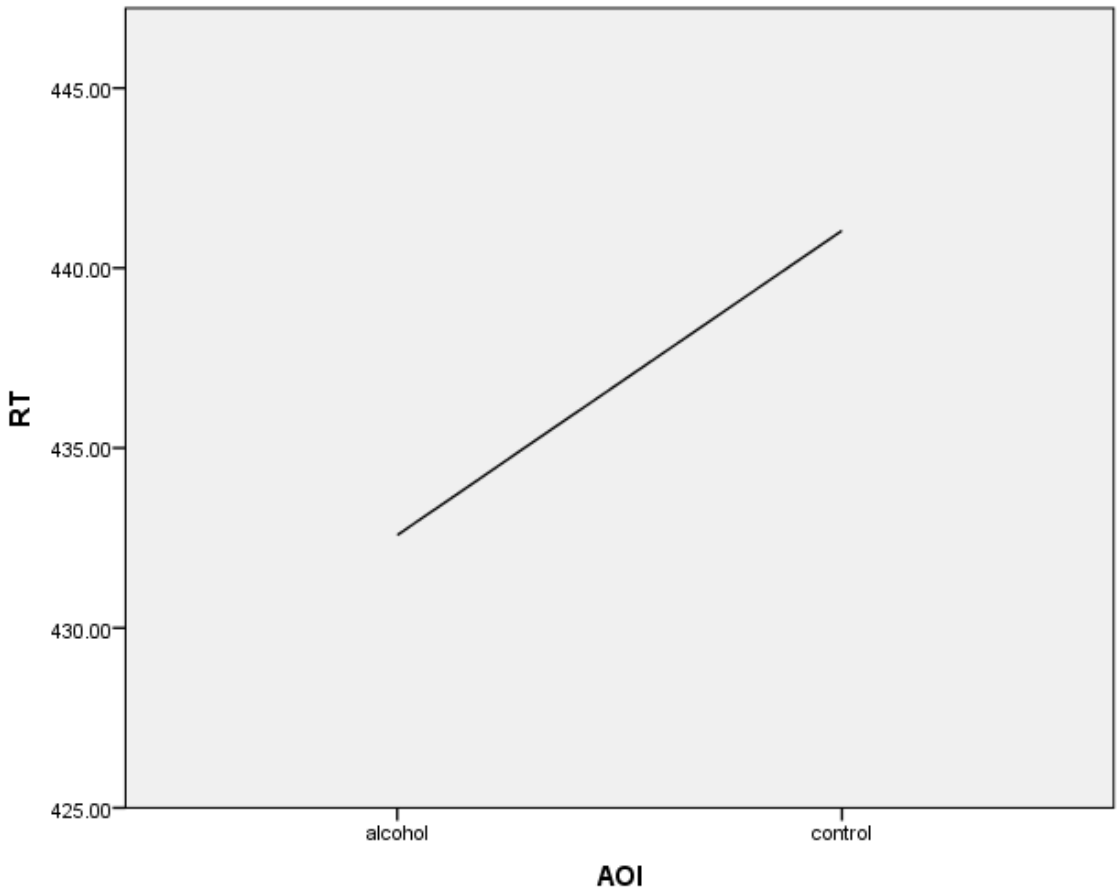


Figure 2. Main effect of AOI on reaction time

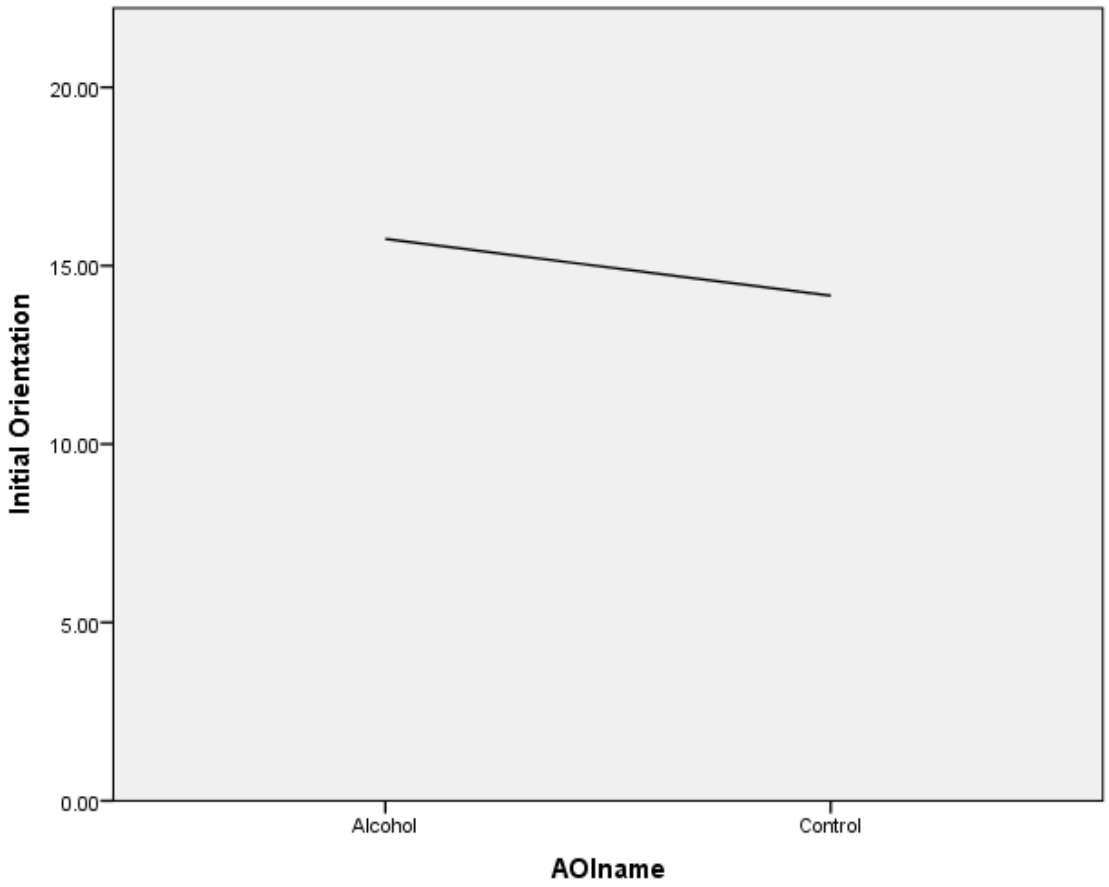


Figure 3. Main effect of AOI on initial orientation

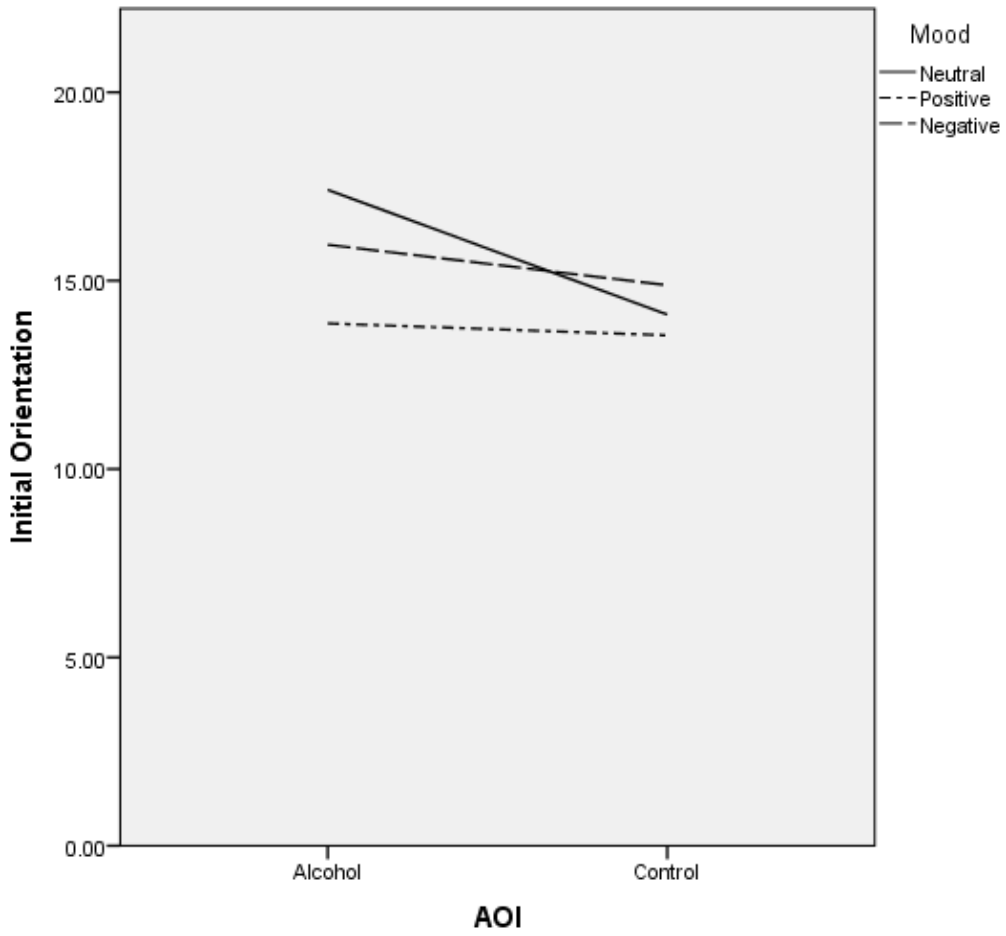


Figure 4. Interactive effects of mood and AOI on initial orientation

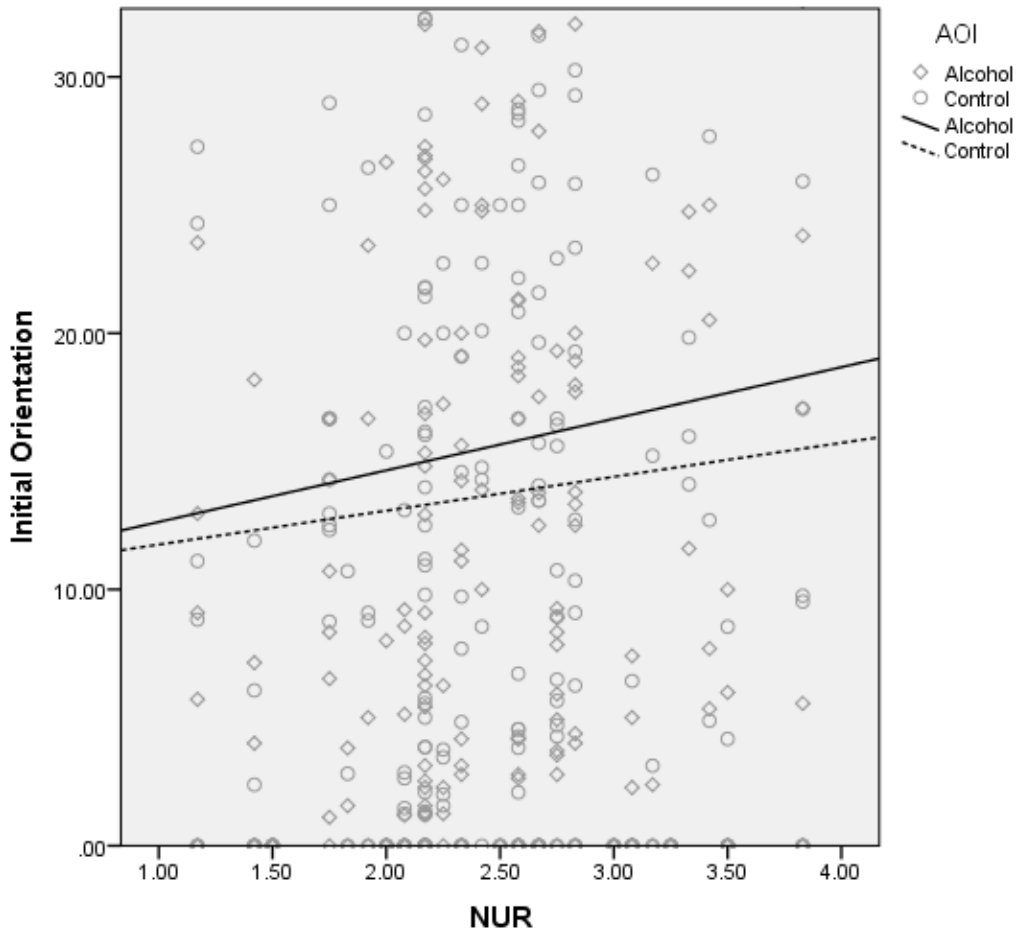


Figure 5. Interactive effects of NUR and AOI on initial orientation

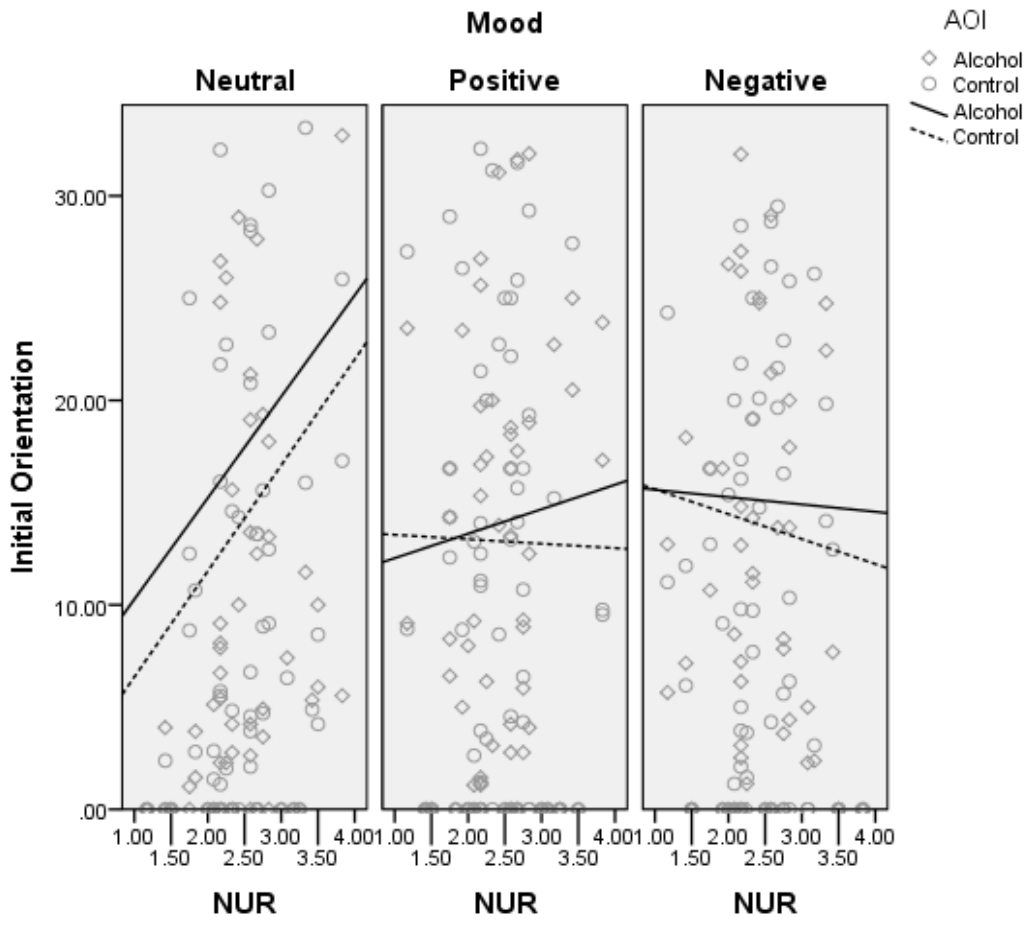


Figure 6. Interactive effect of NUR, mood and AOI on initial orientation

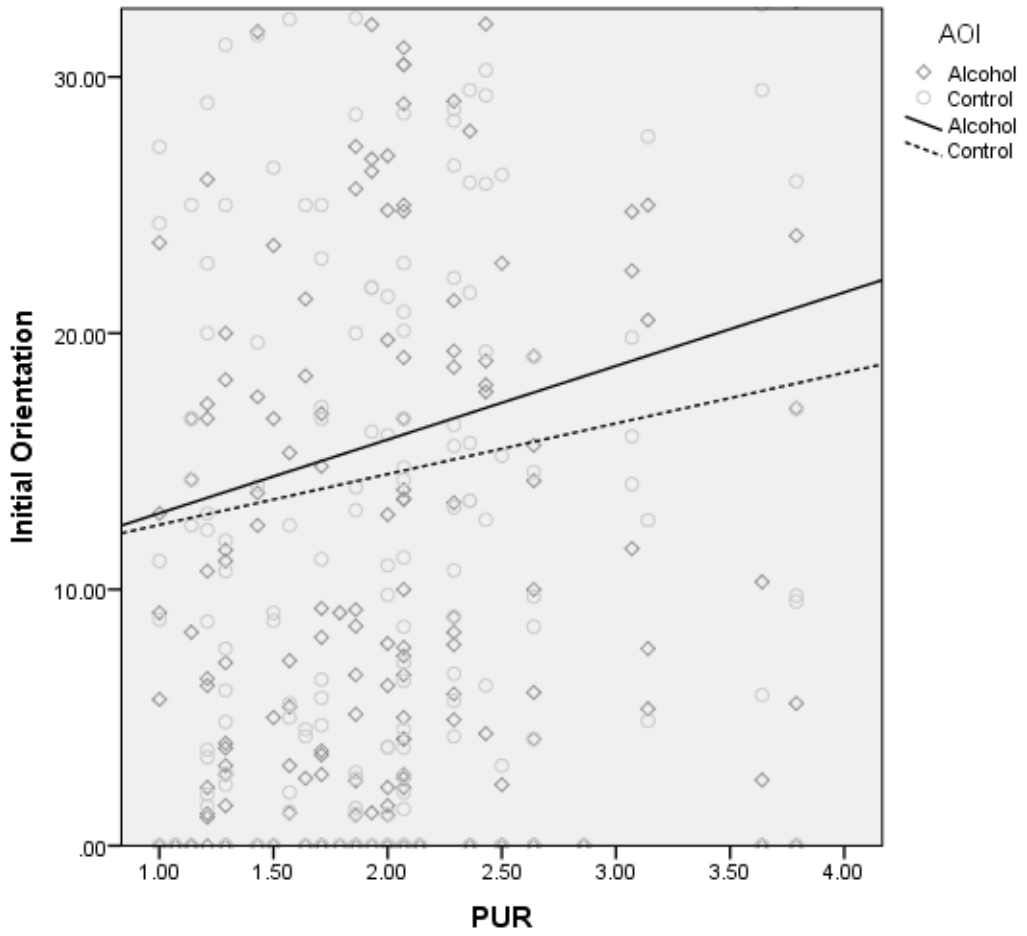


Figure 7. Interactive effects of PUR and AOI on initial orientation

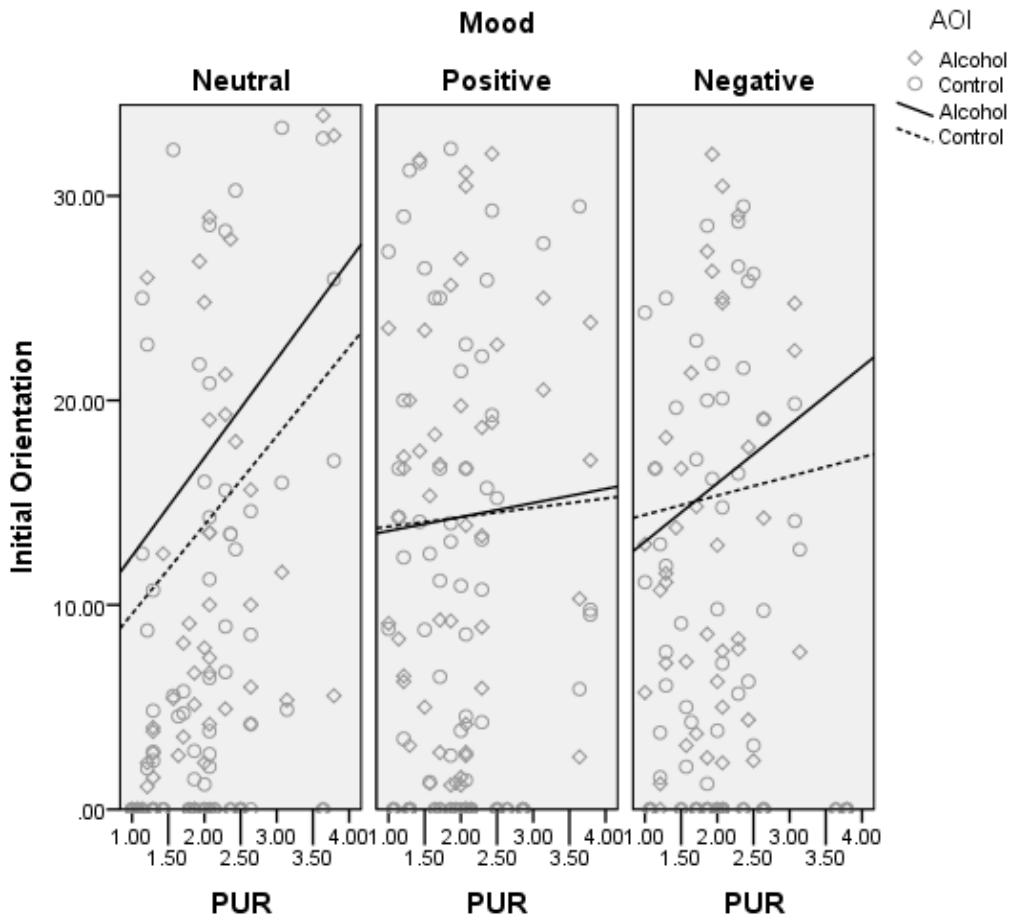


Figure 8. Interactive effects of PUR, mood and AOI on initial orientation

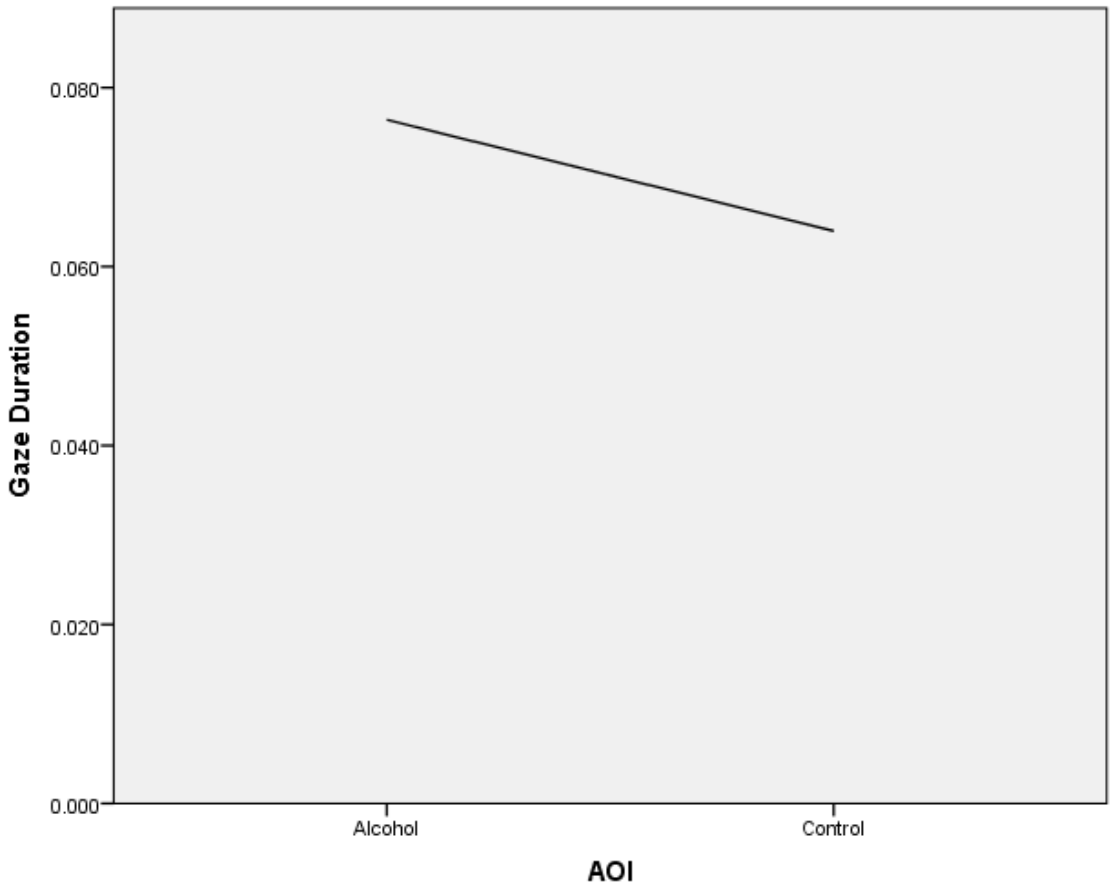


Figure 9. Main effect of AOI on gaze duration

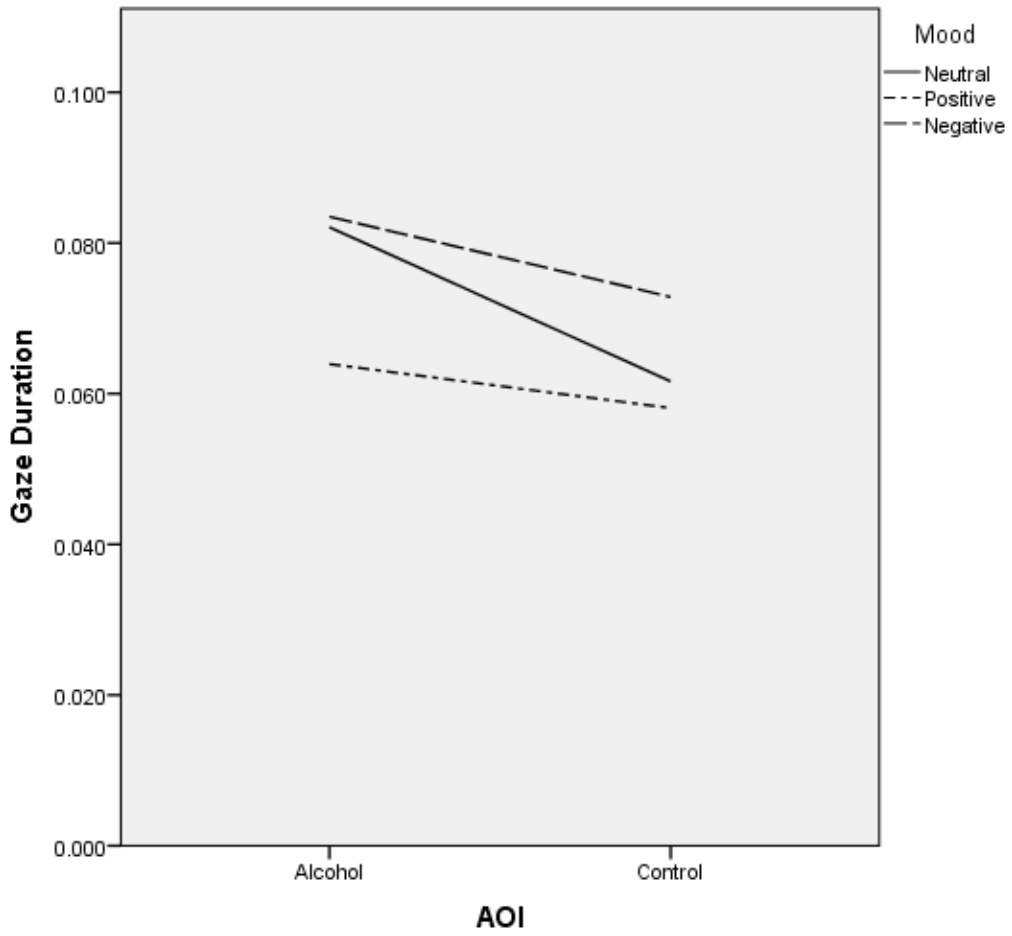


Figure 10. Interactive effects of mood and AOI on gaze duration

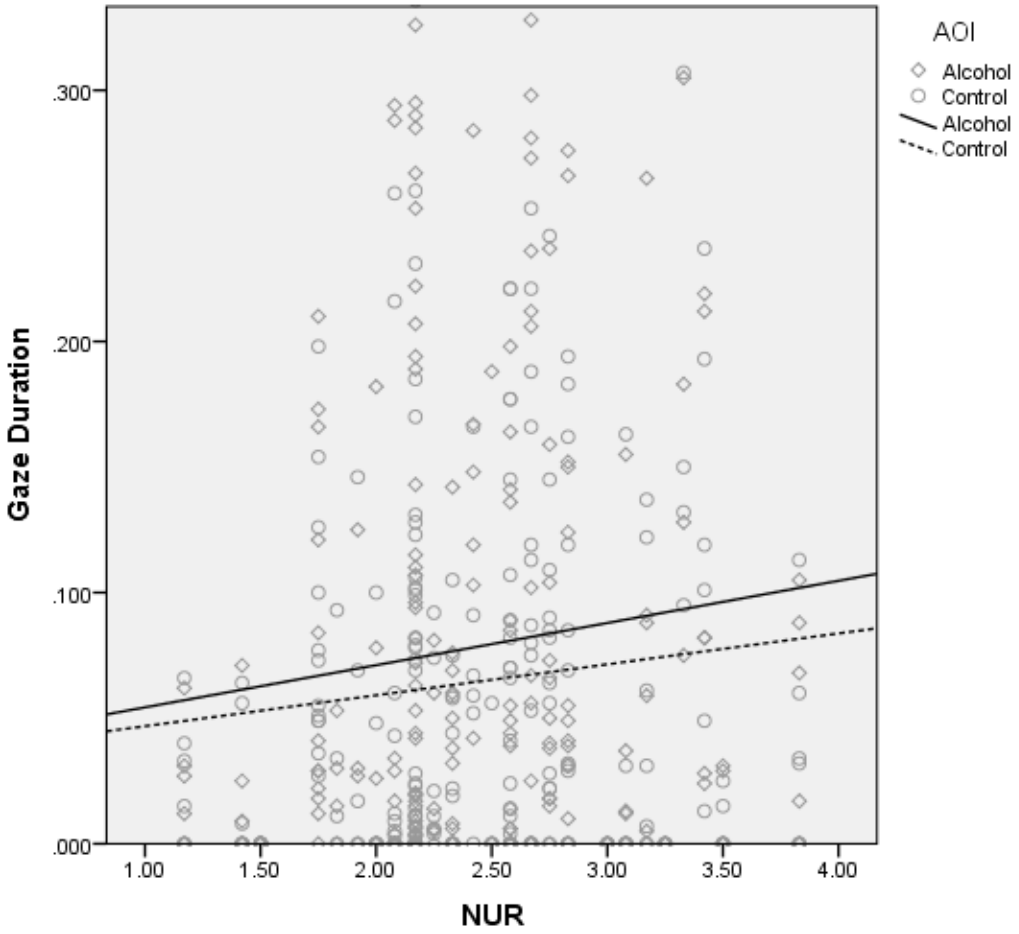


Figure 11. Interactive effects of NUR and AOI on gaze duration

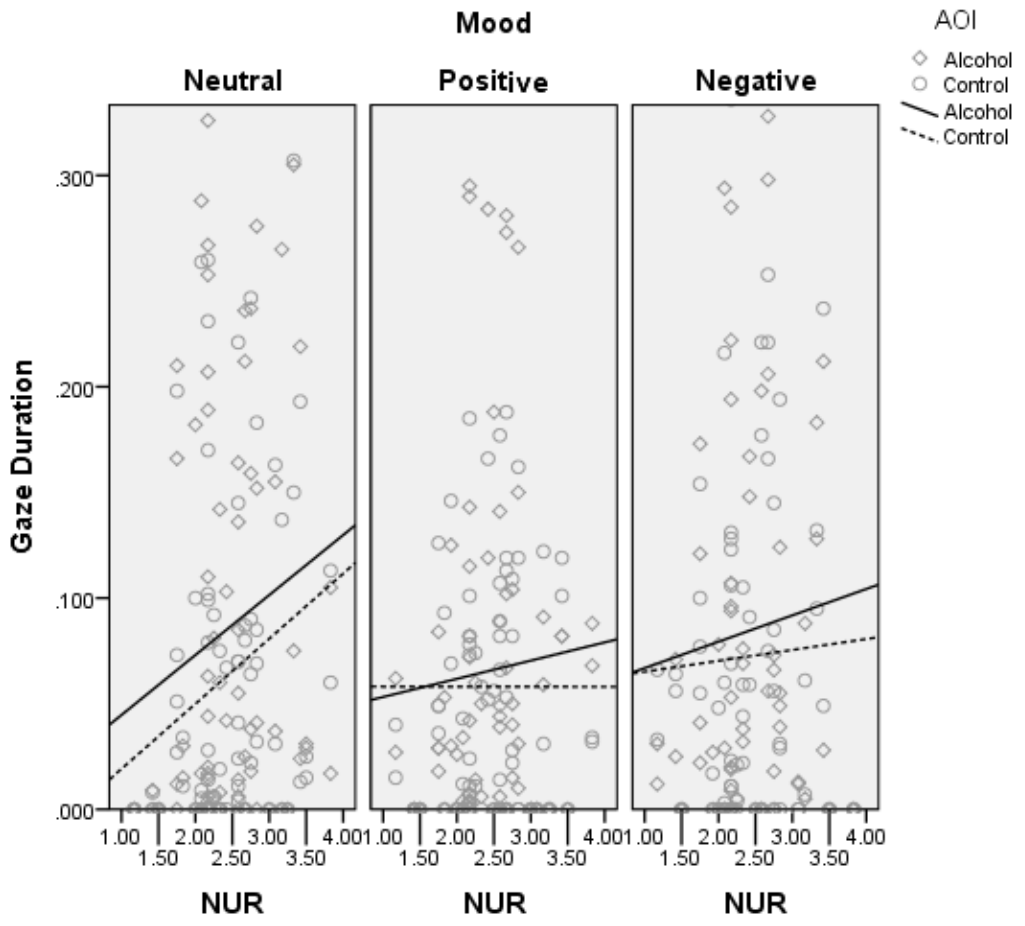


Figure 12. Interactive effects of NUR, mood and AOI on gaze duration

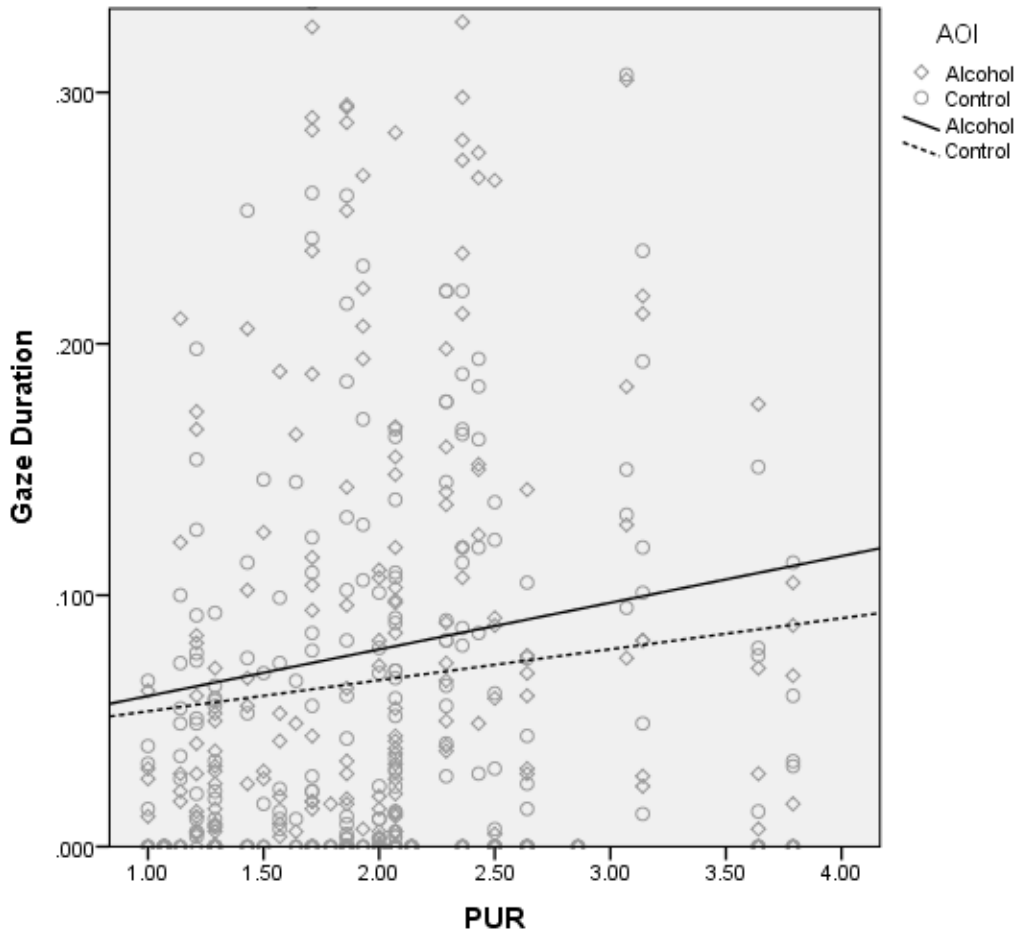


Figure 13. Interactive effects of PUR and AOI on gaze duration

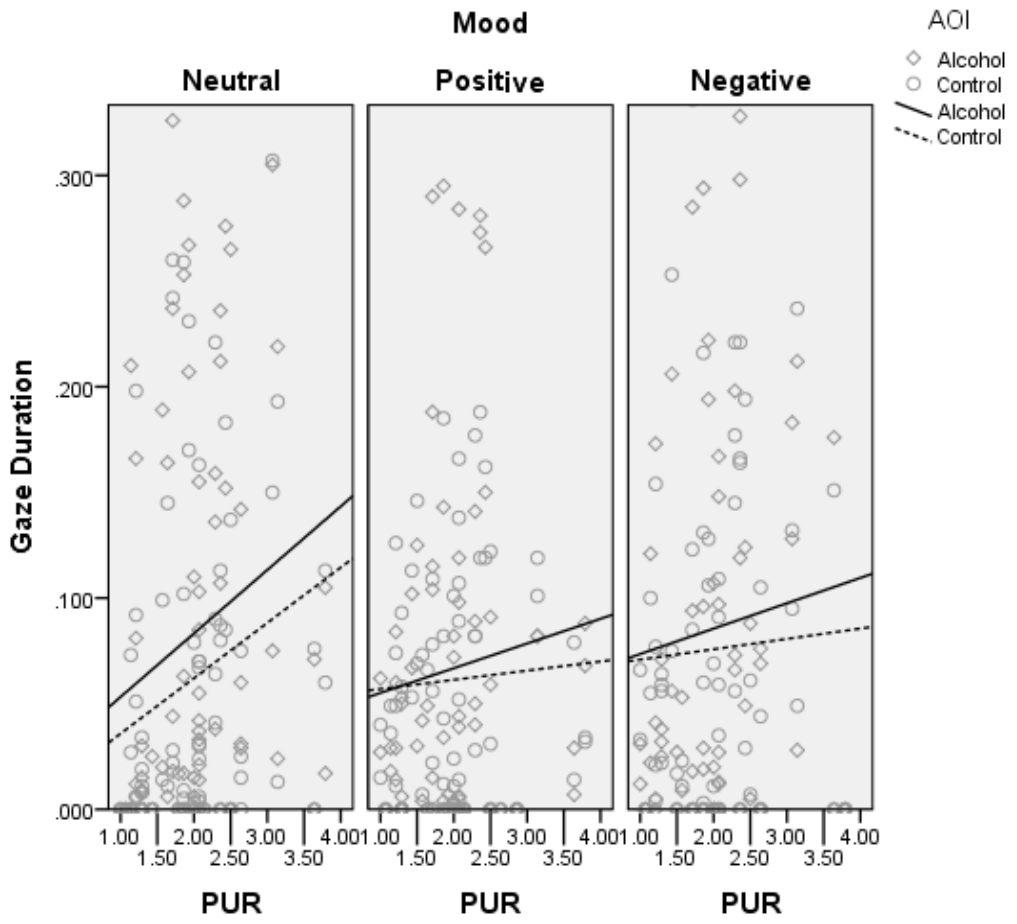


Figure 14. Interactive effects of PUR, mood and AOI on gaze duration

APPENDICES

Appendix A: Demographics Questionnaire

1. Sex:

Male	Female	Other

2. Race:

Caucasian	African-American	Hispanic/Latino	Asian	Other (Specify):

3. Marital Status:

Never married	Engaged	Cohabitating	Married	Divorced	Separated	Widowed	In serious relationship	Single

a. If you have been married, how many times have you been married? _____

4. Number of children? _____

5. Please indicate your highest education level attained:

Grade:	7	8	9	10	11	12	High school diploma	GED
College:		13	14	15	16	Bachelor's degree	Associates degree	
Post Graduate:	17	18	19	20	Masters degree		Ph. D.	other advanced degree

Please circle here if you are still a student.
What year are you in school? _____ What are you studying? _____ What is your current GPA?
What is your cumulative GPA?

6. What is your current employment status?

Employed full-time	self-employed	semi-retired	employed part-time	unemployed	fully retired	student		disabled	work in the home

7. Mother's education:

no High School diploma or GED	High School graduate or GED	some College	College graduate	Post-College education

8. Father's education:

no High School diploma or GED	High School graduate or GED	some College	College graduate	Post-College education

9. Estimated household income:

under $10,000 a year	$10,000-24,000 a year	$25,000-39,000 a year	$40,000-59,000 a year	60,000-79,000 a year	80,000-99,000 a year	over 100,000 a year

10. Sexual Orientation:

Heterosexual	Homosexual	Bisexual	Other:

Appendix B: Alcohol Use Disorder Identification Test

Questions	0	1	2	3	4
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
2. How many drinks containing alcohol do you have on a typical day when you are drinking	1 or 2	3 or 4	5 or 6	7 or 9	10 or more
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
8. How often during the last year have you been unable to remember what happened the night before because of you drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year
					Total

Appendix C: UPPS-P Impulsive Behavior Scale

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you **Agree Strongly** circle **1**, if you **Agree Somewhat** circle **2**, if you **Disagree somewhat** circle **3**, and if you **Disagree Strongly** circle **4**. Be sure to indicate your agreement or disagreement for every statement below. Also, there are questions on the following pages.

		Agree Strongly	Agree Some	Disagree Strongly	Disagree Some
1.	I have a reserved and cautious attitude toward life.	1	2	3	4
2.	I have trouble controlling my impulses.	1	2	3	4
3.	I generally seek new and exciting experiences and sensations.	1	2	3	4
4.	I generally like to see things through to the end.	1	2	3	4
5.	When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.	1	2	3	4
6.	My thinking is usually careful and purposeful.	1	2	3	4
7.	I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4
8.	I'll try anything once.	1	2	3	4
9.	I tend to give up easily.	1	2	3	4
10.	When I am in great mood, I tend to get into situations that could cause me problems.	1	2	3	4
11.	I am not one of those people who blurt out things without thinking.	1	2	3	4
12.	I often get involved in things I later wish I could get out of.	1	2	3	4
13.	I like sports and games in which you have to choose your next move very quickly.	1	2	3	4
14.	Unfinished tasks really bother me.	1	2	3	4
15.	When I am very happy, I tend to do things that may cause problems in my life.	1	2	3	4
16.	I like to stop and think things over before I do them.	1	2	3	4
17.	When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
18.	I would enjoy water skiing.	1	2	3	4
19.	Once I get going on something I hate to stop.	1	2	3	4
20.	I tend to lose control when I am in a great mood.	1	2	3	4
21.	I don't like to start a project until I know exactly how to proceed.	1	2	3	4
22.	Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
23.	I quite enjoy taking risks.	1	2	3	4
24.	I concentrate easily.	1	2	3	4
25.	When I am really ecstatic, I tend to get out of control.	1	2	3	4
26.	I would enjoy parachute jumping.	1	2	3	4
27.	I finish what I start.	1	2	3	4

28.	I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
29.	When I am upset I often act without thinking.	1	2	3	4
30.	Others would say I make bad choices when I am extremely happy about something.	1	2	3	4
31.	I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
32.	I am able to pace myself so as to get things done on time.	1	2	3	4
33.	I usually make up my mind through careful reasoning.	1	2	3	4
34.	When I feel rejected, I will often say things that I later regret.	1	2	3	4
35.	Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4
36.	I would like to learn to fly an airplane.	1	2	3	4
37.	I am a person who always gets the job done.	1	2	3	4
38.	I am a cautious person.	1	2	3	4
39.	It is hard for me to resist acting on my feelings.	1	2	3	4
40.	When I get really happy about something, I tend to do things that can have bad consequences.	1	2	3	4
41.	I sometimes like doing things that are a bit frightening.	1	2	3	4
42.	I almost always finish projects that I start.	1	2	3	4
43.	Before I get into a new situation I like to find out what to expect from it.	1	2	3	4
44.	I often make matters worse because I act without thinking when I am upset.	1	2	3	4
45.	When overjoyed, I feel like I can't stop myself from going overboard.	1	2	3	4
46.	I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
47.	Sometimes there are so many little things to be done that I just ignore them all.	1	2	3	4
48.	I usually think carefully before doing anything.	1	2	3	4
49.	When I am really excited, I tend not to think of the consequences of my actions.	1	2	3	4
50.	In the heat of an argument, I will often say things that I later regret.	1	2	3	4
51.	I would like to go scuba diving.	1	2	3	4
52.	I tend to act without thinking when I am really excited.	1	2	3	4
53.	I always keep my feelings under control.	1	2	3	4
54.	When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.	1	2	3	4
55.	Before making up my mind, I consider all the advantages and disadvantages.	1	2	3	4

56.	I would enjoy fast driving.	1	2	3	4
57.	When I am very happy, I feel like it is ok to give in to cravings or overindulge.	1	2	3	4
58.	Sometimes I do impulsive things that I later regret.	1	2	3	4
59.	I am surprised at the things I do while in a great mood.	1	2	3	4

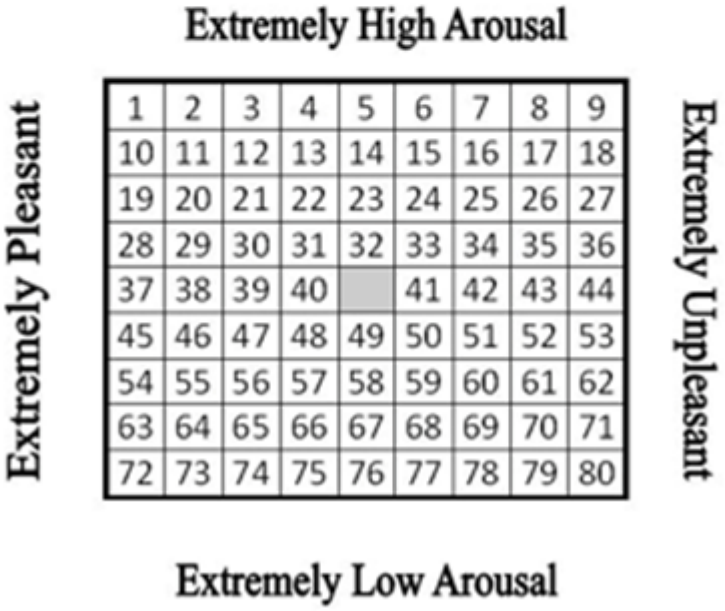
Appendix D: Affect Grid

The purpose of using the affect grid to describe the participants' feelings. The center of the square (the shaded area) represents a neutral, average, everyday feeling. It is neither positive nor negative. The right side of the grid represents pleasant feelings. Therefore, the farther to the right, the more pleasant a feeling. The left half represents unpleasant feelings; the farther to the left, the more unpleasant.

The vertical dimension of the map represents degree of arousal. Arousal has to do with how wide awake, alert, or activated the person feels – independent of whether the feeling is positive or negative. The top half is for feelings that are above average in arousal; the lower half is for feelings that are below average in arousal. The very bottom represents sleep and the higher, the more awake the person feels.

Generally, up in the top and middle can be described as "frantic excitement." Up to the top and to the right is ecstasy, excitement, joy. Opposite these, down and to the left are feelings of depression, melancholy, sadness, and gloom. Up and to the left are feelings of stress and tension. Opposite these, down and the right are feelings of calm, relaxation, and serenity.

Please mark the square on the grid that best represents your current emotional state.



Appendix E: Visual Probe Task

(a) Fixation crosshair (1000ms)

(b) Alcohol matched pictures (1000ms)

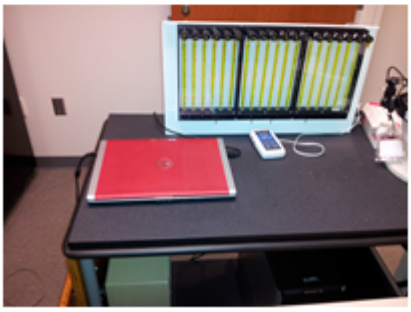
(c) Response Target (1000ms)

Appendix F: Computers Used During the Study

(a) Participant computer

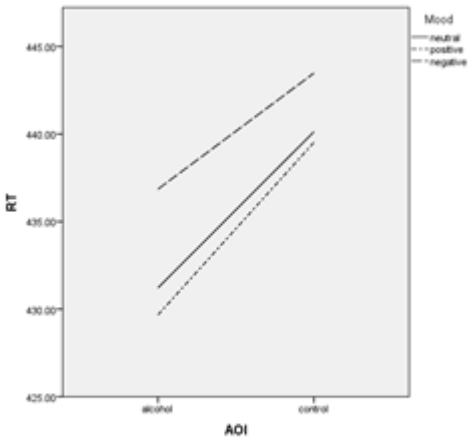
(b) Control computer

(c) Researcher's laptop

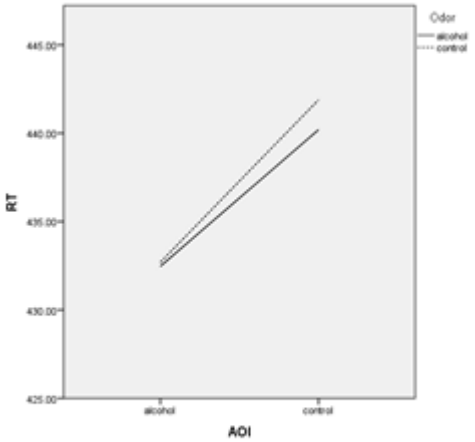


Appendix G: Target Points

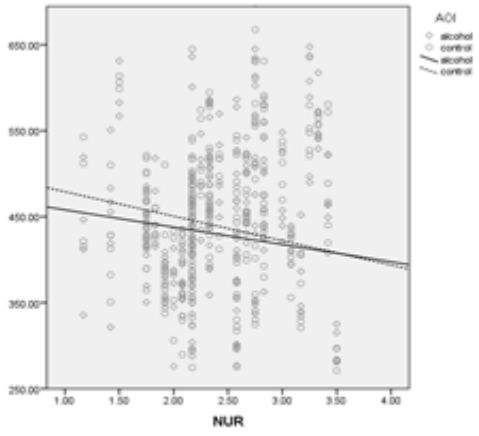
Appendix H: Model 1 Supplemental Graphs



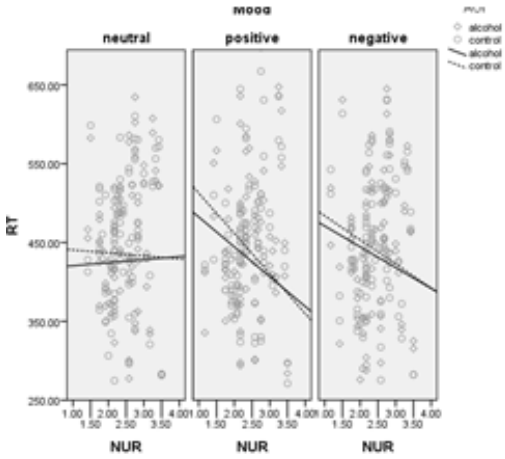
(a) Mood x AOI on RT



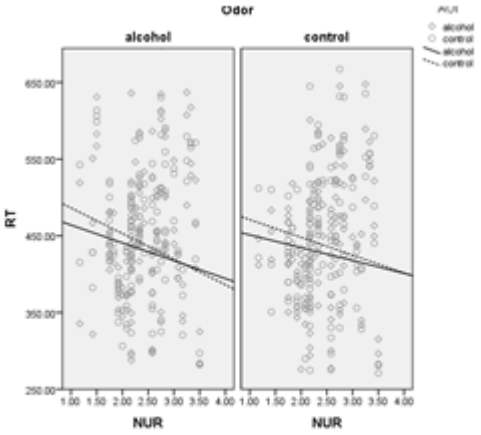
(b) Odor x AOI on RT



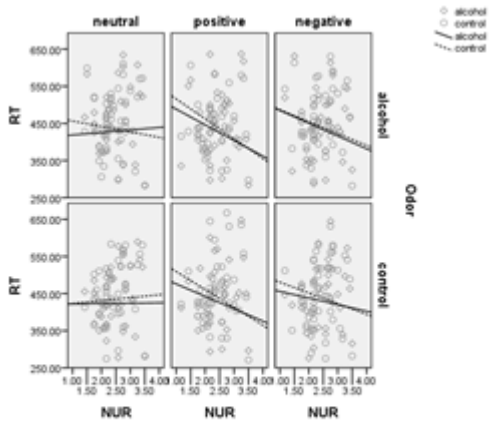
(c) NUR x AOI on RT



(d) Mood x NUR x AOI on RT

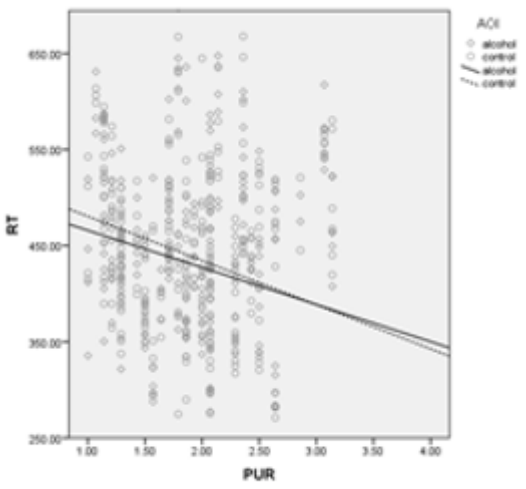


(e) Odor x NUR x AOI on RT

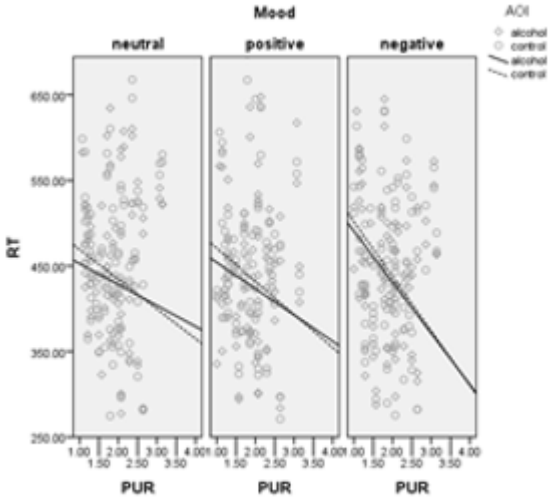


(f) Mood x Odor x NUR x AOI on RT

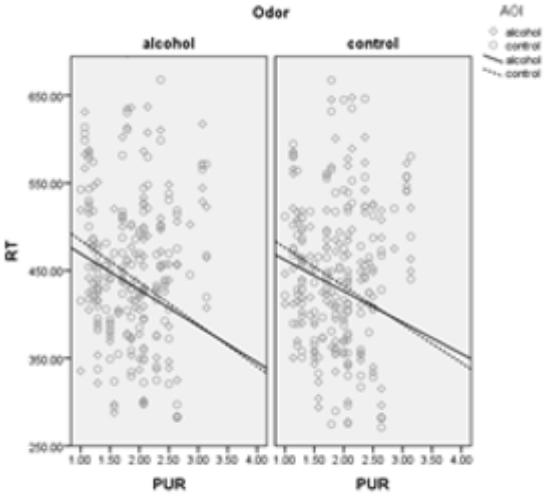
Appendix I: Model 2 Supplemental Graphs



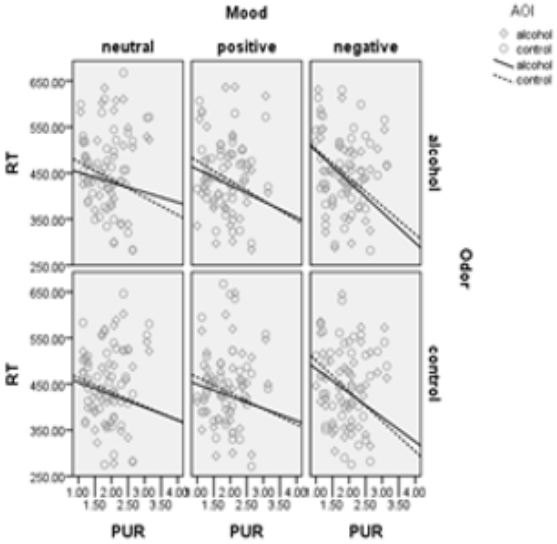
(a) PUR x AOI on RT



(b) Mood x PUR x AOI on RT



(c) Odor x NUR x AOI on RT



(d) Mood x Odor x NUR x AOI on RT

VITA

VITA

AYCA COSKUNPINAR

EDUCATION

August 2015 **Ph.D., Clinical Psychology**
Indiana University-Purdue University Indianapolis (IUPUI)
Indianapolis, IN (APA accredited)
Dissertation: The Relationship between Trait Impulsivity and Alcohol-Related Attentional Biases

June 2014 – June 2015 **Pre-doctoral Internship**
Rush University Medical Center, Neuropsychology Track, Chicago, IL
Supervisors: Christopher Grote, Ph.D., ABPP/CN; Christopher Stewart, Ph.D.; Suzanne Musil, Ph.D.; Nicole Heath, Ph.D.

- Conducted neuropsychological evaluations of individuals from early adolescence to later in life (English and Spanish speaking) in an outpatient and inpatient setting (i.e. pre and post epilepsy surgery, brain tumor resection, rehabilitation, psychiatry)
- Conducted Wada testing
- Conducted language mapping during tumor resection surgery
- Conducted Cognitive Resilience training for people with memory problems due to aging, epilepsy, TBI and other causes
- Conducted individual CBT for a variety of outpatient populations
- Participated in neuropsychology journal club, neuroanatomy review series, psychology teaching conference, and neuropsychology, epilepsy, neurology, and psychotherapy case conferences

August 2011 **M.S., Clinical Psychology**
Indiana University-Purdue University Indianapolis (IUPUI)
Indianapolis, IN (APA accredited)
Thesis: The Creation and Validation of the Activation-Valence Affective Traits Survey (AVATS)

May 2009 **B.A., Psychology**

Hanover College, Hanover, IN *(Cum Laude)*
Honors Thesis: Psychological Health of Parents of Children with Autism Spectrum Disorder

May 2009 **B.A., Economics**
Hanover College, Hanover, IN (*Cum Laude*)

AWARDS AND HONORS

2015 **NIDA Women and Sex/Gender Differences Junior Investigator Travel Award**

2013 **Outstanding Student Teaching Award**
IUPUI Department of Psychology
Awarded to one graduate student in Psychology annually

2012 **Research Excellence Award**
IUPUI Department of Psychology
Awarded to one Ph.D. student in Clinical Psychology annually

2011 **Citizenship Award**
IUPUI Department of Psychology
Awarded to one Ph.D. student in Clinical Psychology annually

2011 **Outstanding Service to Career, Campus and Community Award**
IUPUI
Awarded to one student on campus annually

2009 **Distinguished Student Award**
Hanover College Department of Psychology
Awarded to one student in Psychology annually

2008 **George M. Zirkle Psychology Award**
Hanover College Department of Psychology
Awarded to one student in Psychology annually

2008 **Psi Chi**, The International Honor Society in Psychology

2008 **Mortar Board**, National Honor Society

NEUROPSYCHOLOGY EXPERIENCES

April 2013 – October 2013
Neuropsychology Clinic
Indiana University School of Medicine, Riley Hospital for Children, Indianapolis, IN
Practicum Student
Supervisor: Jennifer M. Katzenstein, Ph.D., ABPP-CN

- Observed test administration and conducted data interpretation, and report writing for diagnosis and treatment planning
- Gained experience in assessing intellectual functioning, language, learning and memory, attention, visuomotor functioning, early academic skills, adaptive behavior, and behavioral, emotional, and social functioning
- Participated in the weekly Neuropsychology Case Conference and fact-finding sessions

June 2012 – June 2013
Neuropsychology Clinic
Indiana University School of Medicine, Indianapolis, IN
Practicum Student
Supervisors: David A. Kareken, Ph.D., ABPP-CN; Daniel F. Rexroth, Psy.D.

- Administered, scored and interpreted neuropsychological evaluations for adults referred from neurology and psychiatry
- Attended the weekly Neurology Grand Rounds in the Indiana University School of Medicine
- Participated in the weekly Neuropsychology Case Conference and fact-finding sessions

OTHER CLINICAL EXPERIENCES

Sept.2011 – June 2012
St. Vincent Joshua Max Simon Primary Care Center
St. Vincent Family Medicine, Indianapolis, IN
Supervisor: Thomas J. Barbera, Ph.D.
Practicum Student

- Trained in the Behavioral Health Consultant model of Integrated Primary Care
- Provided immediate access to psychological care and brief assessment/ intervention for a wide variety of disorders (i.e., depression, anxiety, psychosomatic complaints, pain disorder, and health-related behavior change)

January 2011 – June 2011 **Adult Psychiatry Outpatient Clinic**
Indiana University School of Medicine, Indianapolis, IN
Supervisors: Natalie C. Dattilo, Ph.D.; Jeffrey Lightfoot, Ph.D.
Practicum Student

- Individual Cognitive Behavioral Therapy to patients presented with a variety of concerns (i.e., severe anxiety, depression, gambling addiction, severe speech anxiety, coping with life changes and medical problems)
- Attended weekly didactic training

Sept. 2010 – December 2010 **Larue D. Carter Memorial Hospital**, **Indianapolis, IN**
Supervisors: Kristine Chapleau, Ph.D.; Timothy Lines, Ph.D.
Practicum Student

- Individual therapy on an inpatient unit for adults with severe mental illness (i.e., Schizophrenia, Major Depressive Disorder, Bipolar Disorder, etc.)
- Co-led following groups: Mood Management, Living with Depression and Bipolar Disorder, and Stress and Relaxation
- Worked within a multidisciplinary treatment team setting

June 2007 – August 2007 **NISAN Psychological Clinic, Istanbul, Turkey**
Volunteer

- Provided psychoeducation to families on how to be more involved in their children's lives
- Interacted with clients in the play room while their parents were being interviewed by the psychologist

PEER REVIEWED PUBLICATIONS

1. Dir, A. L., **Coskunpinar, A.**, & Cyders, M. A. (in press). A meta-analytic review of the relationship between impulsivity and risky sexual behavior in adolescents across age, gender, and race. *Clinical Psychology Review, 34*(7), 551-562. doi:10.1016/j.cpr.2014.08.004

2. Cyders, M. A., Dzemidzic, M., Eiler, W. J., **Coskunpinar, A.**, Karyadi, K. A., & Kareken, D. A. (2014). Negative urgency mediates the relationship between amygdala and orbitofrontal cortex activation to negative emotional stimuli and general risk-taking. *Cerebral Cortex*. doi:10.1093/cercor/bhu123

3. Cyders, M. A., Dzemidzic, M., Eiler, W. J., **Coskunpinar, A.**, Karyadi, K. A., & Kareken, D. A. (2014). Negative urgency and ventromedial prefrontal cortex responses to alcohol cues: fMRI evidence of emotion-based impulsivity. *Alcoholism: Clinical and Experimental Research, 38*, 409-417. doi:10.1111/acer.12266

4. **Coskunpinar, A.** & Cyders, M. A. (2013). Impulsivity and substance-related attentional bias: A meta-analytic review. *Drug and Alcohol Dependence, 133*, 1-14 doi:10.1016/j.drugalcdep.2013.05.008

5. **Coskunpinar, A.**, Dir, A. L., & Cyders, M. A. (2013). Multidimensionality in impulsivity and alcohol use: A meta-analysis using the UPPS model of impulsivity. *Alcoholism: Clinical and Experimental Research, 37*, 1441-1450. doi:10.1111/acer.12131

6. **Coskunpinar, A.**, Dir, A. L., Karyadi, K. A., Koo, C.S., & Cyders, M. A. (2013). Mechanisms underlying the relationship between negative affectivity and problematic alcohol use. *Journal of Experimental Psychopathology, 4*, 263-278. doi:10.5127/jep.029612

7. Dir, A. L., **Coskunpinar, A.**, Steiner, J. L. & Cyders, M. A. (2013). Understanding differences in sexting behaviors across gender, relationship status, and sexual identity and the role of socially-learned sexing expectancies in sexting. *Cyber Psychology, 16*, 568-574. doi:10.1111/acer.12131

8. Dir, A. L., Cyders, M. A., & **Coskunpinar, A.** (2013). From the bar to the bed via mobile phone: Relationships among problematic alcohol use, sexting, impulsivity-related traits, and sexual hookups in a college sample. *Computers in Human Behavior, 29*, 1664-1670. doi:10.1016/j.chb.2013.01.039

9. Karyadi, K. A., **Coskunpinar, A.**, Dir, A. L. & Cyders, M. A. (2013). The interactive effects of affect lability, urgency, and sensation seeking on young adult problematic drinking. *Journal of Addiction*. doi:10.1155/2013/636854

10. **Coskunpinar, A.,** & Cyders, M. A. (2012). Mediation-Moderation analysis of problematic alcohol use: The roles of drinking motives, urgency, and risk/benefit perception. *Addictive Behaviors, 37*, 880-883. doi:10.1016/j.addbeh.2012.03.014

11. Cyders, M. A., & **Coskunpinar, A.** (2011). Depression, impulsivity and health-related disability: A moderated mediation analysis. *Journal of Research in Personality, 45*, 679-682. doi:10.1016/j.jrp.2011.08.005

12. Cyders, M. A. & **Coskunpinar, A.** (2011). Measurement of constructs using self-report and behavioral lab tasks: Is there overlap in nomothetic span and construct representation for impulsivity? *Clinical Psychology Review, 31*, 965-982. doi:10.1016/j.cpr.2011.06.001

13. Cyders, M. A. & **Coskunpinar, A.** (2011). The relationship between self-report and lab task conceptualizations of impulsivity. *Journal of Research in Personality, 46*, 121-124. doi:10.1016/j.jrp.2011.11.005

14. Cyders, M. A. & **Coskunpinar, A.** (2010). Is urgency emotionality? Separating urgent behaviors from effects of emotional experiences. *Personality and Individual Differences, 48*, 839-844. doi:10.1016/j.paid.2010.02.009

BOOK CHAPTERS

1. Cyders, M. A., **Coskunpinar, A.**, & VanderVeen, D. J. (in press). Urgency – A common transdiagnostic endophenotype for maladaptive risk-taking. In V. Zeigler-Hill & D. K. Marcus (Eds.), *The Dark Side of Personality* (pp. XX-XX). American Psychological Association.

2. Karyadi, K. A., **Coskunpinar, A**., Entezari, A., Long, C., & Cyders, M. A. (2013). Understanding the high co-prevalence of problematic eating and drinking. In S. B. Harris (Ed.), *Binge Eating and Binge Drinking: Psychological, Social and Medical Implications* (pp. 97-126). New York: Nova Science Publishers.

3. Cyders, M. A., **Coskunpinar, A.**, & Lehman, Z. A. (2012). Difficulties and advancements in the assessment and induction of emotion-based impulsivity: Development of the three-task procedure. In M. A. Cyders (Ed.), *Psychology of Impulsivity* (pp. 237-258). New York: Nova Science Publishers.

4. Karyadi, K. A., **Coskunpinar, A.**, & Cyders, M. A. (2012). Understanding the neurobiological underpinnings of impulsivity traits. In M. A. Cyders (Ed.), *Psychology of Impulsivity* (pp. 97-110). New York: Nova Science Publishers.

5. **Coskunpinar, A.**, Lehman, Z. A., & Cyders, M. A. (2011). Underlying common processes of drug consumption. In L. V. Berhardt (Ed.), *Advances in Medicine and Biology* (pp. 169-187). New York: Nova Science Publishers.

6. Cyders, M. A., & **Coskunpinar, A.** (2011). Advances in the study of emotion-based processes: Implications for research methods and theory. In A. M. Columbus (Ed.), *Advances in Psychology Research* (pp. 75-96). New York: Nova Science Publishers.

PUBLISHED ABSTRACTS

1. **Coskunpinar, A.**, & Cyders, M. A. (2013). Differential relationships between impulsivity-related traits and substance-related attentional biases. *Alcoholism: Clinical and Experimental Research, 37*, 39A.

2. Cyders, M. A., Dzemedzic, M., Eiler, W. J. A., **Coskunpinar, A.**, Karyadi, K. A., & Kareken, D. (2013). Negative urgency and ventromedial prefrontal cortex responses to alcohol cues: fMRI evidence of emotion-based impulsivity. *Alcoholism: Clinical and Experimental Research, 37*, 211A.

3. Dir, A. L., Cyders, M. A., & **Coskunpinar, A.** (2013). From the bar to the bed via mobile phone: A first test of the role of problematic alcohol use, sexting, and impulsivity-related traits in sexual hookups. *Alcoholism: Clinical and Experimental Research, 37*, 44A.

4. **Coskunpinar, A.**, Dir, A., & Cyders, M. A. (2012). Multidimensionality in impulsivity and alcohol use: From small to robust effect sizes. *Alcoholism: Clinical and Experimental Research, 36*, 53A.

5. **Coskunpinar, A.**, & Cyders, M. A. (2011). Moderation effect of benefit perception in the urgency-alcohol use relationship. *Alcoholism: Clinical and Experimental Research, 35,* 165A. doi:10.1111/j.1530-0277.2011.01497.x

6. Dir, A., Cyders, M. A., & **Coskunpinar, A.** (2011). The relationship between alcohol consumption, sexting, and impulsivity, and its prevalence in a college sample. *Alcoholism: Clinical and Experimental Research, 35,* 223A. doi: 10.1111/j.1530-0277.2011.01497.x

7. **Coskunpinar, A.**, & Cyders, M. A. (2010). Role of alcohol as the mediator in emotion based health outcomes. *Alcoholism: Clinical and Experimental Research, 34*, 55A. doi:10.1111/j.1530-0277.2010.01210.x

UNPUBLISHED TECHNICAL REPORT

Coskunpinar, A. (2011). The creation and validation of the Activation-Valence Affective Traits Survey
(AVATS). Unpublished technical report.

INVITED PRESENTATIONS

1. **Coskunpinar, A.** (2013, October). Introduction to Conducting Meta-Analysis. Invited presentation given to the Clinical Psychology Department, IUPUI.

2. **Coskunpinar, A.** (2012, March). The Case of Sally: Differentiating between different types of Dementia: Case presentation given to the Clinical Psychology Department, IUPUI.

3. Dir, A. L., **Coskunpinar, A.**, & Cyders, M. A. (2011, September). Unidimensionality of impulsivity and alcohol use: Clearing up the confusion with meta-analysis: Invited presentation given to the Psychobiology of Addictions Colloquium Series, IUPUI, Indianapolis, IN.

4. **Coskunpinar, A.** (2011, October). Multidimensionality in impulsivity and alcohol use: From small to robust effect sizes: Research presentation given to the Clinical Psychology, IUPUI.

POSTER PRESENTATIONS

1. **Coskunpinar, A.**, Novitski, J., Flannery, J., Henkle, L., & Musil, S. (2015, February). MMPI-2 profiles in an academic medical center: The defended and the defenseless. To be presented at the International Neuropsychological Society, Denver, CO.

2. **Coskunpinar, A.**, Belkin, T., Gao, S., Hake, A. M., Kareken, D. A., Lane, K., Moser, L. R., Callahan, C. M., Hendrie, H. C., & Unverzagt, F. W. (2014, March). MCI in an urban primary care environment. Presented at the Indiana Alzheimer Disease Center's 2014 Scientific Symposium on Alzheimer Disease: Early Detection and Intervention, Indianapolis, IN.

3. **Coskunpinar, A.**, & Cyders, M. A. (2014, March). Differential relationships between impulsivity-related traits and substance-related attentional biases. Presented at the Indiana Psychological Association Annual Conference, Indianapolis, IN.

4. **Coskunpinar, A.**, Belkin, T., Gao, S., Hake, A. M., Kareken, D. A., Lane, K., Moser, L. R., Callahan, C. M., Hendrie, H. C., & Unverzagt, F. W. (2013, November). MCI in an urban primary care environment. Presented at the Indiana Psychological Association 2013 Fall Conference, Indianapolis, IN.

5. **Coskunpinar, A.**, & Cyders, M. A. (2013, November). Differential relationships between impulsivity-related traits and substance-related attentional biases. Presented at the Indiana Psychological Association 2013 Fall Conference, Indianapolis, IN.

6. **Coskunpinar, A.**, Belkin, T., Gao, S., Hake, A. M., Kareken, D. A., Lane, K., Moser, L. R., Callahan, C. M., Hendrie, H. C., & Unverzagt, F. W. (2013, May). MCI in an urban primary care environment. Presented at the American Academy of Clinical Neuropsychology Annual Conference, Chicago, IL.

7. **Coskunpinar, A.**, Dir, A. L., Karyadi, K. A., Koo, C. S., & Cyders, M. A. (2013, April). Mechanisms underlying the relationship between negative affectivity and problematic alcohol use. Paper presented at IUPUI's annual Research Day, Indianapolis, IN.

8. Dir, A. L., **Coskunpinar, A.**, & Cyders, M. A. (2012, April). Sexting behaviors, alcohol use, and impulsivity. Paper presented at IUPUI's annual Research Day, Indianapolis, IN.

9. **Coskunpinar, A.**, & Cyders, M. A. (2012, April). Measurement of constructs using self-report and behavioral lab tasks. Presented at the IUPUI Research Day, Indianapolis, IN.

10. **Coskunpinar, A.**, & Cyders, M. A. (2012, February). Role of alcohol as the mediator in emotion based health outcomes. Presented at the Guze Symposium on Alcoholism, St. Louis, MO.

11. Karyadi, K. A., **Coskunpinar, A.**, & Cyders, M. A. (2011, October). The neural correlates of emotion regulation and urgency. Presented at the annual meeting of the Indianapolis Society for Neuroscience, Indianapolis, IN.

12. Spencer, B., **Coskunpinar, A.**, & Cyders, M. A. (2011, April). The role of impulsivity and triggers in exercise dependence. Paper presented at IUPUI's annual Research Day, Indianapolis, IN.

13. **Coskunpinar, A.**, & Cyders, M. A. (2011, April). Moderated-mediation model of personality and alcohol. Presented at the IUPUI Research Day, Indianapolis, IN.

14. **Coskunpinar, A.**, & Cyders, M. A. (2011, May). Perception of risk and benefit in urgency. Presented at the Midwestern Psychological Association Annual Conference, Chicago, IL.

15. **Coskunpinar, A.**, & Cyders, M. A. (2011, February). Moderated-mediation model of personality and alcohol. Presented at the Guze Symposium on Alcoholism, St. Louis, MO.

16. **Coskunpinar, A.**, & Cyders, M. A. (2010, August). Is urgency emotionality? Separating urgent behaviors from effects of emotional experiences. Presented at the American Psychological Association Annual Convention, San Diego, CA.

17. **Coskunpinar, A.**, & Cyders, M. A. (2010, February). Mediational role of motives in the relationship between urgency and alcohol. Poster presented at the Guze Symposium on Alcoholism, St. Louis, MO.

18. **Coskunpinar, A.**, & Davis, M. C. (2009, April). Psychological health of parents of **c**hildren with Autism Spectrum Disorders. Paper presented at the annual meeting of the Butler Undergraduate Research Conference, Butler, IN.

RESEARCH EXPERIENCES/TRAINING

August 2009 – Spring 2014 **Research Assistant**
Department of Psychology, IUPUI
Impulsivity Neuroscience Laboratory
Chair: Melissa A. Cyders, Ph.D.

- Dissertation Research
- Preliminary Examination Research
- Master's Thesis Research

August 2012 **Research Coordinator Education Program**
Center for Professional Development and Lifelong Learning
Indiana University School of Nursing and School of Medicine

August 2011 – August 2012 **Research Coordinator**
Mentored Career Development Award (K01AA020102),
National Institute on Alcohol Abuse and Alcoholism
Analysis of emotion-based alcohol consumption using fMRI and experimental paradigms: A career development proposal
$757,381 direct costs
Principle Investigator: Melissa A. Cyders, Ph.D.

- Organized and coordinated participant recruitment. Performed phone and in-person screenings, and fMRI setup prior and post each participant. Served as part of the publication team and contributed to manuscripts of research reports

August 2010 – August 2011 **Research Coordinator**
HRSA-10-175 American Recovery and Reinvestment Act
Equipment to Enhance Training for Health Professionals (EETHP) – Graduate Psychology Education (D76HP20905)
U.S. Department of Health and Human Services, Health Resource and Services Administration
Enhancement of Clinical Health Psychology professions via training in non-self report methods of data collection
$56,003 direct costs
Principle Investigator: Melissa A. Cyders, Ph.D.

- Programmed E-Prime and Dasylab software for use in this study. Coordinated data collection and participant recruitment. Trained other graduate students in how to use the equipment and conduct data collection. Performed analyses on the collected data

August 2010 **Grant Writing Workshop**
American Psychological Association Annual Convention
San Diego, CA

June 2010 **Grant Writing Workshop**
Alcoholism: Clinical and Experimental Research Annual Conference
San Antonio, TX

August 2008 – May 2009 **Department of Psychology, Hanover College**
Chair: John H. Krantz, Ph.D.
- Honor's Thesis Research

May 2008 – August 2008 **Counseling Center, Pace University**
Supervisor: Richard N. Shadick, Ph.D.
- Summer Research Assistant: Worked as a research assistant to Clinical Psychology pre-doctoral interns and faculty. I participated in consultation and outreach program development, clinical services training, as well as data entry, data checking. I also participated in weekly lab meetings, daily classes on topics such as applying to graduate school, research methods, and therapy techniques.

GRANTS AND TRAVEL AWARDS

2014 **Travel Grant**
School of Science Graduate Student Counsel, IUPUI, $500

2013 **Diversity Scholarship**
American Academy of Clinical Neuropsychology, $500 for attendance to annual conference

2013 **Travel Grant**
School of Science Graduate Student Counsel, IUPUI, $600

2010 – 2013 **Student Merit Award**
Research Society on Alcoholism, $1085 for attendance to annual conference

2010 – 2013 **Educational Enhancement Grant**
Graduate Student Organization, IUPUI, $2000

2010 – 2012 **Guze Symposium Meeting Award**
Midwest Alcohol Research Center (AA013717), $1300 for attendance to annual conference

2011 **Diversity Travel Award**
Midwestern Psychological Association, $100 for attendance to annual Conference

2010 **Student Travel Award**
American Psychological Association, $400 for attendance to annual conference

LEADERSHIP/PROFESSIONAL SERVICE

2012 - Present Ad Hoc reviewer
- *Addictive Behaviors, Appetite, Drug and Alcohol Dependence, Journal of Anxiety Disorders, Journal of Behavioral Addictions, Journal of Experimental Social Psychology, Journal of Personality and Individual Differences, Journal of Psychoeducational Assessment, Journal of Research in Personality, Journal of Studies on Alcohol and Drugs, PLOS ONE, Psychopharmacology*

2011 – 2012 Student Representative, Clinical Psychology, IUPUI

2010 – 2012 State Advocacy Coordinator, American Psychological Association of Graduate Studies (APAGS)

2009 – 2010 Campus Representative, APAGS

2008 – 2009 President, Mortar Board National Honor Society, Hanover College

PROFESSIONAL MEMBERSHIPS

2013 – Present American Academy of Clinical Neuropsychology, Student Affiliate

2011 – Present Indiana Psychological Association, Student Affiliate

2010 – Present Midwestern Psychological Association, Student Affiliate

2009 – Present Research Society on Alcoholism, Student Affiliate

2009 – Present American Psychological Association, Student Affiliate

CLINICAL TRAINING WORKSHOPS

Fall 2009 – Spring 2014 **ProSeminar on Professional Issues in Clinical Psychology**
Department of Psychology, IUPUI

April 2013 **Self-Hypnosis Training for Chronic Pain Management**
- Mark P. Jensen, Ph.D., Associate Professor of Rehabilitation Science, University of Washington

April 2011 **Group Schema Therapy for Borderline Personality Disorder Clinical Training Workshop**
- Joan Farrell, Ph.D., Indiana University School of Medicine, Department of Psychiatry and Training Director of the Center for BPD Treatment & Research

April 2010 **Evidence-Based Practice Clinical Training Workshop**
- Barbara Walker, Ph.D., Indiana University – Bloomington

PEER SUPERVISION

2013 Ruth L. Firmin
- Provided weekly clinical peer supervision to a graduate-level student during their Neuropsychology practicum placement

2012 – 2013 Nicole A. Hollingshead
- Provided bi-weekly clinical peer supervision to a graduate-level student during their first practicum placement

2012 – 2013 Rebecca N. Adams
- Provided weekly clinical peer supervision to a graduate-level student during their Neuropsychology practicum placement

2010 – 2011 Bethany Spencer
- Supervised honor's thesis: The Role of Impulsivity and Triggers in Exercise Dependence

TRAINING IN CLINICAL SUPERVISION/CONSULTATION and DIVERSITY

Fall 2013 **Infusing Diversity into Teaching**
Leslie Ashburn-Nardo, Ph.D., Associate Professor of Psychology, IUPUI

Fall 2013 **Consultation Seminar**
Susan Hickman, Ph.D., Associate Professor, School of Nursing, IUPUI

Fall 2010 – Summer 2013 **Metasupervision**
Department of Psychology, IUPUI
Supervisor: John C. Guare, Ph.D., HSPP

January 2013 **Consultation Liaison Supervision Training Workshop**
Angie Rollins, Ph.D., Research Director, ACT Center of Indiana

October 2011 **Clinical Supervision Training Workshop**
Julie Lash, Ph.D., Director, Counseling and Psychological Services, IUPUI

Consultation, COMPASS Model, Clinical Supervision Training Workshop
Lisa Ruble, Ph.D., Associate Professor of School Psychology, University of Kentucky

TEACHING EXPERIENCE

Summer 2012 – Spring 2014 **Instructor**
B370: Undergraduate Social Psychology course, Department of Psychology, IUPUI

Summer 2014 **Teaching Assistant**
B201: Foundations of Neuroscience course, Department of Psychology, IUPUI

Summer 2011 & Spring 2014 **Teaching Assistant**
*B370: Undergraduate Social Psychology course***,** Department of Psychology, IUPUI

Summer 2013 **Teaching Assistant**
B310: Life Span Development, Department of Psychology, IUPUI

Summer 2011 **Seminar in Teaching Psychology**

Summer 2011 **Teaching Assistant**
B105: Psychology as a Biological Science, Department of Psychology, IUPUI

Spring 2010	**Teaching Assistant** *B433: Capstone Lab in Psychology*, Department of Psychology, IUPUI
Fall 2009	**Teaching Assistant** *B346: Theories of Personality*, Department of Psychology, IUPUI
Fall 2009	**Teaching Assistant** *Psychology of Addiction*, Department of Psychology, IUPUI