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Randomized controlled trial of attention bias modification in a racially diverse, socially anxious, alcohol dependent sample

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ABSTRACT

Objective: Attention biases may be an important treatment target for both alcohol dependence and social anxiety. This is the first ABM trial to investigate two (vs. one) targets of attention bias within a sample with co-occurring symptoms of social anxiety and alcohol dependence. Additionally, we used trial-level bias scores (TL-BS) to capture the phenomena of attention bias in a more ecologically valid, dynamic way compared to traditional attention bias scores.
Method: Adult participants (N = 86; 41% Female; 52% African American; 40% White) with elevated social anxiety symptoms and alcohol dependence were randomly assigned to an 8-session training condition in this 2 (Social Anxiety ABM vs. Social Anxiety Control) by 2 (Alcohol ABM vs. Alcohol Control) design. Symptoms of social anxiety, alcohol dependence, and attention bias were assessed across time.
Results: Multilevel models estimated the trajectories for each measure within individuals, and tested whether these trajectories differed according to the randomized training conditions. Across time, there were significant or trending decreases in all attention TL-BS parameters (but not traditional attention bias scores) and most symptom measures. However, there were not significant differences in the trajectories of change between any ABM and control conditions for any symptom measures.
Conclusions: These findings add to previous evidence questioning the robustness of ABM and point to the need to extend the effects of ABM to samples that are racially diverse and/or have co-occurring psychopathology. The results also illustrate the potential importance of calculating trial-level attention bias scores rather than only including traditional bias scores.

Alcohol Use Disorders (AUDs) and Social Anxiety Disorder (SAD) are impairing conditions, which are associated with a range of problematic outcomes (APA, 2013). AUDs represent a heterogeneous group of problems associated with maladaptive alcohol use (McCrady, 2008), and SAD is characterized by extreme fear and/or avoidance of social situations (APA, 2013). Lifetime prevalence rates for both disorders are high, with a 12.1% lifetime prevalence rate for social phobia, and an 18.6% lifetime prevalence rate for alcohol abuse and dependence combined (Kessler et al., 2005). Further, epidemiological research suggests that AUD and SAD commonly co-occur (Grant et al., 2004; Schneier et al., 2010), potentially because socially anxious individuals use alcohol to manage physiological arousal and fears of negative evaluation, to enhance positive affect, and/or to facilitate more positive social interactions or greater social avoidance (Buckner, Heimberg, Ecker, & Vinci, 2013). In spite of these common and significantly overlapping problems, insight into the mechanisms linking alcohol dependence and social anxiety symptoms is minimal, and there are not well-established treatment guidelines for this population (see Randall, Thomas, & Thevos, 2001; Thomas, Randall, Book, & Randall, 2008).

1. Attention bias in alcohol use and social anxiety

Attention bias, the tendency to preferentially allocate attention

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toward or experience difficulty disengaging attention from problem-relevant cues, may confer an underlying vulnerability for both AUDs (Field & Cox, 2008; Wiers et al., 2006) and social anxiety disorder (Bögels & Mansell, 2004), as well as symptoms associated with both disorders. First, theory and empirical evidence suggests that attention bias for alcohol cues is associated with symptoms of AUDs (for a review, see Field & Cox, 2008). For instance, lower alcohol attention bias predicts long-term reductions in frequency of alcohol use among heavy drinkers (Cox, Pothos, & Hosier, 2007), and increased attention bias toward alcohol cues predicts poorer treatment outcome among individuals diagnosed with alcohol abuse (Cox, Hogan, Kristian, & Race, 2002). Stronger alcohol attention bias tied to the initial orienting of attention is also associated with greater addiction severity (Nöel et al., 2006), and a meta-analysis indicated there is a significant (albeit small) positive relationship between strength of alcohol attention bias and self-reported craving (Field, Munafò, & Franken, 2009). Moving beyond correlational studies, Field and Eastwood (2005) demonstrated that among heavy social drinkers, individuals who had been trained to attend toward alcohol-relevant cues consumed more beer during a post-training taste test. Such experimental findings suggest that attention bias may play a causal role in the maintenance of AUDs, although more research is needed.

Similarly, empirical evidence suggests that symptoms of social anxiety disorder are associated with biases in attention, at least in certain contexts (Bögels & Mansell, 2004). For example, Pishyar, Harris, and Menzies (2004) found that individuals with high (vs. low) social anxiety symptoms showed an attention bias toward threatening faces, but not toward socially threatening words. In comparison to healthy control participants, individuals diagnosed with SAD showed a bias toward threatening cues at shorter (500 ms), but not longer (1250 ms), durations (Mogg, Bradley, & Philippot, 2004). Finally, in meta-analytic reviews, there is support for an attention bias toward threat broadly in anxiety, as well as specifically within SAD (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van IJzendoorn, 2007).

Although a full review is beyond the scope of this paper, research suggests that there may be critical differences in the initial *shifting* or orienting of attention toward threatening stimuli (typically assessed with exposure durations from 50 to 200 ms), and the *maintenance* or *disengagement* of attention from threatening stimuli (typically assessed with exposure durations above 500 ms; Field & Cox, 2008). In the context of addictions, on the one hand, meta-analytic work suggests that there may be a marginally significant effect ($p = 0.10$) for a larger relation between greater craving and attentional bias when measures of disengagement are used, as compared to when measures of initial orienting are used (Field et al., 2009). On the other hand, although most studies using the visual probe task have found the anticipated bias *toward* substance-relevant stimuli, there is some evidence that individuals with alcohol dependence who are in treatment show a bias *away* from alcohol-relevant cues at longer stimuli exposure durations (Field et al., 2009). There is also evidence that biases toward threatening information among socially anxious individuals may be reduced as stimulus exposure increases (Bögels & Mansell, 2004).

2. Linking attention bias in alcohol dependence and social anxiety

The Avoidance-Coping Cognitive (ACC) model highlights the importance of attention bias to help explain why socially anxious individuals may be particularly susceptible to alcohol problems (Bacon & Ham, 2010). Alcohol use may be reinforcing insofar as it reduces the salience of socially threatening cues. For individuals with social anxiety, this model predicts that the more one drinks, the less pronounced attention bias toward social threat will become. That is, individuals with social anxiety may engage in maladaptive coping strategies (e.g., excessive drinking) to alleviate attention toward socially threatening cues (e.g., negative facial expressions), which minimizes social anxiety symptoms in the short term. Guided by this theory, learning to reduce attention bias toward social threat may lead to reductions in alcohol use and social anxiety symptoms (Bacon & Ham, 2010).

The ACC model is supported by research findings that individuals with social anxiety demonstrated an attention bias toward angry faces when sober, but not after drinking alcohol (Stevens, Rist, & Gerlach, 2009). Thus, alcohol use may weaken the impact of attention bias toward social threat. Results from a different study indicated that individuals with social anxiety were less likely to perceive angry faces as rejecting following the consumption of alcohol, further strengthening the argument that heavy drinking may be negatively reinforcing for people with social anxiety (Stevens, Gerlach, & Rist, 2008).

3. Attention bias modification

Attention Bias Modification (ABM) procedures attempt to directly modify attention bias, typically via repetitive computerized tasks. This approach is based on the pioneering work of MacLeod, Rutherford, Campbell, Ebsworthy, &, Holker (2002), who first tested whether experimentally manipulating attention via a modified dot probe task was associated with later emotional vulnerability. Since then, a number of studies have tested ABM in the context of social anxiety (e.g., Amir et al., 2009; Carlbring et al., 2012; Schmidt, Richey, Buckner, & Timpano, 2009) and alcohol use (e.g., Fadardi & Cox, 2009; Schoenmakers et al., 2010).

In initial demonstrations of the clinical utility of ABM, patients with social anxiety disorder who were trained to disengage their attention from socially threatening cues had significant reductions in social anxiety post-training compared to controls (Amir et al., 2009; Schmidt, Richey, Timpano, & Buckner, 2009). In both of these studies, participants completed eight training sessions that were administered over a 4-week period. Training consisted of a visual probe task that used faces presented for 500 ms, followed by a probe (either the letter E or F). Of note, Amir et al. (2009) found that attention training led to greater attentional disengagement from threat (stimuli were presented for 600 ms). Meta-analytic work has also provided support for the clinical utility of ABM for anxiety generally (see Bar-Haim, 2010; Beard, Sawyer, & Hofmann, 2012; Hakamata et al., 2010), as well as symptoms of social anxiety more specifically (Mogoaşe, David, & Koster, 2014).

Although fewer studies have tested ABM in AUDs, there are some promising findings in support of the model. One study evaluated the clinical utility of ABM among patients with alcohol dependence who were being treated with cognitive behavioral therapy (Schoenmakers et al., 2010). This study used a visual probe task consisting of 5 sessions, and used pictures of alcohol (as compared to neutral pictures). Training targeted both the speeded detection of alcohol cues (displaying stimuli for 200 ms), as well as difficulty disengaging from alcohol cues (displaying stimuli for 500 ms). Of note, rather than using a standard control condition in which probes were equally divided across alcohol vs. neutral stimuli, the control condition used in this study was a categorization task, similar in design to the Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998). Results indicated that it was possible to train patients to disengage their attention from alcohol-relevant cues, although training did not influence speeded detection. Patients in the experimental condition (vs. a control condition) were discharged from treatment earlier and maintained abstinence an average of 1.25 months longer after treatment.