



Influence of alcohol on social anxiety: An investigation of attentional, physiological and behavioral effects



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ABSTRACT

Social anxiety disorder and alcohol use disorders are highly comorbid. It remains unclear, however, if and how alcohol influences attentional processes and physical symptoms in social anxiety. In a balanced-placebo-design, high and normally socially anxious participants gave a speech while performing a task, which simultaneously measures internal and external attention. Only high anxious participants showed a preferential processing of external probes, which was eliminated by alcohol or the mere expectation of drinking alcohol. Furthermore, alcohol reduced facial blushing as well as self-reported social anxiety during public speaking. Decreases in anxiety were significantly associated with a reduction of the external focus in the high anxious group. Understanding alcohol as a substance influencing cognitive processes as well as physiological symptoms of anxiety further contributes to our understanding of alcohol use as a safety behavior in social anxiety disorder.

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1. Introduction

Social anxiety disorder (SAD) and alcohol use disorders (AUDs) are highly comorbid (e.g., Davidson, Hughes, George, & Blazer, 1993; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Compared to the prevalence of alcohol abuse (12.2%) and alcohol dependence (5.4%) in the general population (Kessler et al., 2005), almost half (48.2%) of individuals with SAD also meet the criteria of an AUD (Grant et al., 2005). Individuals with subclinical social anxiety as well as those with clinical social anxiety have an increased risk of an AUD compared to the general population (Buckner & Schmidt, 2009; Buckner et al., 2008; Crum & Pratt, 2001). Symptoms of social anxiety often predate AUDs by several years (Buckner & Turner, 2009; Schneier et al., 2010). Therefore, social anxiety may serve as a risk factor for AUDs (Buckner & Schmidt, 2009) and alcohol-related problems (Buckner, Schmidt, Bobadilla, & Taylor, 2006; Gilles, Turk, & Fresco, 2006).

The most influential cognitive models of social anxiety disorder highlight the crucial role of attentional processes in the development and maintenance of social anxiety. It is suggested that social anxiety develops if a person is motivated to make a specific

impression on an audience or in a social interaction, but doubts that he or she may succeed (Leary & Kowalski, 1995). According to these models, the internal image of one's public self plays a key role when trying to understand why somebody is socially anxious. The models by Clark and Wells (1995) or Rapee and Heimberg (1997) suggest that internal, i.e., interoceptive, but also external information is used to mentally conceptualize how one is perceived by others in a social situation. Dysfunctional processing of both types of stimuli has indeed repeatedly been shown to contribute to social anxiety (for reviews see Bögels & Mansell, 2004; Schultz & Heimberg, 2008). It remains unclear, however, if and how alcohol influences such internal or external attentional processes and what exactly the effects of alcohol are with regard to social anxiety. Improving our understanding of these effects may hold the key to prevent or treat comorbid social anxiety disorder and alcohol abuse more effectively.

Various theories have been proposed to account for the relationship between anxiety and hazardous alcohol consumption and therefore may help to explain the link between SAD and AUDs. Early theories postulated an increased use of alcohol due to negative reinforcement since alcohol alleviates anxiety symptoms (Conger, 1956; Khantzian, 1985). The "Self-Awareness Model" of alcohol use (SAM; Hull, 1981) states that alcohol interferes with the encoding of self-relevant information, leading to a decrease in self-awareness. The "Attention-Allocation Model" (AAM; Steele & Josephs, 1988) proposes that alcohol limits the perceptual capacity of the individual and therefore limits the individuals attentional focus to the

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most salient cue in a situation. Finally, the most recent theories postulate a disruption of anxious appraisal of threatening stimuli by alcohol, leading to a decrease of the activation of threat-related memory networks (Sayette, 1993). In line with the ideas of Sayette, Bacon and Ham (2010) present their Avoidance-Coping Cognitive Model proposing attention to social threat as a possible vulnerability factor for AUD in individuals with social anxiety. The model suggests that individuals with social anxiety might be particularly prone to the anxiolytic effects of alcohol because alcohol consumption reduces or even eliminates attentional biases to social threat stimuli.

Unfortunately, experimental investigations of the effects of alcohol on attentional processes in social anxiety are rare. In a sample of individuals with social anxiety disorder, alcohol reduced the implicit memory bias for social threat words but did not alter attentional processing in an emotional stroop paradigm (Gerlach, Schiller, Wild, & Rist, 2006). Stevens et al. (2009) used a dot-probe task to measure the effect of alcohol on attentional biases to threatening faces in individuals with social anxiety disorder and healthy controls. In this study, alcohol eliminated the attentional bias to angry faces only in the clinical sample. Furthermore, alcohol increased perceived friendliness of angry and neutral facial expressions in both, individuals with social phobia and healthy controls (Stevens, Gerlach, & Rist, 2008). In summary, these studies suggest that alcohol may affect the processing of external social threat and reduce the corresponding attentional bias in socially anxious individuals.

However, two major questions remain: First, cognitive models as mentioned above, particularly the one by Clark and Wells (1995), underscore the importance of self-focused attention and the use of internal information for the formation of a negatively biased self-representation of socially anxious individuals in a social situation. This pivotal role of internal information has been repeatedly shown using different experimental paradigms. For example, socially anxious individuals have a better heartbeat perception (Stevens et al., 2011), react faster to (false) feedback of physiological arousal in a computer task (Mansell, Clark, & Ehlers, 2003), show enhanced early somatosensory event-related potentials to a vibration to the finger signaling physiological changes (Kanai, Nittono, Kubo, Sasaki-Aoki, & Iwanaga, 2012), react faster to arousal-related cues when giving a speech (Deiters, Stevens, Hermann, & Gerlach, 2013), and experience more anxiety when others are made aware of their heart beat (Gerlach, Mourlane, & Rist, 2004). To date, however, it has not been studied whether alcohol can influence biased internal attention and whether alcohol influences external attention compared to internal attention differentially in a typical social situation. Second, although reduced attentional biases have been shown to be associated with lower levels of social anxiety, it has not been investigated whether, concomitant to an alcohol-induced reduction of attentional biases, reduced situational anxiety in an actual social situation can be observed.

In order to test whether alcohol influences internal and external attentional biases in social anxiety, we used a modified version of a dot probe task (compare Deiters et al., 2013) modeled after a computer task first used by Mansell and colleagues (2003). Individuals with either a high or an average level of social anxiety first anticipated and then held a speech in front of an experimenter. Giving a speech is the most common social situation eliciting fear in socially anxious individuals and thus is often used to study this affliction (e.g., Boone et al., 1999; Gerlach, Wilhelm, Gruber, & Roth, 2001). Theoretical models of social anxiety (e.g., Rapee & Heimberg, 1997) suggest that individuals with social anxiety show a bias to stimuli which might signal current or future social threat. As a proxy for internal threat we asked participants to react to a vibration stimulus applied to the nondominant hand that ostensibly signaled physiological arousal as indicated by sweating and increases in heart rate

(internal probe). A flashing light fixated on a headband attached to the experimenters forehead served as a proxy for external threat (external probe). The internal probe was chosen as it has repeatedly been shown that individuals with social anxiety preferentially process their own physical symptoms or signs of arousal, especially those that are potentially visible (e.g., blushing or sweating, compare Deiters et al., 2013). We decided to use the forehead of the experimenter as external probe as the facial region is an important source to detect external signals of social rejection (e.g., Wild, Clark, Ehlers, & McManus, 2008). Indeed, Wieser, Pauli, Alpers, and Muhlberger (2009) found evidence that direct gaze is fear relevant for socially anxious individuals. In consequence, socially anxious individuals are known to avoid direct gaze shifts toward their interactions partners (Weeks, Howell, & Goldin, 2013).

Participants underwent this task either sober (i.e., after drinking orange juice, control condition), or while they expected to receive alcohol but actually drank orange juice (placebo condition), or they actually received alcohol (alcohol condition). In addition, the reaction times to the internal and external probes, self-report anxiety and internal vs. external focus of attention, and physiological activation (heart rate and blushing) were measured. We expected alcohol to eliminate internal and external attentional biases (as measured by self report and the probe task) in the socially anxious individuals, both, in anticipation of and during the speech. Furthermore, alcohol was expected to reduce situational anxiety as assessed by self-report and by autonomic measures as has previously been shown in speech tasks in individuals with social anxiety (Staugaard, 2010) and speech anxiety (Abrams & Kushner, 2004). Finally, we tested whether reaction times to internal and external probes were correlated with the change score of self-report anxiety from baseline to anticipation and speech in the three different drinking conditions.

2. Method

2.1. Participants

Participants were 95 students at the University of Giessen. They had previously filled out several questionnaires including the Social Phobia Scale (SPS; Stangier, Heidenreich, Berardi, Golbs, & Hoyer, 1999) and the Alcohol Use Disorder Identification Test (AUDIT; Rist, Scheuren, Demmel, Hagen, & Aulhorn, 2003) as part of an online survey, in which 2000 first year students had participated. Participants of the online survey were classified as high socially anxious if they scored at least one SD higher than the mean ($M = 12.99$; $SD = 11.17$) of the entire sample on the SPS. If a participant scored between one SD above and below the mean of the entire sample, they were classified as “normally anxious”. One hundred and ninety-eight participants fulfilled the criteria for the high anxious group and 97 of these agreed to participate. The high anxious group was complemented with a group of normally anxious individuals by randomly selecting normally anxious participants matched according to age and education. In order to exclude participants with alcohol abuse or addiction those with a score of six and higher on the AUDIT were interviewed using the section on alcohol use disorders of the German version of the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, 4th version (SCID-I; Wittchen, Wunderlich, Gruschwitz, & Zaudig, 1997). Two participants from the high anxious group were diagnosed with an alcohol use disorder and were consequently excluded from the study. Other exclusion criteria were current use of psychotropic medication or drugs, current psychiatric, psychological or neurological treatment, and heart diseases as assessed by questionnaire. No participant had to be excluded based on these criteria (Table 1).

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