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ORIGINAL INVESTIGATION

Attenuating the alcohol allure: attentional broadening reduces rapid motivational response to alcohol pictures

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Abstract
Rationale Past research has found that exposure to alcohol cues causes a narrowing of attentional scope and enhances the neural responses associated with approach motivation.
Objective The current research sought to determine if a manipulated broadened (global) attentional scope would reduce approach-motivated neural reactivity to alcohol pictures.
Methods In the current study, participants (n = 82) were exposed to alcohol and neutral pictures following either a global or local attentional scope manipulation. Early motivated attentional processing was assessed using the N1 event-related potential (ERP), a neurophysiological marker of rapid motivated attention.
Results A global attentional scope reduced N1 amplitudes to alcohol pictures as compared to a local attentional scope. Self-reported binge drinking related to larger N1 amplitudes to alcohol pictures, but not to neutral pictures. Individuals with greater binge drinking experience demonstrated increased rapid motivated attentional processing to alcohol pictures.
Conclusions These results suggest that enhancing a global (vs. local) attentional scope attenuates rapid motivated attentional processing of alcohol pictures in comparison to neutral pictures.

Keywords Alcohol · Binge drinking · Event-related potential · Approach motivation · Attentional capture

For over half a century, research has found that consumption of alcohol results in attentional narrowing and "short-sighted information processing," called alcohol myopia (pg. 922, Steele and Josephs 1990; Washburne 1956; Moskowitz and DePry 1968; Medina 1970; Steele et al. 1985; MacDonald et al. 2000; Field and Cox 2008). Recent research has demonstrated that this attentional narrowing happens in the absence of alcohol consumption. Exposure to alcohol cues (e.g., pictures of alcohol) can result in a narrowing of attentional scope, termed virtual alcohol myopia (Gable et al. 2016; Hicks et al. 2012). This attentional narrowing to alcohol pictures may help facilitate pursuit and acquisition of the substance.

Alcohol cue-induced narrowing causes one to zero-in on the alcohol cue. The enhanced attentional focus appears to be related to trait approach motivation. Individuals high in state and trait approach motivation have greater attentional narrowing to alcohol pictures (Gable et al. 2016; Hicks et al. 2012). Greater left-frontal activation to alcohol pictures, a neurophysiological correlate of approach motivation and alcohol cue reactivity, relates to greater attentional narrowing (Gable et al. 2016 Alcohol cue reactivity can be defined as physiological and subjective responses evoked from alcohol-related stimuli (Carter and Tiffany 1999). Additionally, past drinking experience enhances attentional bias to alcohol pictures (Hicks et al. 2015; Forestell et al. 2012). It is likely that those with heavier drinking habits experience greater approach motivation to alcohol pictures. This work suggests that approach motivation may be driving a narrowed attentional scope to alcohol pictures. Because of the close link between approach motivation and virtual myopia, manipulating a broadened attentional scope may be one way to reduce approach motivation towards alcohol pictures.

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Approach motivation may enhance virtual alcohol myopia because it enhances cognitive processing of appetitive alcohol pictures. Attentional narrowing, or a local attentional scope, is the restriction of attention causing individuals to focus on specific details of a stimulus compared to the stimulus as a whole. In contrast, attentional broadening, or a global attentional scope, refers to a focus on the stimulus as whole. A conceptual example of attentional scope is "seeing the proverbial forest (global) or the trees (local)". An enhanced narrowed (local) attentional scope towards alcohol pictures may make alcohol more salient and immediate to the organism, thereby increasing the motivation to take action to obtain alcohol. In contrast, reducing this narrowing by manipulating a broadened (global) attentional scope may reduce approach motivation towards alcohol pictures. Because of the strong relationship between approach motivation and virtual alcohol myopia (Gable et al. 2016; Hicks et al. 2012; Hicks et al. 2015), we hypothesize that broadening attention should reduce motivated attentional processing of alcohol pictures. That is, a global attentional scope should reduce the motivated attentional capture of alcohol pictures in comparison to a local attentional scope. The influence of attentional scope on motivated attentional processing should be specific to the approach-motivated pictures, meaning attentional scope should not impact processing of neutral pictures. Along these lines, Gable and Harmon-Jones (2011) found that a global attentional scope reduced early neural responses to appetitive delicious dessert pictures, but not to neutral pictures. Individuals with a global scope demonstrated reduced motivated attentional processing to dessert pictures, suggesting a bi-directional relationship between motivation and broadened attention.

Some past research has found that attentional manipulations towards or away from alcohol cues alter motivational processing of alcohol cues (Field and Cox 2008; Field and Eastwood 2005). This past work has primarily sought to alter motivational processing by directing attention away from alcohol cues or towards non-alcohol cues. Directing attention away from alcohol cues reduces appetitive responses, while directing attention towards alcohol cues increases appetitive responses (Field and Cox 2008; Field and Eastwood 2005). Training problem drinkers to direct attention away from alcohol-related images decreases the inclination to approach alcohol and increases the inclination to avoid alcohol (Lee and Lee 2015). Interventions designed to train heavy drinkers to divert attention away from alcohol cues tend to reduce alcohol consumption (Fadardi and Cox 2009). In sum, diverting attention away from alcohol cues appears to reduce approach behavior.

Past studies examining attention–motivation relationships with alcohol have primarily manipulated attention by either directly increasing or decreasing attention to alcohol cues (Field and Eastwood 2005; Field and Cox 2008; Fadardi and Cox 2009; Lee and Lee 2015). The present research sought to investigate whether attentional scope (not the absence or presence of attention) influences motivational responses to alcohol pictures. Manipulating attentional scope does not direct attention towards or away from alcohol pictures, but instead influences local or global processing of an alcohol picture. A global attentional scope may attenuate the allure of these appetitive features, whereas a local attentional scope may enhance appetitive features related to alcohol pictures.

The impact of motivated attentional processing to alcohol cues occurs rapidly, as measured by early event-related potentials (ERPs; Petit et al. 2014; Dickter et al. 2014). This rapid attentional processing occurs as early as 100 ms after cue onset, as measured by the N1 ERP (Dickter et al. 2014). The N1 is a negative-going wave beginning about 60 ms after stimulus onset and is associated with motivational processes related to attentional capture (Keil et al. 2001) or more focused, detailed processing of stimuli (Vogel and Luck 2000). The N1 is thought to reflect activation of structures involved in motivated attentional processing such as the amygdala (Olofsson et al. 2008) and anterior cingulate cortex (Esposito et al. 2009). The N1 appears to be especially sensitive to highly motivating visual stimuli (Baldauf and Deubel 2009). For example, individuals higher in trait approach motivation demonstrate larger N1 amplitudes to appetitive stimuli (Gable and Harmon-Jones 2012).

Drinking behaviors, such as binge drinking, have been shown to relate to early ERP components to alcohol cues. Binge drinking is defined as consuming large quantities (i.e., over four drinks for females and over five drinks for males) of alcohol during a single drinking episode. Individuals who report binge drinking behaviors demonstrate larger N2 amplitudes during a cognitive matching task in comparison to controls (Crego et al. 2009). Maurage et al. (2012) also found that binge drinkers had reduced N1 and P1 amplitudes in a visual oddball task. These studies suggest that individuals who report binge drinking behaviors show delays or deficits in cognitive processes. The current study will examine N1 and N2 ERP components to alcohol pictures to assess whether alcohol pictures are more salient and motivating to individuals who report more binge drinking. Individuals who report more binge drinking are predicted to have larger N1 amplitudes to alcohol pictures.

Binge drinkers may be lower in alcohol sensitivity. Low alcohol sensitivity, which describes a diminished response to the acute effects of alcohol (intoxication, motor impairment, etc.), has also been found to relate to enhanced early ERP amplitudes (Bartholow et al. 2007; Bartholow et al. 2010). Low alcohol sensitivity is also related to the development of alcohol use disorders and problematic drinking (see Bartholow et al. 2007). Binge drinkers may be less prone to suffer from the negative effects of alcohol consumption (King et al. 2002). Therefore, we hypothesized that binge drinking, but not general alcohol use, would relate to enhanced N1

amplitudes to alcohol cues. For the current study, alcohol use was quantified as the product of two drinking behaviors: frequency of consumption and amount of alcohol consumed (Mechin et al. 2016; Gable et al. 2016; Hicks et al. 2015).

The current study sought to address whether the relationship between virtual alcohol myopia and motivated attentional capture could be bi-directional. That is, would a broadening of attentional scope decrease motivated attentional processing of alcohol pictures? Based on the relationship between attentional narrowing and motivational processing towards alcohol pictures, we predicted that a broadened (global) attentional scope would attenuate rapid motivational processing of alcohol pictures, relative to a narrowed (local) attentional scope. Specifically, a local, compared to a global, attentional scope should enhance N1 amplitudes to alcohol pictures. For highly motivated individuals (i.e., individuals who report higher instances of binge drinking behaviors), the desired aspects of alcohol pictures may be especially salient. Individuals with more past drinking experience (i.e., greater binge drinking behaviors) should show enhanced motivated attentional processing towards alcohol pictures regardless of attentional scope. Specifically, greater past drinking experience should relate to larger N1 amplitudes to alcohol pictures, but not neutral pictures. Although the current research primarily focuses on the N1 ERP component, the P2, N2, and P3 were also investigated based on previous research demonstrating a connection between these components and drinking (Crego et al. 2009; Maurage et al. 2012; Namkoong et al. 2004).

Methods

Eighty-two right-handed participants (49 female, 5 DNI gender) completed the study in return for partial course credit. The average age of the sample was 18.9 years (SD = 1.05). The majority of the sample reported being Caucasian (80.49% Caucasian, 8.54% African American, 3.66% other, 1.22% Asian, 2.44% more than one race, or 3.66% did not indicate).

Narrowed or broadened attentional scope was manipulated using the Navon letters (Navon 1977) in a between-subject design. Prior to exclusionary criteria, 41 participants were assigned to each attentional manipulation condition. This task has been used in past research examining how alcohol and approach motivation influence attentional scope (Gable and Harmon-Jones 2010; Gable et al. 2016; Hicks et al. 2012). In the local scope condition, participants identified the local elements (e.g., small letter T, H, F, and L's) of a Navon letter (see Fig. 1). Using a button box, individuals in the local scope condition pressed one button when the Navon letter consisted of small letter T's or H's and another button when the Navon letter consisted of small letter F's or L's. In the global scope condition, participants identified the global elements (e.g., large letter T, H, F, and L's) of a Navon letter. Individuals in the global condition pressed one button when the Navon letter was a large T or H and another button when the Navon letter was a large F or L. Each Navon letter was followed by an alcohol picture (beer, wine, or liquor) or matched neutral picture (rock).

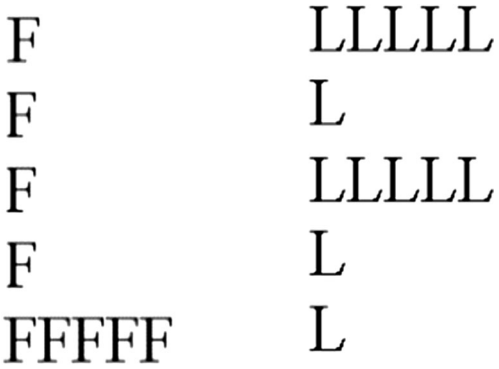

Fig. 1 Navon letter examples: L of T's (*left*) and F of L's (*right*)

The picture stimuli used in this study have been used in a number of previous studies (see Hicks et al. 2012). The alcohol and neutral pictures were matched for color, complexity, and object size to control for perceptual features influencing attention. Additionally, branding information was not visible in the alcohol-related pictures. Each participant completed a total of 64 trials; each trial consisted of the following order: a fixation cross (500 ms), a Navon letter (presented until a response was made), a fixation cross (500 ms), and a neutral or alcohol picture (9 s). An equal number of neutral and alcohol pictures were presented throughout the task. Pictures were presented in a pseudo-random order to ensure one picture type was not presented more than three times in a row.

A small portion of the sample (12.20%) reported abstinence from alcohol. Alcohol abstinence was measured by asking participants "Have you ever had an alcoholic drink?" Participants endorsing "no" on this item were excluded from analyses ($N = 10$) in order to focus on individuals who have previous experience with alcohol consumption and by extension of alcohol-related cues.

In order to calculate the variable alcohol use, participants also reported drinking frequency and amount. Specifically, participants reported the number of drinking episodes in the past month ("During the past month, how many times did you have at least one drink of alcohol?") and the average number of drinks consumed each time they drank ("During the past month, on the days you drank, on average, how many drinks did you have?"; NIAAA, n.d.). Participants reported an average of 4.42 (SD = 5.10) episodes of drinking in the past month and an average of 3.35 (SD = 3.06) drinks each time they drank. In order to assess alcohol use, an index was created by calculating the product of drinking frequency and amount (M = 22.75, SD = 42.212).

In order to measure hazardous drinking habits, participants reported binge drinking episodes over the past month.

Specifically, male participants reported the number of times they had five or more drinks of alcohol at one time and female participants reported the number of times they had four or more drinks of alcohol at one time. This measurement of binge drinking is commonly referred to as the 5/4 definition of binge drinking (NIAAA, n.d.). Following the removal of abstainers, the majority of the sample (56.94%) reported between one and eight instances of binge drinking in the past month (30.55% reported no instances of binge drinking; 5.55% did not respond to this item). A small minority of the sample (6.94%) reported between 15 and 50 episodes of binge drinking per month. Fifteen episodes of binge drinking a month far exceeds standards of heavy drinking (NIAAA, n.d.). Visual and statistical inspection of the data identified these individuals as outliers (>3 SDs from the mean) who would have disproportionately skewed analyses investigating binge drinking. After exclusions, 31 participants were in the attentional narrowing condition and 36 participants in the attentional broadening condition. A t test revealed no significant difference in binge drinking between the two groups, $t(61) = -0.48$, $p = 0.63$. The final sample reported an average of 1.86 binge drinking episodes per month (SD = 2.09).

Electroencephalography (EEG) was recorded during picture presentation using 64 electrodes mounted in a stretch lycra cap (Electro-Caps, Eaton, OH). Electrode impedances were kept under 5 kΩ and within 1 kΩ for homologous pairs. Activity was referenced to the left earlobe with a ground sensor mounted between FPz and Fz. EEG signals were amplified using NeuroScan SynAmps RT amplifier units (El Paso, TX), low-pass filtered at 100 Hz, high-pass filtered at 0.05 Hz, notch filtered at 60 Hz, and digitized at 2 kHZ. All aberrant muscle movements (i.e., horizontal eye movements) were removed by hand before blinks were removed with a regression-based eye movement correction (Semlitsch et al. 1986). Additionally, a visual-based inspection of the data was conducted to ensure proper correction. Data were epoched from 100 ms before picture presentation until 1200 ms after picture onset. Aggregated waveforms were created and visually inspected for the N1 ERP component. Consistent with past studies, the N1 was maximal at midline sites Fz, Fcz, and Cz (Foti et al. 2009; Keil et al. 2001; Plihal et al. 2001). An index was created by averaging the N1s produced at these midline sites in response to alcohol pictures, and another index was created by averaging the N1s produced at these midline sites in response to neutral pictures. Similar to past research, the minimum amplitude was measured within a window of 60–180 ms after picture onset (Gable and Harmon-Jones 2012). The same sites were used to create indexes for the P2 (150–200 ms) and N2 (200–300 ms; see Fig. 2 for ERP waveform). Consistent with past research, P3 amplitudes were examined at posterior midline sites (Cz, CPz, and Pz) in a window of 260–400 ms (Fabiani et al. 2007; Polich 2007). In the local condition, the average number of trials for each participant included in the ERP average was 28 (SD = 10.57) for alcohol pictures and 28.83 (SD = 9.60) for neutral pictures. In the global condition, the average number of trials for each participant included in the ERP average was 27.22 (SD = 11.42) for alcohol pictures and 28.83 (SD = 9.60) for neutral pictures. Due to equipment malfunction during recording, data from seven participants was not available for analyses.

Results

Results revealed a significant 2 (condition: local attention; global attention) × 2 (picture type: alcohol; neutral) interaction for the N1 ERP component, $F(1, 62) = 5.28$, $p = 0.03$, $\eta_p^2 = 0.08$, $n = 72$ (see Fig. 3). There was not a significant main effect of condition, $F(1, 62) = 2.53$, $p = 0.12$. Post hoc analyses demonstrated that N1 amplitudes to alcohol pictures were smaller in the global attentional scope condition (M = −1.63, SD = 1.89) than in the local attentional scope condition (M = −2.85, SD = 2.25, $p = 0.02$). N1 amplitudes to neutral pictures were similar between local (M = −2.53, SD = 1.99) and global scope conditions (M = −2.33, SD = 1.79, $p = 0.68$). Individuals in the global attentional scope condition produced smaller N1 amplitudes to alcohol pictures in comparison to neutral pictures ($p = 0.03$). Individuals in the local attentional scope condition did not differ in N1 amplitudes to neutral or alcohol pictures ($p = 0.32$). These results suggest that having participants identify global Navon letter targets (i.e., encouraging a global attentional scope) attenuates N1 amplitudes to alcohol pictures as compared to neutral pictures.

In order to investigate the impact of hazardous drinking behavior on rapid motivated attentional capture, self-reported binge drinking was correlated with N1 amplitudes. Binge drinking significantly related to larger N1 amplitudes to alcohol pictures ($n = 67$; $r = -0.30$, $p = 0.02$) but not to neutral pictures ($r = -0.02$, $p = 0.89$). Because larger N1 amplitudes are more negative, larger N1 amplitudes and more binge drinking are negatively correlated (see Fig. 4). These results suggest that individuals with greater binge drinking experience demonstrate increased neurological responses to alcohol pictures, but not neutral pictures. The index of alcohol use did not relate to N1 amplitudes to alcohol pictures ($r = 0.03$, $p = .82$) or neutral pictures ($r = -0.05$, $p = 0.66$).

There was also a significant 2 (condition: local attention; global attention) × 2 (picture type: alcohol; neutral) interaction for the N2 ERP component, $F(1, 60) = 4.95$, $p = 0.03$, $\eta_p^2 = 0.08$. Post hoc analyses for these results demonstrated that individuals in the global attentional scope condition produced smaller N2 amplitudes to alcohol pictures (M = −3.06, SD = 3.41) in comparison to neutral pictures (M = −4.85, SD = 2.98, $p = 0.001$). There was no significant difference between the N2 amplitudes to alcohol pictures between local

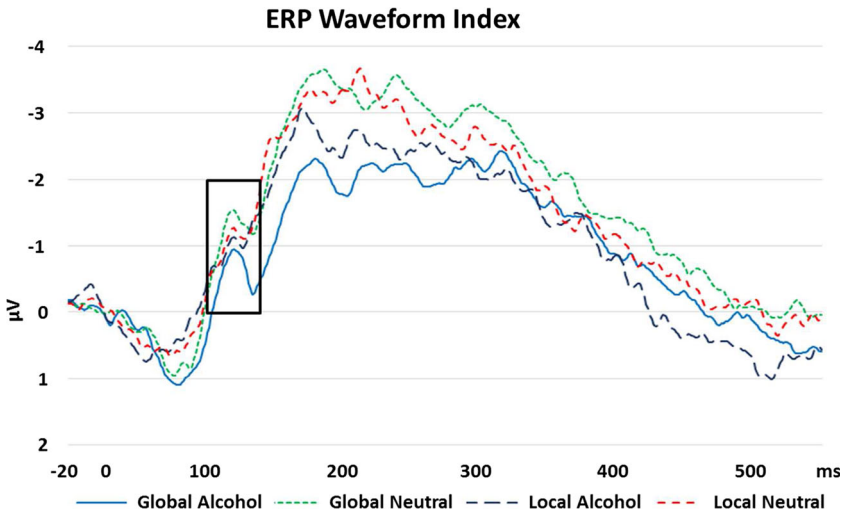

Fig. 2 Waveform (index of sites Fz, FCz, and Cz) demonstrating neural responses to alcohol and neutral pictures. Note: The *black box* indicates the time window of the N1 ERP component

(M = −4.47, SD = 3.95) and global conditions (p = 0.11). N2 amplitudes to neutral pictures were similar between the local (M = −4.56, SD = 3.20) and global conditions (M = −4.85, SD = 2.98, p = 0.74). Individuals in the local condition did not differ in N2 amplitudes to neutral or alcohol pictures (p = 0.88). These results suggest that a global attentional scope attenuates N2 amplitudes to alcohol pictures as compared to neutral pictures. Binge drinking did not significantly relate to N2 amplitudes to alcohol pictures (r = −0.23, p = 0.10) or neutral pictures (r = −0.09, p = 0.53).

Analyses of the P2 and P3 ERP components and condition produced non-significant results (p = 0.15 and p = 0.14, respectively). Binge drinking did not significantly relate to P2 or P3 amplitudes to alcohol pictures (r < 0.22, p > 0.10) or neutral pictures (r < 0.09, p > 0.49).

Discussion

Results from the current study revealed that manipulating a global attentional scope, in comparison to manipulating a narrow attentional scope, reduced rapid motivated attentional processing of alcohol pictures. Furthermore, the lack of an effect produced by condition assignment alone suggests that the observed effect is due to an interaction between attentional scope and picture type. Motivated attentional processing was measured using the N1 ERP wave component, one of the earliest measures of motivation. The effect of attentional scope on N1 amplitudes was specific to alcohol pictures and did not impact rapid attentional processing of neutral pictures. The effect of a manipulated global attentional scope on motivated attentional processing appears to be specific to the alcohol

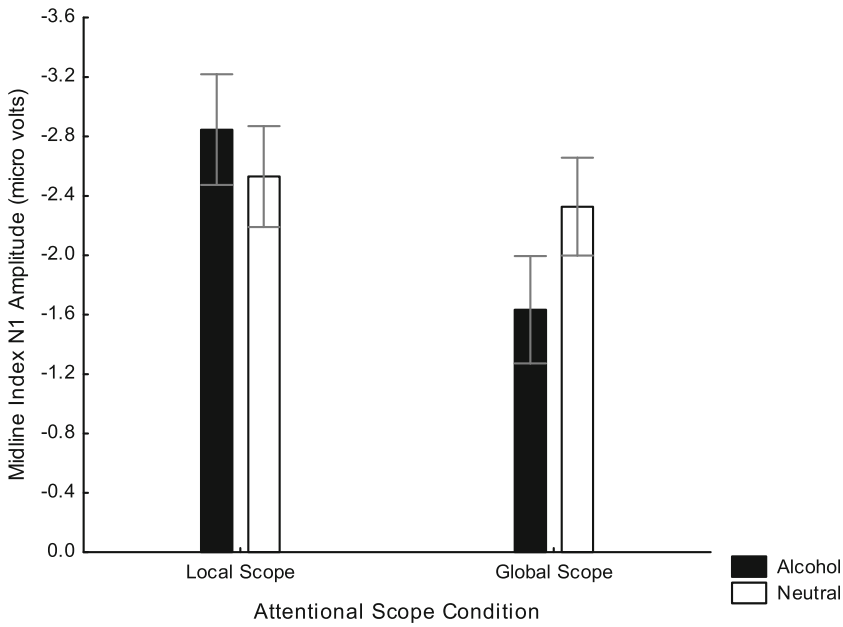

Fig. 3 N1 amplitude index to alcohol and neutral pictures in the local and global attentional scope conditions

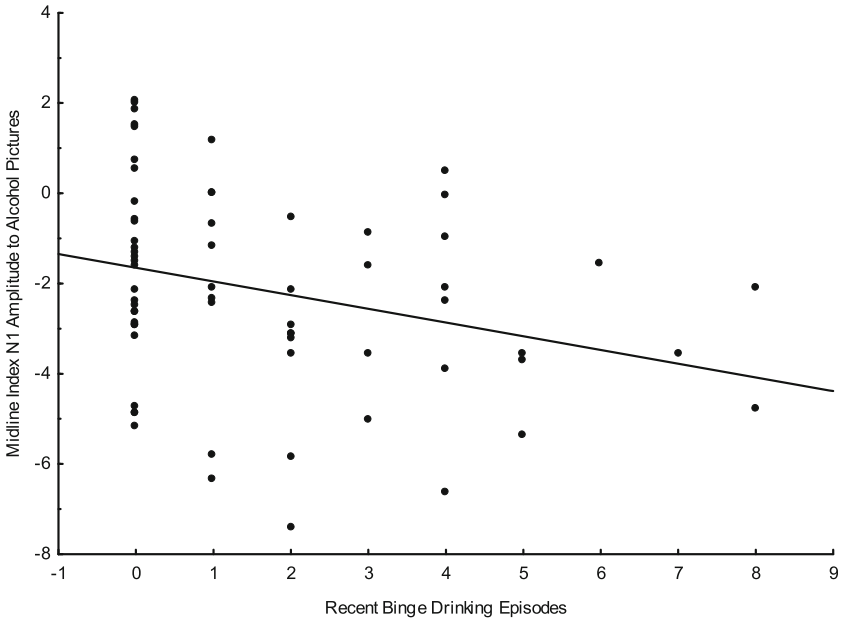

Fig. 4 Correlation between binge drinking and N1 amplitude index to alcohol pictures

pictures. Individuals in the global attentional scope condition demonstrated reduced N1 amplitudes to alcohol pictures compared to individuals in the local attentional scope condition. However, individuals in the global and local conditions did not differ in N1 amplitudes to neutral pictures. These results suggest that a manipulated global attentional scope (vs. a manipulated narrow attentional scope) may attenuate approach motivation to alcohol pictures, even at stages of processing occurring as early as 100 ms after picture onset.

Binge drinking related to increased N1 amplitudes to alcohol pictures but not neutral pictures. N1 amplitudes have been previously found to index approach motivation (Baldauf and Deubel 2009; Gable and Harmon-Jones 2012). Those with past heavy drinking experience are more approach-motivated towards alcohol pictures (Hicks et al. 2015), as evidenced by enhanced N1 amplitudes and greater attentional narrowing. Also, Dickter et al. (2014) have demonstrated that alcohol-dependent subjects have larger N1 amplitudes to alcohol cues than non-dependent subjects, suggesting that past drinking experience impacts rapid motivated attentional processing of drinking cues. Those with more drinking experience may be more approach-motivated to alcohol pictures and therefore deploy rapid attentional processing towards these stimuli.

Results from the current study also demonstrated that manipulating a global attentional scope attenuated the N2 ERP wave component in response to alcohol-related pictures in comparison to neutral pictures. Similar to the N1, the N2 may measure early attentional processes influenced by emotion (Carretié et al. 2004). The attenuated N2 amplitudes to alcohol pictures in a global condition suggest that a broadened attentional scope may attenuate the emotional reactions towards alcohol pictures. N2 amplitudes to alcohol pictures did not relate to binge drinking. Past work suggests that N2 may index valence-specific emotional processing (Carretié et al. 2004). Binge drinkers and non-binge drinkers may process alcohol pictures as similarly pleasant, resulting in a null effect between N2 amplitudes and binge drinking.

The current study found that altering a broadened attentional scope also impacts neural processing of approach motivating pictures by potentially dampening the rapid motivated attentional processing of alcohol pictures. The relationship between attentional scope and motivated attentional processing of alcohol pictures may inform future intervention techniques. Similar to the impact of directing attention away from alcohol-related pictures in order to decrease appetitive responses (Fadardi and Cox 2009), encouraging a global attentional scope may also dampen appetitive alcohol responses. These methodologies are similar in that both result in attentional processes that make individuals less susceptible to the attentional capture of alcohol cues. Increasing a global attentional scope may allow individuals to become less sensitive to the appetitive features of alcohol-related pictures. Dampening the appetitive salience of alcohol could reduce the urge to obtain and consume alcohol. Because it may be difficult to alter drinkers' attention away from alcohol in the environment, a manipulation of global attentional scope may effectively attenuate the approach-motivated responses towards alcohol. Although it is unknown how long our manipulation may have been effective, multiple instances of pairing a global scope manipulation with alcohol cue exposure may have longer-lasting effects. Perhaps, repeated pairings of a manipulated broadened attentional scope towards alcohol cues could reduce myopic responses towards alcohol cues in problem drinkers.

As with any research, there are limitations to the present findings that warrant discussion. One limitation is that the

current research used a sample of college students. As compared to older drinkers, college age drinkers may not have the same length of experience consuming alcohol. Another limitation of the current research is that we did not assess family history of alcoholism or treatment history for alcohol abuse. It is unclear if individuals in the current sample fit the clinical criteria for alcohol use disorder or other disorders related to alcohol abuse. Future research should investigate the impact of a broadened attentional scope on N1 amplitudes in non-college-aged samples as well as alcohol-dependent samples. The current study did not include a condition without a manipulation of attentional scope. An alternative interpretation of the results may be that a narrowed attentional scope enhanced neurophysiological responses to alcohol pictures. However, post hoc analyses do not support this alternative explanation. N1 amplitudes were larger between neutral and alcohol pictures in the global, but not the local condition. These results suggest that the manipulated global attentional scope reduced motivated attentional capture to alcohol pictures relative to neutral pictures.

In the current study, self-reported binge drinking and the N1 ERP component were assessed as measurements of appetitive motivational processes (Baldauf and Deubel 2009; Gable and Harmon-Jones 2012). Other indexes of drinking (i.e., alcohol use) did not relate to N1 amplitudes, suggesting that drinking motivation in general did not influence early ERP responses. Motivation is a multi-faceted construct, and future research should assess other measures of drinking motivation like craving, alcohol expectancies, and specific motivations to consume alcohol.

The current study demonstrated that attentional scope can influence rapid attentional processing of alcohol pictures. This work is part of a growing body of literature investigating early ERP components in response to alcohol cues (Petit et al. 2014; Dickter et al. 2014). Early ERP components index non-conscious cognitive and motivational processes occurring rapidly in response to alcohol pictures. As such, these early neurophysiological processes may strongly influence later processes incentivizing or disincentivizing alcohol consumption. In particular, the N1 ERP component indexes rapid motivated attentional processing. This may reflect an onset of selective attention for alcohol pictures that leads to consumption of alcohol. Dampening neural attentional responses to alcohol pictures that occur within 100 ms could alter the subsequent pattern of thoughts and behaviors that lead to alcohol consumption.

The evidence of a bi-direction relationship between motivated processing of alcohol pictures and attentional scope provides support to the idea that motivation and cognition can impact one another during processing of alcohol cues (Gray 2001). While previous research has provided evidence that neural activity related to approach motivation impacts attentional narrowing to alcohol pictures, the current study extends this idea by demonstrating that manipulated broadened attentional processing can also influence neural activity. The current study adds to a growing body of literature examining the interaction of motivation and attention towards alcohol (Gable et al. 2016; Hicks et al. 2012, 2015; Harmon-Jones et al. 2012; Gable and Harmon-Jones 2011). Together, this work suggests that attentional scope may influence motivation towards alcohol cues.

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