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Alcohol, adventure and sex: social drinkers' P3 event-related potential reactivity to alcohol and arousing cues.

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INTRODUCTION

- Event-related potentials (ERPs) have been used in past research to study the correlates and consequences of alcohol use (Porjesz et al., 2005). In particular, reduced amplitude of the P3 (P300) component is related to risk for alcoholism and other disorders of inhibition (e.g., Iacono et al. 2003).
- Recent research has shown that social drinkers at risk for alcoholism due to (self-reported) low alcohol sensitivity also exhibit reduced P3 amplitude in general, but that they exhibit increased P3 amplitude to alcohol cues, compared to social drinkers with higher self-reported sensitivity to alcohol (Bartholow et al., in press).
- A number of questions remain concerning the relationship between low alcohol sensitivity, reactivity to alcohol-related cues, and risk for alcohol-related problems. Specifically:
 - It is unclear whether enhanced cue reactivity among low-sensitivity drinkers is attributable simply to the arousing nature of alcohol-related stimuli. If so, low-sensitivity drinkers, relative to their high-sensitivity peers, should show enhanced P3 reactivity to all arousing cues, not just to alcohol.
 - It is unclear whether self-reported alcohol sensitivity might simply be a proxy for other known person-level risk factors, such as impulsivity (Soloff et al., 2000).
- The purpose of the current research was to:
 - Compare the P3 responses of low-sensitivity (LS) and high-sensitivity (HS) participants to alcohol and nonalcohol cues with their responses to other arousing cues, to test whether alcohol cue-reactivity is alcohol-specific;
 - Compare the P3 responses to alcohol cues and other arousing cues of LS participants with those of highly impulsive participants.

METHOD

- Participants were 33 (22 men) undergraduates who completed measures of self-reported alcohol sensitivity (O'Neill, Sher, & Bartholow, 2002) and the Barratt impulsivity scale (Barratt, 1959) at the beginning of the experiment.
- ERPs were recorded from 28 standard scalp locations. Electroencephalographic data were sampled at 1000 Hz and filtered online at .05-40Hz.
- Participants completed a visual oddball task that included 5 target conditions: alcoholic beverages, non-alcoholic beverages, adventure-related, erotic, and a neutral control. Targets were shown in the 4th or 5th position within a trial consisting mostly of neutral context images. All images came from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2001). Participants were asked to categorize each picture as either neutral or pleasant by pressing one of two keys.
- Each image was presented for 1000ms, followed by an interstimulus interval (blank screen) that varied randomly between 900ms and 1200ms. There was a 500ms intertrial interval during which the word "pause" appeared on a black background. There were a total of 100 trials (500 total viewed images) such that participants viewed each target type 20 times.

Example of a trial

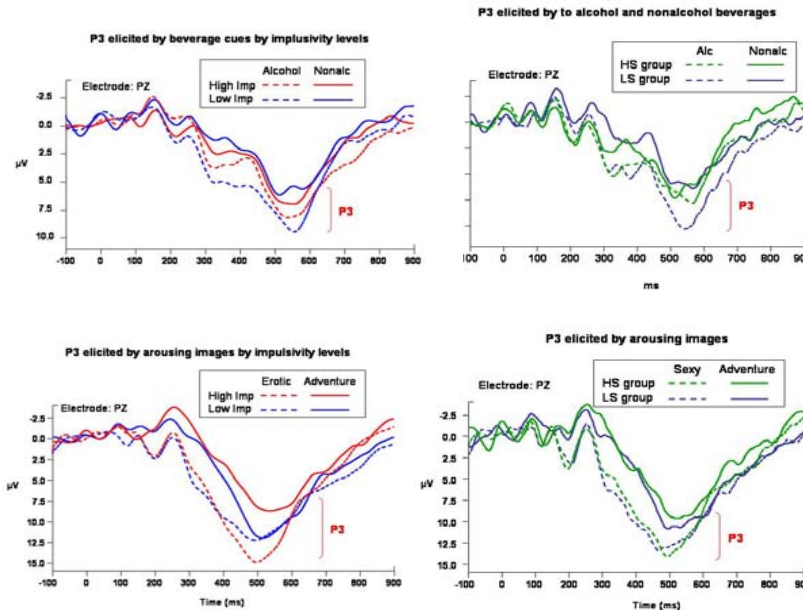


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RESULTS

- Consistent with other recent research (Bartholow et al., in press), drinkers with relatively low alcohol sensitivity showed enhanced P3 to alcohol vs. nonalcoholic beverages whereas high-sensitivity participants showed no difference in response to these cues.
- However, alcohol sensitivity level was uncorrelated with P3 responses to erotic and adventure scenes, and was uncorrelated with a self-report measure of impulsivity ($r = .07$).
- There was a significant Target x Sensitivity group interaction, $F(1, 28) = 9.7, p = .004$ such that LS participants exhibited a larger P3 to alcoholic stimuli ($M = 16.10$) than non-alcoholic stimuli ($M = 10.48$), whereas HS participants' P3 reactions to alcohol ($M = 10.67$) and non-alcohol ($M = 10.50$) were similar. These analyses are reported for electrode site Pz (midline parietal) where the effect is largest ($d = -.935$); however, the effect is similar over the left ($d = -.85$) and right ($d = -.582$) hemispheres. There was no Target x Impulsivity level interaction ($p = .686$), though there was a trend ($p = .07$) such that higher impulsivity was associated with a larger P3 to alcohol than nonalcohol.



- There was no significant Target x Impulsivity level interaction ($p = .17$), nor Target x Sensitivity level interaction ($p = .97$). However erotic pictures produced a larger P3 amplitude ($M = 17.1$) than adventure pictures ($M = 13.55$) among all participants (i.e., regardless of sensitivity group or impulsivity levels).

Target	Valence means	Arousal means
alcohol	4.446	4.416
non-alcohol	4.402	3.63
erotic	5.924	5.924
adventure	7.318	6.91
neutral	5.0245	2.8255

CONCLUSIONS

- Our data suggest that low-sensitivity participants' reactivity to alcohol cues is specific to alcohol and is not driven by a heightened sensitivity to highly arousing cues more generally.
- Also, the current data suggest that differences in alcohol sensitivity, as assessed by our self-report measure (O'Neill et al., 2002) are not simply a proxy for differences in impulsivity. Not only were sensitivity and impulsivity not correlated in this dataset, but patterns of P3 reactivity to alcohol and nonalcohol cues were dissimilar across sensitivity groups and impulsivity levels.
- Since previous research has shown that the P3 elicited by alcohol cues predicts alcohol use prospectively, the data suggest that P3 amplitude reflects the motivational significance of substance-related cues (Bartholow et al., in press).
- One limitation of the current study is that we currently have an imbalance in the number of male vs. female participants classified as low sensitivity (ns = 3 females, 8 males). We are continuing to recruit LS women to balance the gender distribution across groups.

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