

Alcohol-related Problems and EEG Correlates of Attention to Alcohol Stimuli

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Background

- In 2010, 18-24 year-olds were the age group with the highest prevalence of binge drinking and Wisconsin was the state with the highest rate of binge drinking in the U.S. (Centers for Disease Control and Prevention, 2012).
- EEG activity in the Beta range (12-35 Hz)—associated with increased arousal and attention—is higher in binge drinking than non-binge drinking students when at rest (no task or stimuli) (Courtney & Polich, 2010).
- Our previous findings suggest that exposure to full alcohol beverage containers increases alcohol craving and may increase Beta activity.
- We increased the number of participants and examined moderating variables (biological sex, drinking levels, and extent of alcohol-related problems), predicting greater Beta activity in response to alcohol stimuli, especially in those with more significant alcohol problems.

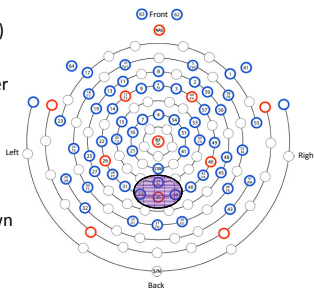
Method

Participants

- 29 UWEC students (36 - 7 excluded due to EEG artifacts or as outliers):
- Sex: 18 female, 11 male
- Age: $M = 21$, $SD = 3.6$
- No alcohol (BAC = 0) or drugs 48 hours prior to testing, neurological conditions, or regular use of psychoactive medications.

Electroencephalography

- 64 electrodes (EGI, Inc.)
- 250 Hz sampling
- 0.3-45 Hz bandpass filter
- Beta range: 12-35 Hz
- Power calculated by wavelet analysis and averages for sites PO3, PO4, Pz, and POz (shown in cluster at right)



Procedure

Interview

- AUDIT (Alcohol Use Disorders Identification Test) assesses alcohol problems based on frequency, amount, bingeing, control, failure to fulfill responsibilities, withdrawal, guilt, blacking out, injury, and others' concerns
- Drinking intensity (mean of the two largest numbers of drinks in any 2-hour period within the past 6 months)
- Other demographic and alcohol-related questions

EEG Session

- Participants sat 75cm away from stimuli
- 3 stimulus conditions:
 - At-rest:** 3 minutes looking at blank sheet of paper
 - Alcohol:** For each alcohol type, 1 minute looking at preferred beverage (between 2 options for each type)
 - Beer:** Leinenkugel's Honey Weiss or Miller Lite
 - Liquor:** Jack Daniel's Whiskey or Smirnoff Vodka
 - Wine:** Barefoot Moscato or Sutter Home Merlot
 - Control:** 1 minute looking at each matched non-alcohol beverage with a roughly similar visual appearance

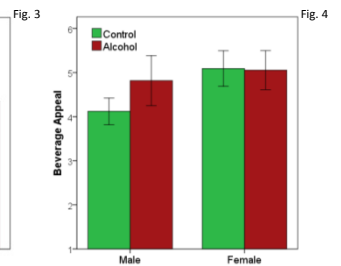
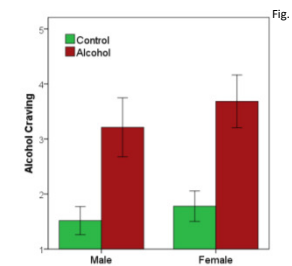
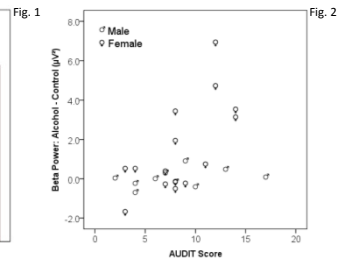
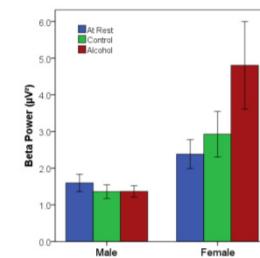


- Ratings collected after each stimulus:

- Appeal:** On a scale from 1 to 10, how appealing did you find the can/bottle of <beverage>, where 1 means "extremely unappealing" and 10 means "extremely appealing"?
- Crave:** How much do you crave an alcohol beverage right now on a scale from 1 to 10, where 1 means "no craving at all" and 10 means "the most craving you've ever felt"?

Results

- Drinking intensity.** Females: $M = 5.86$, $SD = 2.01$; Males: $M = 5.68$, $SD = 2.89$; no significant difference
- AUDIT scores.** Females: $M = 8.81$, $SD = 3.62$; Males: $M = 8.00$, $SD = 4.52$; no significant difference
- Beta power** in females greater for alcohol stimuli than control stimuli ($p < .02$) or at-rest ($p < .04$); no difference in males (Fig. 1).
- Females but not males show positive correlation between AUDIT scores and difference in Beta for alcohol vs. control stimuli ($r = .68$, $p < .01$) (Fig. 2).
- Beta difference (alcohol - control) and drinking intensity not correlated.
- Positive correlation between AUDIT score and drinking intensity ($r = .47$, $p < .02$)
- Craving for alcohol rose more after viewing alcohol stimuli than after control stimuli ($p < .001$) (Fig. 3) but no difference in appeal (Fig. 4).



Discussion

- Beta response to alcohol may reflect underlying vulnerability to alcohol problems, not simply drinking levels
- Alternatively, development of alcohol problems may change brain response to alcohol stimuli, increasing arousal and/or attention to them
- Alcohol stimuli increased Beta activity in females but not males
- Males and females differ in Beta activity but not drinking intensity or AUDIT scores—why?