Acute Alcohol Consumption and the Recognition of Human Emotions via Facial Expressions

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Abstract

Research regarding the relationship between alcohol consumption and affective perception has been ongoing since the mid twentieth century, yet the exact nature of this relationship remains poorly understood. Early work maintains that alcohol increases responses to angry or threatening stimuli, suggesting a relationship between alcohol intake and aggression. Conversely, recent studies utilizing fMRI technology suggest that alcohol consumption attenuates amygdal response to fearful stimuli. Though the neurobiological implications of this research are widespread, psychosocial applications remain largely ignored. Considering the idea of amygdal attenuation to fearful stimuli during acute alcohol consumption, this study explores the relationship between acute intoxication and the ability to recognize emotions in facial expressions. Students aged 21 and over will complete two computer-based matching tasks and one computer-based emotion-labeling task measuring speed and recognition of emotional facial expression stimuli. We hypothesize that acute alcohol consumption inhibits individuals’ ability to recognize expressions of fear in others, and we consider the applications of this miscategorization to alcohol related violence.

*Keywords: alcohol, emotions, facial expressions, affect recognition, non-verbal communication*
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The effects of alcohol on social inhibition, impulsivity, and aggression are well documented (Leonard & Blane, 1999). Contemporary research indicates that alcohol “impairs higher cognitive functions needed to process affective cues” (Curtin et al., 2001). And yet, despite the obvious ties between alcohol use and emotional processing, the relationship between alcohol consumption and the recognition of facial emotion cues remains largely unexplored. Several studies have sought to investigate the nature of impaired emotional perception in alcohol and substance dependent populations, and have indicated that substance abuse contributes to errors in detecting sad, angry, and fearful faces, but little research has been conducted regarding acute use in the normative population (Townshend & Duka, 2003). The data that does exist is conflicting, with some researchers arguing that alcohol consumption, even among the healthy population, contributes to a hypersensitivity to threatening or provoking (e.g. angry) stimuli (Borril, Rosen & Summerfield, 1987; Taylor & Gammon, 1975). This corresponds well with Dr. Roland Gustafson’s findings that alcohol consumption may increase aggressive behavior when individuals are presented with certain cues (Borril, Rosen, & Summerfield, 1987; Gustafson as cited in Kornreich et al., 2002). Conversely, a 2003 study conducted by Kano et al. suggests that low doses of alcohol enhance the drinker’s ability to discern positive emotional faces (e.g. happy faces) from other emotional expressions, and have no effect on negative expressions. In a study including subjects suffering from social phobia, alcohol intake was correlated with a decreased attenuation to threatening social stimuli (Stevens, Rist, & Gerlach, 2009). Developing a comprehensive understanding of the relationship between alcohol consumption and “interpersonal judgment” errors, whether they are related to positive or negative emotional expressions, has widespread implications ranging from the prevention of substance-related
violence, to supporting treatment interventions for alcoholics suffering from social phobia (Borril, Rosen & Summerfield, 1987; Hoaken & Stewart as cited in Attwood et. al, 2008, Stevens, Rist, & Gerlach, 2009). In order to fully explore the impact of acute alcohol intake on the perception of emotions, research must shift away from the alcohol-aggression paradigm, and instead emphasize the impact of alcohol on interpersonal judgments as a whole, including the possible “miscategorization” of facial expressions (Attwood et. al, 2009).

In this study, we aim to explore the impact of acute alcohol consumption on the perception of six basic emotional faces and neutral faces, with particular attention paid to the perception of fearful faces. We hope to corroborate and expand upon two recent studies, which suggest that alcohol inhibits amygdal reactivity to fearful faces, in essence impairing an individual’s ability to recognize signs of fear and threat in the expressions of others (Sripada et. al, 2012; Gilman et. al, 2008). While Sripada and Gilman’s recent studies are ground breaking, they are incredibly limited in scope. Sripada’s study features only twelve subjects and Gilman’s features just seven, all of who were women. In addition to these sample size limitations, these studies are neuroimaging studies, and much greater emphasis is placed on the neurobiological implications of fear attenuation as opposed to the psychosocial applications (Sripada et. al, 2012; Gilman et. al, 2008). With the risk of arrest for violent crime highest among individuals between eighteen and twenty-four years old, and nearly four in ten violent crimes involving the use of alcohol to some extent, it is essential to include individuals from the collegiate social drinking population in studies investigating the impact of alcohol on affect perception (Shukla, 2001; Weiss, 2007). The current study was designed to reflect any effect of acute alcohol intake on the perception of affect via facial expressions. Unlike previous investigations, the current study utilizes a labeling task so as to not only identify errors in affective perception, but also to
characterize what the expressions are being recognized as (Attwood et. al, 2009). Additionally, this study includes a personal drinking history measure, male and female participants, three subject groups (control, placebo, and alcohol administration) as well as a number of participants from the targeted collegiate social drinking population. Based on the breadth of emerging work in the area of alcohol intake and the recognition of emotions, we hypothesize that acute alcohol intake, even in social drinkers, impairs the drinker’s ability to recognize fearful faces (Sripada, 2012).

Method

Participants

We will recruit participants from the student population at American University using Internet advertising, flyers, and word of mouth. We will only accept participants over the age of twenty-one into the screening stage of the study. In addition to informed consent, we will require participants to present a valid government ID, and were required to sign a sworn statement indicating that they: A) Are over the age of 21 B) Are not pregnant C) Have no history of substance abuse or mental illness D) Are not taking any medication that could interact with alcohol E) Have not consumed any alcohol prior to their scheduled participation time F) Will not leave the testing area until their BAC dropped to 0.02 or lower G) Will not drive home from the experiment and would either walk, use public transportation, or be driven by a friend. These statements are in compliance with NIAA guidelines regarding ethical administration of alcohol to human subjects (NIAA, 2014). Participants will provide written informed consent, we will inform them that they will complete three computer-based tasks involving viewing emotional pictures and making judgments about those pictures.
Design

We will randomly assign participants to the control, placebo, or alcohol administration group. Random selections will be made via the informed consent forms. Three versions of the document exist: one with a highlighted letter “A” typed in the upper right corner, one with a highlighted and circled letter “A” typed in the upper right corner, and one with the letter A typed in the upper right corner. The variations of the “A” correspond with the three different groups, a plain “A” indicating the control group, the circled and highlighted “A” indicating the placebo group, and the highlighted “A” representing the alcohol administration group. The experimenter in charge during the participant’s session will randomly draw the document from a file.

Procedure

Following the completion of the informed consent process, we will provide participants with a Drinking and Health History Questionnaire. The questionnaire covers mental health and substance abuse issues, individual drinking history, as well as attitudes regarding alcohol consumption and emotions. After completion of the questionnaire, all individuals will complete the computer-based tasks one time. We will then debrief and release the control group participants. Individuals in the placebo group will perform the computer tasks immediately after completing the informed consent paperwork. After this, we will administer a prepared non-alcoholic drink made to taste as though it contains alcohol. We will inform placebo participants that their BAC is at 0.08 approximately twenty minutes after the drink is consumed. Following this, placebo participants will repeat the computer tasks. We will then debrief and release the placebo group participants. Participants in the alcohol administration group will complete the computer tasks immediately upon completion of the informed consent paperwork. We will then administer a prepared alcoholic drink to the participant, and we will measure his or her BAC ten
minutes after the complete consumption of the drink. If the participant’s BAC reaches 0.08, he or she will repeat the computer tasks. If not, his or her BAC will be measured every ten minutes for thirty additional minutes. If his or her BAC has not reached 0.08 in this timeframe, we will administer a 1 oz. shot to the participant. If following n additional thirty-minute absorption period the participant’s BAC still has not reached 0.08, we will repeat the shot administration procedure once more. If his or her BAC still does not reach 0.08 following the second thirty-minute absorption period, we will record the participant’s BAC and he or she will repeat the computer tasks.

Alcohol Administration

We will make the alcoholic beverages with 0.08g/kg 40% alcohol vodka, and mix them so that the beverage includeds one part vodka to two parts soda. Other studies involving alcohol administration have utilized this same ratio in alcohol administration because it is deemed to produce the desired level of intoxication (legal drunkenness) relatively quickly (Kamboj, et. al, 2012, Sripada et. al, 2012). We will make the placebo beverage using tonic water, with vodka rubbed around the edge of the glass to simulate the experience of consuming alcohol. We will measure BAC using a Breathalyzer.

Tasks

This study utilizes three computer-based tasks, including two affect recognition tasks (emotion matching and emotion labeling) and one control task. The Cohn-Kanade image set developed by joint researchers at Carnegie Mellon University and the University of Pittsburgh serves as the facial expression stimuli in the affect recognition tasks. The Cohn Kanade sequences include stills from film clips where subjects morphed their expressions from a neutral expression to one of Ekman’s seven basic emotional expressions (Kanade et. al, 2000; Lucey et al., 2010; Ekman
& Friesen, 1978). The image sets are coded using FACS criteria to identify the emotion in its peak phase (Kanade et. al, 2000; Lucey et. al, 2010; Ekman & Friesen, 1978). For the purposes of this study, we selected images of three male and three female subjects displaying angry, disgusted, happy, sad, neutral, surprised, and scared faces, for a total of forty-two images. The same forty-two images are used throughout the affect recognition tasks. Images were selected from the middle of the image set (e.g. at a point between neutral and peak emotional expressions) in order to provide viewers with subtle emotion cues, rather than overt and exaggerated expressions. In the first affect recognition task, the program will present participants with an emotion label (angry, disgusted, happy, sad, neutral, surprised or scared) for 750ms followed by one of the expression images for 750ms, and instructions will direct participants to indicate if the label matches the image by hitting the spacebar on the computer. If the label and image do not match, the instructions will direct participants to abstain from responding. The presentation of the labels and images is without replacement. In the second part of this task, the program will present participants with an expression image for 750ms, followed by an emotional label for 750ms, and participants are once again asked to indicate if the image matches the label by hitting the spacebar on the computer. If the image and label do not match, the instructions direct the participant to abstain from responding. The images and emotion labels are randomized without replacement. In the control task, the program will present participants with a categorical label (actor, athlete, politician, singer, businessperson, historical figure, and comedian) for 750ms followed by an image of an individual representative of one of those categories for 750ms. Following the same instructions as in the emotion-matching task, participants are asked to hit the spacebar if the categorical label and image match, and to abstain from responding if the label and image do not match. The labels and images are randomized without replacement. Finally,
participants will complete an emotion-labeling task. The program will present participants with an emotional expression image and six emotion labels surrounding the image (angry, disgusted, happy, sad, scared, and surprised). The neutral label is excluded from this task, but images of neutral faces are included in an effort to catch the possible miscategorization of neutral faces while under the influence of alcohol. The instructions direct participants to select the emotion label that best matches the image on screen by clicking on the emotion label. The expression image, along with the six emotion labels, remains on screen until the participant selects an option, at which point, the next image and set of labels appear on screen. All tasks were created using Superlab 4.0, and images are presented in black and white on a 17in desktop computer screen.

Discussion
While this research is ongoing, we hope to consider the psychosocial implications of not only this current study, but also the implications of other recent work in the field. The inability of individuals under the influence of alcohol to accurately perceive fearful expressions in others has a number of theoretical ramifications, including contribution to alcohol related violence, particularly alcohol facilitated sexual assault. With the incidence of sexual violence on college campuses on the rise, and the extreme availability and free use of alcohol in the collegiate setting, the possible contribution of affective perception errors to the perpetuation of alcohol related violence must be considered. We will compare the findings of our current study to recent work in the field, and will suggest potential policy and education applications, as well as future directions for research.
References


