Short Communication

Emotional reactions to alcohol-related words: Differences between low- and high-risk drinkers

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HIGHLIGHTS

• Alcohol-related words are more appetitive for high-risk drinkers.
• High-risk drinkers perceive alcohol-related words as highly arousing.
• For alcohol-related words, high AUDIT scores are related to less dominance.

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ABSTRACT

Introduction: Research that has examined responses to alcohol-related words in drinkers has mostly linked such responses to memory, attentional, and perceptual bias. However, studies of emotional processing in alcoholics have not received much attention. The main goal of the present study was to identify the features and differences of emotional responses to alcohol-related words in low- and high-risk drinkers.

Method: A total of 149 low-risk drinkers and 125 high-risk drinkers evaluated five alcohol-related words and 15 words from the Affective Norms for English Words in the dimensions of valence, arousal, and dominance using the Self-Assessment Manikin.

Results: The results indicated that high-risk drinkers evaluated alcohol-related words as more appetitive and arousing.

Conclusion: These results, together with findings in the attention and memory research literature, suggest that alcohol-related words can serve as conditioned cues in alcohol consumption.

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1. Introduction

Previous research has demonstrated the ability of words to prompt emotional reactions in humans (Bradley & Lang, 1999). These studies indicate that words that have appetitive and aversive content generate high arousal, and words that have neutral valence prompt low arousal. This pattern has been described across different countries (Kristensen, Gomes, Justo, & Vieira, 2011; Redondo, Fraga, Padrón, & Comesaña, 2007; Soares, Comesaña, Pinheiro, Simões, & Frade, 2012).

Previous studies have also demonstrated that words facilitate the recognition of emotions in facial expressions (Gendron, Lindquist, Barsalou, & Barrett, 2012), modulate the activation of facial muscles that are sensitive to stimulus valence (Herbert, Deutsch, Süterlin, Kübler, & Pauli, 2011), and allow the study of neurological processes that are associated with emotions (Herbert, Kissler, Junghöfer, Peyk, & Rockstroh, 2006). Words can also reliably capture an individual's attention, especially those that depict sexual and aversive content (Aquino & Arnell, 2007; Arnell, Killman, & Fijavz, 2007), but the effect diminishes rapidly with aversive words (Harris & Pashler, 2004).

Research that has used words with alcoholic patients has focused on assessing attention, memory bias (Fridrici et al., 2014; Johnsen, Laberg, Cox, Vaksdal, & Hugdahl, 1994) and emotional reactions (Stormark, Laberg, Nordby, & Hugdahl, 2000). Nevertheless, studies on emotional responses to alcohol-related words have been inconclusive. For example, Stormark et al. (2000) reported that alcohol-dependent subjects exhibited a significantly greater skin conductance response and greater heart rate deceleration in response to alcohol-related words compared with neutral and aversive words; however, no differences were found between alcoholic and nonalcoholic participants. Additionally, this study did not use appetitive words, which may be pivotal when considering that social interaction and advertising associated with alcohol consumption are related to appetitive cues, which is reflected in verbal and written language (van Zyl & Meiselman, 2015). Furthermore, studies on emotional responses to alcohol-related words have only been performed with alcoholic patients. Differences between low- and
high-risk drinkers have not been examined. Such drinkers represent the
typology of the largest proportion of drinkers in the population.
To address this issue, the present study sought to identify the fea-
tures and differences of emotional responses to alcohol-related words
in low- and high-risk drinkers and make comparisons with emotional
responses to affective and neutral words.

2. Methods

2.1. Participants

A total of 274 university students (139 females) voluntarily partici-
pated in the study. The participants were distributed into two groups
according to scores on the AUDIT (WHO, 2001): low-risk drinkers
\( n = 149 \); scores between 1 and 7; \( M = 3.89, SD = 1.85 \) and high-
risk drinkers \( n = 125 \); scores between 8 and 19; \( M = 11.56, SD = 3.54; t(272) = -22.92, p < .0001 \). No significant differences
were found between groups in age, percent of men and women, and
years of drinking \( (p > .49) \). A 3-year history of alcohol consumption
was used as the inclusion criterion. The study was approved by the
University of San Buenaventura Review Board and all of the subjects
signed written informed consent forms.

2.2. Stimuli

Fifteen words (five pleasant, five neutral, five unpleasant) were se-
lected from the Affective Norms for English Words (ANEW) (Bradley
& Lang, 1999), which were translated to Spanish by Redondo et al.
(2007). Five alcohol-related words\(^1\) were also included. For the selected
ANEW words significant differences were found between word catego-
ries in the valence dimension \( (p < .0001) \). For the arousal dimension,
significant differences were found between affective words (pleasant
and unpleasant) and neutral words \( (p = .001) \).

2.3. Measures

The Self-Assessment Manikin (SAM; Bradley & Lang, 1994) is a non-
verbal pictographic scale designed to assess a participant’s feelings in
three emotional dimensions: valence (pleasant vs. unpleasant), arousal
(relaxed vs. activated), and dominance (feeling in control vs. feeling
controlled). Each dimension is represented by humanoid figures that in-
dicate different levels of intensity.

2.4. Procedure

In small groups of not more than 28 individuals, the participants
were provided with booklets that contained the SAM scales to evaluate
the words. The Spanish instructions were presented in a digital audio
format. After instructions were given to the participants, three words
were used as examples, one word from each of the affective categories
(Friend, Cabinet, and Killer). The instructions and words were presented
using a projector. The words were presented in white against a black
background in the center of the screen in 80-pt Arial font. Each trial
consisted of three parts: 6 s of word presentation, 15 s to rate the
word using the SAM scale, and a 5 s intertrial interval. After the words
were presented, the participants completed the AUDIT. Four different
pseudo-randomized word presentation orders were prepared. Each
order had the constraint of not presenting the same word category con-
secutively more than twice.

\(^1\) Pleasant words: Kiss, Caress, Chocolate, Orgasm, and Treasure. Neutral words: Street, Basket, Square, Table, and Paper. Unpleasant words: Infection, Abuse, Dirty, Torture, and Rape. Alcohol-related words: Beer, Bar, Party, Drunk, and Drink.

2.5. Statistical analysis

Pearson’s linear correlation was used to analyze correlations be-
tween valence and arousal, and valence and dominance. To examine
the emotional processing of alcohol-related words and ANEW words
in the two alcohol consumption groups, we ran separate mixed ANOVAs
\( 2 \times 4 \) for each emotional dimensions, with type of alcohol consumption
as the between-subjects factor (low- and high-risk drinkers) and word
category (pleasant, neutral, unpleasant, and alcohol-related) as the
within-subjects factor. Bonferroni correction. Finally, a Pearson correlation was used to analyze
the association between AUDIT scores and SAM ratings for alcohol-
related words. The level of significance was set at \( p < .05 \). All of the sta-
tistical analyses were performed using SPSS 20.0 software.

3. Results

3.1. Affective space

Fig. 1A and B illustrates the distribution of the 20 words in the two-
dimensional affective space that was composed of the valence and
arousal dimensions. In both groups, pleasant words were very appeti-

tive and highly arousing. Neutral words had an intermediate valence
and were slightly arousing. Unpleasant words were aversive but not

highly arousing. Alcohol-related words had a different distribution for
low- and high-risk drinkers. Low-risk drinkers evaluated them with
an intermediate valence and arousal \( (r = 1.85) \). As indicated by
Fig. 1A, they were particularly aversive and highly arousing for high-risk drinkers (Fig. 1B).

The quadratic correlation was positive and significant for low-risk
drinkers \( (R^2 = .96, p < .0001) \) and high-risk drinkers \( (R^2 = .94, p < .0001) \), suggesting the influence of valence on arousal. For low-risk
drinkers, Pearson’s correlation between appetitive valence and arousal
was positive and significant \( (r = .97, p < .0001, R^2 = .94) \) and negative
and significant for aversive valence and arousal \( (r = -.93, p < .0001, R^2 = .86) \). Pearson’s correlation was also positive and significant be-
tween appetitive valence and arousal for high-risk drinkers \( (r = .94, p < .0001, R^2 = .88) \), but it was negative and not significant between
aversive valence and arousal \( (r = -.14, p = .66, R^2 = .01) \).

Fig. 1C and D shows the distribution of the 20 words in the two-
dimensional affective space that was composed of the dominance and
valence dimensions. The words were generally distributed similarly
in both groups, but alcohol-related words were placed in a similar region
as neutral words for low-risk drinkers (Fig. 1C). In contrast, in high-
risk drinkers, words that depicted alcohol content were placed in a re-
region that was closer to pleasant words (Fig. 1D). A positive and signifi-
cant linear relationship was found in both groups (low-risk drinkers:
\( r = .88, p < .0001, R^2 = .77 \); high-risk drinkers: \( r = .86, p < .0001, R^2 = .73 \)).

3.2. Emotional dimensions

3.2.1. Valence

The ANOVA revealed a significant main effect of word category
\( F_{5,516} = 732.59, p < .0001, \eta^2 = .79 \). Pleasant words were the most
appetitive and unpleasant words were the most aversive \( (p < .0001) \).
Alcohol-related words were perceived as more appetitive than unpleasant
and neutral words but less appetitive than pleasant words
\( (p < .0001) \). A significant quadratic trend was found \( F_{1,172} = 1140.26, p < .0001, \eta^2 = .86 \). A significant Word × Alchol consumption interaction was found \( F_{5,516} = 14.96, p < .0001, \eta^2 = .01 \). High-risk drinkers perceived alcohol-related words as more appetitive than
low-risk drinkers \( (p < .001) \), and low-risk drinkers evaluated neutral
words with more valence than high-risk drinkers \( p < .001 \) (Fig. 2A).
3.2.2. Arousal

The ANOVA revealed a significant main effect of word category ($F_{3,516} = 205.98, p < .0001, \eta^2 = .52$), indicating that the participants felt more arousal when reading the pleasant words (all $p < .0001$). Alcohol-related words were perceived as more arousing than unpleasant and neutral words and unpleasant words were evaluated as more arousing than neutral words (all $p < .03$). A significant quadratic trend was found ($F_{1,172} = 479.98, p < .0001, \eta^2 = .71$). A significant Word $\times$ Alcohol consumption interaction was found ($F_{3,516} = 13.80, p < .0001, \eta^2 = .03$). Low-risk drinkers felt more arousal when reading neutral and unpleasant words (both $p < .03$), and high-risk drinkers felt more arousal when reading alcohol-related words compared with low-risk drinkers ($p = .001$) (Fig. 2B).

3.2.3. Dominance

The ANOVA revealed a significant main effect of word category ($F_{3,516} = 103.49, p < .0001, \eta^2 = .37$). The participants felt more dominant (i.e., in control) when reading pleasant and alcohol-related words compared with neutral words (both $p < .001$). Furthermore, the participants felt less dominant when reading unpleasant words compared with neutral words ($p < .05$).
with the other word categories (all \( p < .0001 \)). A significant quadratic trend was obtained (\( F_{1,172} = 133.20, p < .0001, \eta^2 = .43 \)).

3.3. Correlation analysis

For alcohol-related words, the subjects’ AUDIT scores were positively and significantly correlated with SAM ratings in the affective dimensions of valence (\( r = .55, p < .0001, R^2 = .30 \)) and arousal (\( r = .50, p < .0001, R^2 = .25 \)). A significant negative correlation was found between AUDIT scores and the dominance scale (\( r = -.16, p = .007, R^2 = .02 \)).

4. Discussion

The results showed that alcohol-related words were perceived as appetitive and highly arousing in high-risk drinkers. Low-risk drinkers evaluated them as moderately appetitive and slightly arousing.

Previous studies evaluated emotional responses to words that depicted different affective contents and found that words that were perceived with either appetitive or negative valence also generated high arousal, and words that were evaluated with intermediate valence generated low arousal (Bradley & Lang, 1999). However, the words that were perceived as aversive in the present study did not generate a high level of arousal. These results may be explained by the characteristics of the sample (i.e., unselected undergraduate participants). Evidence suggests that fear/threat words are rather weak emotional cues in the normal population compared with patients diagnosed with anxiety disorders (Williams, Mathews, & MacLeod, 1996). Previous research also showed that fear/threat words less powerfully prompt emotional responses compared with sexual words in the normal population (Arnell et al., 2007).

Concerning alcohol-related words, the present results showed that high-risk drinkers rated them as more appetitive and arousing compared with low-risk drinkers. These results may suggest that these words serve as alcohol-related cues that activate appetitive motivational systems in high-risk drinkers, which would suggest a greater likelihood of approach behaviors (Lang, 2010). These findings, together with attentional (Stormark et al., 2000), interpretation (Woud et al., 2014), and memory (Fridrici et al., 2014) bias, suggest that high-risk drinkers and alcoholic patients selectively pay attention to, interpret, and recall alcohol-related words, and they feel appetitive valence and high arousal when reading them. Our results also indicate a significant negative correlation between AUDIT scores and dominance ratings, indicating that people with greater alcohol consumption feel less in control when reading words that depict alcohol content. This effect, together with previous results, favors approach behavior.

Such findings may have implications for alcohol-related advertising and therapeutic techniques (Field, Marhe, & Franken, 2014; Gantiva & Flórez-Alarcón, 2015). Alcohol-related advertising and cues appear to have a greater impact on high-risk drinkers and alcoholic patients compared with moderate drinkers (Loeber et al., 2007). Alcohol-related words in advertising may have a greater influence on maintaining and increasing alcohol consumption than on the onset of intake.

The present study has two limitations. First, neither non-drinkers nor alcoholic patients participated in the study. Second, the present study did not assess psychophysiological measures. Future studies should incorporate psychophysiological measures of emotional and motivational responses, with the purpose of increasing the objectivity of the data.

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Contributors

The first author designed the study, conducted the statistical analysis and wrote the protocol. The second and third authors conducted literature searches and provided summaries of previous research studies. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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