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Affective impairments in binge drinking: Investigation through emotional facial expression decoding

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ABSTRACT

Objective: Binge drinking, an excessive alcohol consumption pattern frequently observed in young people, is known to be associated with psychological and cerebral deficits. While cognitive dysfunctions have been widely investigated, emotional abilities have scarcely been explored. Such an exploration would however offer a more exhaustive understanding of the deficits associated with binge drinking, as well as of the possible transition towards alcohol-dependence.
Methods: 46 young adults (23 binge drinkers, 12 women; 23 control participants, 12 women) were recruited among university students. They performed an emotional recognition task consisting of the visual decoding of six basic emotions (i.e. anger, contempt, disgust, fear, happiness, and sadness). Accuracy scores and detection thresholds were collected for each emotion.
Results: Binge drinkers showed lower performance than control participants for the decoding of all emotions and increased detection threshold, this later reflecting less ability to capture an emotion. Binge drinking is thus associated with a need for higher emotional intensity to perform correct detection. Moreover, these emotional difficulties appear specifically related to alcohol consumption.
Conclusion: These findings reinforce previous experimental evidence of altered emotional processing among binge drinkers, and extend these results for various emotional contents. They support the hypothesis of a continuum between binge drinking and alcohol-dependence, in which massive emotional impairments have been documented. Indeed, these impairments could be involved in the onset and maintenance of excessive alcohol consumption, notably through the established relationship between emotional deficits and social distress.

1. Introduction

Binge drinking is an alcohol consumption pattern widely prevalent among young people, consisting of repeated alternations between large alcohol intakes and withdrawal episodes [1]. National Institute on Alcohol Abuse and Alcoholism (NIAAA) defined binge drinking by a blood alcohol concentration (BAC) of 0.08 g/dl, corresponding to the consumption of at least 4 (for women) or 5 (for men) drinks within 2 h. This excessive alcohol consumption pattern induces deleterious cognitive and brain consequences, which are similar to those observed in alcohol-dependence [2,3]. This led to the continuum hypothesis [4,5], suggesting that binge drinking could be an initial step towards alcohol-dependence. This proposal, widely explored for cognitive abilities, has however not yet been generalized to other key deficits observed in alcohol-dependence, like affective and social abilities. Alcohol-dependent individuals indeed present emotional and interpersonal deficits, which have been identified as key processes for the development and maintenance of this disorder [6]. An impairment for these emotion-related processes, which play a pivotal role for social adaptation, everyday life interactions, and global well-being, could thus also exist in binge drinkers, leading them to perpetuate and even increase alcohol consumption (e.g., to feel more relaxed in social context or to cope with negative emotions) [7,8], potentially facilitating the transition towards alcohol-related disorders. Therefore, the exploration of emotional abilities in binge drinking would allow for a better understanding of the deficits associated with this alcohol consumption pattern, and could offer new insights about the processes involved in the maintenance of excessive drinking.

Few binge drinking studies have investigated emotional abilities *per se*. However, binge drinking was characterized by an impaired fear conditioning [9], suggesting that binge drinkers failed at modifying their behavior in response to aversive events. Cerebral dysfunctions were also identified in binge drinkers when confronted with emotional stimuli [10,11]. First, electrophysiological data showed that, during the

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passive viewing of negative pictures, binge drinkers presented a reduced amplitude of the Late Positive Potential component compared to controls. This impaired later electrophysiological processing suggested a reduced brain response to negative affect in binge drinking [10]. Second, during the detection of the emotional valence (happiness or anger) related to affective voices, young binge drinkers displayed delayed latencies of early and late electrophysiological components compared to controls [11]. Furthermore, behavioral impairments were also highlighted during the processing of morphed affective voices (anger and fear), where binge drinkers had lower performance to identify both emotions, this deficit being accompanied by a reorganization of brain activity [12]. Conversely, during the emotional identification of faces and voices (happiness and anger), it has recently been shown that emotional and crossmodal integration (namely the coherent and unitary integration of stimuli coming from different modalities) were preserved among binge drinkers [13]. These inconsistencies in previous results might be explained by the fact that earlier studies focused on simple binary decoding tasks (e.g., distinguishing positive versus negative emotions), not exploring the whole scope of emotional contents, in line with what has been conducted in alcohol-dependence.

The aim of this research was thus to explore emotional abilities in binge drinking, by going beyond the classic binary tasks [12,13] to target a larger range of emotions. Moreover, to offer a more comprehensive evaluation of emotional decoding, this study simultaneously assessed emotional recognition and detection threshold by using morphed stimuli, allowing a more accurate and ecological evaluation of emotional decoding [14,15] with sufficient difficulty level [16].

2. Material and methods

2.1. Participants

Forty-six volunteers were recruited at the Université catholique de Louvain (Belgium) on the basis of a first online screening assessing age, gender, education level, native language, psychiatric and medical disorders, as well as alcohol consumption. Particularly, the mean number of alcohol doses per drinking occasion (a standard alcohol dose containing 10 g of pure ethanol in Belgium), the mean number of drinking occasions per week, the consumption speed, the mean number of alcohol doses per week, and the drunkenness frequency were evaluated. Participants were contacted according to their alcohol consumption pattern [17]: 23 Control Participants (CP; binge drinking score ≤ 12) and 23 Binge Drinkers (BD; binge drinking score ≥ 16). The binge drinking score, focusing on the consumption speed (i.e. the number of alcohol drinks consumed per hour), the number of drunkenness episodes (i.e. drunkenness is defined as an inability to speak clearly, a loss of coordination, and nausea), and the percentage of drunkenness episodes (i.e. number of drunkenness episodes / total number of drinking episodes) in the last six months, has been calculated as follows: [(4 × consumption Speed) + number of Drunkenness episodes + (0.2 × percentage of Drunkenness episodes)] and allowed targeting specific binge drinking pattern. This group selection was moreover supported by other alcohol-related variables showing intense alcohol consumption in the BD group (see Table 1). Based on self-reported measures, we also ensured that participants reported no alcohol-dependence, no psychiatric or neurological disorder, no visual impairment, took no medication impacting vigilance, and that there was no current or past drug consumption (except alcohol and tobacco). Moreover, family history of alcohol-dependence was evaluated in this screening phase to exclude from the final sample participants reporting a family history of alcohol-related problems. All these criteria were evaluated during the screening phase by binary assessments (e.g., Have you ever had a diagnosis of psychiatric disorders such as depression, anxiety, or phobia?) with the possibility to give more details when answering positively. The study was approved by the ethics committee of the Psychological Science Research Institute of the Université catholique de Louvain and conducted according to the principles of the Declaration of Helsinki. Students (24 women) were native French speakers and aged between 18 and 27 years old ($M = 20.02$, $SD = 1.95$).

Table 1
Demographic and psychological measures for Binge Drinkers (BD) and Control Participants (CP): mean (*SD*).

Variable	BD ($n = 23$)	CP ($n = 23$)
Demographic measures		
Age[ns]	19.70 (1.69)	20.35 (2.17)
Gender ratio (female/male)[ns]	12/11	12/11
Psychological measures		
Beck depression inventory[ns]	4.39 (3.03)	4.83 (3.30)
State anxiety inventory (STAI-A)[ns]	30.04 (7.14)	32.70 (8.80)
Trait anxiety inventory (STAI-B)[ns]	35.26 (8.05)	36.26 (7.34)
Alcohol consumption measures		
Alcohol Use Disorder Identification Test[*]	16.35 (4.99)	2.83 (5.08)
Total alcohol units per week[*]	26.74 (11.92)	3.30 (8.35)
Number of occasions per week[*]	3.17 (0.98)	0.52 (1.16)
Number of alcohol units per occasion[*]	8.18 (3.43)	1.11 (2.60)
Consumption speed (units per hour)[*]	3.48 (0.90)	0.87 (0.82)

[ns] = non-significant.
[*] $p < 0.001$.

2.2. Procedure and measures

The Facial Emotion Recognition Test (TREF) is a validated emotion decoding task [15] in which participants had to recognize 6 basic emotional faces: anger, contempt, disgust, fear, happiness, and sadness. Each emotional face was morphed (from neutral to full-blown emotion) to evaluate 9 different levels of emotional intensity (i.e. from 20% to 100%) and each emotion was expressed by 6 different faces (3 women, 3 men) from people of different cultures, aged between 20 and 60 years old [see [15] for stimuli illustration]. Stimuli were fully-screened presented with a white six-label list (right side) where each response key was specified. The response keys corresponded to the first letter of the emotion and stickers were used on the keyboard for an easy access (i.e. all response keys on the same line). Participants had to indicate which emotion was presented by pressing the corresponding button with their dominant hand. The total task contained 54 trials (6 blocks of 9 trials). Facial expressions were presented randomly for 10 s but participants had no time limit to answer. The dependent variables were the accuracy score (percentage of correct responses) and the detection threshold (intensity at which the emotional content is reliably detected) for each emotion and the total score. This threshold was obtained by averaging the intensity of the first good recognition (namely the first correct response for a specific emotion), and the intensity from which the emotion is perfectly recognized (namely the intensity from which the emotion is always correctly detected), i.e. [(first threshold + perfect threshold) / 2]. This procedure has been previously validated [15] and allows the comprehensive investigation of emotional recognition by considering the ability to perceive low-intensity emotions.

The task was presented on a computer screen located at 60 cm of viewing distance. Before the experiment, questionnaires were also used to assess state-trait anxiety (State-Trait Anxiety Inventory) [18], depressive symptoms (Beck Depression Inventory, BDI-II) [19], and alcohol-related disorders (Alcohol Use Disorder Identification Test, AUDIT) [20].

2.3. Statistical analyses

First, between groups Student *t*-tests were performed on demographic and psychopathological characteristics. Second, two repeated measures analyses of variance (ANOVAs) were performed with Group (BD, CP) as between-subjects factor and Emotion

(Anger, Contempt, Disgust, Fear, Happiness, Sadness) as within-subjects factor, separately for accuracy score and detection threshold. Post hoc *t*-tests were used to explore significant main effects and interactions. Finally, bivariate Pearson's correlations and multiple linear regressions (with stepwise method) were performed between task performance and alcohol consumption (i.e. specific variables related to binge drinking pattern: binge drinking score, including drunkenness and consumption speed, as well as the mean number of doses consumed per occasion) to evaluate how emotional difficulties were related to alcohol consumption in the whole sample. Moreover, to ensure the absence of acute consumption effect, we performed bivariate Pearson's correlations between emotional recognition performance and total alcohol consumption in the three days preceding the experiment.

3. Results

3.1. Demographic, psychopathological, and alcohol consumption measures

As shown in Table 1, there was no significant group difference for age [$t(44) = 1.14$, $p = 0.26$], gender [$\chi^2(1, N = 44) = 0$, $p = 1$], depressive symptoms [$t(44) = 0.47$, $p = 0.44$], state anxiety [$t(44) = 1.12$, $p = 0.27$], and trait anxiety [$t(44) = 0.44$, $p = 0.66$]. Significant differences were however observed regarding alcohol consumption: BD had higher AUDIT score [$t(44) = 9.11$, $p < 0.001$] than CP. They also drank more frequently [$t(44) = 8.35$, $p < 0.001$] and drank higher alcohol quantity [$t(44) = 7.72$, $p < 0.001$] per week. When drinking, BD consumed more doses per occasion [$t(44) = 7.89$, $p < 0.001$] and per hour [$t(44) = 9.06$, $p < 0.001$] than CP.

3.2. Emotional recognition abilities

Mean performance are reported in Table 2.

3.2.1. Accuracy score

There was a main effect of Group [$F(1,44) = 8.44$, $p = 0.001$, $\eta^2_p = 0.16$], showing that BD had lower scores than CP (see Fig. 1), but no Group × Emotion interaction [$F(5,220) = 0.54$, $p = 0.75$, $\eta^2_p = 0.01$]. A main effect was also found for Emotion [$F(5,220) = 42.10$, $p < 0.001$, $\eta^2_p = 0.49$], post hoc comparisons are detailed in Table 3 (part A).

3.2.2. Detection threshold

There was a main effect of Group [$F(1,44) = 6.48$, $p = 0.01$, $\eta^2_p = 0.13$], showing that BD need higher intensity to detect emotional content than CP, but no Group × Emotion interaction [$F(5,220) = 0.74$, $p = 0.60$, $\eta^2_p = 0.02$]. A main effect was also found for Emotion [$F(5,220) = 34.36$, $p < 0.001$, $\eta^2_p = 0.44$], post hoc comparisons are detailed in Table 3 (part B).

Table 2
Accuracy score (percentage of correct answers) and detection threshold (intensity at which the emotional content is reliably detected) for Binge Drinkers (BD) and Control Participants (CP) for each emotion in the Facial Emotion Recognition Test (TREF): mean (SD).

Experimental variable	BD ($n = 23$)	CP ($n = 23$)
Accuracy score		
Anger	67.63 (18.01)	75.36 (14.97)
Contempt	41.55 (20.44)	49.76 (20.88)
Disgust	58.45 (10.17)	65.70 (10.00)
Fear	85.02 (12.80)	85.02 (8.61)
Happiness	85.02 (15.21)	86.96 (10.93)
Sadness	70.05 (19.94)	76.33 (19.04)
Total	67.95 (6.64)	73.19 (5.52)
Detection threshold		
Anger	54.13 (18.07)	45.43 (16.92)
Contempt	70.87 (8.87)	67.61 (13.89)
Disgust	57.39 (8.24)	51.96 (8.89)
Fear	36.30 (14.56)	38.70 (14.63)
Happiness	34.57 (14.37)	32.39 (11.76)
Sadness	50.87 (18.93)	45.65 (17.92)
Total	50.69 (4.68)	46.96 (5.25)

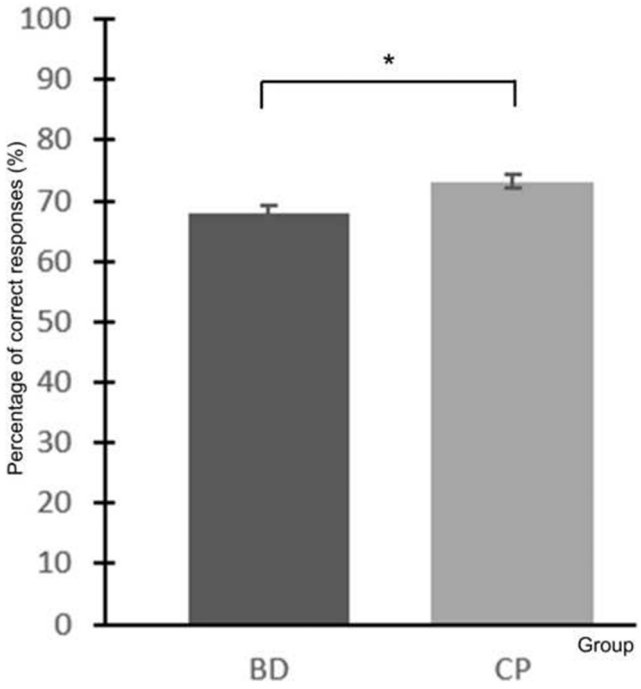

Fig. 1. Accuracy score (percentage of correct responses) for the mean performance of emotional recognition among Binge Drinkers (BD) and Control Participants (CP). *$p < 0.01$.

3.2.3. Correlational analyses

Both accuracy score and detection threshold were significantly related to the binge drinking score (respectively $r = -0.35$, $p = 0.02$; $r = 0.34$, $p = 0.02$) and to the specific number of doses consumed per drinking occasion (respectively $r = -0.31$, $p = 0.04$; $r = 0.30$, $p = 0.04$), indicating that excessive alcohol consumption was related to lower emotional recognition and higher emotional intensity needed to

Table 3
Post hoc comparisons between emotions for accuracy score (percentage of correct answers) and detection threshold (intensity at which the emotional content is reliably detected): *t*-value [1,45], (*p*-value).

	Anger	Contempt	Disgust	Fear	Happiness
Part A. Accuracy score					
Anger	–				
Contempt	**15.40 (0.001)**	–			
Disgust	**3.03 (0.004)**	**4.94 (0.001)**	–		
Fear	**4.90 (0.001)**	**13.28 (0.001)**	**9.75 (0.001)**	–	
Happiness	**4.76 (0.001)**	**10.97 (0.001)**	**9.34 (0.001)**	0.35 (0.73)	–
Sadness	0.46 (0.65)	**6.19 (0.00)**	**3.41 (0.001)**	**3.62 (0.001)**	**3.34 (0.002)**
Happiness = Fear > Sadness = Anger > Disgust > Contempt					
Part B. Detection threshold					
Anger	–				
Contempt	**5.44 (0.001)**	–			
Disgust	1.54 (0.130)	**4.94 (0.001)**	–		
Fear	**4.02 (0.001)**	**12.01 (0.001)**	**6.48 (0.001)**	–	
Happiness	**4.94 (0.001)**	**14.55 (0.001)**	**9.09 (0.001)**	1.32 (0.19)	–
Sadness	0.43 (0.67)	**5.85 (0.001)**	**2.14 (0.038)**	**3.03 (0.004)**	**4.11 (0.001)**
Happiness = Fear < Sadness < Disgust < Contempt; Sadness = Anger = Disgust < Contempt					

Note. Significant comparisons in bold.

perform correct detection. Moreover, when entering accuracy score and detection threshold as predictors of alcohol consumption in stepwise linear regressions, only the percentage of correct responses (accuracy score) was kept in the model and predicted the binge drinking score [$F(1,44) = 6.14$, $p = 0.02$] with a R^2 of 0.122 and the number of drinks consumed per occasion [$F(1,44) = 4.70$, $p = 0.04$] with a R^2 of 0.096. Eventually, results supported the absence of acute consumption effect by showing no relationship between alcohol consumption in the three days preceding the experiment and accuracy score ($r = 0.09$, $p = 0.64$) or detection threshold ($r = 0.27$, $p = 0.17$).

4. Discussion

The present study offers, to the best of our knowledge, the first systematic exploration of emotional decoding abilities for the six basic emotions in binge drinking. Indeed, research in alcohol-dependence has repeatedly emphasized emotional and interpersonal impairments, as well as their implication in alcohol relapse [6]. Research on binge drinking, however, remains poor and lacks clarity regarding possible emotional disturbances. Accordingly, this study investigated emotional recognition processing through six emotions presented at different intensity levels. As this study particularly focused on group differences, only these effects will be discussed in this section.

The main finding of this study is the group effect, showing that BD have lower performance to detect emotional content and need higher detection threshold than CP. This effect is not qualified by a Group × Emotion interaction, suggesting that the lower performance observed in BD is not related to the processing of a specific emotion. This result could suggest a global deficit for the detection of both positive and negative emotions, beyond the previously observed impairment for negative affect [12]. Indeed, while research in alcohol-dependence highlighted specific difficulties for negative emotions like fear [21] or disgust [14,22], studies using more complex paradigms showed that the impairments found for negative emotions were generalizable to positive ones [23]. In the present study, a complex recognition task with morphed stimuli was proposed, as BD seemed efficient in easier paradigms [13]. Additionally, for both theoretical and clinical perspectives, it appears important to underline the possible consequences of these impairments. Indeed, emotional impairments can damage social functioning and generate conflicts [24], a reduced recognition of others' emotions leading to poor understanding and inappropriate responses. This relationship has already been shown for acute binge consumption [25], and the present study indicates that it could be observed in more chronic binge drinking pattern. Importantly, this impact on social relationships could precipitate the use of alcohol as a maladaptive strategy, as it was reported in alcohol-dependence [6], and is further supported by regression analyses in the current study. Indeed, results indicate that the percentage of correct emotional recognition predicts the binge drinking score and the number of doses consumed per occasion. However, as binge drinking is also described as a practice used in recreational contexts among students who do not present pronounced social difficulties [13], further studies are needed to explore this proposal and the relationship between emotional and interpersonal abilities in BD. Importantly, this assumption is based on cross-sectional results and should thus be supported by strong experimental and longitudinal designs. Beyond this proposal and while the current cross-sectional findings do not allow the inference of causal links, it may also be hypothesized that the specific binge drinking pattern would induce emotional impairments, as it was previously conveyed and supported by animal studies [1]. This is moreover reinforced by longitudinal studies in humans showing electrophysiological modifications during the processing of affective voices after nine months of binge drinking, whereas baseline's performance were similar to those of control participants [11].

Besides, the current results are supported by a reliable selection, excluding participants with psychological or neurological disorders and family history of alcohol dependence (although it should be underlined that this selection was conducted exclusively using brief self-reported measures), as well as an effective group matching regarding sociodemographic and psychopathological variables. Moreover, correlation and regression analyses reinforce the proposal of a specific link between emotional impairments and alcohol consumption intensity and underline that these difficulties can predict future binge drinking, even if longitudinal studies are still necessary. Nevertheless, the lack of exploration regarding potential confounding factors hampers the strong statement of this proposal. As this study is the first to show emotional recognition deficit in binge drinking, this research field should thus more comprehensively investigate the underlying processes related to emotional recognition, notably the role of psychological factors (e.g., emotional reactivity or regulation) and the interaction between vision and emotion [16,26]. Furthermore, given the small number of participants in the current study, a lack of statistical power could hide the existence of an interaction between Group and Emotion. Indeed, while BD appeared less efficient to detect emotional contents than CP, findings showed that the detection of fear and happiness led to quite similar results in BD and CP. It can thus be hypothesized that the difference between groups is mainly related to the processing of specific emotions (i.e., anger, contempt, disgust, and sadness). However, the statistical thresholds of these interactions are not close to the critical value, which hampers to strongly support this hypothesis. Further works are thus necessary to investigate a possible differential processing between emotional contents. Future studies should also support these results with carefully selected groups, namely by using comprehensive and validated measures to explore psychiatric disorders and family history of alcohol-dependence. Finally, while the procedure to compute the detection threshold has been previously validated [15], further studies should confirm the reliability of this index.

As a whole, this study supports the presence of emotional impairments in binge drinking. These findings suggest that binge drinking is not only characterized by cognitive deficits but also by emotional ones, extending the understanding of this alcohol consumption pattern, but also its relationship with alcohol-dependence [4]. Indeed, it suggests that the continuum hypothesis, up to now observed for cognitive abilities, might be extended to affective ones. This research also conveys that emotional impairments could be implicated in the maintenance of excessive drinking, notably by their close relationship with social and interpersonal abilities, being thus potentially involved in the transition towards alcohol-dependence for some BD. Moreover, whereas this assumption needs further investigations, notably with longitudinal designs, the current result could be consistent with the proposal of Stephens and Duka [1]. These authors suggested emotional disturbances in binge drinking due to the alternations between intense intakes and repeated abstinences. Indeed, emotional impairments in alcohol-dependence also appeared related to withdrawal episodes [27].

5. Conclusion

This study supports the presence of emotional impairments in binge drinking, already observable at the behavioral level when using more complex experimental paradigms. Particularly, BD present reduced emotional recognition and need higher detection threshold to correctly capture the emotion. This difficulty to recognize emotional content also appears as a predictor of binge drinking in this cross-sectional design.

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Conflict of interest

None.

References

[1] Stephens DN, Duka T. Cognitive and emotional consequences of binge drinking: role of amygdala and prefrontal cortex. Philos Trans R Soc Lond B Biol Sci 2008;12:3169–79.
[2] Goudriaan AE, Grekin ER, Sher KJ. Decision making and binge drinking: a longitudinal study. Alcohol Clin Exp Res 2007;31:928–38.
[3] Hartley DE, Elsabagh S, File SE. Binge drinking and sex: effects on mood and cognitive function in healthy young volunteers. Pharmacol Biochem Behav 2004;78:611–9.
[4] Bonomo YA, Bowes G, Coffey C, Carlin JB, Patton GC. Teenage drinking and the onset of alcohol dependence: a cohort study over seven years. Addiction 2004;99:1520–8.
[5] Enoch M-A. Genetic and environmental influences on the development of alcoholism: resilience vs. risk. Ann N Y Acad Sci 2006;1094:193–201.
[6] Oscar-Berman M, Valmas MM, Sawyer KS, Ruiz SM, Luhar RB, Gravitz ZR. Profiles of impaired, spared, and recovered neuropsychologic processes in alcoholism. Handbook of clinical neurology [Internet]. Elsevier; 2014. p. 183–210 Available from http://linkinghub.elsevier.com/retrieve/pii/B9780444626196000124.
[7] Kuntsche E, Rehm J, Gmel G. Characteristics of binge drinkers in Europe. Soc Sci Med 2004;59:113–27.
[8] Mushquash AR, Stewart SH, Sherry SB, Sherry DL, Mushquash CJ, MacKinnon AL. Depressive symptoms are a vulnerability factor for heavy episodic drinking: a short-term, four-wave longitudinal study of undergraduate women. Addict Behav 2013;38:2180–6.
[9] Stephens DN, Ripley TL, Borlikova G, et al. Repeated ethanol exposure and withdrawal impairs human fear conditioning and depresses long-term potentiation in rat amygdala and hippocampus. Biol Psychiatry 2005;58:392–400.
[10] Connell AM, Patton E, McKillop H. Binge drinking, depression, and electrocortical responses to emotional images. Psychol Addict Behav 2015;29:673–82.
[11] Maurage P, Pesenti M, Philippot P, Joassin F, Campanella S. Latent deleterious effects of binge drinking over a short period of time revealed only by electrophysiological measures. J Psychiatry Neurosci 2009;34:111.
[12] Maurage P, Bestelmeyer PEG, Rouger J, Charest I, Belin P. Binge drinking influences the cerebral processing of vocal affective bursts in young adults. Neuroimage Clin 2013;3:218–25.
[13] Lannoy S, Dormal V, Brion M, Billieux J, Maurage P. Preserved crossmodal integration of emotional signals in binge drinking. Front Psychol 2017;8:894.
[14] Donadon MF, Osório FDL. Current alcohol dependence and emotional facial expression recognition: a cross-sectional study. Arch Clin Psychiatry (São Paulo) 2017;44:56–62.
[15] Gaudelus B, Virgile J, Peyroux E, Leleu A, Baudouin J-Y, Franck N. Mesure du déficit de reconnaissance des émotions faciales dans la schizophrénie. Étude préliminaire du test de reconnaissance des émotions faciales (TREF). L'Encéphale 2015;41:251–9.
[16] D'Hondt F, Campanella S, Kornreich C, Philippot P, Maurage P. Below and beyond the recognition of emotional facial expressions in alcohol dependence: from basic perception to social cognition. Neuropsychiatr Dis Treat 2014:2177.
[17] Townshend JM, Duka T. Binge drinking, cognitive performance and mood in a population of young social drinkers. Alcohol Clin Exp Res 2005;29:317–25.
[18] Spielberger DC, Gorsuch RL, Lushene R, Vagg PR, Jacobs GA. Manual for the state-trait anxiety inventory. Palo Alto: Consulting Psychology Press; 1983.
[19] Beck AT, Steer RA, Brown GK. Beck depression inventory manual. 2nd ed. San Antonio: Psychological Corporation; 1996.
[20] Babor T, Higgins-Biddle J, Saunders J, Monteiro M. The alcohol use disorders identification test: guidelines for use in primary care. Geneva: World Health Organization; 2001.
[21] Townshend JM, Duka T. Mixed emotions: alcoholics' impairments in the recognition of specific emotional facial expressions. Neuropsychologia 2003;41:773–82.
[22] Quaglino V, De Wever E, Maurage P. Relations between cognitive abilities, drinking characteristics, and emotional recognition in alcohol dependence: a preliminary exploration. Alcohol Clin Exp Res 2015;39:2032–8.
[23] Maurage P, Grynberg D, Noël X, et al. The "reading the mind in the eyes" test as a new way to explore complex emotions decoding in alcohol dependence. Psychiatry Res 2011;190:375–8.
[24] Fischer AH, van Kleef GA. Where have all the people gone? A plea for including social interaction in emotion research. Emot Rev 2010;2:208–11.
[25] Attwood AS, Munafò MR. Effects of acute alcohol consumption and processing of emotion in faces: implications for understanding alcohol-related aggression. J Psychopharmacol 2014;28:719–32.
[26] Maurage P, Campanella S, Philippot P, Martin S, de Timary P. Face processing in chronic alcoholism: a specific deficit for emotional features. Alcohol Clin Exp Res 2008;32:600–6.
[27] O'daly OG, Trick L, Scaife J, Marshall J, Ball D, Phillips ML, et al. Withdrawal-associated increases and decreases in functional neural connectivity associated with altered emotional regulation in alcoholism. Neuropsychopharmacology 2012;37:2267.