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Enhancement motivation to drink predicts binge drinking in adolescence: a longitudinal study in a community sample

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ABSTRACT

Background: Binge drinking, characterized by alternations between intense alcohol intakes and abstinence periods, is the most frequent alcohol-consumption pattern among adolescents and is associated with cognitive impairments.

Objectives: It appears crucial to disentangle the psychological factors involved in the emergence of binge drinking in adolescence, and centrally the role played by drinking motives, which are related to binge drinking.

Methods: This longitudinal study explored the role of drinking motives (i.e., social order, conformity, enhancement, coping) in the emergence of binge drinking among 144 adolescents (56.3% girls) from the community, who were assessed for alcohol consumption and drinking motives at two times (T1/T2), with a 1-year interval. After data checking, 101 adolescents (12–15 years old; 56.4% girls) constituted the final sample.

Results: Strong relationships were found between drinking motives and binge drinking. Regression analyses were computed to determine how drinking motives at T1 predicted binge drinking at T2, while controlling for global alcohol use. The statistical model explained 60% of the binge-drinking variance. In particular, enhancement motivation (i.e., the search for the enjoyable sensations felt when drinking) constituted the unique predictor of future binge drinking. Conversely, social motives did not predict binge drinking.

Conclusion: These findings highlight the central role of enhancement motivation (e.g., focusing on the positive expectancies towards alcohol) in youths' alcohol consumption and call for the development of preventive interventions. The previously reported relationship between social motives and college drinking does not seem to play a key role in the early steps of binge drinking.

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Introduction

Alcohol abuse has been identified as the third risk factor of premature death by the World Health Organization (WHO), and its excessive consumption among adolescents and young adults already leads to numerous negative consequences (e.g., missed classes, sexual assaults/risky sexual behaviours, memory blackouts; 1). Regarding excessive drinking in youth, binge drinking is a widespread alcohol consumption pattern described by repeated alternations between intense alcohol intakes (classically categorized as episodes during which a blood alcohol concentration (BAC) level of at least 0.08% is reached) and abstinence periods (2). According to the National Institute of Alcohol Abuse and Alcoholism (NIAAA), binge drinking corresponds to the consumption of at least four (for women) or five (for men) doses of alcohol in a 2-h interval, occurring at least once a month (3). This description should,

however, be adapted according to the definition of alcohol units in each country, as a dose of alcohol contains 14 grams of pure ethanol in the USA (NIAAA) but 10 grams in most European countries. Some studies have also proposed to focus on the specific drinking pattern and have computed a binge-drinking score by targeting consumption speed and drunkenness frequency (4). Beyond this definition debate, binge drinking has been identified as a hazardous habit (5,6), inducing far more deleterious cognitive (e.g., working memory impairments) and neuronal (e.g., widespread modifications of electrophysiological activities) dysfunctions than other alcohol use patterns (7). Moreover, over the last decades, binge drinking has been extended towards adolescent populations (8), adolescence indeed constituting a critical period for the emergence of psychopathological states and substance use disorders (9). As their brain is still in maturation (10), adolescents are also more prone to

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suffer from deleterious cerebral consequences related to alcohol use. Especially, binge drinking leads to functional disturbance of the normal brain maturation process (11). Moreover, it has been shown that the early onset of excessive alcohol consumption was associated with stronger long-term cognitive consequences. For example, an increased frequency of blackout episodes (potentially related to hippocampal dysfunctions) has been observed in early onset drinkers and persisted after the decrease of binge-drinking habits (12). Such consequences emphasize the urge to identify the specific mechanisms involved in the emergence of binge-drinking habits in adolescence. This would then help to propose prevention and intervention programmes focused on the psychological factors underlying alcohol consumption in this population.

Regarding the explanatory factors related to binge drinking in adolescence, longitudinal studies have mainly highlighted the role of environmental factors and life experiences (e.g., alcohol exposure, family history of alcohol misuse) combined with neurobiological differences such as genetic factors and brain volume (13), but also showed a strong influence of peers, social context (14), and alcohol marketing (15). Although offering a relevant conceptual background for public and health policies, these earlier works did not allow the identification of the key psychological factors related to the emergence of binge drinking. Indeed, beyond social and environmental influences or personality traits (e.g., impulsivity), the specific drinking motivations reported by young adolescents appear as a crucial factor to predict alcohol consumption (16) and binge-drinking habits (17). A motivational model of alcohol use has indeed been proposed, first characterized through a unitary frame (e.g., incentive motivation; 18) and then subdivided into specific motives (16). These influential models postulate that drinking alcohol enables the achievement of specific outcomes, which are classified according to the valence (positive or negative) and source (external or internal) of reinforcement. In particular, the currently recognized and well-validated motivational model identifies four drinking motives (16). At the external level, *social order* is a positive reinforcement motive related to alcohol consumption in affiliative social contexts and *conformity* is a negative reinforcement motive related to alcohol consumption to avoid negative judgments from others. At the internal level, *enhancement* is a positive reinforcement motive related to the enjoyable sensations provided by alcohol consumption and *coping* is a negative reinforcement motive related to alcohol consumption to relieve negative affect.

Several studies applying this model among adolescents have shown that enhancement motives are associated with heavy drinking and increased drunkenness

frequency, while social motives are related to moderate alcohol use, and coping motives to alcohol-related problems (19,20). Some works have also investigated the role of these factors at the longitudinal level and showed that, in college students, drinking motives underlie the relationships between alcohol consumption and subsequent alcohol-related problems (21,22). Drinking motives also clarified the relationship between parental drinking and offspring's drinking, which was especially mediated by enhancement and social motives (23). Beyond this parental influence, it also appears central to emphasize that coping and social motives predicted long-term alcohol-use disorders in youth with a family history of severe alcohol-use disorders (24). Besides, in a community sample, enhancement motives predicted the number of drinks consumed two weeks later, particularly during weekends, thus identifying enhancement as a potential key factor for heavy drinking frequency (25).

More precisely, a recent cross-sectional study using the binge-drinking score, conducted in late adolescence (16–19 years old), showed that all drinking motives were associated with binge drinking but that, although enhancement and conformity motives predicted the number of drinks consumed per occasion, only coping motives predicted the binge-drinking score (26). Besides, to explore the predictive value of drinking motives on upcoming drinking habits, longitudinal studies have been conducted. It has been shown that the onset of binge drinking was predicted by social expectancies in youth with a family history of severe alcohol-use disorders between 6 and 17 years of age (27). This result is interesting but focuses on a specific population, which hampers a generalization of the results to the global adolescent population. In a community sample of adolescents (14–18 years of age), enhancement was identified as a mediator between left insula white matter volume and binge-drinking frequency at 1-year follow-up (28). This study, however, focused on one specific motivation, thus not offering a global exploration of these motives. In this perspective, a longitudinal study exploring all drinking motives in adolescents (13–16 years of age at T1) supported that social motives played a crucial role to predict the total weekly alcohol consumption after 1 year, but also the frequency of heavy drinking episodes (29). While offering critical insights to the current research question, these results have to be replicated to predict the occurrence of specific binge-drinking pattern in adolescents from the community. Centrally, global alcohol consumption (e.g., weekly drinking) should be controlled for to specifically target the influence of binge-drinking habits.

Altogether, previous results support that drinking motives are important psychological factors in

adolescents' alcohol consumption and are effective predictors of excessive drinking habits. Nevertheless, the currently available evidence does not allow informing about the specific prediction of binge-drinking onset in young adolescents from the community. First, most studies focused on heavy drinking frequency and were, thus, based on the quantity of alcohol consumed in one episode rather than on the specific binge-drinking pattern. Second, this research question especially underlines the need for additional longitudinal research. In particular, for a better understanding of the factors underlying binge-drinking onset, it appears central to investigate the motivations towards alcohol before the emergence of excessive alcohol consumption. The aim of the present study was, therefore, to target young adolescents, with a longitudinal and theoretically grounded approach of drinking motivations, to explore how drinking motives can predict binge drinking over 1 year in young adolescents (from 12 to 15 years old) from the community. In view of the large literature exploring drinking motives in college students and showing inconsistent results, it appears central to consider the four-factor model and to explore which specific motive is related to binge-drinking pattern onset. According to the literature, and particularly the studies evaluating heavy drinking frequency (29) or binge drinking (28) at the longitudinal level, we hypothesized that the onset of binge-drinking pattern would be mainly predicted by social and enhancement motives.

Method

Participants

Adolescents were selected from a secondary school in Louvain-la-Neuve [located in the Walloon Brabant province (French-speaking part of Belgium), characterized by a socio-economic status which is higher than in other Wallonia provinces but similar to the one observed in the Dutch-speaking part of Belgium, i.e., Flanders (30)]. This study aimed at recruiting all adolescents in second, third and fourth school years (corresponding to 8th, 9th, and 10th Grade in the USA) with no other specific inclusion criteria. Participants were informed about the study by a letter addressed to them and their parents. Agreement to participate in this study was transmitted to the assistant director, which forwarded the experimenters the information needed to organize the subsequent experimental sessions. Totally, 430 French-speaking adolescents (49.05% of girls), between 12 and 19 years old ($M = 14.56$; $SD = 1.10$), performed the first study phase during the 2015–2016 academic year (T1; from

February to April 2016). Among these 430 participants, a sub-sample of 144 adolescents (56.3% of girls), between 13 and 18 years old ($M = 15.65$; $SD = 1.10$), took part in the second study phase during the 2016–2017 academic year (T2; from February to April 2017). All adolescents contacted for the second assessment time accepted to take part in the study but, as the study took part during school hours, only a part of the initial sample was tested at T2 due to organizational and time constraints. A total of 144 adolescents have, thus, completed both testing times and were included in the present study. For all participants, personal and parental consents were obtained before starting the survey. Whereas several versions of the questionnaire were proposed to adjust the assessment to the participants (see below for details), the online survey was implemented in such a way that answers to all items were mandatory. Therefore, adolescents included in the study did not present missing data. The anonymity of the participants was ensured throughout all the steps of the questionnaire by means of a coding system. The study protocol has been approved by the ethical committee of the University and conducted according to the declaration of Helsinki.

Procedures and measures

The online survey was implemented using Qualtrics software (Qualtrics LLC, Provo, OR, USA) and was identical at both testing times. Questionnaires assessed socio-demographic and personal variables, alcohol consumption habits and drinking motives.

Socio-demographic and personal variables

Age, gender, education level and native language were evaluated. Participants were also asked about family history of severe alcohol-use disorders (i.e., a binary assessment was proposed with the possibility to give more details when answering positively).

Alcohol consumption habits

Adolescents were evaluated regarding alcohol consumption and a first item (i.e., do you drink alcohol?) allowed the adjustment of the online survey by proposing two versions: the complete questionnaire including alcohol consumption assessment or the adapted questionnaire without alcohol consumption assessment. In the first version, a primary screening assessed the age of alcohol use onset and alcohol consumption by means of the validated French version of the Alcohol Use Disorders Identification Test (AUDIT; 31), measuring the harmfulness of alcohol consumption by 10 items with Likert

scales. The AUDIT score classically consists of the sum of the score for the 10 items. Several complementary items were also used to specifically explore binge-drinking habits (i.e., number of alcohol units consumed per week, number of drinking occasions per week, mean number of alcohol units consumed per occasion, consumption speed, and number of times being tipsy, drunk or completely drunk during the last 6 months). On this basis, a binge-drinking score (BD score; 4) was computed using the following formula: $BD\ score = [(4 * consumption\ speed) + drunkenness\ frequency + (0.2 * drunkenness\ percentage)]$. This formula has been validated by a factor analysis, in which factor scores determined the weight of each item using coefficient loadings (32,33). Moreover, the selected items allowed targeting the specific variables related to binge drinking, so that the BD score reflects specific drinking pattern, beyond the global quantity of alcohol consumed.

Drinking motives

Motivations were measured using the french version of Drinking Motives Questionnaire-Revised (DMQ-R; 34), a 20-item scale assessing four drinking motives: enhancement (e.g., “because you like the feeling”), social order (e.g., “because it helps you to enjoy a party”), conformity (e.g., “so that others won’t kid you about not drinking”) and coping (e.g., “because it helps you when you feel depressed or nervous”). Each motive was evaluated by five items rated from 1 (rarely or never) to 5 ([almost] always). The sum of the five items constituted the score for each motive, higher scores indicating stronger drinking motivation. Before the assessment of drinking motives, a preliminary item screened whether participants had drunk alcohol in the last 12 months (at least one drink). As participants were instructed to think about all the times they have consumed alcohol to specify their motivations, adolescents who did not drink in the past year were not evaluated regarding motivations. However, as this study particularly focused on the beginning of alcohol use, all participants (including non-drinkers, who did not report drinking motives) were included in the analyses at T1.

Data analyses

Analyses were conducted with IBM SPSS Statistics 21. Preliminary group comparisons were performed between the initial sample recruited at T1 and the final sample obtained at T2 to ensure the absence of selection bias. Subsequent data exclusions have also been described in this preliminary step (inclusions being based on age and alcohol consumption). Then, the relationships between binge drinking and drinking motives were explored at

cross-sectional and longitudinal levels in the whole final sample. For cross-sectional analyses, bivariate correlations corrected for multiple comparisons were performed between binge drinking and motivations at T1. For longitudinal analyses, as the aim was to observe the relationships between predictors (drinking motives) and alcohol consumption after 1 year, predictors were selected at T1 and binge drinking at T2. First, bivariate Pearson’s correlations corrected for multiple comparisons were performed between drinking motives (T1) and BD score (T2). The relationships between binge drinking and potential influencing variables [age, gender (1 = boy; 2 = girl), and family history of severe alcohol-use disorders (1 = yes; 2 = no) reported at T2] were also evaluated. Second, regression analyses were performed to predict binge drinking in adolescents over 1 year and to find out which drinking motives best predicted binge drinking after controlling for global alcohol use (modified AUDIT score). The modified AUDIT score consisted of the sum of the seven last items of the scale (i.e., excluding the items already taken into account in the BD score, namely items 1, 2 and 3). A multiple linear regression was computed using the T2 BD score as dependent variable and the T1 drinking motives (DMQ-R) as predictors. The model was also completed by the variables influencing alcohol consumption (i.e., age, gender and/or family history of severe alcohol-use disorders) and controlled for global alcohol consumption at T2. The control variable was indeed selected at the same assessment time than the dependent variable (T2 BD score) to ensure a reliable control of the model. Due to the strong relationships between the different drinking motives, regressions were computed with the stepwise method (35). This method allowed the selection of the variable(s) best explaining the variance of the dependent variable, thus limiting the number of selected predictors and reducing multicollinearity.

Results

Preliminary analyses

First, analyses were conducted to ensure the absence of selection bias. The sample recruited for the longitudinal study ($n = 144$ at T1 and T2) did not differ from the sample recruited at T1 ($N = 430$) for age [$t(572) = 0.11$, $p = .91$], gender [$\chi^2(1, N = 574) = 1.57$, $p = .21$], AUDIT score [$t(572) = 0.81$, $p = .42$] and BD score [$t(572) = 0.73$, $p = .46$]. Moreover, there was no significant difference between these samples for enhancement [$t(572) = 0.54$, $p = .59$], social order [$t(572) = 0.56$, $p = .58$] and conformity [$t(572) = 0.82$, $p = .41$] motives. A difference was observed for coping, with stronger coping motives in the initial sample [$t(572) = 3.30$, $p < .001$, $\eta^2 = 0.02$].

Besides, from this preliminary sample ($n = 144$), 43 participants have been excluded, leading to a final sample of 101 adolescents. First, as the aim of this study was to specifically focus on the onset of binge drinking among adolescents, participants were initially selected in specific classes (second, third, and fourth secondary school years). Accordingly, to offer a homogeneous sample in terms of age and alcohol-consumption habits, only participants between 12 and 15 years old at T1 have been included ($n = 111$). Indeed, the mean age of drinking onset in Europe is 13 years old, and binge drinking also begins at this age range with a higher prevalence from 15 years of age (36). Second, some participants have been removed after data-checking: nine due to inconsistent responses regarding alcohol consumption (i.e., participants who reported incompatible alcohol consumption characteristics at different parts of the survey) and one outlier (i.e., beyond three standard deviations, as identified with SPSS software) for the BD score.

Descriptive results

Characteristics of the final sample are described in Table 1. In total, 51.48% of the sample did not drink alcohol at T1. Among drinkers, 10.9% displayed a binge-drinking pattern according to an adapted BD cut-off score of 16. This cut-off has been proposed to match the alcohol measures used in most European countries (i.e., where an alcohol unit contains 10gr of pure ethanol) and reliably used in previous studies (37). At T2, 72.78% of the sample drank alcohol and 17.8% of the drinkers presented a binge-drinking pattern. In the whole sample, significant differences were observed regarding alcohol consumption, with a global increase at T2 [AUDIT score: $t(100) = 5.90$, $p < .001$, $\eta^2 = 0.26$ and BD score $t(100) = 3.77$, $p < .001$,

Table 1. Demographical, alcohol consumption, and drinking motives results at T1 and T2: Mean (SD).

Variable	T1	T2
Age	14.25 (1.02)	15.39 (1.06)
Gender ratio (F/M)	57/44	57/44
Tobacco consumption (n)	4	4
Psychological difficulties (n)	13	15
Family history of severe alcohol-use disorders (n)	15	22
Alcohol consumption		
Age alcohol use onset	12.73 (1.54)	13.38 (1.60)
AUDIT score	2.50 (4.29)	5.62 (6.73)
BD score	5.06 (8.29)	7.88 (9.54)
Alcohol consumption (in units per week)	1.34 (3.05)	2.41 (4.21)
Number of drinking occasions per week	0.54 (1.06)	0.83 (1.13)
Number of alcohol units per occasion	0.65 (1.38)	1.29 (2.01)
Consumption speed (in units per hour)	2.00 (1.60)	2.13 (1.31)
DMQ-R		
Enhancement	5.89 (6.71)	8.67 (6.95)
Social order	6.73 (7.33)	10.35 (8.00)
Conformity	2.53 (5.58)	4.35 (3.28)
Coping	3.72 (4.41)	5.33 (4.14)

$\eta^2 = 0.12$]. Drinking motives were also higher at T2 in the whole sample [enhancement $t(100) = 5.03$, $p < .001$, $\eta^2 = 0.20$, social order $t(100) = 5.16$, $p < .001$, $\eta^2 = 0.21$, conformity $t(100) = 5.63$, $p < .001$, $\eta^2 = 0.24$, and coping $t(100) = 4.43$, $p < .001$, $\eta^2 = 0.16$]. Correlations within each drinking motive reported at T1 and T2 were significant [enhancement ($r = 0.67$, $p < .001$), social order ($r = 0.58$, $p < .001$), conformity ($r = 0.41$, $p < .001$), and coping ($r = 0.64$, $p < .001$)], and drinking motives were also positively related to age [enhancement ($r = 0.49$, $p < .001$), social order ($r = 0.44$, $p < .001$), conformity ($r = 0.45$, $p < .001$), and coping ($r = 0.36$, $p < .001$)]. Moreover, binge drinkers at T1 had significantly stronger enhancement, social order and coping motives than other drinkers at the same testing time [$t(47) = 2.83$, $p = .01$, $\eta^2 = 0.15$; $t(47) = 2.55$, $p = .01$, $\eta^2 = 0.12$; and $t(47) = 2.46$, $p = .02$, $\eta^2 = 0.11$, respectively], therefore, supporting the validity of these variables to predict binge drinking. Cronbach's alphas for drinking motives at T1 were very good for enhancement ($\alpha = 0.84$), social order ($\alpha = 0.77$) and coping ($\alpha = 0.84$), but poor for conformity ($\alpha = 0.52$). Besides, alphas were very good for AUDIT ($\alpha = 0.89$) and modified AUDIT ($\alpha = 0.84$) scores. At T2, Cronbach's alphas ranged from good to very good [enhancement ($\alpha = 0.82$), social order ($\alpha = 0.82$), conformity ($\alpha = 0.81$), and coping ($\alpha = 0.67$) motives; AUDIT ($\alpha = 0.79$)].

Cross-sectional results

Correlational analyses

All correlations are presented in Table 2 (part A), with adjusted p -values after Bonferroni correction. Results showed that drinking motives were strongly and positively correlated with BD score.

Longitudinal results

Correlational analyses

Longitudinal findings (see Table 2, part B) fitted with cross-sectional results, showing significant positive relationships with all drinking motives.

Regarding possible biasing variables, correlations were also reported with Bonferroni adjusted p -values.

Table 2. Correlations between drinking motives at T1 and binge drinking (BD score) at T1 (Part A, cross-sectional results) and T2 (Part B, longitudinal results).

	Enhancement	Social order	Conformity	Coping
Part A				
BD score	0.70*	0.66*	0.46*	0.66*
Part B				
BD score	0.77*	0.71*	0.62*	0.61*

P -values were adjusted after Bonferroni correction for multiple comparisons. * $p < .001$.

Findings showed that the BD score was significantly related to age ($r = 0.46$, $p < .001$) but not to gender ($r = -0.03$, $p = .75$) or family history of severe alcohol-use disorders ($r = -0.23$, $p = .06$).

Linear regression analysis

The regression analysis considered the four drinking motives as predictors of the BD score. Age, significantly correlated with the BD score, and the modified AUDIT score were also added in the model (see Table 3). A significant regression equation was found [$F(1,66) = 51.61$, $p < .001$] with an adjusted R^2 of 0.60, enhancement being the only drinking motives that significantly predicted binge drinking (see Figure 1), even when AUDIT score was taken into account.

Table 3. Multiple linear regression with BD score as dependent variable.

Variable	S.E	<i>t</i>	β	<i>p</i>
Modified AUDIT score ¹	0.19	5.46	0.47	< .001
Enhancement motives	0.12	5.45	0.46	< .001
<i>Excluded variables</i>				
Age		1.07	0.09	0.29
Social order motives		0.31	0.05	0.76
Conformity motives		0.13	0.01	0.90
Coping motives		1.14	0.12	0.26

¹The same results are obtained when using the total AUDIT score as control variable. $R^2 = 0.61$ and adjusted $R^2 = 0.60$; $p < .001$.

Discussion

This study explored how drinking motives predict binge-drinking pattern over 1 year among young adolescents initiating alcohol consumption. The present results centrally support the existence of important relationships between all drinking motives and binge drinking, at cross-sectional and longitudinal levels. Results also emphasize the crucial role of drinking motives in predicting binge drinking in a sample of adolescents aged from 12 to 15 years, as we underlined that drinking motives significantly contribute to predict alcohol consumption one year later. Interestingly, when considering young adolescents from the community, and after controlling for global alcohol use, binge drinking was predicted by enhancement, a motive associated with positive internal reinforcement. These longitudinal findings extend previous cross-sectional research showing that enhancement motive is specifically related to heavy drinking frequency (20,25) and constitutes an efficient binge-drinking predictor (28). Remarkably, as the current regression has been controlled for global alcohol consumption, it can be suggested that these results are specific to binge drinking pattern. Therefore, according to our findings, more than half of the variance of binge-drinking onset in adolescents appears driven by pleasure, fun and alcohol-related sensations.

Nevertheless, contradictory to our hypotheses and previous studies emphasizing the importance of social influence in adolescence (29,38), binge-drinking onset

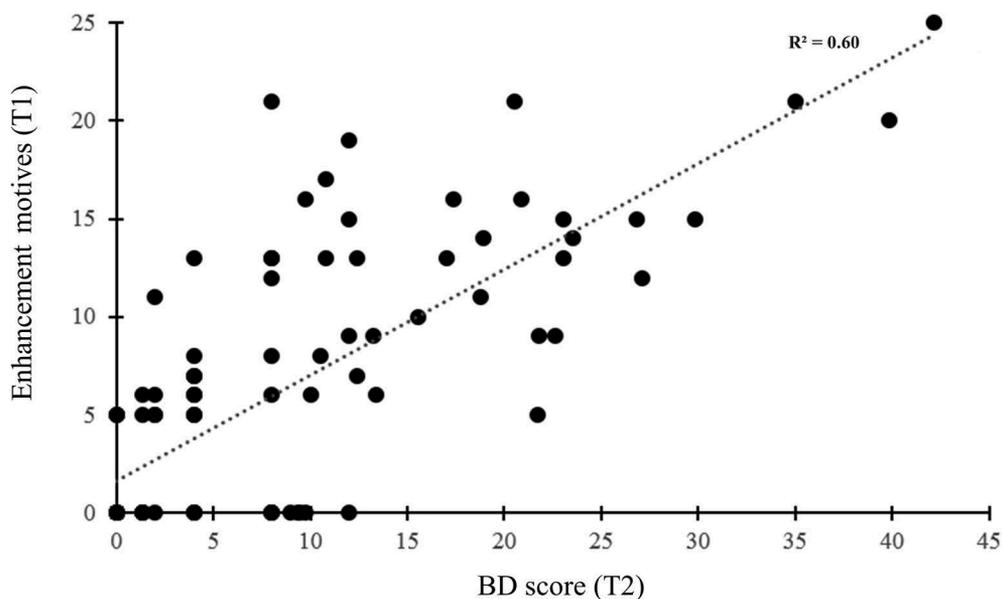


Figure 1. Linear relationship between enhancement motives at T1 and binge drinking score at T2 (BD score). This figure illustrates the relationship between enhancement motives and binge drinking, controlled for age and modified AUDIT score.

Note. The dotted line shows that greater enhancement motives at T1 predict binge drinking one year later (T2).

in community youth does not appear strongly driven by social motivations. Indeed, social motives have not been identified as significant predictors of binge drinking in the current study, even though both cross-sectional and longitudinal correlations showed strong relationships. First, compared to previous ones (14), this study was focused on young adolescents. One longitudinal research, investigating alcohol expectancies among an at-risk population, also showed the importance of social/relaxation factors in the prediction of binge-drinking age onset (27). Although the present research focused on binge drinking, which reflects a harmful alcohol use, the sample was constituted of non-problematic drinkers, before the emergence of (excessive) drinking habits. Therefore, it could be hypothesized that a temporal scheme exists regarding the links between alcohol consumption and drinking motives: the emergence of binge drinking would be predicted by internal enhancement motives while its maintenance and extension would be more related to external social influence. Indeed, the study of Jester and colleagues (27) demonstrated that the emergence of alcohol drinking led to a significant increase in social expectancies. Second, previous studies conducted in community samples have underlined the importance of social motives but have focused on weekly alcohol consumption (29), whereas the current results are controlled for global alcohol use. This proposal is moreover supported by results showing that social motives were rather related to moderate alcohol use in adolescents (20).

Importantly, the present study confirms that early adolescence now constitutes the critical period for the emergence of excessive alcohol consumption. A 1-year follow-up showed significant changes in binge drinking, together with an increase of drinking motives, thus underlining the need to start prevention programmes (39) at early adolescence stages. Indeed, beyond binge-drinking prediction, these findings highlight an increase of alcohol consumption and drinking motives between T1 and T2, which is also related to the age of participants. It can, thus, be hypothesized that desires and motivations to consume alcohol increase and evolve with age, as it has been previously observed for coping motives (40). Specific interventions should, thus, be developed to prevent the emergence of excessive alcohol consumption. In this perspective, adapted programmes could be proposed by targeting youth regarding their actual alcohol consumption but also their drinking motivations. Specifically, prevention programmes should be focused on the feelings experienced by young people when drinking alcohol (in reference to enhancement motives) by proposing, for example,

alternative activities for spending time and experiencing positive and stimulating emotions (39).

Before concluding, it is worth noting that the current sample is of limited size, which might impact the significance of some predictors. The consideration of other influential factors (e.g., depressive symptoms) would also have allowed better specifying the predictors of binge drinking, as reported in a recent study (41), and should be explored in future ones. Beyond psychopathological comorbidities, this study did not evaluate the psychological factors (e.g., sensation seeking, emotion regulation, social competence) that may explain the relationship between drinking motives and binge drinking. Further works conducted in young adolescents should thus consider these variables, deepen the evaluation of family history of severe alcohol-use disorders, and potentially take into account neurobiological factors. Moreover, it should be mentioned that the validity of the current results could be impacted by the decrease of the sample at T2. Eventually, this study has been conducted among a specific population (one secondary school in a region characterized by quite high socio-economic status), subsequent studies have, therefore, to support the generalizability of the current findings in other populations. Nevertheless, the current study also presents several implications. In a fundamental view, these results confirm and extend the pivotal role of drinking motives to predict binge drinking in a community sample, which is further reinforced by controlling for global alcohol use. They, thus, underline the theoretical validity of the drinking motives' model and the suitability of its exploration at different life periods (34,42). In young adolescents, we found results that may differ from previous ones obtained in older populations (e.g., regarding the involvement of social motives), therefore, addressing the possible specificity of this model. Particularly, enhancement may be related to the initial motivation proposed to characterize alcohol use (18), and this study supports its importance in the emergence of binge drinking. In a prophylactic perspective, this study first encourages the development of interventions focused on enhancement motive, as specified above. Findings moreover underline the usefulness of prevention programmes in early adolescence with young people who do not display excessive alcohol consumption yet. The current results indeed show that alcohol consumption and drinking motives strongly increase in one year, and the ideal time to get young people thinking about their alcohol consumption is before the emergence of drinking habits. Actually, a main difficulty for preventing excessive drinking in youth is that people experience lots of positive outcomes and few negative

consequences in the first year of consumption (43). At that time, prevention programmes are, thus, less efficient, which reinforce the relevance to test their implementation with adolescents presenting emerging binge-drinking habits (41).

Disclosure statement

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