wide range of negative consequences, including elevated risks of physical injury and death, high-risk sexual behavior, assault, decreased academic performances and subsequent alcohol use disorder (AUD) (Kuntsche *et al.*, 2017). With the aim of curbing the prevalence of

of countries worldwide. These behaviors have been associated with a

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Article

Disentangling the Relationship Between Self-Esteem and Problematic Alcohol Use Among College Students: Evidence From a Cluster Analytic Approach

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Abstract

Aims: Investigation of the relationship between self-esteem and alcohol use among college students has yielded discrepant results. We hypothesized that these discrepancies could originate from a potential heterogeneity of self-esteem patterns among young adult with an alcohol use disorder (AUD).

Methods: A community sample of 343 college students was recruited and categorized with or without AUD using the Alcohol Use Disorders Identification Test cut-offs. College students were compared on the dimensions of the Coopersmith Self-Esteem Inventory (CSEI) as well as mood, impulsiveness, alcohol- and other substance-related measures, including drinking motives.

Results: A cluster analysis conducted among college students with AUD highlighted two subgroups characterized by contrasting patterns on the CSEI: one group with a high level of self-esteem and low levels of anxiety and depression symptoms and one group with a low level of self-esteem and high levels of impulsiveness, mood symptoms and drinking to cope motives.

Conclusion: Findings caution against assuming that AUD is associated with low self-esteem, as reported in previous studies. These results rather emphasize a heterogeneity of self-esteem in college students, showing that high self-esteem was also related to AUD. Implications of these results are major for prevention purposes and clinical practice.

INTRODUCTION

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these behaviors and therefore their consequences, researchers have investigated the correlates of alcohol consumption among college students. A variety of factors have been identified, such as impulsivity (Caswell et al., 2016), drinking motives (Jones et al., 2014), peer pressure (Tahaney and Palfai, 2018), cognition (Carbia et al., 2018), metacognition (Gierski et al., 2015) and anxiety and depression (Capron et al., 2018). Other studies have focused on self-esteem, which was defined by Coopersmith (1967) as 'the evaluation which the individual makes and customarily maintains with regard to himself: it expresses an attitude of approval or disapproval, and indicates the extent to which the individual believes himself to be capable, significant, successful and worthy.' Self-esteem has been long considered as an important factor associated with AUD (Charalampous et al., 1976), but results among college students are currently contrasted. While the association between low self-esteem and AUD seems clearly established, the relationship between alcohol use and self-esteem among college students remains unclear, and the literature provides divergent results.

Low levels of self-esteem have long been established as a central factor among alcohol-dependent adults. For instance, Charalampous *et al.* (1976) found that alcohol-dependent individuals had globally lower self-esteem than non-alcoholic individuals and that among alcohol-dependent women was lower than that of alcohol-dependent men and controls but similar to that of women in treatment for psychiatric disorders unrelated to alcohol or drugs misuse. Consequences of low self-esteem are of major importance. Low self-esteem has been found to be an important factor in the development and maintenance of psychopathology (Salsali and Silverstone, 2003) and has been associated with several negative outcomes such as depression, non-suicidal self-injury, suicidal ideation and tendencies (Forrester *et al.*, 2017).

In college student populations, some studies have shown that heavier alcohol use is associated with low self-esteem (Bitancourt et al., 2016). These results have been explained by the assumption that individuals with low self-esteem are prone to use alcohol as a maladaptive coping strategy (Tomaka et al., 2013). In support to this view, the relationship between self-esteem and alcohol use has been shown to be mediated by either coping (Tomaka et al., 2013) or self-medication drinking motives (Backer-Fulghum et al., 2012) and the relationship between depressive symptoms and heavy episodic drinking has been shown to be mediated by coping motives (Kenney et al., 2018). Other studies have highlighted a differential effect of sex. For instance, in a prospective study, Walitzer and Sher (1996) found that low self-esteem was associated with alcohol use over the college years for women but not for men. More recently, Neumann et al. (2009) found an interaction between sex and self-esteem on drinking frequency and peak alcohol consumption among a group of 285 college students: women who exhibited higher alcohol use had low self-esteem, whereas men with particular alcohol-related concerns had high self-esteem. This differential association between self-esteem and alcohol use in men and women has also been supported by a recent study conducted in a sample of 5082 college students (Blank et al., 2016). Finally, some authors have reported a lack of association between alcohol consumption and self-esteem. For instance, Greenberg et al. (1999) found no significant association between self-esteem and alcohol use among a sample of 64 men and 65 women. One could argue that this result was due to the relatively small sample. However, Luhtanen and Crocker (2005) also failed to find evidence of an association between alcohol use and self-esteem among a sample of 620 college students.

These discrepant results in the literature may stem from methodological differences, especially in the definition or measurement of self-esteem, but may also indicate that college students with AUD exhibit different psychological patterns. This notion is supported by several findings suggesting that college student drinkers should not be considered as a homogeneous group, but rather as a heterogeneous one (Lannoy *et al.*, 2017; Gierski *et al.*, 2017).

The main goal of the current study was to disentangle the relationship between self-esteem and AUD in young adult college students. To this end, we conducted an interview-based study of alcohol use and self-esteem among college students. We hypothesized that AUD among college students is not related to a single pattern but can be associated either with high or with low levels of self-esteem. Therefore, we performed a cluster analysis on self-esteem measures. Clusters were then compared on the basis of external variables including alcohol and other substance uses, drinking motives, impulsivity and mood.

MATERIALS AND METHODS

Participants

Participants were 391 students (mainly Caucasian) aged 18–23 years, who were recruited from two French universities (University of Reims Champagne-Ardenne and University of Picardy Jules Verne). We excluded from this pool participants with incomplete data (n = 1), participants who scored > five points on the Lie scale of the Coopersmith Self-Esteem Inventory (CSEI; n = 14) and multivariate outliers on this questionnaire (n = 3). The final sample consisted of 373 participants (206 women and 167 men; mostly freshmen: 57.40%). Participants were then categorized as AUD or controls according to cut-off scores (men: ≥ 9 ; women: ≥ 8) on the Alcohol Use Disorders Identification Test (AUDIT; Babor *et al.*, 1992) defined by Hagman (2016) for screening DSM-5 AUD in college students.

These cut-offs allowed the identification of two groups: 159 individuals with AUD (AUD; 83 women and 76 men) and 214 individuals without AUD (controls; 123 women and 91 men). Characteristics of the two groups are displayed in Table 1.

In accordance with the Declaration of Helsinki, all participants freely gave their formal, written informed consent at the beginning of the study. They were provided with an information sheet setting out the main objectives of the study, and were informed that they could withdraw at any time. No reward was given for the participation. The filling of the questionnaires and the interview were conducted in a quiet room of the universities.

Measures

Alcohol use and drinking motives The AUDIT (Babor *et al.*, 1992) consists of 10 questions about recent alcohol use, alcohol-dependence symptoms and alcohol-related problems. It was used to identify individuals with AUD based on Hagman (2016) cut-off scores.

We used the Alcohol Use Questionnaire (Mehrabian and Russell, 1978) to calculate the weekly level of alcohol use, that is, the mean number of alcohol units consumed per week over the previous 6 months (in France, a unit of alcohol is defined as 10 g of pure ethanol). A binge score was also computed on the basis of drinking speed (mean number of drinks consumed per hour on drinking occasions), number of times being drunk in the previous 6 months and percentage of times getting drunk when drinking (for more information, see Townshend and Duka, 2002).

Variable	Controls $(n = 214)$	AUD (<i>n</i> = 159)	t or chi ²
Demographics			
Sex (% men)	42.52	47.79	1.03
Age	20.10 ± 1.48	20.19 ± 1.71	0.51
Education level	12.75 ± 1.05	12.81 ± 1.28	0.51
Alcohol and other substance use			
AUDIT score	4.50 ± 2.17	12.23 ± 4.01	22.06*
Binge drinking score	13.45 ± 11.05	29.41 ± 17.07	10.29*
Consumption speed (drinks/hour)	1.96 ± 1.29	30.01 ± 1.60	6.73*
Drunkenness episodes in previous 6 months	2.19 ± 4.67	9.51 ± 10.75	8.03*
Percentage of times drunk when drinking	17.01 ± 18.54	39.43 ± 25.87	9.75*
Alcohol units per week	2.41 ± 3.17	10.14 ± 8.99	11.61*
Age at drinking onset	15.11 ± 2.19	14.28 ± 1.86	3.90*
Family history of AUD (%)	10.28	19.5	6.36*
Lifetime cigarette smoker (%)	23.36	35.85	6.95*
Current cigarette smoker (%)	20.56	29.56	4.00*
FTND ^a score	2.68 ± 1.47	3.70 ± 1.91	2.84*
Lifetime cannabis user (%)	28.04	47.80	15.38*
Regular cannabis user (%)	5.14	10.06	3.29
Drinking motives			
DMQ-R enhancement	6.69 ± 2.80	9.96 ± 2.43	12.04*
DMQ-R social	7.35 ± 3.31	10.50 ± 2.42	10.60*
DMQ-R conformity	3.84 ± 1.70	4.52 ± 2.11	3.34*
DMQ-R coping	4.17 ± 2.10	6.36 ± 2.95	7.98*
Barratt Impulsiveness scale-11			
Total score	59.55 ± 9.09	66.27 ± 10.97	6.29*
Motor impulsiveness	20.27 ± 3.81	22.99 ± 5.09	5.65*
Attentional impulsiveness	16.22 ± 3.38	18.07 ± 3.54	5.09*
Non-planning impulsiveness	23.06 ± 4.37	25.21 ± 4.76	4.53*
Depression and anxiety symptoms			
BDI-II	7.90 ± 6.19	8.92 ± 6.96	1.48
STAI-trait	38.30 ± 9.90	40.15 ± 10.24	1.75
STAI-state	33.43 ± 9.39	34.48 ± 9.86	1.05

 Table 1. Demographics, alcohol and other substance use, drinking motives and mood assessment of college students stratified as without

 AUD (controls) and with AUD

Data are shown as mean \pm SD unless otherwise specified.

^aFor current cigarette smokers only.

*P < 0.05.

Family history of AUD and age at drinking onset were collected using the family informant schedule and criteria (Mannuzza *et al.*, 1985) and through a structured interview. Participants who reported having at least one first-degree family member (parent, sibling) and/or second-degree family member (grandparent), with AUD past or present were deemed to have a positive family history of AUD. Age at first drink was determined by asking the participants how old they were when they first start drinking alcoholic beverages, not including small tastes.

Regarding drinking motives, the short form of the Drinking Motive Questionnaire Revised (DMQ-R SF; Kuntsche and Kuntsche, 2009) is a 12-item scale assessing four distinct dimensions of drinking motivations: enhancement, social, conformity and coping motives. Participants were asked to consider all the times they had drunk alcohol in the previous 12 months and to indicate the number of occasions they had drunk for each type of motive. Each dimension is measured by three items, which are rated on a Likert scale ranging from 1 (Never) to 5 (Almost always).

Self-esteem Self-esteem was assessed with the CSEI (Coopersmith, 1981). This inventory comprises 50 items, to which participants have to answer by indicating whether the statement describes them or not (either 'Like me' or 'Unlike me'; e.g. 'I have a low opinion of myself').

The CSEI provides an overall self-esteem score as well as four subscale scores representing specific aspects of self-esteem, namely, general (self), social (peers), family (home/parents) and professional. This multidimensional view is particularly suitable to perform cluster analysis and observe the possible variations of self-esteem in different subgroups of college students. The four subscale scores are summed to make up the total CSEI score, which ranges between 0 and 50. Eight additional items constitute a Lie scale, but are not included in the final score.

Other assessments Impulsiveness was evaluated using the Barrat Impulsiveness Scale 11 (BIS-11; Patton *et al.*, 1995). This questionnaire generates a total score of general impulsiveness obtained by summing three subtest scores: motor (acting without thinking), attentional (an inability to focus attention or concentrate) and non-planning (lack of forethought) impulsiveness.

Anxiety and depression were evaluated with the State-Trait Anxiety Inventory (STAI; Spielberger *et al.*, 1983) and the second version of the Beck Depression Inventory (BDI-II; Beck *et al.*, 1996). Standards cut-off scores for moderated anxiety and depressive symptoms are respectively 46 for the State-Trait Anxiety Inventory (STAI) state and 20 for the BDI-II.

Variable	Controls ($n = 214$)	AUD $(n = 159)$	F	P value	η_p^2
CSEI					
Total score	38.25 ± 7.15	36.14 ± 8.32	7.25	0.007	0.02
General subscale	19.62 ± 4.18	18.38 ± 4.90	7.74	0.006	0.01
Social subscale	6.41 ± 1.64	6.42 ± 1.46	0.91	0.943	0.01
Family subscale	6.00 ± 2.04	5.57 ± 2.17	2.35	0.052	0.01
Professional	6.22 ± 1.46	5.78 ± 1.77	4.53	0.009	0.02
subscale					

Table 2. Comparison between college students without AUD (controls) and with AUD on the total score and four factor scores of the CSEI

Data are shown as mean \pm SD.

Use of other substances. We assessed tobacco consumption by inquiring about current cigarette smoking habits, and regular smokers were evaluated with the Fagerström Test for Nicotine Dependence (FTND, Heatherton *et al.*, 1991). We also collected information about lifetime and regular (≥ 1 joint per week) use of cannabis.

Data analysis plan

We conducted two different analyses. First, to investigate the role of self-esteem in AUD in line with previous findings, we explore the differences between the AUD and control groups. Groups were compared on demographic and clinical characteristic by means of either Student t tests or chi-square tests, as appropriate. Then, we investigated for a potential main effect of alcohol use and/or alcohol use by sex interaction on self-esteem by performing a multivariate analysis of variance (MANOVA) on the four subscores of the CSEI with group and sex as between factors. This analysis was followed by univariate analysis of variance (ANOVA) on each domain of the CSEI separately.

Second, to take into account the population heterogeneity in self-esteem, we ran a two-step cluster analysis among the AUD group. This classification method provided by IBM-SPSS (version 23) automatically identified subgroups of college students using the four CSEI subscale scores. At the first step, the log-likelihood distance was used to assign participants to the cluster leading to the largest log-likelihood. At the second step, the Bayesian Information Criterion was used to assess multiple cluster solutions and automatically determine the optimum number of clusters. As clustering have been shown to be sensitive to outliers and multicollinearity issue, we computed Mahalanobis distance for the CSEI subscale scores as well as variance inflation factors (VIFs). Two participants under the critical χ^2 *P*-value (*P* < 0.001) on Mahalanobis distance were excluded from the sample. VIFs ranged from 1.30 to 1.82, indicating that there was no multicollinearity issue.

Then, to explore the effects of cluster membership on the four domains of self-esteem, we performed a MANOVA on the four subscale scores of the CSEI with clusters and sex as between factors. Finally, we characterized the resulting clusters relative to the control group, using ANOVAs for continuous variables and χ^2 tests for categorical variables. *Post-hoc* comparisons were conducted using *t* tests.

The significance level was set at 5%. The effect sizes were estimated by computing partial eta-squared (0.01 = small effect, 0.06 = medium effect; 0.06 and 0.14 = large effect).

RESULTS

Group comparison

Analysis of the participants' demographic characteristics (see Table 1) revealed no significant differences between the control

and AUD groups on sex ratio, age or education level. As expected, significant differences were found for each alcohol use measure. Age at first drink was significantly lower for AUD participants than controls, while family history of AUD was higher in AUD group. Moreover, we found that scores for each drinking motive and impulsiveness subscales were higher among AUD participants than among controls. Information on substance use also revealed that the AUD group exhibited a higher prevalence of cigarette and cannabis use. No significant differences were found on depression symptoms or state or trait anxiety.

A MANOVA conducted on the four CSEI subscale scores with group (controls vs. AUD) and sex as between-participants variables revealed significant effects of group [$F(4, 366) = 3.19, P = 0.014, \eta_p^2 = 0.03$] and non-significant effects of sex [$F(4, 366) = 2.00, P = 0.094, \eta_p^2 = 0.02$] or group x sex interaction [$F(4, 366) = 0.19, P = 0.941, \eta_p^2 = 0.01$]. Consecutive univariate analyses showed a significant difference between groups on the total self-esteem score and the general and professional subscales, with controls scoring higher than AUD college students. The effect sizes for these differences, as assessed by partial eta-squared, were small (see Table 2).

Clustering analysis

The two-step cluster analysis carried out among the AUD sample resulted in two separate clusters: Cluster 1 was composed of 90 participants (56.60% of the sample), while cluster 2 was composed of 69 participants (43.40% of the sample). A MANOVA conducted on the four CSEI subscales scores with group (controls, AUD cluster 1 and AUD cluster 2) and sex as between factors revealed a significant effect of group $[F(8,728) = 25.40, P < 0.001, \eta_p^2 = 0.22]$ and nonsignificant effects of sex [F(4, 364) = 1.77, P = 0.134, $\eta_p^2 = 0.02$] or group x sex interaction [F(8, 728) = 0.50, P = 0.853, η_p^2 = 0.01]. Univariate analyses and post-hoc comparisons revealed that the AUD cluster 1 group had significantly higher scores on all the CSEI subscales than the AUD cluster 2 group, but also higher scores on all the CSEI subscales than the control group. By contrast, the AUD cluster 2 group had significantly lower scores on all the CSEI subscales than the AUD cluster 1 group and all the CSEI subscales than controls (see Table 3). We therefore labeled cluster 1 as the high self-esteem AUD group, and cluster 2 as the low self-esteem AUD group.

Univariate analyses conducted on external variables revealed that both AUD groups significantly differed from controls on most of alcohol use, drinking motives, impulsiveness, depression and anxiety measures. Indeed, regarding alcohol use, the high self-esteem group was characterized by a significantly higher number of drunkenness episodes in the previous 6 months as well as a higher level of alcohol units per week than the low self-esteem group. However, people from this subgroup exhibited lower coping dinking motives than

		AUD college students		
Variable	Controls	Cluster 1	Cluster 2	
N	214	90	69	
Cluster variables	Mean \pm SD	Mean \pm SD	Mean \pm SD	
CSEI general	19.62 ± 4.18	$21.17\pm2.71^{\text{a}}$	$14.74 \pm 4.73^{a,b}$	
CSEI social	6.41 ± 1.64	$60.98\pm0.95^{\mathrm{a}}$	$5.70 \pm 1.68^{\rm a,b}$	
CSEI family	6.00 ± 2.04	70.01 ± 1.14^{a}	$3.68 \pm 1.70^{a,b}$	
CSEI professional	6.22 ± 1.46	60.76 ± 1.03^{a}	$4.51 \pm 1.74^{a,b}$	
External variables				
Total CSEI	38.45 ± 6.64	41.91 ± 3.57^{a}	$28.62 \pm 6.55^{a,b}$	
CSEI Lie scale	2.70 ± 1.50	20.61 ± 1.61	2.35 ± 1.51	
Age	20.10 ± 1.48	20.36 ± 1.81	19.97 ± 1.55	
Education level	12.75 ± 1.05	13.01 ± 1.43	12.55 ± 1.01^{b}	
AUDIT score	40.50 ± 2.17	12.37 ± 4.22^{a}	12.06 ± 3.73^{a}	
Binge drinking score	13.45 ± 11.05	30.83 ± 17.91^{a}	27.55 ± 15.45^{a}	
Consumption speed (units/hour)	10.96 ± 1.29	$20.99 \pm 1.55^{\rm a}$	3.05 ± 1.59^{a}	
Drunkenness episodes in previous 6 months	2.19 ± 4.67	11.15 ± 7.36^{a}	$7.36 \pm 7.74^{a,b}$	
Percentage of times drunk while drinking	17.01 ± 18.54	39.17 ± 24.47^{a}	39.78 ± 27.76^{a}	
Alcohol units per week	2.41 ± 3.17	$12.28\pm9.72^{\rm a}$	$7.34 \pm 7.06^{a,b}$	
Age at first drink	15.11 ± 2.19	$14.04 \pm 1.87^{\mathrm{a}}$	14.58 ± 1.81	
FTND ^c score	2.68 ± 1.47	30.75 ± 2.01^{a}	3.65 ± 1.85^{a}	
DMQ-R enhancement	60.69 ± 2.80	10.21 ± 2.38^{a}	$9.64\pm2.47^{\mathrm{a}}$	
DMQ-R social	70.35 ± 3.31	10.50 ± 2.39^{a}	10.49 ± 2.48^{a}	
DMQ-R conformity	30.84 ± 1.70	40.44 ± 2.03^{a}	4.62 ± 2.22^{a}	
DMQ-R coping	40.17 ± 2.10	50.62 ± 2.64^{a}	$7.33 \pm 3.07^{a,b}$	
BIS-11 total score	59.55 ± 9.09	64.63 ± 10.32^{a}	$68.41 \pm 2.64^{a,b}$	
BIS-11 motor impulsiveness	20.27 ± 3.81	22.72 ± 4.63^{a}	23.33 ± 5.67^{a}	
BIS-11 attentional impulsiveness	16.22 ± 3.38	17.37 ± 3.58^{a}	$18.99 \pm 3.30^{a,b}$	
BIS-11 non-planning impulsiveness	23.06 ± 4.37	24.54 ± 4.40^{a}	$26.09 \pm 5.09^{a,b}$	
BDI-II	7.90 ± 6.19	50.31 ± 4.05^{a}	$13.62 \pm 7.16^{a,b}$	
STAI trait	38.30 ± 9.90	35.03 ± 6.69^{a}	$46.83 \pm 10.26^{a,b}$	
STAI state	33.43 ± 9.39	$30.78\pm5.80^{\rm a}$	$39.30 \pm 11.84^{a,b}$	
	Percentage	Percentage	Percentage	
Sex (men/women)	45.52/57.48	47.78/52.22	47.82/52.18	
Family history of alcohol	10.28	15.55	24.64ª	
Lifetime cigarette smoker	23.36	30.00	43.48ª	
Current cigarette smoker	20.56	26.67	33.33ª	
Lifetime cannabis user	28.04	50.00ª	44.93 ^a	
Regular cannabis user	5.14	7.77	13.04 ^a	

Table 3. Comparison	of scores on CSEI and external	variables among the two	AUD cluster groups and	the control group
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^aSignificantly different from controls at P < 0.05.

^bSignificantly different from cluster 1 at P < 0.05.

^cFor current cigarette smokers only.

individuals from the low self-esteem group. They also reported significantly lower non-planning and attentional impulsiveness. Moreover, the high self-esteem AUD group exhibited lower BDI and STAI scores than both the low self-esteem AUD group and the control group, whereas the low self-esteem AUD group was characterized by higher levels of depression symptoms and state-trait anxiety than other groups. Finally, only the low-self-esteem AUD group displayed significantly higher family history of alcohol, lifetime and current cigarette use, lifetime and regular cannabis use than controls.

Using standard cut-off scores of the STAI-A and BDI-II, we also compared the ratio of participants with probable anxiety and depressive disorders in the two clusters. For the STAI-A, we found that one participant (1.11%) from the high self-esteem AUD group had a score beyond the cut-off for moderated anxiety, while they were 20 participants (28.98%) in the low self-esteem AUD group ($\chi^2 = 12.43$; P < 0.001). For the BDI-II, we found that no participant from the high self-esteem AUD group scored above the standard cut-off for moderated depressive symptoms, while they were 13 participants (18.84%) in the low self-esteem AUD group ($\chi^2 = 18.47$; P < 0.001).

DISCUSSION

The present study was conducted to compare levels of self-esteem dimensions in young college students with and without AUD and to investigate the heterogeneity of self-esteem among college students with AUD.

The initial analysis, comparing college students with or without AUD, revealed a pattern of low self-esteem in the AUD group, in line with the study of Bitancourt et al. (2016). More precisely, univariate analysis emphasized lower self-esteem for AUD college students in several areas assessed by the CSEI: general, family and professional self-esteem. These results suggest that students with AUD have low personal self-esteem (general subscale) and when considering specific contexts, they reported low self-esteem in the professional and family domains but not with peers (social subscale). Nevertheless, our results outline that the mean differences between AUD and controls were associated with a small effect size. By contrast, the analyses conducted after applying a cluster classification on the AUD group yielded more clear-cut results. Clustering showed that the sample of AUD college students was actually composed of two contrasted clusters: one with higher levels of self-esteem than both the other AUD group and the control group; and one with lower levels of self-esteem. The high self-esteem AUD group was composed of young adults who reported no mental health problem (i.e. depressive and anxiety symptoms), but a higher overall drinking pattern including binge drinking, higher nicotine dependence, for those who smokes, and a higher prevalence of lifetime cannabis experimentation. According to Dehart et al. (2009), college students with high self-esteem may be more likely to find themselves in social situations where drinking is viewed positively and may use alcohol and other substances, when they experience more positive interpersonal interactions, presumably as a way to enhance their positive experiences. This group also exhibited higher self-reported impulsivity than non AUD college students, which could also explain the observed differences with the control group in the use of alcohol and other substances (Caswell et al., 2016).

In contrast to Blank *et al.* (2016) who find that high levels of selfesteem was specifically related to men college drinkers, we found no interaction between sex and group on self-esteem measures, and the two clusters of AUD college students displayed an even sex-ratio.

The low self-esteem AUD group had significantly lower scores than controls on all the self-esteem areas explored by the CSEI, but with particularly lower scores on the professional and family dimensions of self-esteem. First, lower professional self-esteem could be related to a lower achievement in studies, in line with the lower education level found in this cluster compared to the high self-esteem cluster, while age was similar. Second, family self-esteem could be related to the higher level of family histories of AUD found for this cluster, which has been associated with negative family climate and thus increases the likelihood of alcohol use by the age of 15 (e.g. Johnson *et al.*, 2019).

In addition to their excessive drinking, this cluster reported a higher prevalence of tobacco consumption, cannabis experimentation but also regular use as well as higher levels of depression and anxiety symptoms than the other cluster and the control group. Taken together, these findings strongly suggest that this group is in poor mental health. In line with previous studies, college students in this group seemed to use alcohol, along with other substances such as cannabis and tobacco, as a maladaptive coping strategy (Backer-Fulghum *et al.*, 2012; Kenney *et al.*, 2018; Tomaka *et al.*, 2013). It is also important to emphasize that the higher level of family histories of AUD found in this cluster has been associated with several vulnerability factors for alcohol misuse, including genetic liability (Brown-Rice *et al.*, 2018).

Finally, the low self-esteem AUD cluster was also characterized by the higher level of impulsiveness. More specifically, this group reported higher attentional and non-planning impulsiveness than other groups. This result is in line with Moustafa *et al.* (2017), who showed that depression and anxiety were the strongest predictors of BIS-11 total score among young and middle-aged individuals. As outlined by these authors, the combinations between impulsiveness and maladaptive coping styles, such as alcohol consumption, and low self-esteem could increase depression levels and have been associated with increase deliberated self-harm and suicidal behavior in young adults (Forrester *et al.*, 2017).

Our results have several implications for alcohol misuse prevention and clinical practice. College students with low self-esteem and AUD could be particularly vulnerable to risky behavior, including intentional but also unintentional injuries (see Kuntsche et al., 2017). It is therefore crucial to intervene to try to improve the mental health and wellbeing of this group. Likewise, alcohol screening and prevention initiatives need to consider the heterogeneity of college students with AUD and provide tailored interventions. To our opinion, self-esteem inventories, such as the CSEI, may be interesting tools, probably easier to propose in some alcohol screening and prevention initiatives than more direct anxiety and depression scales, and could be easily used by preventive medicine services. Furthermore, it has been shown that the exposure to an alcohol risk message may increase the alcohol-related attitudes, behaviors and drinking intentions of college students with high levels of self-esteem, particularly in men (Neumann et al., 2009). The high level of self-esteem appears to lead these students to consider themselves less liable to alcohol-related damage, and may give rise to counterproductive effects. Yet, the current development of person-centered prevention programs such as those using e-technologies (smartphone-based intervention, social networking; see, for instance, Flaudias et al., 2015) could benefit from the assessment of self-esteem to adjust the delivered prevention messages for each AUD pattern.

Several limitations should be borne in mind when considering the results of the present study. First, the cross-sectional nature of the present study does not allow to establish any causal pathways between self-esteem, AUD and mental health of college students; this will require additional longitudinal studies. Second, this study relied solely on explicit measures of self-esteem, even though some authors have found differences between explicit and implicit measures of self-esteem and alcohol-related behaviors (see Dehart et al., 2009). Finally, in contrast to previous studies (Walitzer and Sher, 1996, Neumann et al., 2009; Blank et al., 2016), we did not found any significant effect of sex on self-esteem. This discrepancy can originate from our sample size or from particularities of our sample such as culture (Schmitt and Allik, 2005) or the ratio of freshman and senior students (Blank's et al., 2016; sample was exclusively composed of final year students). This observation should therefore be supported by further studies conducted with more representative samples of college students, a larger sample size, in other cultures or by comparing freshman and senior students.

CONCLUSION

The present study, using a cluster analysis approach, allows to disentangle the relationship between AUD and self-esteem among young college students. It provides the first evidence that college students with AUD may have either high or low self-esteem. It emphasizes that AUD college students with low self-esteem had a pattern of poor mental health and higher impulsivity and could be therefore more prone to risky behaviors, including deliberated self-harm. Combined with previous research using person-centered approach in the investigation of alcohol-related behaviors among college students, the present study underlines the heterogeneity of this population and emphasizes the need to adopt targeted interventions at both the clinical and preventive levels.

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CONFLICTS OF INTEREST STATEMENT

Dr Benzerouk reports personal fees from Eutherapie and from Lundbeck, outside the submitted work. The other authors declare that they have no conflict of interest to disclose.

CONTRIBUTIONS

E.G., V.Q., A.K. and M.N. designed the study, wrote the protocol and obtained the financial support. F.G. and E.D.W. collected the data. F.G., F.B. and S.L. conducted the statistical analysis and wrote the first draft of the article. All authors contributed to the interpretation of the data, reviewed and approved the final article.

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