High and low self-esteem as pathways to alcohol use disorders among college students: results of a cluster analysis

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Abstract

Background: Investigation of the relationship between self-esteem and alcohol use among college students have yielded discrepant results, with some studies highlighting a negative relationship between self-esteem and alcohol-related measures, and others supporting either the opposite pattern or no relationship at all. The aim of the present study was to compare college students with or without an alcohol use disorder (AUD) on self-esteem dimensions, and to use a cluster analysis to investigate the potential heterogeneity of self-esteem among college students with AUD. Methods: Participants were 343 community-recruited college students aged 18 23 years. They were categorized on AUD using AUDIT cut-offs, and compared on the dimensions of the Coopersmith Self-Esteem Inventory (CSEI), and mood, alcohol- and other substance-related measures, including drinking motives. A cluster analysis was then carried out to investigate potential heterogeneity within the AUD group on self-esteem. Results: Results of a MANOVA on CSEI scores revealed lower self-esteem for the AUD group, but the pattern was not clear-cut. The cluster analysis highlighted two contrasting groups of college students with AUD: one with high levels of self-esteem and one with low levels. The low self-esteem group was also characterized by high levels of anxiety and depression symptoms, and high coping drinking motives. Conclusions: These findings caution against assuming that AUD among college students is associated with a single pattern and, in line with recent studies, emphasize its heterogeneity. Future studies will have to investigate the alcohol-use trajectories of these contrasting groups.

Keywords	alcohol use disorder; self-esteem; college students; cluster analysis; coping motives
Taxonomy	Psychological Disorders, Statistical Method, Personality Psychology

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Reims, March 27th, 2018

Dear Editor,

We are submitting for publication in *Addictive Behaviors* the following manuscript entitled "High and low self-esteem as pathways to alcohol use disorders among college students: results of a cluster analysis".

Although the relationship between low self-esteem and alcohol dependence has been long established, the investigation of the relationship between self-esteem and alcohol use among college students have yielded discrepant results.

This manuscript reports an original study which aims to disentangle this relationship. In line with recent research in the field of alcohol use in college students, which tends to show heterogeneity among young drinkers (Gierski et al., 2017 *ACER*; Lannoy et al., 2017 *Psy. Res.*), our findings support the idea of two distinct clusters of drinkers: one with high levels of self-esteem and the other one with low levels of self-esteem. The last cluster was associated with higher levels of anxiety and depressions symptoms as well as coping drinking motives or positive family history of alcohol. We sincerely believe that our results have major implications for clinical treatment and prevention, which are discussed in the manuscript.

We hope that you will be interested in publishing our work in *Addictive Behaviors.*

Kind regards,

F. Gierski

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Highlights

- College students with an alcohol use disorder (AUD) reported reduced self-esteem.
- Cluster analysis on reported self-esteem revealed two contrasting AUD groups.
- One had higher self-esteem and lower anxiety and depression than the non-AUD group.
- One had lower self-esteem and higher anxiety and depression than the non-AUD group.
- Self-esteem in students with AUD may differ according to mood and coping motives.

High and low self-esteem as pathways to alcohol use disorders among college students: results of a cluster analysis

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Abstract

Background: Investigation of the relationship between self-esteem and alcohol use among college students have yielded discrepant results, with some studies highlighting a negative relationship between self-esteem and alcohol-related measures, and others supporting either the opposite pattern or no relationship at all. The aim of the present study was to compare college students with or without an alcohol use disorder (AUD) on self-esteem dimensions, and to use a cluster analysis to investigate the potential heterogeneity of self-esteem among college students with AUD.

*Methods***:** Participants were 343 community-recruited college students aged 18-23 years. They were categorized on AUD using AUDIT cut-offs, and compared on the dimensions of the Coopersmith Self-Esteem Inventory (CSEI), and mood, alcohol- and other substance-related measures, including drinking motives. A cluster analysis was then carried out to investigate potential heterogeneity within the AUD group on self-esteem.

Results: Results of a MANOVA on CSEI scores revealed lower self-esteem for the AUD group, but the pattern was not clear-cut. The cluster analysis highlighted two contrasting groups of college students with AUD: one with high levels of self-esteem and one with low levels. The low self-esteem group was also characterized by high levels of anxiety and depression symptoms, and high coping drinking motives.

Conclusions: These findings caution against assuming that AUD among college students is associated with a single pattern and, in line with recent studies, emphasize its heterogeneity. Future studies will have to investigate the alcohol-use trajectories of these contrasting groups.

Keywords: alcohol use disorder; self-esteem; college students; cluster analysis; coping motives

1 Introduction

Problematic alcohol use, such as binge or heavy drinking (SAMSHA, 2016), is a major public health problem among college students in a number of countries worldwide. These behaviors have been associated with a 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, Kuntsche, Thrul, & Gmel, 2017). With the aim of curbing the prevalence of these behaviors and therefore their consequences, researchers have investigated the correlates of alcohol consumption among college students. A variety of factors have been identified, including impulsivity (Carlson, Johnson, & Jacobs, 2010; Caswell, Celio, Morgan, & Duka, 2016), drinking motives (Jones, Chryssanthakis, & Groom, 2014), peer pressure (see Tahaney & Palfai, 2018), metacognition (Clark et al., 2012; Gierski et al., 2015), and anxiety and depression (Capron, Bauer, Madson, & Schmidt, 2017). Other studies, on the basis of clinical observations of alcohol-dependent patients, have focused on self-esteem.

Self-esteem 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". Low levels of self-esteem have long been established among alcohol-dependent adults (Beckman, 1978; Charalampous, Ford, & Skinner, 1976). By contrast, the association between alcohol use and self-esteem among college students remains unclear, and the literature provides divergent results.

Some studies have shown that low self-esteem is associated with heavier use of alcohol among college students (Benjamin & Wulfert, 2005; Bitancourt, Tissot, Fidalgo, Galduroz, & da Silveira Filho, 2016). These results have been explained by the assumption

that people with low self-esteem are prone to use alcohol as a maladaptive coping strategy (Tomaka, Morales-Monks, & Shamaley, 2013). In support of 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 (Backer-Fulghum, Patock-Peckham, King, Roufa, & Hagen, 2012) drinking motives, and the relationship between depressive symptoms and heavy episodic drinking to be mediated by coping motives (Kenney, Anderson, & Stein, 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, Leffingwell, Wagner, Mignogna, and Mignogna (2009) found an effect of the 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. Results from a web-based survey among 5082 university students found that higher self-esteem was associated with heavy drinking frequency (i.e., number of episodes when more than six units of alcohol are consumed) for men, while for women, lower self-esteem scores were associated with particularly heavy drinking, as well as with other alcohol-related measures (Blank, Connor, Gray, & Tustin, 2016).

Finally, some authors have reported a lack of association between alcohol consumption and self-esteem. For instance, Greenberg, Lewis, and Dodd (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-related variables, such as drinking frequency and bingeing frequency (i.e., number of episodes

within the previous 6 months when six or more units of alcohol were consumed in a row) 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 problematic alcohol use exhibit different psychological patterns. This notion is supported by several findings suggesting that college student drinkers should not be considered as homogeneous, but as heterogeneous. Using latent profile analysis, Cadigan, Martens, and Herman (2015) identified six different patterns of drinking motives among college students, with four being associated with alcohol-related problems, two of these involving elevated depressive symptoms. Other recent studies using cluster analysis have also emphasized the psychological heterogeneity of binge drinking college students in terms of drinking motives and impulsivity (Lannoy, Billieux, Poncin, & Maurage, 2017) or measures of temperament (Gierski et al., 2017).

The main goal of the current study was to determine whether self-esteem is related to problem drinking in young adult college students, and if it is, to establish the direction of that relationship. To this end, we conducted an interview-based study of alcohol use and self-esteem among college students. In line with the aforementioned literature, we also hypothesized that problematic alcohol use is not related to a single pattern, and conducted a cluster analysis on self-esteem measures. Clusters were identified on the basis of external variables including alcohol and other substance use, drinking motives, and mood.

2 Material and methods

2.1 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 the total alcohol abstainers, participants with psychiatric or neurological disorders past or present, those who were currently taking psychotropic medication, and those who scored > 5 points on the Lie scale of the Coopersmith Self-Esteem Inventory (CSEI). The final sample consisted of 343 participants (184 women and 159 men). Participants were then categorized as AUD or controls according to the cut-off scores on the Alcohol Use Disorders Identification Test (AUDIT; Babor, De la Fuente, Saunders, & Grant, 1992; see below).

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.

2.2 Measures

2.2.1 Alcohol use and drinking motives

The *AUDIT* consists of 10 questions about recent alcohol use, alcohol dependence symptoms, and alcohol-related problems. The total AUDIT score was used to categorize participants as controls or AUD (men: AUDIT ≥ 9; women: AUDIT ≥ 8). These cut-off scores were based on Hagman (2016)'s study, which validated the AUDIT for screening DSM-5 AUDs in college students.

We used the *Alcohol Use Questionnaire* (Mehrabian & Russell, 1978) to calculate the weekly level of alcohol use, that is, the mean number of units of alcohol consumed per week over the previous 6 months (in France, a unit of alcohol is defined as 10 g (12.5 ml) of pure ethanol). A binge score was 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 & Duka, 2002).

Family history of AUD and age at drinking onset were collected using the Family Informant Schedule and Criteria (FISC; Mannuzza, Fyer, Endicott, & Klein, 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.

Regarding *drinking motives*, the short form of the Drinking Motive Questionnaire Revised (DMQ-R SF; Kuntsche & 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*). Higher scores represent higher levels of drinking motivations.

2.2.2 Self-esteem

Self-esteem was assessed with the CSEI (Coopersmith, 1967, 1981). The French version of the CSEI (Coopersmith, 1984) comprises 50 items, to which participants have to answer by indicating whether the statement describes them or not (either “Like me” or “Unlike me”). The CSEI yields an overall score and four subscale scores representing specific aspects of self-esteem, namely, general (self), social (peers), family (home/parents), and professional. These four subscores 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. The internal consistency of the French version of the CSEI was good (split-half coefficient = .90). The CSEI has also been shown to have satisfactory test-retest reliability in a population of college students (Ryden, 1978).

2.2.3 Other assessments

Anxiety and depression were evaluated with the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) and the second version of the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996).

Intellectual ability was evaluated using the short-form version of the Wechsler Adult Intelligence Scale-Third Edition (WAIS-III; Wechsler, 1997) which includes the Vocabulary, Similarities, Digit-Symbol-Coding and Matrix Reasoning subtests (Grégoire & Wierzbicki, 2009).

2.3 Data analysis plan

We began by investigating the differences between the AUD and control groups by means of either Student *t* tests or chi-square tests, as appropriate. We then ran a two-step cluster analysis among the AUD group. This classification method automatically identified subgroups using the four CSEI subscores. 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 (see Hair, Black, Babin, & Anderson, 2014). We characterized the resulting clusters relative to the control group, using analyses of variance (ANOVAs) for continuous variables and $\chi 2$ 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 Cohen's *d* or Cramer's *V*, as appropriate.

3. Results

Analysis of the participants' demographic characteristics (see Table 1) revealed no

significant differences between the control group and AUD group on sex ratio, age, education level or IQ. However, significant differences were found for each alcohol use measure. Compared with controls, AUD college students had higher AUDIT and binge drinking scores, a higher drinking speed, more episodes of drunkenness over the previous 6 months, a higher percentage of drunkenness, and higher mean weekly alcohol consumption. Age at first drink was also significantly lower for AUD participants than for controls. Consistent with this, we found that scores for each drinking motive were higher among AUD participants than among controls. Information on other substance use revealed that the AUD group exhibited a higher prevalence of cigarette and cannabis use. No significant differences were found on family history of AUD, depression symptoms, or state or trait anxiety.

Insert Table 1 about here

A multivariate ANOVA (MANOVA) conducted on the four CSEI subscores with group (controls vs. AUD) and sex as between-participants variables revealed significant effects of group, $F(4, 336) = 2.83$, $p = 0.025$, and sex, $F(4, 336) = 2.86$, $p = 0.023$, and a nonsignificant Group x Sex interaction, $F(4, 336) = 0.10$, $p = 0.983$. However, univariate analyses on the four subscales only showed a significant difference between groups on the Professional subscale, with controls scoring higher than AUD college students. Furthermore, the effect size for this difference, as assessed by Cohen's *d*, was small (see Table 2). Univariate analyses of the sex effect revealed significantly lower scores for women on the General subscale (women: 18.95 ± 4.07, men: 19.99 ± 4.01), $F(1, 341) = 5.69$, $p = 0.02$, $d = 0.26$. No other comparison was significant (Fs < 1).

Insert Table 2 about here

The two-step cluster analysis carried out among the AUD sample resulted in two separate clusters: Cluster 1 contained 78 participants (52.70% of the sample), while Cluster 2 contained 70 participants (47.30% of the sample). A MANOVA conducted on the four CSEI subscores with group (controls vs. AUD Cluster 1 vs. AUD Cluster 2) and sex as between-participants variables revealed significant effects of group, $F(8, 668) = 22.33$, $p < 0.001$, and sex, $F(4, 334) = 3.13$, $p = 0.036$, and a nonsignificant Group x Sex interaction, $F(8, 668) = 0.25$, $p = .981$. 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, and 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 almost all the CSEI subscales than controls (see Fig. 1 and Table 3). We therefore labelled Cluster 1 as the *high self-esteem* AUD group, and Cluster 2 as the *low self-esteem* AUD group.

Insert Table 3 and Figure 1 about here

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4. Discussion

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

The initial analysis comparing college students with or without AUD, determined according to Hagman's cut-off scores (Hagman, 2016), highlighted the difficulty of clearly identifying a pattern of low self-esteem in the AUD group. Although we found a significant difference between the two groups using a multivariate analysis, a univariate analysis only

yielded a lower score for AUD college students for one of the four subscales (Professional). Furthermore, the mean difference for this subscale was associated with a small effect size. By contrast, the analyses we conducted after applying a cluster analysis yielded more clear-cut results. Clustering showed that the sample of AUD college students contained two contrasting clusters: one had higher levels of self-esteem than both the other AUD group and controls; and one had lower levels of self-esteem. The *high self-esteem AUD group*, as we labelled the first cluster, was composed of young adults who reported no problems other than excessive drinking and a higher prevalence of cannabis experimentation. They reported lower depression symptoms and both state and trait anxiety than the control group, had higher drinking motives (except for conformity) and had started to drink at a younger age. According to Dehart, Tennen, Armeli, Todd, and Mohr (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 when they experience more positive interpersonal interactions, presumably as a way to enhance their positive experiences. This group was quite similar to the one identified by Blank et al. (2016) among men. However, in our study there was no interaction between sex and group on self-esteem measures, and the two clusters had an even sex ratio.

The *low self-esteem AUD group*, as we labelled the second cluster, had significantly lower scores than controls on almost all the CSEI subscales. In addition to their excessive drinking, they reported a higher prevalence of tobacco consumption, cannabis experimentation but also regular use, and high levels of depression symptoms and both state and trait anxiety. Taken together, these findings suggest that this group had 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 coping strategy (Backer-

Fulghum et al., 2012; Kenney, Anderson, & Stein, 2018; Tomaka et al., 2013). A direct comparison between the two clusters revealed that the low self-esteem group had a significantly lower mean IQ and education level than the high self-esteem group, even though they had a comparable mean age. Several individuals in the low self-esteem group may therefore have encountered academic failure. This relation is not necessarily causal, of course. Finally, it is important to emphasize that this group had more family histories of AUD, suggesting that they had several vulnerability factors for alcohol misuse, including genetic liability (Brown-Rice et al., 2018).

Although we did not administer the UPPS-P impulsive behavior scale (Billieux et al., 2012), some comparisons can be made with the cluster identified in Lannoy et al. (2017)'s study. Thus, college students in the high self-esteem group were comparable to the *recreational binge drinkers* identified by these authors, who were also characterized by lower conformity motives and lower levels of psychological disorders (mainly depression and anxiety disorders) past or present. College students in the low self-esteem group were comparable to the *emotional binge drinkers*, who were also characterized by higher levels of psychological disorders past or present, and higher tobacco consumption. Binge drinking behavior in this group was conceptualized by Lannoy et al. (2017) as a *maladaptive* emotion regulation strategy.

These results have potential implications for alcohol misuse prevention and clinical practice. It is important to intervene to improve the mental health and wellbeing of college students with low self-esteem and AUD. Furthermore, prevention campaigns need to consider the heterogeneity of college students with AUD. For instance, 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 men (Neumman et al., 2009).

Their 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.

4.1 Limitations

Several limitations should be borne in mind when considering the results of the present study. First, this study was exclusively based on retrospective self-reported measures of alcohol consumption, raising the possibility of errors in recall or assessment. Second, we did not control for social desirability, even though several studies have demonstrated a relationship between social desirability and self-esteem. The high self-esteem AUD group may have been more prone to a social desirability bias and may thus have underestimated some aspects of self-esteem or depression symptoms and anxiety measures. By contrast, the low self-esteem group may have been less prone to a social desirability bias and may thus have given more honest answers. However, it should be noted that individuals with a high score on the CSEI Lie scale were excluded from the analyses, and the two AUD clusters did not differ on this scale. Finally, this study relied solely on explicit measures of self-esteem (i.e., the CSEI), even though some authors have found differences between explicit and implicit measures of self-esteem and alcohol-related behaviors (see Dehart et al., 2009).

5. Conclusions

These results provide the first evidence that young college students with AUD may have either high or low self-esteem, regardless of sex. Combined with previous research, they underline the heterogeneity of this population and emphasize the need to adopt a differentiated approach at both the clinical and preventive levels of addictive behaviors. More research will be necessary to investigate the alcohol-use trajectories of these contrasting groups.

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Contributions

FG, VQ, AK and MN designed the study and wrote the protocol. FG and EDW collected the data. FG conducted the statistical analysis and wrote the first draft of the manuscript. All authors contributed to the interpretation of the data, and reviewed and approved the final manuscript.

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Table 1. Demographics, alcohol and other substance use, drinking motives and mood assessment of college students stratified as without alcohol use disorder (controls) and with alcohol use disorder (AUD).

	Controls (n = 195)	AUD (n = 148)	t or chi^2	P value
Demographics				
Sex (% men)	45.13	47.97	0.27	0.601
Age	20.14 ± 1.48	20.17 ± 1.72	0.17	0.863
Education level	12.75 ± 1.06	12.84 ± 1.29	0.64	0.520
WAIS-III SF IQ	97.73 ± 9.93	97.55 ± 10.30	0.17	0.867
Alcohol and other substance use				
AUDIT score	4.62 ± 2.09	12.24 ± 3.94	21.36	< 0.001*
Binge drinking score	13.87 ± 11.19	29.81 ± 17.03	9.88	< 0.001*
Consumption speed (drinks/hour)	2.03 ± 1.28	3.01 ± 1.56	6.42	< 0.001*
Drunkenness episodes in previous 6 months	2.28 ± 4.87	9.82 ± 10.96	7.80	< 0.001*
Percentage of times drunk when drinking	17.36 ± 18.89	39.67 ± 25.90	8.84	< 0.001*
Alcohol units per week	2.49 ± 3.25	10.33 ± 9.05	10.06	< 0.001*
Age at drinking onset	15.09 ± 2.24	14.34 ± 1.85	3.30	0.001*
Family history of AUD (%)	12.82	17.57	1.49	0.221
Current cigarette smoker (%)	18.97	28.34	4.20	0.040*
FTND [a] score	2.70 ± 1.49	3.72 ± 1.84	2.69	0.009*
Lifetime cannabis user (%)	25.64	47.97	18.38	< 0.001*
Regular cannabis user (%)	3.59	10.81	7.01	0.008*
Drinking motives				
DMQ-R Enhancement	6.82 ± 2.72	10.05± 2.41	11.63	< 0.001*
DMQ-R Social	7.50 ± 3.21	10.55 ± 2.44	9.90	< 0.001*
DMQ-R Conformity	3.92 ± 1.68	4.51 ± 2.11	2.76	0.005*
DMQ-R Coping	4.26 ± 2.07	6.24 ± 2.84	7.16	< 0.001*
Depression and anxiety symptoms				
BDI-II	6.17 ± 4.68	7.84 ± 5.46	0.74	0.456
STAI-Trait	37.69 ± 9.11	38.99 ± 9.24	1.29	0.196
STAI-State	32.88 ± 8.65	33.61 ± 8.82	0.77	0.442

Note. Data are shown as mean ± *SD* unless otherwise specified. AUDIT = Alcohol Use Disorders Identification Test; FTND = Fagerström Test for Nicotine Dependence; STAI = State-Trait Anxiety Inventory; [a] for current cigarette smokers only; DMQ-R = Drinking Motives Questionnaire Revised. * = significant differences.

Table 2. Comparison between college students without alcohol use disorder (controls) and with alcohol use disorder (AUD) on the total score and four factor scores of the Coopersmith Self-Esteem Inventory.

	Controls (*n* = 195)	AUD (*n* = 148)	*F*	*p* value	Cohen's *d*
Coopersmith Self-Esteem Inventory					
Total score	38.45 ± 6.64 [18-49]	37.07 ± 7.53 [12-50]	3.20	0.075	0.20
General subscale	19.78 ± 3.84 [8-26]	18.97 ± 4.31 [6-26]	3.75	0.067	0.20
Social subscale	6.38 ± 1.44 [1-8]	6.53 ± 1.35 [2-8]	0.91	0.312	0.11
Family subscale	6.03 ± 2.00 [0-8]	5.68 ± 2.16 [1-8]	2.35	0.123	0.17
Professional subscale	6.26 ± 1.43 [2-8]	5.89 ± 1.73 [0-8]	4.53	0.033	0.24

Note. Data are shown as mean ± *SD* [range].

Table 3. Comparison of scores on Coopersmith Self-Esteem Inventory (CSEI) and external variables among the two AUD cluster groups and the control group.

	Controls	AUD college students		Inferential statistics			
		Cluster 1 (C1)	Cluster 2 (C2)	*F* groups	Controls vs. C1	Controls vs. C2	C1 vs. C2
N	195	70	78				
Cluster variables	Mean ± *SD*	Mean ± *SD*	Mean ± *SD*				
CSEI General	19.78 ± 3.84	21.68 ± 2.36	15.96 ± 3.98	52.21***	4.94***	6.96***	10.49***
CSEI Social	6.38 ± 1.44	7.01 ± 0.96	6.00 ± 1.51	10.90***	4.23***	1.82	4.80***
CSEI Family	6.03 ± 2.00	7.18 ± 0.96	4.00 ± 1.88	59.59***	6.40***	7.60***	12.73***
CSEI Professional	6.26 ± 1.43	6.79 ± 0.94	4.89 ± 1.85	34.68***	3.63***	5.63***	7.79***
External variables							
Total CSEI	38.45 ± 6.64	42.67 ± 3.11	30.84 ± 5.93	79.35***	7.13***	8.91***	14.93***
CSEI Lie scale	2.70 ± 1.50	2.62 ± 1.60	2.36 ± 1.57	1.61	0.43	1.60	0.99
Age	20.14 ± 1.48	20.31 ± 1.83	20.01 ± 1.58	0.71	0.73	0.57	1.04
Education level	12.75 ± 1.06	13.09 ± 1.48	12.56 ± 0.97	3.83*	1.83	1.41	2.61**
WAIS-III SF IQ	97.73 ± 9.93	99.68 ± 10.92	95.17 ± 9.07	7.38**	1.42	1.89	2.71**
AUDIT score	4.62 ± 2.09	12.29 ± 4.09	12.19 ± 3.80	271.90***	15.77***	15.84***	0.17
Binge drinking score	13.87 ± 11.19	29.18 ± 16.15	30.51± 18.06	56.78***	7.67***	7.23***	0.47
Consumption speed (units/hour)	2.03 ± 1.28	2.98 ± 1.55	3.06 ± 1.58	20.84***	4.78***	4.90***	0.30
Drunkenness episodes in previous 6 ıonths	2.28 ± 4.87	9.32 ± 10.31	10.37 ± 11.69	39.65***	5.78***	5.62***	0.58
Percentage of times drunk while rinking	17.36 ± 18.89	39.74 ± 24.35	39.57 ± 27.70	41.10***	7.29***	6.21***	0.04
Alcohol units per week	2.49 ± 3.25	11.96 ± 9.26	8.51 ± 8.51	74.55***	12.52***	5.77***	2.36*
Age at first drink	15.09 ± 2.24	13.89 ± 1.90	14.84 ± 1.66	9.51***	4.15***	0.98	3.23**
DMQ-R Enhancement	6.82 ± 2.72	10.23 ± 2.36	9.84 ± 2.48	65.12***	10.34***	8.54***	0.97
DMQ-R Social	7.50 ± 3.21	10.49 ± 2.38	10.61 ± 2.53	45.01***	8.43***	8.21***	0.31
DMQ-R Conformity	3.92 ± 1.68	4.36 ± 1.87	4.67 ± 2.36	4.32*	1.78	2.44*	0.90
DMQ-R Coping	4.26 ± 2.07	5.45 ± 2.37	7.13 ± 3.06	38.36***	3.87***	7.25***	3.70***
Beck Depression Inventory-II	6.17 ± 4.68	5.05 ± 3.82	10.96 ± 5.35	28.19***	4.16***	4.80***	7.65***
STAI Trait	37.69 ± 9.11	34.40 ± 6.49	44.10 ± 9.19	27.26***	3.35***	5.03***	7.34***
STAI State	32.88 ± 8.65	30.90 ± 5.84	36.64 ± 10.50	9.96***	2.19*	2.69**	4.05***
	Percentage	Percentage	Percentage	Chi-square			
Sex (men – women)	45.12 – 54.87	43.60 – 56.41	52.85 – 47.14	1.55	0.05	1.23	1.27
Family history of alcohol	12.82	8.97	27.14	11.12**	0.80	7.63**	8.41**
Current cigarette smoker	18.97	23.08	34.28	6.81*	0.58	6.81**	2.28
Lifetime cannabis user	25.64	50.00	45.71	18.67***	15.04***	9.71**	0.27

Regular cannabis user	3.59	6.41	15.71	12.12**	1.05	11.96***	3.21

Note. WAIS-III SF = Wechsler Adult Intelligence Scale 3rd Edition Short Form; AUDIT = Alcohol Use Disorders Identification Test; DMQ-R = Drinking Motives Questionnaire Revised; STAI = State-Trait Anxiety Inventory. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

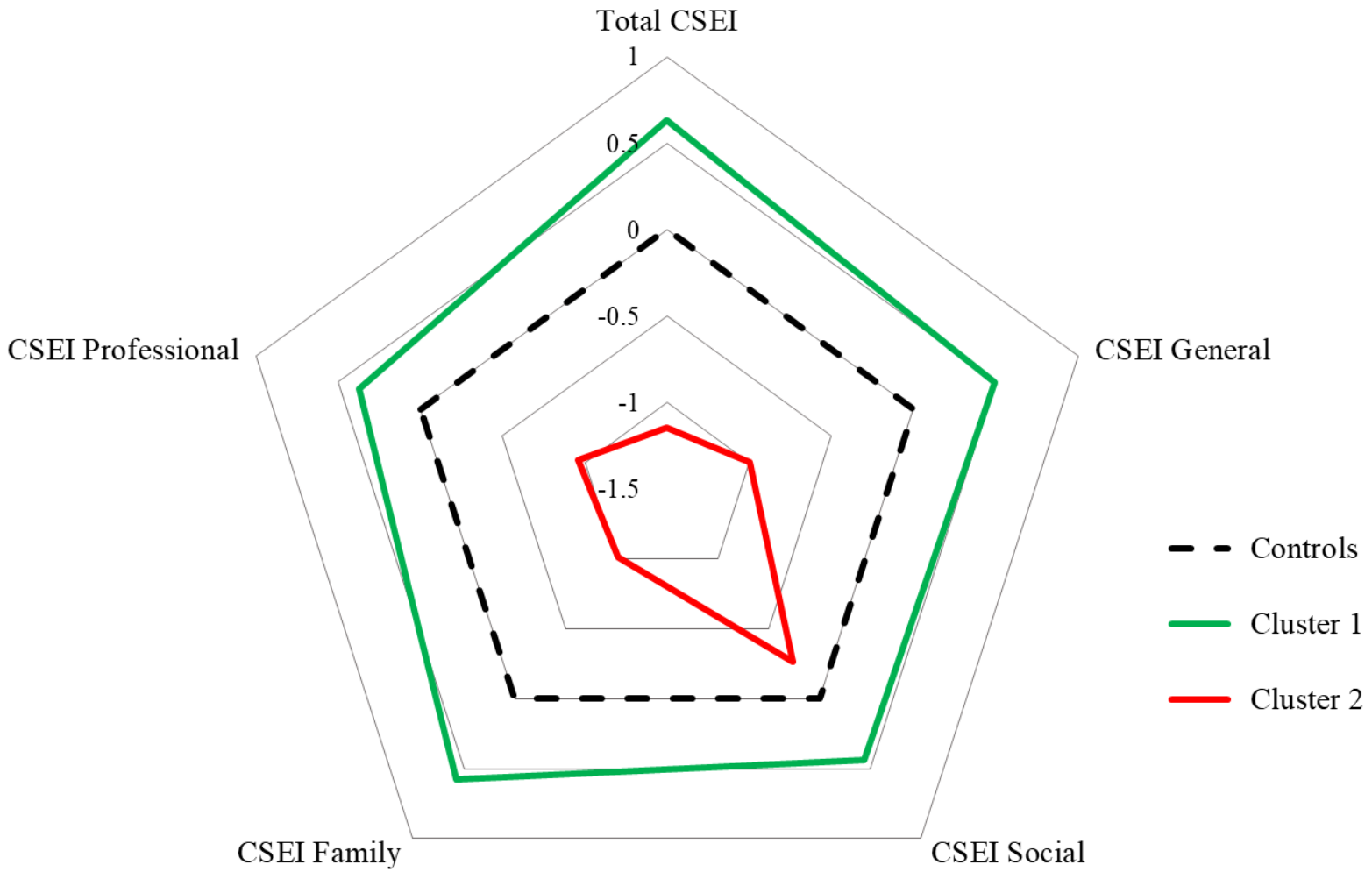

Figure 1. Comparison between college students without alcohol use disorder (controls) and alcohol use disorder (AUD) clusters on the four factor scores and total score of the Coopersmith Self-Esteem Inventory (CSEI).

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This manuscript entitled “High and low self-esteem as pathways to alcohol use disorders among college students: results of a cluster analysis” contains an original work that has not been previously published and that is not being submitted for publication elsewhere.

All authors have read and approved the manuscript for submission to *Addictive Behaviors*; have made a substantial contribution to the conception, design, gathering, analysis and/or interpretation of data and a contribution to the writing and intellectual content of the article; and acknowledge that they have exercised due care in ensuring the integrity of the work.

Kind regards,

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