Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity (2020) 25:709–718
https://doi.org/10.1007/s40519-019-00675-y

ORIGINAL ARTICLE

Psychological characteristics and eating attitudes in adolescents with drunkorexia behavior: an exploratory study

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Received: 24 December 2018 / Accepted: 13 March 2019 / Published online: 19 March 2019

Abstract

Purpose Drunkorexia represents an emerging phenomenon that is still understudied especially among adolescents. The present study aimed to investigate the relation between drunkorexia and psychological characteristics relevant and commonly associated with existing forms of eating disorders.

Methods The sample was composed of 849 adolescents (513 boys, 334 girls, 2 unknown; range 14–22) who completed a survey composed of Compensatory Eating and Behaviors in Response to Alcohol Consumption Scale and Psychological scales of the Eating Disorders Inventory-3.

Results Our findings highlighted that drunkorexia was associated with low self-esteem, personal alienation, interoceptive deficits, emotional dysregulation, and asceticism. Hierarchical multiple regression analysis indicated that difficulties with emotion regulation and ascetic tendencies were significant predictors of drunkorexia among adolescents.

Conclusions Our findings suggest the importance for programs preventing drunkorexia to be focused on training adolescents in using more adaptive strategies to manage emotions and accepting both emotional and physical signals without feeling guilty or threatened.

Level of evidence Level V, descriptive study.

Keywords Drunkorexia · Adolescence · Psychological characteristics · Emotion dysregulation · Asceticism

Introduction

Drunkorexia represents a phenomenon that has received increased attention and consideration over the last few years and reflects the indulging in diet-related behaviors prior to consuming alcohol [1–4]. Even though there is no precise and systematic definition, existing studies have highlighted that drunkorexia refers to individuals who choose to engage in a self-imposed caloric restriction to consume large amounts of alcohol [5–7]. Compensating for calories consumed though alcoholic beverages to prevent weight gain, appears the main motivation for drunkorexia [2, 3, 6, 8, 9], along with the desire to intensify the intoxicating effects of alcohol [3, 6, 10]. To reach the intended purpose, different disordered eating behaviors have been reported to produce a calorie restriction when drinking alcohol is planned: reducing the consumption of high-calorie or fatty foods, skipping meals, fasting and compensatory behaviors such as self-induced vomiting, use of laxatives and/or diuretics and excessive exercising [4, 6, 7, 10–16].

Available evidence suggests that drunkorexia is prevalent among young people; as for adolescents, it has been found [13] that 12% of high-school age students reported restricting food, calories, or carbohydrates on days they planned to drink alcohol to avoid weight gain with similar rates among boys and girls. The co-occurrence of unhealthy weight management behaviors and drinking large amounts of alcohol represents a serious risk for adolescents' health, which could result in short- and long-term unfavorable consequences, such as depressive and anxious symptoms, alcohol problems, cognitive impairment and nutritional deficiencies [1, 17]. Despite the potential negative outcomes associated with drunkorexia behavior, medical community has not yet

This article is part of topical collection on Personality and eating and weight disorders.

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recognized this emerging phenomenon and an appropriate terminology that takes into account its specific characteristics is still missing [7, 18, 19]. Indeed, existing studies suggest that drunkorexia may be considered a stand-alone phenomenon, which is separate and different from existing eating disorders; what distinguishes drunkorexia from other traditional forms of eating disorders is the indulging in unhealthy weight control behaviors on days when drinking large amounts of alcohol is planned [4, 7, 20–22]. Consuming great quantities of alcohol without having to worry about the calories contained in alcoholic beverages represents a primary aspect of drunkorexia. However, common features with other eating disorders have been found in drunkorexia, as, for instance, indulging in compensatory behaviors (use of laxatives or self-induced vomiting) that characterizes bulimic tendencies or fear of weight gain and use of fasting that reflect anorexic tendencies [2, 13, 14]. Furthermore, earlier studies highlighted that eating disorder symptoms were significant predictors of drunkorexia [12–14]; for instance, it has been found that binge eating, purging, and excessive exercise significantly predicted drunkorexia among college-aged students [12]. A recent study carried out in the Italian context also showed that disordered eating significantly predicted drunkorexia behavior among adolescents and young adults [23]; in particular, it has been underlined that the relationship between disordered eating behaviors and drunkorexia was strongest in females older than 18 years. Despite the contribution of this study, which highlighted the role of disordered eating patterns in predicting drunkorexia, it is still unclear whether some psychological features that characterize eating disorders may also be associated with drunkorexia.

Indeed, it seems reasonable to assume that drunkorexia may be related to certain psychological characteristics or traits relevant to existing forms of eating disorders. Specifically, the present study aimed to investigate the relationship between drunkorexia and psychological features commonly associated with eating disorders, such as difficulties with emotion regulation, interpersonal problems, perfectionism, asceticism, low self-esteem, and maturity fears. Indeed, literature on drunkorexia in adolescence is still poor and very little knowledge is available about the relation between drunkorexia and psychological characteristics.

It is well established that difficulties regulating emotions are associated with disordered eating behaviors, including dietary restriction, self-induced vomiting and binging [24–30] and represent a common characteristic of eating disorders, as anorexia nervosa, bulimia nervosa and binge eating disorder [31–34]. To our knowledge, only one study, performed on a sample of adolescents, was addressed to investigate emotion regulation in drunkorexia [13]; results highlighted that, even young people who engage in drunkorexia, showed difficulties with emotion regulation; specifically, drunkorexia among adolescents was associated with difficulties controlling impulsive behaviors when intense negative emotions are experienced, and problems in differentiating one's emotions. Furthermore, existing research on eating disturbances, suggests that, in addition to difficulties managing emotional states, individuals with various types of eating disorders are also characterized by interoceptive deficits, that is the inability to identify specific individual sensations related to hunger and satiety signals and difficulties discriminating between these visceral sensations and emotions [35–40].

One of the main factors consistently associated with weight management behaviors is also perfectionism [41–45]; specifically, weight control behaviors, such as fasting, dietary restraint and the use of compensatory behaviors, are related both to the tendency to hold unrealistic personal high standards and goals, and the tendency to meet standards believed to be imposed by others [41, 43]. In addition, Ventura et al. [45] found an association between unhealthy weight control behaviors and the tendency to appear perfect in the eyes of others without apparent and visible efforts. Together with perfectionism, low self-esteem is frequently considered a prominent psychological risk factor for disordered eating [44, 46, 47]; indeed, it has been noted [47–50], that young people who indulge in unhealthy eating behaviors to control and manage their weight, are characterized by a negative self-evaluation. Furthermore, individuals with perceptions of being overweight who exhibit both low self-esteem and perfectionist tendencies were found to be at increased risk to report disordered eating behaviors; thus, failures in reaching a body standard are seen as a consequence of their ineffectiveness and inadequacy [51].

An association between eating disorder symptoms and asceticism has also been found [52–56]. Asceticism reflects the tendency to attain spiritual ideas such as, self-denial, self-discipline, hypercontrol over bodily needs and sacrifice [57]. It has been highlighted that ascetic tendencies may function as a way to regain control over one's body; for instance, refusal of food in people with anorexia nervosa may be used in attempts to obtain power and control over self [52–54]. When the achievement of high standards fails and self-esteem decreases even more, an urgent need to restore control over one's body and life in general is perceived [55].

Another psychological predisposing characteristic for disordered eating is related to fears of maturing that represent the desire to find refuge in the security of childhood, and to avoid facing maturational tacks and challenges of adulthood [56, 58–61]. The fear of taking responsibilities, as well as the fear of having to face one's problems, are considered important factors that may affect and hinder treatment in eating disorders [56, 61]. Finally, earlier studies [62–65] showed a relation between dysfunctional eating and interpersonal

difficulties with parents and peers. For instance, Pelletier Brochu et al. [65] highlighted that adolescents with problematic eating behaviors perceived alienation in the relationship with their mothers and peers; specifically, those who perceived high levels of distance, resentment in the interactions reported more severe symptoms.

The present study aimed to investigate the relationship between drunkorexia and psychological characteristics relevant to existing forms of eating disorders. According to a previous study [13], we hypostasized that drunkorexia would be associated with emotion dysregulation. Due to the lack of research in this area, we do not provide a priori hypotheses about which other psychological characteristics would predict drunkorexia behavior.

Methods

Participants and procedure

The sample was composed of 849 adolescents (513 boys, 334 girls, and 2 unknown) with a mean age of 17.89 years (SD = 1.10; range 14–22). The study involved ten high schools that were selected on the basis of their willingness to participate in the study. Recruitment began by sending letters where objectives and procedures of the study were explained. After obtaining acceptance from schools' principals to participate in the study, informed-consent forms, together with an information letter for students' parents to explain the general aim of the study were delivered to students. The questionnaires were administered during lesson times and took approximately 30 min to complete. The anonymity of the results as well as the voluntary nature of the research participation were guaranteed. This survey was reviewed and approved by the Ethics Commission of the Department of Developmental and Social Psychology of Sapienza, University of Rome.

Measures

Drunkorexia

To assess Drunkorexia, Compensatory Eating and Behaviors in Response to Alcohol Consumption Scale (CEBRACS; [15]) was used. The scale is composed of 21 items on a Likert type-scale ranging from 1 = never; 2 = rarely (approximately 25% of occasions); 3 = sometimes (approximately 50% of occasions); 4 = often (approximately 75% of occasions); 5 = nearly always. Items are divided into three sections reflecting three-time periods: before drinking (sample item, "In the past 3 months, I have eaten less than usual during one or more meals before drinking to get drunker"), while under the effects of alcohol (sample item, "In the past 3 months, I have eaten less than usual while I was drinking because I wanted to feel the effects of the alcohol faster") and after effects from alcohol have worn off (sample item, "In the past 3 months, I have taken laxatives to make up for the calories in alcohol that I had consumed previously while I was under the effects of alcohol"). Each section assesses the same compensatory behaviors in response to calories consumption by drinking alcohol and include five individual factors: Factor 1, "Alcohol Effect" which reflects eating behaviors designed to enhance the effects of alcohol; Factor 2, "Laxative Use" which reflects the use of laxatives to compensate calorie intake by drinking alcohol; Factor 3, "Dietary Restraint and Exercise" which comprises items related to the engagement in physical exercise and low-calorie food intake; Factor 4, "Diuretic Use" is composed by two items that are related to use of diuretics and finally Factor 5, "Restriction and Vomiting" which reflects the use of self-induced vomiting to compensate calories intake by drinking alcohol and eating behaviors such as skipping meals or eating less than usual; The Italian version of CEBRACS [66] has shown good psychometric properties, as a satisfactory construct validity and good internal consistency. In the present study Cronbach's alpha was satisfactory for the total scale ($\alpha = 0.91$), as well as for individual Factors "Alcohol Effect" ($\alpha = 0.91$), "Laxative Use" ($\alpha = 0.81$), "Dietary Restraint and Exercise" ($\alpha = 0.78$), "Diuretic Use" ($\alpha = 0.71$) and "Restriction and Vomiting" ($\alpha = 0.81$).

To discriminate adolescents who engage in compensatory behaviors prior to consuming alcohol (restrictors), and adolescents who reported never engaging in drunkorexic behaviors (non-restrictors), we considered as indicating no drunkorexic tendencies, only non-reported compensatory behaviors in response to alcohol use (0% of the time, answer option 1), in line with previous studies [4, 15].

Psychological characteristics

Psychological scales of the Eating Disorders Inventory-3 (EDI-3; [57]) were administered for the study. The EDI-3 is a self-report instrument consisting of 91 items and 12 subscales organized into 3 eating disorder-specific scales (Drive for Thinness-DT; Bulimia-B; Body Dissatisfaction-BD) and 9 general psychological scales (Low Self-Esteem-LSE; Personal Alienation-PA; Interpersonal Insecurity-II; Interpersonal Alienation-IA; Interoceptive Deficits-ID; Emotional Dysregulation-ED; Perfectionism-P; Asceticism-A; Maturity Fears-MF) that are relevant, but are not specific to, eating disorders. The Low Self-Esteem scale assesses negative self-evaluation, feelings of inadequacy and insecurity, lack of self-worth. The Personal Alienation scale is conceptually related to low self-esteem, even though reflects more broadly, feelings of loneliness, a sense of emotional

emptiness and a poor self-understanding. The Interpersonal Insecurity scale focuses on difficulties in expressing personal thoughts and feelings to others and discomfort in social situations. The Interpersonal Alienation scale reflects impairment in attachment of relationships, a sense of lack of trust, understanding and love in relationships. The Interoceptive Deficits scale evaluates confusion and difficulty in accurately recognizing and responding to emotional states. The Emotional Dysregulation scale refers to internal states as well, reflecting mood instability, impulsivity and self-destructiveness. The Perfectionism scale focuses on the importance a person gives to the achievement of high standards and goals. The Asceticism scale reflects the tendency to seek virtue through spiritual ideals such as self-restraint, self-denial, self-discipline. Finally, the Maturity Fears scale evaluates difficulties with physical, psychological, and social developmental processes, and a desire to return to security of childhood.

The Italian version of EDI-3 [67] has shown good psychometric properties. Internal reliability of the scales ranges from 0.80 to 0.90, and test–retest reliability coefficients for the composite scales are between 0.93 and 0.98. In the present study, internal consistency was satisfactory for all the psychological scales ranging from 0.62 to 0.82.

Added questions asked participants for self-reported weight and height to calculate Body Mass Index (BMI).

Statistical analyses

Data were analyzed using SPSS Statistics Version 24.0. A Chi square test was performed to investigate gender differences among restrictors and non-restrictors. Later, we tested sex and age differences among the total sample; for comparative purposes, the sample was divided into two age groups (14–17 years vs. 18–22 years). To this end, we conducted a series of MANOVAs with gender and age groups as between-subjects factors on CEBRACS total score, CEBRACS individual factors (Alcohol Effect, Laxative Use, Dietary Restraint and Exercise, Diuretic Use, Restriction and Vomiting) and EDI-3 psychological scales (Low Self-Esteem, Personal Alienation, Interpersonal Insecurity, Interpersonal Alienation, Interoceptive Deficits, Emotional Dysregulation, Perfectionism, Asceticism and Maturity Fears). For these multivariate analyses, Wilks' λ criterion was used. Partial eta-squared values were calculated as a measure of effect size, and results were interpreted using Cohen's [68] guidelines for determining small (0.01), medium (0.06), and large (0.14) effects. Furthermore, Pearson correlations were performed to examine the relationship among the key variables: CEBRACS total score, gender, age, BMI, and EDI-3 psychological scales. Finally, hierarchical regression analysis was performed in two steps with CEBRACS total score as dependent variable; age and BMI were entered in step 1, followed by psychological characteristics (EDI-3 psychological scales) in step 2. For the regression analysis, Cohen's [68] guidelines were used for interpreting magnitude of R^2: small (0.02), medium (0.13) and large (0.26) effect.

Results

Preliminary analyses

Drunkorexia behavior

The sample was composed of 652 (77%) non-restrictors and 195 (23%) adolescents who reported compensatory behaviors in response to calories consumption by drinking alcohol. Of those, 123 (63%) were boys and 72 (37%) were girls. A Chi square test was performed to examine whether there were gender differences among non-restrictors and restrictors. No significant differences for gender, $\chi^2 = (1) = 0.72$, $p = 0.40$ were found.

Gender and age differences

Descriptive statistics for the key variables used in the present study are presented in Table 1. Factorial MANOVA on CEBRACS total score and individual factors showed neither main effect of gender, $\lambda = 0.99$, F (5,837) = 1.737, $p = 0.12$, $\eta p^2 = 0.01$, nor of age, $\lambda = 0.99$, F (5,837) = 1.542, $p = 0.17$, $\eta p^2 = 0.01$. There was no significant effect of the interaction between gender and age, $\lambda = 1.00$, F (5,837) = 0.494, $p = 0.78$, $\eta p^2 = 003$. Factorial MANOVA on EDI-3 psychological scales revealed only a significant effect of gender, $\lambda = 0.92$, F (9,834) = 8.200, $p < 0.001$, $\eta p^2 = 0.08$, and not of age, $\lambda = 0.99$, F (9,834) = 0.895, $p = 0.53$, $\eta p^2 = 0.01$, or of the interaction between gender and age, $\lambda = 0.98$, F (9,834) = 1.767, $p = 0.07$, $\eta p^2 = 0.02$. Results from the univariate tests revealed that boys and girls differed on the scales of Low Self-Esteem, F (1,842) = 42.41, $p < 0.001$, $\eta p^2 = 0.05$, Personal Alienation, F (1,842) = 17.53, $p < 0.001$, $\eta p^2 = 0.02$, Interpersonal Insecurity, F (1,842) = 12.92, $p < 0.001$, $\eta p^2 = 0.01$, Interpersonal Alienation, F (1,842) = 6.84, $p < 0.01$, $\eta p^2 = 0.01$, Interoceptive Deficits, F (1,842) = 35.99, $p < 0.001$, $\eta p^2 = 0.04$, Emotional Dysregulation, F (1,842) = 11.28, $p = 0.001$, $\eta p^2 = 0.01$, and Maturity Fears, F (1,842) = 10.05, $p < 0.01$, $\eta p^2 = 0.01$, where girls showed higher mean scores than boys.

Correlations among study variables

Pearson correlations were performed to examine the relationship among the key variables used in the present study: CEBRACS total score, gender, age, BMI, Low Self-Esteem, Personal Alienation, Interpersonal Insecurity, Interpersonal

Table 1 Descriptive statistics for CEBRACS total score, CEBRACS individual factors and EDI-3 psychological scales

Variables	Boys ($N=513$)		Girls ($N=334$)		Total sample ($N=849$)	
	M	SD	*M*	SD	*M*	SD
1. CEBRACS: total score	21.91	4.92	21.97	6.01	21.93	5.37
2. CEBRACS: alcohol effect	7.76	2.05	7.96	2.99	7.84	2.46
3. CEBRACS: laxative Use	3.09	0.55	3.09	0.85	3.09	0.68
4. CEBRACS: dietary restraint and exercise	5.78	1.98	5.59	1.94	5.70	1.96
5. CEBRACS: diuretic use	2.08	0.52	2.07	0.51	2.08	0.52
6. CEBRACS: restriction and vomiting	3.20	0.94	3.25	1.21	3.22	1.06
7. Low self-esteem	4.97	4.72	7.41	5.70	5.92	5.26
8. Personal alienation	6.32	4.63	7.77	5.80	6.88	5.17
9. Interpersonal insecurity	8.45	5.36	9.89	5.99	9.00	5.66
10. Interpersonal alienation	7.70	4.51	8.45	5.03	7.98	4.74
11. Interoceptive deficits	7.90	6.72	10.90	7.62	9.07	7.24
12. Emotional dysregulation	6.93	6.26	8.13	6.40	7.40	6.34
13. Perfectionism	7.74	4.78	7.28	4.87	7.55	4.82
13. Asceticism	5.95	4.87	6.24	4.51	6.06	4.73
14. Maturity fears	11.47	6.60	12.88	6.57	12.02	6.63

Alienation, Interoceptive Deficits, Emotional Dysregulation, Perfectionism, Asceticism and Maturity Fears (Table 2). CEBRACS was significantly and positively correlated with Low Self-Esteem, Personal Alienation, Interoceptive Deficits, Emotional Dysregulation, and Asceticism.

The EDI-3 psychological scales as predictors of drunkorexia

Preliminary, we ascertained that the assumptions of hierarchical regression were met and checked for multicollinearity. All the variance inflation factor scores (VIF) were within accepted limits, thus, there was no issues with multicollinearity within the data [69, 70]. To examine the role of psychological characteristics relevant for eating disorders (Low Self-Esteem, Personal Alienation, Interpersonal Insecurity, Interpersonal Alienation, Interoceptive Deficits, Emotional Dysregulation, Perfectionism, Asceticism and Maturity Fears) as predictors of drunkorexia, hierarchical regression analysis was conducted. Specifically, hierarchical regression allowed us to enter age and BMI in step 1 as covariates; consistent with previous studies [50, 71], BMI is a significant predictive factor of disordered eating and we wanted to control for any confounding influence of BMI on the relationship between drunkorexia and psychological features.

Table 2 Correlations among the variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. CEBRACS total score	–												
2. Gender (1 = girls; 0 = boys)	0.01	–											
3. Age	0.01	−0.11**	–										
4. BMI	0.03	−0.21**	0.04	–									
5. Low self-esteem	0.12**	0.23**	−0.004	−0.02	–								
6. Personal alienation	0.13**	0.14**	0.03	−0.02	0.74**	–							
7. Interpersonal insecurity	0.03	0.12**	−0.004	0.003	0.54**	0.61**	–						
8. Interpersonal alienation	0.03	0.08*	0.07*	0.02	0.46**	0.60**	0.68**	–					
9. Interoceptive deficits	0.11**	0.20**	−0.04	0.000	0.52**	0.56**	0.38**	0.44**	–				
10. Emotional dysregulation	0.19**	0.09**	0.02	0.05	0.37**	0.46**	0.30**	0.38**	0.65**	–			
11. Perfectionism	0.05	−0.05	−0.05	0.002	0.08*	0.16**	0.08*	0.17**	0.37**	0.35**	–		
12. Asceticism	0.17**	0.03	0.02	0.08*	0.36**	0.45**	0.26**	0.35**	0.58**	0.64**	0.42**	–	
13. Maturity fears	0.06	0.10**	0.01	0.000	0.35**	0.39**	0.28**	0.23**	0.40**	0.28**	0.17**	0.24**	–

*$p<0.05$, **$p<0.01$

Hierarchical regression analysis was carried out to examine the role of psychological characteristics relevant for eating disorders (Low Self-Esteem, Personal Alienation, Interpersonal Insecurity, Interpersonal Alienation, Interoceptive Deficits, Emotional Dysregulation, Perfectionism, Asceticism and Maturity Fears) in predicting drunkorexia. Results revealed that age and BMI did not significantly predicted drunkorexia in step 1; the EDI-3 psychological scales were entered in step 2, $R^2 = 0.06$ (small effect size), $F\,(9,815) = 5.40$, $p < 0.001$; results indicated that Emotional Dysregulation, $\beta = 0.17$, $p = 0.001$, and Asceticism, $\beta = 0.10$, $p < 0.05$, emerged as significant and positive predictors of drunkorexia (Table 3).

Discussion

The aim of the current study was to investigate the relation between drunkorexia and psychological characteristics that are relevant and commonly associated with existing forms of eating disorders. Our findings highlighted the role of emotion dysregulation in predicting drunkorexia among adolescents. A link between difficulties regulating emotional states and unhealthy eating and drinking attitudes and behaviors has been consistently underlined [24, 29, 72]. Indeed, it has been suggested that food and alcohol may represent substances that young people may use to regulate their emotions, and, thus, their drinking and eating behaviors may be seen as a strategy of emotion regulation to influence and alter affective states [72–75]. Adolescents experience frequent and intense emotions, and their difficulties modulating and regulating emotions in a functional and adaptive way have been considered a predisposing factor for disordered eating and drinking [76–79]. In line with a previous study [13], the current research supports the argument of emotion dysregulation as a potential risk factor for drunkorexia behavior among adolescents. The lack of emotional skills may drive adolescents to indulge in such dysfunctional behavior as a way to control or change an emotional experience perceived too intense and strong.

Furthermore, the present study highlighted a relation between drunkorexia and ascetic tendencies. Drunkorexia is a behavior characterized by self-imposed strict rules related both to the amount and the type of food to consume (e.g., avoiding the consumption of high-calorie foods) [4, 6]. Thus, individuals who engage in such behavior, seem to mainly use cognitive strategies rather than internal physiologic feelings of hunger and satiety [20, 80]. In this respect, it is possible to note the important role of control that adolescents have on their own eating behaviors to feel free to drink as much as they want, without feeling guilty or worried about the calories consumed trough alcoholic beverages. Indeed, a recent work [81] found that young people, to offset their feelings of guilt, triggered by the awareness of the harmfulness of their behavior, highly engage in a healthy behavior as physical activity. Thus, engaging in excessive exercising seems to be perceived as a self-sacrifice that individuals need to use to counterbalance their feeling guilty. In accordance with previous studies on disordered eating [52, 53, 55], our results suggest that adolescents may use drunkorexia in attempts to gain control over their body and, consequently, over themselves, suppressing their physical urges, such as hunger. Indeed, their choice to engage in a self-imposed caloric restriction may be seen as a source of power and control for themselves; especially adolescents, who are faced with developmental tasks, may perceive self-discipline and self-control as a way to pursue a sense of freedom and strength, which may allow them to distance from dependence on their parents

Table 3 Hierarchical regression analysis for EDI-3 psychological scales predicting drunkorexia

Predictor	*B*	SE *B*	*β*	VIF	R^2	ΔR^2	*df*	ΔF
Step 1					0.001	0.001	2, 824	0.39
Age	0.02	0.17	0.01	1.00				
BMI	0.05	0.05	0.03	1.00				
Step 2					0.06	0.06	9, 815	5.40
Low self-esteem	0.06	0.05	0.06	2.35				
Personal alienation	0.10	0.06	0.09	3.02				
Interpersonal insecurity	−0.04	0.05	−0.05	2.21				
Interpersonal alienation	−0.10	0.06	−0.09	2.21				
Interoceptive deficits	−0.06	0.04	−0.08	2.34				
Emotional dysregulation	0.14	0.04	0.17**	2.11				
Perfectionism	−0.02	0.04	−0.02	1.28				
Asceticism	0.11	0.05	0.10*	1.97				
Maturity fears	0.001	0.03	0.001	1.26				

VIF variance inflation factor

*$p < 0.05$, **$p \leq 0.001$

[82]. Probably adolescents who engage in drunkorexia may believe that controlling their bodily needs may be the only way to attain greater autonomy and independence; the lack of awareness of more adaptive and functional ways may put them at increased risk for engaging in such unhealthy behavior.

The present study has several strengths. It provides an important contribution to research on drunkorexia, a behavior that is still understudied, although estimates suggest that is prevalent among young people. Further, unlike the majority of existing studies in this area that involved college-aged students, our study included a sample of adolescents. To our knowledge, the current research was the first to investigate the relation between drunkorexia and psychological characteristics repeatedly associated with eating disorders; only one earlier study explored the role of emotion regulation in drunkorexia among adolescents.

Despite the strengths of the study, it is important to acknowledge some of the limitations. First, the study implemented a cross-sectional design, precluding the ability to draw casual inferences amongst study variables. Second, this research relied on self-report measures, thus, data may be subjected to inaccuracy and potential bias in the responses. Third, the participation of a school-based sample of adolescents in the study may limit the generalizability of our findings. Finally, although our results highlighted that emotion dysregulation and asceticism predicted drunkorexia, however, other variables not included in the study may have a more central role in predicting such dysfunctional behavior. For instance, future research could investigate whether negative affect may be an important predictor of drunkorexia. Indeed, previous studies showed that adolescents may use unhealthy eating and drinking behaviors as a coping strategy in attempt to regulate and manage their negative emotions [74, 83]; thus, avoiding or reducing negative emotional states may be a potential trigger factor that may drive adolescents to engage in drunkorexia. Moreover, it would be interesting to examine the role of expectations that drunkorexia may alleviate negative emotions, as well as may lead to positive experiences; indeed, it has been found that the belief that drinking will lead to an increasing in sociability or reducing social anxiety seem to be significant predictors of unhealthy drinking behaviors among young people [84, 85].

To our knowledge, this was the first study to explore associations between drunkorexia and different psychological characteristics relevant to eating disorders; thus, future studies should replicate and expand our findings including a longitudinal design, which could help to better understand the temporal nature of the study variables. In addition, it could be interesting to investigate self-esteem as potential moderator in the relation between drunkorexia and asceticism. Indeed, it has been underlined [55] that disordered eating may represent a way by which individuals try to regain control over one's body and life in general, especially when self-esteem decreases for failures in achieving specific bodily standards. Moreover, in relation to the link between drunkorexia and emotion regulation, future research could consider the interaction of other variables such as, for instance, negative affect. Previous studies showed that adolescents may use unhealthy eating and drinking behaviors as a coping strategy in attempt to regulate and manage their negative emotions [74, 83]; thus, avoiding or reducing negative emotional states may be a potential trigger factor that may drive adolescents to engage in drunkorexia.

Finally, our results have important implications. Specifically, the present study underlined how difficulties with emotion regulation and the tendency to exert extreme control over one's bodily needs, may be important factors involved in drunkorexia. Further, our findings highlighted the relevance of training adolescents in using more functional and adaptive ways to manage intense and strong emotions. The improvement of the ability to tolerate overwhelming emotional states may be a crucial aspect of prevention programs, as well as increasing emotional expressiveness. Helping adolescents to learn to accept both emotional and physical signals without feeling threatened or guilty, may be of primary importance in protecting them from using drunkorexia to regulate unpleasant emotions or regain control over self. Thus, it could be also useful to train adolescents in listening to their body's needs and respond to these in a proper way, without suppressing internal physiological feelings, such as hunger or satiety.

Funding This study was not funded.

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Approval from the Research Ethics Board of Department of Developmental and Social Psychology, Sapienza University of Rome was obtained before data were collected for the current study.

Informed consent Participants gave their informed consent to take part to the study, and for underage students below 18 years written informed consents were also obtained from parents.

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