



College students' engagement in drunkorexia: Examining the role of sociocultural attitudes toward appearance, narcissism, and Greek affiliation

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Abstract

Drunkorexia is a term used to describe compensatory and calorie restriction behaviors that individuals engage in related to alcohol consumption. The present study examined the role of sociocultural attitudes toward appearance (internalization of the thin and muscular ideals, pressures from peers, family, media to modify appearance), narcissism (grandiose, vulnerable), and Greek life affiliation in drunkorexia behaviors among college students. This study involved 206 undergraduates who participated in the study in November and December 2017. Participants completed the Sociocultural Attitudes Toward Appearance Questionnaire (SATAQ-4), the Narcissistic Personality Inventory (NPI-16), the Hypersensitive Narcissism Scale (HSNS), the Compensatory Eating Behaviors Related to Alcohol Consumption Scale (CEBRACS), and health and demographic questions via Qualtrics. Hierarchical linear regressions indicated that internalization of the thin ideal was the strongest predictor of drunkorexia. Greek affiliation, pressure from peers, and internalization of the muscular ideal also emerged as predictors of drunkorexia dimensions. Notably, both internalization of the thin ideal and Greek affiliation were associated with drunkorexia across the alcohol effects and calorie compensation dimensions. Our results indicate that drunkorexia is a complex behavior pattern with multifaceted risk factors; therefore, individual and community-level factors should be considered in addressing this health-risk behavior.

Keywords Drunkorexia · Internalization of body ideals · Compensatory behaviors · Alcohol consumption · Sociocultural attitudes · Greek affiliation

Introduction

Drunkorexia is a term originally coined by the media to describe a range of compensatory and disordered eating behaviors that coincide with drinking (CBS News 2008). These behaviors can include restrictive eating, excessive exercise, or purging before or after engaging in alcohol consumption. Broadly, the goals of drunkorexia include reducing caloric intake to prevent weight gain and/or to become rapidly intoxicated (Bryant et al. 2012; Roosen and Mills 2015). This behavior pattern seems to be relatively common, particularly among college students (Bryant et al. 2012; Buchholz et al. 2018; Eisenberg and Fitz 2014; Giles et al. 2009). For

example, studies conducted among college students have shown that a substantial proportion of their participants (approximately 20–40%) engage in drunkorexia-oriented behaviors (Bryant et al. 2012; Buchholz et al. 2018; Eisenberg and Fitz 2014; Knight et al. 2017).

Much of the research on drunkorexia has focused on body dissatisfaction and disordered eating as precipitating factors and correlates of the behavior pattern. Although there are mixed findings with some research showing no significant correlation between body dissatisfaction and drunkorexia behaviors (Hunt and Forbush 2016; Pompili and Laghi 2018), other studies have found that drive for thinness (Pinna et al. 2015; Pompili and Laghi 2018; Rahal et al. 2012) and body dissatisfaction (Pinna et al. 2015; Rahal et al. 2012) are positively correlated with drunkorexia. Related research in this area indicates that drunkorexia is associated with restrained and restrictive eating (Hunt and Forbush 2016; Luce et al. 2013; Roosen and Mills 2015), dieting behaviors (Ward and Galante 2015; Ward et al. 2015), and weight control motivations (Eisenberg and Fitz 2014; Wilkerson et al. 2017). On the

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more extreme end of the disordered eating spectrum, drunkorexia has been linked to severity of eating disorder symptomatology (Knight et al. 2017; Roosen and Mills 2015), excessive exercise (Hunt and Forbush 2016), fasting (Pompili and Laghi 2018), purging (Hunt and Forbush 2016), and other bulimia symptoms (Blackmore and Gleaves 2013; Pompili and Laghi 2018; Rahal et al. 2012; Ward and Galante 2015; Ward et al. 2015).

While many of the studies focused on drunkorexia examine body image and disordered eating correlates of the behavior pattern, a broader and more distal collection of risk factors for disordered eating—sociocultural attitudes toward appearance—is an important consideration. In other words, it would be beneficial to understand what might lead to the disordered eating and body image concerns that place an individual at risk for drunkorexia engagement. Sociocultural attitudes toward appearance encompass body ideal pressures, including the sources of such pressures (friends, family, media) and the degree to which an individual internalizes and seeks to achieve body ideal standards (Schaefer et al. 2015). In general, sociocultural attitudes toward appearance seem to be a constellation of risk factors that can increase one's likelihood of engaging in problematic eating and compensatory behaviors to achieve a certain body ideal (Cafri 2005; Fitzsimmons-Craft et al. 2014; Flament et al. 2012; Halliwell and Harvey 2006; Rodgers et al. 2011). In turn, it is also likely that such risk factors translate to drunkorexia tendencies, a behavior pattern marked by compensatory behaviors and, in some cases, significant restriction of calories when engaging in alcohol consumption.

Along with examining sociocultural attitudes toward appearance, individual differences and trait variables are important to consider in the context of disordered eating and drinking (e.g., Martin et al. 2015; Martin and Racine 2017; Tylka et al. 2015). That is, in examining drunkorexia engagement, there may be overlap in terms of predictive variance between sociocultural attitudes toward appearance and trait variables. Furthermore, our research was governed by the socioecological framework, acknowledging that there are both proximal (e.g., individual traits) and distal factors (e.g., community behaviors and norms) that influence alcohol use (Sudhinaraset et al. 2016).

One trait variable that may be particularly relevant to drunkorexia is narcissism. Its relevance stems from the fact that narcissism, broadly defined, has been linked to both disordered eating behaviors and substance use (e.g., Luhtanen and Crocker 2005; Maples et al. 2011)—behavior patterns that directly correspond to drunkorexia. In examining narcissism, it is important to note that there are broadly two types of narcissism—grandiose (or overt) narcissism, characterized by an outward expression of superiority and entitlement, and vulnerable (or hypersensitive/covert) narcissism, characterized by negative affect and insecure grandiosity (Miller et al.

2011). In exploring a possible connection between the types of narcissism with drunkorexia, past research indicates that grandiose narcissism is positively associated with risk-taking behaviors (Buelow and Brunell 2014; Foster et al. 2009), alcohol use (Hill 2016; MacLaren and Best 2013), and binge drinking (Luhtanen and Crocker 2005). Vulnerable narcissism, on the other hand, has been linked to disordered eating (Gordon and Dombek 2010; Maples et al. 2011) and body dissatisfaction (Purton et al. 2018; Swami et al. 2015). The increased likelihood of drinking associated with grandiose narcissism and the elevated risk of disordered eating associated with hypersensitive narcissism make such variables particularly relevant to understanding drunkorexia, a behavior pattern characterized by a combination of risky drinking and disordered eating.

In terms of the community variables that can potentially influence drinking behaviors, the places where young adults live and socialize also merit attention in the context of drunkorexia. In research on college students, Greek affiliation is a well-established community-level correlate of drinking behaviors (Miley and Chalk 2015; Scott-Sheldon et al. 2008) including binge drinking tendencies (Wechsler et al. 2009) and other forms of risky drinking (Park et al. 2008; Tyler et al. 2018). Greek affiliation has also been linked to body image disturbance and disordered eating, particularly among women (Allison and Park 2004; Averett et al. 2017; Basow et al. 2007; Rolnik et al. 2010). It is perhaps unsurprising then that Greek affiliation has been linked to drunkorexia engagement among college students (Giles et al. 2009; Ward et al. 2015; Wilkerson et al. 2017). It could be that the drinking culture associated with Greek life—that alcohol is “central” to the college experience (Ward et al. 2015), along with body ideal pressures and corresponding disordered eating behaviors associated with this population (Basow et al. 2007; Rolnik et al. 2010) directly translate to an increased likelihood of engaging in drunkorexia.

Although there have been various studies examining body image and disordered eating correlates of drunkorexia, to our knowledge, no study has examined sociocultural attitudes toward appearance or narcissism in this context. In addition to sociocultural attitudes and narcissism, we also took an important collegiate community variable, Greek affiliation, into account, given its salient role in both disordered eating and drinking as well as its previously established link with drunkorexia (Giles et al. 2009; Ward et al. 2015; Wilkerson et al. 2017). Therefore, the overall purpose of this study was to examine three sets of variables in relation to drunkorexia behaviors among college students: (1) sociocultural attitudes toward appearance, (2) narcissism, and (3) affiliation with Greek life. As a point of consideration, it should be noted that we did not measure nor identify having a diagnosable eating or substance use disorder as exclusion criteria. In turn, our study and its approach should be considered with this point in mind—that the sample used was from a general college population,

and it is possible that individuals with a history of a diagnosis/ diagnoses may be impacting the results.

This research examined drunkorexia from a socio-ecological perspective, acknowledging that, in understanding health behaviors, there are proximal individual variables that are likely impacted by one's microsystem (e.g., family, school environment) as well as community norms that could have an influence on behavior patterns (e.g., Greek life norms related to eating, drinking; Sudhinaraset et al. 2016). It is noteworthy the present study was not exhaustive in its approach to understanding drunkorexia; there are several variables, including excessive alcohol use and alcohol-related problems that have been found to correlate with drunkorexia (e.g., Lupi et al. 2017; Pinna et al. 2015), which were not of focus in our investigation. Nonetheless, as guided by the socio-ecological perspective, our research covered variables that spanned from the individual to the community and considered their potential shared variance in relation to drunkorexia engagement.

Method

Participants and Procedure

Participants were recruited using two sources: (1) an undergraduate participant pool at a public university in the northeastern United States and (2) social media. Participants who were recruited through the participant pool received 1 research credit toward their 2-credit research requirement for their introductory psychology course. For social media recruitment, the study was advertised using a brief recruitment paragraph along with the link to the Qualtrics survey on research assistants' Facebook pages and in groups of organizations they were involved in. The recruitment post stated that our research team was conducting research on body image perceptions, personality, eating, and alcohol use among college students and that participation would involve completing an online questionnaire. In taking part in the study, participants completed the consent form and questionnaires¹ via Qualtrics. Participants were required to be at least 18 years of age to participate in the study. At the end of the study, participants were provided with information and resources about health and counseling services on campus, eating disorders, and alcohol use.

The overall study was designed to be completed in approximately 25 min. Participants took part in the present study in November and December 2017. In terms of compliance with ethical standards, (a) the authors declare that there are no conflicts of interest, (b) all procedures involving human subjects were approved by the ethical standards of the institution and

approval was obtained prior to data collection, and (c) informed consent was obtained by all individual participants included in the study. The study is in compliance with the 1964 Declaration of Helsinki and its later amendments.

Measures

Compensatory Eating and Behaviors in Response to Alcohol Consumption Scale

In assessing engagement in drunkorexia, participants were asked to complete the Compensatory Eating and Behaviors in Response to Alcohol Consumption Scale (CEBRACS) (Rahal et al. 2012). The CEBRACS is a 21-item scale that assesses compensatory behaviors in relation to alcohol consumption across four domains: 1) alcohol effects (7 items; measuring the extent to which participants have eaten less to become drunker or drunk more quickly), 2) bulimia (6 items), 3) dietary restraint and exercise (6 items), and 4) restriction (2 items). Participants respond to each item on a 5-point Likert scale, and items are summed for the overall and subscale scores. The scale was initially validated using an undergraduate sample (Rahal et al. 2012) and has been used to examine drunkorexia behaviors in other studies (Abrantes et al. 2017; Galante et al. 2017; Knight et al. 2017; Peralta and Barr 2017; Pinna et al. 2015). In the present study, the overall CEBRACS ($\alpha = .91$) and subscales (alcohol effects: $\alpha = .94$, bulimia: $\alpha = .76$, dietary restraint and exercise: $\alpha = .85$, restriction: $\alpha = .69$) had adequate internal consistency.

Sociocultural Attitudes toward Appearance Questionnaire-4

Participants completed the Sociocultural Attitudes Toward Appearance Questionnaire-4 (SATAQ-4) (Schaefer et al. 2015), which consists of 22 items scored on a Likert scale ranging from 1 "definitely disagree" to 5 "definitely agree". The items of the SATAQ-4 measure five subscales: (1) internalization of the thin/low body fat ideal (5 items), (2) internalization of the muscular/athletic ideal (5 items), (3) pressures from family (4 items), (4) pressures from peers (4 items), and (5) pressures from the media (4 items). In determining a score for each subscale, the mean rating is computed. In the present study, all five subscales had adequate internal consistency (thin ideal: $\alpha = .71$, muscular ideal: $\alpha = .90$, family pressures: $\alpha = .84$, peer pressures: $\alpha = .88$, media pressures: $\alpha = .95$).

Narcissistic Personality Inventory

The Narcissistic Personality Inventory-16 (NPI-16) (Ames et al. 2006) was used to assess grandiose narcissism in the present study. The NPI-16 is comprised of 16 forced-choice items reflecting various facets of narcissism. In scoring the scale, narcissism-consistent responses are coded as 1 and narcissism-inconsistent responses are coded as 0, and items are summed to compute an overall score with higher scores indicating higher levels of grandiose narcissism. In terms of internal consistency, the Cronbach's alpha for the NPI-16 in the present study was .66.

¹ All questionnaires completed by participants are included in this manuscript with the exception of the Ten Item Personality Inventory The TIPI was not included in the analyses of the present study. Gosling et al. (2003).

Hypersensitive Narcissism Scale The Hypersensitive Narcissism Scale (HSNS) (Hendin and Cheek 1997) is a 10-item scale that was used to assess vulnerable narcissism in the present study. Participants responded to each item on a 5-point Likert scale ranging from 1 “very uncharacteristic or untrue, strongly disagree” to 5 “very characteristic or true, strongly agree”. In computing an overall score, items are summed with higher scores indicating greater vulnerable narcissism. In terms of internal consistency, the Cronbach’s alpha for the HSNS in the present study was .68.

Demographics and Lifestyle Participants completed questions about their gender, ethnicity, living situation (on-campus, off-campus, at home with family), their Greek affiliation, weight, height, and lifestyle—including health behaviors. Health behaviors assessed included weekday drinking and weekend drinking.

Statistical Approach

A total of 314 participants consented to taking part in the study ($n = 254$ from participant pool, $n = 60$ from social media). Six cases did not complete any questions beyond the consent form. Another 19 cases did not complete some of the questionnaires and were therefore excluded from the dataset. Identifying as a non-drinker was not initially acknowledged as an exclusion criteria; however, based on previous drunkorexia literature that focuses on individuals who consume alcohol (Abrantes et al. 2017; Bryant et al. 2012; Burke et al. 2010; Eisenberg et al. 2018; Giles et al. 2009; Knight et al. 2017; Landry et al. 2016; Pinna et al. 2015; Rahal et al. 2012), individuals who reported consuming ‘0 drinks’ in terms of alcohol consumption on weekdays and the weekend ($n = 83$) were excluded from analyses (leaving $n = 206$). Data were screened for missing data and response sets prior to analyses. Regression assumptions were also assessed. The distribution of residuals generally followed a normal curve, but had a positive tail, related to the positive skew of the outcome variables (drunkorexia). Although this contributed to a violation of the assumption of multivariate normality, Hayes (2013) notes that this regression assumption is rarely met in practice and only severe deviations from normality substantially impact regression results. As such, no transformations were made to the drunkorexia variables for the regression analyses.

Results

Descriptives and Correlations

Participants in the present study ranged in age from 18 to 36 years ($M = 19.72$, $SD = 2.26$). The majority of the sample

was female ($n = 141$, 68.4%), identified as White American ($n = 167$, 81.1%), lived on campus ($n = 115$, 55.8%), and reported no affiliation with Greek life ($n = 143$, 69.4%). BMI ranged from 16.7 to 43.4 kg/m² ($M = 24.47$, $SD = 4.50$). Frequency data for the sociodemographic information and drinking behavior are presented in Table 1 and descriptive statistics for quantitative variables are presented in Table 2. Table 2 presents descriptive statistics for the entire sample and across gender. Gender differences were found for the following SATAQ subscales: internalization of the thin ideal ($F > M$), internalization of the muscular ideal ($M > F$), and pressures from the media ($F > M$). Bivariate correlations were conducted on the quantitative variables in the study and results are presented in Table 3.

Hierarchical Linear Regression Analyses

Table 4 presents the results of the five hierarchical linear regression analyses that were conducted with the four CEBRAC subscales (alcohol effects, bulimia, dietary restraint and exercise, restriction) and CEBRACS total score as outcome variables. All final models were statistically significant with the exception of the bulimia model ($F(10, 194) = 1.80$, $p = .063$). For the alcohol effects model, block two ($F(5, 199) = 3.43$, $p = .005$, $Adj. R^2 = .056$) and block three ($F(10, 194) = 5.41$, $p < .001$, $Adj. R^2 = .178$) were statistically significant. In block two, both Greek affiliation ($\beta = .158$, $p = .026$) and hypersensitive narcissism ($\beta = .234$, $p = .001$) were positive predictors of alcohol effects. In block three, Greek affiliation remained a significant predictor ($\beta = .135$, $p = .044$) and internalization of the thin ideal was also significant in the model ($\beta = .378$, $p < .001$). Hypersensitive narcissism ($\beta = .123$, $p = .076$) was not significant in the final alcohol effects model. The dietary restraint and exercise model was only significant at block three (final model; $F(10, 194) = 8.401$, $p < .001$, $Adj. R^2 = .266$). In the final model, internalization of the muscular ideal ($\beta = .317$, $p < .001$), internalization of the thin ideal ($\beta = .192$, $p = .014$), and peer pressures ($\beta = .162$, $p = .025$) were significant predictors.

The restriction model was significant at block one ($F(3, 201) = 3.58$, $p = .015$, $Adj. R^2 = .037$) with Greek affiliation emerging as a significant predictor ($\beta = .166$, $p = .020$). The final restriction model was also significant ($F(10, 194) = 6.59$, $p < .001$, $Adj. R^2 = .215$) with Greek affiliation ($\beta = .145$, $p = .027$), internalization of the thin ideal ($\beta = .274$, $p = .001$), and peer pressures ($\beta = .162$, $p = .025$) as significant predictors. The regression with the overall CEBRACS score as the outcome variable was significant at block two and block three. In block two ($F(5, 199) = 2.92$, $p = .014$, $Adj. R^2 = .045$), Greek affiliation ($\beta = .143$, $p = .044$) and hypersensitive narcissism ($\beta = .209$, $p = .003$) were significant predictors. In block three ($F(10, 194) = 8.66$, $p < .001$, $Adj. R^2 = .273$), internalization of the thin ideal ($\beta = .374$,

Table 1 Demographics and characteristics of sample

Variable	Category	<i>n</i>	(%)
Gender	Male	64	31.1
	Female	141	68.4
	Non-binary	1	0.5
Year	First-year	87	42.2
	Sophomore	51	24.8
	Junior	39	18.9
	Senior	28	13.6
Ethnicity	White American	167	81.1
	Hispanic/Latino American	9	4.4
	African American	19	9.2
	Asian	2	1.0
	Other	9	4.4
Greek Affiliation	Sorority	53	25.7
	Fraternity	10	4.9
	No involvement	143	69.4
Living Situation	On-campus (e.g., residence halls)	115	55.8
	Off-campus (e.g., with roommates)	67	32.5
	At home with family	19	9.2
	Other	5	2.4
Alcohol Consumption on a Typical Weekday	0 drinks	147	71.4
	1–2 drinks	44	21.4
	3–4 drinks	8	3.9
	5–6 drinks	4	1.9
	7 or more drinks	3	1.5
Alcohol Consumption on a Typical Weekend	0-drinks	1	.5
	1–4 drinks	95	46.1
	5–8 drinks	62	30.1
	9–12 drinks	31	15.0
	13 or more drinks	17	8.3

$p < .001$), internalization of the muscular ideal ($\beta = .177$, $p = .011$), and peer pressures ($\beta = .167$, $p = .020$) emerged as significant predictors. Greek affiliation ($\beta = .115$, $p = .068$) and hypersensitive narcissism ($\beta = .079$, $p = .227$) were not significant in the final model.

Discussion

Drunkorexia is largely considered a risk behavior as it is characterized by both disordered eating and risky alcohol use (Hunt and Forbush 2016; Pompili and Laghi 2018; Roosen and Mills 2015). Our results indicate that sociocultural attitudes toward appearance and Greek affiliation are associated with drunkorexia behaviors among college students. For the significant regression models, the predictors explained 18–27% of the variance in drunkorexia—a substantial proportion of variance in this health behavior. Notably, our results also indicate that sociocultural attitudes and Greek affiliation are

predictive of multiple dimensions of drunkorexia—including alcohol effects, which is the substance use-oriented dimension, and restriction, a disordered eating-oriented dimension. It is particularly noteworthy that drunkorexia, as measured in our study with the CEBRACS, captures these related yet distinct components of drunkorexia. Other research on drunkorexia has noted that some individuals are motivated to engage in the behavior pattern related to weight concerns, while others engage in the behavior as a way to become drunk more quickly (Roosen and Mills 2015). Therefore, our results further emphasize that drunkorexia is indeed multifaceted and seems to have both substance use and disordered eating components.

In the regression models, the sociocultural attitudes toward appearance variables emerged as the strongest predictors of drunkorexia behaviors. Specifically, internalization of the thin ideal was predictive of alcohol effects, dietary restraint and exercise, and the overall CEBRACS score. This finding largely corresponds to the literature indicating a significant

Table 2 Descriptive statistics for the study variables across sample and by gender

Variable	Total (<i>n</i> = 206)			Men (<i>n</i> = 64)			Women (<i>n</i> = 141)		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
BMI	24.47	4.50	16.7–43.4	25.54	4.59	19.9–40.7	24.04	4.36	17.2–43.4
NPI-16	5.11	3.17	0–14	6.09	3.42	0–13	4.70	2.96	0–14
HSNS	29.38	5.48	17–43	28.72	5.82	18–41	29.66	5.33	17–43
SATAQ-thin ideal*	3.41	.75	1.40–5	3.03	.67	1.4–5	3.58	.73	1.4–5
SATAQ-muscular ideal*	3.07	.95	1–5	3.48	.80	1.6–5	2.90	.95	1–5
SATAQ-family pressures	2.23	.96	1–4.5	2.10	.88	1–4	2.30	1.00	1–4.5
SATAQ-peer pressures	2.34	1.08	1–5	2.26	.99	1–4.5	2.37	1.11	1–5
SATAQ-media pressures*	3.64	1.2	1–5	2.79	1.17	1–5	4.01	1.01	1–5
CEBRACS-alcohol effects	10.68	5.84	7–35	10.20	5.46	7–34	10.87	6.02	7–35
CEBRACS-bulimia	6.53	1.73	6–22	6.55	1.90	6–18	6.52	1.65	6–22
CEBRACS-dietary restraint and exercise	9.94	4.76	6–27	8.86	3.60	6–22	10.42	5.15	6–27
CEBRACS-restriction	2.60	1.23	2–9	2.31	0.89	2–8	2.73	1.35	2–9
CEBRACS-total	29.75	10.67	21–89	27.92	9.54	21–77	30.55	11.10	21–89

*indicates gender differences identified at $p \leq .00385$

To protect against familywise error rate, a Bonferroni correction was applied in the examination of gender differences. A new alpha level of .00385 (.05/13 comparisons) was determined

relationship between drunkorexia behaviors and poor body image (Pinna et al. 2015; Rahal et al. 2012) and disordered eating behaviors (Hunt and Forbush 2016; Knight et al. 2017; Pompili and Laghi 2018; Roosen and Mills 2015). In building upon this area of study, our results indicate that the degree to which individuals internalize the thin ideal is a risk factor for drunkorexia—in terms of college students’ propensity to want to get drunker/become drunk more quickly (as measured by the alcohol effects CEBRAC subscale) and in compensating

for alcohol-related calories through exercise and diet (as measured by the dietary restraint and exercise CEBRAC subscale). The notion that internalization of the thin ideal predicts these separate dimensions of drunkorexia indicates that striving for body ideals is associated with risky behaviors across the substance use and disordered eating dimensions of drunkorexia.

In addition to the strong role internalization of the thin ideal plays in drunkorexia, internalization of the muscular ideal was

Table 3 Bivariate zero-order correlations among study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. BMI												
2. NPI-16	.048											
3. HSNS	-.059	-.139*										
4. SATAQ-thin ideal	.078	-.050	.266**									
5. SATAQ-muscular ideal	.152*	.117	-.034	.228*								
6. SATAQ-family pressures	.312**	-.055	.100	.218*	.016							
7. SATAQ-peer pressures	.250**	-.132	.216*	.254**	.119	.392**						
8. SATAQ-media pressures	.163*	-.233*	.268**	.504**	-.027	.258**	.393**					
9. CEBRACS-alcohol effects	.046	.070	.207*	.410**	.130	.103	.195*	.206*				
10. CEBRACS-bulimia	.145*	.000	.134	.187*	.157*	.056	.197*	.075	.439**			
11. CEBRACS-dietary restraint and exercise	.147*	-.118	.108	.397**	.335**	.082	.296**	.341**	.351**	.424**		
12. CEBRACS-restriction	.188*	-.080	.131	.397**	.154*	.175*	.350**	.303**	.566**	.553**	.567**	
13. CEBRACS-total	.136	-.023	.198*	.478**	.263**	.122	.311**	.312**	.841**	.656**	.773**	.768**

* $p < .05$ ** $p < .001$

For *r*-values, the calculated value is the effect size. Values less than 0.10 are trivial. Those between 0.10 and 0.30 are small; those between 0.30 and 0.50 are moderately-sized, and those over 0.50 are considered large (Cohen 1992)

Table 4 Hierarchical linear regressions of covariates, Greek affiliation, narcissism, and sociocultural attitudes toward appearance on drunkorexia

	Alcohol Effects		Bulimia		Dietary Restraint and Exercise		Restriction		CEBRACS Total	
	β (SE)	<i>p</i>	<i>B</i> (SE)	<i>p</i>	β (SE)	<i>p</i>	β (SE)	<i>p</i>	β (SE)	<i>p</i>
Block 1	$F(3, 201) = 1.34$, <i>p</i> = .261		$F(3, 201) = .088$, <i>p</i> = .967		$F(3, 201) = 2.00$, <i>p</i> = .115		$F(3, 201) = 3.58$, <i>p</i> = .015, <i>Adj. R</i> ² = .037		$F(3, 201) = 1.81$, <i>p</i> = .147	
Greek affiliation	.129 (.072)	.074	-.035 (.073)	.629	.077 (.072)	.286	.166 (.071)	.020	.118 (.072)	.100
Gender	.024 (.072)	.739	.002 (.074)	.977	.135 (.071)	.059	.120 (.071)	.090	.088 (.072)	.221
Age	-.044 (.070)	.531	.013 (.071)	.853	.013 (.070)	.854	-.023 (.069)	.744	-.019 (.070)	.788
Block 2	$F(5, 199) = 3.43$, <i>p</i> = .005, <i>Adj. R</i> ² = .056		$F(5, 199) = .77$, <i>p</i> = .572		$F(5, 199) = 1.89$, <i>p</i> = .098		$F(5, 199) = 3.06$, <i>p</i> = .011, <i>Adj. R</i> ² = .048		$F(5, 199) = 2.92$, <i>p</i> = .014, <i>Adj. R</i> ² = .045	
Greek affiliation	.158 (.070)	.026	-.019 (.072)	.796	.088 (.072)	.224	.182 (.071)	.011	.143 (.071)	.044
Gender	.024 (.072)	.741	-.008 (.074)	.913	.110 (.073)	.134	.099 (.072)	.171	.072 (.072)	.318
Age	-.019 (.069)	.787	.021 (.071)	.773	.005 (.070)	.944	-.023 (.069)	.737	-.007 (.070)	.916
NPI-16	.118 (.071)	.097	.020 (.073)	.783	-.075 (.072)	.302	-.036 (.071)	.617	.031 (.072)	.669
HSNS	.234 (.069)	.001	.136 (.072)	.060	.097 (.071)	.171	.136 (.070)	.052	.209 (.070)	.003
Final Model	$F(10, 194) = 5.41$, <i>p</i> < .001, <i>Adj. R</i> ² = .178		$F(10, 194) = 1.80$, <i>p</i> = .063		$F(10, 194) = 8.40$, <i>p</i> < .001, <i>Adj. R</i> ² = .266		$F(10, 194) = 6.59$, <i>p</i> < .001, <i>Adj. R</i> ² = .215		$F(10, 194) = 8.66$, <i>p</i> < .001, <i>Adj. R</i> ² = .273	
Greek affiliation	.135 (.066)	.044	-.042 (.072)	.562	.069 (.063)	.274	.145 (.065)	.027	.115 (.063)	.068
Gender	-.096 (.082)	.241	.020 (.089)	.822	.081 (.078)	.295	.014 (.080)	.863	-.012 (.077)	.880
Age	-.009 (.066)	.890	.049 (.072)	.494	.026 (.063)	.678	-.005 (.065)	.945	.014 (.062)	.822
NPI-16	.106 (.067)	.116	.017 (.073)	.810	-.069 (.064)	.277	-.024 (.066)	.714	.027 (.063)	.666
HSNS	.123 (.069)	.076	.085 (.075)	.254	-.008 (.065)	.905	.007 (.067)	.109	.079 (.065)	.227
SATAQ-thin ideal	.378 (.081)	<.001	.143 (.088)	.107	.192 (.069)	.014	.274 (.080)	.001	.347 (.077)	<.001
SATAQ-muscular ideal	.016 (.073)	.821	.110 (.079)	.165	.317 (.069)	<.001	.077 (.072)	.283	.177 (.069)	.011
SATAQ-family pressures	-.009 (.071)	.902	-.029 (.077)	.704	-.074 (.067)	.267	.001 (.069)	.994	-.043 (.066)	.523
SATAQ-peer pressures	.070 (.076)	.357	.180 (.083)	.030	.162 (.072)	.025	.237 (.075)	.002	.167 (.072)	.020
SATAQ-media pressures	.012 (.088)	.889	-.088 (.095)	.355	.145 (.083)	.081	.050 (.086)	.556	.063 (.083)	.445

The Adj. R^2 presented represents the total variance explained for the block/model (not change in variance)

predictive of the dietary restraint and exercise dimension of drunkorexia as well as the overall CEBRACS score. Notably, in the dietary restraint and exercise model, the predictive capacity of the muscular ideal was the strongest of all predictors and persisted even with internalization of the thin ideal in the model. That is, both internalization of the thin and muscular ideals independently predicted this dimension of drunkorexia. Greater internalization of the muscular ideal has been linked with excessive exercise and modification of one's diet (Schaefer et al. 2017; Thompson et al. 2017; Vartanian et al. 2018) and our results suggest drunkorexia, particularly restraining one's diet or exercising to compensate for alcohol-related calories, is another behavior linked to internalization of the muscular ideal.

In addition to internalization of body ideals, among the SATAQ subscales, pressures from peers to be thin or improve one's appearance was predictive of various drunkorexia dimensions. This finding is consistent with previous literature noting the role that peer pressure can play in distorted body

image and disordered eating behaviors (Helfert and Warschburger 2011; Johnson et al. 2014; Thompson et al. 2017) as well as drinking behaviors (Borsari and Carey 2001). It is also possible that calorie restriction and related compensatory behaviors take place in a social context/with peers (e.g., going to the gym together before an evening of drinking), which might help to explain the role of peer pressures in drunkorexia. However, examining the contexts in which compensatory behaviors took place was beyond the scope of the present study. Nonetheless, this area of examination would be an important avenue for further research, particularly in considering ways to prevent or mitigate drunkorexia behaviors among college students.

In addition to sociocultural attitudes toward appearance, our results indicated that Greek affiliation was a significant predictor of drunkorexia tendencies, specifically in terms of alcohol effects and restriction. Previous research has indicated a relationship between Greek affiliation and an increased likelihood of engaging in drunkorexia behaviors (Giles et al.

2009; Ward et al. 2015; Wilkerson et al. 2017). However, these studies measured drunkorexia in a more simplified way—with 2–3 items (Giles et al. 2009; Wilkerson et al. 2017) or with a unitary measure of drunkorexia (Ward et al. 2015). In expanding this area of study, our results suggest that Greek affiliation is associated with different drunkorexia dimensions: alcohol effects and restriction. These dimensions of drunkorexia largely represent two distinct motivations—one to increase the effect of a substance and the other focused on decreasing one's calories prior to drinking.

It is noteworthy that the majority of sample who were Greek-affiliated were members of a sorority rather than a fraternity. The disparity between sorority and fraternity members in the sample is not only an important limitation of the study, but should also be considered in interpreting the results. Greek affiliation, likely related to its association with heavy drinking (Borsari et al. 2009) as well as body dissatisfaction and disordered eating (Allison and Park 2004; Averett et al. 2017) remains an important risk factor for various drunkorexia behaviors in the college setting—which, in turn, may be particularly salient among sorority members.

In the present study, we also investigated the role of grandiose and vulnerable narcissism in relation to drunkorexia. Grandiose narcissism was not correlated with any of the drunkorexia tendencies. Vulnerable narcissism was, however, a significant predictor in some of the intermediate blocks of the drunkorexia regression models. Previous research has suggested that vulnerable narcissism is a risk factor for disordered eating (Gordon and Dombeck 2010; Maples et al. 2011), so it is curious that our results also indicate that vulnerable narcissism is positively correlated with the alcohol effects dimension—the aspect of drunkorexia associated with becoming drunker/drank more quickly—rather than the compensatory-oriented dimensions of drunkorexia. In terms of variance explained in drunkorexia, the relative influence of vulnerable narcissism was not present after considering socio-cultural attitudes toward appearance, but it was correlated with an unexpected dimension of drunkorexia—alcohol effects—and is therefore a finding that could be further examined.

Finally, it may be especially important to consider the context in which our study took place—college. Our sample was primarily comprised of individuals who could be classified as in the emerging adulthood phase of their life, marked by significant identity exploration and instability (Arnett 2015). This developmental period involves many transitions as individuals grapple with their own identity and navigate various work, living situation, and relationship changes. Although much of the research on drunkorexia has been conducted on adolescents or emerging adults, it is notable this work tends to focus on college students in particular (e.g., Bryant et al. 2012; Buchholz et al. 2018; Eisenberg and Fitz 2014; Knight et al. 2017). This may be related to sampling convenience or it could be intentional, as some of the contextual factors

associated with college attendance—lack of parental supervision along with having a large cohort of peers living in close proximity—have been found to be associated with heavier drinking (Carter et al. 2010).

The developmental phase of college students, marked by considerable identity exploration and instability, along with the various drinking-promoting factors associated with college attendance (e.g., Greek affiliation, peer influences; Simons-Morton et al. 2016; Ward et al. 2015) may be precipitating factors in drunkorexia engagement. Overall, given the paucity of research on drunkorexia among emerging adults not attending college, it would be beneficial for future research to examine how strongly drunkorexia engagement is associated with the college experience—or whether it is a behavior pattern that tends to occur among emerging adults in general.

Limitations

There are limitations of the present study that should be considered when interpreting the results. First, the design of the study was cross-sectional in nature. Therefore, although the models are presented in a way that tested the predictive capacity of Greek affiliation, narcissism, and the sociocultural attitudes toward appearance dimensions in drunkorexia, we cannot confirm causality or the temporal sequence of the relationships (i.e., the extent to which variables precede drunkorexia engagement). It is possible that bidirectional relationships exist, and therefore longitudinal or experimental designs, potentially using vignettes or other methods, would be helpful in further understanding the nature of the relationships among the study variables.

Additionally, it should be noted that some of our scales had relatively weak internal consistencies (e.g., NPI-16, HSNS at .66 and .68 respectively), which could have impacted the results, particularly with regard to the association between narcissism and drunkorexia. It is also important to consider that the correlations observed in the present study between the drunkorexia dimensions and predictor variables were small-moderate ($r = .1-.5$; Field 2013). This perhaps speaks to the complexity of drunkorexia as a construct; the present study involved the assessment of a small number of possible predictor variables, and there are likely various other factors, such as mental health symptomatology (e.g., anxiety, depressive symptoms) or other forms of substance use, associated with the behavior pattern that should be examined in future research.

It is also notable that some of our recruitment methods along with characteristics of the sample limit the generalizability of the results (e.g., the sampling method to obtain Greek affiliated vs. non-affiliated participants, sorority vs. fraternity disproportion, gender disproportion). As mentioned earlier, there was no formal assessment of eating disorders or substance use disorders as part of the exclusion criteria for this

study. This, in turn, might have impacted the results, and future research should consider collecting this information in order to understand if drunkorexia is expressed differently among individuals with diagnosable disorders compared to the general college population. In terms of other features of the sample, it should be noted that women were overrepresented in the sample, as were individuals not affiliated with Greek life. Specifically, less than one-third of the sample was Greek affiliated, and fraternity members were a very small proportion (15.9%) of this part of the sample. Although some of our findings speak to the role of Greek affiliation in drunkorexia, more research is needed on this topic. For example, it is possible that differences in drunkorexia exist between individuals affiliated with sororities compared to fraternities, but such an analysis was not possible in the present study.

An important finding in the present study was that drunkorexia was associated with internalization of appearance ideals. However, one limitation is that we did not examine the mediation effect of body dissatisfaction as an intermediate variable in the relationship. It is quite possible that internalization of body ideals contributes to body dissatisfaction, which, in turn, is a factor that motivates individuals to engage in restrictive eating or compensatory behaviors. Indeed, this is the general framework for understanding the relationship between internalization of appearance ideals and disordered eating (Stice and Shaw 2002). However, measures of body dissatisfaction were not included in the present study, and thus, future research testing such a mediation effect would be helpful in understanding factors underlying the relationship between internalization of body ideals and drunkorexia.

Conclusion

Overall, our results suggest that internalization of appearance ideals, pressure from peers, and Greek affiliation are associated with drunkorexia among college students. While some previous research has noted that Greek affiliation is a risk factor for drunkorexia engagement (Giles et al. 2009; Ward et al. 2015; Wilkerson et al. 2017), our study focused on its role across various drunkorexia dimensions. Furthermore, to our knowledge, the present study was the first to focus on socio-cultural attitudes toward appearance, and our findings highlight that internalization of appearance ideals and pressure from peers are significant factors related to engagement in drunkorexia. Therefore, in line with the socio-ecological framework (Sudhinaraset et al. 2016), both individual and community-level risk factors seem to increase the risk of engaging in problematic eating and compensatory behaviors in the context of alcohol consumption. Notably, both internalization of the thin ideal and Greek affiliation were associated with drunkorexia across the alcohol effects and calorie compensation dimensions. Therefore, these risk factors seem to be

linked to both the substance use and disordered eating aspects of drunkorexia. Overall, drunkorexia is a complex and multifaceted behavior pattern, and our results point to specific sociocultural variables that should be considered both in future research on the topic and in interventions to reduce drunkorexia in the college population.

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