



Gender differences in relations between alcohol-related compensatory behavior and eating pathology

Sasha Gorrell¹ · D. Catherine Walker² · Drew A. Anderson¹ · James F. Boswell¹

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Abstract

Purpose Concerns about caloric intake associated with alcohol use (e.g., fear of weight gain) are positively associated with compensatory eating behaviors (e.g., caloric restriction, self-induced vomiting), a phenomenon that has been identified across gender. Specific motivations for compensatory behaviors differ; some relate to eating disorder (ED) pathology (e.g., shape and weight concerns), and others to alcohol (e.g., enhancing effects). Research examining motivations for alcohol-related compensatory behaviors in men is limited to date. The current study sought to assess how specific types of alcohol-related compensatory behaviors and their association with ED pathology present differently by gender.

Methods Undergraduates ($N=530$, 48% female) completed the Compensatory Eating Behaviors in Response to Alcohol Consumption Scale (CEBRACS), Eating Disorders Diagnostic Scale (EDDS), and reported height, weight, and frequency and quantity of alcohol consumption. Data were examined using linear regression, and relations between CEBRACS behaviors and eating pathology were compared across gender.

Results Factors that were positively associated with EDDS scores for both men and women included alcohol-related dietary restraint, and exercise. For women, but not men, alcohol-related bulimic behavior also contributed to elevations in EDDS scores.

Conclusions Findings indicate that specific types of alcohol-related compensatory eating behaviors (i.e., dietary restraint and exercise) are positively related to ED pathology for both male and female participants. In contrast, bulimic behaviors' association with ED pathology is gender specific. Understanding gender differences in alcohol-related compensatory behaviors and ED risk may inform gender-specific intervention targets.

Level of evidence Cross-sectional descriptive study, Level V.

Keywords Compensatory eating behavior · Drunkorexia · Alcohol · Eating disorder · Gender

Introduction

Longitudinal examination of college students has consistently found a high prevalence of alcohol consumption [1] with a wide range of associated negative consequences [2]. College students are also at elevated risk for eating and

exercise-related pathology, which are associated with significant negative physical and mental health outcomes [3]. Recently, a pattern of risky eating behaviors associated with alcohol use, colloquially termed “drunkorexia,” has been identified and well-documented within undergraduate populations [4–8]. Initial research suggests that when combined, pathological eating-related and drinking behaviors result in worse outcomes than either condition alone [9]. For example, among women, caloric restriction prior to drinking was associated with increased likelihood of blackouts, injuries, driving under the influence, and unprotected and unintended sexual activity and in males was associated with increased likelihood of engaging in physical fights [10].

However, previous research on “drunkorexia” has been somewhat limited, and considerable variation in definitions of this pattern of behavior exists across the literature.

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✉ Sasha Gorrell
sashadmo@gmail.com

¹ University at Albany, State University of New York,
1400 Washington Avenue, Social Sciences 399, Albany,
NY 12222, USA

² Union College, 807 Union Street, Schenectady, NY 12308,
USA

Some studies have included narrow definitions, only considering caloric restriction prior to drinking alcohol [e.g., 11], whereas other work has considered a broader pattern of behaviors including self-induced vomiting [12], excessive exercise [13], and proactive as well as reactive dietary restriction in response to alcohol use [5]. Furthermore, the underlying rationale for engagement in these behavior patterns may include motives not specific to weight control (e.g., increasing psychoactive effects of alcohol), and as such, the current study uses “alcohol-related compensatory behaviors” (ARCBs) to better describe the range of behaviors and motivations that may be present.

Prior research into ARCBs has found that increased calories consumed in alcoholic beverages and associated weight concern may be a key motivator for engagement in compensatory behaviors [10, 14, 15]. However, alternate motivations have been reported. Restricting meals may save money, allowing for allocation of resources toward purchasing alcohol rather than food, which has been reported across gender [5, 11]. A desire to compensate for the calories consumed in alcohol may also motivate purging, with 20–66% of undergraduate females reporting intentionally-induced vomiting (at least once) after drinking alcohol [12, 16]. Additionally, vomiting is associated with greater frequency of alcohol use and negative consequences associated with this increased consumption in undergraduate women [17, 18]. Dietary restraint, or the cognitive effort to restrict food intake, has also been linked with high-risk drinking among female undergraduates [19], with greater risk for alcohol-related compensatory behaviors [20, 21], particularly among heavier drinkers [21, 22], but to date, no mixed gender studies have explicitly examined alcohol-related dietary restraint and its relation to ED pathology. In addition to dietary restraint, consistent evidence within the literature also confirms a positive relation between physical activity level and alcohol consumption [13, 23], with physical activity uniquely predicting binge drinking in mixed-gender undergraduate samples [4].

Despite increased interest in ARCBs, a majority of investigations have studied female samples [e.g., 24] and presentation of these problematic behaviors in mixed-gender populations remains less well understood. Specifically, engagement in ARCBs may lead to increased vulnerability for eating disorder (ED) pathology, but this association may depend upon the specific type of compensatory behavior reported, and may present differently across gender. A recent review and synthesis by Murray and colleagues [25] suggests multiple detrimental outcomes on patients and on the field, writ large, result from the systematic underrepresentation of men in the ED research. Thus, it is essential that a comprehensive understanding of ARCBs includes male and female participants and examines differences in the associations between ARCBs and eating pathology across gender.

Recently, researchers have begun to note the importance of examining ARCBs in men and women separately to identify distinct risk patterns [26, 27]. However, to date, no work has specifically examined the *type* of ARCB that might specifically incur risk for eating pathology, based on gender. Identification of domains of behavior that may be particularly salient differential to gender might augment intervention and prevention efforts in at-risk populations (e.g., mixed-gender, undergraduate samples).

Current study

The purpose of the current study was twofold. One, using a measure that assesses compensatory behaviors in response to alcohol use across multiple domains, we sought to examine a more inclusive range of ARCBs and motivations for their use. Two, in response to increasing evidence that compensatory behavior may vary in presentation in men versus women, we examined gender differences in ARCBs. As no prior work has specifically investigated gender differences in a broad range of ARCBs, as is examined in the CEBRACS subscales in association with eating pathology, examination of these variables was exploratory and no *a priori* hypotheses were generated for this aim of the study.

Materials and methods

Participants

The current sample was drawn from a larger study ($N=761$) of undergraduate Psychology research pool students at a large Northeastern university, who participated for course credit. For the current analyses, participants ($N=530$, 48% female) were selected from the original sample based on having endorsed consuming at least one alcoholic beverage within the last 30 days. Inclusion criteria for the study were students who were at least 18 years of age, and reported sex, height and weight. Reported ethnicity was White (57%), Hispanic (13%), Black (12%), Asian (8%), Other (0.6%) and 9% chose not to respond.

Measures

Demographics form

Participants completed a basic demographics form, including items regarding self-reported ethnicity, sex, age, and year in school.

Alcohol consumption

Alcohol consumption was measured using two single items that respectively measured frequency and quantity of alcohol use. To assess frequency, participants responded to the question “How often did you drink in the past month? (check one)” with response options ranging from (1) “I did not drink at all” to (6) “Nearly every day.” To gauge quantity of drinking, participants responded to the question “Think of a typical weekend (Friday or Saturday) in the last month. How much did you drink on that evening? (check one).” Participants reported the appropriate number, with options to indicate any specific number up to 30 drinks, and then another option for “More than 30.” Past work supports the use of single-item measures in assessing alcohol consumption, suggesting that single items show comparable validity and reliability to scales with multiple items [28, 29].

Eating Disorder Diagnostic Scale (EDDS; [30])

The EDDS, a 22-item self-report scale, was used to measure ED symptomatology. The scale has shown good internal consistency and test–retest reliability [30]; in the current sample, Cronbach’s α was 0.84 for men, and 0.82 for women. The response scale used varies, as certain items required responses on a Likert-type scale ranging from 1 (“Not at all”) to 7 (“Extremely”), whereas others require that participants endorse the number of times a certain behavior occurred. Using an individual’s responses on the measure, one can generate an “ED symptom composite score,” which was calculated in the present study. Items on this scale included self-reported height and weight, which were used to calculate participants’ BMI (in kg/m^2). The EDDS has been used in mixed-gender samples [e.g., 31, 32], demonstrating acceptable internal consistency and similar item loading among adolescent boys and girls in a sample of Hong Kong youth [34].

Compensatory Eating Behaviors in Response to Alcohol Consumption Scale (CEBRACS; [33])

The CEBRACS is a 21-item self-report measure that asks respondents to rate items pertaining to the last 3 months, for three time periods: before drinking, while under the effects of alcohol (during drinking), and after the effects of alcohol have worn off (after drinking). It uses a Likert-type rating scale from 1 to 5 (“Never” to “Almost all the time”). Each of the three main sections assesses the same compensatory behaviors in response to calories consumed from drinking alcohol. Ordered randomly within each time frame, these behaviors include eating less than usual, skipping meals or days of eating, eating low-fat or low-calorie food, exercising, vomiting, and taking diet pills, diuretics, or laxatives.

Four subscales are calculated from the full measure: alcohol effects, bulimia (i.e., vomiting, laxative, and diuretic use; this subscale excludes compensatory exercise that is commonly included in traditional definitions of bulimic behavior), dietary restraint and exercise, and restriction. The overall scale demonstrated discriminant and convergent validity in its original development and demonstrated good internal consistency in the scale validation sample (Cronbach’s $\alpha=0.89$) as well as in the current study [Cronbach’s $\alpha=0.71$ (men), 0.84 (women)]. The CEBRACS was developed and validated for use in mixed-gender samples.

Procedure

During one in-lab appointment, participants provided informed consent and completed the self-report questionnaires described. All students were granted course credit for their participation. The university’s Institutional Review Board approved all study methods and procedures.

Analytic plan

Linear regression analyses evaluated the interaction of gender and CEBRACS subscales in relation to total EDDS scores. Given that alcohol frequency, alcohol quantity, and BMI are often associated with outcomes of ED pathology and ARCBs [e.g., 6, 15], these covariates were included in linear regression analyses; gender was entered as a categorical predictor. All four CEBRACS subscales were entered into the model simultaneously to determine their association with EDDS total scores, followed by two-way interaction terms created from gender and CEBRACS subscales. The parameter coefficient for the interaction effect is the slope between significant independent variables and EDDS total scores as a function of reported gender status; in post hoc follow-up examination, we further tested the slopes of significant interaction effects in both gender groups.

Results

Descriptive statistics

Analyses included bivariate correlations assessing the relation of all variables within the study (see Table 1). Tests for multicollinearity between independent variables did not reveal elevated correlations. Male and female participants were similar in age ($M_{\text{male}} = 18.96$, $SD = 1.75$; $M_{\text{female}} = 19.48$, $SD = 1.56$) as well as BMI ($M_{\text{male}} = 23.68$, $SD = 3.63$; $M_{\text{female}} = 23.30$, $SD = 4.60$). Descriptive statistics for all alcohol, eating, and related compensatory variables are presented in Table 2.

Table 1 Pearson product bivariate correlation for variables of interest

Variable	1	2	3	4	5	6	7	8	9
1. BMI	–	0.01	0.00	0.37**	0.13	0.08	0.06	0.10	0.21**
2. Alcohol frequency	–0.17**	–	0.58**	–0.06	0.09	0.11	0.06	0.05	–0.05
3. Alcohol quantity	–0.12	0.62**	–	0.12*	0.14*	0.10	0.08	0.10	0.04
4. EDDS total	0.22**	0.16*	0.12	–	0.32**	0.14*	0.21**	0.24**	0.27**
5. CEBRACS total	–0.09	0.36**	0.34**	0.31**	–	0.61**	0.32**	0.82**	0.48**
6. <i>Alcohol effects</i>	–0.09	0.32**	0.33**	0.18**	0.76**	–	0.19**	0.09	0.31**
7. <i>Bulimia</i>	0.02	0.04	0.14*	0.24**	0.21**	0.08	–	0.10	0.42**
8. <i>Dietary restraint/exercise</i>	–0.07	0.28**	0.23**	0.27**	0.87**	0.35**	0.10	–	0.24**
9. <i>Restriction</i>	–0.07	0.28**	0.26**	0.26**	0.65**	0.47**	0.30**	0.46**	–

Correlations for females are presented below the diagonal

Alcohol Frequency (value of 3) is 1–2 times per month; (value of 4) is 2–3 times per month

*Significant at <0.05, **Significant at <0.01

EDDS Eating Disorder Diagnostic Scale, CEBRACS Compensatory Eating Behavior in Response to Alcohol Consumption Scale

Italicized variable = subscale of the CEBRACS

Table 2 Descriptive statistics for variables of interest

	Range	<i>M</i> (<i>SD</i>)	Skewness (<i>SE</i>)
Alcohol frequency			
Females	1–6	3.33 (0.90)	0.11 (0.15)
Males	1–6	3.67 (0.96)	–0.13 (0.15)
Alcohol quantity			
Females	1–26	5.77 (3.44)	1.86 (0.15)
Males	1–21	8.66 (4.34)	0.35 (0.15)
EDDS total			
Females	0–48	16.44 (11.10)	0.71 (0.16)
Males	0–58	9.81 (9.97)	1.75 (0.15)
CEBRACS total			
Females	21–49	26.27 (5.94)	1.47 (0.16)
Males	21–45	26.07 (4.59)	0.99 (0.15)
<i>Alcohol effects</i>			
Females	7–21	8.71 (2.79)	2.21 (0.16)
Males	7–19	8.34 (2.28)	2.20 (0.15)
<i>Bulimia</i>			
Females	6–9	6.11 (0.38)	4.30 (0.16)
Males	6–11	6.13 (0.47)	5.73 (0.15)
<i>Dietary restraint/exercise</i>			
Females	6–24	9.17 (3.77)	1.29 (0.16)
Males	6–19	9.43 (3.47)	0.74 (0.15)
<i>Restriction</i>			
Females	2–5	2.28 (0.65)	2.41 (0.15)
Males	2–5	2.17 (0.49)	3.54 (0.15)

Regression analyses

The full model with all four subscales entered simultaneously was significant, $F(12, 419) = 13.49$, $p < .001$, accounting for 29% of the variance in EDDS total scores (Table 3).

Within the full model, only the Dietary Restraint and Exercise subscale of the CEBRACS demonstrated a significant relation to EDDS scores. In contrast, CEBRACS subscales of alcohol effects, bulimia, and restriction did not have significant main effects.

An interaction effect was demonstrated between gender and Bulimia CEBRACS subscale scores, $b = 4.92$, $t(419) = 1.98$, $p = .048$, 95% CI [0.03, 9.80]. These findings indicate that higher scores on the CEBRACS Bulimia subscale were positively related to elevations in reported eating pathology, but not consistently across gender. Simple slope tests indicated that the relation between the Bulimia subscale and EDDS scores was significant only for women, $t = 3.78$, $p < .001$.

Discussion

Within a large, mixed-gender sample of college undergraduates, scores on the Dietary Restraint and Exercise CEBRACS subscale indicated significant relations with greater eating pathology when considering the sample as a whole; none of the three other subscales evidenced a significant main effect. While consistent evidence exists that the use of ARCBs is problematic across gender, the current study provides important clarification that for both men and women, behaviors that specifically relate to restraint and exercise are positively related to reported ED pathology. In contrast, dietary restriction did not demonstrate a significant relation with eating pathology across gender, which does not align with the conceptualization of ARCBs as originally qualified (i.e., by restriction [11]). It should be noted, tests of this relation were just shy of meeting a significance threshold, suggesting that further investigation is warranted.

Table 3 Regression model for EDDS scores for males and females

Model	Variable	R^2	Adjusted R^2	F	β	b	SE(b)	t	p	CI (95%)
Full ($n = 420$)		0.29	0.26	13.49		–36.29	8.90	–4.08	<0.001***	–53.78, –18.79
	BMI				0.26	0.67	0.11	6.08	<0.001***	0.45, 0.88
	Alcohol frequency				0.11	1.32	0.64	2.07	0.039	0.07, 2.57
	Alcohol quantity				–0.17	–0.44	0.15	–2.97	0.003**	–0.73, –0.15
	Gender (Gen)				–0.98	–21.86	14.44	–1.51	0.13	–50.24, 6.52
	<i>Alcohol Effects (AE)</i>				0.072	0.32	0.31	1.01	0.31	–0.30, 0.93
	<i>Bulimia (BU)</i>				0.10	2.49	1.53	1.63	0.11	–0.52, 5.50
	<i>Dietary Restraint/ Exercise (DRE)</i>				0.17	0.50	0.19	2.58	0.010*	0.12, 0.88
	<i>Restriction (RSCT)</i>				0.17	3.25	1.67	1.95	0.052	–0.03, 6.53
	Gen X AE				0.010	0.022	0.41	0.054	0.96	–0.79, 0.84
	Gen X BU				1.35	4.92	2.48	1.98	0.033*	0.03, 9.80
	Gen X DRE				–0.021	–0.044	0.28	–0.16	0.88	–0.59, 0.50
	Gen X RSCT				–0.14	–1.24	2.12	–0.59	0.56	–0.538, 2.90

Italicized variables refer to CEBRACS subscales

*Significance of $p < .05$; **Significance of $p < .01$; ***Significance of $p < .001$

For both men and women, subscale scores that would indicate motivation for compensatory behavior related to enhancing alcohol's effects were not significantly related to ED pathology. Enhancing alcohol effects is a motive for ARCBs that has been less studied across the ED literature; preliminary findings from the current study add important knowledge to the field, in that ARCBs aimed at increasing alcohol's effects were not related to ED pathology.

Overall, evidence from the current study suggests that some relations between compensatory behaviors and reported ED pathology appear to function differently according to gender. For women, elevated Bulimia subscale scores on the CEBRACS were associated with greater eating pathology, an effect that was not evidenced for men. Consequently, more nuanced evaluations of ARCBs may be required for men and women. For women, bulimic behaviors (i.e., vomiting, laxative, and diuretic use) may be more problematic, whereas for both men and women, dietary restraint and exercise may indicate greater risk for ED pathology.

In female samples, women have reported bulimic behavior in relation to alcohol consumption (e.g., [12]); the current mixed-gender sample suggests that this behavior pattern is unique to women. However, a more expanded definition of bulimic behavior includes excessive exercise. Based on current study results, *both* men and women may be at risk for this functionally maladaptive pattern of exercising to control weight in response to alcohol use. Prevention efforts in undergraduate samples would benefit from more careful screening and assessment. Specifically, assessing restraint and examining the function of exercise in relation to alcohol use is recommended. Furthermore, this study adds to a growing body of literature supporting the importance of

assessing these ARCBs in men and women. Despite evidence that EDs are *not* relatively uncommon among men as once thought [25], ED treatment remains disproportionately implemented in this population [34]. Accordingly, public health initiatives to improve prevention and intervention efforts for EDs require increased awareness of behavior patterns such as ACRBs that increase risk for ED, specifically according to gender.

Limitations

The current study has several limitations. First, the study design is cross-sectional and based on retrospective recall. Longitudinal work might identify mediational influences in the etiology of compensatory behaviors and might also be improved using ecological measures of drinking and eating behavior that do not rely on memory. Further, the current self-report measure only includes an alcohol quantity consumption assessment for Friday and Saturday; future work might expand upon this time frame (i.e., to include Thursday) in an effort to more accurately capture undergraduate drinking behavior. Second, the measure of compensatory behavior related to alcohol that was used in this study includes motives related to weight control and alcohol effects, but does not include other possible motives that might influence compensatory behavior (e.g., cost). Also limited in this study was the binary report of gender (i.e., transgender was not given as a possible gender category), and did not assess for overall substance use (e.g., marijuana, stimulants). Future research would benefit from including these additional motivations for ARCBs and assessing a

range of substance use. Despite these limitations, this study represents the first study to examine patterns of ARCBs in predicting ED pathology in a large sample of undergraduate men and women.

Conclusions

Past research has focused on compensatory weight loss behaviors related to alcohol use largely in female samples, and often examining only specific behaviors such as caloric restriction. This study used a more comprehensive assessment of ARCBs in comparing male and female participants' use of these behaviors and their relation to eating pathology.

In the current study, women were more likely to report use of bulimic behaviors (i.e., vomiting, laxative, and diuretic use), whereas both men and women were likely to use restriction, dietary restraint and excessive exercise to compensate for the calories in alcohol. Neither gender evidenced that use of ARCBs to increase alcohol's effects was associated with eating pathology. Prevention protocols within vulnerable populations (i.e., college students) should consider addressing compensatory eating behaviors related to alcohol use differently, according to gender. Results from the current study indicate that for females, urges to engage in bulimic behavior may be an important domain to assess and target in efforts to prevent ARCBs and eating pathology. In contrast, restriction, dietary restraint and endorsement of exercise for weight-loss purposes appear to be important targets for screening, prevention, and treatment in both male and female undergraduates.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Statement of human rights 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.

Informed consent During one in-lab appointment, participants provided informed consent and completed the self-report questionnaires described.

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