Drunkorexia: empirical investigation and analysis of the characteristics of the phenomenon in an Italian sample of adolescents and young adults

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ABSTRACT: The term drunkorexia refers to the act of self-imposed utilization of extreme weight control methods to compensate for alcohol consumption typically observed among university students. Despite its diffusion, there is a lack of research investigating the presence of this new alarming trend in Italy. *Aim:* this study estimates the frequency of drunkorexia behaviours in a sample of Italian youth aged 14-24, explores the motivations for alcohol consumption among those presenting drunkorexia-type behaviours, and examines the relationship between drunkorexia and disordered eating. *Methods:* drunkorexia behaviors, eating habits and motives for alcohol use were investigated in 403 subjects (F=301, M=102) aged 14-24 through self-report questionnaires. A series of analyses, including descriptive statistics, univariate analysis of the variance and multiple regressions were run. *Results:* 62.5% of the sample showed drunkorexia-type behaviours. Drunkorexia was related to disordered eating, especially among females older than eighteen. *Discussion and Conclusions:* this the first study investigating the incidence of drunkorexia behaviors in a sample of youth living in Northern Italy. Evidence-based interventions for eating disorders and drinking problems should inspire the development of ad hoc preventive and treatment actions for drunkorexia.
Keywords: eating disorders, alcohol consumption, Italy, youth, adolescence

Drunkorexia: investigación empírica y análisis de las características del fenómeno en una muestra italiana de adolescentes y adultos jóvenes

RESUMEN: El termino drunkorexia se refiere al acto de un uso propio de métodos de control del peso para compensar el consumo de alcohol observado típicamente entre los estudiantes universitarios. A pesar de su difusión, esta nueva tendencia alarmante aún carece de una definición sistemática. *Objetivo*: Este estudio estima la frecuencia de comportamientos de drunkorexia en una muestra de jóvenes Italiana, de edades comprendidas entre 14 y 24 años, examina la relación entre la drunkorexia y los desórdenes alimentarios, y explora las motivaciones para el consumo de alcohol entre aquellos que presentan comportamientos de drunkorexia. *Métodos*: los comportamientos de drunkorexia, los hàbitos alimentarios y los motivos para el uso del alcohol fueron investigados en 403 sujetos (F=301, M=102) de entre 14 y 24 años mediante cuestionarios. Se llevaron a cabo una serie de análisis, incluyendo estadísticas descriptivas, análisis univariado de la varianza y regresiones múltiples. *Resultados*: el 62.5% de los sujetos mostraron comportamientos de tipo drunkorexico. La drunkorexia resultó relacionada con patrones de desorden alimentario, especialmente entre las mujeres mayores de dieciocho años. *Discusión y conclusiones*: el presente es el primer estudio que investiga la incidencia de comportamientos drunkorexicos en una muestra de adolescentes y jovenes adultos que viven en el Norte de Italia. Los tratamientos basados en pruebas empíricas para los trastornos alimentarios y los problemas de alcohol deberían inspirar el desarrollo de programas de prevención y de tratamiento especial para la drunkorexia.
Palabrabas clave: desordenes alimentarios, consumo de alcohol, Italia, juventud, adelescencia

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Introduction

Over recent years, there has been a growing interest in the tendency to use extreme weight control methods as a way of compensating for the caloric content associated with heavy drinking.

This behavioural pattern has been referred to as "Drunkorexia", a non-medical term that was newly coined by the popular media in 2008 (Chambers, 2008). Repeated episodes of alcohol abuse in combination with dietary restriction, excessive physical activity, self-induced purging and other extreme diet-related behaviors can result in nutritional deficiencies, alteration of metabolic processes, and a host of serious cognitive, behavioural, and physical health problems (Burke, Cremeens, Vail-Smith, & Woolsey, 2010; Piazza-Gardner & Barry, 2013). In particular, individuals aged 18 to 24 have the highest percentage of drinking problems (Barry & Piazza-Gardner, 2012; Hingson, Zha, & Weitzman, 2009).

Previous research has highlighted the association between alcohol use and disordered eating (Bulik et al., 2004; Gadalla & Piran, 2007; Kelly-Weeder, 2011; Rolland et al., 2017), mostly amongst females (Barry, Whiteman, Piazza-Gardner, & Jensen, 2013; Bryant, Darkes, & Rahal, 2012; M.H. Eisenberg & C.C. Fitz, 2014; Giles, Champion, Sutfin, McCoy, & Wagoner, 2009) but also in samples of young males (Ward & Galante, 2015). In particular, it has been noted that - to compensate for the calories associated with alcohol intake - females tend to adopt dysfunctional eating patterns, while males prefer to over-exercise (Barry et al., 2013). In

contrast, other studies did not find any significant gender differences related to drunkorexia (Burke et al., 2010; Lupi et al., 2014).

Although drunkorexia seems to represent the overlap of disordered eating and risky alcohol consumption, within the literature it is still quite unclear whether this behavior is more strongly related to substance use or disordered eating (Hunt & Forbush, 2016). The diffusion and seriousness of this emerging trend highlights the importance of developing diagnostic criteria to facilitate classification of patients who meet criteria for this particular problem (Castelnuovo, Pietrabissa, Cattivelli, Manzoni, & Molinari, 2016), in order to develop appropriate tests and interventions (Knight, Castelnuovo, Pietrabissa, Manzoni, & Simpson, 2016).

The present study primarily aimed to identify the frequency of drunkorexia-type behaviors among non-clinical Italian adolescents and young adults , and to explore whether there was any gender- (M vs F) or age-related (<18 vs ≥18) difference in rates of drunkorexia behaviours within the sample. The relationship between drunkorexia and disordered eating was also explored.

Methods

Participants

Between January and September 2017, 403 non-clinical students (F=301; M=102) were screened for the presence of drunkorexia and disordered eating. Inclusion criteria for the subjects in the study were: (1) being aged 14-24; (2) being native Italian speakers; (3) signing written and informed consent to participate in the study.

Ethics statement

All procedures performed in the study 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 was obtained from all participants prior to the commencement of the study.

Measures

Sociodemographic characteristics

Information regarding the *age, gender, education, civil status,* and *living conditions* of participants were collected.

Biomedical data

Data on *height* and *weight* were registered and *BMI* was calculated as weight (kg) divided by height squared (m^2). Participants were also asked to report on the *presence of any existing diagnosis of eating disorders* (American Psychiatric Association, 2013).

Psychological variables

The following Italian versions of previously validated scales were used:

Drunkorexia behaviors

The *Compensatory Eating and Behaviors in Response to Alcohol Consumption Scale (CEBRACS)* (Pinna et al., 2015) was administered to assess for severity of drunkorexia symptomatology. The CEBRACS consists of 36 items on a 5-point Likert scale (1 = Never; 2 = Rarely – about 25% of the time; 3 = Sometimes – about 50% of the time; 4 = Often – about 75% of the time; and 5 = Almost all the time) following a four-factor model (Alcohol Effects, Bulimia, Diet and Exercise, and Extreme Restriction) that also provides a global score. Respondents were asked to rate items for three-time periods: before drinking, while drinking, after drinking. The total drunkorexia score ranges from 21 to 105, calculated by summing the single-item scores. Cronbach's alpha for total score of the Italian version of the CEBRACS was 0.88 (Pinna et al., 2015), while the overall reliability coefficient for the present sample was 0.87.

Eating attitudes

Symptoms and concerns characteristic of eating disorders were assessed using the Italian validation of Eating Attitude Test (EAT-26) (Dotti & Lazzari, 1998). The EAT-26 is composed of 26 items rated on a 6-point Likert scale (0 = Never; 0 = Rarely; 0 = Sometimes; 1 = Often; 2 = Usually; 3 = Always) and consists of three subscales: Diet Scale (DS); Bulimia Factor (BF), and Oral Control (OC). Items are summed to produce a score for the corresponding subscales, and the EAT-26 total score is calculated by summing each subscale score. A score higher than 20 does not indicate the presence of an eating disorder but means that a person experiences significant concerns in relation to body weight and shape. The EAT-26 is a particularly useful screening tool for assessing eating disorder risk in high school, college and other special risk samples such as athletes, and can be used in non-clinical as well as a clinical setting. The EAT-26 demonstrated good internal consistency in both its Italian validation (Cronbach's α=0.86) (Dotti & Lazzari, 1998) and in the present sample (Cronbach's α=0.84).

Procedure

Participants included high school students from three publicly administered institutions of higher education located in Northern Italy and undergraduate students from one large public university in Milan, Italy (Catholic University of Milan).

High school students were recruited by first contacting the head teacher - through email and phone-calls – and, in the event of a positive response, by soliciting active support from teachers. Seminars were offered to parents, teachers and students in return for their willingness and collaboration in the survey, with the aim of raising awareness about the increase in alcohol use among youth, to promote education and understanding about the link between alcohol consumption and the development of disordered eating behaviours, as well as to clarify the

impact of eating disorders in our society. Meetings were conducted in the ratio of one per school during evening hours to allow a greater number of people (i.e. workers) to participate on a voluntary basis, lasting about two hours each, and were run by undergraduate students in psychology (authors MG, VB, CV, AT) trained by an accredited clinical psychologist working in the field of eating disorders (authors GP).

The same undergraduate student(s) who ran the seminars had also been employed for data collection. Administration of measures took place in the classrooms during school hours. Both parental (of those students below the age of 18) and student consent were required for study participation.

University students were recruited from a non-random sample of classes in the departments of psychology. The research team contacted 3 instructors in the aforementioned department to request class time to discuss the study requirements and to administer the survey, and all gave permission for the research team to recruit participants to complete the survey.

For both high school and university students, instructors were asked to leave the classroom to help ensure anonymity and to decrease the risk for any potential bias. During recruitment, at least one of the co-authors attended each of the classes to describe the study aims and procedures and to respond to students' questions. Students were advised that participation was anonymous, voluntary, and that they were free to discontinue the study at any time during survey completion. Participants did not receive remuneration or incentives.

Statistical analysis

This study employed quantitative approaches to examine the research questions by means of the R statistical software (R Core Team, 2014) – with an alpha set at $p < .05$ for all analyses.

Data were examined prior to hypothesis testing to inspect for any missing data and normality This revealed no missing data and an approximately normal distribution.

Various levels of analyses were then run on the completed and cleaned data set: descriptive statistics were performed to describe the characteristics of the sample and to estimate the percentage of the drunkorexia phenomenon among the participants, and a series of univariate analysis of variance (ANOVA) were carried out to inspect differences in age and gender for drunkorexia tendency. Moreover, Pearson product-moment correlation was conducted to test the relationship between dysfunctional eating habits and drunkorexia.

Finally, a series of multiple regression analyses were performed to test whether disordered eating, gender, age - and their interactions predict drunkorexia-type behaviors. For selecting the best regression model, the Akaike Information Criterion (AIC) – which measures the discrepancy between the observed model and the hypothesized one (Akaike, 1987) – was employed. The model having the smallest AIC value exhibits the greatest potential for replication.

Results

Sample characteristics

Of 403 participants, 301 were female (74.7%) and 102 were male (25.3%). The mean age of the sample was 20.36 (*SD* = 3.29), while its average BMI was 20.81 (*SD* = 2.83) (Table 1).

Table 1. *Sample descriptive statistics and differences*

	Overall sample (*n* = 403)		No-drunkorexic tendencies (*n* = 151)		Drunkorexic tendencies (*n* = 252)			
Age (*mean*; *SD*)	20.36	3.86	20.40	3.51	20.34	3.15	*t*=0.18	*p*=0.86
Gender (*n*; %)							V=0.08	*p*=0.09
Male	102	25.3	31	20.5	71	28.2		
Female	301	74.7	120	79.5	181	71.8		
BMI (*mean*; *SD*)	20.81	2.83	20.49	3.01	21.00	2.71	*t*=-1.73	*p*=0.08
Civil status (*n*; %)							V=0.04	*p*=0.40
Single	235	58.3	84	55.6	151	59.9		
In a relationship	168	41.7	67	44.4	101	40.1		
Education (*n*; %)							V=0.04	*p*=0.38
High school	117	29.0	40	26.5	77	30.6		
University	286	71.0	111	73.5	175	69.4		
Living Condition (*n*; %)							V=0.04	*p*=0.94
Alone	14	03.5	6	04.0	8	03.2		
With parents	317	78.7	119	78.8	198	78.6		
Both alone and with parents	37	09.2	12	07.9	25	09.9		
With flat mates	16	04.0	6	04.0	10	04.0		
With the partner	19	04.7	8	05.3	11	04.4		

V = Cramér's V; *t* = t-test; *p* = *p*-value

Incidence of drunkorexia-type behaviours

In line with the existing literature (Rahal, Bryant, Darkes, Menzel, & Thompson, 2012), only non-reported risk behaviours (0% of the time) was considered indicative of the absence of drunkorexia-type behaviours. Overall, 37.5% (*n* = 151) of the students scored the minimum of 21 on the CEBRACS, while the remaining 62.5% (*n* = 252) revealed they were engaging in drunkorexia-type behaviours at least 25% of the time during the three months prior to completing the survey.

Table 2 shows the percentage of subjects who exhibited strategies to improve caloric compensation 0% of the time (*Never*), 25% of the time (*Rarely*) and for at least 25% of the time (from *Rarely* to *Almost all the time*) respectively *before, during* or *after* consuming alcohol at a planned drinking event during the period of three months prior to questionnaires completion.

Table 2. *Sample descriptive statistics who engaged in compensatory strategies in response to alcohol consumption (before, during and after) – in the past three months.*

	M	SD	min%	25%	≥25%	max%
BEFORE alcohol consumption						
I have eaten less than usual to get drunker	1.37	0.71	72.5	20.6	27.5	0.8
I have exercised to make up for the calories in alcohol	1.28	0.72	83.8	8.2	16.2	0.8
I have eaten less to feel the effects of alcohol faster	1.31	0.65	77.2	6.8	22.8	0.4
I have skipped one or more meals to make up for the number of calories in alcohol	1.14	0.48	90.1	7.3	9.9	0.4
I have taken laxatives	1.01	0.08	99.4	0.6	0.6	0.0
I have skipped one or more meals to feel the effects of alcohol faster	1.11	0.45	92.2	5.7	7.8	0.4
WHILE alcohol consumption						
I ate less to feel the effects of alcohol first	1.24	0.59	81,9	14.1	18.1	0.4
I have taken diuretics	1.00	0.87	99.8	0.0	0.2	0.0
I did not eat at all to feel the effects of alcohol	1.18	0.51	86.2	11.3	13.8	0.2
I ate low-calorie foods	1.23	0.59	83.7	11.5	16.3	0.2
I drank low-calorie drinks	1.41	0.83	74.5	15.0	25.5	1.7
I ate less because I wanted to get drunk	1.26	0.57	79.2	17.3	20.8	0.4
I have taken laxative while I was drinking	1.01	0.76	99.4	0.6	0.6	0.0
I did not eat at all to get drunk	1.11	0.44	91.9	5.8	8.1	0.2
AFTER alcohol consumption						
I have taken diuretics	1.03	0.27	97.9	1.3	2.1	0.2
I have eaten low-calorie or low-fat foods	1.31	0.74	80.3	11.9	19.7	1.1
I have taken laxative	1.02	0.14	98.7	1.1	1.3	0.0
I have exercised	1.52	0.94	69.3	17.7	30.7	2.5
I have made myself vomit	1.08	0.41	94.6	3.3	5.4	0.4
I have eaten less than usual	1.29	0.67	79.5	15.5	20.5	0.8
I have skipped an entire day or more of eating	1.04	0.24	96.7	2.7	3.3	0.0

M = mean; SD = Standard deviation; min% = 0% of the time; 25% of the time = rarely; max% = for at least 25% of the time and almost all the time.

At all time-points, the *use of laxatives or diuretics* turned out to be the compensatory strategies less frequently implemented within the sample, while *eating less* (27.5%), *drinking low-calorie drinks* (25.5%) and *exercising* (30.7%) were the predominant ways of compensating for caloric intake respectively before, during and after alcohol consumption at a planned drinking event.

Differences in age and gender for the four CEBRACS subscales and CEBRACS total score

As shown in table 3, a series of ANOVAs - conducted separately both on the total sample and considering only those individuals showing drunkorexia-type behaviours - revealed significant gender differences in the *diet and exercises* CEBRACS-subscale *after drinking*, with females reporting higher values of drunkorexia-type behaviors than males. In contrast, no significant difference in age (< 18 *vs.* ≥ 18 years old) was found for the CEBRACS subscales and total score.

Characteristics of Drunkorexia

Table 3. *Differences in gender (Male vs. Female) and age (< 18 vs. ≥ 18 years old).*

	Overall sample (n = 403)												
	Male		Female					< 18 y.o.		≥ 18 y.o.				
	M	SD	M	SD	F	p-value	partial η²	M	SD	M	SD	F	p-value	partial η²
Alcohol effects	8.64	2.59	8.64	2.97	0.00	0.99	0.00	8.85	2.99	8.58	2.84	0.62	0.43	0.00
Bulimia	6.15	0.61	6.17	0.76	0.09	0.76	0.00	6.17	0.61	6.16	0.76	0.01	0.93	0.00
Diet & Exercise	7.51	2.16	8.31	3.86	3.88	**0.05**	0.01	7.75	2.97	8.21	3.66	1.17	0.28	0.00
Restriction	2.11	0.42	2.21	0.67	2.01	0.16	0.00	2.21	0.63	2.18	0.62	0.13	0.72	0.00
Before	7.12	1.67	7.28	2.19	0.45	0.51	0.00	7.13	1.94	7.27	2.11	0.29	0.59	0.00
While	9.42	2.16	9.55	2.57	0.21	0.65	0.00	9.76	2.57	9.45	2.33	1.10	0.29	0.00
After	7.85	1.40	8.49	2.74	5.03	**0.03**	0.01	8.03	2.13	8.42	2.56	1.61	0.21	0.00
Total	24.36	4.29	25.35	6.81	1.81	**0.18**	0.00	24.98	5.61	25.14	6.46	0.04	0.83	0.00

	Drunkorexia-type behaviours (n = 252)												
	Male		Female					< 18 y.o.		≥ 18 y.o.				
	M	SD	M	SD	F	p-value	partial η²	M	SD	M	SD	F	p-value	partial η²
Alcohol effects	9.38	2.84	9.75	3.43	0.64	0.42	0.00	10.04	3.34	9.54	3.25	0.98	0.32	0.00
Bulimia	6.21	0.72	6.29	0.98	0.39	0.53	0.00	6.28	0.77	6.26	0.94	0.02	0.89	0.00
Diet & Exercise	8.19	2.30	9.89	4.36	9.43	**0.002**	0.04	8.87	3.36	9.56	4.10	1.26	0.26	0.00
Restriction	2.16	0.50	2.35	0.84	3.25	0.07	0.01	2.34	0.78	2.29	0.76	0.18	0.67	0.00
Before	7.61	1.79	8.13	2.49	2.59	0.11	0.01	7.82	2.19	8.03	2.36	0.33	0.56	0.00
While	10.06	2.33	10.61	2.89	1.98	0.16	0.01	10.87	2.76	10.34	2.75	1.59	0.21	0.00
After	8.24	1.55	9.50	3.17	9.72	**0.002**	0.04	8.70	2.52	9.28	2.96	1.72	0.19	0.00
Total	25.94	4.39	28.36	7.49	6.10	**0.014**	0.025	27.63	5.92	27.71	6.86	0.06	0.94	0.00

M = mean; SD = Standard deviation; F = F test (One-Way ANOVA).

Relationship between drunkorexia and disordered eating

Table 4 provides a summary of the correlations between the CEBRACS and EAT-26 subscales and total scores. Significant, correlations were found for all variables (*r* range: 0.17-0.45), except for the *Oral Control subscale* of the EAT-26, which did not show any significant correlation with the CEBRACS subscales and total score.

Tabla 4. *Means, standard deviation and correlations between disordered eating (EAT-26) and drunkorexia tendencies (CEBRACS).*

		M	DS	1	2	3	4	5	6	7	8	9	10	11	12
1	CEBRACS total	25.10	6.28	-											
2	Alcohol effects	8.64	2.87	0.81	-										
3	Bulimia	6.17	0.73	0.54	0.44	-									
4	Diet & Exercise	8.11	3.53	0.86	0.44	0.35	-								
5	Restriction	2.19	0.62	0.73	0.53	0.58	0.57	-							
6	Before	7.24	2.07	0.87	0.82	0.43	0.65	0.69	-						
7	While	9.52	2.47	0.91	0.83	0.47	0.73	0.61	0.72	-					
8	After	8.33	2.49	0.88	0.52	0.61	0.90	0.65	0.63	0.69	-				
9	EAT26 total	8.05	8.13	0.38	0.26	0.17	0.35	0.26	0.34	0.31	0.33	-			
10	Dieting	4.72	6.03	0.45	0.31	0.26	0.42	0.36	0.40	0.38	0.41	0.92	-		
11	Bulimia	1.29	2.38	0.31	0.26	0.28	0.23	0.21	0.23	0.30	0.24	0.70	0.56	-	
12	Oral control	2.13	2.47	0.04*	0.02*	0.02*	0.05*	0.05*	0.08*	0.00*	0.04*	0.45	0.19	0.08	-

All correlations are significant at *p* < 0.001. **p* > 0.05.

The effects of age and gender on the relationship between disordered eating and drunkorexia

A simple linear regression was initially calculated to predict drunkorexia tendencies (CEBRACS total score) based on the EAT-26 total score, indicating that disordered eating significantly predicted the CEBRACS total scores: β = 0.265, SE = 0.034, *p* < 0.001, $R^2 = 0.146$.

Then, to test whether *age* (<18 vs ≥18) and *gender* (M vs F) moderate the relationship between disordered eating and drunkorexia, a series of regression models were sequentially run.

First, the role *gender* (simple predictor, M2 *vs.* moderator, M3) and *age* (simple predictor, M4 *vs.* moderator, M5) were evaluated – separately – in the aforementioned path. As reported in table 5, both variables revealed significant interaction effects with disordered eating in predicting drunkorexia tendencies – Gender: β = 0.327, SE= 0.117, *p* = 0.005, $R^2 = 0.158$; age:

$\beta = 0.193$, SE $= (0.083)$, $p = 0.021$, $R^2 = 0.151$. Second, the – independent – moderating effect of gender and age on the relationship between disordered eating and drunkorexia was tested (M7), proving to be the best model.

Table 5. *Effects of gender (G) and age (A) on the relationship between disordered eating tendencies (ED) and drunkorexia tendencies (DR).*

	β	SE	*p*-value	LLCI	ULCI	Contrast	R^2	ΔR^2	AIC	ΔAIC
M1: ED → DR										
Eating disorder	0.265	0.034	$p < 0.001$	0.199	0.331		0.143		2255.956	
M2: ED + G → DR										
Eating disorder	0.266	0.034	$p < 0.001$	0.199	0.334					
Gender	-0.136	0.652	$p = 0.834$	-1.420	1.147	M2 *vs.* M1	0.146	0.003	2257.912	1.956
M3: ED * G → DR										
Eating disorder	-0.031	0.112	$p = 0.781$	-0.251	0.188					
Gender	-1.926	0.911	$p = 0.035$	-3.720	-0.139					
Interaction (ED*G)	0.327	0.117	$p = 0.005$	0.097	0.559	M3 *vs.* M2	0.158	0.012	2252.094	-5.818
M4: ED + A → DR										
Eating disorder	0.265	0.034	$p < 0.001$	0.199	0.332					
Age	0.088	0.662	$p = 0.894$	-1.214	1.139	M4 *vs.* M1	0.146	0.003	2257.938	1.982
M5: ED * A → DR										
Eating disorder	0.112	0.074	$p = 0.133$	-0.034	0.258					
Age	-1.577	0.975	$p = 0.106$	-3.494	0.339					
Interaction (ED*A)	0.193	0.083	$p = 0.021$	0.029	0.356	M5 *vs.* M4	0.151	0.005	2254.551	-3.387
M6: ED + S + A → DR										
Eating disorder	0.267	0.035	$p < 0.001$	0.198	0.335					
Gender	-0.145	0.657	$p = 0.825$	-1.435	1.445					
Age	0.102	0.666	$p = 0.879$	-1.207	1.411	M6 *vs.* M1	0.146	0.003	2259.888	3.932
M7: (ED*S) + (ED*A) → DR										
Eating disorder	-0.192	0.130	$p = 0.142$	-0.448	0.064					
Gender	-1.856	0.909	$p = 0.042$	-3.644	-0.067					
Age	-1.567	0.973	$p = 0.108$	-3.479	0.347					
Interaction (ED*G)	0.333	0.117	$p = 0.004$	0.103	0.562					
Interaction (ED*A)	0.196	0.083	$p = 0.018$	0.033	0.358	M7 *vs.* M6	0.177	0.031	2250.398	-9.491

Specifically, results revealed female gender to have a positive effect on the relationship between disordered eating and drunkorexia tendencies ($\beta = 0.297$, SE = 0.038, $p < 0.001$) – as compared to male gender ($\beta = -0.031$, SE = 0.094, $p = 0.742$) – accounting for 18% of the variance. Similarly, being older than 18 years had a positive effect on the relationship between disordered eating and drunkorexia tendencies ($\beta = 0.305$, SE = 0.037, $p < 0.001$) – compared to the younger generation ($\beta = 0.112$, SE = 0.081, $p = 0.170$) – accounting for 19% of the variance. Overall, females older than 18 years showed the strongest positive relationship between disordered eating and drunkorexia tendencies: $\beta = 0.324$, SE = 0.041, $p < 0.001$; accounting for by 22% of the variance.

Discussions

Research indicates a growing number of students are engaging in recurrent inappropriate compensatory behaviors to prevent weight gain from drinking alcohol (Bryant et al., 2012; Burke et al., 2010; Giles et al., 2009; Osborne, Sher, & Winograd, 2011; Piazza-Gardner & Barry, 2013).

The results of the present study confirmed this trend in Northern Italy by revealing that 62.5% of the survey participants (age range: 14-24) adopted extreme weight control methods to compensate for planned over-drinking. Eating less, drinking low-calorie drinks and exercising were the main ways to reduce calorie intake respectively before, during and after alcohol consumption.

Data also supported findings from previous research in observing significant correlations between disordered eating patterns and drunkorexia behaviours (Knight et al., 2016), and revealed that both gender and age have an independent role in affecting the strength of this relationship.

Drunkorexia was confirmed to be prevalent among female students (Barry & Piazza-Gardner, 2012; Burke et al., 2010; M. H. Eisenberg & C. C. Fitz, 2014; Osborne et al., 2011) older than 18 years, with dieting and exercising after alcohol consumption representing the most common strategies adopted to facilitate alcohol consumption without gaining weight.

As in other countries, Italy is wrestling with the societal issue of excessive drinking in the university-aged population. But drunkorexia doesn't fit many of the party-hardy stereotypes of university drinking, for one main reason: the majority of drunkorexics are females.

A standardized definition and a set of diagnostic criteria of drunkorexia are still missing. Nevertheless, diverse inappropriate behaviour, such as excessive consumption of alcohol, fasting - typical of anorexia nervosa -, self-induced vomiting and the use of laxatives - typical of bulimia nervosa - and concerns about physical appearance, have all been recognized as characteristic of this alarming trend (Piazza-Gardner & Barry, 2013).

Women are traditionally more likely to develop eating disorders in response to body dissatisfaction than men, and studies have demonstrated that individuals showing disordered eating are also more likely to register higher rates of binge drinking than those who do not

engage in dysfunctional eating patterns (Rush, Curry, & Looney, 2016). Prevalence of drunkorexia is, therefore, tied to the dual social norms of binge drinking and striving for the perfect body, which create an internal conflict.

This study presents some methodological weaknesses that limit the generalizability of the results.

First, all the variables were assessed using self-report measures, therefore they might be subject to self-report bias (i.e. social desirability). Second, the cross-sectional design limits capacity to distinguish the causal relations between variables. Third, the current study was performed on a school-based random sample of youth, which was not homogeneous. Also, a quantity–frequency index measure of alcohol consumption was not provided, and the extent to which drunkorexia may predict both the occurrence of dysfunctional eating and/or over-drinking (Knight et al., 2016) was not investigated. Despite these limits this study holds clinical and public health importance, providing further evidence for an emerging serious problem among young individuals.

Conclusions

This represents the first study investigating the frequency of drunkorexia-type behaviour amongst youth living in Northern Italy. Only one previous study has noted the co-occurence of alcohol misuse and behaviours associated with prevention of weight gain amongst young adults living in the South of the Country (Lupi, Martinotti, & Di Giannantonio, 2017), but age-related differences were not investigated. Also, while in the present study significant gender difference in the use of weight control strategies *after* planned alcohol consumption were found, Lupi et al., reported no gender-related differences in drunkorexia-type behaviors.

Whether drunkorexia represents more of an eating disorder or an alcohol abuse issue is a question for future research: at present the jury is still out, with some authors viewing drunkorexia as one type of disordered eating, while others believe this is just one aspect of risky drinking.

However, given its characteristics, current indications suggestion that drunkorexia seems to originate mainly from the co-occurrence of alcohol consumption and weight management behaviors, thus emerging as a separate problem. Indeed, this is supported by the fact that a specific measure of drunkorexia behaviors (i.e. the Compensatory Eating and Behaviors in Response to Alcohol Consumption Scale - CEBRACS) has been developed in order to measure and better understand this condition (Pinna et al., 2015; Rahal et al., 2012). Also, Hunt and Forbush (2016) referred to the phenomenon of drunkorexia with a specific index named ICB (Inappropriate Compensatory Behaviors) - WGA (Weight Gain Alcohol), on the basis of recognition of the drunkorexia phenomenon as a standalone problem (Hunt & Forbush, 2016)

From a clinical point of view, these conclusions are of great importance. While treatment approaches that have proven efficacy in addressing eating and alcohol use disorders may be a useful starting point for someone engaging in these behaviors (i.e. cognitive behavioral therapy,

nutrition counseling, motivational interviewing as well as psychotherapy and psychopharmacology to treat potential underlying mental health disorders), specific treatments for drunkorexia have yet to be studied. Evidence-based interventions for eating and weight problems should provide inspiration for the development of appropriate and effective prevention and treatment interventions for addressing drunkorexia symptoms, through focusing on those treatment strategies that are most relevant and effective for this population.

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