



## Original article

# Understanding body image in adolescents with drunkorexia behaviors: The roles of body image disturbance, coping strategies and gender

Dora Bianchi<sup>a,\*</sup>, Daniele Di Tata<sup>a</sup>, Stefania Sette<sup>a</sup>, Emiddia Longobardi<sup>b</sup>, Fiorenzo Laghi<sup>a</sup>

<sup>a</sup> Department of Social and Developmental Psychology, Sapienza University of Rome, Italy

<sup>b</sup> Department of Dynamic and Clinical Psychology, and Health Studies, Sapienza University of Rome, Italy

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## ABSTRACT

Drunkorexia consists of any calorie compensation or eating restrictive conduct enacted before, during, or immediately after alcohol intake. These behaviors raise many health concerns, but studies on adolescents are still limited. Specifically, understanding how body image impacts adolescent drunkorexia might be crucial for prevention and treatment. Following the multidimensional body image framework, this study investigated the role of various body image features (i.e., body image disturbance, adaptive and maladaptive body image coping) in explaining two types of drunkorexia behaviors in teenage girls and boys: (1) eating-related restrictive and compensative conducts; and (2) overexercising. The participants were 832 alcohol-drinking adolescents aged 15 to 20 years (48.6 % girls), who completed an online anonymous survey administered at school. A multigroup mediation model was estimated in line with the aims of the study. Body image disturbance symptoms were positively related to eating drunkorexia behaviors via the mediating effects of increasing maladaptive coping (avoidance and appearance fixing). However, the same relation was negative when the mediating effect of increasing adaptive coping (positive rational acceptance) was considered. Moreover, body image disturbance was positively associated with exercise-related drunkorexia behaviors via increasing appearance fixing coping. Finally, the indirect effect of body image disturbance on eating-related drunkorexia via appearance fixing was positive and significant only in girls (not in boys). These findings provide indications for implementing prevention and educational programs for schools, and for identifying core themes to address in clinical treatment and public health policies.

## Introduction

The alarming diffusion of drunkorexic conducts (i.e., restrictive eating or calorie compensative behaviors in conjunction with alcohol intake; Berry et al., 2024) constitutes a new source of concern for public health. In international research, scholars are currently giving the most attention to the spread of drunkorexia in young adults, specifically in college students (e.g., Shepherd et al., 2021), whilst few studies have been conducted on adolescent samples. However, high prevalence rates have also been reported among teenagers (e.g., Pinna et al., 2024), suggesting that adolescent drunkorexia should be dealt with as a serious social problem that deserves greater attention in research.

Despite the paucity of empirical studies, there are numerous hints for considering adolescents a specific vulnerable group to develop these dysfunctional conducts. At this age, adolescents are indeed more exposed to body image concerns and dissatisfaction, due to normative

instances of adolescence (Erikson, 1968; Kusina & Exline, 2019). Recently, body image difficulties have also been found to be a key risk factor for drunkorexia behaviors (e.g., Hill & Lego, 2020), and an emerging line of research is shedding light on these relations in young adults (e.g., Hill et al., 2021). To date, however, almost no studies have investigated the specific body image issues that may characterize adolescent drunkorexia.

Therefore, the main novelty of the present study is the attempt to describe the possible role of two body image features (i.e., body image disturbance and body image coping, within the multidimensional model of body image; Cash & Grasso, 2005), in contributing to explaining different drunkorexia behaviors among alcohol-drinking adolescents. In body image disturbance, aesthetic imperfections are perceived as a threat to self-value (Ahrberg et al., 2011) and are managed through various coping strategies (Cash & Grasso, 2005). Positive or dysfunctional coping related to body image can then give rise to different

\* Corresponding author at: Department of Social and Developmental Psychology, University of Rome Sapienza, via dei Marsi 78, 00185 Rome, Italy.

E-mail address: [dora.bianchi@uniroma1.it](mailto:dora.bianchi@uniroma1.it) (D. Bianchi).

behavioral outcomes (Bianchi et al., 2023), among which we expect drunkorexia conducts to be included. Despite its recognized relevance in psychological research (e.g., Prnjak et al., 2022), to the best of our knowledge, Cash's multidimensional model of body image has never been applied to drunkorexia studies, thus constituting a further strength of our research.

#### *Drunkorexia behaviors in girls and boys*

"Drunkorexia" is the commonly used term to identify Food and Alcohol Disturbance (FAD; Choquette et al., 2018), referring to any calorie compensatory behavior performed before, during, or after alcohol consumption. Previous researchers have identified two main behavioral patterns in drunkorexia: (1) restrictive eating or purging behaviors on occasions of alcohol consumption; and (2) compulsive exercise behaviors, before or after alcohol intake (e.g., Bryant et al., 2012). Two main motivational drivers have been identified behind these behaviors: the attempts to enhance the inebriating effects of alcohol (e.g., drinking on an empty stomach; alcohol enhancement), and/or the desire to compensate for the calories consumed from alcoholic beverages (caloric compensation; for a review, see Berry et al., 2024).

As enhancement and compensation motives appeared positively correlated in young people (see Pompili & Laghi, 2018), several studies have found drunkorexia often co-occurring with both problem drinking and disordered eating patterns (e.g., Hunt & Forbush, 2016; Pompili & Laghi, 2020). However, beyond these associations, drunkorexia is specifically characterized by the functional relation between disordered eating and alcohol misuse (Berry et al., 2024), as compensatory behaviors exclusively occur in the context of an alcohol-drinking episode and are functional to it (i.e., alcohol effect enhancement or alcohol calorie compensation).

As regards drunkorexia prevalence, research up to now has mostly focused on young adults, raising alarms about the widespread occurrence of these behaviors in university and college students (prevalence rates of 30 %; Lupi et al., 2014, 2017). However, recent studies (e.g., Pinna et al., 2024) have also detected the alarming diffusion of these behaviors among adolescents, with rates between 12 % and 34 % for adolescents in Italy (Laghi et al., 2020; Pompili & Laghi, 2018). Gender differences are another relevant theme in drunkorexia studies, with some evidence suggesting a higher prevalence of these behaviors among girls (e.g., Di Tata et al., 2023; Eisenberg & Fitz, 2014), while other studies have found no significant gender differences (e.g., Burke et al., 2010; Lupi et al., 2017). In this regard, a recent review study (Speed et al., 2022) has found no gender differences in the overall frequency of drunkorexia behaviors, suggesting the need to differentiate their specific behavioral patterns to detect possible gender trends. According to Bryant et al. (2012), girls (vs. boys) are indeed more likely to adopt dysfunctional eating patterns, such as skipping meals or avoiding fatty foods, while over-exercising behaviors are reported equally in both genders.

The negative consequences of adolescent drunkorexia include social, psychological, and physiological effects of early alcohol misuse (see Berry et al., 2024), as well as the damage caused by eating restrictions and/or overexercising in combination with alcohol use. Youths engaging in drunkorexia seem to report a higher prevalence of alcohol-related problems, such as getting hurt or injured, and negative consequences resulting from intoxication (Shepherd et al., 2021). There are negative long-term effects of early alcohol abuse on brain development (Speer, 2018), and increased risk of developing alcohol dependence, premature death, and social maladjustment across adulthood (Marshall, 2014). While drunkorexia does not necessarily evolve into other eating disorders (e.g., Wilkinson et al., 2022), there is evidence for nutritional deficiency disorders, cognitive impairments, and hepatic toxicity due to dysfunctional patterns of restrictive eating during alcohol abuse (reviews by Szydal et al., 2022; Vasiliu, 2023). Similarly, over-exercising following alcohol abuse has been found to be related to

unfavorable health outcomes affecting the brain, liver, and cardiovascular system (El-Sayed et al., 2005). However, longitudinal studies are lacking and the long-term developmental consequences of adolescent drunkorexia remain largely unknown, raising relevant concerns for public health. Given this evidence, it becomes crucial to understand the individual and relational determinants of drunkorexia among adolescents, for expanding knowledge and developing effective intervention and prevention programs.

#### *Body image concerns in adolescent drunkorexia*

Body image has been conceptualized by Cash and colleagues (e.g., Cash & Grasso, 2005) as a multidimensional construct, encompassing cognitive, affective, and behavioral components. The multidimensional body image model thus includes perceptions and evaluations of one's own body, emotions and attitudes one experiences in relation to their body, as well as the value attributed to physical appearance and the consequent behaviors. Cash's body image model has been successfully applied to research in clinical and nonclinical samples of young adults (e.g., Mancuso, 2016; Prnjak et al., 2022), while the evolutionary stage of adolescence has been less studied within this framework.

Developmental research has, however, largely proven the physiological upsurge of body image concerns during adolescence (e.g., Hartman-Munick et al., 2020). According to Erikson (1968), starting from puberty and up to late adolescence, individuals must integrate the internal representation of their changing bodies in a global sense of self, affording challenges related to the comparison with peers, social models, and idealized body standards. This developmental process may easily result in a dramatic increase in body dissatisfaction at this age (Frisén et al., 2015). Gender trends have also been found, with adolescent girls resulting at higher risk for body image concerns compared to boys, due to the increased social emphasis on thin-body ideals for girls (Frisén et al., 2015). Body image concerns during adolescence may have negative consequences for health, including poor psychological well-being, eating disorders, and dysfunctional eating and exercise conducts (see Voelker et al., 2015). Thus, understanding the multiple facets of body image in adolescent development should be considered of primary importance, and special attention should be paid to their relations with health-risk conditions.

Accordingly, an emerging line of research has recently shed light on the role of body image concerns in predicting drunkorexia behaviors, providing initial evidence in support of this hypothesis. Specifically, drunkorexia in young people has been found to be predicted by body dissatisfaction, drive for thinness (Pinna et al., 2015; Rahal et al., 2012), poor appearance and weight esteem (Hill & Lego, 2020), and body image concerns (Michael & Witte, 2020). College students engaging in drunkorexia behaviors also reported higher internalization of fit-body ideals, thin ideals, and muscular ideals (Hill & Nolan, 2021; Hill et al., 2021), suggesting that body image concerns involved in drunkorexia may be influenced by the comparison with social models, to which adolescents are extremely sensitive.

Body image dissatisfaction and internalized body ideals frequently predict drunkorexia for alcohol-calorie compensation, such as eating restraint and excessive exercising (Hill et al., 2021; Pinna et al., 2015). Young people who attribute significant value to weight and physical appearance may indeed feel guilty for the calories assumed with alcohol and thus may engage in behaviors to compensate for them (Choquette et al., 2018). On the other hand, there is initial evidence about the association between low appearance esteem, internalized thin-ideal, and drunkorexia behaviors aimed at getting drunk faster (e.g., drinking on an empty stomach; Hill & Lego, 2020; Hill et al., 2021), thus suggesting another explanatory pattern in which drunkorexia serves as a maladaptive form of negative affect regulation (e.g., Pompili & Laghi, 2018). Negative affect may be caused, among other, by poor body esteem, which is specifically triggered by peer comparison in the social contexts where heavy drinking occurs (Holzhauer et al., 2016; Stanesby

et al., 2019).

In summary, the extant knowledge on drunkorexia and body image among young people seems to suggest the presence of a multifaceted relation between these two constructs. Considering the different facets of body image (Cash & Grasso, 2005), it could be important to further identify the mechanisms through which body image influences drunkorexia behaviors in adolescence.

#### *The possible roles of body image disturbance and body image coping*

The multidimensional body image model addresses, among others, the distress perceived in relation to one's own body (i.e., *body image disturbance*, Cash et al., 2004), and the positive and negative strategies individuals may employ to manage their body image concerns (i.e., *body image coping*, Cash et al., 2005). According to Cash et al. (2004), body image disturbance includes, but is not limited to, body dissatisfaction. Individuals with body image disturbance have a negative body image, composed of evaluative and affective components (i.e., negative evaluation and feelings of disease with own body or its specific parts), perceptive components (i.e., misperception or overestimation of body weight and size), and behavioral components (i.e., continuous checking or maladaptive strategies to manage or hide the perceived "defects"; see Ahrberg et al., 2011). The main feature of body image disturbance is the distorted value attributed to physical appearance, so that body dissatisfaction has an undue effect on reducing global self-esteem (Ahrberg et al., 2011). To date, the presence of body image disturbance is widely supported in many eating disorders (see reviews by Lewer et al., 2017; Sattler et al., 2020), and there is also some evidence about symptoms of body image disturbance in alcohol abuse (e.g., Cavale et al., 2014). However, to our knowledge, no studies have been conducted on the possible role of this condition in drunkorexia behaviors. Notwithstanding, stemming from this previous evidence (Cavale et al., 2014; Sattler et al., 2020), it is reasonable to expect that adolescents experiencing body image disturbance may attempt to escape and/or manage their concerns through drunkorexia behaviors. Compensating for alcohol calories may, in fact, serve as a controlling behavior to address body image concerns, while enhancing the effects of alcohol may help to escape awareness of bodily discomfort.

As regards body image coping, researchers have addressed positive and negative coping strategies (Cash et al., 2005). Maladaptive strategies include persistent attention to fixing or correcting the perceived defects, as well as their avoidance (e.g., wearing baggy clothes to conceal body shape, avoiding contexts in which the body can be specifically noticed, such as swimming pools or sports activities; Cash et al., 2005). Adaptive coping strategies are conversely related to positive self-care, rational acceptance, and cognitive reframing of the perceived "defects", such as reducing their importance in the whole individual experience (Cash et al., 2005). Despite the limited research up to now, maladaptive strategies have been identified as risk factors for negative health outcomes (Choma et al., 2009; Matera et al., 2024), including disordered eating (Arabaci et al., 2021; Bianchi et al., 2023). Conversely, positive rational acceptance has been found to be protective (e.g., Bianchi et al., 2023; Choma et al., 2009). No data yet exist about body image coping strategies that may predict drunkorexia behaviors, albeit their role could be expected in light of the abovementioned studies. Specifically, coping strategies are cognitive responses to factual or imagined threats (Lazarus & Folkman, 1984) which, in body image disturbance, are constituted by perceived body defects that threaten self-worth (Ahrberg et al., 2011). In Cash's model, body image disturbance symptoms may trigger adaptive and maladaptive coping strategies, which in turn can result in dysfunctional behaviors to control or escape these concerns. In this way, it is conceivable that body image coping strategies might mediate the psychological pathways leading from body image disturbance symptoms to drunkorexic behaviors.

About gender differences, body image disturbance has been generally more reported by girls (e.g., Naraindas et al., 2024; Varnado-Sullivan et al., 2006). For body image coping, some studies support the

higher prevalence of positive rational acceptance and appearance fixing among young women (Dhurup & Nolan, 2014), and of avoidance among young men (Avci & Akliman, 2018). Other studies indicated that girls more frequently report maladaptive (vs. adaptive) coping strategies (Smith-Jackson et al., 2011). Again, there is a lack of research about the possible gender trends in the relation between body image features and adolescent drunkorexia, although it is reasonably conceivable.

#### *The present study*

Within the theoretical model of the multidimensional body image (Cash & Grasso, 2005), the present study aims to investigate the psychological pathways by which two body image features (i.e., body image disturbance and body image coping strategies) may be related to drunkorexia behaviors in adolescent girls and boys. Specifically, two drunkorexia behaviors are investigated: eating-related (e.g., food restraint, limiting calorie intake) and exercise-related (e.g., overexercising before and after alcohol consumption; Bryant et al., 2012). In line with the extant research (e.g., Sattler et al., 2020), we expect that body image disturbance symptoms will be associated with exercise- and eating-related drunkorexia behaviors in adolescents (H1). Moreover, in line with stress and coping theory (Lazarus & Folkman, 1984), we expect a mediating role of body image coping in the relation from body image disturbance to drunkorexia behaviors (H2). Specifically, based on recent findings (e.g., Bianchi et al., 2023), we hypothesize that maladaptive coping strategies (i.e., avoidance and appearance fixing) may positively mediate these relations (H2a), while conversely positive rational acceptance can be a negative mediator, with a protective role (H2b). Finally, gender is supposed to be a possible moderator in the direct and indirect hypothesized paths (H3). In the absence of previous evidence on the multidimensional body image model in girls and boys with drunkorexic behaviors, gender-specific paths were examined herein only on an exploratory basis.

## **Method**

### *Participants*

The initial sample was composed of 1062 participants who agreed to take part in the study and correctly completed the whole survey. The small percentage of non-binary gender adolescents (0.9 %) were subsequently excluded from data analyses due to excessively small group size, which prevented effective comparisons with girls and boys. Moreover, for specific research purposes, 221 participants (20.9 %) were excluded as they reported never having drunk alcohol. The study sample was thus composed of 832 alcohol-drinking adolescents aged from 15 to 20 years ( $M_{age} = 17.17$ ,  $SD_{age} = 1.06$ ; 12.6 % with migrant background). Specifically, participants were 404 girls (48.6 %) and 428 boys (51.4 %). Of them, 461 were middle adolescents (age range 15–17;  $M_{age} = 16.36$ ;  $SD_{age} = 0.66$ ; 49 % girls) and 371 were late adolescents (age range 18–20;  $M_{age} = 18.18$ ;  $SD_{age} = 0.41$ ; 48 % girls).

They attended different types of schools, and specifically: 25.7 % were from technical and vocational institutes, and 74.3 % from high schools. About their grade level, 4.8 % attended the 10th grade, 30.4 % were in the 11th grade, 18.5 % in the 12th grade, and 46.3 % were in the 13th grade. Participants reported their socioeconomic status (SES), with 7.3 % self-assessing as having low or very low SES, 80.2 % reporting an average SES, and 12.5 % reporting a high or very high SES.

### *Procedures*

Data collection was run from January to October 2023 and involved eight public schools located in the urban and suburban areas of different Italian cities. The schools constituted a convenience sample, selected based on their willingness to participate. Written informed consents were preliminarily provided by parents and school authorities. Then, all

students from the 10th to the 13th grade were invited to take part in the study. The survey administration was conducted in each class group during school time by trained research collaborators. After a detailed presentation of the research aims, participants were invited to access the link to the anonymous online survey using their personal devices. The research collaborators supervised the adolescents while compiling the self-report scales, answered their questions and guaranteed the privacy and voluntariness of their participation. The whole procedure took 40 min on average. For the two copyrighted questionnaires (BIDS and BICSI), the licenses of use were purchased by prof. Cash, as indicated on the official website (<http://www.body-images.com>). This research and its procedures were approved by the ethics committee of Sapienza University of Rome.

## Measures

### Individual information

Participants self-reported their gender identity (coded as: 0 = *girl*; 1 = *boy*; 2 = *other*; the third group was subsequently excluded from the data analyses due to its extremely low number) and their SES (from 0 = *very low*; to 5 = *very high*). Adolescents also indicated their age, country of origin, and information about their height and weight. Height and weight were then used for computing participants' body mass index (BMI, computed as kg/m<sup>2</sup>).

### Body image disturbance

The uneasiness perceived with body image was assessed using the Body Image Disturbance Questionnaire (BIDQ; Cash, Phillips et al., 2004). The BIDQ is composed of seven closed-ended (Part A) and seven open-ended questions (Part B), which investigate the perceived discomfort with body shape and weight, and its possible impact on individual functioning. For the purposes of the present study, only the seven closed-ended items were included in the data analyses (e.g., "Are you concerned about the appearance of some part(s) of your body, which you consider especially unattractive?"; "Has your physical "defect" significantly interfered with your social life? How much?"). Answers were rated on a 5-point scale from 1 (*not at all*) to 5 (*yes, extremely*). In the absence of an Italian validation of the scale, the original BIDQ questions underwent a forward-backward translation procedure (Sousa & Rojjanasirir, 2011). The few inconsistencies that emerged between the two versions were resolved within the research team, and the resulting Italian translation was then included in the online survey. Thereafter, a series of factorial analyses were conducted on the seven closed-ended items to ascertain the single-factor structure of the BIDQ in our study.

For capitalizing on the information contained in our data, factor analyses were conducted on two subgroups of participants, obtained by randomly splitting the study sample (procedure suggested in previous research, Fabrigar et al., 1999). Thus, a *calibration sample* ( $n = 446$ , 48.4% girls,  $M_{age} = 17.17$ ,  $SD_{age} = 1.05$ ) was extracted for explorative factor analyses (EFA), and a *validation sample* ( $n = 386$ , 48.7% girls,  $M_{age} = 17.17$ ,  $SD_{age} = 1.07$ ) for confirmative factor analyses (CFA). Accordingly, the EFA was run on the calibration sample, showing adequate values of Kaiser–Meyer–Olkin index ( $KMO = 0.89$ , acceptable values  $> 0.80$ ) and Bartlett's test of sphericity ( $p < .001$ ; acceptable values of  $p < .05$ ), which confirmed the adequacy of the seven items for factor analyses. The principal component analysis with Oblimin rotation suggested the presence of only one factor (eigenvalue of 4.35), explaining 62.11 % of the variance. The CFA was then run on the validation sample using the Mplus software for statistical analyses. The goodness of fit indicators (i. e. relative Chi-square test,  $\chi^2/df$ ; comparative fit index, CFI; Tucker–Lewis index, TLI; root mean square error of approximation, RMSEA; standardized root mean square residual, SRMR; benchmarks for adequacy are reported in data analyses section) confirmed the hypothesized

one-factor structure of the scale,  $\chi^2(12) = 39.97$ ,  $p < .001$ ;  $\chi^2/df = 3.33$ ; RMSEA = 0.078; CFI = 0.971, TLI = 0.950; SRMR = 0.036. Factor loadings of all items were statistically significant ( $p < .001$ ) and ranged between 0.68 and 0.84. The good psychometric properties of the Italian BIDQ version were confirmed by the good reliability in calibration and validation samples, and in the total sample (McDonald's  $\omega$  from 0.90 to 0.91), and by the moderate to high corrected item-total correlations (ranging from 0.52 to 0.77; acceptable values  $\geq 0.40$ ).

### Body image coping strategies

The cognitive strategies that people may adopt in response to body image concerns have been investigated with the Body Image Coping Strategies Inventory (BICSI; Cash et al., 2005; Italian validation by Rollero et al., 2017). The BICSI is a 24-item self-report scale, with answers rated on a 4-point scale from 0 (*definitely not me*) to 3 (*definitely me*). The scale allows us to measure three coping strategies: (1) *appearance fixing*, evaluating efforts to fix or correct the perceived defects (9 items; e.g.: "I spend extra time trying to fix what I don't like about my looks"; McDonald's  $\omega = 0.90$ ); (2) *avoidance*, regarding the attempts to avoid awareness of the perceived defects (7 items; e.g.: "I avoid looking at myself in the mirror"; McDonald's  $\omega = 0.79$ ); (3) *positive rational acceptance*, assessing the attempts to accept and reduce the importance of perceived flaws, reframing the situation in positive (8 items; e.g.: "I tell myself that I am probably just overreacting to the situation"; McDonald's  $\omega = 0.80$ ). The scale has shown good psychometric properties in previous international (Cash & Grasso 2005; Farid et al., 2018; Melnyk et al., 2004) and Italian studies (Bianchi et al., 2023; Rollero et al., 2017; , 2022). In the present study, the three BICSI dimensions also obtained good to excellent reliability values.

### Alcohol abuse

The indicators of alcohol abuse were assessed with the 10-item version of the Alcohol Use Disorders Identification Test (AUDIT-10; Saunders et al., 1993; Italian version by Piccinelli et al., 1997). The ten items are rated on a 5-point scale from 0 (*never*) to 4 (*almost daily*; or *yes, in the last year*), and specifically: three items assess the frequency of alcohol consumption (e.g., item 1: "How often do you drink?"), three items investigate the symptoms of alcohol addiction (e.g., item 4: "In the last year, how often have you found you weren't able to stop drinking once you started?"), and four items measured the negative consequences of alcohol misuse (e.g., item 9: "Have you injured yourself or anyone else because of your drinking?"). The questionnaire showed good psychometric properties in previous international (Kuitunen-Paul & Roerecke, 2018) and Italian studies (Ciccarelli et al., 2019; Pavarin et al., 2020). The good reliability has been confirmed in the present study (McDonald's  $\omega$  of 0.80).

### Drunkorexia behaviors

The presence and frequency of different drunkorexia-typical behaviors (i.e., food restriction, compensative behaviors, excessive exercise in association with alcohol use) were measured by the "drunkorexia behaviors" dimension, from the Drunkorexia Motives and Behaviors Scale (DMBS; Ward & Galante, 2015; Italian adaptation by Pompili & Laghi, 2018). This dimension is composed of 12 self-report items rated on a 5-point scale from 0 (*never*) to 5 (*always*), which demonstrated good psychometric properties in previous international (Azzi et al., 2022; Ward & Galante, 2015) and Italian (Laghi et al., 2020, 2021; Pompili et al., 2024) studies.

As the "drunkorexia behaviors" items were used to estimate a latent variable in this study, a series of factor analyses were preliminary applied on the two calibration and validation subsamples, obtained by splitting the whole study sample (as described above). With the first CFA (validation sample), a single-factor solution was tested as suggested in



previous research (Ward & Galante, 2015), but this model did not reach a satisfactory fit to the data,  $\chi^2(52) = 214.079, p < .001; \chi^2/df = 4.12$ ; RMSEA = 0.090; CFI = 0.878, TLI = 0.845; SRMR = 0.058. Thus, an EFA was run on the calibration sample, to explore the factorial structure of the scale in Italian adolescents. The adequacy of items for factor analyses was confirmed (KMO index of 0.92 and Bartlett's sphericity test of  $p < .001$ ), but the scree-plot and eigenvalues suggested a bidimensional structure with two correlated factors, explaining respectively the 62.19 % of variance (9 items; eating-related behaviors, e.g., "On a day I planned to drink, I controlled my eating ...by avoiding fatty foods") and 10.23 % of variance (3 items; exercise-related behaviors, e.g., "...by exercising before I drank").

The second CFA on the validation sample confirmed the psychometric adequacy of this bifactor model,  $\chi^2(51) = 135.016, p < .001; \chi^2/df = 2.65$ ; RMSEA = 0.065; CFI = 0.937, TLI = 0.918; SRMR = 0.059, and it also explained data significantly better than the previous single-factor model ( $\Delta CFI = 0.06$ ). Following the modification indexes, residual variances of items 15 and 17 ("eating less fat" and "avoiding fatty foods"), and of items 13 and 19 ("eating less all day" and "eating less at each meal") were let to correlate to each other (Cole et al., 2007). Both dimensions showed excellent reliability values (McDonald's  $\omega$  from 0.88 to 0.95 in calibration and validation samples, and in the total sample). Details on the items included in each dimension, factor loadings and internal consistency, are available as supplementary material (Appendix A).

Gender invariance was also ascertained on this bifactor model, with good fit indexes for configural (CFI = 0.920), metric ( $\Delta CFI = 0.000$ ), and scalar gender invariance ( $\Delta CFI = 0.006$ ). Age invariance was confirmed between middle and late adolescents, with adequate configural (CFI = 0.920), metric ( $\Delta CFI = 0.003$ ), scalar ( $\Delta CFI = 0.004$ ), and strict factorial invariance ( $\Delta CFI = 0.009$ ). Details on fit indexes for gender and age invariance are reported in Appendix B.

## Data analyses

The analyses were performed using statistical software SPSS version 27 and MPLUS version 8.2. The normality of the variables' distribution (acceptable values of skewness  $\leq 2$  and kurtosis  $\leq 7$ ; Hair et al., 2010) was investigated in our data. Descriptive statistics and bivariate correlations were run on study variables, and differences by gender (girls vs. boys) and age (middle adolescents aged 15 to 17 vs. late adolescents aged 18 to 20; Allen & Waterman, 2019) were performed using a series of factorial univariate analyses of variance (ANOVAs). Given the wide sample size, in the analyses of variance the significance of  $p$  level was taken at  $< 0.01$  (rather than  $< 0.05$ ), and the corresponding partial eta-square ( $\eta_p^2$ ) values were observed for estimating effect sizes ( $\eta_p^2 < 0.01$  are considered negligible; Cohen, 1988). Thereafter, a series of multigroup and mediation models were tested in line with research hypotheses.

To maximize the statistical power of our sample, only the criterion variables—drunkorexia exercise-related and drunkorexia eating-related behaviors—were estimated as latent constructs, while the statistical predictor, mediators, and covariates were entered in the models as observed indicators. Since the distribution of "drunkorexia-eating behaviors" was borderline for normality, the maximum likelihood estimator with robust standard errors (MLR) was applied with the MPLUS program.

The fit of the measurement model for the latent variables of "drunkorexia behaviors" was first verified on the whole study sample (while previously it was ascertained on two subsamples, see Measures section). Then, a parallel mediation model was hypothesized investigating the direct and indirect effects of body image disturbance (X) on drunkorexia eating ( $Y_1$ ) and drunkorexia exercise ( $Y_2$ ) behaviors, via the three coping strategies of appearance fixing ( $M_1$ ), avoidance ( $M_2$ ), and positive rational acceptance ( $M_3$ ). The effects of gender, age, and BMI were controlled as covariates on drunkorexia behaviors and body image

coping strategies, in line with recent research (e.g., Bianchi et al., 2023; Di Tata et al., 2024). The covariate effects of alcohol abuse were also controlled on drunkorexia behaviors, as suggested in other studies (e.g., Di Tata et al., 2023). The three mediators were correlated to each other, as in previous research (Bianchi et al., 2023). In line with the CFA model, also the two drunkorexia behaviors were let to correlate to each other.

Initially, all hypothesized paths were estimated in Model 1. A more parsimonious model was then run in which nonsignificant paths were removed (Model 2), and the two models were compared to verify whether the nested model explained data as well as the full model. On this trimmed model, a series of multigroup analyses were subsequently performed entering gender as a grouping variable, to verify the possible gender differences in the model paths. In the first multigroup model (Model 3), all parameters were enabled to vary freely between girls and boys. A fully constrained model was then tested in which all parameters were set to be equal in the two groups (Model 4), and the two models were compared. Group differences on each parameter were also tested with a series of separate Wald chi-square difference tests, and a final adjusted model was hypothesized, in which only the paths that showed significant differences in girls and boys were allowed to vary freely between genders (Model 5). The adjusted Model 5 was then compared with both the fully constrained and the fully unconstrained models, to verify whether it could be considered the most conservative model to adequately explain our data.

The goodness of fit of the models was estimated by the CFI and the TLI indexes (acceptable values  $> 0.90$ ; Hu & Bentler, 1999); and by the RMSEA and the SRMR indexes (acceptable values  $< 0.08$ ; Hu & Bentler, 1999). As the Chi-square test statistic and the Chi-square difference test are often biased in large sample sizes (Werner & Schermelleh-Engel, 2010), the relative Chi-square ( $\chi^2/df$ ) index was considered for model fit (acceptable values ranging between 1 and 5; Schumacker & Lomax, 2004), and the CFI-difference test ( $\Delta CFI$ ; significant values  $\geq 0.01$ , Cheung & Rensvold, 2002) was used to estimate the significance of differences between models. The significance of indirect effects was estimated using the bootstrapping method with 5000 bias-corrected bootstrap resampling and 95 % confidence intervals (CIs). Bootstraps 95 %CIs are considered significant when not including zero (Hayes, 2013). The significance of differences in indirect effects between gender groups was investigated by a series of Wald chi-square difference tests.

## Results

### Descriptive results

The normal distribution of study variables was preliminarily ascertained, and only the drunkorexia-eating dimension resulted borderline for normality (skewness of 2.56 and kurtosis of 7.08). Descriptive statistics on study variables and bivariate Pearson's correlations are reported in Table 1. Gender and age differences in study variables are reported in Table 2.

Results of the factorial ANOVAs showed significant differences by gender, but not by age groups. Specifically, body image disturbance, the three body image coping strategies, and drunkorexia eating-related behaviors were significantly more reported by girls (vs. boys), with small to large effects. Two significant gender-age interactions were also found. The first interaction effect regarded body image disturbance symptoms,  $F(1,831) = 7.74, p = .006, \eta_p^2 = .01$ , which were significantly more reported by younger (vs. older) adolescent girls,  $t(402) = 2.31, p = .02$  ( $M_{\text{younger girls}} = 16.54; SD = 6.66; M_{\text{older girls}} = 15.12; SD = 5.34$ ), while no age differences were present in boys,  $t(426) = -1.50, p = .13$  ( $M_{\text{younger boys}} = 11.26; SD = 4.33; M_{\text{older boys}} = 11.89; SD = 4.40$ ). The second gender-age interaction concerned drunkorexia exercise-related behaviors,  $F(1,831) = 7.50, p = .006, \eta_p^2 = 0.01$ , with younger (vs. older) girls reporting significantly higher scores,  $t(402) = 2.46, p = .01$  ( $M_{\text{younger girls}} = 4.36; SD = 2.55; M_{\text{older girls}} = 3.82; SD = 1.59$ ), whilst no age

**Table 1**  
Descriptive statistics and correlations among study variables.

	1	2	3	4	5	6	7	8	9	10
1. Gender (0 = girls; 1 = boys)	1									
2. Age	0.006	1								
3. BMI	0.11**	0.19***	1							
4. Alcohol abuse	0.08*	0.09*	0.03	1						
5. Body Image Disturbance	-0.38***	-0.02	0.13***	0.14***	1					
6. Appearance fixing	-0.32***	-0.03	0.05	0.16***	0.68***	1				
7. Avoidance	-0.28***	0.08*	0.18***	0.15***	0.63***	0.59***	1			
8. Positive rational acceptance	-0.10**	0.03	-0.07*	0.06	0.19***	0.47***	0.36***	1		
9. Drunkorexia exercise-related behaviors	-0.002	-0.008	0.13***	0.15***	0.24***	0.21***	0.19***	0.02	1	
10. Drunkorexia eating-related behaviors	-0.22***	-0.02	0.15***	0.22***	0.45***	0.38***	0.37***	0.06	0.69***	1
range	0–1	15–20	13.8–53.3	1–40	7–35	0–27	0–18	0–23	3–15	9–45
M	–	17.17	22.13	6.55	13.67	11.34	4.05	8.62	4.12	12.31
SD	–	1.06	3.54	5.31	5.74	6.95	3.99	4.88	2.20	6.38

Note:.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

**Table 2**  
Descriptive statistics by gender and age groups.

	Girls <i>n</i> = 404		Boys <i>n</i> = 428		<i>F</i> ( <i>df</i> = 1, 831)	$\eta^2_p$	Middle Adolescents <i>n</i> = 461		Late Adolescents <i>n</i> = 371		<i>F</i> ( <i>df</i> = 1, 831)	$\eta^2_p$
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
1. Alcohol abuse	6.08	4.95	6.99	5.59	6.45	.008	6.21	5.72	6.97	4.71	4.09	.005
2. Body Image Disturbance	15.91	6.14	11.55	4.37	132.98**	.14	13.84	6.18	13.44	5.13	1.12	.001
3. Appearance fixing	13.66	7.04	9.16	6.11	92.99**	.10	11.41	7.29	11.26	6.51	0.06	.00
4. Avoidance	5.19	4.30	2.98	3.33	67.59**	.07	3.82	3.95	4.34	4.02	4.03	.005
5. Positive rational acceptance	9.10	4.49	8.16	4.83	7.99*	.01	8.41	4.91	8.87	4.83	1.92	.002
6. Drunkorexia exercise-related behaviors	4.13	2.19	4.12	2.21	0.07	.00	4.17	2.33	4.06	2.04	0.59	.00
7. Drunkorexia eating-related behaviors	13.76	7.88	10.94	4.11	38.99**	.05	12.50	6.74	12.08	5.91	0.97	.00

Notes:.

\*  $p < .01$ .

\*\*  $p < .001$ .

*F* = Fisher *F* values.  $\eta^2_p$  = Partial eta squared values. Benchmarks for effect size are:  $\eta^2_p \geq .01$  for small,  $\geq .06$  for medium, and  $\geq .14$  for large effects; effects  $< 0.01$  are considered negligible in size (Cohen, 1988). Middle adolescents were aged from 15 to 17 years; late adolescents were aged from 18 to 20 years (Allen & Waterman, 2019).

differences were found in the group of boys,  $t(426) = -1.41$ ,  $p = .16$  ( $M_{younger\ boys} = 3.98$ ;  $SD = 2.08$ ;  $M_{older\ boys} = 4.28$ ;  $SD = 2.36$ ).

### Mediation model

The measurement model for the two latent dimensions of drunkorexia behaviors was first examined in the study sample, and the adequacy of fit indexes confirmed the two-factor structure emerged in factorial analyses (see Table 3). Thereafter, the first mediation model (Model 1) was tested in line with the research hypotheses and obtained a good fit

to the data (see Table 3). Most of the hypothesized paths were significant, except for 11 relations, which were removed in the subsequent trimmed model (Model 2, see Fig. 1). This nested model also exhibited good fit indexes and explained the data as effectively as the full Model 1 (see Table 3). Model 2 was thus accepted as the most adequate description of our data. The fit indexes of the models and their comparison are reported in Table 3.

In Model 2, significant portions of variance were explained in all dependent variables, specifically: 8 % of the variance in drunkorexia exercising behaviors, 25 % in drunkorexia eating behaviors, 47 % in

**Table 3**  
Model fit indexes and model comparisons.

	$\chi^2$	<i>df</i>	$\chi^2/df$	CFI	TLI	RMSEA	SRMR	$\Delta CFI$
<b>Measurement model</b>								
Model for drunkorexia latent dimensions	189.454	51	3.71	.944	.928	.057	.045	–
<b>Mediation models</b>								
Model 1: Full model	384.005	134	2.86	.952	.935	.047	.036	–
Model 2: Trimmed model	408.711	145	2.81	.949	.937	.047	.045	$\Delta CFI_{M1-M2} = 0.003$
<b>Multigroup models</b>								
Model 3: Totally unconstrained model	653.255	288	2.27	.925	.914	.055	.070	–
Model 4: Totally constrained model	736.606	307	2.39	.911	.905	.058	.114	$\Delta CFI_{M3-M4} = 0.014$
Model 5: Adjusted model	681.437	301	2.26	.922	.914	.055	.085	$\Delta CFI_{M5-M4} = 0.011$
								$\Delta CFI_{M3-M5} = 0.003$

Notes:  $\chi^2$  = Chi-square value; *df* = degrees of freedom;  $\chi^2/df$  = relative Chi-square (acceptable values between 1 and 5; Schumacker & Lomax, 2004); CFI = comparative fit index; TLI = Tucker–Lewis index (CFI and TLI acceptable values  $> 0.90$ ; Hu & Bentler, 1999); RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual (RMSEA and SRMR acceptable values  $\leq 0.08$ ; Hu & Bentler, 1999);  $\Delta CFI$  = CFI difference test (significant values  $\geq 0.01$ , Cheung & Rensvold, 2002).

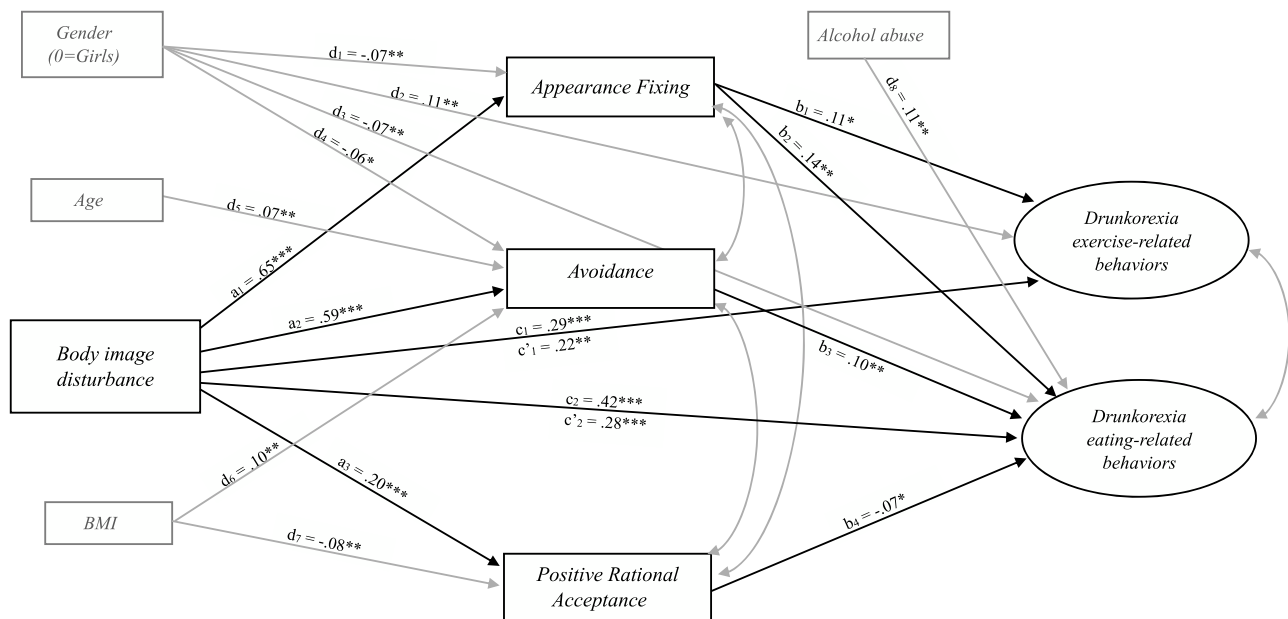


Fig. 1. Trimmed mediation model from body image disturbance to drunkorexia behaviors via body image coping strategies.

Notes: Standardized regression coefficients are reported. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

(a) = effects of the independent variable on the mediators; (b) = effects of the mediators on criterion variables; (c) = total effect of independent variable on criterion variables; (c') = direct effects of independent variable on criterion variables.

appearance fixing, 41 % in avoidance, and 4 % in positive rational acceptance. Both the total and the direct effects of body image disturbance on the two drunkorexia dimensions were positive and significant, as were the effects of body image disturbance on the three coping strategies. Avoidance was positively related, and positive rational acceptance was negatively related to only drunkorexia eating behaviors, while appearance fixing was positively associated with both drunkorexia dimensions. As regards covariates, gender was positively related to drunkorexia exercising behaviors—with higher scores for boys—and negatively related to appearance fixing, avoidance, and drunkorexia eating behaviors—with higher scores in girls. Avoidance increased with age and BMI, while positive rational acceptance decreased with higher BMI. Finally, alcohol abuse showed a positive association with drunkorexia eating-related behaviors. Model statistics are represented in Fig. 1.

Four significant indirect effects were also found, and specifically: body image disturbance was positively related to drunkorexia eating behaviors via the increase in (1) appearance fixing,  $\beta = 0.09$ ,  $SE = 0.03$ , 95 %CI [0.033, 0.156], and in (2) avoidance,  $\beta = 0.06$ ,  $SE = 0.02$ , 95 %CI [0.017, 0.101], which both were positive statistical predictors of drunkorexia eating behaviors; however, the same relationship was also negatively mediated via the increase in (3) positive rational acceptance,  $\beta = -0.02$ ,  $SE = 0.007$ , 95 %CI [-0.03, -0.002], which conversely was a protective factor, reducing drunkorexia eating behaviors. Finally, body image disturbance was positively related to drunkorexia exercise behaviors via the increase in (4) appearance fixing,  $\beta = 0.07$ ,  $SE = 0.03$ , 95 %CI [0.007, 0.136], which in turn was positively associated with drunkorexia exercising behaviors.

In summary, higher symptoms of body image disturbance appear to enhance the risk for drunkorexia eating-control behaviors in adolescents, through the increase of dysfunctional strategies of appearance fixing and avoidant coping. However, body image disturbance symptoms may also reduce drunkorexia eating-related behaviors by enhancing the adaptive response of positive rational acceptance, which appears to be a protective factor. On the other hand, body image disturbance can increase the risk for drunkorexia exercise-related behaviors in adolescents by enhancing appearance fixing coping.

### Multigroup model

A multigroup analysis was then applied to the trimmed Model 2, entering gender as a grouping variable. When all parameters were allowed to vary freely between groups in Model 3, a good fit to the data was obtained (see Table 3). The subsequent Model 4, in which all parameters were constrained to equality between groups, showed a worse fit to the data. A significant difference emerged between models, suggesting that equality constraints significantly worsened the model fit (see Table 3). Independent Wald chi-square tests were conducted on each model parameter, and six significant group differences were detected: (1) from body image disturbance to avoidance ( $p = .04$ ); (2) from body image disturbance to positive rational acceptance ( $p = .03$ ); (3) from body image disturbance to drunkorexia eating behaviors, ( $p = .005$ ); (4) from appearance fixing to drunkorexia eating behaviors ( $p = .04$ ); (5) from positive rational acceptance to drunkorexia eating behaviors ( $p = .05$ ); (6) correlation between appearance fixing and positive rational acceptance ( $p = .02$ ). Therefore, an adjusted model was finally tested (Model 5), in which only these six parameters were allowed to vary freely between girls and boys. Model 5 obtained acceptable fit indexes and explained data significantly better than its nested Model 4 (completely constrained). Moreover, the adjusted model was not significantly different from the fully unconstrained Model 3, suggesting it was the most conservative solution to explain our data (see Table 3).

Model 5 allows to explain significant portions of variance in both groups; for girls, 13 % of the variance in drunkorexia-exercising; 31 % in drunkorexia-eating; 47 % in appearance fixing; 45 % in avoidance; and 3 % in positive rational acceptance, were explained. For boys, 5 % of the variance in drunkorexia-exercising; 8 % in drunkorexia-eating; 32 % in appearance fixing; 24 % in avoidance; and 5 % in positive rational acceptance.

As regards the gender differences detected in the model's paths, body image disturbance was positively related to avoidance with a significantly stronger effect for girls than for boys (see Fig. 2); conversely, body image disturbance was positively related to positive rational acceptance with a significantly stronger effect for boys (vs. girls). Moreover, body image disturbance was positively and significantly associated with

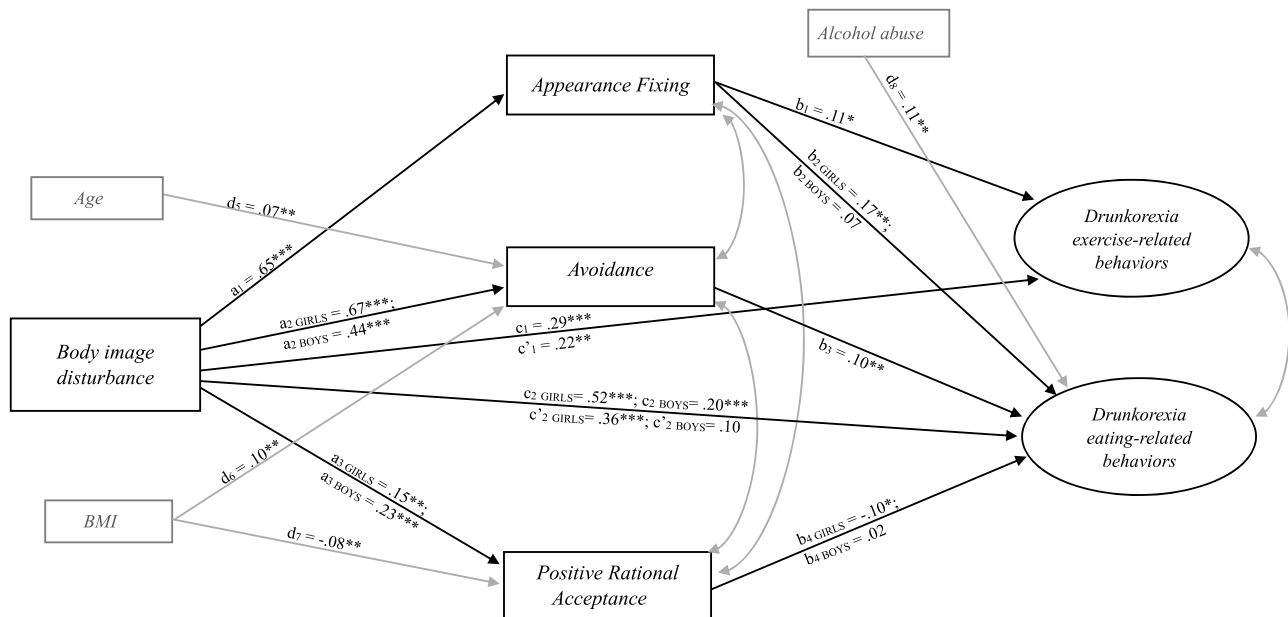


Fig. 2. Multigroup mediation model from body image disturbance to drunkorexia behaviors via body image coping strategies.

Notes: Standardized regression coefficients are reported. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

(a) = effects of the independent variable on the mediators; (b) = effects of the mediators on criterion variables; (c) = total effect of independent variable on criterion variables; (c') = direct effects of independent variable on criterion variables.

drunkorexia-eating behaviors only for girls (not for boys). Similarly, appearance fixing showed a positive relation, and positive rational acceptance a negative relation with drunkorexia-eating behaviors only in girls—but not in boys. Also, the positive correlation between appearance fixing and positive rational acceptance was significantly stronger for boys than girls ( $\beta_{\text{girls}} = 0.38, p < .001$ ;  $\beta_{\text{boys}} = 0.58, p < .001$ ). Detailed statistics for the adjusted Model 5 are represented in Fig. 2.

Finally, the four indirect effects (detected in the previous Model 2) were also specifically compared between girls and boys in the multigroup model, using a series of independent Wald tests. Only an indirect relation was significantly different by gender ( $p = .04$ ), specifically: body image disturbance was positively associated with drunkorexia eating-related behaviors via the increase in appearance fixing only for the group of girls,  $\beta = 0.12, SE = 0.04, 95\% CI[0.039, 0.202]$ , while the same indirect effect was not present for boys,  $\beta = 0.04, SE = 0.03, 95\% CI[-0.017, 0.101]$ .

To ensure the robustness of the model, a post-hoc power analysis was also performed (Moshagen & Bader, 2024). The parameters were set as follows: degrees of freedom ( $df$ ) = 301; sample size ( $N$ ) = 404, 428; and RMSEA = 0.055, 0.055. The statistical power of our sample exceeded 99 % at a significance level ( $\alpha$ ) of 0.05.

## Discussion

Within the multidimensional body image framework (Cash & Grasso, 2005), the present study aimed to understand which body image features may be involved in adolescent drunkorexia. In detail, the study investigated the psychological pathways from body image disturbance to eating-related and exercise-related drunkorexia conducts, hypothesizing mediation effects of adaptive and maladaptive coping strategies and moderation effects by gender.

The first noteworthy finding in our study is that, when the factorial structure was tested in Italian adolescents, a two-factor structure emerged for the drunkorexia behaviors measure. As such, drunkorexia behaviors resulted composed of two distinct dimensions: eating-related conducts, including eating restraint and avoiding fatty foods; and exercise-related conducts, regarding practicing physical exercise before/

after drinking or increasing exercise in general. This bifactor model turned out to be consistent in different gender and age groups, with a strong factorial invariance in boys and girls, and in middle and late adolescents. Our findings are in line with recent research that suggested differentiating the two conducts in which drunkorexia may manifest (Speed et al., 2022). Accordingly, some studies have measured exercise and eating patterns separately, detecting gender-specific trends (Bryant et al., 2012). The present study thus demonstrated the psychometric adequacy of a measure aimed at assessing these two dimensions and we also ascertained its suitability for different gender and age groups.

As regards descriptive results, drunkorexia eating behaviors were more reported by girls (vs. boys), while exercise-related conducts were equally distributed by gender, in line with previous evidence (Bryant et al., 2012). Girls (vs. boys) also reported significantly higher scores in body image disturbance and in the three coping strategies, confirming results from other studies (e.g., Naraindas et al., 2024; Smith-Jackson et al., 2011). The gender-age interactions also pointed out a particular vulnerability of younger (vs. older) girls to body image disturbance symptoms and drunkorexia exercise-related behaviors. In sum, adolescent girls are generally more exposed than boys to drunkorexia behaviors and to body image concerns, with younger girls being the most vulnerable group.

As regards the hypothesized model, body image disturbance symptoms were positively and significantly related to the two drunkorexia dimensions, confirming the first research hypothesis (H1). Our findings are in line with previous evidence about the core role of body image disturbance in several eating disorders (e.g., Sattler et al., 2020) and corroborate the extant knowledge about the presence of body image issues in drunkorexia behaviors (e.g., Michael & Witte, 2020). Our model also demonstrates the key role of this disturbed body image pattern in the upsurge of two different drunkorexia conducts, specifically leading adolescents to overexercise and/or to restrict eating in conjunction with drinking alcohol.

Moreover, body image disturbance was positively associated with the three coping dimensions, suggesting that adolescents suffering from these symptoms are more inclined to enact various—adaptive and maladaptive—strategies to manage the discomfort perceived about their body, as expected according to the stress and coping theory (Lazarus &



Folkman, 1984). Coping is indeed the individual's response to a perceived threat, and, in body image disturbance, the body imperfections constitute a threat to self-worth (Ahrberg et al., 2011). Each coping strategy, in turn, leads to different drunkorexia behaviors. The two dysfunctional strategies of avoidance and appearance fixing are related to an increase in eating-related drunkorexia, confirming the role of maladaptive coping in eating disorder symptomatology (e.g., Arabaci et al., 2021). In contrast, positive rational acceptance was negatively associated with eating-related drunkorexia, confirming the protective role of this adaptive coping for mental health (e.g., Choma et al., 2009). Appearance fixing is the only strategy associated with exercise-related drunkorexia, further supporting the negative effects of this coping style on individual well-being (Choma et al., 2009), and suggesting it is a powerful motivator for adolescents, driving them to engage in various and challenging attempts to control alcohol-related calories.

Within these relationships, various positive and negative indirect effects were also found, confirming the hypothesized roles of adaptive and maladaptive coping (H2a and H2b confirmed). First, the positive indirect effect *from body image disturbance to eating-related drunkorexia behaviors via increasing avoidance* indicates that, when the body image discomfort is faced with avoidant coping—such as removing awareness of negative emotions about one's appearance—this pattern may lead to more dysfunctional behaviors related to eating restraint, fasting, or drastically reducing calorie intake in association with alcohol drinking. This psychological route seems to describe the use of drunkorexia as an acting-out behavior, that gives vent to rationally denied negative affect (see for example Weinberger & Gomes, 1995). Drunkorexia is characterized indeed by difficulties in emotion regulation (Pompili & Laghi, 2018). Drinking with an empty stomach may be finalized to enhance the inebriating alcohol effects (Hill & Lego, 2020) and the perceived rewards of drunkenness in social contexts may be, in this case, diminishing awareness of body uneasiness, reducing inhibition, and facilitating interactions with peers.

Second, a negative indirect effect was found *from body image disturbance to eating-related drunkorexia behaviors via the increase in positive rational acceptance*, detecting an opposite functioning, in which body image disturbance symptoms may also reduce drunkorexia behaviors when adaptive coping responses are solicited. Thus, some adolescents may answer body uneasiness with positive cognitive strategies, such as acceptance of their perceived imperfections, positive self-care, and relativizing the importance of the body in the whole individual value. This coping response seems to counteract the negative effects of body image disturbance on eating behaviors, reducing the likelihood of engaging in eating restraint when drinking alcohol. This pattern seems to describe resilient functioning, in which a disorder (i.e., body image disturbance) does not necessarily lead to another (i.e., dysfunctional eating behaviors), thanks to the individual skills of some resilient adolescents, who respond to internal stressors with positive cognitive strategies, resulting in better adjustment and reduced health risks. Similar findings about the protective role of this adaptive coping have been proven in recent research on eating disorders (Bianchi et al., 2023).

The third and fourth positive indirect effects refer to the roles of *appearance fixing in the relations from body image disturbance to eating-related and exercise-related drunkorexia behaviors*. These findings suggest that, when adolescents manage body image discomfort with strategies of continuous checking and correcting defects (appearance fixing coping), this pattern may lead to more controlled eating and excessive exercise in conjunction with alcohol consumption. However, our findings also detect a *moderating role of gender* in this pattern, so that the indirect effect of body image disturbance on eating-related drunkorexia via appearance fixing is positive and significant only for girls (not for boys; H3 confirmed). In sum, boys and girls equally answer to body image disturbance and appearance fixing coping with dysfunctional exercise behaviors to compensate for alcohol calories, but girls may also engage in unhealthy eating patterns, thus increasing the risks of alcohol to their health.

The two indirect effects seem to describe an individual functioning characterized by overcontrol, as typical of various eating disorders (Isaksson et al., 2021), in which some adolescents with body uneasiness make diverse attempts to control their weight while consuming alcohol. This phenomenon may be understood in the light of the motives surrounding alcohol consumption in young people, as adolescents desire to drink to adhere to peer group norms (conformity motives; Cooper, 1994), while, at the same time, they desire to compensate for alcohol calories to adhere to idealized body standards (calorie compensation motives; Berry et al., 2024). Within these dysfunctional dynamics, girls were found to be at higher risk for restricting eating due to appearance fixing, as expected in light of previous studies about the vulnerability of adolescent girls to body image and eating disorders (e.g., Striegel-Moore & Cachelin, 1999). The detrimental role of appearance fixing for mental health has already been proven in research (e.g., Bianchi et al., 2023; Matera et al., 2024), but our model adds new information about the specific conditions under which this coping mechanism may explain drunkorexia in girls and boys.

Besides this moderated indirect effect, our findings also detect other gender differences in model paths, confirming the third research hypothesis (H3). Specifically, the effect of body image disturbance on avoidant coping is significantly stronger in girls, while its effect on positive rational acceptance is significantly stronger in boys. Therefore, girls appear to be more vulnerable to maladaptive coping in response to body image issues, while boys are generally more resilient, answering to body uneasiness more frequently with adaptive strategies. Accordingly, the direct effects of body image disturbance and of appearance fixing on drunkorexia eating-related behaviors are significant only in girls, further confirming their vulnerability to dysfunctional eating patterns. However, there is also evidence for the protective role of positive rational acceptance, which significantly reduced drunkorexia eating behaviors only in girls (but not in boys).

Overall, these findings confirm previous evidence (Frisén et al., 2015), suggesting that adolescent girls are more exposed than boys to the negative consequences of body image issues, and specifically to their dysfunctional cognitive and behavioral outcomes. Interestingly, girls (unlike boys) also benefit the most from adaptive coping, which appears to effectively reduce their eating-related drunkorexia conducts. Thereafter, an increased sensitivity of girls to positive and negative body image instances emerged; this evidence might be explained by the exposure of adolescents to sociocultural models, which usually emphasize thin-body ideals for women (Balcetis et al., 2013; Sicilia et al., 2023). Encouragingly, our findings suggest that body acceptance and positive self-care in girls may effectively counteract this phenomenon with its negative consequences, providing new insights for research, education, and prevention programs.

### Strengths and limitations

Given the paucity of extant research on adolescents who engage in drunkorexia, this study fills a gap in the literature, advancing our comprehension of drunkorexia at an early age. To the best of our knowledge, a comprehensive body image assessment has never been applied to drunkorexia studies, and the two drunkorexia conducts (i.e., eating-related and exercise-related) have been rarely distinguished in prior research. A further contribution of the present study is the detection of gender differences in the hypothesized model paths, which were expected in light of previous studies on adolescent body image (e.g., Frisén et al., 2015).

Besides these strengths, some limitations must also be considered in our findings. First, the data collection was cross-sectional—not longitudinal—therefore the directionality of the relations among study variables cannot be undoubtedly ascertained, but only theoretically inferred. Future research should incorporate longitudinal designs, also including ecological momentary assessments of drunkorexia behaviors, to better identify their antecedents and risk factors in everyday life.

Second, this study relied on self-report measures, which may have introduced a potential desirability bias in respondents' answers, so that some sensitive information might have been underreported. Nonetheless, significant effects were still detected. Third, the use of convenience sampling raises concerns about selection bias and limits the generalizability of our findings to the broader population in Italy and in other cultural contexts. Finally, only adolescents who self-identified as either boys or girls were included, while those who did not identify within the gender binarism were excluded due to a small sample size in this group. Given the importance of inclusivity in research, we aim to conduct future studies on body image and drunkorexia actively involving nonbinary individuals, also in the light of recent evidence about the higher risk of drunkorexia behaviors for gender minority adolescents (Peralta & Barr, 2017).

#### Implications for research and practice

Despite these limitations, the present study contributes to the literature on drunkorexia behaviors suggesting new directions for research, prevention, and clinical practice. Stemming from our findings and considering the evolutionary instances involving body image (Erikson, 1968), future development of this research should include a longitudinal assessment of body image changes across adolescence and early adulthood, to understand their reciprocal relationships with drunkorexia conducts and motivations. Paying attention to the enhanced vulnerability of girls, as emerged in our study, more specific risk profiles should be investigated in gender groups, encompassing emotional and cognitive functioning, as well as sensitivity to body ideals and social models. Future studies are also desirable to better understand the protective factors (e.g., personality traits, family functioning) which may characterize the resilient pattern that emerged in our model, i.e. the adolescents who answer to body image concerns with positive coping and, in turn, with lower drunkorexia behaviors.

Our findings may also suggest valuable insights in terms of education, prevention, and public health policies. Large-scale prevention programs, for drunkorexia and similar health risk behaviors, should be targeted to adolescent boys and girls in educational contexts, with the aim to deconstruct idealized body standards, implement positive thinking and attitudes towards the body, and reduce the emphasis on physical appearance as a measure of personal value. As regards the context of drinking, prevention programs should also pay attention to how adolescents perceive social norms around alcohol consumption. Young people may view drinking as a positive behavior in social gatherings, which makes them feel more "adult", or as an acceptable coping mechanism to avoid negative self-awareness and improve relational skills. Prevention programs should help adolescents recognize the distorted social value attributed to alcohol and consider its negative consequences for health instead.

For the interest of clinicians and practitioners, our model may suggest some vulnerability factors (such as being girls, considering body image as the foundation of self-worth, and the inclination toward maladaptive body image coping), for an early identification of at-risk adolescents. Our results also indicate that body uneasiness, distorted body-image value, and maladaptive coping strategies should be possible areas of clinical intervention while encouraging a positive attitude toward the body (i.e., positive rational acceptance) may effectively counteract drunkorexia conducts in boys and girls.

#### Conclusion

The present study provides new evidence for the role of body image disturbance in affecting two forms of drunkorexia behaviors (i.e., eating-related and exercise-related conducts) in adolescents, specifically detecting indirect effects of body image coping strategies, and a moderating role of gender. The direct and indirect relationships found in our model shed first light on the psychological routes by which body

image disturbance symptoms may lead adolescents to engage in dysfunctional drunkorexia conducts. These findings can provide valuable hints for future research and suggestions for implementing prevention projects and clinical interventions.

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#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

The data that support the findings of this study are available on request from the corresponding author.

#### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.ijchp.2025.100584](https://doi.org/10.1016/j.ijchp.2025.100584).

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