


Evaluation of the DSM-5 Severity Specifier for Bulimia Nervosa in Treatment-Seeking Youth

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Abstract A new severity specifier for bulimia nervosa (BN), based on the frequency of inappropriate weight compensatory behaviours (e.g., laxative misuse, self-induced vomiting, fasting, diuretic misuse, and excessive exercise), has been added to the most recent (fifth) edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as a means of addressing variability and heterogeneity in the severity of the disorder. While existing research provides support for the DSM-5 severity specifier for BN in adult patients, evidence for its validity and clinical utility in youth is currently lacking. To address this gap, data from 272 treatment-seeking adolescents with DSM-5 BN (94.2% female, $M_{\text{age}} = 15.3$ years, $SD 1.7$) were analysed to examine whether these patients, sub-grouped based on the DSM-5 severity definitions, would show meaningful differences in a broad range of clinical variables and demographic and physical characteristics. Analyses revealed that participants categorized with mild, moderate, severe, and extreme severity of BN significantly differed from each other in 15 variables regarding eating disorder pathological features and putative maintenance factors (i.e., core low self-esteem, perfectionism, social appearance anxiety, body

surveillance, and mood intolerance), health-related quality of life and comorbid psychiatric (i.e., affective and anxiety) disorders (large effect sizes). Between-group differences in demographics, body mass index, or age-of-BN onset were not observed. Collectively, our findings provide support for the utility of the frequency of inappropriate weight compensatory behaviours as a severity indicator for BN and suggest that age-at-onset of BN is probably more disorder-than severity-dependent. Implications for future research are outlined.

Keywords Bulimia nervosa · DSM-5 · Severity · Treatment-seeking youth

Introduction

Since Russell's original description of bulimia nervosa (BN) in 1979 [1], a great deal of aetiological and treatment literature has been published on this serious eating disorder condition [2–4]. BN is characterized by unsatisfactory recovery rates and a chronic and relapse-ridden course, and associated with high rates of medical complications, psychosocial impairment, psychiatric comorbidity and significant mortality rates [3–8]. There is also evidence that BN, like anorexia nervosa and binge-eating disorder [9–12], is marked by substantial within-diagnosis heterogeneity such that different individuals with the same disorder may exhibit variability in terms of symptom severity [8, 13–17], underscoring the need for valid indicators of disease severity [18].

Traditionally, the existence of purging has been used to distinguish DSM-IV [19] diagnostic subtypes of BN based on early research indicating differences in severity of eating disorder psychopathology, prognosis, and psychiatric

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comorbidity between subjects who purge and those who do not [20]. Nevertheless, competing results over time and uncertainty about the validity, correct categorization and clinical utility of the DSM-IV diagnosis of BN-non-purging subtype [20–23] led the DSM-5 [24] to drop subtyping. Two further changes were made in the most recent (fifth) edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [24] with respect to the diagnostic criteria for BN. First, the minimum frequency criterion for both recurrent episodes of binge eating (i.e., eating unusually large quantities of food accompanied by subjective feelings of loss of control) and inappropriate weight compensatory behaviours (IWCBs; e.g. laxative misuse, self-induced vomiting, fasting, diuretic misuse, and excessive exercise) was reduced from twice per week (i.e., DSM-IV stipulations) to once per week over the past 3 months [13, 16, 20]. Studies with either adolescents or adults found that this change had minimal impact on the prevalence or composition of the diagnosis of BN, probably because the margin for engaging in a behaviour at least once versus at least twice per week is too narrow to capture many individuals [25–27]. Second, the DSM-5 [24] added a new *severity specifier* (or *indicator*) based on the (sole) frequency of IWCBs to address heterogeneity and variability in severity within the broad DSM-5 BN category, which no longer includes purging and non-purging subtypes [13, 20]. Specifically, four BN severity groups based on the average weekly frequency of episodes of *all* (mentioned) IWCBs over the past 3 months were defined in the DSM-5 as follows: *mild* (1–3 episodes/week), *moderate* (4–7 episodes/week), *severe* (8–13 episodes/week), and *extreme* (>14 episodes/week) [24].

Although the new severity specifier for BN is deemed helpful in conveying prognostic information and helping clinicians to track patients' progress, the possibility that the defined mild, moderate, severe and extreme severity groups of BN are (or are not) arbitrary cannot be ruled out since they were added to the DSM-5 in the absence of published research, including DSM-5 field trial evidence [16, 18]. However, recent research testing the validity of the DSM-5 severity specifier for BN in 199 community adult volunteers categorized with BN based on self-reported data collected on-line [13] provides evidence that the four aforementioned severity groups of BN are valid in terms of both the distribution in the community (i.e., the severity of most cases was mild to moderate) and the significant between-group differences observed in eating-specific variables (i.e., binge eating, eating concerns). Similar findings have been reported in two more recent independent studies performed with clinical samples of adults diagnosed with DSM-5 BN [14, 17], which also revealed that the mild, moderate, severe, and extreme severity groups of BN significantly differed from each other in non-eating specific variables

assessed at pre-treatment, i.e., psychiatric comorbidity and psychosocial impairment [14, 17], with significantly higher levels/rates across the severity groups. In addition, the four DSM-5 severity groups of BN were statistically distinguishable on end-of-treatment abstinence from (i.e., no episodes of) IWCBs, with significantly lower rates across the severity groups [17]. Despite the fact that BN and its symptoms most frequently begin during adolescence [2, 28–37] and research evidence for a significant association between severity and the proportion of adolescent cases with BN detected and treated by mental health care services [16, 37], no research has to date evaluated the utility of the frequency of IWCBs as a severity indicator for BN in adolescents presenting for treatment. Thus, while existing research provides support for the DSM-5 severity specifier for BN in adults, its validity and clinical utility in treatment-seeking youth remains to be seen [14, 17].

The present study uses existing data from adolescents with DSM-5 BN presenting for treatment [38, 39] to test the DSM-5 severity specifier (or indicator) for BN by examining whether these patients sub-grouped based on the DSM-5 severity levels, defined by the frequency of IWCBs, would show meaningful and consistent differences in a broad range of variables of clinical interest assessed before patients are triaged to a treatment programme. These variables include eating disorder pathological features, comorbid psychiatric disorders, putative factors involved in the maintenance process of BN and health-related quality of life (see methods for details). Potential between-group differences on basic demographic and physical (body mass index) characteristics were also investigated.

Methods

Participants and Procedures

Participants were 272 treatment-seeking adolescents with DSM-5 BN (94.2% [$n=256$] female, $M_{age}=15.3$ years, SD 1.7, range 11–19) who participated in one of two (independent) multisite studies conducted by our research group in Italy regarding the assessment and role of social appearance anxiety (*Study 1*, $N=131$ [38]) and objectified body consciousness (*Study 2*, $N=141$ [39]) in eating disorder psychopathology. Shared exclusion criteria for both studies comprised mental retardation or pervasive developmental disorders, history of traumatic brain injury or any other neurological illness, medical conditions (diabetes mellitus type 1) or any type of concurrent treatment influencing eating or weight, and insufficient proficiency in Italian [38, 39]. For the purposes of the current inquiry, the (merged) sample for which existing data were re-analysed included all 272 treatment-seeking adolescents with threshold

DSM-5 [24] diagnosis of BN. Diagnosis was determined via administration of the diagnostic items of the Italian Eating Disorder Examination—Interview-12.0D [40] by the senior clinician of each specialized care centre for child and adolescent eating disorders (recruitment site) where participants were originally referred and assessed for eligibility (see also below and [38, 39] for full details); inter-rater reliability (κ) for DSM-5 BN diagnosis ($\kappa=1.0$), examined in a 40% random sample ($n=109$) based on audiotape ratings, was excellent [38, 39]. Following DSM-5 severity definitions (see “Introduction”) and prior research conventions [14, 17], 29% ($n=79$) of the sample was categorized with mild (1–3 episodes/week), 28.3% ($n=77$) with moderate (4–7 episodes/week), 23.5% ($n=64$) with severe (8–13 episodes/week), and 19.2% ($n=52$) with extreme (>14 episodes/week) severity of BN, based on the Eating Disorder Examination interview records regarding their (pre-treatment) frequency of episodes of all IWCBs.¹ The average weekly frequency of episodes of IWCBs (e.g., laxative misuse, self-induced vomiting, fasting, diuretic misuse, and excessive exercise) over the past 3 months was 1.9 (SD 0.5), 5.5 (SD 0.9), 9.8 (SD 1.2) and 14.9 (SD 0.5) for patients with mild, moderate, severe, and extreme severity of BN, respectively.

Amongst the 713 adolescents who were consecutively referred and assessed for eligibility at three Italian medium to large sized specialized care centres (in Northern, Central and Southern Italy) for child and adolescent eating disorders between January 2010 and January 2014, 131 adolescents [94.7% ($n=124$) female, $M_{\text{age}}=14.9$ years, SD 1.6, range 11–18], meeting DSM-5 diagnosis of BN and none of the already mentioned exclusion criteria, participated in *Study 1*; a full description of the recruitment procedure and sites is available elsewhere [38]. Amongst the 704 adolescents who were consecutively referred and assessed for

eligibility at four Italian small to medium sized specialized care centres (in Northern and Central Italy) for child and adolescent eating disorders between March 2011 and January 2015, 141 adolescents [93.6% ($n=132$) female, $M_{\text{age}}=15.6$ years, SD 1.7, range 13–19], meeting DSM-5 diagnosis of BN and none of the already mentioned exclusion criteria, participated in (the independent) *Study 2*; a full description of the recruitment procedure and sites is available elsewhere [39]. Participants in both studies 1 and 2 completed (the same) clinical interviews (administered by the senior clinician of each specialized care centre for eating disorders (recruitment site) where participants were originally referred and assessed for eligibility [38, 39]) and selected standardized self-reported questionnaires (administered in counterbalanced order to offset possible ordering effects [38, 39]), which were used in the current inquiry for assessing a range of variables of clinical interest (see measures below). In line with the legal requirements of the study country (Italy), informed written consent was sought from all subjects and their legal guardians (after all study procedures were fully explained and before individuals were being triaged to a treatment programme) and both studies 1 and 2 were approved by the ethics review board of each local specialized care centre for eating disorders (recruitment site) and of the co-ordinating body of these studies (University of Pavia) [38, 39].

Measures

The Italian versions of standardized questionnaires and clinical interviews with well-established psychometric properties (for details, see the references provided) among Italian community samples and a variety of psychiatric samples (>11 years) of both genders were used to assess a range of variables of clinical interest. These variables include eating disorder pathological features, comorbid psychiatric disorders, health-related quality of life and five putative factors involved in the maintenance process of BN, i.e., core low self-esteem, perfectionism, social appearance anxiety, body surveillance, and mood intolerance [2, 26, 28, 38, 39, 41–46].

Eating disorder pathological features were assessed using the Italian Eating Disorder Examination—Interview—12.0D [40] and the Italian Yale–Brown–Cornell Eating Disorder Scale [47]. Except for DSM-based diagnostic items, the Eating Disorder Examination measures the frequency of different forms of overeating, including (objective) binge-eating episodes and the severity of attitudinal aspects of eating disorder pathology over the past 4 weeks [17]. The latter was assessed in four subscales yielded by the Eating Disorder Examination—restraint, shape, weight, and eating concern ($\alpha=0.85$ – 0.87), whose scores range from 0 to 6, with higher scores reflecting greater severity

¹ Since preliminary analysis did not detect any significant differences among participants of Study 1 [38] and those of Study 2 [39] and among the Italian sites (where data for Studies 1 and 2 were originally collected [38, 39]) in the portion of adolescents classified with mild, moderate, severe, and extreme severity of BN, the merged sample of 272 DSM-5 BN patients was sub-grouped into the four DSM-5 severity groups. In addition, preliminary analysis did not detect any significant differences among participants of Study 1 and those of Study 2 and among the Italian specialized care centres for child and adolescent eating disorders (recruitment sites) in any variable of clinical interest considered (in and) for the purposes of the present inquiry including basic demographic (e.g., gender) and physical (body mass index) characteristics of adolescents classified with mild, moderate, severe, and extreme severity of BN; thus, the results that follow are not stratified by site. For interested readers, the results of these preliminary analyses along with details regarding the frequencies of the specific forms of IWCBs across the four (aforementioned) severity groups of BN are available from the corresponding author on request.

Table 1 Comparison of participants with bulimia nervosa across DSM-5 severity groups on demographic and physical characteristics

Variable ^a	Mild (<i>n</i> =79)	Moderate (<i>n</i> =77)	Severe (<i>n</i> =64)	Extreme (<i>n</i> =52)	<i>F</i>	χ^2	<i>p</i>
Age (years), M (SD)	15.5 (1.4)	14.9 (1.8)	15.2 (1.9)	15.4 (1.6)	1.85		0.139
Caucasian, <i>n</i> (%)	76 (96.2)	74 (96.1)	63 (98.4)	51 (98.1)		1.06	0.786
Gender (women), <i>n</i> (%)	73 (92.4)	73 (94.8)	61 (95.3)	49 (94.2)		0.65	0.885
Body mass index (kg/m ²), M (SD)	20.8 (2.6)	21.3 (3.0)	20.9 (3.1)	21.0 (3.5)	0.39		0.758

^aDifferences for continuous and categorical variables among the severity groups were assessed by means of ANOVA and χ^2 test [*df* (3, *N*=272)], respectively

[31]. Intra-class correlation coefficients (ICC), examined in a 40% random sample (*n*=109) based on audiotape ratings [38, 39], were excellent for (objective) binge-eating episodes (ICC=1.0) and the four Eating Disorder Examination subscales (ICC=0.97–0.99). The Yale–Brown–Cornell Eating Disorder Scale is a semi-structured interview that yields two subscales—obsession and compulsion (α s=0.90–0.91) assessing the severity of obsessions and rituals relating to food and body size/weight issues [48], respectively over the past month; subscale scores range from 0 to 16, with higher scores reflecting greater severity; ICC, examined in a 40% random sample (*n*=109) based on audiotape ratings [38, 39], were 0.99 for both the subscales of the Yale–Brown–Cornell Eating Disorder Scale.

Comorbid (current) *psychiatric* (i.e., affective and anxiety) *disorders* were evaluated through the Italian Schedule for Affective Disorder and Schizophrenia for School-Age Children–Present Version (i.e., a psychiatric diagnostic interview for children and adolescents) [49]. Inter-rater reliability (κ) for (current) affective and anxiety disorder diagnoses, examined in a 40% random sample (*n*=109) based on audiotape ratings [38, 39], were excellent (κ s=0.99–1.0). As in prior eating disorder research in adolescents [50] the global scores of the Italian (23-item) Pediatric Quality of Life Inventory–Version 4.0 [47], measuring levels of physical, emotional, school and social functioning [51], were used to assess *health-related quality of life* (α =0.89); scores range from 0 to 100, with 0 meaning the worst and 100 meaning the best levels of health-related quality of life.

The assessment of the *putative factors involved in the maintenance process of BN* included (a) selected scales of the Italian Eating Disorder Inventory-3 [52] for measuring core low self-esteem (via the 6-item low self-esteem scale; α =0.92; score range 0–24), perfectionism (via the 6-item perfectionism scale; α =0.91; score range 0–24) and mood intolerance or deficits in coping with aversive emotional states (via the 8-item emotional dysregulation scale; α =0.93; score range 0–32), (b) the Italian (8-item) Body Surveillance Subscale of the Objectified Body Consciousness Scale [39] for measuring body surveillance (α =0.87; score range 1–7) or persistent thinking and habitual

monitoring of one's body, and (c) the Italian (16-item) Social Appearance Anxiety Scale [38] for measuring social appearance anxiety (α =0.95; score range 16–80) or anxiety in situations where one's overall appearance (including body shape) may be negatively evaluated. Higher scale or subscale scores indicate a greater manifestation of the particular construct measured.

As anticipated, basic demographic and physical characteristics (i.e., measured body mass index, see [38, 39] for details), and other information, e.g., age of BN onset (determined by review of BN history) obtained at face-to-face interview assessment [38, 39] are also considered in the analyses.

Statistics

Data are presented as means and standard deviations for continuous data and *N*s and percentages for categorical data; there were no missing data. Differences in all the variables considered between the mild, moderate, severe, and extreme severity groups of BN were assessed by means of ANOVA or χ^2 test, as appropriate, followed by post-hoc pairwise comparisons with Bonferroni correction if needed [53]. The appropriate measures of effect size for continuous (partial η^2) or categorical variables (Cramer's ϕ) were calculated [53]. Cut-off conventions for partial η^2 are as follows: small (0.01–0.09), medium (0.10–0.24), and large (≥ 0.25) [53]. Cut-off conventions for Cramer's ϕ (with *df*=3) are as follows: small (0.06–0.16), medium (0.17–0.28), and large (≥ 0.29) [53].

Results

As shown in Table 1 summarising statistical analyses comparing the mild, moderate, severe and extreme severity groups of BN on demographic and physical (body mass index) characteristics, significant differences between the four severity groups of BN were not evidenced.

Table 2 Comparison of participants with bulimia nervosa across DSM-5 severity groups on clinical indicators

Variable	Mild (<i>n</i> =79)	Moderate (<i>n</i> =77)	Severe (<i>n</i> =64)	Extreme (<i>n</i> =52)	<i>F</i>	χ^2	<i>p</i>	η^2	ϕ
Age of BN onset (years) ^a , M (SD)	14.0 (0.7)	13.8 (0.8)	13.7 (0.9)	13.8 (0.7)	1.91		0.129		
EDE—binge eating episodes (over the past 4 weeks) ^{a,b} , M (SD)	4.8 (4.4)	12.6 (7.8)	18.9 (9.6)	28.9 (10.3)	101.34		<0.001	0.53	
EDE—restraint (score range 0–6) ^{a,b} , M (SD)	2.1 (1.6)	3.1 (1.1)	3.9 (0.5)	4.6 (0.6)	62.44		<0.001	0.41	
EDE—eating concern (score range 0–6) ^{a,b} , M (SD)	2.5 (1.6)	3.6 (1.2)	4.3 (0.7)	5.1 (0.4)	61.38		<0.001	0.40	
EDE—shape concern (score range 0–6) ^{a,b} , M (SD)	2.4 (1.8)	3.6 (1.1)	4.6 (0.5)	5.4 (0.3)	81.19		<0.001	0.48	
EDE—weight concern (score range 0–6) ^{a,b} , M (SD)	2.3 (1.5)	3.3 (1.0)	4.0 (0.4)	4.9 (0.5)	76.41		<0.001	0.46	
YBCEDS—obsession (score range 0–16) ^{a,b} , M (SD)	5.1 (3.0)	8.0 (4.5)	9.9 (3.7)	12.0 (1.9)	45.93		<0.001	0.33	
YBCEDS—compulsion (score range 0–16) ^{a,b} , M (SD)	3.9 (2.8)	6.5 (4.9)	8.7 (4.8)	10.9 (2.4)	37.42		<0.001	0.29	
Affective disorders ^{a,b} , <i>n</i> (%)	5 (6.3)	15 (19.5)	22 (34.4)	28 (53.8)		39.10	<0.001		0.41
Anxiety disorders ^{a,b} , <i>n</i> (%)	1 (1.3)	9 (11.7)	16 (25.0)	22 (42.3)		38.60	<0.001		0.40
Pediatric quality of life inventory (score range 0–100) ^{a,b} , M (SD)	71.5 (11.2)	62.9 (10.1)	52.8 (9.9)	42.9 (9.0)	94.47		<0.001	0.51	
EDI3—perfectionism (score range 0–24) ^{a,b} , M (SD)	5.5 (4.7)	8.9 (5.1)	12.9 (5.4)	15.5 (2.2)	58.70		<0.001	0.38	
EDI3—low self-esteem (score range: 0–24) ^{a,b} , M (SD)	6.0 (5.7)	11.8 (5.1)	14.7 (5.8)	16.9 (2.0)	59.45		<0.001	0.39	
EDI3—emotional dysregulation (score range 0–32) ^{a,b} , M (SD)	6.0 (5.5)	10.8 (7.0)	16.2 (6.0)	23.9 (5.2)	101.31		<0.001	0.53	
Social appearance anxiety scale (score range 16–80) ^{a,b} , M (SD)	45.3 (10.5)	52.0 (9.5)	59.3 (8.4)	66.7 (7.8)	63.60		<0.001	0.42	
OBCS—body surveillance (score range 1–7) ^{a,b} , M (SD)	2.8 (1.9)	3.9 (0.9)	4.8 (0.7)	5.8 (0.4)	74.14		<0.001	0.45	

BN bulimia nervosa, EDE eating disorder examination-interview, YBCEDS Yale–Brown–Cornell eating disorders scale, EDI3 eating disorder inventory-3, OBCS objectified body consciousness scale

^aDifferences for continuous and categorical variables among the severity groups were assessed by means of ANOVA and χ^2 test [*df* (3, *N*=272)], respectively

^bAll severity groups of BN were statistically different in post-hoc pairwise comparisons at *p*<0.012 (Bonferroni correction) or less. The appropriate measures of effect size for continuous (partial η^2) or categorical variables (Cramer's ϕ) are reported; cut-off conventions for partial η^2 and Cramer's ϕ are available in [Statistics](#) section

As shown in Table 2 summarising descriptive statistics² and analyses comparing the four BN severity groups (including measures of effect size) on all the variables of clinical interest considered, the mild, moderate, severe and extreme severity groups of BN were statistically indistinguishable only in age-at-onset of BN. Group comparisons revealed that the extreme severity group of BN reported significantly greater frequency of binge eating, obsessions and rituals relating to food and body size/

weight issues and severity of attitudinal aspects of eating disorder pathology (assessed by the four subscales of the Eating Disorder Examination), and poorer health-related quality of life, than the severe, moderate, and mild severity groups, which also differed significantly from each other. Furthermore, the extreme severity group of BN featured significantly higher scores on the measures of putative factors involved in the maintenance process of the disorder (i.e., core low self-esteem, perfectionism, mood intolerance, social appearance anxiety, and body surveillance), and higher rates of comorbid (affective and anxiety) psychiatric disorders as compared with the severe, moderate, and mild severity groups, which also differed significantly from each other. The observed between-group differences between the four severity

² We acknowledge that within group outlines on any study variables were not observed; for interested readers, further details along with the ranges for each clinical variable assessed (and displayed in Table 2) for each severity group of BN are available on request from the corresponding author.

groups on the clinical measures reflected large effect sizes.

Discussion

This study evaluated, for the first time, the new DSM-5 severity specifier for BN [24] in 272 adolescents with DSM-5 BN presenting for treatment. Participants were categorized with mild (29%), moderate (28.3%), severe (23.5%), and extreme (19.2%) severity of BN based on their clinician-rated frequency of episodes of IWCBs and compared on demographic and physical (body mass index) characteristics and a broad range of variables of clinical interest. Rates of each severity group in the current inquiry were similar to those for treatment-seeking adults with DSM-5 BN (see [14]). The four severity groups of BN were statistically indistinguishable in demographics, body mass index, and age-of-BN onset. Nevertheless, this pattern of findings is consistent with prior adolescent and adult research showing that different degrees of IWCB frequency are unrelated to demographic and physical (body mass index) characteristics but also to the age when BN first occurred [13, 14, 16, 17, 34, 37, 54, 55], lending some credence to scholars' suggestions that age-at-onset is probably more disorder—than severity-dependent [14, 16]. The mild, moderate, severe, and extreme severity groups of BN were found to significantly differ from each other in a broad range of clinical variables regarding eating disorder pathological features, putative factors involved in the maintenance process of the disorder and comorbid psychiatric disorders, with significantly higher levels/rates across the severity groups. In addition, they were statistically distinguishable in health-related quality of life, with significantly lower levels across the severity groups. These findings, which directly speak to the concurrent validity of the DSM-5 severity specifier (or indicator) for BN [24], converge with those previously reported for two independent clinical (treatment-seeking) samples of adults [14, 17] (see also “Introduction”) and are also consistent with earlier research indicating that amongst adults and adolescents greater IWCB frequency was significantly correlated with lower quality of life and psychosocial functioning and higher eating disorder and body-related, general, and comorbid psychopathology [13, 31, 34, 37, 46, 54–66]. According to the effect sizes (Table 2) binge eating and deficits in coping with aversive emotional states (or mood intolerance) are the primary eating and non-eating specific variables distinguishing the four DSM-5 severity groups of BN. These findings also appear to concur with earlier research and the cognitive-behavioural theory that BN patients use IWCBs to mitigate and/or prevent the weight gain consequent of binge-eating episodes [13, 14, 17, 26,

34, 41, 54, 66–69]. They are also in line with longitudinal and ecological momentary assessment studies [42, 46, 70–72] highlighting that IWCBs serve as a self-regulation strategy for negative affective states and that addressing maladaptive coping in response to adverse affective states and/or cognitive-behavioural patterns eliciting these states may reduce the persistence and/or frequency of the IWCBs [26, 73].

Although this study conducted with adolescents seeking treatment for BN provides support for the DSM-5 severity specifier (or indicator) for BN (based on the frequency of IWCBs [24]), replication of the findings with other methods of data collection (e.g. ecological momentary assessment) would be beneficial. We note several strengths and limitations of our study as a context for interpreting these results. Strengths include the relatively large study group of treatment-seeking adolescents diagnosed with DSM-5 BN and characterized by diverse gender and ethnic/racial composition, and the assessment of a broad range of clinical, demographic and physical variables, allowing a more refined comparison of the four DSM-5 severity groups of BN. It should also be mentioned that although our study/patient group was recruited from different small to large sized specialized care centres for child and adolescent eating disorders (in Northern, Central and Southern Italy, see “Methods” and [38, 39] for full details), it appears to be representative of a general clinical population based on the demographics [14, 17, 26, 31, 34, 37, 54, 55, 67, 73–75] and even distribution of symptom severity [14, 17]. Limitations of the current study include the self-report assessment of some variables of clinical interest and the cross-sectional study design that precludes examination of the predictive significance of the DSM-5 severity indicator for BN [24]. In addition to comparing the DSM-5 severity approach with alternative ones, e.g., use of multiple v. single methods of IWCBs (see [34, 66]), future studies with adolescent clinical samples should also track severity fluctuation across time and test additional clinical validators for the DSM-5 severity specifier including, perhaps most importantly, prognostic significance for treatment outcome. The latter aspect is particularly salient because utilization of an empirically validated standard allowing comparisons across BN studies virtually does not exist [8, 17]. Nevertheless, it is worth mentioning that, despite the frequent use of change in binge-eating and purging rates as an outcome measure in research for BN [3, 8], a recent study [74] conducted with five adolescent and adult clinical samples with BN emphasized that the pre-treatment and end-of-treatment frequency of IWCBs, defined to include both non-purging and purging behaviours as in the DSM-5 [24] and the current study, is the only efficient predictor for long-term recovery (i.e., absence of any symptom and normalization of eating disorder pathological features). Further, adult

patients sub-grouped based on the DSM-5 severity definition showed meaningful differences on end-of-treatment abstinence from (i.e., no episodes of) IWCBs, with significantly lower rates across the (mild, moderate, severe, and extreme) severity groups of BN [17]. If in future research adolescents with mild, moderate, severe and extreme severity of BN show a differential response to treatment, this will provide evidence for the predictive validity of the DSM-5 severity specifier (or indicator) in youth, which is currently lacking. Additionally, it will help in establishing a common benchmark that informs BN patients and clinicians about progress and outcome [14, 17] and will be particularly informative for promoting more suitable treatment for BN, since for certain mild disorders this should differ from treatment regimens for moderate-to- severe/extreme presentations [17, 18].

Summary

The current study corroborates prior research on the validity and clinical utility of the frequency of IWCBs (e.g., laxative misuse, self-induced vomiting, fasting, diuretic misuse, and excessive exercise) as a severity indicator for BN amongst adult samples and extends the research base by examining whether adolescents seeking treatment for BN, sub-grouped based on the DSM-5 severity definitions, show meaningful and consistent differences in a broad range of variables of clinical interest and demographic and physical characteristics. Collectively, our findings provide support for the severity specifier (or indicator) for BN introduced in the DSM-5 as a means of addressing heterogeneity and variability in the severity of the disorder, which no longer includes purging and non-purging subtypes.

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