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The Use of Multiple Methods of Compensatory Behaviors as an Indicator of Eating Disorder Severity in Treatment-Seeking Youth

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Abstract

Objective—This study investigated the use and frequency of multiple methods of compensatory behaviors and how they relate to eating-related and general psychopathology for youth with eating disorders (ED).

Method—Participants were 398 referrals to a pediatric ED treatment program (91.2% female; M age=14.9±2.2). ANOVA and chi-square tests compared participants reporting multiple methods of compensatory behaviors, single method of compensatory behaviors, and no compensatory behaviors on measures of ED and general psychopathology. Partial correlations examined associations between compensatory behavior, frequency and severity of ED and general psychopathology.

Results—Participants reporting multiple methods of compensatory behaviors had significantly greater ED and general psychopathology than the other groups ($p < .001$). Frequency of compensatory behaviors was associated with ED psychopathology (partial $r = .14$; $p = .007$), but not with general psychopathology.

Discussion—Engaging in multiple methods of compensatory behaviors is related to greater ED and general psychopathology, whereas frequency is only related to greater ED symptom severity.

Keywords

compensatory behaviors; adolescent eating disorders; assessment

Compensatory behaviors are eating disordered behaviors designed to counteract the effects of eating in order to avoid weight gain or to alleviate guilt associated with eating.¹ Compensatory behaviors include self-induced vomiting, laxative or diuretic misuse, driven exercise, and fasting, and are common features of anorexia nervosa (AN), bulimia nervosa (BN), and eating disorder not otherwise specified (EDNOS).² These behaviors are

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associated with serious medical complications and psychosocial impairments, such as suicidality.³⁻⁵

The frequency of compensatory behaviors is commonly used as an indicator of eating disorder (ED) severity⁶⁻⁸ and to inform diagnostic decision-making. It has also been suggested that the number of distinct compensatory behaviors reported by an individual may provide information regarding ED severity and related psychopathology.⁹⁻¹¹ Several adult studies have indicated that the presence of multiple methods of compensatory behaviors (specifically, self-induced vomiting, and laxative and diuretic misuse) provide more information about ED severity than compensatory behavior frequency. Specifically, multiple methods of compensatory behaviors appears to be related to both eating-related and general psychopathology, whereas frequency of compensatory behaviors is only related to ED psychopathology.^{9, 12} Thus, multiple methods of compensatory behaviors may provide valuable information about functioning outside of the ED domain.

It is important to extend the evaluation of the presence of compensatory behaviors to the pediatric ED population in order to provide effective treatments that may prevent or minimize chronicity and negative physical and psychosocial health outcomes.¹³ Despite findings indicating that the number of distinct compensatory behaviors can provide important diagnostic information in adult populations⁹ and that adults significantly differ from youth in terms of use of compensatory behaviors,¹⁴ to our knowledge, no research has examined the significance of number of compensatory methods in pediatric populations. In addition, existing studies have neglected to examine all forms of compensatory behaviors, which represents another limitation to the existing literature as non-purging compensatory behaviors (i.e., driven exercise) have been found to be prevalent in adolescent ED samples,^{15, 16} and have been associated with greater eating disorder and depressive symptomatology, especially when paired with self-induced vomiting.^{17, 18} Given these past findings, it appears that non-purging compensatory behaviors should also be considered in investigations of the number of distinct compensatory behaviors.

The purpose of the current study was to fill these gaps in the literature by examining the significance of multiple methods of compensatory behaviors and frequency of compensatory behaviors with respect to eating-related and general psychopathology in children and adolescents presenting for ED treatment. We hypothesized that, consistent with previous research in the adult arena,¹² multiple methods of compensatory behaviors would be associated with both eating-related and general psychopathology, while frequency of compensatory behaviors would be associated with eating-related psychopathology only. A second aim of the current study was to examine the relation between the number of distinct compensatory behaviors endorsed and eating-related and general psychopathology. We hypothesized that, consistent with previous research in the adult arena,¹² the number of endorsed compensatory behaviors would be positively associated with eating-related and general psychopathology.

Methods

Participants

Participants were children and adolescents ($n=398$), aged 7 to 18 years ($M_{age}=14.9\pm 2.2$ years), presenting for an initial ED evaluation at The University of Chicago Medical Center's Eating Disorders Program. Participants had a mean body mass index (BMI; kg/m^2) of 20.08 ± 5.67 , and were comprised of mostly females (91.2%; $n=363$) and Caucasians (72.4%; $n=288$). Participants met criteria Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV TR) criteria² for AN (33.2%; $n=132$), BN (13.6%; $n=54$), or EDNOS (53.3%; $n=212$).

Procedure

Participants completed questionnaires and a semi-structured interview during a three-hour baseline assessment. All data were collected before the start of treatment. Written consent for patients over 18 years of age or parental/guardian consent and adolescent assent for patients under 18 years of age were obtained. This study was approved by The University of Chicago's Institutional Review Board.

Physical Assessment

Participants' weight and height were measured by a trained research assistant using a calibrated digital or balance-beam scale and stadiometer. All patients were weighed in light, indoor clothing.

Measures

*The Eating Disorder Examination (EDE)*¹⁹ is a semi-structured investigator-based interview measuring cognitive and behavioral symptoms related to ED. Cognitive symptoms of ED (e.g., fear of weight gain, overevaluation of shape and weight) are assessed for the past 28 days using a 7-point Likert scale, with higher scores indicating more severe eating-related psychopathology. Global scores reflect the overall severity of ED symptoms, including dietary restraint, eating concerns, shape concerns, and weight concerns. Frequency of self-induced vomiting, laxative misuse, diuretic misuse, driven exercise, fasting, and objective binge eating (OBE; eating episodes involving the consumption of an objectively large amount of food accompanied by a sense of loss of control) is assessed for 3 months prior to assessment. Frequency of subjective binge eating (SBE; eating episodes involving an amount of food that is not objectively large, but is considered excessive by the respondent, accompanied by a sense of loss of control) is assessed for 1 month prior to assessment. The EDE has demonstrated good reliability and validity^{20, 21} and has been utilized in multiple studies of youth with AN, BN, or EDNOS.^{22–24} The EDE was used to generate DSM-IV TR diagnoses for an ED.

*Schedule for Affective Disorders and Schizophrenia for School-Aged Children (KSADS)*²⁵ is a semi-structured diagnostic interview designed to assess current and past presence (lifetime prevalence) of psychiatric disorders in children and adolescents according to DSM-IV criteria. The K-SADS has also been utilized in multiple studies of children and adolescents with EDs.^{1, 26} The presence or absence of a current Axis I comorbid diagnosis, including anxiety, and mood disorders, was used as a dependent variable in the current study. Separate analyses of each comorbid diagnosis were not conducted.

*The Beck Depression Inventory I (BDI)*²⁷ is a 21-item self-report questionnaire designed to assess depressive symptoms. Scores range from 0–63, with scores over 18 indicating moderate to severe depressive symptoms. The BDI has good psychometric properties^{28, 29} and has been utilized in multiple studies of children and adolescents with EDs.^{26, 30}

*The Rosenberg Self-Esteem Scale (RSE)*³¹ is a 10-item self-report inventory designed to assess self-esteem, with higher scores indicating higher self-esteem. The psychometric qualities of the RSE are good.³² The RSE has also been utilized in multiple studies of children and adolescents with EDs.^{26, 33}

*The Global Assessment of Functioning Scale (GAF)*² is a 100-point scale detailed in the DSM-IV that measures an individual's overall level of psychological, social, and occupational functioning, with 1 being the lowest level of functioning and 100 being the highest level of functioning. Measurements of GAF scores have been found to have acceptable reliability.³⁴

Data Analysis

ANOVA and chi-square analyses were used to compare participants reporting multiple methods of compensatory behaviors, single method of compensatory behaviors, and those who denied compensatory behaviors on basic demographic features and diagnostic status. ANCOVA's, controlling for frequency of compensatory behaviors, gender, BMI, and DSM-IV diagnosis, were used to compare participants reporting multiple methods of compensatory behaviors, a single method of compensatory behaviors, and no compensatory behaviors on continuous measures of eating-related and general psychopathology. We considered including race/ethnicity and age as covariates as well; however, none of these variables significantly contributed to the models and were therefore removed from the analyses. A chi-square test was used to compare groups in terms of likelihood of having a comorbid psychiatric diagnosis. Partial correlations, controlling for age, gender, race/ethnicity, BMI, diagnosis, and frequency of compensatory behaviors, were used to examine associations between the number of reported compensatory behaviors and measures of eating-related and general psychopathology.

Compensatory behavior frequency was defined as the weekly number of compensatory behaviors endorsed in the 3 months prior to assessment. Spearman's rho correlations, Mann-Whitney U-tests, and Kruskal-Wallis tests were used to examine the relation between frequency of compensatory behavior usage, and demographic features and diagnostic status. Partial correlations, controlling for age, diagnosis, BMI, gender, race/ethnicity, and number of reported compensatory behaviors, were used to examine associations between compensatory behavior frequency and measures of eating-related and general psychopathology. Mann-Whitney U-tests were used to examine associations between frequency of compensatory behaviors, and the presence/absence of a comorbid psychiatric disorder.

Results

A total of 150 (37.7%) children and adolescents reported multiple methods of compensatory behaviors; 128 (85.3%) reported driven exercise; 119 (79.3%) reported self-induced vomiting; 85 (56.7%) reported fasting; 26 (17.3%) reported laxative misuse; and 8 (5.3%) reported diuretic misuse in the 3 months prior to assessment. Among participants reporting multiple methods of compensatory behaviors, 96 (64%) endorsed two compensatory methods, 44 (29.3%) endorsed three compensatory methods, 8 (5.3%) endorsed four compensatory methods, and 2 (1.3%) endorsed five compensatory methods. A total of 135 (33.9%) children and adolescents reported a single method of compensatory behaviors, of whom 72 (53.3%) reported driven exercise; 49 (36.3%) reported self-induced vomiting; 11 (8.1%) reported fasting; and 3 (2.2%) reported laxative misuse in the 3 months prior to assessment. The remaining 113 (28.4%) of the total sample denied any compensatory behaviors in the past 3 months. Participants reporting multiple methods of compensatory behaviors were comprised of significantly more females than those reporting either a single method of compensatory behaviors or no compensatory behaviors [$\chi^2(2, N=398)=8.97; p=.01$; see Table 1]; they were also more likely to be diagnosed with BN and less likely to be diagnosed with AN, compared to participants reporting no compensatory behaviors participants, who showed the opposite pattern [$\chi^2(4, N=398)=45.06; p<.01$]. Participants reporting no compensatory behaviors were significantly younger than those reporting multiple methods of compensatory behaviors and a single method of compensatory behaviors [$F(2,397)=21.87; p<.001$]. There were no group differences in terms of BMI or race/ethnicity ($ps>.08$).

Eating-related and general psychopathology in relation to number of reported compensatory behaviors

There were significant group differences on global ED severity in the 3 months prior to assessment [$F(6, 393)=78.97; p<.001$; see Table 2]. Post-hoc simple contrasts revealed that participants reporting multiple methods of compensatory behaviors had significantly higher EDE Global Severity scores than those reporting a single method of compensatory behaviors and those reporting no compensatory behaviors ($ps<.001$); participants reporting a single method of compensatory behaviors also had significantly higher global EDE scores than those reporting no compensatory behaviors ($ps<.001$). There were also significant group differences on the RSE [$F(6,359)=25.37; p<.001$], with participants endorsing multiple methods of compensatory behaviors reporting lower self-esteem than both those endorsing a single method of compensatory behaviors and no compensatory behaviors ($ps<.001$). Participants reporting a single method of compensatory behaviors participants also reported lower self-esteem than those reporting no compensatory behaviors ($p=.001$). Groups also differed in terms of GAF score [$F(6,191)=3.28; p=.04$]: participants reporting multiple methods of compensatory behaviors exhibited significantly lower functioning relative to those reporting no compensatory behaviors participants ($p=.01$) but not those reporting a single method of compensatory behaviors participants ($p=.11$). Participants reporting a single method of compensatory behaviors and no compensatory behaviors did not differ on GAF scores ($p=.14$). Finally, participants reporting multiple methods of compensatory behaviors and a single method of compensatory behaviors were more likely to have a comorbid psychiatric disorder than those reporting no compensatory behaviors [$\chi^2(2, N=398)=7.32; p=.03$]. There were no significant group differences in terms of OBE frequency ($p=.10$), SBE frequency ($p=.21$), or BDI Total scores ($p=.18$).

The total number of compensatory methods used by participants was significantly related to EDE Global scores (partial $r=.55; p<.001$), RSE total scores (partial $r=-.39; p<.001$), and GAF score (partial $r=-.31; p=.004$), but not to BDI Total scores or OBE frequency ($ps .15$).

Eating-related and general psychopathology in relation to compensatory behavior frequency

Participants reported an average of 9.3 ($SD=13.8$) weekly episodes of compensatory behaviors in the 3 months prior to assessment. Participants with BN reported significantly greater frequencies of compensatory behaviors than those with AN or EDNOS [$\chi^2(2, N=398)=85.29; p<.001$]. There were also significant racial/ethnic differences, with Hispanic participants reporting the highest frequency of compensatory behaviors [$\chi^2(3, N=395)=9.11; p=.03$]. Moreover, frequency of compensatory behaviors was associated with both age ($r=.28; p<.001$) and BMI ($r=.34; p<.001$). Frequency of compensatory behaviors was not related to gender ($z=-1.42; p=.16$).

Frequency of compensatory behaviors was significantly related to EDE Global Severity Score (partial $r=.14; p=.007$) and OBE frequency (partial $r=.37; p=.11$), but not RSE total score (partial $r=-.09; p=.08$), GAF score (partial $r=.03; p=.67$), or BDI Total Score (partial $r=-.02; p=.77$). Frequency of compensatory behaviors was associated at a trend-level with presence of a comorbid psychiatric disorder ($z=-1.95; p=.05$).

Discussion

The current study sought to determine the significance of the number and frequency of reported compensatory behaviors, as well as the relation between the number of distinct compensatory behaviors endorsed and the severity of eating-related and general psychopathology, in children and adolescents presenting for ED treatment. Results indicate

that more than one-third of children and adolescents in our sample reported multiple methods of compensatory behaviors. These youth endorsed higher levels of ED attitudes and cognitions, as well as lower self-esteem and lower overall functioning, and were more likely to present with a comorbid psychiatric diagnosis, relative to youth reporting only a single method of compensatory behaviors. These findings are consistent with the adult literature showing that greater numbers of compensatory methods are related to increased eating-related and general psychopathology.¹² By contrast, the reported frequency of compensatory behaviors was associated only with eating-related psychopathology, indicating that the number of compensatory behavior methods may be a better indicator of distress and impairment in children and adolescents with EDs than the frequency of these behaviors.

Older age was associated with the presence of multiple methods of compensatory behaviors as well as the frequency of compensatory behaviors. Previous findings have suggested that late adolescence is a high-risk period for onset of purging behaviors,³⁵ however we cannot claim that the current findings are consistent with this as our data did not include the date of onset of compensatory behaviors. Hispanic youth and youth with higher BMIs showed greater frequency of compensatory behaviors. This is also consistent with past research that has noted the highest levels of disordered eating to occur among Hispanic youth in a general population sample.¹⁵ Although the reasons for this are unknown, it is possible that the participants in our sample felt distressed about their appearance and therefore were more inclined to engage in compensatory behaviors. We can also speculate that the positive relationship between BMI and frequency of compensatory behaviors could be related to previous general population findings that compensatory behaviors are more common in overweight youth.³⁶ Gender was not associated with either the number or frequency of compensatory behaviors.

Unlike studies of adults with ED in which self-induced vomiting is the most common method of compensation,^{37, 38} the most frequently utilized compensatory behavior in this pediatric population was driven exercise. A possible explanation for this difference is that exercise is viewed and experienced as less pathological and more socially acceptable than purging behaviors such as vomiting. Children and adolescents are also under the supervision of parents who might serve as obstacles to engaging in more overt ED behaviors such as self-induced vomiting, whereas exercise is less likely to be viewed as problematic. Additionally, past studies suggest that driven exercise is associated with greater ED and depressive symptomatology^{17, 18} and the development and maintenance of EDs.¹⁶ Given that driven exercise is the most commonly reported form of compensatory behavior among youth using both single method of compensatory behaviors and multiple methods of compensatory behaviors, this behavior could be serving as a “gateway” behavior that might eventually lead children and adolescents to utilize other, and potentially more harmful, methods as well.

To our knowledge, this is the first study to investigate single versus multiple compensatory methods in children and adolescents. EDs typically onset in this age group and understanding EDs in their early stages of development can result in more effective treatments.³⁹ In addition, a strength of this study is that the sample size was reasonably large and included both males and females. Adolescents included in this sample had diagnoses spanning the ED spectrum (i.e., AN, BN, and ED-NOS), which enhances generalizability. This is particularly important for adolescents, as most youth fall into the EDNOS category²² and diagnostic crossover is often the rule rather than the exception.⁴⁰ Another strength of this study is the inclusion of a comparison group of youth with ED who do not use compensatory behaviors. This allowed us to make a comparison between youth who engage in multiple or single compensatory behaviors and youth who do not utilize compensatory behaviors. However, with previous adult studies, a non-ED comparison group was used. Our

use of an eating disordered comparison group increases the likelihood that it is the specific compensatory behaviors, rather than the presence of an ED, that accounts for the group difference. ED severity was assessed using well-validated measures. Finally, unlike studies of adults, which have only examined purging methods (vomiting, laxative misuse/diuretic misuse),¹² this study includes non-purging compensatory behaviors as well.

While this study has multiple strengths it also has several limitations. First, the sample consisted of treatment-seeking children and adolescents, which precludes generalization to non-treatment-seeking samples. For instance, it is possible that a clinical population is typically more distressed by ED symptoms than individuals who are not actively seeking treatment.⁴¹ Secondly, our data were limited to the past 3 months, which may only represent a brief glimpse of compensatory behavior patterns as these behaviors may fluctuate significantly over time.⁴⁰ Finally, due to the cross-sectional nature of this study, it is unclear whether higher numbers and frequency of compensatory behaviors contribute to or result from increased eating-related and/or general psychopathology.

These findings have implications for early identification and treatment. ED assessments with youth should evaluate for the presence of all forms of compensatory behaviors, as well as the frequency of these behaviors. Additionally, assessors should note the distinct number of compensatory behaviors endorsed. Future research should examine whether the number of compensatory behaviors is related to treatment outcome. In addition, research may explore how adolescents with multiple methods of compensatory behaviors could be targeted for more intensive treatment to measure if this reduces the potential for higher ED-specific and general psychopathology. This concept would be in line with the ideal of reducing symptom severity early in treatment.

In conclusion, we found that, irrespective of diagnosis, multiple methods of compensatory behaviors are related to greater ED severity and general psychopathology. This suggests that number of methods may provide a more comprehensive clinical picture than frequency of compensatory behaviors, which was only related to ED severity. Longitudinal studies are needed to determine whether greater general and ED-specific psychopathology leads to the initiation of more forms of compensatory behaviors or whether the behaviors drive the greater levels of psychopathology.

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Table 1

Distribution of demographic variables among compensatory behavior groups

Variables	No Compensatory Behaviors (n =113)		Single Compensatory Behaviors (n =135)		Multiple Compensatory Behaviors (n =150)		Total Sample (n =398)	Test Statistic
	Mean±SD	%	Mean±SD	%	Mean±SD	%		
Age (years)	13.8±2.7		14.9±2.0		15.5±1.6		14.9±2.2	$F(2,395)=21.89; p<.001$ ***
BMI	19.3±7.9		19.9±5.2		20.7±3.7		20.08±5.7	$F(2,395)=2.31; p=.101$
	n	%	n	%	n	%	n	%
Gender								
Male	14	3.5	16	4.0	5	1.2	35	8.8
Female	99	24.9	119	28.9	145	36.4	363	91.2
Ethnicity								
White	86	21.8	103	26.0	99	25.0	288	72.4
Black	12	3.0	12	3.0	10	2.5	34	8.5
Hispanic	9	2.3	14	3.5	29	7.3	52	13.1
Other	6	1.5	5	1.3	10	2.5	21	5.3
DSM-IV TR Diagnosis								
AN	50	12.6	48	12.0	34	8.5	132	33.2
BN	0	0.0	14	3.5	40	10.0	54	13.6
EDNOS	63	15.8	73	18.3	76	19.0	212	53.3

Note: BMI=Body Mass Index; DSM-IV TR=Diagnostic and Statistical Manual of Mental Disorder Fourth Edition, Text Revision; AN=Anorexia Nervosa; BN=Bulimia Nervosa; EDNOS=Eating Disorder Not Otherwise Specified.

* $p<.05$

** $p<.01$

*** $p<.001$

Table 2

Comparison of groups based upon number of reported compensatory behaviors across eating-related and psychosocial measures ($M \pm SD$, unless otherwise indicated)

Measure	No compensatory behaviors ($n=113$)	Single method of compensatory behaviors ($n=135$)	Multiple methods of compensatory behaviors ($n=150$)	Test Statistic
EDE Global Score	1.0 \pm 1.1	2.3 \pm 1.3	3.5 \pm 1.1	$F(6, 393)=78.97; p<.001$
EDE Weight Concern	1.2 \pm 1.4	2.3 \pm 1.6	3.7 \pm 1.4	$F(6, 393)=43.77; p<.001$
EDE Shape Concern	1.1 \pm 1.4	2.7 \pm 1.7	4.0 \pm 1.3	$F(6, 391)=65.79; p<.001$
EDE Eating Concern	.6 \pm 1.1	1.7 \pm 1.4	2.8 \pm 1.3	$F(6, 392)=46.96; p<.001$
EDE Restraint	1.0 \pm 1.4	2.5 \pm 1.6	3.6 \pm 1.4	$F(6, 392)=59.39; p<.001$
OBE Frequency	1.7 \pm 9.2	18.8 \pm 51.4	22.6 \pm 46.2	$F(6, 388)=2.33; p=.10$
SBE Frequency	2.4 \pm 7.8	5.2 \pm 15.4	9.7 \pm 18.1	$F(6, 388)=1.55; p=.21$
Purging Frequency	0	30.53 \pm 72.15	70.40 \pm 84.95	$F(1,284)=17.98; p<.001$
BDI Total Score	9.7 \pm 9.7	23.5 \pm 78.2	24.7 \pm 11.6	$F(6, 283)=1.74; p=.18$
GAF	61.1 \pm 10.4	58.5 \pm 8.5	55.4 \pm 8.0	$F(6, 191)=3.28; p=.04$
RSE	20.4 \pm 6.2	17.1 \pm 6.9	12.30 \pm 5.6	$F(6, 359)=25.37; p<.001$

Note: EDE=Eating Disorder Examination; OBE Frequency=Objective Binge-Eating Frequency; SBE Frequency=Subjective Bulimic Frequency; BDI=Beck Depression Inventory; GAF=Global Assessment of Functioning; and RSE=Rosenberg Self-Esteem Scale.