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Subtypes of Adaptive and Maladaptive Perfectionism in Anorexia Nervosa: Associations with Eating Disorder and Affective Symptoms

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Abstract

Perfectionism is hypothesized to contribute to the etiology of anorexia nervosa (AN). However, there is little research regarding whether individuals with AN can be classified according to maladaptive (e.g., evaluative concerns) and adaptive (e.g., high personal standards) facets of perfectionism that predict distinct outcomes and might warrant different intervention approaches. In this study, a latent profile analysis was conducted using data from adults with AN ($n = 118$). Frost Multidimensional Perfectionism Scale (Frost et al. *Cognitive Therapy and Research*, 14(5), 449–46, 1990) subscales were used to identify subgroups differing according to endorsed perfectionism features (e.g., adaptive and maladaptive perfectionism). Generalized linear models were used to compare subgroups on eating disorder and affective symptoms measured through questionnaire and ecological momentary assessment. Four subgroups were identified: (a) Low

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Compliance with Ethical Standards

Experiment Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest Ann F. Haynos, Linsey M. Utzinger, Jason M. Lavender, Ross D. Crosby, Li Cao, Carol B. Peterson, Scott J. Crow, Stephen A. Wonderlich, Scott G. Engel, James E. Mitchell, Daniel Le Grange and Andrea B. Goldschmidt declare that they have no conflict of interest.

Perfectionism; (b) High Adaptive and Maladaptive Perfectionism; (c) Moderate Maladaptive Perfectionism; and (d) High Maladaptive Perfectionism. Subgroups differed on overall eating disorder symptoms ($p < .001$), purging ($p = .005$), restrictive eating ($p < .001$), and body checking ($p < .001$) frequency, depressive ($p < .001$) and anxiety ($p < .001$) symptoms, and negative ($p = .001$) and positive ($p < .001$) affect. The Low Perfectionism group displayed the most adaptive scores and the Moderate and High Maladaptive Perfectionism groups demonstrated the most elevated clinical symptoms. The High Adaptive and Maladaptive Perfectionism group demonstrated low affective disturbances, but elevated eating disorder symptoms. Results support the clinical significance of subtyping according to perfectionism dimensions in AN. Research is needed to determine if perfectionism subtyping can enhance individualized treatment targeting in AN.

Keywords

Adaptive perfectionism; Maladaptive perfectionism; Anorexia nervosa; Eating disorder

Perfectionism is a personality construct characterized by setting high personal standards demanding precision and exactitude (Frost et al. 1990). Early research considered perfectionism to be a predominantly negative, unidimensional trait (Pacht 1984). Indeed, substantial evidence supports the link between perfectionism and psychiatric disorders (Flett and Hewitt 2002). However, contemporary research has emphasized that perfectionism may include both maladaptive and adaptive tendencies (Bieling et al. 2004; Frost et al. 1993). Adaptive facets of perfectionism encompass striving for personal standards and achievement, while maladaptive facets involve self-critical evaluation and concerns about others' expectations and critiques (Bieling et al. 2004). In contrast to maladaptive facets of perfectionism, adaptive facets may be protective, as they have been associated with reduced anger, depression, and stress in non-clinical populations (Besharat and Shahidi 2010; Rice and Richardson 2014). Research has demonstrated that non-clinical (e.g., undergraduate) samples can be categorized reliably into subsets characterized by low perfectionism, maladaptive perfectionism, and adaptive perfectionism (Rice and Ashby 2007), as well as mixed groups with elevations on both adaptive and maladaptive forms of perfectionism (Gaudreau and Thompson 2010). When examining clinical correlates of these subgroups, those exhibiting purely maladaptive perfectionism have been found to exhibit the most negative outcomes, and those exhibiting purely adaptive perfectionism the most positive outcomes (Stoeber and Otto 2006).

Perfectionism is emphasized as a key mechanism in theoretical models of anorexia nervosa (AN; Fairburn 2008; Schmidt and Treasure 2006). Perfectionism is elevated among both ill and recovered individuals with AN compared to healthy and psychiatric controls (Bastiani et al. 1995; Halmi et al. 2000; Kaye et al. 2004; Srinivasagam et al. 1995) and has been linked to greater eating disorder and affective severity in this population (Halmi et al. 2000; Kaye et al. 2004). Few studies have examined maladaptive and adaptive facets of perfectionism independently in AN, limiting the ability to understand which particular aspects of this construct may be harmful to those with this disorder. Studies that have separated these dimensions of perfectionism have found that both are elevated across symptomatic and

recovered AN groups compared to healthy controls (Bastiani et al. 1995; Halmi et al. 2000; Srinivasagam et al. 1995). However, initial evidence suggests that maladaptive perfectionism may be particularly linked with negative outcomes in AN. Facets of maladaptive perfectionism (e.g., concern over mistakes and doubts about actions) have been found to differentiate individuals with eating disorders from non-clinical and psychiatric controls, while aspects of adaptive perfectionism (e.g., high personal standards) have not (Ashby et al. 1998; Bulik et al. 2003). Further, a recent analysis from the same dataset as used in this investigation found that a composite maladaptive perfectionism score was associated with the severity of cognitive eating disorder symptoms in AN (Lavender et al. 2016). In contrast, there has been little investigation of the independent effects of adaptive components of perfectionism in AN. Therefore, it is unclear whether adaptive perfectionism facets are harmful or protective in AN. The impact of elevations on one dimension of perfectionism (e.g., maladaptive), but not the other (e.g., adaptive) in this population is also unclear.

Despite data indicating that non-psychiatric groups can be empirically categorized according to adaptive and maladaptive perfectionism (Gaudreau and Thompson 2010; Rice and Ashby 2007), such latent categories of perfectionism only have been investigated in relation to eating disorder symptoms in two studies. One study, conducted in a non-clinical adolescent sample, found that those in an elevated adaptive perfectionism latent class had significantly lower eating-related symptoms compared to subgroups with elevated scores on maladaptive perfectionism (Boone et al. 2010). Another study classified a heterogeneous eating disorder group according to perfectionism and impulsivity and found that a subgroup endorsing elevated adaptive and maladaptive perfectionism had greater eating disorder and co-morbid psychopathology compared to other personality profiles (Slof-Op't Landt et al. 2016). To date, empirical classification methods have not been used to identify perfectionism subgroups specifically in AN, despite the emphasis on this variable in the theory and treatment of this eating disorder population. Investigation of empirically derived perfectionism categories among individuals with AN is desirable because it would permit detection of clinically meaningful heterogeneity within an allegedly homogenous diagnostic category (Wonderlich et al. 2007), enhancing the ability to move towards precise, individualized treatments for clearly defined subgroups with the disorder.

Therefore, in this study, we used the statistical classification method of Latent Profile Analysis (LPA) to empirically derive latent profiles using multiple uncombined facets of perfectionism, including those that have been previously classified as adaptive and maladaptive, within a sample of adult females with AN. We tested the external validity of these profiles to determine whether they were associated with differences in clinical variables measured using baseline assessments and data collected via ecological momentary assessment (EMA). Consistent with prior research, we hypothesized that subgroups with elevations on solely on facets of perfectionism associated with maladaptive features would have greater clinical symptoms compared to subgroups with elevations on more traditionally adaptive facets. Although several manuscripts have been published from the dataset used for these analyses, including manuscripts examining other empirically derived symptom taxonomies (Goldschmidt et al. 2014; Lavender et al. 2013), only one study from this sample has examined effects of perfectionism on clinical variables (Lavender et al. 2016). Because that manuscript focused solely on maladaptive facets of perfectionism, and used

theoretical, rather than empirical classification of maladaptive perfectionism, the current manuscript constitutes a novel contribution to this literature not captured in prior analyses.

Methods

Participants

Participants were adult females ($n = 118$) meeting Diagnostic and Statistical Manual of Mental Disorders 4th Edition (APA 1994) criteria for AN ($n = 59$) or sub-threshold AN ($n = 59$), which was defined as meeting AN criteria except (a) having a BMI between 17.6 to 18.5 kg/m² or (b) not endorsing the amenorrhea or cognitive criteria for AN. Seventy-three (61.9%) participants were diagnosed with AN restricting subtype and 45 (38.1%) with binge eating-purging subtype. The sample was predominantly White (96.6%) with at least some college education (90.7%). The mean age and BMI of the sample were 25.3 ± 8.4 years and 17.2 ± 1.0 kg/m², respectively.

Procedures

Institutional Review Boards at each of three study sites approved this study and all procedures were performed in accordance with the ethical standards of the Declaration of Helsinki. Participants were recruited through referrals and advertisements. After an initial phone screen, all potential eligible participants provided informed consent. Participants then completed two assessment visits involving a physical examination and laboratory tests to ensure medical stability, and structured interviews and questionnaires.

During the first assessment visit, participants received training in the use of the palmtop computer for the EMA protocol. Participants completed two EMA practice days (data not used in analyses) and then two subsequent weeks of EMA. Participants completed EMA ratings when eating disorder behaviors occurred, at the end of each day, and in response to six semi-random signals during waking hours. For semi-random signals, participants delayed reporting if safety was a concern or they felt unable to reply (e.g., while driving). During the two-week protocol, participants had approximately two to three visits to obtain data and provide compliance feedback. Study methods have been described in additional detail elsewhere (Engel et al. 2013).

Measures

Diagnostic Assessment—The Structured Clinical Interview for DSM-IV Axis-I Disorders, Patient Edition (SCID-I/P; First et al. 1995) is a semi-structured interview that was used to assess diagnostic criteria for AN. SCID interviews were recorded and a random sample of 25% ($n = 30$) were rated by a second independent assessor. Interrater reliability based on a kappa coefficient was .93 for AN diagnosis.

Indicator Variables—The Frost Multidimensional Perfectionism Scale (FMPS; Frost et al. 1990) is a 35-item questionnaire assessing major dimensions of perfectionism. The FMPS has high internal consistency and good convergent validity (Frost et al. 1990). Four subscales have been previously conceptualized as reflecting maladaptive aspects of perfectionism: *Parental Expectations (PE)* (e.g., “My parents wanted me to be the best at

everything”; $\alpha = .86$), *Parental Criticism*, (*PC*) (e.g., “My parents never tried to understand my mistakes”; $\alpha = .87$), *Doubts about Action* (*DA*) (e.g., “I usually have doubts about the simple everyday things I do”; $\alpha = .82$), and *Concern over Mistakes* (*CM*) (e.g., “I hate being less than the best at things”; $\alpha = .93$). On the other hand, the *Personal Standards* (*PS*) subscale (e.g., “I am very good at focusing my efforts on attaining a goal”; $\alpha = .86$) has been consistently identified as capturing an adaptive aspect of perfectionism (Stoeber and Otto 2006). The *Organization* (*O*) subscale (e.g., “I try to be an organized person”; $\alpha = .94$) has also been conceptualized as an aspect of adaptive perfectionism, although inconsistently (Kim et al. 2015; Stoeber and Otto 2006). Each subscale was entered individually into the LPA, rather than forming composite scales representing adaptive and maladaptive features of perfectionism as has been done in some other investigations (DiBartolo et al. 2004). Further, the *O* and *PC* subscales were included despite debate about whether or not these subscales capture core domains of perfectionism (Enns et al. 2005; Frost et al. 1990; Kim et al. 2015). This approach was used for several reasons. First, we wished to empirically, rather than theoretically, derive perfectionism subgroups in order to most effectively capture the structure of the data. Utilizing pre-defined composite groups would have limited this approach. Second, in order to allow for the maximum variability within the latent model, thereby optimally specifying the model of perfectionism, we oriented towards inclusivity of indicator variables. Third, the prior investigations of latent perfectionism subtypes, including one conducted in an eating disorder population, utilized each of these scales (Sironic and Reeve 2015; Slof-Op’t Landt et al. 2016), and we wished to allow potential comparability across studies.

External Validators—We examined eating disorder and affective symptoms, measured through baseline self-report and real-time EMA assessments as external validators.

Eating disorder symptoms were assessed at baseline through the Eating Disorder Examination (EDE; Fairburn and Cooper 1995), a semi-structured interview with well-established validity and reliability (Berg et al. 2012). The interview provides a global score reflecting eating disorder psychopathology during the past month. A second independent assessor rated 25% ($n = 31$) of the interviews. Intraclass correlations coefficients for reliability on the EDE scales ranged from .89 to .997. Additionally, specific eating disorder behaviors were assessed by EMA. Participants reported episodes of binge eating, purging (i.e., vomiting and laxative use), exercise, body checking, and self-weighing in real-time. Participants were also asked to report instances of eating and to complete questions regarding restrictive features of the eating episode. Any instance in which the item “I ate as little as possible” was endorsed was coded as restrictive eating in line with prior analyses (Fitzsimmons-Craft et al. 2015). A frequency variable for each behavior was calculated as the average number of episodes reported per week.

Affective symptoms were assessed at baseline using the Beck Depression Inventory (BDI; Beck et al. 1961), a 21-item questionnaire with well-established psychometric properties (Beck et al. 1988) ($\alpha = .92$), to baseline depressive symptomology, and the state subscale of the Spielberger State-Trait Anxiety Inventory (STAI; Spielberger 1983) ($\alpha = .95$), a psychometrically sound 40-item questionnaire, to measure anxiety symptoms. Additionally, average negative and positive affect were measured via EMA. Momentary positive and

negative mood states were measured at every EMA report using sixteen items from the Positive and Negative Affect Schedule – Expanded Form (Watson and Clark 1994) that were selected for high factor loadings and theoretical relevance to AN. Negative affect items included: afraid, angry at self, ashamed, nervous, disgusted, dissatisfied with self, distressed, and sad ($\alpha = .94$). Positive affect items included: strong, enthusiastic, proud, attentive, happy, energetic, confident, and cheerful ($\alpha = .92$). For each participant, the mean of all EMA ratings of negative and positive affect was calculated to create individual-level variables reflecting average negative and positive affect during the two-week EMA period.

Statistical Analyses

Latent Profile Analysis (LPA)—LPA is an extension of latent class analysis appropriate for continuous indicator variables that statistically classifies individuals into latent categorical groups, rather than relying upon researcher-derived classifications, which may not accurately identify meaningful covariance among individuals. This approach relies on the principal of conditional independence; within each identified class, indicator variables should be uncorrelated (Vermunt and Magidson 2005). Latent Gold version 4.5 (Statistical Innovations, Inc., Belmont, MA) was used to fit 1- to 8-class LPA models with FMPS subscales as indicator variables. The Bayesian Information Criterion (BIC; Schwarz 1978) and Consistent Akaike Information Criterion (cAIC; Bozdogan 1987) were used to identify the best fitting model. Posterior Bayesian probabilities were utilized in determining class membership. A multivariate analysis of variance with Tukey's HSD post-hoc comparisons was used to compare identified classes on the FMPS subscales.

External Validation of LPA Subgroups—Several baseline demographic and clinical variables (i.e., age, BMI, ethnicity, education level, and AN subtype) were compared between profiles using generalized linear modeling (GLM) to determine if any warranted inclusion as covariates in the validation models. To externally validate the LPA-identified profiles, GLM was conducted comparing perfectionism latent classes on eating disorder and affective symptoms. Linear models were used for STAI state anxiety and EMA positive affect, which were continuous and symmetrical, whereas gamma with log link models were used for all other models, which involved positively skewed data. We corrected for multiple comparisons using the Benjamini and Hochberg (1995) procedure with a 5% false discovery rate.

Results

Latent Profile Analysis

The PE subscale of the FMPS was excluded from the final model due to high intercorrelations with other subscales, violating the assumptions of LPA. The results of the final model, involving the remaining FMPS subscales, supported a 4-class solution (see Table 1). The identified profiles represented the following subgroups: (a) Low Perfectionism (Class 1: $n = 34$; 28.81%); (b) High Adaptive and Maladaptive Perfectionism (Class 2: $n = 31$; 26.27%); (c) Moderate Maladaptive Perfectionism (Class 3: $n = 38$; 32.20%); and (c) High Maladaptive Perfectionism (Class 4: $n = 15$; 12.71%). Perfectionism subgroups differed significantly on all FMPS subscales (see Fig. 1). The High Adaptive and

Maladaptive Perfectionism group scored the highest on PS and O sub-scales, and moderately high on CM, DA, and PC subscales. The Moderate Maladaptive Perfectionism group scored moderately high on CM, DA, and PC subscales and low on PS and O subscales. The High Maladaptive Perfectionism group had the highest scores on CM, DA, and PC subscales, a high score on the PS subscale, but a low on the O subscale. The Low Perfectionism group had the lowest scores on all subscales, with scores on all subscales falling within previously reported normative range (Frost et al. 1990).

External Validation of LPA Subgroups

Perfectionism subgroups did not differ in age, BMI, ethnicity, education level, or AN subtype (see Table 2). Therefore, these variables were not included as covariates in subsequent analyses.

Eating Disorder Symptoms—Perfectionism subgroups significantly differed on EDE global score and EMA purging, restrictive eating, and body checking frequency (see Table 2). Post-hoc comparisons indicated that the Low Perfectionism group demonstrated lower EDE global scores than all other profiles (High Adaptive and Maladaptive Perfectionism: $p = .001$, $d = .81$; Moderate Maladaptive Perfectionism: $p < .001$, $d = 1.24$; High Maladaptive Perfectionism: $p < .001$, $d = 1.40$). On EMA measures, the Low Perfectionism group reported less purging than the Moderate Maladaptive Perfectionism group ($p = .001$, $d = .58$), less restrictive eating than the High Adaptive and Maladaptive Perfectionism ($p < .001$, $d = .97$) and Moderate Maladaptive Perfectionism ($p < .001$, $d = .73$) groups, and less body checking than all other profiles (High Adaptive and Maladaptive Perfectionism: $p = .001$, $d = .83$; Moderate Maladaptive Perfectionism: $p = .001$, $d = .89$; High Maladaptive Perfectionism: $p = .02$, $d = 1.10$). Thus, the pattern of results indicated lower eating disorder pathology among the Low Perfectionism group versus other profiles.

Affective Symptoms—Perfectionism subgroups also significantly differed on BDI and STAI scores, and EMA average negative and positive affect (see Table 2). Post-hoc comparisons indicated that the Low Perfectionism group had lower BDI scores than all other profiles (High Adaptive and Maladaptive Perfectionism: $p = .006$, $d = .73$; Moderate Maladaptive Perfectionism: $p < .001$, $d = 1.11$; High Maladaptive Perfectionism: $p < .001$, $d = 2.13$) and lower STAI scores than the Moderate ($p < .001$, $d = .91$) and High ($p = .001$, $d = 1.29$) Maladaptive Perfectionism groups. The High Adaptive and Maladaptive Perfectionism group also scored lower on the STAI than the Moderate ($p = .009$, $d = .68$) and High ($p = .007$, $d = 1.06$) Maladaptive Perfectionism groups.

For EMA mood measures, the Low Perfectionism group reported lower negative affect than the Moderate ($p = .001$, $d = .75$) and High ($p = .01$, $d = .77$) Maladaptive Perfectionism groups and higher positive affect than the Moderate ($p < .001$, $d = .97$) and High ($p = .003$, $d = .90$) Maladaptive Perfectionism groups. The High Adaptive and Maladaptive Perfectionism group also reported lower negative affect ($p = .01$, $d = .63$) and higher positive affect ($p = .007$, $d = .67$) compared to the Moderate Maladaptive Perfectionism group. In sum, the overall pattern of results demonstrated lowest affective symptoms among the Low Perfectionism group, but also fewer affective symptoms among the High Adaptive and

Maladaptive Perfectionism group compared to groups characterized primarily by maladaptive perfectionism.

Discussion

We examined for the first time whether women with AN could be empirically categorized into distinct subgroups according to adaptive and maladaptive dimensions of perfectionism and whether these subgroups would demonstrate differing severity on eating disorder and affective variables. Although maladaptive features of perfectionism have been linked to key symptoms among individuals with AN (Ashby et al. 1998; Boone et al. 2010; Bulik et al. 2003; Lavender et al. 2016; Slof-Op't Landt et al. 2016), little has been known regarding the influence of more adaptive features of this construct on clinical variables in AN.

Additionally, there have been no investigations to determine if different individuals with AN vary on perfectionistic qualities, and whether any variations are associated with clinically meaningful outcomes. This information would assist in moving towards optimized clinical interventions targeting perfectionistic features in a more nuanced manner according to individual presentation.

Using LPA, we identified four discrete perfectionism subtypes. Two subtypes, comprising nearly half of the sample, were associated with elevations primarily on traditionally maladaptive facets of perfectionism at differing levels of severity (Moderate and High Maladaptive Perfectionism groups). Another subgroup, accounting for just over one quarter of the sample, was characterized by elevations on all facets of perfectionism (High Adaptive and Maladaptive Perfectionism group). Finally, the last subgroup, also accounting for approximately one quarter of the sample, had the lowest levels on all aspects of perfectionism (Low Perfectionism group). Unlike prior investigations in non-clinical samples (Gaudreau and Thompson 2010; Rice and Ashby 2007), we did not identify a subgroup characterized by solely adaptive features of perfectionism, which likely reflects the clinical nature of the current sample.

The Low Perfectionism group exhibited the most optimal functioning in terms of eating disorder pathology (i.e., lowest EDE scores and EMA purging, restrictive eating, and body checking frequency) and affective symptoms (i.e., lowest depression, anxiety, and EMA negative affect, and highest EMA positive affect). Additionally, the High Adaptive and Maladaptive Perfectionism group demonstrated better affective functioning (i.e., lower anxiety and negative affect, and higher positive affect) than the Moderate and High Maladaptive Perfectionism groups. However, the High Adaptive and Maladaptive Perfectionism group endorsed elevated eating disorder symptoms, especially restrictive eating and body checking. These findings validate that discrete subgroups demonstrating differing clinical profiles can be identified based on facets of perfectionism, including maladaptive and adaptive aspects of this construct.

The elevated psychopathology among the Moderate and High Maladaptive Perfectionism groups parallels prior research indicating that maladaptive characteristics of perfectionism are associated with negative outcomes in AN (Ashby et al. 1998; Boone et al. 2010; Bulik et al. 2003; Lavender et al. 2016; Slof-Op't Landt et al. 2016). In contrast, few studies have

examined whether adaptive forms of perfectionism are problematic in AN. The results of this study correspond with theories that posit a 2 (maladaptive: yes/no) $\times$ 2 (adaptive: yes/no) model of perfectionism, in which individuals exhibiting features of both adaptive and maladaptive aspects of perfectionism are expected to experience mixed positive and negative outcomes (Gaudreau and Thompson 2010). For example, similar to findings by Slof-Op't Landt et al. (2016), individuals in this study in the High Adaptive and Maladaptive Perfectionism group demonstrated problematic eating pathology; however, this same group had fewer affective difficulties than those only exhibiting maladaptive characteristics. These results may be partially explained in connection with the affect regulation literature in AN. Certain eating disorder behaviors (e.g., purging, restrictive eating, body-checking) have been found to regulate affect among individuals with AN (Engel et al. 2013; Espeset et al. 2012; Haynos et al. 2017). However, the mechanism by which these behaviors impact mood remains unclear. It could be that these eating disorder behaviors regulate affect for individuals with adaptive traits of perfectionism through a fulfillment of high personal eating and weight standards, which then results in fewer reported affective difficulties. Further research is needed to clarify the relationship between adaptive perfectionism, eating disorder symptoms, and affect.

The Moderate and High Maladaptive Perfectionism groups did not generally differentiate on external validator variables. Further, the Moderate Maladaptive Perfectionism group surprisingly displayed greater severity in purging and restrictive eating compared to the High Maladaptive Perfectionism group. Both the Moderate and High Maladaptive Perfectionism groups exhibited elevated FMPS scores on traditionally maladaptive subscales (e.g., CM, DA, and PC) compared to norms (Frost et al. 1993); therefore, the similarities between these two subgroups may reflect a ceiling effect for maladaptive qualities of perfectionism. Alternatively, the High Maladaptive Perfectionism group scored considerably higher than the Moderate Maladaptive Perfectionism group on the PS subscale, which has been considered a more adaptive component of perfectionism, perhaps providing protection against certain negative outcomes. Further, the High Maladaptive Perfectionism group was relatively small ($n = 15$). Therefore, the analyses may have been underpowered to detect significant distinctions between the High Maladaptive Perfectionism group and other subtypes. Future replications of this perfectionism taxonomy are needed to determine whether the Moderate and High Maladaptive Perfectionism groups are better understood as distinct categories or severity markers along a continuum.

There are important clinical implications of our findings. First, this study adds to a growing literature that has identified heterogeneity in process variables within specific eating disorder diagnoses (Wildes and Marcus 2013; Wonderlich et al. 2007). Importantly, these results suggest that different intervention approaches could be warranted for different subsets of individuals with the same diagnosis (e.g., AN). For instance, although perfectionism has been targeted as a key mechanism in treatments of AN (Fairburn 2008; Schmidt and Treasure 2006), these data suggest that a substantial portion of individuals with AN may not exhibit elevated perfectionistic concerns and, therefore, may not require substantial focus on this variable in treatment. Additionally, the subset of individuals with AN who exhibit high scores on all facets of perfectionism may warrant an intervention that differs from traditional approaches, perhaps one that emphasizes utilizing the potential strengths of high personal

standards and organization in an adaptive manner that does not promote disordered eating, rather than simply decreasing perfectionistic qualities. These findings also suggest that treating individuals with eating disorders transdiagnostically according to common processes (e.g., maladaptive and/or adaptive perfectionism) may have advantage over attending to diagnosis alone (Wonderlich et al. 2007). Accordingly, one avenue for future research would be to test this model in a heterogeneous eating disorder sample in order to test the hypothesis that these latent groups reflect putative mechanisms shared across eating disorder samples.

However, the results also indicate that targeting perfectionism, especially maladaptive features of perfectionism, in treatment may be helpful for the majority of individuals with AN. Existing treatments for AN include a focus on altering perfectionistic patterns (Fairburn 2008; Schmidt and Treasure 2006); however, these tendencies are often addressed later in treatment (Fairburn 2008). Because perfectionism and eating and affective patterns appear to be linked, simultaneously targeting eating behavior and perfectionism early in treatment may promote more rapid symptom amelioration for many individuals with AN. Further, eating disorder treatments generally do not distinguish between targeting maladaptive and adaptive perfectionism characteristics. Because the High Adaptive and Maladaptive Perfectionism group fared better than the Moderate and High Maladaptive Perfectionism groups in terms of affect, there may be utility in prioritizing targeting maladaptive aspects of perfectionism over adaptive aspects of perfectionism in treatment. However, this study did not directly examine adaptive and maladaptive perfectionism as treatment targets and, because a group solely characterized by adaptive perfectionism was not identified, the degree to which adaptive perfectionism contributes to clinical symptoms remains unclear. Therefore, these clinical hypotheses require empirical testing. Future directions for this line of research should include testing if these perfectionism profiles predict or moderate treatment response.

There are notable strengths of this study, including the use of advanced statistical categorization methods, the examination of EMA validator variables, which lend greater external validity to the investigation, and the relatively large sample. Further, this is one of very few studies to examine the role of adaptive facets of perfectionism in AN, and the only to use empirical methods to cluster individuals with AN according to perfectionistic tendencies. There are also limitations. Although we chose to include the O and PC subscales in order to be inclusive in our latent models, there is debate regarding whether these subscales reflect core features of perfectionism (Enns et al. 2005; Frost et al. 1990). Further, although we followed a precedent for labeling FMPS subscales according to maladaptive and adaptive aspects of perfectionism (Slof-Op't Landt et al. 2016), other approaches have been used to categorize these dimensions. For instance, in some prior studies PS subscale has been altered to remove items that are least related to fear of negative evaluation in order to reflect pure adaptive qualities (Dibartolo et al. 2004). Future examinations using variations on the measurement of maladaptive and adaptive perfectionism are needed to validate the profiles identified in this study. This study was also cross-sectional, limiting the ability to determine causality between perfectionism and clinical symptoms. Finally, concepts of adaptive and maladaptive concepts of perfectionism are socially constructed. Although high personal standards and organization are considered adaptive within Western

culture, this does not guarantee that these qualities function effectively for all individuals or would be adaptive in other cultural contexts.

Conclusions

This study provides evidence that women with AN can be categorized into empirically-derived subgroups according to different dimensions of perfectionism, including those reflecting adaptive and maladaptive features of this construct, and that these subgroups differ in clinical profile. Further research is warranted to determine the utility of precision interventions to differentially target maladaptive and adaptive facets of perfectionism according to perfectionism profile.

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Fig. 1.

Latent profile analysis indicators by perfectionism subtype. Note: PS = Personal Standards subscale; O = Organization subscale; CM = Concern over Mistakes subscale; DA = Doubt about Actions subscale; PC = Parental Criticism subscale. Different subscripts denote significant differences ($p < .05$) between perfectionism subtype

Table 1

Fit Indices for 1- to 8-Class latent profile analysis models

Number of Classes	Number of Parameters	LL	BIC	cAIC
1	10	-1832.27	3712.26	3722.26
2	21	-1760.43	3621.05	3642.05
3	32	-1728.93	3610.52	3642.52
4	43	-1690.62	3586.38	3629.38
5	54	-1679.99	3617.59	3671.59
6	65	-1657.08	3624.26	3689.26
7	76	-1648.26	3659.10	3735.10
8	87	-1638.55	3692.15	3779.15

LL, Log-likelihood; *BIC*, Bayesian Information Criterion; *cAIC*, Consistent Akaike Information Criterion. The best fitting model is indicated in bold

Table 2

Comparison of perfectionism subtypes on demographics, eating disorder symptoms, and affective symptoms

Dependent variable	Perfectionism subtype		Test Statistic		Effect Size	
	Low (<i>n</i> = 34)	High Adaptive and Maladaptive (<i>n</i> = 31)	Moderate Maladaptive (<i>n</i> = 38)	High Maladaptive (<i>n</i> = 15)	<i>Wald</i> χ^2 (<i>df</i>)	<i>p</i>
	<i>M</i> (<i>SD</i>) or %	<i>M</i> (<i>SD</i>) or %	<i>M</i> (<i>SD</i>) or %	<i>M</i> (<i>SD</i>) or %		<i>Partial</i> η^2
Demographics						
Age	24.91 (7.90) ^a	24.20 (7.48) ^a	26.45 (10.09) ^a	24.20 (6.48) ^a	1.39	.707
BMI	16.91 (1.06) ^a	17.23 (0.89) ^{ab}	17.08 (1.20) ^{ab}	17.68 (0.77) ^b	5.95	.114
Ethnicity (% White)	94.1% ^a	96.8% ^a	100.0% ^a	93.3% ^a	0.22	.953
Education level (% some college)	94.1% ^a	93.6% ^a	89.5% ^a	86.7% ^a	1.09	.781
Diagnostic subtype (% restricting)	67.7% ^a	67.7% ^a	55.3% ^a	53.3% ^a	2.08	.555
Eating disorder symptoms						
EDE Global	1.85 (1.19) ^a	2.80 (1.19) ^{ab}	3.25 (1.11) ^b	3.44 (1.08) ^b	26.40	<.001 [*]
EMA Binge Eating Frequency	0.64 (1.21) ^a	1.16 (2.39) ^{ab}	1.63 (2.93) ^b	1.26 (2.01) ^{ab}	7.78	.050
EMA Purging Frequency	1.08 (2.43) ^a	2.22 (4.72) ^{ab}	3.47 (5.28) ^b	2.03 (2.57) ^{ab}	12.90	.005 [*]
EMA Exercise Frequency	2.43 (2.83) ^a	3.52 (4.03) ^a	3.31 (4.35) ^a	2.10 (2.70) ^a	3.61	.307
EMA Restrictive Eating Frequency	2.78 (3.91) ^a	8.62 (7.85) ^b	7.04 (7.20) ^b	5.71 (4.44) ^{ab}	24.67	<.001 [*]
EMA Body Checking Frequency	5.10 (9.80) ^a	18.97 (22.36) ^b	18.09 (18.23) ^b	18.23 (16.38) ^b	24.82	<.001 [*]
EMA Self-Weighing Frequency	1.52 (2.31) ^a	3.14 (5.81) ^b	2.16 (2.79) ^{ab}	3.53 (3.48) ^{ab}	8.14	.043
Affective symptoms						
BDI	13.18 (9.47) ^a	20.84 (11.80) ^b	26.34 (13.95) ^b	34.13 (11.28) ^b	32.18	<.001 [*]
STAI State Anxiety	42.85 (11.78) ^a	45.74 (13.42) ^{ab}	53.95 (12.79) ^b	57.67 (11.70) ^b	24.12	<.001 [*]
EMA Negative Affect	15.60 (8.06) ^a	16.90 (6.76) ^{ac}	21.01 (6.61) ^b	21.39 (6.79) ^{bc}	15.95	.001 [*]
EMA Positive Affect	20.47 (5.08) ^a	19.34 (5.62) ^{ac}	16.23 (3.77) ^b	16.10 (4.73) ^{bc}	19.15	<.001 [*]

EDE, Eating Disorder Examination (Fairburn and Cooper 1995); *EMA*, ecological momentary assessment; *BDI*, Beck Depression Inventory (Beck et al. 1961); *STAI*, Spielberger State-Trait Anxiety Inventory (Spielberger 1983). Different superscripts denote significant differences between groups

^{*} significant after Benjamini-Hochberg corrections