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## Different clusters of perfectionism in inpatients with anorexia nervosa and healthy controls

Paola Longo <sup>a</sup>, Matteo Aloï <sup>b</sup>, Nadia Delsedime<sup>a</sup>, Marianna Rania <sup>b</sup>,  
Cristina Segura Garcia <sup>c</sup>, Giovanni Abbate-Daga <sup>a</sup>, and Enrica Marzola <sup>a</sup>

<sup>a</sup>Eating Disorders Center, Department of Neuroscience “Rita Levi Montalcini”, University of Turin, Turin, Italy; <sup>b</sup>Department of Health Sciences, University “Magna Graecia” of Catanzaro, Catanzaro, Italy; <sup>c</sup>Department of Medical and Surgical Sciences, University “Magna Graecia” of Catanzaro, Catanzaro, Italy


### ABSTRACT

Perfectionism is a risk and maintaining factor for anorexia nervosa (AN) but studies on its classification are lacking. This study aimed to classify patients with AN and healthy controls (HCs) according to their perfectionism; to evaluate the association between perfectionism clusters and severity of general and eating psychopathology for both groups; to investigate the relationship between baseline perfectionism and hospitalization outcome for patients. A sample of 207 inpatients with AN and 292 HCs completed: Eating Disorders Inventory-2, Frost Multidimensional Perfectionism Scale, Beck Depression Inventory, and State-Trait Anxiety Inventory. Cluster analyses were run to classify participants according to their perfectionism scores. Three clusters (i.e., high, medium, low perfectionism) emerged for both patients with AN and HCs. The high perfectionism cluster was over-represented among patients. Both groups reported significant differences across clusters in eating-related difficulties. In AN, anxiety and depression severity varied across clusters according to perfectionism, but patients' baseline perfectionism was unrelated to hospitalization outcome. Inpatients with AN and HCs could be grouped in clusters of high, medium, and low perfectionism which also mirrored their eating psychopathology severity. Finally, hospitalization outcome was unrelated to inpatients' baseline perfectionism.

### Clinical implications

- Patients (AN) and controls (HCs) were classified into three perfectionism clusters
- The clusters were defined as high, medium, and low perfectionism for both AN and HCs
- Higher perfectionism mirrored greater psychopathology in AN and HCs
- Higher perfectionism was related to more severe symptoms not only in AN acute phase

**CONTACT** Giovanni Abbate-Daga  [giovanni.abbatedaga@unito.it](mailto:giovanni.abbatedaga@unito.it)  Eating Disorders Center, Department of Neuroscience, “Rita Levi Montalcini”, University of Turin, Via Cherasco 11, Turin 10126, Italy

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- Patients' baseline perfectionism does not influence brief term treatment outcomes

## Introduction

Anorexia nervosa (AN) is a debilitating mental illness characterized by restricting eating patterns and body image disturbances leading to low body weight (APA, 2013). Patients with AN present marked emotion dysregulation and relevant comorbidities; moreover, personality traits, including perfectionism, are now considered as risk factors for eating disorders (EDs) (Donahue et al., 2018; Elliott et al., 2018).

Perfectionism is a complex construct that could be defined as “the tendency to set high standards and employ overly critical self-evaluation” (Frost & Marten, 1990, p. 559). Although earlier studies defined perfectionism as a unidimensional concept (Burns, 1980), since 1990 (Frost & Marten, 1990) a multidimensional view of perfectionism has gained interest (Frost & Marten, 1990). Research later also proposed a distinction between adaptive and maladaptive perfectionism. The first is characterized by healthy experiences of satisfaction after goal achievement, and failures are not followed by extreme self-critical attitudes which instead characterize maladaptive perfectionism (Stoltz & Ashby, 2007).

Many studies agreed on the key role of perfectionism in psychopathology, describing it as a transdiagnostic and maintaining factor in a variety of mental disorders (Dahlenburg et al., 2019; Flett et al., 2016; Limburg et al., 2017). Perfectionism has been shown to be a maintenance factor for AN (Fairburn et al., 2003; Schmidt & Treasure, 2006) with genetic underpinnings: twin studies suggested higher importance of genetic factors than the environment in the transmission of perfectionism (Culbert et al., 2015). Indeed, patients with AN showed higher levels of perfectionism compared not only to healthy controls but also to other psychiatric groups (Farstad et al., 2016) both during the acute phase of the illness and after recovery (Strober et al., 2000). Relatedly, many researchers described perfectionism as a risk and maintaining factor for AN since it may enhance patients' thinness ideal and adherence to diets (Thornton et al., 2017).

Perfectionism is also linked to the severity of eating and affectivity-related symptoms, psychiatric comorbidities, suboptimal neuropsychological performances, and negative outcomes (Buzzichelli et al., 2018; Drieberg et al., 2019; Haynos et al., 2018; Slof-Op't Landt et al., 2016). More in detail, anxiety has been found to mediate the relationship between perfectionism and eating symptoms (Egan et al., 2013) and, as stated before, perfectionism is considered as a transdiagnostic factor across EDs, anxiety, and depression (Drieberg et al., 2019). Still, anxiety and depression are frequently comorbid with AN (Abbate

Daga et al., 2011; Ulfvebrand et al., 2015) and overall relevant since often precede the onset of EDs (Keski-Rahkonen et al., 2014; Klump et al., 2004). Therefore, it could be relevant to take anxiety and depression into account when investigating perfectionism in AN.

To date, there is a paucity of classification studies on perfectionism with only three studies classifying patients with EDs according to their perfectionism (Boone et al., 2010; Haynos et al., 2018; Slob-Op't Landt et al., 2016). The first, conducted on a sample with mixed diagnoses of EDs (i.e., AN, bulimia nervosa, binge-eating disorder, and ED not otherwise specified), found higher severity of eating-related pathology in individuals with elevated adaptive and maladaptive perfectionism (Slob-Op't Landt et al., 2016). The second study recruited a non-clinical sample of adolescents reporting marked eating-related symptoms in individuals with maladaptive perfectionism (Boone et al., 2010). The last study described heightened eating and affective-related pathology and worse outcomes in those with elevated maladaptive perfectionism (Haynos et al., 2018). Taken together, the current literature investigated specific aspects of perfectionism (i.e., adaptive versus maladaptive) mostly on samples with mixed diagnoses of EDs; therefore, classification studies on global perfectionism focused specifically on AN are lacking.

Given these gaps in the literature, we became interested in developing a novel classification of perfectionism based on cluster analysis. This technique makes it possible to classify participants based on the principle of similarity (i.e., the members of a group are similar to the ones of their group, and different from the ones belonging to other groups). Thus, cluster analysis can reveal the internal structure of the data, showing a potential pattern useful to distinguish the cases (Clatworthy et al., 2005). Therefore, the present study was designed aiming: a) to cluster and classify patients with AN and healthy controls (HCs) according to their perfectionism; b) to evaluate the association between perfectionism clusters and severity of general and eating psychopathology for both groups; c) to study the association between patients' total score of baseline perfectionism and clinical outcome including changes in eating-related, depressive, and anxious symptoms.

We hypothesized to find, across AN and HC groups, clusters characterized by different levels of perfectionism (i.e., low, medium, and high perfectionism) eventually mirroring the severity of anxiety and depressive symptoms, and eating-related difficulties, in both patients and HCs. Additionally, we expected a negative association between baseline perfectionism and hospitalization outcome, so that higher levels of perfectionism could be linked to poorer symptom improvement.

## Method

### Participants

We consecutively recruited 223 inpatients with AN hospitalized at the Psychiatry ward of Eating Disorders Center; however, 5 candidates refused to participate in this study, 8 provided incomplete assessment, and 3 did not meet inclusion criteria. So the clinical sample included 207 inpatients with AN, of which 135 with restricter (AN-R) and 72 with binge-purging (AN-BP) subtype of AN. All patients met the criteria for AN according to DSM-5 (APA, 2013), as assessed by an experienced psychiatrist administering the Structured Clinical Interview for DSM-5 (First et al., 2015) upon admission. To ensure data generalizability, we focused our research on patients meeting the following inclusion criteria: (a) age range: 18–55 years-old; (b) absence of alcohol or substance use; (c) absence of medical problems (e.g., diabetes and epilepsy).

All patients were voluntarily admitted in a severe and acute phase of AN. Individualized treatment plans were provided (National Institute for Health and Care Excellence, 2017) with a multidisciplinary approach. The main goal of treatment was the resolution of the life-threatening clinical condition, potentially achieving the improvement of both eating patterns and motivation to undergo further treatments.

A sample of 320 HCs was recruited at two Universities sites among medical and psychology students, residents, and individuals interested in contributing to research; participants were contacted through online advertisements, flyers, and word of mouth. Ten participants refused to provide written informed consent to the study, assessments were not complete in 13 cases, and 5 did not meet inclusion criteria; thus, the final HCs sample consisted of 292 individuals. To ensure a reliable comparison group, we applied the following exclusion criteria for HCs: (a) age lower than 18 years-old, and higher than 55 years-old; (b) use of psychotropic medications; (c) lifetime history of mental and medical disorders (e.g., diabetes, epilepsy).

All participants provided written informed consent according to the Ethical Committee of the Institutions where the study was carried out.

### Procedure and measures

Trained nurses measured patients' weight and height to acquire body mass index (BMI) at hospital admission (T0). At T0, patients were also interviewed by an experienced psychiatrist to collect clinical and demographic data.

HCs were interviewed to verify exclusion criteria and completed the Eating Disorders Inventory—2 (Garner, 1991) and the Frost Multidimensional Perfectionism Scale (Frost & Marten, 1990) at one time-point. Differently, patients completed both at T0 and end of treatment (EOT) the following self-report questionnaires:

- Eating Disorders Inventory—2 (EDI—2; Garner, 1991): the inventory provides a measure of eating-related pathology with 11 subscales: drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fear, asceticism, impulse regulation, social insecurity. We included in the analyses only the first three, known as the symptomatic subscales of the EDI-2, assessing attitudes towards eating, weight, and body (Garner, 1991; Segura-García et al., 2015). The questionnaire was scored according to the manual guidelines: higher scores corresponded to more severe symptoms. Internal consistency of the Italian validation is good with Cronbach's alpha  $> .90$  (Calugi et al., 2017).
- Frost Multidimensional Perfectionism Scale (FMPS; Frost & Marten, 1990): the questionnaire assesses the main components of perfectionism. It consists of 35 items on a five-point scale ranging from 1 (*total disagreement*) to 5 (*complete agreement*). The questionnaire is organized into seven subscales: concern over mistakes, personal standards, parental expectations, parental criticism, doubts about actions, organization, total score. Higher scores are associated with higher perfectionism traits. The Italian version of the measure has a good internal consistency, with an alpha  $> .75$  (Lombardo, 2008). Cronbach's alpha in the sample was .93.
- Beck Depression Inventory (BDI; Beck et al., 1961): the measure assesses depression severity through 13 items ranging from 0 (low depressive symptoms) to 3 (high depressive symptoms). Global score 0–4, 5–15, and 16–39, respectively, indicate low, moderate, and severe depressive symptomatology. The internal consistency has a mean alpha of .86 (Wang & Gorenstein, 2013).
- State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983): the tool measures anxiety levels. It includes two sets of questions: 20 items evaluate state anxiety (i.e., a transitory state), and other 20 questions assess trait anxiety (i.e., a stable trait) through a Likert scale from 1 (never) to 4 (always); higher scores correspond to higher anxiety. The measure has a high internal consistency (Cronbach's alpha between .86-.95; Spielberger, 2010).

### **Statistical analysis**

Cluster analyses, hierarchical and k-means ones, were performed to classify participants according to perfectionism scores. Firstly, we conducted hierarchical cluster analysis on patients group to decide the number of clusters to adopt. Hierarchical cluster analysis includes a series of steps in which cases are joined together according to their similarities. Each step of the process is described in a dendrogram, a schematic part of the analysis output. Examining the output the researcher can detect the appropriate number of

clusters to adopt (Clatworthy et al., 2005). In particular, we used the process of tree cutting, included in the stopping rules, which consists of cutting the dendrogram at the stage where the cluster coefficients rise exponentially, namely at the step in which the dissimilarity increases inconsistently (Clatworthy et al., 2005; Everitt, 2005); then we applied the formula [number of cases—number of stages = number of clusters]. Then k-means cluster analysis was run introducing the number of clusters detected by the previous analysis also for the HCs group to make the study homogenous. K-means enables to create a new categorical variable assigning each subject to a cluster; this variable was used for the following analysis.

One-way ANOVA with eta-squared ( $\eta^2$ ) calculation and Tukey post-hoc analysis was used to investigate differences in continuous variables across clusters, and Fisher's exact test to assess differences in categorical variables. Differences were estimated as small  $\eta^2 = .01-.06$ ; moderate  $\eta^2 = .06-.14$ ; large  $\eta^2 > .14$  (Cohen, 1988). Differences in the proportion of patients and HCs for each cluster were analyzed with Fisher's exact test.

A paired-sample t-test was used to investigate changes in clinical outcomes. In order to ascertain if perfectionism was associated with changes in symptoms during hospitalization, a linear regression analysis was run considering total perfectionism score at T0 as the independent predictor and the deltas (e.g., BDI score at T0—BDI at EOT) of clinical variables (i.e., STAI, BDI, and the three core subscales of the EDI-2: drive for thinness, bulimia and body dissatisfaction) as dependent variables. When regression results were significant, the model (i.e., T0 scores and deltas of clinical variables) was adjusted for confounding variables (i.e., influent variables according to experienced clinical judgment, namely lifetime minimum BMI and number of previous hospitalizations) to control whether they had a role in the observed differences.

## Results

No significant differences between patients with AN and HCs emerged in age ( $t = 1.632$ ;  $p = .054$ ), while more female participants were in the AN group compared to HCs Fisher's exact test ( $p < .001$ ).

### *Cluster analysis on patients and healthy controls*

The AN group consisted of 194 (93.7%) female and 13 (6.3%) male participants, with an overall mean age of 24.5 years ( $SD = 9.1$ ). As regards clinical variables, mean BMI for patients was 14.71 ( $SD = 2.46$ ), mean lowest lifetime BMI was 13.62 ( $SD = 1.98$ ), mean duration of illness was 6.25 years ( $SD = 7.85$ ).

**Table 1.** Final clusters of perfectionism for patients with AN and healthy controls.

Inpatients with AN (n = 207)			
	High perfectionism (n = 62) Mean (SD)	Medium perfectionism (n = 76) Mean (SD)	Low perfectionism (n = 69) Mean (SD)
Concern over mistakes	39.73 (4.2)	30.97 (6.1)	18.12 (6.4)
Personal standards	30.71 (5.9)	24.86 (5.2)	17.94 (6.2)
Parental expectations	15.19 (5.9)	9.61 (4.1)	9.06 (6.8)
Parental criticism	13.94 (7.2)	9.50 (3.6)	6.80 (2.1)
Doubts about actions	16.69 (7.2)	13.64 (3.4)	9.10 (3.5)
Organization	25.31 (5.1)	23.71 (5.2)	22.00 (5.0)
Total score	142.18 (12.1)	112.26 (8.2)	82.25 (13.9)
Healthy controls (n = 292)			
	High perfectionism (n = 47) Mean (SD)	Medium perfectionism (n = 134) Mean (SD)	Low perfectionism (n = 111) Mean (SD)
Concern over mistakes	31.17 (6.3)	21.90 (4.9)	13.65 (2.8)
Personal standards	27.38 (4.7)	20.88 (4.5)	16.25 (3.9)
Parental expectations	16.64 (4.4)	11.46 (3.8)	7.94 (2.5)
Parental criticism	10.28 (3.5)	7.17 (2.8)	5.53 (2.0)
Doubts about actions	13.34 (3.6)	10.31 (2.6)	8.14 (2.6)
Organization	23.38 (5.1)	21.93 (4.7)	20.30 (4.7)
Total score	122.09 (11.0)	93.64 (7.1)	71.99 (7.4)

FMPS: Frost Multidimensional Perfectionism Scale

We cut the dendrogram of hierarchical cluster analysis at stage 204; then we applied [number of cases—number of stages = number of clusters] as it follows: 207–204 = 3.

K-means analysis classified patients homogeneously across clusters of perfectionism (Table 1). As shown in Table 1, the three clusters were related to total perfectionism mean score: high (30%), medium (36.7%), and low perfectionism (33.3%). K-means cluster analysis classified HCs into three clusters that showed the same trend in perfectionism scores, namely high (16.1%), medium (45.9%), and low perfectionism (38%) (Table 1).

Fisher's exact test showed that the high perfectionism cluster for HCs was significantly smaller than patients' high perfectionism group ( $p < .001$ ), while no significant differences in groups' size between patients and HCs emerged for medium ( $p = .059$ ) and low perfectionism ( $p = .386$ ).

### 2.1 Differences in eating-related, anxiety and depression symptoms across clusters of perfectionism in inpatients with AN

One-way ANOVA showed significant differences across the three clusters in BMI, minimum lifetime BMI, number of hospitalizations, and in all subscales of the EDI-2. The difference in BMI across clusters remained significant also after statistical control for the number of lifetime AN-related hospitalizations. Compared to low perfectionism, medium and high perfectionism clusters showed significantly higher scores on all EDI-2 subscales (see Table 2).



**Table 2.** Differences in eating-related, anxiety and depression symptoms across clusters of perfectionism in patients with AN.

	Inpatients with AN (n = 207)			Statistical analysis					
	High perfec- tionism (HP: n = 62)	Mediumperfectionism (MP: n = 76)	Low perfec- tionism (LP: n = 69)	ANOVA		Tukey post-hoc test			
	Mean (SD)	Mean (SD)	Mean (SD)	F	p	$\eta^2$	HP vs MP	HP vs LP	MP vs LP
Clinical variables									
BMI	15.45(2.6)	14.73(2.4)	13.97(2.0)	5.33	.019 <sup>s</sup>	.06	.251	.004	.170
Age, years	26.59(10.4)	23.17(6.9)	24.74(10.5)	1.91	.152	-	.128	.553	.605
Duration of illness, years	7.42(8.4)	5.38(5.9)	6.52(9.6)	.89	.411	-	.387	.833	.710
Length of hospitalization, days			33.22(13.7)	34.63					
(18.9)	35.66(17.5)	.26	.771	-	.907		.751	.940	
Minimum BMI	13.85(2.1)	13.92(2.0)	13.03(1.7)	3.88	.023	.05	.980	.079	.030
Daily caloric intake before admission	627.38(405.8)	752.68(464.3)	760.86(398.1)	1.43	.243	-	.321	.271	.994
Number of previous hospitalizations		hospitalizations	2.93(3.1)	2.38					(2.6)
1.75(1.3)	3.19	.044	.04	.464	.035		.319		Assessment
EDI-2 Drive for thinness	16.72(6.9)	13.02(7.3)	6.82(7.3)	27.37	<.001	.24	.019	<.001	<.001
Bulimia	3.08(3.5)	3.57(5.7)	1.61(3.4)	3.29	.040	.04	.826	.189	.037
Body dissatisfaction	11.15(6.2)	11.11	16.60(6.4)	14.76	<.001		.006	STAI-	(6.6)
State	62.41(11.8)	56.80(12.8)	45.23(12.1)	28.99	<.001	.25	.043	<.001	<.001
STAI-Trait	64.43(9.1)	59.65(12.3)	46.15(14.5)	33.93	<.001	.28	.104	<.001	<.001
BDI	19.81(7.7)	16.82(7.0)	10.40(6.3)	27.10	<.001	.24	.065	<.001	<.001

BMI = body mass index; EDI-2 = Eating Disorder Inventory—2; STAI = State-Trait Anxiety Inventory; BDI = Beck Depression Inventory.

$\eta^2$  = eta-squared; Cohen's effect size: 0.01–0.06 = small effect; 0.06–0.14 = moderate effect; >0.14 = large effect.

<sup>s</sup>Model adjusted for number of lifetime AN-related hospitalizations.

Significant differences across clusters were found for anxiety and depression, with higher scores in the high and medium than the low perfectionism one (Table 2).

Finally, no differences in the distribution of AN subtypes were found across clusters Fisher's exact test ( $p = .221$ ).

### **Differences in eating-related symptoms across clusters of perfectionism in healthy controls**

One-way ANOVA showed significant differences across the three clusters on all subscales of the EDI-2. Compared to individuals with low perfectionism, those in medium and high perfectionism clusters showed higher scores on all considered variables (Table 3).

**Table 3.** Differences in eating-related symptoms across clusters of perfectionism in healthy controls.

	Healthy controls (n = 292)				Statistical analysis					
	High perfectionism (HP: n = 47)	Medium perfectionism (MP: n = 134)	Low perfectionism (LP: n = 111)		ANOVA			Tukey post-hoc test		
	Mean (SD)	Mean (SD)	Mean (SD)	F	p	$\eta^2$	HP vs MP p	HP vs LP p	MP vs LP p	
Age, years	22.48(3.3)	22.48(3.2)	23.30(3.4)	2.066	.129	-	1.000	.339	.137	
EDI-2										
Drive for thinness	6.94(7.1)	2.80(4.3)	1.80(3.7)	20.652	<.001	.125	<.001	<.001	.220	
Bulimia	2.66(3.7)	1.15(2.3)	1.02(1.8)	8.443	<.001	.055	.001	<.001	.904	
Body dissatisfaction	11.83(8.1)	6.86(6.5)	5.32(5.8)	16.676	<.001	.104	<.001	<.001	.155	

EDI-2 = Eating Disorder Inventory—2.

$\eta^2$  = eta-squared; Cohen's effect size: 0.01–0.06 = small effect; 0.06–0.14 = moderate effect; >0.14 = large effect.

**Table 4.** Association between perfectionism total score upon admission and hospitalization outcomes in severe and acutely ill inpatients with anorexia nervosa (independent predictor FMPS total score at baseline).

		Inpatients with AN (n = 163)				
Factor		R/Adj R <sup>2</sup>	F	B	95% IC for B	p
FMPS total score at baseline	Delta BMI	.213/.039	7.65	.007	.002—-.012	.238 <sup>§</sup>
	Delta daily caloric intake before admission	.101/.004	1.52	1.912	-1.151—4.976	.219
	Delta DT	.074/-.003	.68	.011	-.016—-.038	.411
	Delta BU	.086/-.001	.91	.007	-.008—-.021	.342
	Delta BD	.003/-.008	.01	.001	-.030—-.029	.977
	Delta STAI-State	.015/-.007	.03	.006	-.064—-.076	.864
	Delta STAI-Trait	.042/-.005	.24	-.016	-.079—-.048	.623
	Delta BDI	.112/.005	1.77	.022	-.011—-.055	.186

model adjusted for lifetime minimum Body Mass Index and number of previous hospitalizations.

FMPS: Frost Multidimensional Perfectionism Scale; BMI = body mass index; DT = drive for thinness; BU = bulimia; BD = body dissatisfaction; STAI = State-Trait Anxiety Inventory; BDI = Beck Depression Inventory

### ***Association between baseline perfectionism and clinical outcome for acutely ill and severe inpatients with AN***

Complete assessments (e.g., both T0 and EOT) were available for 163 out of 207 AN inpatients and no patients dropped out from the study. About clinical outcome, the whole sample significantly improved in all variables but body dissatisfaction and the global score of perfectionism after hospitalization (see Supplementary Table).

Perfectionism was significantly associated only with inpatients' change in BMI ( $p = .006$ ) but did not survive statistical correction after adjusting the model for confounders (i.e., lifetime minimum BMI and number of previous hospitalizations; see Table 4).

## **Discussion**

Three clusters corresponding to high, medium, and low perfectionism in both patients with AN and HCs emerged in this study. However, as expected, the proportion of individuals with high perfectionism was larger in patients with AN than in HCs. Significant differences across clusters in eating-related difficulties—mirroring perfectionism levels—were found in both groups. Moreover, in patients with AN, anxiety and depression severity varied across clusters according to the gradient of patients' perfectionism. Interestingly, patients' baseline perfectionism levels were unrelated to hospitalization outcomes.

Our first aim was to investigate whether inpatients with AN could be classified according to perfectionism scores. Cluster analysis identified three

clusters with high, medium, and low perfectionism. Our data are partially comparable to earlier studies (Boone et al., 2010; Haynos et al., 2018; Slof-Op't Landt et al., 2016) but the larger high perfectionism subgroup among patients with AN provides support to perfectionism as a clinical hallmark of AN (Farstad et al., 2016; Halmi et al., 2000).

Secondly, we found significant differences across perfectionism clusters in the severity of eating-related symptoms, anxiety, and depression in patients with AN. As expected, patients with AN in the high and medium perfectionism clusters, compared to those with low perfectionism, showed more severe eating psychopathology, in keeping with previous studies (Boone et al., 2010). In contrast, we found that BMI was higher among those patients with high versus low perfectionism (Fichter et al., 2006; Halmi et al., 2000). Patients with AN and high perfectionism showed a higher number of lifetime AN-related hospitalizations so at first we hypothesized this might have influenced BMI. However, after statistical adjustment, differences in BMI across clusters were still significant. Notwithstanding, inpatients in the high perfectionism cluster showed on one hand higher BMI than those in the other groups, but on the other hand more severe psychopathology than those with lower perfectionism. This “mismatch” between BMI and global psychopathological severity could be read in the light of those lines of research questioning BMI as a measure of patients' severity (Gianini et al., 2017; Machado et al., 2017). However, it is noteworthy that BMI was very low across clusters and corresponded to DSM-5 criteria for severe/extreme AN, so only future research could clarify these matters. Finally, we found patients with high and medium perfectionism reporting more severe depression and anxiety than those with low perfectionism. Therefore, our findings are in keeping with several studies that observed an association between perfectionism and anxiety and depression (Drieberg et al., 2019; Morgan-Lowes et al., 2019; Puccio et al., 2016).

As a third finding, we showed that also HCs could be classified according to their perfectionism levels and, relatedly, that different clusters of perfectionism in HCs mirrored a gradient in eating psychopathology as well. In fact, in HCs the clusterization followed the same trend observed in patients, with three clusters—high, medium, and low perfectionism—emerging also for HCs. However, it is of interest that the size of each cluster was proportioned for patients, while the high perfectionism cluster for HCs was small, suggesting that high perfectionism may be less common in the general population than in AN (Farstad et al., 2016; Halmi et al., 2000).

Similar to patients, HCs with high and medium perfectionism scored higher on all EDI-2 subscales than those with low perfectionism. These data are in line with earlier research describing an association between perfectionism and altered eating patterns in HCs (Bento et al., 2010) and in a non-clinical sample of adolescents (Boone et al., 2010). Notwithstanding, both clusterization and the gradient of perfectionism mirroring eating-related symptoms severity both

in patients with AN and HCs, represent a novel finding. That said, it could be hypothesized that the association between high perfectionism and marked levels of eating psychopathology in patients could be independent of the acute phase of AN, given the same trend reported in HCs.

Finally, the overall hospitalization outcomes (i.e., changes in BMI, eating psychopathology, depression, and anxiety between admission and discharge) of severe and acute inpatients improved independently of their baseline perfectionism. In fact, at the first round of analysis baseline perfectionism seemed to impact on patients' BMI trajectory but, after statistical adjustment, that finding was no longer significant. Therefore, it could be surmised that, despite high perfectionism, patients could report encouraging outcomes at discharge in terms of weight gain and eating, and general psychopathology. All in all, our findings are only partially in line with studies proposing perfectionism as hampering treatment outcome (Mitchell et al., 2013; Sutandar-Pinnock et al., 2003). However, when reading these data, it should be noted that different variables are at play (i.e., age of the sample, type of assessments). Also, data on inpatients are lacking, particularly when hospitalized because of life-threatening conditions with BMI corresponding to severe/extreme AN; therefore, the scientific debate should be considered as much open on this topic. However, according to our data, a high level of perfectionism did not influence a short and intensive treatment focused on the improvement of inpatients' clinical parameters, thus suggesting that perfectionistic traits could influence patients' outcome trajectory over a longer run.

In closing, despite some strengths, the present study suffers from some limitations as well: BMI, sociodemographic variables, and anxiety and depression measures were not available for HCs; self-report assessments were adopted; power analysis was not conducted; Cronbach's alpha was not calculated for all measures; HCs were recruited among university students thus potentially generating selection bias. However, it is noteworthy that we found that both inpatients with AN and HCs could be grouped in clusters according to their high, medium, and low perfectionism levels. However, fewer HCs were classified as reporting high perfectionism than inpatients with AN. For both inpatients with AN and HCs, the gradient of perfectionism mirrored eating psychopathology severity. This is a novel finding, suggesting perfectionism as a state AN-independent factor in its relationship with eating psychopathology. Finally, from a clinical standpoint, the outcome at discharge was shown to be unrelated to baseline levels of perfectionism. Taken together, our data thus highlighted also real-world clinical implications since perfectionism could be considered by clinicians working with acutely ill inpatients with AN as a clinical aspect not substantially impacting on clinical outcome.

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## ORCID

Paola Longo  <http://orcid.org/0000-0003-1347-7054>  
 Matteo Aloï  <http://orcid.org/0000-0001-5585-6488>  
 Marianna Rania  <http://orcid.org/0000-0001-7742-7086>  
 Cristina Segura Garcia  <http://orcid.org/0000-0002-5756-3045>  
 Giovanni Abbate-Daga  <http://orcid.org/0000-0002-5826-5664>  
 Enrica Marzola  <http://orcid.org/0000-0003-1328-9678>

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