**Perfectionism in patients with eating disorders:**

**the role of metacognitive beliefs and repetitive negative thinking**

**1st draft revised: 04/12/2023**

Sara Palmieri1,2,3,4, Sandra Sassaroli1,3,4, Giovanni Maria Ruggiero1,3,

Gabriele Caselli1,3, Rosaria Nocita4, Ana Nikčević5, Marcantonio M. Spada2, Giovanni Mansueto2,6

1Department of Psychology, Sigmund Freud University, Ripa di Porta Ticinese 77, 20143 Milan, Italy

2Division of Psychology, School of Applied Sciences, London South Bank University, 103 Borough Rd, SE1 0AA London, UK

3Studi Cognitivi, Cognitive Psychotherapy School and Research Center, Foro Buonaparte 57, 20121 Milan, Italy

4 Italian psychotherapy clinics, eating disorders unit, Ripa di Porta Ticinese 79, 20143 Milan, Italy

5Department of Psychology, School of Law, Social and Behavioural Sciences, Kingston University, Kingston, UK

6Department of Health Sciences, University of Florence, Via di San Salvi 12, 50135 Florence, Italy

Sara Palmieri: s.palmieri@milano-sfu.it, ORCID ID: 0000-0002-7329-8683

Sandra Sassaroli: s.sassaroli@milano-sfu.it, ORCID ID: 0000-0002-4201-6559

Giovanni Maria Ruggiero: gm.ruggiero@milano-sfu.it, ORCID ID: 0000-0002-1415-4495

Gabriele Caselli: g.caselli@milano-sfu.it, ORCID ID: 0000-0002-5159-7164

Rosaria Nocita: r.nocita@clinichepsicoterapia.it

Ana Nikčevic: A.Nikcevic@kingston.ac.uk ORCID ID: 0000-0002-5311-5704

Marcantonio M. Spada: spadam@lsbu.ac.uk ORCID ID: 0000-0003-4548-9578

Giovanni Mansueto: [giovanni.mansueto@unifi.it](giovanni.mansueto%40uifi.it) ORCID ID: 0000-0002-9571-2486

**Corresponding author**

Giovanni Mansueto

Department of Health Sciences, University of Florence,

Via di San Salvi 12, 50135 Florence, Italy

Email: giovanni.mansueto@unifi.it

**Abstract**

**Introduction**: Using the Self-Regulatory Executive Function model as a basis, this study explored whether, in patients with eating disorders (EDs), metacognitions and repetitive negative thinking are associated with higher levels of perfectionisms.

**Methods:** 123 outpatients with eating disorders were recruited. Perfectionism, metacognitive beliefs, worry, rumination, anger rumination, affective and eating symptoms were assessed. Correlation and hierarchal regression analyses were run.

**Results:** Higher endorsement of positive beliefs about worry were associated with higher levels of “personal standards perfectionism”. Higher endorsement of positive beliefs about worry, need to control thoughts, worry and rumination were associated with higher levels of “concern over mistakes perfectionism”.

**Conclusions** Among patients with EDs, perfectionism appears to be associated with the endorsement of dysfunctional metacognitive beliefs, worry, and rumination. Dysfunctional metacognitive beliefs and repetitive negative thinking could be suitable therapeutic targets to reduce the levels of perfectionism among patients with EDs.

**Keywords**: metacognitive beliefs; worry; rumination; anger rumination; perfectionism; eating disorder

**Key Practitioner Message**

* A higher endorsement of metacognitive beliefs is associated with an increase in perfectionism in patients with EDs.
* A higher endorsement of repetitive negative thinking is associated with higher levels of perfectionism in patients with EDs.
* Dysfunctional metacognitive beliefs and repetitive negative thinking may be suitable therapeutic targets to reduce the levels of perfectionism among patients with EDs.
1. **Introduction**

Perfectionism is defined as the setting of and striving for excessively high standards of personal performance and overly critical evaluation of oneself (Frost, Marten, Lahart, & Rosenblate, 1990). Factor analytic studies have found evidence for perfectionism having two higher-order dimensions, namely ‘perfectionistic strivings’ and ‘perfectionistic concerns’ (Limburg, Watson, Hagger, & Egan, 2017; Frost, Heimberg, Holt, Mattia, & Neubauer, 1993; Stackpole, Greene, Bills, & Egan, 2023; Stoeber & Damian, 2014). Perfectionistic strivings include setting and pursuing high standards (Stoeber & Otto, 2006), while perfectionistic concerns include concern over mistakes, fear of negative evaluation by others if not perfect, doubts about own actions, feelings of discrepancy between one’s high standards and actual performance, and negative reactions to imperfection (Stoeber & Otto, 2006). Differentiating perfectionistic strivings and perfectionistic concerns is important because these two dimensions of perfectionism show different relations with indicators of psychological adjustment and maladjustment (Stoeber & Gaudreau, 2017). Perfectionistic strivings could be considered as a less maladaptive form of perfectionism since it has mixed associations with both negative and positive health outcomes (Flett et al., 2009, Fry and Debats, 2009, Molnar et al., 2006; Molnar et al., 2012). Perfectionistic concerns are generally considered to reflect the more problematic aspects of perfectionism (Dahlenburg, Gleaves, & Hutchinson, 2019; Frost et al., 1990; Hewitt & Flett, 1991; Kehayes, Smith, Sherry, Vidovic, & Saklofske, 2019; Stoeber & Otto, 2006) because of its associations with worse mental health outcomes (Molnar, Reker, Culp, Sadava, & DeCourville, 2006; Sirios et al., 2017).

Both forms of perfectionism (i.e., perfectionistic concerns and perfectionistic strivings) have been found to be significantly associated with the onset and maintenance of eating disorder symptoms (Limburg et al., 2017; Stackpole et al., 2023; Vincent, Gonzálvez, Quiles, & Sánchez-Meca, 2023) in both clinical and non-clinical samples (Bardone-Cone et al., 2007; Stackpole et al., 2023), although some evidence suggests that perfectionistic concerns are more strongly associated with eating psychopathology than perfectionistic strivings (Limburg et al., 2017). Among patients with EDs, higher levels of perfectionism were found to be associated with worse clinical outcomes, higher rates of psychopathology comorbidity, dropping out of treatment, and poor prognosis at 5–10 years post-inpatient admission (Bardone-Cone et al., 2007; Egan, Wade, & Shafran, 2011; Nilsson, Sundbom, & Hägglöf, 2008).Hence, identifying potential underlying maintenance mechanisms of perfectionism in patients with EDs has been recognized as an important challenge (Bardone-Cone et al., 2007; Stackpole et al., 2023) that would allow clinicians to develop targeted clinical interventions for its reduction (Bardone-Cone et al., 2007; Stackpole et al., 2023; Ruggiero, Spada, Caselli, & Sassaroli, 2018).

Within the framework of the Self-Regulatory Executive Function (S-REF) model (Wells, 2011; Wells & Matthews, 1994, 1996), it has been hypothesized that in those who present with EDs, perfectionism may be a consequence of the tendency to engage in maladaptive forms of mental control, such as repetitive negative thinking, that is underpinned by unhelpful metacognitive beliefs (Macedo, Marques, & Pereira, 2014; Wells, 2011). Metacognitive beliefs refer to “the information that individuals hold about their own cognition and about coping strategies which impact on it” (Wells & Matthews, 1996). Repetitive negative thinking is a cognitive process characterised by recurrent thoughts and self-focused attention (Segerstrom, Stanton, Alden, & Shortridge, 2003) that includes worry and rumination as its main constituents (Ehring & Watkins, 2008; Watkins, 2008). A brief review of the literature underpinning the delineation of the hypothesized associations between metacognitive beliefs and perfectionism as well as between repetitive negative thinking and perfectionism, among those diagnosed with EDs is presented below.

**1.1 Possible associations between metacognitive beliefs, repetitive negative thinking and perfectionisms**

According to the S-REF model (Wells & Matthews, 1994, 1996), perfectionism can be considered to be an end product of repetitive negative thinking maintained by the activation of metacognitions (Macedo et al., 2014; Fearn, Marino, Spada, & Kolubinski, 2022; Myers, Fisher, & Wells, 2009a, 2009b; Solem, Myers, Fisher, Vogel, & Wells, 2010). As pointed out by Macedo and colleagues (2014), due to their stronger trait disposition towards control and avoidance of failure, perfectionists are likely to hold unhelpful metacognitive beliefs; accordingly significant positive associations between metacognitive beliefs about the meaning and danger of thoughts, and metacognitive beliefs about self-critical rumination, on the one hand, and perfectionism on the other, have been found in community samples and among university students (Fearn et al, 2022; Myers et al., 2009a,b; Solem et al., 2010). With regards to the relationship between repetitive negative thinking and perfectionism, it has been suggested that perfectionists may be inclined to worry about perceived pressures, social judgements, acceptance by other, quality and quantity of their performance, making mistakes, potential future threats and situations where their performance would not be “perfect” (Hill, Huelsman, & Araujo, 2010; Macedo et al., 2014), as well as, being inclined to ruminate about past failures (Macedo et al., 2014). Research findings appear to support the possible positive association between repetitive negative thinking (i.e., worry, rumination, anger rumination) and perfectionism (Besharat & Shahidi, 2010; Bardone-Cone et al., 2007; Fearn et al, 2022; Flett, Madorsky, Hewitt, & Heisel, 2002; Myers et al., 2009a, 2009b; Randles, Flett, Nash, McGregor, & Hewitt, 2010; Xie, Kong, Yang, & Chen, 2019).

**1.2 Metacognitive beliefs and repetitive negative thinking in patients with EDs**

Metacognitive beliefs and repetitive negative thinking have been shown to be involved as etiological and maintenance mechanisms for EDs (Palmieri, Gentile, Da Ros, & Spada, 2021a). According to the literature, subjects with EDs (i.e., Anorexia Nervosa, Bulimia Nervosa, Eating Disorders Not Otherwise Specified) reported significantly greater levels of both positive and negative metacognitions compared to healthy controls (Palmieri et al., 2021a; Palmieri, Sassaroli, Ruggiero, Caselli, Spada, & Mansueto, 2023). This was also evident in subjects from the general population who report problematic eating attitudes compared to those with normal eating attitudes (Palmieri et al., 2021a). Literature also showed that specific positive and negative metacognitions about binge eating have been reported by subjects with a diagnosis of Binge Eating Disorder (Palmieri, Mansueto, Ruggiero, Caselli, Sassaroli, & Spada, 2021b; Palmieri et al., 2023). Furthermore, patients diagnosed with an ED reported higher levels of repetitive negative thinking (i.e., worry and rumination) than subjects from the general population (Palmieri, Mansueto, Scaini, Caselli, Sapuppo, Spada, Sassaroli, & Ruggiero, 2021c; Palmieri et al., 2023; Smith, Mason, & Lavender, 2018). Finally, a significant association between higher levels of repetitive negative thinking (i.e., worry and rumination) and more acute eating problems have been found both in patients and controls from the general population (Palmieri et al., 2021c; Sassaroli, Bertelli, Decoppi, Crosina, Milos, & Ruggiero, 2005; Smith et al., 2018).

**1.3. Aims**

Given positive associations between perfectionism and EDs (Bardone-Cone et al., 2007; Stackpole et al., 2023) on the one hand, and the higher endorsement of unhelpful metacognitive beliefs and repetitive negative thinking in patients with EDs on the other (Palmieri et al., 2021a, 2021b, 2021c, 2022; 2023; Smith et al., 2018), we examined in this study whether metacognitive beliefs and repetitive negative thinking could act as potential maintenance factors of perfectionisms in patients with EDs. Understanding these relationships would offer insight into whether metacognitive beliefs and repetitive negative thinking are suitable therapeutic targets towards the reduction of perfectionism in patients with EDs. To our knowledge this is the first study aimed to explore the possible associations between metacognitive beliefs, repetitive negative thinking, and perfectionisms in patients with EDs. In line with the S-REF model (Wells & Matthews, 1994, 1996), we hypothesised that, among patients with EDs, perfectionism may be a consequence of dysfunctional metacognitions and repetitive negative thinking (Macedo et al., 2014; Fearn, Marino, Spada, & Kolubinski, 2022; Myers, Fisher, & Wells, 2009a, 2009b; Solem, Myers, Fisher, Vogel, & Wells, 2010). This means that patients with EDs: (a) may hold dysfunctional metacognitive beliefs about the usefulness of engaging in perfectionistic behaviours (Macedo et al., 2014; Palmieri et al., 2023), and (b) as a response to own worry and/or rumination (e.g., worry about being able to achieve high standards or about the risk of making mistake) may engage in perfectionistic behaviours as a coping strategy to stop their repetitive negative thinking (Palmieri et al., 2021c; Smith et al., 2018). The following hypotheses were put forward: (a) higher endorsement of metacognitive beliefs would be positively associated with perfectionism among patients with EDs; (b) higher endorsement of repetitive negative thinking would be positively associated with perfectionism among patients with EDs.

**2. Method**

2.1. Participants

One hundred and twenty-three outpatients with eating disorders were consecutively recruited at the private clinical centre Studi Cognitivi in Milan (Italy) within one week of admission from March 2020 to June 2023. Inclusion criteria were: (a) 18 years of age or above; (b) able to provide informed consent; and (c) able to complete the assessment protocol; (d) meeting the Diagnostic and Statistical Manual of Mental Disorders Five Edition (DSM-5, APA, 2013) criteria for Eating Disorders. Patients with EDs were excluded if they had current or lifetime neurological or organic diseases that might compromise cognitive functioning. Ethics approval for the study was obtained from the ethics committee of the Sigmund Freud University. All procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All participants provided a signed informed consent.

The sample was composed of a total of 123 (100%) female outpatients; the mean age of the sample was 28.67 ± 9.97 years. With regard to education level, a total of 5 (3.3%) outpatients completed secondary school, 42 (34.1%) completed high school, 28 (22.8%) were graduates, and 11 (8.9%) achieved a post-bachelor degree. With regard to civil status, 71 (57.7%) participants were unmarried, 17 (13.8%) were married, 15 (12.2%) were cohabiting, 7 (5.7%) were divorced and one (0.8%) was widower. With regard to working status, 83 (67.5%) participants were unemployed, 16 (13%) were students, 8 (6.5%) were employed, and 16 (13%) were housewives. With regard to the diagnosis, 33 (26.8%) participants reported a diagnosis of Anorexia Nervosa (AN), 41 (33.3%) participants reported a diagnosis of Bulimia Nervosa (BN), 39 (31.7%) participants reported a diagnosis of Binge Eating Disorder (BED), and 10 (8.1%) participants reported a diagnosis of Eating Disorder Not Otherwise Specified (EDNOS).

**2.2. Measures**

Socio-demographic and clinical information was collected via an ad hoc set of questions used previously (Mansueto, Pennelli, De Palo, Monacis, Sinatra, & De Caro, 2016; Palmieri et al., 2018).

Perfectionism was measured with two subscales of the Frost Multidimensional Perfectionism Scale (MPS, Frost et al., 1990), a 35-item questionnaire rated on a 5-point Likert-type scale (1 = “disagree strongly”, 5 = “agree strongly”). Due to clinical practice protocol of the recruiting clinical center, only the Concern Over Mistakes (CM) and Personal Standards (PS) subscales were used. The CM subscale (e.g. “If I fail at work/school, I am a failure as a person”, “I hate being less than best at things”) reflects a tendency to be overly self-critical and self-evaluative and is central to the construct of perfectionism (Frost et al., 1990). The PS subscale (e.g., “I set higher goals than most people”, “I am very good at focusing my efforts on attaining a goal”) reflects a tendency to set high standards for performance (Frost et al., 1990). The MPS has been found to be reliable and valid (Frost et al., 1990; Lombardo, 2008).

Metacognitive beliefs were measured with the Meta-Cognitions Questionnaire 30 (MCQ-30, Wells & Cartwright-Hatton, 2004), a 30 item self-report measure assessing individual differences in metacognitive beliefs, judgments, and monitoring tendencies. The MCQ-30 is characterized by 5 sub-scales measuring: (1) Positive metacognitive beliefs (MCQ-30 POS) (e.g., “Worry / rumination helps me cope”); (2) Negative metacognitive beliefs (MCQ-30 NEG) about thoughts concerning uncontrollability and danger (e.g., “When I start worrying I cannot stop”; “If I continue to ruminate I will lose my mind”); (3) Cognitive confidence (MCQ-30 CC) (e.g., “My memory can mislead me at times”); (4) Beliefs about the need to control thoughts (MCQ-30 NC) (e.g., “Not being able to control my thoughts is a sign of weakness”); and (5) Cognitive self-consciousness (MCQ-30 CSC) (e.g., “I pay close attention to the way my mind works”). The items are rated on a 4-point Likert scale (from 1 = “I do not agree” to 4 = “I totally agree”). Higher scores indicate higher levels of maladaptive metacognitive beliefs. The MCQ-30 has been showed good psychometric properties (Quattropani et al., 2014; Wells & Cartwright-Hatton, 2004).

Repetitive negative thinking was evaluated by considering the following cognitive processes: worry (Meyer et al., 1990), rumination (Nolen-Hoeksema & Davis, 1999), and anger rumination (Sukhodolsky, Golub, & Cromwell, 2001). Worry was measured with the Penn State Worry Questionnaire (PSWQ) (Meyer, Miller, Metzger, & Borkovec, 1990), a 16-item self-report measure based on what has been theorized about worry by Borkovec (1994). The items are rated on a 5-point Likert scale (from 1 = “not at all typical of me” to 5 = “very typical of me”) (Meyer et al., 1990) and higher scores indicate higher levels of worry (Meyer et al., 1990). The PSWQ has been shown to possess good psychometric properties (Meyer et al., 1990; Morani, Pricci, & Sanavio, 1999). Rumination was measured with the Ruminative Response Scale (RRS) (Nolen-Hoeksema & Davis, 1999; Nolen-Hoeksema & Morrow, 1991; Palmieri, Gapsarre, & Lanciano, 2007), a 22 item self-report measure assessing the propensity to ruminate in response to depression. The items are rated on a 4-point Likert scale (from 1 = “almost never” to 4 = “almost always”), and higher scores indicate higher levels of rumination (Nolen-Hoeksema & Davis, 1999; Nolen-Hoeksema & Morrow, 1991). The RRS has been shown to possess good psychometric properties (Nolen-Hoeksema & Davis, 1999; Nolen-Hoeksema & Morrow, 1991; Palmieri et al., 2007). Anger rumination was measured with the Anger Rumination Scale (ARS, Sukhodolsky et al., 2001), a 19 item self-report measure assessing the tendency to focus on angry moods, recall past anger episodes, and think over the causes and consequences of anger episodes. The items are rated on a 4‐point Likert scale (from 1= “almost never” to 4= “almost always”), and higher scores correspond to a higher level of anger rumination. The ARS has been shown to possess good psychometric properties (Sukhodolsky et al., 2001).

Anxious and depressive symptoms were measured with the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). The HADS consists of 14 items, 7 assessing anxiety and 7 assessing depression. The anxiety factor includes items such as “I get a sort of frightened feeling as if something horrible is about to happen”. The depression factor includes items such as “I feel as if I am slowed down”. Higher scores represent higher levels of anxiety and depression. The HADS possesses good validity and reliability (Caci, Baylé, Mattei, Dossios, Robert, & Boyer, 2003; Costantini et al., 1999; Herrmann, 1997; Mykletun, Stordal, & Dahl, 2001; Zigmond & Snaith, 1983).

General eating pathology was measured with the Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Beglin, 2008), a 28-item self-report measure in which participants indicate how many days in the past 28 days they engaged in eating-disordered behaviour and experienced negative cognitions (e.g., “on how many of the past 28 days have you had a definite fear that you might gain weight?”). The items are rated on a 7-point Likert scale (from 0 = “no days” to 6 = “every day”). The EDE-Q is characterized by 4 factors and a global score. In the present study, the global score was utilized to assess eating pathology. The EDE-Q has been shown to possess good psychometric properties (Calugi et al., 2017; Fairburn & Beglin, 2008).

**2.3. Statistical analyses**

First, descriptive analyses were calculated. Skewness and kurtosis were assessed and were considered adequate for a linear model of analysis in a range of ±2 (Gravetter & Wallnau, 2016).

Second, bivariate correlation analyses were run in order to explore the associations between perfectionisms, metacognitive beliefs, rumination, anger rumination, worry, anxious and depressive symptoms, and eating symptoms severity. Because of the high number of comparisons (*n*=91), Bonferroni post hoc correction was applied (Munro, 2005) and a conservative significance level of p ≤ .00055 was used.

Third, hierarchical linear regression analyses were run to evaluate whether metacognitive beliefs and repetitive negative thinking will predict perfectionism among patients with EDs. Only those variables surviving to Bonferroni correction and showing a significant correlation with perfectionisms were included in the regression models as independent variables. Five adjustment variables were selected based on the literature, i.e., age, anxious and depressive symptoms, eating symptoms and eating disorders diagnosis (Limburg et al., 2017; Palmieri et al., 2023; Stackpole et al., 2023; Xie et al., 2019). The ordering of independent variables in the hierarchical linear regression analyses was defined according to the causal structure suggested by the metacognitive model (Wells, 2011; Wells & Matthews, 1994, 1996): age, anxious and depressive symptoms, eating symptoms, and eating disorders diagnosis were entered in the first step; metacognitive beliefs were entered in the second step; repetitive negative thinking (i.e., worry, rumination, anger rumination) was entered in the third step. Statistical assumptions for using hierarchical linear regression analyses were evaluated (Barbaranelli & D'Olimpio, 2006; Field, 2013; Myers, 1990). Effect size was calculated via Cohen's f2 (Cohen, 1988; Coolican, 2009; Ialongo, 2016). The two-sided significance level was set at p ≤ 0.05. Statistical analyses were run using SPSS version 27 of SPSS (IBM SPSS Statistics).

**3. Results**

Table 1 shows the means, standard deviations, ranges, skewness and kurtosis for all the study variables. All variables had skewness and kurtosis in the range of acceptability (skewness ranging from -1.05 to 0.63; kurtosis ranging from -0.88 to 0.95).

Table 2 shows correlation analyses among patients with EDs revealing that personal standards perfectionism was significant positively associated with positive beliefs about worry, beliefs about the need to control thoughts, cognitive self-consciousness, and worry (r ranging from 0.31 to 0.42). Correlation analyses also revealed that concern over mistakes perfectionism was significant positively associated with positive beliefs about worry, negative beliefs about thoughts concerning uncontrollability and danger, beliefs about the need to control thoughts, repetitive negative thinking (i.e., worry, rumination, anger rumination), anxious and depressive symptoms, and eating psychopathology (r ranging from 0.31 to 0.56).

 Table 3 shows the hierarchical linear regression examining the role of metacognitions and repetitive negative thinking in the prediction of personal standard perfectionisms adjusted for age and ED diagnosis. Before analysing data, assumptions were tested. Multicollinearity statistics were within acceptable ranges (Tolerance Index ranged from 0.59 to 0.87; Variance Inflation Factor [VIF] ranged from 1.14 to 1.67 (Barbaranelli & D'Olimpio, 2006; Bowerman & O'Connell, 1990; Field, 2013; Hair, Anderson, Tatham, & Black, 1998). The Durbin–Watson test (2.16) showed that there were no significant correlations between standardized residuals and independent variables (Barbaranelli & D’Olimpio, 2006; Field, 2013). The criterion variable (i.e., dependent variable) in the hierarchical regression model was personal standards perfectionism. The entry order of predictor variables (i.e., independent variables) was the following: age and ED diagnosis were entered in the first step; they were not found to be significant predictors of personal standards perfectionism. Subsequently positive belief about worry, beliefs about need to control thoughts, and cognitive self-consciousness, were added in the second step; positive belief about worry, beliefs about need to control thoughts, and cognitive self-consciousness, were found to predict personal standards perfectionism contributing to an additional 25% variance to that explained by age and ED diagnosis. Subsequently worry was added in the third step and it was found that it did not significantly increase the predictive ability of the model. A closer inspection of the final equation indicates that positive belief about worry was a significant predictor of personal standards perfectionism for a total of 31.6% of the variation in this variable (F = 8.93, df = 6, p < 0.001).

 Table 4 shows the hierarchical linear regression examining the role of metacognitions and repetitive negative thinking, adjusted for age, anxious symptoms, depressive symptoms, eating psychopathology, and eating disorder diagnosis, in the prediction of concern over mistakes perfectionism. Before analysing data, assumptions were tested. Multicollinearity statistics were within acceptable ranges (Tolerance Index ranged from .40 to .83; Variance Inflation Factor [VIF] ranged from 1.18 to 2.53 (Barbaranelli & D'Olimpio, 2006; Bowerman & O'Connell, 1990; Field, 2013; Hair et al., 1998). The Durbin–Watson test (1.90) showed that there were no significant correlations between standardized residuals and independent variables (Barbaranelli & D’Olimpio, 2006; Field, 2013). The criterion variable (i.e., dependent variable) in the hierarchical regression model was the concern over mistakes perfectionism. The entry order of predictor variables (i.e., independent variables) was the following: age, anxious symptoms, depressive symptoms, eating psychopathology, and eating disorder diagnosis were entered in the first step; anxious symptoms and eating psychopathology were found to significantly predict concern over mistakes perfectionism explaining the 26.7% of the variance. Subsequently, metacognitive beliefs (i.e., positive beliefs about worry, negative beliefs about worry concerning uncontrollability and danger, beliefs about the need to control thoughts) were entered in the second step; positive beliefs about worry and beliefs about the need to control thoughts were found to significantly predict concern over mistakes perfectionism contributing to an additional 19.4% variance to that explained by anxious symptoms and eating psychopathology. Subsequently repetitive negative thinking (i.e., worry, rumination, anger rumination) was entered in the third step; repetitive negative thinking (i.e., worry, rumination, anger rumination) was found to significantly predict concern over mistakes perfectionism contributing to an additional 6.7% variance to that explained by all other variables. A closer inspection of the final equation indicates that positive beliefs about worry, beliefs about the need to control thoughts, worry, rumination, and anger rumination were significant predictors of concern over mistakes perfectionism accounting for a total of 52.8% of the variation in this variable (F = 11.28, df = 11, p < 0.001).

**4. Discussion**

The aim of the present study was to extend our understanding of the underlying mechanisms of perfectionism in patients with EDs according to the metacognitive psychopathology tenets (Wells, 2011; Wells & Matthews, 1994, 1996). We examined whether metacognitive beliefs and repetitive negative thinking would be positively associated with perfectionism among patients with EDs.

Correlational analyses showed that, among patients with EDs, a higher endorsement of metacognitive beliefs (i.e., positive beliefs about worry, negative beliefs about thoughts concerning uncontrollability and danger, beliefs about the need to control thoughts, cognitive self-consciousness) was positively associated with an increase in personal standards perfectionism and concern over mistakes perfectionism. These results are consistent with previous studies conducted among university students (Fearn et al, 2022; Myers et al., 2009a, 2009b; Kannis-Dymand, Hughes, Mulgrew, Carter, & Love, 2020; Solem et al., 2010). To our knowledge, this is the first study to have assessed the correlation between metacognitions and perfectionism in patients with EDs. Moreover, correlation analyses suggested that higher endorsement of repetitive negative thinking (i.e., worry, rumination, anger rumination) was associated with higher levels of personal standards perfectionism and concern over mistakes perfectionism. These findings are congruent with those of previous studies, which were run with general population samples (Kawamura, Hunt, Frost, & DiBartolo, 2001; Santarello & Gardner, 2007; Stöber & Joormann, 200), undergraduate students (Besharat & Shahidi, 2010; Flett et al., 2002; Harris, Pepper, & Maack, 2008), and in patients with post-traumatic stress disorder (Egan, Hattaway, & Kane, 2014). To our knowledge, our study is the first to report on correlation between repetitive negative thinking and perfectionism in patients with EDs.

Hierarchal regression models suggested that metacognitive beliefs and repetitive negative thinking made a unique contribution to perfectionism in EDs patients. More specifically, with regards to the association between metacognitive beliefs and perfectionism, hierarchal regression models suggested that higher endorsement on the positive beliefs about worry and need to control thoughts were significant predictors of perfectionisms.

 Positive beliefs about worry were significant predictors of both personal standards perfectionism and concern over mistakes perfectionism. Due to their dispositional propensity towards control and avoidance of failure (Bardone-Cone et al., 2007; Latner et al., 2007); Lawrence, 1979; Stackpole et al., 2023), individuals with EDs may have developed dysfunctional metacognitive beliefs about the usefulness of worrying about being able (or not) to achieve high standards, about the risk of making mistake, and about the probability of being appreciated by others (Macedo et al., 2014; Palmieri et al., 2021b); worrying is then initiated in order to protect themselves against perceived threats to their self-image in situations where they did not perform to their exacting standards (Kannis-Dymand et al., 2020; Palmieri et al., 2021b). However, higher endorsement of positive beliefs about the usefulness of worry may counter-intuitively reinforce the tendency of ED patients to set higher standard (i.e., personal standards perfectionism) and to be concerned over mistakes (i.e., concern over mistakes perfectionism) (Bardone-Cone et al., 2007; Macedo et al., 2014; Kannis-Dymand et al., 2020).

Need to control thoughts was a significant predictor of concern over mistakes perfectionism. It can be assumed that individuals with EDs, as a response to their perceived failure, may develop a tendency to believe that thoughts concerning the possibility of making a mistake or about the possibility that one will lose the respect of others following failure need to be suppressed (Frost et al., 1990; Palmieri et al., 2021b; Wells & Matthews, 1996). However, efforts to avoid these negative thoughts may counter-intuitively increase their perseverance (Macedo et al., 2014) and thus reinforce the tendency in EDs patients to be concerned over mistakes. This in turn will lead to the maintenance of the associated perfectionism behaviours, even when they are no longer functional (Macedo et al., 2014; Kannis-Dymand et al., 2020).

With regards to the association between repetitive negative thinking and perfectionism, hierarchal regression models showed that, in patients with EDs, higher endorsement of repetitive negative thinking (i.e., worry, rumination, and anger rumination) was a significant predictor of concern over mistakes perfectionism. Worry, among EDs patients, could be initiated to deal with the uncertainty regarding achievement of important personal goals and the fear of not being able to perform adequately (Hill et al., 2010; Macedo et al., 2014). Rumination, on the other hand, may be focussed on their past actions and perceived mistakes (Macedo et al., 2014) or, in the case of angry rumination, on the discrepancy between their actual selves and their ideal selves ([Hewitt & Flett, 2002](https://www.sciencedirect.com/science/article/pii/S0191886907002760#bib27)). ED patients who score high on perfectionism may thus view repetitive negative thinking as necessary and protective of future failures. Repetitive negative thinking may also serve as a distraction to avoid thoughts of self-criticism (Palmieri et al., 2021c; Smith et al., 2018).

Our results also showed that repetitive negative thinking was not a significant predictor of personal standards perfectionism. These findings may suggest that among patients with EDs, repetitive negative thinking may be lees involved in the activation of less maladaptive form of perfectionism such as perfectionistic strivings (i.e., setting high standards to pursue), which is consistent with what has been observed in the general population (Kawamura et al., 2001; Santarello & Gardner, 2007; Stöber & Joormann, 2001).

Our findings are congruent with the conceptualisation of perfectionism within the metacognitive perspective (Wells, 2011; Wells & Matthews, 1994, 1996) according to which higher endorsement of metacognitive beliefs and repetitive negative thinking may act as maintaining mechanisms of perfectionism. In our sample of patients with EDs, associations between metacognitive beliefs, repetitive thinking and perfectionisms were of greater magnitude for the more maladaptive aspects of perfectionism, i.e., “perfectionistic concerns”, rather than for “perfectionistic strivings”, which are generally considered less problematic. These findings are consistent with previous studies reporting that these two dimensions of perfectionism show different relations with indicators of psychological adjustment and maladjustment (Stoeber & Gaudreau, 2017).

Given that positive metacognitive beliefs seem to be associated with both perfectionistic concerns andperfectionistic strivings, while the need to control thoughts and repetitive negative thinking appear to be associated only with perfectionistic concerns”, it can be assumed that, among ED patients: (a) positive metacognitions may represent unspecific maintenance factors of perfectionisms; (b) need to control thoughts and repetitive negative thinking may be specific maintaining mechanisms of perfectionistic concerns.

 These preliminary findings bring us to consider their potential clinical implications. In terms of assessment, profiling metacognitive beliefs and repetitive negative thinking during the anamnesis of perfectionism in patients with EDs could be carried out. The S-REF model (Wells, 2011; Wells & Matthews, 1994, 1996) may be used to develop an idiosyncratic case conceptualization of perfectionism and to socialize patients with EDs to the idea that metacognitive beliefs (i.e., positive beliefs about worry, need to control thoughts) and repetitive thinking (i.e., worry, rumination, anger rumination) may contribute to the persistence of perfectionism. Psychological treatments such as metacognitive therapy (Wells, 2011; Wells & Matthews, 1994, 1996) aimed at restructuring metacognitive beliefs and reducing the propensity to engage in repetitive negative thinking could be utilised to reduce the levels of perfectionism among patients with EDs.

 Results of this study must be considered with regards to its limitations: (a) a cross-sectional design was adopted, and this precludes the drawing of conclusions as to whether or not metacognitive beliefs and repetitive negative thinking play a causal role in predicting perfectionisms in patients with EDs; (b) social desirability, self-report biases, context effects, and poor recall may have contributed to errors in self-report measurements; (c) the sample was collected from clinics in the same city in a single country, which may limit the generalisation of findings. Further studies with patients with EDs that utilise a more diverse sample of participants, and longitudinal designs are warranted.

**4.3 Conclusion**

 In alignment with the S-REF model (Wells, 2011; Wells & Matthews, 1994, 1996), our findings suggest that in patients with EDs, higher endorsement of: (a) positive beliefs about worry may be associated with personal standards perfectionism; (b) positive beliefs about worry and need to control thoughts may be associated with concern over mistakes perfectionism; (c) worry and rumination may be associated with concern over mistakes perfectionism. Dysfunctional metacognitive beliefs and repetitive negative thinking could be considered as potential therapeutic targets in clinical interventions aimed at reducing the levels of perfectionism in patients with EDs.

**Author contribution**

**Sara Palmieri**: data curation, formal analysis, methodology, and writing–original draft. **Sandra Sassaroli**: supervision and writing–review and editing. **Giovanni Maria Ruggiero, Gabriele Caselli**: supervision. **Rosaria Nocita**: acquisition of data. **Ana Nikčević**: supervision and writing–review and editing. **Marcantonio M. Spada**: supervision and writing–review and editing. **Giovanni Mansueto**: Designed the research, methodology, wrote the–original draft, and revised all drafts of the manuscript. All authors revised the manuscript critically and provided final approval.

**Conflict of interest statement**

The authors have no conflict of interest to declare.

**Acknowledgements**

The authors like to thank all participants in this study. No specific funding has been attributed to the project.

**Data availability statement**

Data will be made available on request.

**Ethics statement**

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by Ethics Committee of the Sigmund Freud University. Informed consent was obtained from all individual subjects participating in the study.

**References**

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders ((5th ed.) ed.). 4th ed-rev. Washington: DC, American Psychiatric Publishing. <https://doi.org/10.1176/appi.books.9780890425596>

Barbaranelli, C., & D’Olimpio, F. (2006). *Analisi dei dati con SPSS* (1st ed., Vol. 2).

Bardone-Cone AM, Wonderlich SA, Frost RO, Bulik CM, Mitchell JE, Uppala S, Simonich H. (2007) Perfectionism and eating disorders: current status and future directions. *Clinical Psychology Review*. 27(3):384-405. <https://doi.org/10.1016/j.cpr.2006.12.005>

Besharat, M. A., & Shahidi, S. (2010). Perfectionism, anger, and anger rumination. *International Journal of Psychology*, *45*(6), 427-434. https://doi.org/ 10.1080/00207594.2010.501336

Borkovec, T. D. (1994). The nature, functions, and origins of worry. In G. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory assessment and treatment* (p. 533). Wiley.

Bowerman, B. L., & O’Connell, R. T. (1990). *Linear statistical models: An applied approach* (2nd ed.). Duxbury.

Caci, H., Baylé, F. J., Mattei, V., Dossios, C., Robert, P., & Boyer, P. (2003). How does the Hospital and Anxiety and Depression Scale measure anxiety and depression in healthy subjects?. *Psychiatry research*, *118*(1), 89-99. https://doi.org/10.1016/s0165-1781(03)00044-1

Calugi, S., Milanese, C., Sartirana, M., El Ghoch, M., Sartori, F., Geccherle, E., ... & Dalle Grave, R. (2017). The Eating Disorder Examination Questionnaire: reliability and validity of the Italian version. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *22*, 509-514. https://doi.org/10.1007/s40519-016-0276-6

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Routledge.

Coolican, H. (2009). Research methods and statistics in psychology (1st ed.). Hodder Education.

Costantini, M., Musso, M., Viterbori, P., Bonci, F., Del Mastro, L., Garrone, O., ... & Morasso, G. (1999). Detecting psychological distress in cancer patients: validity of the Italian version of the Hospital Anxiety and Depression Scale. *Supportive Care in Cancer*, *7*, 121-127. https://doi.org/10.1007/s005200050241

Dahlenburg, S. C., Gleaves, D. H., & Hutchinson, A. D. (2019). Anorexia nervosa and perfectionism: A meta-analysis. *International Journal of Eating Disorders, 52*(3), 219–229. <https://doi.org/10.1002/eat.23009>

Egan, S. J., Hattaway, M., & Kane, R. T. (2014). The relationship between perfectionism and rumination in post traumatic stress disorder. *Behavioural and cognitive psychotherapy*, *42*(2), 211-223. https://doi.org/10.1017/S1352465812001129

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic process: A clinical review. *Clinical Psychology Review, 31*(2), 203–212. [https://doi.org/ 10.1016/j.cpr.2010.04.009](https://doi.org/%2010.1016/j.cpr.2010.04.009)

Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic process. *International journal of cognitive therapy*, *1*(3), 192-205. https://doi.org/10.1680/ijct.2008.1.3.192

Fairburn, C. G., & Beglin, S. (2008). Eating disorder examination questionnaire. In C. G. Fairburn (Ed.), *Cognitive behavior therapy and eating disorders* (pp. 309–313). Guilford Press.

Fearn, M., Marino, C., Spada, M. M., & Kolubinski, D. C. (2022). Self-critical rumination and associated metacognitions as mediators of the relationship between perfectionism and self-esteem. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *40*(1), 155-174. https://doi.org/10.1007/s10942-021-00404-4

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Sage.

Flett, G. L., Blankstein, K. R., & Hewitt, P. L. (2009). Perfectionism, performance, and state positive affect and negative affect after a classroom test. *Canadian Journal of School Psychology*, *24*(1), 4–18. http://dx.doi.org/10.1177/ 0829573509332457

Flett, G. L., Madorsky, D., Hewitt, P. L., & Heisel, M. J. (2002). Perfectionism cognitions, rumination, and psychological distress. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, *20*, 33-47. https://doi.org/10.1023/A:1015128904007

Frost, R. O., Heimberg, R. G., Holt, C. S., Mattia, J. I., & Neubauer, A. L. (1993). A comparison of two measures of perfectionism. *Personality and Individual Differences, 14*(1), 119–126. [https://doi.org/ 10.1016/0191-8869(93)90181-2](https://doi.org/%2010.1016/0191-8869%2893%2990181-2)

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research, 14*(5), 449–468. [https://doi.org/10.1007/ BF01172967](https://doi.org/10.1007/%20BF01172967)

Fry, P. S., & Debats, D. L. (2009). Perfectionism and the five-factor Personality traits as predictors of mortality in older adults. *Journal of Health Psychology*, *14*(4), 513–524. http://dx.doi.org/10.1177/1359105309103571

Gravetter, F. J., & Wallnau, L. B. (2016). *Statistics for the behavioral sciences*. Cengage Learning.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis* (5th ed.). USA.

Harris, P. W., Pepper, C. M., & Maack, D. J. (2008). The relationship between maladaptive perfectionism and depressive symptoms: The mediating role of rumination. *Personality and Individual differences*, *44*(1), 150-160. https://doi.org/10.1016/j.paid.2007.07.011

Herrmann, C. (1997). International experiences with the Hospital Anxiety and Depression Scale-a review of validation data and clinical results. *Journal of Psychosomatic Research, 42*(1), 17–41. [https://doi.org/10.1016/S0022-3999(96)00216-4](https://doi.org/10.1016/S0022-3999%2896%2900216-4)

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology, 60*(3), 456–470. <https://doi.org/10.1037/0022-3514.60.3.456>

Hewitt, P. L., & Flett, G. L. (2002). Perfectionism and stress processes in psychopathology. In G. L. Flett & P. L. Hewitt (Eds.), *Perfectionism: Theory, research, and treatment* (pp. 255–284). American Psychological Association. https://doi.org/10.1037/10458-011

Hill, R. W., Huelsman, T. J., & Araujo, G. (2010). Perfectionistic concerns suppress associations between perfectionistic strivings and positive life outcomes. *Personality and Individual Differences*, *48*(5), 584-589. <https://doi.org/10.1016/j.paid.2009.12.011>

Ialongo, C. (2016). Understanding the effect size and its measures. *Biochemia Medica*, *26*(2), 150–163. https://doi.org/10.11613/BM. 2016.015

Kannis-Dymand, L., Hughes, E., Mulgrew, K., Carter, J. D., & Love, S. (2020). Examining the roles of metacognitive beliefs and maladaptive aspects of perfectionism in depression and anxiety. *Behavioural and Cognitive Psychotherapy*, *48*(4), 442-453. https://doi.org/ 10.1017/S1352465820000144

Kawamura, K. Y., Hunt, S. L., Frost, R. O., & DiBartolo, P. M. (2001). Perfectionism, anxiety, and depression: Are the relationships independent?. *Cognitive therapy and research*, *25*, 291-301. https://doi.org/10.1023/A:1010736529013

Kehayes, I.-L. L., Smith, M. M., Sherry, S. B., Vidovic, V., & Saklofske, D. H. (2019). Are perfectionism dimensions risk factors for bulimic symptoms? A meta-analysis of longitudinal studies. *Personality and Individual Differences, 138*, 117–125. <https://doi.org/10.1016/j.paid.2018.09.022>

Latner, J. D., Hildebrandt, T., Rosewall, J. K., Chisholm, A. M., & Hayashi, K. (2007). Loss of control over eating reflects eating disturbances and general psychopathology. *Behaviour research and therapy*, 45(9), 2203-2211. https://doi.org/10.1016/j.brat.2006.12.002

Lawrence, M. (1979). Anorexia nervosa—The control paradox. Women's Studies International *Quarterly*, 2(1), 93-101. https://doi.org/10.1016/S0148-0685(79)93118-X

Limburg, K., Watson, H. J., Hagger, M. S., & Egan, S. J. (2017). The relationship between perfectionism and psychopathology: A meta-analysis. *Journal of clinical psychology*, *73*(10), 1301-1326. <https://doi.org/10.1002/jclp.22435>

Lombardo, C. (2008). Adattamento italiano della multidimensional perfectionism scale (MPS). *Psicoterapia Cognitiva e Comportamentale*, *14*(3), 31-46.

Macedo, A., Marques, M., & Pereira, A. T. (2014). Perfectionism and psychological distress: A review of the cognitive factors. *International Journal of Clinical Neurosciences and Mental Health*, *1*(6), 1-10.

Mansueto, G., Pennelli, M., De Palo, V., Monacis, L., Sinatra, M., & De Caro, M. F. (2016). The role of metacognition in pathological gambling: A mediation model. *Journal of Gambling Studies*, 32, 93-106. <https://doi.org/10.1007/s10899-014-9519-5>

Meyer, T., Miller, M., Metzger, R., & Borkovec, T. D. (1990). Development and validity of the Penn State Worry Scale. *Behaviour Research and Therapy, 28*, 487–495. [https://doi.org/10.1016/ 0005-7967(90)90135-6](https://doi.org/10.1016/%200005-7967%2890%2990135-6)

Morani, S., Pricci, D., & Sanavio, E. (1999). Penn State Worry Questionnaire e Worry Domains Questionnaire. Presentazione delle versioni italiane ed analisi della fedeltà. *Psicoterapia cognitiva e comportamentale*, *5*(3), 13-34.

Molnar, D. S., Reker, D. L., Culp, N. A., Sadava, S. W., & DeCourville, N. H. (2006). A mediated model of perfectionism, affect, and physical health. *Journal of Research in Personality*, *40*(5), 482–500. http://dx.doi.org/10.1016/j.jrp.2005.04.002

Munro, B.H. (2005). Statistical Methods for Health Care Research, fifth ed. Lippincott Williams & Wilkins, Philadelphia.

Myers, R. (1990). *Classical and modern regression with applications* (2nd ed.). Duxbury.

Myers, S. G., Fisher, P. L., & Wells, A. (2009a). An empirical test of the metacognitive model of obsessive-compulsive symptoms: fusion beliefs, beliefs about rituals, and stop signals. *Journal of anxiety disorders*, *23*(4), 436-442. https://doi.org/10.1016/j.janxdis.2008.08.007

Myers, S. G., Fisher, P. L., & Wells, A. (2009b). Metacognition and cognition as predictors of obsessive-compulsive symptoms: a prospective study. *International Journal of Cognitive Therapy*, *2*(2), 132-142. https://doi.org/10.1521/ijct.2009.2.2.132

Mykletun, A., Stordal, E., & Dahl, A. A. (2001). Hospital Anxiety and Depression (HAD) scale: Factor structure, item analyses and internal consistency in a large population. *The British Journal of Psychiatry, 179*(6), 540–544. [https://doi.org/10.1192/bjp. 179.6.540](https://doi.org/10.1192/bjp.%20179.6.540)

Nilsson, K., Sundbom, E., & Hägglöf, B. (2008). A longitudinal study of perfectionism in adolescent onset anorexia nervosa-restricting type. *European Eating Disorders Review, 16*(5), 386–394. <https://doi.org/10.1002/erv.850>

Nolen-Hoeksema, S., & Davis, C. G. (1999). “Thanks for sharing that”: Ruminators and their social support networks. *Journal of Personality and Social Psychology, 77*(4), 801–814. [https://doi.org/10. 1037//0022-3514.77.4.801](https://doi.org/10.%201037//0022-3514.77.4.801)

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural dis- aster: The 1989 Loma Prieta Earthquake. *Journal of Personality and Social Psychology, 61*(1), 115. [https://doi.org/10.1037// 0022-3514.61.1.115](https://doi.org/10.1037//%200022-3514.61.1.115)

Palmieri, R., Gapsarre, A., & Lanciano, T. (2007). Una misura disposizionale della ruminazione depressiva: la RRS di Nolen-Hoeksema e Morrow. *Psychofenia: Ricerca ed Analisi Psicologica*, (17), 15-33.

Palmieri, S., Gentile, N., Da Ros, A., & Spada, M. M. (2021a). Profiling metacognition in binge eating disorder. *Journal of Rational- Emotive & Cognitive-Behavior Therapy, 39*, 163–171. <https://doi.org/10.1007/s10942-020-00364-1>

Palmieri, S., Mansueto, G., Ruggiero, G. M., Caselli, G., Sassaroli, S., & Spada, M. M. (2021b). Metacognitive beliefs across eating disorders and eating behaviours: A systematic review. *Clinical Psychology & Psychotherapy, 28*(5), 1254–1265. [https://doi.org/ 10.1002/cpp.2573](https://doi.org/%2010.1002/cpp.2573)

Palmieri, S., Mansueto, G., Scaini, S., Caselli, G., Sapuppo, W., Spada, M. M., Sassaroli, S., & Ruggiero, G. M. (2021c). Repetitive negative thinking and eating disorders: A meta-analysis of the role of worry and rumination. *Journal of Clinical Medicine, 10*(11), 2448. <https://doi.org/10.3390/jcm10112448>

Palmieri, S., Mansueto, G., Scaini, S., Fiore, F., Sassaroli, S., Ruggiero, G. M., ... & Carducci, B. J. (2018). Role of rumination in the relationship between metacognition and shyness. *World journal of psychiatry*, 8(4), 108. https://doi.org/10.5498/wjp.v8.i4.108

Palmieri, S., Mansueto, G., Ruggiero, G. M., Sassaroli, S., Borlimi, R., Bertelli, S., Anselmetti, S., Paganoni, M., D’Agostino, A., & Gambini, O. (2022). Credenze metacognitive e caratteristiche alimentari in pazienti con disturbi dell’alimentazione. *Psicoterapia Cognitiva e Comportamentale, 28*(1), 8–9.

Palmieri, S., Sassaroli, S., Ruggiero, G. M., Caselli, G., Spada, M. M., & Mansueto, G. (2023). Emotion Dysregulation in Patients with Eating Disorders: The Role of Metacognitions and Repetitive Negative Thinking. *Cognitive Therapy and Research*, 1-14. https://doi.org/10.1007/s10608-023-10398-1

Quattropani, M. C., Lenzo, V., Mucciardi, M., & Toffle, M. E. (2014). Psychometric properties of the Italian version of the Short Form of the Metacognitions Questionnaire (MCQ-30). *BPA-Applied Psychology Bulletin (Bollettino di Psicologia Applicata)*, *62*(269).

Randles, D., Flett, G. L., Nash, K. A., McGregor, I. D., & Hewitt, P. L. (2010). Dimensions of perfectionism, behavioral inhibition, and rumination. *Personality and Individual Differences*, *49*(2), 83-87. https://doi.org/10.1016/j.paid.2010.03.002

Ruggiero, G. M., Spada, M. M., Caselli, G., & Sassaroli, S. (2018). A historical and theoretical review of cognitive behavioral therapies: From structural self-knowledge to functional processes. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 36*, 378–403. <https://doi.org/10.1007/s10942-018-0292-8>

Santanello, A. W., & Gardner, F. L. (2007). The role of experiential avoidance in the relationship between maladaptive perfectionism and worry. *Cognitive Therapy and Research*, *31*, 319-332. https://doi.org/10.1007/s10608-006-9000-6

Sassaroli, S., Bertelli, S., Decoppi, M., Crosina, M., Milos, G., & Ruggiero, G. M. (2005). Worry and eating disorders: A psychopathological association. *Eating behaviors*, *6*(4), 301-307. https://doi.org/10.1016/j.eatbeh.2005.05.001

Segerstrom, S. C., Stanton, A. L., Alden, L. E., & Shortridge, B. E. (2003). A multidimensional structure for repetitive thought: what's on your mind, and how, and how much?. *Journal of personality and social psychology*, *85*(5), 909. https://doi.org/10.1037/0022-3514.85.5.909

Sirois, F. M., & Molnar, D. S. (2017). Perfectionistic strivings and concerns are differentially associated with self-rated health beyond negative affect. *Journal of Research in Personality*, *70*, 73-83. https://doi.org/10.1016/j.jrp.2017.06.003

Smith, K. E., Mason, T. B., & Lavender, J. M. (2018). Rumination and eating disorder psychopathology: A meta-analysis. *Clinical psychology review*, *61*, 9-23. doi: 10.1016/j.cpr.2018.03.004

Solem, S., Myers, S. G., Fisher, P. L., Vogel, P. A., & Wells, A. (2010). An empirical test of the metacognitive model of obsessive-compulsive symptoms: Replication and extension. *Journal of anxiety disorders*, *24*(1), 79-86. doi: 10.1016/j.janxdis.2009.08.009.

Stackpole, R., Greene, D., Bills, E., & Egan, S. J. (2023). The association between eating disorders and perfectionism in adults: A systematic review and meta-analysis. *Eating Behaviors*, *50*, 101769. doi: 10.1016/j.eatbeh.2023.101769

Stoeber, J., & Gaudreau, P. (2017). The advantages of partialling perfectionistic strivings and perfectionistic concerns: Critical issues and recommendations. *Personality and Individual Differences*, *104*, 379-386. https://doi.org/10.1016/j.paid.2016.08.039

Stöber, J., & Joormann, J. (2001). Worry, procrastination, and perfectionism: Differentiating amount of worry, pathological worry, anxiety, and depression. *Cognitive Therapy and Research*, *25*, 49–60. https://doi.org/10.1023/A:1026474715384

Stoeber, J., & Damian, L. E. (2014). The Clinical Perfectionism questionnaire: Further evidence for two factors capturing perfectionistic strivings and concerns. *Personality and Individual Differences, 61–62*, 38–42. <https://doi.org/10.1016/j.paid.2014.01.003>

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review, 10*(4), 295–319. [https://doi.org/10.1207/s15327957p spr1004\_2](https://doi.org/10.1207/s15327957p%20spr1004_2)

Sukhodolsky, D. G., Golub, A., & Cromwell, E. N. (2001). Development and validation of the anger rumination scale. *Personality and individual differences*, *31*(5), 689-700. https://doi.org/10.1016/S0191-8869(00)00171-9

Vicent, M., Gonzálvez, C., Quiles, M. J., & Sánchez-Meca, J. (2023). Perfectionism and binge eating association: a systematic review and meta-analysis. *Journal of Eating Disorders*, *11*(1), 101. https://doi.org/10.1186/s40337-023-00817-9

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological bulletin*, *134*(2), 163. doi: 10.1037/0033-2909.134.2.163

Wells, A. (2011). *Metacognitive Therapy for Anxiety and Depression*. Guilford Press.

Wells, A., & Cartwright-Hatton, S. (2004). A short form of the metacognitions questionnaire: properties of the MCQ-30. *Behaviour research and therapy*, *42*(4), 385-396. doi: 10.1016/S0005-7967(03)00147-5

Wells, A., & Matthews, G. (1994). *Attention and Emotion: A Clinical Perspective*. Erlbaum.

Wells, A., & Matthews, G. (1996). Modelling cognition in emotional disorder: The S-REF model. *Behaviour Research and Therapy,34*(11–12), 881–888. doi:10.1016/S0005-7967(96)00050-2

Xie, Y., Kong, Y., Yang, J., & Chen, F. (2019). Perfectionism, worry, rumination, and distress: A meta-analysis of the evidence for the perfectionism cognition theory. *Personality and Individual Differences*, *139*, 301-312. https://doi.org/10.1016/j.paid.2018.11.028

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta psychiatrica scandinavica*, *67*(6), 361-370. doi: 10.1111/j.1600-0447.1983.tb09716.x

**Table 1.** Means, standard deviations, ranges, skewness, kurtosis (n=123)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | M(SD) | Range | Skewness | Kurtosis |
| MPS-PS | 23.37(6.42) | 9-35 | -0.04 | -0.88 |
| MPS-CM | 30.39(8.73) | 10-45 | -0.57 | -0.28 |
| MCQ-30 POS | 12.19(3.89) | 6-24 | 0.36 | -0.25 |
| MCQ-30 NEG | 16.40(3.62) | 8-24 | 0.18 | -0.38 |
| MCQ-30 CC | 11.93(5.55) | 0-24 | 0.63 | -0.69 |
| MCQ-30 NC | 13.67(4.05) | 6-24 | 0.20 | -0.36 |
| MCQ-30 CSC | 15.76(3.94) | 6-23 | -0.26 | -0.38 |
| PSWQ | 60.59(12.74) | 24-95 | -0.38 | -0.06 |
| RRS | 58.61(12.09) | 26-88 | -0.26 | 0.77 |
| ARS | 30.43(7.89) | 14-47 | 0.02 | -0.34 |
| HADS-A | 10.54(4.88) | 1-21 | 0.19 | -0.70 |
| HADS-D  | 9.24(4.45) | 0-20 | 0.11 | -0.74 |
| EDE-Q | 4.19(1.12) | .36-5.75 | -1.05 | 0.95 |

Abbreviations: MPS-PS= Multidimensional Perfectionism Scale - Personal Standards; MPS-CM= Multidimensional Perfectionism Scale - Concern Over Mistakes; MCQ-30 - POS = Metacognitions Questionnaire-30 - Positive Beliefs about Worry; MCQ-30 - NEG = Metacognitions Questionnaire-30 – Negative Beliefs about Thoughts concerning Uncontrollability and Danger; MCQ-30 - CC = Metacognitions Questionnaire-30 - Cognitive Confidence; MCQ-30 - NC = Metacognitions Question-naire-30 - Beliefs about the Need to Control Thoughts; MCQ-30 - CSC = Metacognitions Questionnaire-30 - Cognitive Self-Consciousness; PSWQ = Penn State Worry Questionnaire; RRS = Rumination Response Scale; ARS= Anger Rumination Scale; HADS-A = Hospital Anxiety and Depression Scale—Anxiety; HADS-D = Hospital Anxiety and Depression Scale—Depression; EDE-Q= EDE-Q Eating Disorder Examination Questionnaire

**Table 2.** Inter-correlations between perfectionism, metacognitive beliefs, repetitive negative thinking, affective symptom, eating psychopathology

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | r | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) | r(p) |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1. MPS-PS | 1 | **0.67****(p= 0.000000)** | **0.40****(p= 0.000004)** | 0.27(p=0.002) | -0.03(p=0.699) | **0.41****(p=0.000002)** | **0.31**(p=0.0004) | **0.42**(p= 0.000002) | 0.29(p=0.001) | 0.15(p=0.106) | 0.30(p=0.001) | 0.15(p=0.095) | 0.18(p=0.040) |
| 2. MPS-CM |  | 1 | **0.45****(p=0.000000)** | **0.42****(p=0.000001)** | 0.22(p=0.01) | **0.56****(p=0.000000)** | 0.21(p=0.021) | **0.55****(p=.000000)** | **0.50****(p=0.000000)** | **0.32****(p=.0003)** | **0.43****(p=0.000000)** | **0.31****(p=0.0004)** | **0.35****(p=0.00007)** |
| 3. MCQ-30 POS |  |  | 1 | 0.21(p=0.020) | 0.29(p=0.001) | 0.28(p=0.002) | 0.23(p=0.010) | **0.34****(p=0.0001)** | 0.27(p=0.002) | 0.21(p=0.021) | 0.20(p=0.026) | -0.01(p=0.899) | 0.20(p=0.030) |
| 4. MCQ-30 NEG |  |  |  | 1 | 0.15(p=0.105) | **0.61****(p= 0.000000)** | **0.33****(p= 0.0002)** | **0.65****(p= 0.000000)** | **0.44****(p= 0.000000)** | **0.41****(p=0.000002)** | 0.**66****(p=0.000000)** | **0.45****(p=0.000000)** | **0.23****(p=0.011)** |
| 5. MCQ-30 CC |  |  |  |  | 1 | 0.18(p=0.041) | 0.09(p=0.281) | 0.10(p=0.286) | 0.19(p=0.0034) | 0.21(p=0.021) | -0.002(p=0.98) | 0.18(p=0.043) | 0.24(p=0.008) |
| 6. MCQ-30 NC |  |  |  |  |  | 1 | **0.34****(p=0.0001)** | **0.59****(p= 0.000000)** | **0.43****(p=0.000001)** | **0.48****(p=0.000000)** | **0.53****(p=0.000000)** | **0.41****(p=0.000002)** | 0.29(p=0.001) |
| 7. MCQ-30 CSC |  |  |  |  |  |  | 1 | 0.24(p=0.007) | 0.21(p=0.020) | **0.33****(p= 0.0002)** | 0.19(p=0.033) | 0.03(p=0.72) | -0.015(p=0.871) |
| 8. PSWQ |  |  |  |  |  |  |  | 1 | **0.46****(p=0.000000)** | **0.55****(p=0.000000)** | **0.61****(p=0.000000)** | **0.38****(p=0.00001)** | 0.28(p=0.002) |
| 9. RRS |  |  |  |  |  |  |  |  | 1 | **0.55****(p=0.000000)** | **0.49****(p=0.000000)** | **0.48****(p=0.000000)** | **0.46****(p=0.000000)** |
| 10. ARS |  |  |  |  |  |  |  |  |  | 1 | **0.44****(p=0.000000)** | 0.26(p=0.004) | 0.22(p=0.013) |
| 11. HADS-A |  |  |  |  |  |  |  |  |  |  | 1 | **0.50****(p=0.000000)** | 0.23(p=0.009) |
| 12. HADS-D  |  |  |  |  |  |  |  |  |  |  |  | 1 | **0.35****(p=0.00008)** |
| 13. EDE-Q |  |  |  |  |  |  |  |  |  |  |  |  | 1 |

Bonferroni post-hoc correction (p ≤ .05/91 that is p ≤ .00055). Bold p-values are statistically significant. Abbreviations: MPS-PS= Multidimensional Perfectionism Scale - Personal Standards; MPS-CM= Multidimensional Perfectionism Scale - Concern Over Mistakes; MCQ-30 - POS = Metacognitions Questionnaire-30 - Positive Beliefs about Worry; MCQ-30 - NEG = Metacognitions Questionnaire-30 – Negative Beliefs about Thoughts concerning Uncontrollability and Danger; MCQ-30 - CC = Metacognitions Questionnaire-30 - Cognitive Confidence; MCQ-30 - NC = Metacognitions Question-naire-30 - Beliefs about the Need to Control Thoughts; MCQ-30 - CSC = Metacognitions Questionnaire-30 - Cognitive Self-Consciousness; PSWQ = Penn State Worry Questionnaire; RRS = Rumination Response Scale; ARS= Anger Rumination Scale; HADS-A = Hospital Anxiety and Depression Scale—Anxiety; HADS-D = Hospital Anxiety and Depression Scale—Depression; EDE-Q= EDE-Q Eating Disorder Examination Questionnaire

**Table 3.** Independent predictors of “personal standards perfectionism” among patients with Eating Disorders. Hierarchical regression analysis

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Predictors | B | Std. Error | β | t | p | 95% CI | R | R2 | Adjusted R2 | ΔR2 | Cohen's f2 |
|  | Lower Bound | Upper Bound |
| Model |  |  |  |  |  |  |  |  |  |  |  |  |
| Step 1 |  |  |  |  |  |  |  | 0. 223 | 0.050 | 0.034 | 0.050\* | 0.05 |
| Age  | -.113 | .061 | -.176 | -1.851 | 0.067 | -.235 | .008 |  |  |  |  |  |
| EDs | -.604 | .653 | -.088 | -.924 | 0.357 | -1.898 | 0.690 |  |  |  |  |  |
| Step 2 |  |  |  |  |  |  |  | 0.548 | 0.300 | 0.270 | 0.250\*\*\* | 0.43 |
| Age  | -0.083 | 0.054 | -0.128 | -1.523 | 0.130 | -0.190 | 0.025 |  |  |  |  |  |
| EDs | -0.255 | 0.575 | -0.037 | -0.443 | 0.659 | -1.393 | 0.884 |  |  |  |  |  |
| MCQ-30 POS | 0.444 | 0.136 | 0.269 | 3.261 | 0.001 | 0.174 | 0.713 |  |  |  |  |  |
| MCQ-30 NC | 0.410 | 0.259 | 0.259 | 3.023 | 0.003 | 0.141 | 0.679 |  |  |  |  |  |
| MCQ-30 CSC | 0.274 | 0.137 | 0.168 | 2.006 | 0.047 | 0.004 | 0.545 |  |  |  |  |  |
| Step 3 |  |  |  |  |  |  |  |  |  |  |  |  |
| Age  | -0.069 | 0.054 | -0.107 | -1.271 | 0.206 | -0.177 | 0.039 | 0.562 | 0.316 | 0.281 | 0.016 | 0.46 |
| EDs | -0.257 | 0.571 | -0.037 | -0.451 | 0.653 | -1.388 | 0.873 |  |  |  |  |  |
| MCQ-30 POS | 0.398 | 0.138 | 0.241 | 2.884 | 0.005 | 0.125 | 0.671 |  |  |  |  |  |
| MCQ-30 NC | 0.275 | 0.157 | 0.173 | 1.745 | 0.084 | -0.037 | 0.587 |  |  |  |  |  |
| MCQ-30 CSC | 0.265 | 0.136 | 0.162 | 1.953 | 0.053 | -0.004 | 0.534 |  |  |  |  |  |
| PSWQ | 0.083 | 0.050 | .165 | 1.661 | 0.099 | -0.016 | 0.182 |  |  |  |  |  |

\*p < .05; \*\*\*p < .001. Abbreviations: EDs: Eating disorders diagnosis; MCQ-30 - POS = Metacognitions Questionnaire-30 - Positive Beliefs about Worry; MCQ-30 - NC = Metacognitions Questionnaire-30 - Beliefs about the Need to Control Thoughts; MCQ-30 - CSC = Metacognitions Questionnaire-30 - Cognitive Self-Consciousness; PSWQ = Penn State Worry Questionnaire

**Table 4.** Independent predictors of **“**concern over mistake perfectionism” among patients with Eating Disorders. Hierarchical regression analysis

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Predictors | B | Std. Error | β | t | p | 95% CI  | R | R2 | Adjusted R2 | ΔR2 | Cohen's f2 |
|  | Lower Bound | Upper Bound |
| Model |  |  |  |  |  |  |  |  |  |  |  |  |
| Step 1 |  |  |  |  |  |  |  | 0.517 | 0.267 | 0.236 | 0.267\*\*\* | 0.36 |
| Age  | -0.045 | 0.076 | -0.051 | -0.586 | 0.559 | -0.195 | 0.106 |  |  |  |  |  |
| HADS-A | 0.686 | 0.170 | 0.383 | 4.037 | <0.001 | 0.350 | 1.023 |  |  |  |  |  |
| HADS-D | 0.067 | 0.189 | 0.034 | 0.356 | 0.723 | -0.307 | 0.441 |  |  |  |  |  |
| EDE-Q | 1.995 | 0.672 | 0.255 | 2.970 | 0.004 | 0.665 | 3.325 |  |  |  |  |  |
| EDs | 1.092 | 0.822 | 0.117 | 1.328 | 0.187 | -0.536 | 2.720 |  |  |  |  |  |
| Step 2 |  |  |  |  |  |  |  | 0.679 | 0.461 | 0.423 | 0.194\*\*\* | 0.85 |
| Age  | -0.005 | 0.067 | -0.006 | -0.077 | 0.939 | -0.138 | 0.127 |  |  |  |  |  |
| HADS-A | 0.281 | 0.181 | 0.157 | 1.552 | 0.123 | -0.078 | 0.639 |  |  |  |  |  |
| HADS-D | 0.101 | 0.172 | 0.052 | 0.589 | 0.557 | -0.240 | 0.443 |  |  |  |  |  |
| EDE-Q | 1.178 | 0.598 | 0.151 | 1.972 | 0.051 | -0.006 | 2.363 |  |  |  |  |  |
| EDs | 0.924 | 0.718 | 0.099 | -0.499 | 0.201 | 2.347 |  |  |  |  |  |  |
| MCQ-30 POS | 0.665 | 0.168 | 0.297 | 3.950 | <0.001 | 0.332 | 0.999 |  |  |  |  |  |
| MCQ-30 NEG | -0.012 | 0.246 | -0.005 | -0.050 | 0.960 | -0.499 | 0.474 |  |  |  |  |  |
| MCQ-30 NC | 0.755 | 0.200 | 0.350 | 3.766 | <0.001 | 0.358 | 1.152 |  |  |  |  |  |
| Step 3 |  |  |  |  |  |  |  | 0.727 | 0.528 | 0.481 | 0.067\*\* | 1.12 |
| Age  | 0.072 | 0.066 | 0.082 | 1.080 | 0.282 | -0.060 | 0.203 |  |  |  |  |  |
| HADS-A | 0.127 | 0.181 | 0.071 | 0.702 | 0.484 | -0.231 | 0.485 |  |  |  |  |  |
| HADS-D | -0.019 | 0.168 | -0.010 | -0.116 | 0.908 | -0.353 | 0.314 |  |  |  |  |  |
| EDE-Q | 0.656 | 0.595 | 0.084 | 1.103 | 0.273 | -0.523 | 1.834 |  |  |  |  |  |
| EDs | 0.810 | 0.689 | 0.087 | 1.175 | 0.243 | -0.556 | 2.175 |  |  |  |  |  |
| MCQ-30 POS | 0.512 | 0.165 | 0.228 | 3.101 | 0.002 | 0.185 | 0.838 |  |  |  |  |  |
| MCQ-30 NEG | -0.269 | 0.245 | -0.112 | -1.096 | 0.275 | -0.755 | 0.217 |  |  |  |  |  |
| MCQ-30 NC | 0.707 | 0.199 | 0.328 | 3.549 | 0.001 | 0.312 | 1.102 |  |  |  |  |  |
| PSWQ | 0.212 | 0.071 | 0.309 | 2.983 | 0.004 | 0.071 | 0.353 |  |  |  |  |  |
| RRS | 0.206 | 0.070 | 0.286 | 2.941 | 0.004 | 0.067 | 0.345 |  |  |  |  |  |
| ARS | 0.233 | 0.101 | 0.211 | 2.313 | 0.023 | 0.033 | 0.433 |  |  |  |  |  |

\*\*p < .01; \*\*\*p < .001. Abbreviations: EDs: Eating disorders diagnosis; HADS-A = Hospital Anxiety and Depression Scale—Anxiety; HADS-D = Hospital Anxiety and Depression Scale—Depression; MCQ-30 - POS = Metacognitions Questionnaire-30 - Positive Beliefs about Worry; MCQ-30 - NEG = Metacognitions Questionnaire-30 – Negative Beliefs about Thoughts concerning Uncontrollability and Danger; MCQ-30 - NC = Metacognitions Question-naire-30 - Beliefs about the Need to Control Thoughts; PSWQ = Penn State Worry Questionnaire; RRS = Rumination Response Scale; ARS = Anger Rumination Scale