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Do metacognitions mediate the relationship between irrational beliefs, eating disorder symptoms and cognitive reappraisal?

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3 Do metacognitions mediate the relationship between irrational beliefs, eating disorder
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5 symptoms and cognitive reappraisal?
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7

8 **Abstract**

9 **Objective:** Cognitively-oriented therapies, first-line treatment for eating disorders (EDs),
10 still show room for improvement in treatment retention and outcomes. Despite the development of
11 additional cognitive models and therapies, few studies examine the relationship between traditional
12 and third-wave cognitive targets in EDs. The study explores the relationship between irrational
13 beliefs (IBs) and metacognitions and their relationship with ED psychopathology and cognitive
14 reappraisal in ED outpatients. **Method:** Seventy-seven patients (mean age 27.49±12.28 years) were
15 assessed with The Attitudes and Beliefs Scale-ABS-2, Meta-cognitions Questionnaire-MCQ-65,
16 Eating Disorder Inventory 3-EDI-3, Eating Attitudes Test-EAT-40, Emotion Regulation
17 Questionnaire-ERQ. **Results:** Correlational analyses showed that IBs and metacognitions
18 significantly correlated with each other. Metacognitions partially mediated the relationship between
19 IBs and ED-related general psychological maladjustment and completely mediated the relationship
20 between IBs and ED symptom severity. Cognitive reappraisal was predicted only by IBs and
21 metacognitions were not significant mediators. **Conclusions:** While IBs are sufficient in explaining
22 ED-related psychopathology and reduced cognitive reappraisal, a potential integration of
23 metacognitions about need to control thoughts in CBT models for EDs may offer incremental
24 validity given their contribution to ED severity. Treatment implications include targeting
25 metacognitions concerning need to control thoughts, as a potential maintenance mechanism of ED
26 symptomatology through cognitive restructuring.
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50 *keywords:* irrational beliefs, metacognitions, eating disorders, cognitive behavioral therapy, CBT
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3 Do metacognitions mediate the relationship between irrational beliefs, eating disorder
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5 symptoms and cognitive reappraisal?
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8 Cognitive theory applied to eating disorders (EDs) posits that maladaptive cognitions and
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10 evaluations about the self, others, and the world generate emotional distress and perpetuate
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12 dysfunctional eating behaviors (Cooper, 2005) such as dietary restraint in anorexia nervosa (AN)
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14 and binge-eating in bulimia nervosa (BN). Indeed, EDs like all psychopathologies have been found
15
16 to be marked by maladaptive thinking (Möller & Bothma, 2001; Del Pozo, Harbeck, Zahn, Kliem,
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18 & Kröger, 2018) conceptualized in second-wave cognitive models as irrational beliefs in Rational-
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20 Emotive Behavior Therapy (Ellis, 1958; Višlā, Flückiger, grosse Holtforth, David, 2016) and
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22 cognitive distortions in Beck's (Beck & Haigh, 2014) Cognitive Behavioral Therapy, as well as
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24 being characterized by difficulties in cognitive reappraisal, the capacity to alter one's emotional
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26 state by cognitively reassessing the situation (Danner, Evers, Stok, van Elburg, & de Ridder, 2012).
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28 Currently the most evidence-based treatment for adults with an eating disorder is the enhanced
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30 transdiagnostic cognitive behavioral therapy (CBT-E) proposed by Fairburn, Cooper and Shafran
31
32 (2003) stemming from specialized psychopathological and maintenance model for EDs.
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38 Although cognitively-oriented therapies are considered first-line treatment in clinical
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40 guidelines for EDs (APA, 2010; National Health Service, 2017), room for improvement in
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42 treatment retention and outcomes remains, as failure to complete standard CBT-based treatment in
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44 ED outpatients is particularly high (Fairburn et al., 2012). CBT-E randomized trials, according to a
45
46 recent review, do not demonstrate superiority over comparison treatments, especially in the longer-
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48 term (Atwood & Freidman, 2020). Clinicians and researchers have called for further development
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50 of cognitive models that may enhance interventions for EDs (Jones, Leung, & Harris, 2007; Cooper,
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52 Todd, & Wells, 2009). “Third wave” approaches such as metacognitive therapy (MT), dialectical
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54 behavior therapy (DBT), and acceptance and commitment therapy (ACT), are currently being
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56 adapted and tested in EDs to overcome limits of traditional CBT in EDs (Vann et al., 2014;
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58 Linardon et al., 2017). Such approaches retain CBT elements but integrate new methods to improve
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3 clinical change in psychological functioning by targeting function or awareness of cognitions and
4 emotions rather than directly targeting the content and validity of cognitive processes. Thus, third-
5 wave therapies emphasize metacognition, acceptance, mindfulness, and psychological flexibility,
6 and reduction of experiential avoidance (Hays & Hofmann, 2017; Linardon et al., 2017). To date,
7 however while large pre-post symptom improvements were observed for several third-wave
8 treatments, results on randomized controlled trials have not yet shown superiority compared to the
9 recommended CBT treatments in EDs (Linardon et al., 2017).

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19 Despite the expansion of the number of cognitive models (DiGiuseppe, Venezia, &
20 Gotterbarn, 2017) few studies examine the relationship between traditional CBT and third-wave
21 CBT cognitive targets of therapy and their role on psychological distress and dysfunctional
22 behavior (DiGiuseppe, David, & Venezia, 2016) specifically in EDs where treatment response is
23 not optimal. While the emergence of novel approaches and psychotherapeutic options might be
24 needed, it would be beneficial to first investigate their possible contribution to already well-
25 validated and tested models and therapies for EDs. In particular, the possibility of integrating in
26 CBT models for EDs the third-wave concept of metacognition which has been previously proposed
27 (Cooper, Todd, & Wells, 2009) remains to be investigated. Metacognition refers to the "how" we
28 think, rather than "what" we think (Wells, 2009) and subsequently metacognitive therapy (Wells,
29 2009) focuses on how we judge and evaluate our thoughts, that is, metacognitions, in addition to
30 focusing on attentional biases, and cognitive processes of worry and repetitive negative thinking
31 (RNT) (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Ehring & Watkins, 2008; Ehring,
32 Zetsche, Weidacker, Wahl, Schönfeld, & Ehlers, 2011). Metacognitions concerning the need to
33 control thoughts and metacognitions about uncontrollability and danger of thoughts, have been both
34 implicated in ED symptomatology and maintenance (Davenport, Rushford, Soon, & McDermott,
35 2015; Olstad, Solem, Hjemdal, & Hagen, 2015; Quattropani et al., 2016; Sun, Zhu, & So, 2017).

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58 Therefore, in the current study, we investigated how the second-wave construct of irrational
59 beliefs (IBs), rigid, absolutistic and inflexible negative thoughts about the self, the world and others
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3 (Vîslă et al., 2016), which represent the first and original conceptualization of maladaptive
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5 cognitions in the cognitive behavioral framework (Ellis, 1958; Ellis & Dryden, 2007) are related to
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7 the third-wave construct of metacognitions , the maladaptive evaluations of one's own thoughts in
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9 predicting ED symptomatology and cognitive reappraisal in ED patients. The specific aims of this
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11 cross-sectional study are to: 1) explore the relationship between IBs and metacognitions, 2)
12
13 examine whether IBs in predicting ED severity, ED-related psychopathology, and cognitive
14
15 reappraisal are mediated by metacognitions, specifically metacognitions about the need to control
16
17 thoughts and about dangerousness and uncontrollability of thoughts. Understanding such
18
19 relationships may yield important clinical information on whether they both might contribute to one
20
21 latent dysfunctional cognitive variable or whether they each contribute uniquely in predicting
22
23 psychopathological disturbance (DiGiuseppe et al., 2016; Tecuta, Tomba, Lupetti, & DiGiuseppe,
24
25 2019) specifically in EDs.

30 **Methods**

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32 The project was approved by University of Bologna Bioethics Committee and Department of
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34 Psychology Ethics Committee. Informed consent was obtained from all participants included in the
35
36 study.
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39 **ED outpatient sample**

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41 Consecutively recruited patients (n = 79) who met diagnostic criteria for EDs (DSM 5;
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43 American Psychiatric Association, 2013) anorexia nervosa (AN), bulimia nervosa (BN), binge-
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45 eating disorder (BED), and other specified feeding or eating disorder (OSFED) were recruited from
46
47 a specialized ED treatment center before commencing CBT-based treatment. ED diagnoses were
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49 established at intake by the consensus of a psychiatrist and a clinical psychologist independently
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51 using the Structured Clinical Interview for DSM 5 (SCID-5: First, Williams Karg & Spitzer, 2015).
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55 Each diagnostic interview was conducted and recorded by a clinical psychologist expert in
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57 assessment (E.T.) and subsequently reviewed by a consulting psychiatrist specialized in EDs who
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3 confirmed the diagnosis. Consent to be recorded while interviewed was obtained from all
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5 participants. Interrater reliability of ED diagnoses in terms of percent agreement was 83.11%.
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8 With the exception of two patients who refused to participate, all invited patients took part in
9
10 the study (n = 77). The inclusion criterion was the patients' age between 18 and 65 years. The
11
12 exclusion criteria were comorbid drug/alcohol abuse, psychotic or neurocognitive disorders, acute
13
14 suicidality, and pregnancy. The socio-demographic and clinical data of the sample appear in Table
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20 **Measures**

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22 The sample was assessed with the following instruments:

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25 **Attitudes and Beliefs Scale 2** (ABS-2: DiGiuseppe, Leaf, Gorman, & Robin, 2018,
26
27 DiGiuseppe, Gorman, B. & Raptis, 2020) is composed by 72 likert scale items and attempts to
28
29 measure the four irrational and four rational belief processes respectively identified by Albert Ellis
30
31 (1958): demandingness (DEM) versus non-demanding preferences, awfulizing (AWF) versus
32
33 realistic negative expectations, low frustration tolerance (LFT) versus high frustration tolerance,
34
35 and negative global evaluation/self-downing (NGE) versus self-acceptance. The various irrational
36
37 and rational belief processes are presented in three contextual areas; those that are related to issues
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39 (needs or expectations) of comfort, achievement, and affiliation. Demands represent rigid,
40
41 inflexible, and nonpragmatic beliefs and reflect absolutistic “must statements.” Awfulizing
42
43 statements are instead excessive negative evaluations and expectations of events, while low
44
45 frustration tolerance beliefs refer to thinking that one cannot tolerate an event or set of
46
47 circumstances. Negative global self-evaluations/self-downing refer to generalized negative labeling
48
49 and self-statements. The ABS-2 has demonstrated excellent construct validity pertaining to the four
50
51 irrational and four rational belief processes (DiGiuseppe et al., 2018, 2020) and good psychometric
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53 properties including good internal consistency, divergent and convergent validity in numerous
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3 studies (Macavei, 2002, 2005; Sava, 2009 Terjesen, Salhany, & Sciutto, 2009; Di Giuseppe et al.,
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5
6 2018).

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8 In the current study only the following four irrational belief process scales were used, all of
9
10 which are composed of nine items: irrational AWF, irrational DEM, irrational NGE, and irrational
11
12 LFT. The Italian translation of the ABS-2 utilized in a previous study was used (Tecuta et al.,
13
14 2019). This translation has already demonstrated excellent internal consistency in the general Italian
15
16 college-age population ($\alpha = 0.926$) and cronbach α coefficients for the four irrational belief
17
18 processes (ranging from 0.738 to 0.832) (Tecuta et al., 2019). In the current study, Cronbach's
19
20 alphas for irrational beliefs were similarly acceptable, that is, 0.88 for AWF, 0.85 for DEM, 0.93 for
21
22 NGE, and 0.85 for LFT and internal consistency also was excellent ($\alpha = 0.971$) in line with
23
24 validation studies (DiGiuseppe et al., 2018, 2020).
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29 **Meta-cognitions Questionnaire** (MCQ-65: Cartwright-Hatton & Wells, 1997) is a self-
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31 report questionnaire with 65 likert scale items assessing five positive and negative evaluations of
32
33 one's cognitive processes: positive beliefs about worry (19 items), beliefs about need to control
34
35 thoughts (16 items), cognitive confidence (10 items), negative beliefs about the uncontrollability
36
37 and danger of thoughts (13 items), and cognitive self-consciousness (7 items). The Italian
38
39 translation of the MCQ-65 provided in Well's (1999; Brazzelli & G. Cocchini Trans.) treatment
40
41 manual for anxiety disorders was used. In the current study sample, Cronbach's alphas were 0.89
42
43 for positive beliefs about worry, 0.86 for beliefs about need to control thoughts, 0.88 for cognitive
44
45 confidence, 0.87 for negative beliefs about the uncontrollability and danger of thoughts, and 0.66
46
47 for cognitive self-consciousness. Such values are in line with the validation of the original English
48
49 version (Wells, 2009).
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54 **Eating Disorder Inventory 3** (EDI-3:Garner, 2008) is a self-rating 91 likert scale item
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56 questionnaire assessing clinically relevant psychological traits and constructs in EDs which has
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58 been standardized and translated in numerous languages including Italian. In the current study the
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60 Italian adaptation of the EDI-3 was used (Giannini, Pannocchia, dalle Grave, Muratori, & Viglione,

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3 2008). It yields 12 primary scales (three of which are ED-risk scales and nine of which are ED-
4 related psychological scales) and the following six composite scales: eating disorder risk/severity,
5
6 related psychological scales) and the following six composite scales: eating disorder risk/severity,
7 ineffectiveness, interpersonal problems, affective problems, overcontrol, general psychological
8 maladjustment. Only the latter composite EDI-3 general psychological maladjustment scale was
9 used. It is composed of the following nine psychological scales: low self-esteem (six items),
10 personal alienation (seven items), interpersonal insecurity (seven items), interpersonal alienation
11 (seven items), interoceptive deficits (nine items), emotion dysregulation (eight items), perfectionism
12 (six items), asceticism (six items), and maturity fears (eight items), with a total of 64 items. This
13 composite score represents a total global psychological functioning index and levels of ED-related
14 psychopathology. The Italian EDI-3 adaptation has shown satisfactory internal consistency
15 (Cronbach's alpha ranging from for subscales in 0.70-0.94 in ED patients) and validity.
16 Specifically for the EDI-3 general psychological maladjustment scale, previously reported
17 Cronbach alpha was 0.94 (Giannini et al., 2008) while in the current study sample it was .91.
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33 **Eating Attitudes Test-40** (EAT: Garner & Garfinkel, 1979) is a 40 likert scale item
34 screening measure identifying behaviors and cognitive patterns associated with eating disorders
35 where a greater total score indicates greater eating disorder severity. The measure yields a total
36 score and three subscales scores: dieting, body and food preoccupations, and oral control. The
37 measure shows excellent psychometric properties (Garner & Garfinkel, 1979). In this study, we
38 used the Italian version of the EAT-40, which has been validated (Cuzzolaro & Petrilli, 1988)
39 which also exhibits good psychometric properties with reported Cronbach alphas of 0.80 for dieting
40 subscale, 0.70 for food and bulimic preoccupations subscale, and 0.83 for oral control subscale. In
41 the current study only the EAT total score was used for which the reliability coefficient was .90 in
42 the study population.
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56 **Emotion Regulation Questionnaire** (ERQ: Gross & John, 2003) is a 10 likert item
57 questionnaire that assesses emotion regulation strategies of expressive suppression and cognitive
58 reappraisal. The ERQ is composed of two subscales: Cognitive Reappraisal and Expressive
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3 Suppression of six items and four items respectively. Validation studies presented in Gross and
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5 John, (2003) showed that both subscales have an adequate internal consistency. In this study, the
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7 Italian version validated by Balzarotti, John, & Gross (2010) was used where Cronbach's alpha
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9 were 0.84 for the Reappraisal scale and 0.72 for the Suppression scale. Only the cognitive
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11 reappraisal subscale was used in the current study with Cronbach's alpha of .89 in the study
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Clinical variables. Body mass index (kg/m²) and illness duration was collected.

Statistical Analyses

Descriptive statistics were run for socio-demographic and clinical characteristics. Correlational analyses were conducted to examine the relationship between ABS-2 irrational beliefs and MCQ-65 metacognitions scores.

Using the PROCESS macro created by A. Hayes (2013), several models of mediation were tested to determine whether the relationships between IBs (ABS-2 total score) and ED symptomatology and cognitive reappraisal, were mediated by metacognitions. A total of six mediation analyses were conducted, which included bootstrapped confidence intervals (CIs) for assessing the significance of the indirect paths. Such bootstrapped confidence intervals are considered less biased than Sobel's test (Preacher & Hayes, 2004). When lower-level and upper-level confidence intervals (CI) do not overlap zero, the mediation is significant.

The mediational model tests the indirect effect of the independent variable (Irrational beliefs: ABS-2 total) on the consequent dependent variables of EDI-3, EAT-40, ERQ scores through the mediators metacognitions about uncontrollability and danger and metacognitions about need to control thoughts. Path c prime (ϕ) represents the indirect effect of IV on DV once the mediator is considered. In all the analyses, the level of significance was set at $p < 0.05$ (two-sided). The Statistical Package for Social Sciences Version 23 (SPSS) was used for all calculations.

Results

Correlational analyses

Bivariate correlational analyses showed that all ABS-2 subscales and MCQ subscales are moderately, positively and significantly correlated with each other. See Tables 2 for all correlational coefficients.

Mediation analyses

Mediation analyses revealed that both MCQ-negative beliefs about uncontrollability and danger ($F_{(2,69)} = 49.052, p < 0.0001, R^2 = 0.587$) and MCQ-need to control thoughts ($F_{(2,69)} = 39.827, p < 0.0001, R^2 = 0.536$) significantly mediate the relationship between IBs (ABS-2-total score) and EDI-3-general psychological maladjustment. However, the ABS-2 total score remains a significant predictor in the mediation model, indicating only partial mediation.

Scores in MCQ-negative beliefs about uncontrollability and danger mediate significantly and partially the relationship between IBs (ABS-2 total scores) and EAT-40 total scores ($F_{(2,70)} = 13.353, p < 0.0001, R^2 = 0.276$). Instead, scores in MCQ-need to control thoughts mediate the same relationship ($F_{(2,70)} = 14.716, p < 0.0001, R^2 = 0.296$) however completely, with ABS-2 total score losing significance as a predictor.

To a lesser extent, MCQ-negative beliefs about uncontrollability and danger ($F_{(2,70)} = 7.873, p < 0.008, R^2 = 0.1836$) mediated the relationship between IBs (ABS-2 total score) and ERQ-cognitive reappraisal, while MCQ-need to control thoughts did not ($F_{(2,70)} = 6.087, p = 0.0037, R^2 = 0.1481$). However, confidence intervals revealed that such mediations are not statistically significant. Please see Table 3 for all coefficients and confidence intervals and Figure 1 for mediation models with significant partial and complete mediations.

Discussion

The current study is the first, to our knowledge, to investigate the relationship between IBs and metacognitions, as a potential additional contributing factor in predicting ED symptom severity and ED-related psychopathology as well as in predicting the capacity to apply cognitive reappraisal.

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3 Overall, IBs and metacognitions seem to be related constructs. While IBs are associated with all
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5 outcomes, including ED symptom severity, ED-related psychopathology and cognitive reappraisal,
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7 metacognitions were found to contribute, albeit not completely, to the relationship between IBs and
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9 ED-related psychopathology, but not to the relationship between IBs and cognitive reappraisal.
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11 Instead, the metacognition need to control thoughts contributed significantly to explaining ED
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13 severity, where IBs' contribution is lost.
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17 Concerning correlational analyses, IBs and metacognitions were moderately and positively
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19 correlated with each other, with the exception of the metacognition of cognitive confidence, in line
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21 with the partial overlap that different conceptualizations of maladaptive cognitions within the
22
23 cognitive framework may conceptually have (Digiuseppe et al., 2017). For example, overlap in
24
25 constructs of cognitions were found in studies on anxiety and depression, where Beck's CBT
26
27 concepts of maladaptive cognitions overlapped partially with Ellis' irrational beliefs processes
28
29 (Szentagotai & Freeman, 2007; Wong, 2008; Sava, 2009; Tecuta et al., 2019). In the current study,
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31 ED patients who reported greater levels of negative self-beliefs and/or of awfulizing thinking
32
33 endorse more strongly metacognitions about uncontrollability and danger of thoughts. Both IBs and
34
35 metacognitions have been found to be associated with higher psychopathology and with negative
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37 emotions (Tarjishi, Mohammadkhani, & Jadidi, 2011; Vîslă, Flückiger, Grosse Holtforth, & David,
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39 2016).
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45 Considering the mediational relationships explored among the examined constructs, the
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47 contribution of metacognitions varied depending on the type of considered metacognition and the
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49 type of outcome. Concerning ED symptom severity, the relationship between IBs and ED symptom
50
51 severity including bulimia symptoms, dietary restraint, bulimic and food preoccupations, was found
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53 to be completely mediated by the metacognition of need to control thoughts and partially mediated
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55 by uncontrollability and danger of thoughts (See Figure 1). Thus, irrational belief processes
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57 contribute to increased ED severity, however the relationship is entirely explained by the patient's
58
59 tendency of controlling such rigid and negative thought patterns. Integrating in CBT models of EDs
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3 the metacognitive tendency to control/suppress thoughts might offer incremental and unique
4 information which is not captured by irrational belief processes, since they do not include elements
5 of control. While the IB of demandingness or "must statements", included in the total IB score used
6 in mediation analyses may be conceptually extendable to rigid expectations of control (e.g. I *must*
7 control my thoughts), the predictive value of this IB has been found to be weaker compared to other
8 IBs in the literature (Višlă et al., 2016; Tecuta et al., 2019). Similarly to our study, metacognitions
9 concerning the need to control thoughts were found to predict drive for thinness in AN patients
10 (Davenport et al., 2015). A sense of control seems to have an important role in ED etiology
11 (Surgenor, Horn, Plumridge, & Hudson, 2002) due to a sense of loss of control in other aspects of
12 one's life (Fairburn, Shafran, & Cooper, 1999), as hypothesized by clinical researchers for quite
13 some time (Bruch, 1973; Crisp, 1980; Garfinkel & Garner, 1982). Moreover, higher endorsement of
14 negative beliefs concerning the self were found to lead to greater thoughts on loss of control, which
15 predicted binge eating and craving in a sample of BN and BED patients more so than other types of
16 thoughts concerning dietary restraint (Legenbauer, Radix, Augustat, & Schütt-Strömel, 2018).
17 However, the current study findings where IBs lose predictive value on ED symptom severity may
18 be due to not differentiating between the four specific IBs which might have revealed different
19 associations.

20
21
22 With regards to ED-related psychopathology, both metacognitions concerning the need to
23 control thoughts and uncontrollability and danger partially mediated the relationship between IBs
24 and this outcome. IBs retain their predictive role on ED-related psychopathology despite the
25 significant contribution of metacognitions. While a causal relationship between IBs and
26 metacognitions has not yet been investigated, theoretical metacognitive models (Vann, Strodl, &
27 Anderson, 2013) would posit that ED patients in response to negative thought contents may judge
28 such negative thinking negatively as uncontrollable, dangerous or needing to be controlled which in
29 turn might contribute to an increased use of dysfunctional coping strategies encompassed in ED-
30 related psychopathology (See Figure 1). However, considering a REBT theoretical perspective,

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3 metacognitions concerning a need to control thoughts and uncontrollability and danger of thoughts,
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5 might represent a manifestation of the IB of awfulizing, demandingness or negative global
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7 evaluation (e.g. "worrying/having negative thoughts is terrible", "I must control my thoughts").
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10 Concerning cognitive reappraisal, no support was instead found for a possible mediation role
11
12 of either metacognition considered in the current study. While metacognitions were found to be
13
14 associated with other cognitive processes in EDs such as worry (Sapuppo, Ruggiero, Caselli, &
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16 Sassaroli, 2018) and craving/desire thinking (Spada et al., 2016), metacognitions did not contribute
17
18 to reduced cognitive reappraisal due to irrational belief processes in our ED sample. However, a
19
20 lack of significant results could be due to the relatively small sample size.
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24 Several important clinical and theoretical implications for ED cognitive models and ED
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26 treatment emerge. In particular, in present CBT models and treatment approaches for EDs, irrational
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28 belief processes might be sufficient to explain difficulties in cognitive reappraisal as well as in
29
30 explaining ED-related psychopathology, which may be targeted with cognitive restructuring, the
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32 primary mechanism of cognitive change in traditional second-wave CBT (Ellis, 1994; Beck &
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34 Haigh, 2014; Kazantzis et al., 2018). Such results might be clinically important in supporting the
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36 notion promoted by clinicians of working towards an increasingly optimal transtheoretical approach
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38 in CBT rather than pursuing a fragmentation of CBT approaches (Ellard, Fairholme, Boisseau,
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40 Farchione, & Barlow, 2010).
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44 While metacognitions may not warrant integration in CBT models of EDs in directly
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46 predicting cognitive reappraisal and ED-related psychopathology above and beyond the contribution
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48 of IBs, on the other hand, metacognitions pertaining to attempts to control and suppress thoughts
49
50 may offer incremental validity to CBT models of EDs given their important contribution to ED
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52 symptom severity. For example, within the CBT-E model (Fairburn et al., 2003), which introduces
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54 to the traditional CBT model for EDs four crucial maintenance mechanisms of core low self-
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56 esteem, clinical perfectionism, mood intolerance and interpersonal difficulties, metacognitions
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58 about the need to control thoughts might be integrated as an additional maintenance mechanism, to
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3 be considered as a transdiagnostic feature (Vann, Strodl, & Anderson, 2014). Interventions on
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5 metacognitions may include cognitive restructuring, a technique of traditional CBT approaches, of
6
7 such metacognitions (Wells, 2009). Especially in EDs, the metacognitions that should be targeted
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9 concern the need to control thoughts, independently of the content of such thoughts. Additional
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11 interventions for RNT through metacognitive therapy (MT) techniques (Wells, 2009) or through
12
13 rumination-focused CBT techniques (Watkins, 2016) may be warranted to further enhance ED
14
15 symptom reduction. Thus far, an integration of CBT with MT has been proposed for bulimia
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17 nervosa (Cooper et al., 2009), however a transdiagnostic MT model for EDs has not yet been
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19 formulated or tested in an randomized controlled trial (Vann et al., 2014).
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24 Limitations of the current study include a small sample size and not considering ED
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26 diagnostic differences. The findings may also be due to the ABS-2 instrument's focus on contextual
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28 areas of life regarding achievement, approval and comfort rather than focusing on specific ED
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30 themes of food, body weight and shape as well as the MCQ-65 measuring general metacognitions
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32 rather than specific ED-related metacognitions. Future research should further explore irrational
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34 beliefs pertaining to ED themes in relation to metacognitions over time, as well as retesting the
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36 relationship in predicting cognitive reappraisal with a larger sample.
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Table 1

ED Outpatient and Control Sample Sociodemographic Data and Comparisons in ABS-2, MCQ, and ERQ-Cognitive reappraisal Scores

Variables	Total ED sample (N=77)	AN group (N=29)	BN group (N=15)	BED group (N=13)	OSFED group (N=20)
Age (years)	27.49±12.28	23.72±10.7 1	30.87±13.8 1	32.08±13.5 6	27.45±11.49
Marital Status (% single)	80.5	89.7	60	84.6	80
BMI	22.47±8.27	17.53±3.04	22.41±3.62	35.59±9.83	20.67±5.20
Illness Duration (years)	8.87±10.11	7.24±10.23	11.31±12.1 1	9.33±9.35	9.09±9.18
ABS-2 Irrational Awfulizing	19.26±8.16	19.86±8.90	21.80±8.89	17.00±7.80	17.95±6.46
ABS-2 Irrational Demandingness	16.30±6.68	16.59±7.04	18.80±8.40	13.77±4.97	15.65±5.30
ABS-2 Irrational Negative global evaluations	13.65±9.86	14.69±11.1 1	16.13±9.79	9.54±8.48	12.95±8.50
ABS-2 Irrational Low Frustration Tolerance	19.79±6.18	19.97±6.98	20.67±6.32	17.69±6.33	20.25±4.70
MCQ Positive beliefs about worry	35.50±10.11	38.93±11.3 1	34.87±10.0 6	31.54±8.80	33.56±7.85
MCQ Negative beliefs about worry	42.73±9.28	42.32±10.4 1	43.67±8.81	40.15±8.08	44.44±8.85
MCQ Cognitive Confidence	18.88±7.02	17.79±6.20	21.40±8.27	17.31±6.52	19.61±7.35
MCQ Need to control thoughts	28.51±7.45	28.32±8.97	30.53±8.77	26.38±6.84	28.67±5.12
MCQ Cognitive Self-Consciousness	18.80±3.67	19.18±4.32	18.87±2.70	17.31±3.99	19.22±2.96
ERQ Cognitive Reappraisal	26.42±6.74	26.64±6.23	24.93±7.07	28.77±7.11	25.70±7.00

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Table 2

Correlational Analyses between ABS-2 Irrational beliefs and MCQ-Metacognitions (n = 77)

	MCQ Positive Beliefs about Worry	MCQ Negative Beliefs about Worry	MCQ Cognitive Confidence	MCQ Need to Control Thoughts	MCQ Cognitive Self- Consciousness
ABS-2 Irrational Awfulizing	0.441 p<0.0001	0.461 p<0.0001	0.165 p=0.160	0.641 p<0.0001	0.306 p=0.008
ABS-2 Irrational Demandingness	0.423 p<0.001	0.388 p=0.001	0.186 p=0.112	0.579 p<0.0001	0.354 p=0.002
ABS-2 Irrational Negative global evaluations	0.532 p<0.0001	0.497 p<0.0001	0.216 p=0.065	0.624 p<0.0001	0.362 p=0.002
ABS-2	0.469	0.457	0.114	0.586	0.337

Irrational Low	p<0.0001	p<0.0001	p=0.334	p<0.0001	p=0.003
Frustration Tolerance					
ABS-2 Total Irrational	0.518	0.501	0.193	0.672	0.374
Beliefs Score	p<0.0001	p<0.0001	p=0.100	p<0.0001	p=0.001

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Table 3a

Mediation Analyses Examining the Role of Irrational Beliefs as Predictor and MCQ-Negative Beliefs about Uncontrollability and Danger as Mediator(Med) on ED Symptomatology and Cognitive Reappraisal (N=72)

Mediator: MCQ Negative Beliefs about Uncontrollability and Danger						
	EDI-3 General Psychological Maladjustment		EAT TOT		ERQ Cognitive Reappraisal	
	β	SE	β	SE	β	SE
Path c (IV-DV)	0.8501**	0.1158	0.3991**	0.0867	-0.0862 ⁺	0.0271
Path a (IV-Med)	0.1675**	0.0344	0.1606**	0.0333	0.1672**	0.0340
Path b (Med-DV)	1.7474**	0.3466	0.6379 ⁺	0.3018	-0.2060 ⁺	0.0920
Path c ¹ (Direct IV-DV)	0.5575**	0.1154	0.2966 ⁺	0.3018	-0.0518	0.0305
Indirect effect	Path ab 95% Bootstrapped Confidence Interval					
	Lower	Upper	Lower	Upper	Lower	Upper
	0.1475	0.4503	0.0000	0.2029	-0.0778	0.0003

Table 3b

Mediation Analyses Examining the Role of Irrational Beliefs as Predictor and MCQ-Beliefs about Need to Control Thoughts as Mediator (Med) on ED Symptomatology and Cognitive Reappraisal (N=72)

Mediator: MCQ Beliefs about Need to Control Thoughts						
	EDI-3 General Psychological Maladjustment		EAT TOT		ERQ Cognitive Reappraisal	
	β	SE	β	SE	β	SE

Path c (IV-DV)	0.8501**	0.1158	0.3991**	0.0867	-0.0862 ⁺	0.0271
Path a (IV-Med)	0.1876**	0.0245	0.1819**	0.0239	0.1873**	0.0242
Path b (Med-DV)	1.9985*	0.5162	1.0613 ⁺	0.4141	-0.1816	0.1319
Path c ¹ (Direct IV- DV)	0.4752 ⁺	0.1434	0.2060	0.1124	-0.0522	0.0365
Indirect effect	Path ab 95% Bootstrapped Confidence Interval					
	Lower	Upper	Lower	Upper	Lower	Upper
	0.1559	0.6128	0.0396	0.3574	-0.0983	0.0279

Note: ABS, Attitudes and Beliefs Scale; AN, Anorexia Nervosa; BED, Binge Eating Disorder; BMI, Body Mass Index; BN, Bulimia Nervosa; DV, dependent variable; EAT, Eating Attitudes Test; ED, Eating Disorders; EDI, Eating Disorder Inventory; ERQ, Emotion Regulation Questionnaire; IV, independent variable; MCQ, Meta-cognitions Questionnaire; OSFED, Other Specified Feeding or Eating Disorders; p, statistical significance

Note: 95% CI = bias corrected confidence intervals based on 5000 bootstrapped samples.

⁺ p= .01; * p< .001; ** p < .0001

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Figure 1. Mediation models

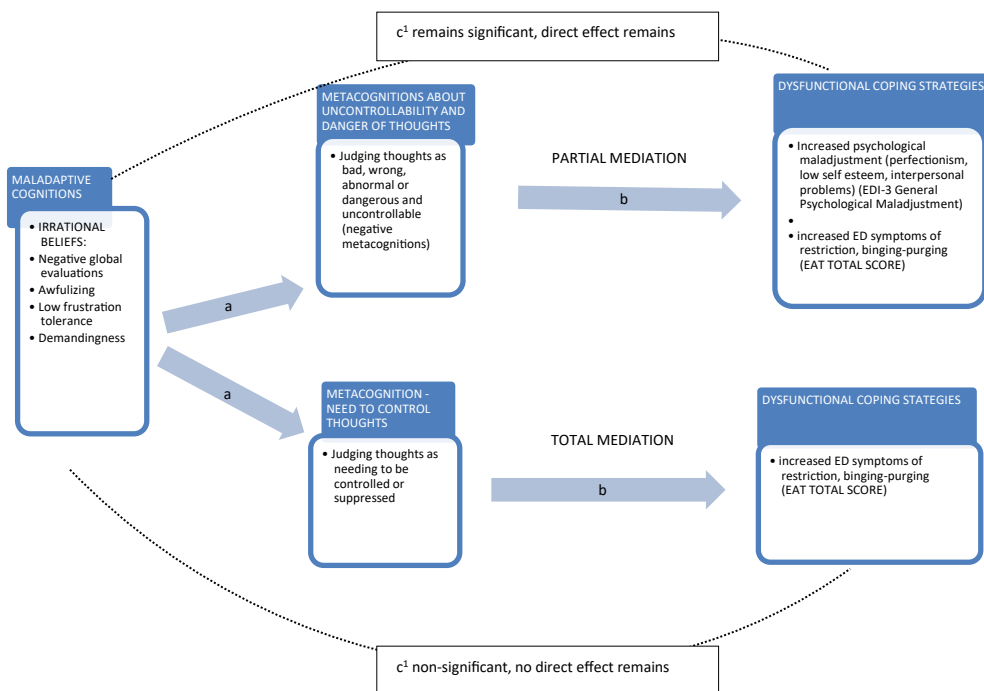


Figure 1. Mediation models

