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

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(Article begins on next page)

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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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49  
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  
9  
10 evaluations about the self, others, and the world generate emotional distress and perpetuate  
11  
12 dysfunctional eating behaviors (Cooper, 2005) such as dietary restraint in anorexia nervosa (AN)  
13  
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,  
17  
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  
21  
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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31 Currently the most evidence-based treatment for adults with an eating disorder is the enhanced  
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33 transdiagnostic cognitive behavioral therapy (CBT-E) proposed by Fairburn, Cooper and Shafran  
34  
35 (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  
39  
40 guidelines for EDs (APA, 2010; National Health Service, 2017), room for improvement in  
41  
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  
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46 recent review, do not demonstrate superiority over comparison treatments, especially in the longer-  
47  
48 term (Atwood & Freidman, 2020). Clinicians and researchers have called for further development  
49  
50 of cognitive models that may enhance interventions for EDs (Jones, Leung, & Harris, 2007; Cooper,  
51  
52 Todd, & Wells, 2009). “Third wave” approaches such as metacognitive therapy (MT), dialectical  
53  
54 behavior therapy (DBT), and acceptance and commitment therapy (ACT), are currently being  
55  
56 adapted and tested in EDs to overcome limits of traditional CBT in EDs (Vann et al., 2014;  
57  
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  
5 emotions rather than directly targeting the content and validity of cognitive processes. Thus, third-  
6  
7 wave therapies emphasize metacognition, acceptance, mindfulness, and psychological flexibility,  
8  
9 and reduction of experiential avoidance (Hays & Hofmann, 2017; Linardon et al., 2017). To date,  
10  
11 however while large pre-post symptom improvements were observed for several third-wave  
12  
13 treatments, results on randomized controlled trials have not yet shown superiority compared to the  
14  
15 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  
21 Gotterbarn, 2017) few studies examine the relationship between traditional CBT and third-wave  
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23 CBT cognitive targets of therapy and their role on psychological distress and dysfunctional  
24  
25 behavior (DiGiuseppe, David, & Venezia, 2016) specifically in EDs where treatment response is  
26  
27 not optimal. While the emergence of novel approaches and psychotherapeutic options might be  
28  
29 needed, it would be beneficial to first investigate their possible contribution to already well-  
30  
31 validated and tested models and therapies for EDs. In particular, the possibility of integrating in  
32  
33 CBT models for EDs the third-wave concept of metacognition which has been previously proposed  
34  
35 (Cooper, Todd, & Wells, 2009) remains to be investigated. Metacognition refers to the "how" we  
36  
37 think, rather than "what" we think (Wells, 2009) and subsequently metacognitive therapy (Wells,  
38  
39 2009) focuses on how we judge and evaluate our thoughts, that is, metacognitions, in addition to  
40  
41 focusing on attentional biases, and cognitive processes of worry and repetitive negative thinking  
42  
43 (RNT) (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Ehring & Watkins, 2008; Ehring,  
44  
45 Zetsche, Weidacker, Wahl, Schönfeld, & Ehlers, 2011). Metacognitions concerning the need to  
46  
47 control thoughts and metacognitions about uncontrollability and danger of thoughts, have been both  
48  
49 implicated in ED symptomatology and maintenance (Davenport, Rushford, Soon, & McDermott,  
50  
51 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  
60 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  
4  
5 cognitions in the cognitive behavioral framework (Ellis, 1958; Ellis & Dryden, 2007) are related to  
6  
7 the third-wave construct of metacognitions , the maladaptive evaluations of one's own thoughts in  
8  
9 predicting ED symptomatology and cognitive reappraisal in ED patients. The specific aims of this  
10  
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  
33  
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**

40  
41 Consecutively recruited patients (n = 79) who met diagnostic criteria for EDs (DSM 5;  
42  
43 American Psychiatric Association, 2013) anorexia nervosa (AN), bulimia nervosa (BN), binge-  
44  
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  
48  
49 established at intake by the consensus of a psychiatrist and a clinical psychologist independently  
50  
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  
56  
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  
4  
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**

21  
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  
38  
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  $\alpha$  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  
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35 thoughts (16 items), cognitive confidence (10 items), negative beliefs about the uncontrollability  
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37 and danger of thoughts (13 items), and cognitive self-consciousness (7 items). The Italian  
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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  
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47 for cognitive self-consciousness. Such values are in line with the validation of the original English  
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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  
55  
56 questionnaire assessing clinically relevant psychological traits and constructs in EDs which has  
57  
58 been standardized and translated in numerous languages including Italian. In the current study the  
59  
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-  
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5 related psychological scales) and the following six composite scales: eating disorder risk/severity,  
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7 ineffectiveness, interpersonal problems, affective problems, overcontrol, general psychological  
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9 maladjustment. Only the latter composite EDI-3 general psychological maladjustment scale was  
10  
11 used. It is composed of the following nine psychological scales: low self-esteem (six items),  
12  
13 personal alienation (seven items), interpersonal insecurity (seven items), interpersonal alienation  
14  
15 (seven items), interoceptive deficits (nine items), emotion dysregulation (eight items), perfectionism  
16  
17 (six items), asceticism (six items), and maturity fears (eight items), with a total of 64 items. This  
18  
19 composite score represents a total global psychological functioning index and levels of ED-related  
20  
21 psychopathology. The Italian EDI-3 adaptation has shown satisfactory internal consistency  
22  
23 (Cronbach's alpha ranging from for subscales in 0.70-0.94 in ED patients) and validity.  
24  
25 Specifically for the EDI-3 general psychological maladjustment scale, previously reported  
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27 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  
35 screening measure identifying behaviors and cognitive patterns associated with eating disorders  
36  
37 where a greater total score indicates greater eating disorder severity. The measure yields a total  
38  
39 score and three subscales scores: dieting, body and food preoccupations, and oral control. The  
40  
41 measure shows excellent psychometric properties (Garner & Garfinkel, 1979). In this study, we  
42  
43 used the Italian version of the EAT-40, which has been validated (Cuzzolaro & Petrilli, 1988)  
44  
45 which also exhibits good psychometric properties with reported Cronbach alphas of 0.80 for dieting  
46  
47 subscale, 0.70 for food and bulimic preoccupations subscale, and 0.83 for oral control subscale. In  
48  
49 the current study only the EAT total score was used for which the reliability coefficient was .90 in  
50  
51 the study population.  
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55

56 **Emotion Regulation Questionnaire** (ERQ: Gross & John, 2003) is a 10 likert item  
57  
58 questionnaire that assesses emotion regulation strategies of expressive suppression and cognitive  
59  
60 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  
6  
7 Italian version validated by Balzarotti, John, & Gross (2010) was used where Cronbach's alpha  
8  
9 were 0.84 for the Reappraisal scale and 0.72 for the Suppression scale. Only the cognitive  
10  
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/m<sup>2</sup>) 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 ( $\phi$ ) 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  
4  
5 outcomes, including ED symptom severity, ED-related psychopathology and cognitive reappraisal,  
6  
7 metacognitions were found to contribute, albeit not completely, to the relationship between IBs and  
8  
9 ED-related psychopathology, but not to the relationship between IBs and cognitive reappraisal.  
10  
11 Instead, the metacognition need to control thoughts contributed significantly to explaining ED  
12  
13 severity, where IBs' contribution is lost.  
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16  
17 Concerning correlational analyses, IBs and metacognitions were moderately and positively  
18  
19 correlated with each other, with the exception of the metacognition of cognitive confidence, in line  
20  
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,  
30  
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  
36  
37 emotions (Tarjishi, Mohammadkhani, & Jadidi, 2011; Vîslă, Flückiger, Grosse Holtforth, & David,  
38  
39 2016).  
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45 Considering the mediational relationships explored among the examined constructs, the  
46  
47 contribution of metacognitions varied depending on the type of considered metacognition and the  
48  
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  
52  
53 to be completely mediated by the metacognition of need to control thoughts and partially mediated  
54  
55 by uncontrollability and danger of thoughts (See Figure 1). Thus, irrational belief processes  
56  
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  
60

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2  
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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2  
3 metacognitions concerning a need to control thoughts and uncontrollability and danger of thoughts,  
4  
5 might represent a manifestation of the IB of awfulizing, demandingness or negative global  
6  
7 evaluation (e.g. "worrying/having negative thoughts is terrible", "I must control my thoughts").  
8  
9

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, &  
15  
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  
25  
26 treatment emerge. In particular, in present CBT models and treatment approaches for EDs, irrational  
27  
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  
31  
32 primary mechanism of cognitive change in traditional second-wave CBT (Ellis, 1994; Beck &  
33  
34 Haigh, 2014; Kazantzis et al., 2018). Such results might be clinically important in supporting the  
35  
36 notion promoted by clinicians of working towards an increasingly optimal transtheoretical approach  
37  
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  
45  
46 predicting cognitive reappraisal and ED-related psychopathology above and beyond the contribution  
47  
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  
51  
52 symptom severity. For example, within the CBT-E model (Fairburn et al., 2003), which introduces  
53  
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  
8  
9 concern the need to control thoughts, independently of the content of such thoughts. Additional  
10  
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  
29  
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)

<b>Mediator: MCQ Negative Beliefs about Uncontrollability and Danger</b>						
	<b>EDI-3 General Psychological Maladjustment</b>		<b>EAT TOT</b>		<b>ERQ Cognitive Reappraisal</b>	
	$\beta$	SE	$\beta$	SE	$\beta$	SE
Path c (IV-DV)	0.8501**	0.1158	0.3991**	0.0867	-0.0862 <sup>+</sup>	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 <sup>+</sup>	0.3018	-0.2060 <sup>+</sup>	0.0920
Path c <sup>1</sup> (Direct IV-DV)	0.5575**	0.1154	0.2966 <sup>+</sup>	0.3018	-0.0518	0.0305
Indirect effect	<b>Path ab 95% Bootstrapped Confidence Interval</b>					
	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)*

<b>Mediator: MCQ Beliefs about Need to Control Thoughts</b>						
	<b>EDI-3 General Psychological Maladjustment</b>		<b>EAT TOT</b>		<b>ERQ Cognitive Reappraisal</b>	
	$\beta$	SE	$\beta$	SE	$\beta$	SE

Path c (IV-DV)	0.8501**	0.1158	0.3991**	0.0867	-0.0862 <sup>+</sup>	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 <sup>+</sup>	0.4141	-0.1816	0.1319
Path c <sup>1</sup> (Direct IV- DV)	0.4752 <sup>+</sup>	0.1434	0.2060	0.1124	-0.0522	0.0365
Indirect effect	<b>Path ab 95% Bootstrapped Confidence Interval</b>					
	Lower	Upper	Lower	Upper	Lower	Upper
	0.1559	0.6128	0.0396	0.3574	-0.0983	0.0279

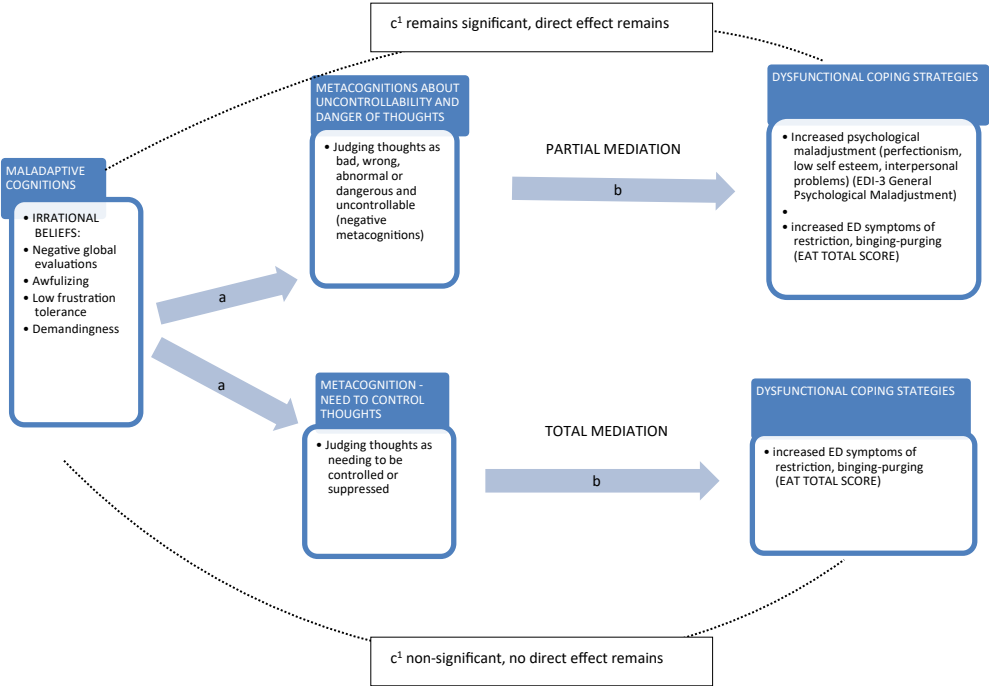
Note: ABS, Attitudes and Beliefs Scale; AN, Anorexia Nervosa; BED, Binge Eating Disorder; BMI, Body Mass Index; BN, Bulimia Nervosa; DV, dependent variable; EAT, Eating Attitudes Test; ED, Eating Disorders; EDI, Eating Disorder Inventory; ERQ, Emotion Regulation Questionnaire; IV, independent variable; 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.

<sup>+</sup> p= .01; \* p< .001; \*\* p < .0001

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Figure 1. Mediation models



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Figure 1. Mediation models

