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


## Abstract

**Objective:** Cognitively-oriented therapies, first-line treatment for eating disorders (EDs), still show room for improvement in treatment retention and outcomes. Despite the development of additional cognitive models and therapies, few studies examine the relationship between traditional and third-wave cognitive targets in EDs. The study explores the relationship between irrational beliefs (IBs) and metacognitions and their relationship with ED psychopathology and cognitive reappraisal in ED outpatients. **Method:** Seventy-seven patients (mean age 27.49±12.28 years) were assessed with The Attitudes and Beliefs Scale-ABS-2, Meta-cognitions Questionnaire-MCQ-65, Eating Disorder Inventory 3-EDI-3, Eating Attitudes Test-EAT-40, Emotion Regulation Questionnaire-ERQ. **Results:** Correlational analyses showed that IBs and metacognitions significantly correlated with each other. Metacognitions partially mediated the relationship between IBs and ED-related general psychological maladjustment and completely mediated the relationship between IBs and ED symptom severity. Cognitive reappraisal was predicted only by IBs and metacognitions were not significant mediators. **Conclusions:** While IBs are sufficient in explaining ED-related psychopathology and reduced cognitive reappraisal, a potential integration of metacognitions about need to control thoughts in CBT models for EDs may offer incremental validity given their contribution to ED severity. Treatment implications include targeting metacognitions concerning need to control thoughts, as a potential maintenance mechanism of ED symptomatology through cognitive restructuring.


*keywords*: irrational beliefs, metacognitions, eating disorders, cognitive behavioral therapy, CBT

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

Cognitive theory applied to eating disorders (EDs) posits that maladaptive cognitions and evaluations about the self, others, and the world generate emotional distress and perpetuate dysfunctional eating behaviors (Cooper, 2005) such as dietary restraint in anorexia nervosa (AN) and binge-eating in bulimia nervosa (BN). Indeed, EDs like all psychopathologies have been found to be marked by maladaptive thinking (Möller & Bothma, 2001; Del Pozo, Harbeck, Zahn, Kliem, & Kröger, 2018) conceptualized in second-wave cognitive models as irrational beliefs in Rational-Emotive Behavior Therapy (Ellis, 1958; Vîslă, Flückiger, grosse Holtforth, David, 2016) and cognitive distortions in Beck's (Beck & Haigh, 2014) Cognitive Behavioral Therapy, as well as being characterized by difficulties in cognitive reappraisal, the capacity to alter one's emotional state by cognitively reassessing the situation (Danner, Evers, Stok, van Elburg, & de Ridder, 2012). Currently the most evidence-based treatment for adults with an eating disorder is the enhanced transdiagnostic cognitive behavioral therapy (CBT-E) proposed by Fairburn, Cooper and Shafran (2003) stemming from specialized psychopathological and maintenance model for EDs.

Although cognitively-oriented therapies are considered first-line treatment in clinical guidelines for EDs (APA, 2010; National Health Service, 2017), room for improvement in treatment retention and outcomes remains, as failure to complete standard CBT-based treatment in ED outpatients is particularly high (Fairburn et al., 2012). CBT-E randomized trials, according to a recent review, do not demonstrate superiority over comparison treatments, especially in the longer-term (Atwood & Freidman, 2020). Clinicians and researchers have called for further development of cognitive models that may enhance interventions for EDs (Jones, Leung, & Harris, 2007; Cooper, Todd, & Wells, 2009). “Third wave” approaches such as metacognitive therapy (MT), dialectical behavior therapy (DBT), and acceptance and commitment therapy (ACT), are currently being adapted and tested in EDs to overcome limits of traditional CBT in EDs (Vann et al., 2014; Linardon et al., 2017). Such approaches retain CBT elements but integrate new methods to improve

clinical change in psychological functioning by targeting function or awareness of cognitions and emotions rather than directly targeting the content and validity of cognitive processes. Thus, third-wave therapies emphasize metacognition, acceptance, mindfulness, and psychological flexibility, and reduction of experiential avoidance (Hays & Hofmann, 2017; Linardon et al., 2017). To date, however while large pre-post symptom improvements were observed for several third-wave treatments, results on randomized controlled trials have not yet shown superiority compared to the recommended CBT treatments in EDs (Linardon et al., 2017).

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

Therefore, in the current study, we investigated how the second-wave construct of irrational beliefs (IBs), rigid, absolutistic and inflexible negative thoughts about the self, the world and others

(Vîslă et al., 2016), which represent the first and original conceptualization of maladaptive cognitions in the cognitive behavioral framework (Ellis, 1958; Ellis & Dryden, 2007) are related to the third-wave construct of metacognitions , the maladaptive evaluations of one's own thoughts in predicting ED symptomatology and cognitive reappraisal in ED patients. The specific aims of this cross-sectional study are to: 1) explore the relationship between IBs and metacognitions, 2) examine whether IBs in predicting ED severity, ED-related psychopathology, and cognitive reappraisal are mediated by metacognitions, specifically metacognitions about the need to control thoughts and about dangerousness and uncontrollability of thoughts. Understanding such relationships may yield important clinical information on whether they both might contribute to one latent dysfunctional cognitive variable or whether they each contribute uniquely in predicting psychopathological disturbance (DiGiuseppe et al., 2016; Tecuta, Tomba, Lupetti, & DiGiuseppe, 2019) specifically in EDs.

## Methods

The project was approved by University of Bologna Bioethics Committee and Department of Psychology Ethics Committee. Informed consent was obtained from all participants included in the study.

### ED outpatient sample

Consecutively recruited patients (n = 79) who met diagnostic criteria for EDs (DSM 5; American Psychiatric Association, 2013) anorexia nervosa (AN), bulimia nervosa (BN), binge-eating disorder (BED), and other specified feeding or eating disorder (OSFED) were recruited from a specialized ED treatment center before commencing CBT-based treatment. ED diagnoses were established at intake by the consensus of a psychiatrist and a clinical psychologist independently using the Structured Clinical Interview for DSM 5 (SCID-5: First, Williams Karg & Spitzer, 2015).

Each diagnostic interview was conducted and recorded by a clinical psychologist expert in assessment (E.T.) and subsequently reviewed by a consulting psychiatrist specialized in EDs who

confirmed the diagnosis. Consent to be recorded while interviewed was obtained from all participants. Interrater reliability of ED diagnoses in terms of percent agreement was 83.11%.

With the exception of two patients who refused to participate, all invited patients took part in the study (n = 77). The inclusion criterion was the patients' age between 18 and 65 years. The exclusion criteria were comorbid drug/alcohol abuse, psychotic or neurocognitive disorders, acute suicidality, and pregnancy. The socio-demographic and clinical data of the sample appear in Table 1.

**Measures**

The sample was assessed with the following instruments:

**Attitudes and Beliefs Scale 2** (ABS-2: DiGiuseppe, Leaf, Gorman, & Robin, 2018, DiGiuseppe, Gorman, B. & Raptis, 2020) is composed by 72 likert scale items and attempts to measure the four irrational and four rational belief processes respectively identified by Albert Ellis (1958): demandingness (DEM) versus non-demanding preferences, awfulizing (AWF) versus realisitic negative expectations, low frustration tolerance (LFT) versus high frustration tolerance, and negative global evaluation/self-downing (NGE) versus self-acceptance. The various irrational and rational belief processes are presented in three contextual areas; those that are related to issues (needs or expectations) of comfort, achievement, and affiliation. Demands represent rigid, inflexible, and nonpragmatic beliefs and reflect absolutistic “must statements.” Awfulizing statements are instead excessive negative evaluations and expectations of events, while low frustration tolerance beliefs refer to thinking that one cannot tolerate an event or set of circumstances. Negative global self-evaluations/self-downing refer to generalized negative labeling and self-statements. The ABS-2 has demonstrated excellent construct validity pertaining to the four irrational and four rational belief processes (Digiuseppe et al., 2018, 2020) and good psychometric properties including good internal consistency, divergent and convergent validity in numerous

studies (Macavei, 2002, 2005; Sava, 2009 Terjesen, Salhany, & Sciutto, 2009; Di Giuseppe et al., 2018).

In the current study only the following four irrational belief process scales were used, all of which are composed of nine items: irrational AWF, irrational DEM, irrational NGE, and irrational LFT. The Italian translation of the ABS-2 utilized in a previous study was used (Tecuta et al., 2019). This translation has already demonstrated excellent internal consistency in the general Italian college-age population ($\alpha = 0.926$) and cronbach $\alpha$ coefficients for the four irrational belief processes (ranging from 0.738 to 0.832) (Tecuta et al., 2019). In the current study, Cronbach's alphas for irrational beliefs were similarly acceptable, that is, 0.88 for AWF, 0.85 for DEM, 0.93 for NGE, and 0.85 for LFT and internal consistency also was excellent ($\alpha = 0.971$) in line with validation studies (DiGiuseppe et al., 2018, 2020).

**Meta-cognitions Questionnaire** (MCQ-65: Cartwright-Hatton & Wells, 1997) is a self-report questionnaire with 65 likert scale items assessing five positive and negative evaluations of one's cognitive processes: positive beliefs about worry (19 items), beliefs about need to control thoughts (16 items), cognitive confidence (10 items), negative beliefs about the uncontrollability and danger of thoughts (13 items), and cognitive self-consciousness (7 items). The Italian translation of the MCQ-65 provided in Well's (1999; Brazzelli & G. Cocchini Trans.) treatment manual for anxiety disorders was used. In the current study sample, Cronbach's alphas were 0.89 for positive beliefs about worry, 0.86 for beliefs about need to control thoughts, 0.88 for cognitive confidence, 0.87 for negative beliefs about the uncontrollability and danger of thoughts, and 0.66 for cognitive self-consciousness. Such values are in line with the validation of the original English version (Wells, 2009).

**Eating Disorder Inventory 3** (EDI-3:Garner, 2008) is a self-rating 91 likert scale item questionnaire assessing clinically relevant psychological traits and constructs in EDs which has been standardized and translated in numerous languages including Italian. In the current study the Italian adaptation of the EDI-3 was used (Giannini, Pannocchia, dalle Grave, Muratori, & Viglione,

2008). It yields 12 primary scales (three of which are ED-risk scales and nine of which are ED-related psychological scales) and the following six composite scales: eating disorder risk/severity, ineffectiveness, interpersonal problems, affective problems, overcontrol, general psychological maladjustment. Only the latter composite EDI-3 general psychological maladjustment scale was used. It is composed of the following nine psychological scales: low self-esteem (six items), personal alienation (seven items), interpersonal insecurity (seven items), interpersonal alienation (seven items), interoceptive deficits (nine items), emotion dysregulation (eight items), perfectionism (six items), asceticism (six items), and maturity fears (eight items), with a total of 64 items. This composite score represents a total global psychological functioning index and levels of ED-related psychopathology. The Italian EDI-3 adaptation has shown satisfactory internal consistency (Cronbach's alpha ranging from for subscales in 0.70-0.94 in ED patients) and validity. Specifically for the EDI-3 general psychological maladjustment scale, previously reported Cronbach alpha was 0.94 (Giannini et al., 2008) while in the current study sample it was .91.

**Eating Attitudes Test-40** (EAT: Garner & Garfinkel, 1979) is a 40 likert scale item screening measure identifying behaviors and cognitive patterns associated with eating disorders where a greater total score indicates greater eating disorder severity. The measure yields a total score and three subscales scores: dieting, body and food preoccupations, and oral control. The measure shows excellent psychometric properties (Garner & Garfinkel, 1979). In this study, we used the Italian version of the EAT-40, which has been validated (Cuzzolaro & Petrilli, 1988) which also exhibits good psychometric properties with reported Cronbach alphas of 0.80 for dieting subscale, 0.70 for food and bulimic preoccupations subscale, and 0.83 for oral control subscale. In the current study only the EAT total score was used for which the reliability coefficient was .90 in the study population.

**Emotion Regulation Questionnaire** (ERQ: Gross & John, 2003) is a 10 likert item questionnaire that assesses emotion regulation strategies of expressive suppression and cognitive reappraisal. The ERQ is composed of two subscales: Cognitive Reappraisal and Expressive

Suppression of six items and four items respectively. Validation studies presented in Gross and John, (2003) showed that both subscales have an adequate internal consistency. In this study, the Italian version validated by Balzarotti, John, & Gross (2010) was used where Cronbach's alpha were 0.84 for the Reappraisal scale and 0.72 for the Suppression scale. Only the cognitive reappraisal subscale was used in the current study with Cronbach's alpha of .89 in the study population.

**Clinical variables.** Body mass index (kg/m$^2$) 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 reppraisal, 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 ($\acute{c}$) 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.

Overall, IBs and metacognitions seem to be related constructs. While IBs are associated with all outcomes, including ED symptom severity, ED-related psychopathology and cognitive reappraisal, metacognitions were found to contribute, albeit not completely, to the relationship between IBs and ED-related psychopathology, but not to the relationship between IBs and cognitive reappraisal. Instead, the metacognition need to control thoughts contributed significantly to explaining ED severity, where IBs' contribution is lost.

Concerning correlational analyses, IBs and metacognitions were moderately and positively correlated with each other, with the exception of the metacognition of cognitive confidence, in line with the partial overlap that different conceptualizations of maladaptive cognitions within the cognitive framework may conceptually have (Digiuseppe et al., 2017). For example, overlap in constructs of cognitions were found in studies on anxiety and depression, where Beck's CBT concepts of maladaptive cognitions overlapped partially with Ellis' irrational beliefs processes (Szentagotai & Freeman, 2007; Wong, 2008; Sava, 2009; Tecuta et al., 2019). In the current study, ED patients who reported greater levels of negative self-beliefs and/or of awfulizing thinking endorse more strongly metacognitions about uncontrollability and danger of thoughts. Both IBs and metacognitions have been found to be associated with higher psychopathology and with negative emotions (Tarjrishi, Mohammadkhani, & Jadidi, 2011; Vîslă, Flückiger, Grosse Holtforth, & David, 2016).

Considering the mediational relationships explored among the examined constructs, the contribution of metacognitions varied depending on the type of considered metacognition and the type of outcome. Concerning ED symptom severity, the relationship between IBs and ED symptom severity including bulimia symptoms, dietary restraint, bulimic and food preoccupations, was found to be completely mediated by the metacognition of need to control thoughts and partially mediated by uncontrollability and danger of thoughts (See Figure 1). Thus, irrational belief processes contribute to increased ED severity, however the relationship is entirely explained by the patient's tendency of controlling such rigid and negative thought patterns. Integrating in CBT models of EDs

the metacognitive tendency to control/suppress thoughts might offer incremental and unique information which is not captured by irrational belief processes, since they do not include elements of control. While the IB of demandingness or "must statements", included in the total IB score used in mediation analyses may be conceptually extendable to rigid expectations of control (e.g. I *must* control my thoughts), the predictive value of this IB has been found to be weaker compared to other IBs in the literature (Vîslă et al., 2016; Tecuta et al., 2019). Similarly to our study, metacognitions concerning the need to control thoughts were found to predict drive for thinness in AN patients (Davenport et al., 2015). A sense of control seems to have an important role in ED etiology (Surgenor, Horn, Plumridge, & Hudson, 2002) due to a sense of loss of control in other aspects of one's life (Fairburn, Shafran, & Cooper, 1999), as hypothesized by clinical researchers for quite some time (Bruch, 1973; Crisp, 1980; Garfinkel & Garner, 1982). Moreover, higher endorsement of negative beliefs concerning the self were found to lead to greater thoughts on loss of control, which predicted binge eating and craving in a sample of BN and BED patients more so than other types of thoughts concerning dietary restraint (Legenbauer, Radix, Augustat, & Schütt-Strömel, 2018). However, the current study findings where IBs lose predictive value on ED symptom severity may be due to not differentiating between the four specific IBs which might have revealed different associations.

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

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

Concerning cognitive reappraisal, no support was instead found for a possible mediation role of either metacognition considered in the current study. While metacognitions were found to be associated with other cognitive processes in EDs such as worry (Sapuppo, Ruggiero, Caselli, & Sassaroli, 2018) and craving/desire thinking (Spada et al., 2016), metacognitions did not contribute to reduced cognitive reappraisal due to irrational belief processes in our ED sample. However, a lack of significant results could be due to the relatively small sample size.

Several important clinical and theoretical implications for ED cognitive models and ED treatment emerge. In particular, in present CBT models and treatment approaches for EDs, irrational belief processes might be sufficient to explain difficulties in cognitive reappraisal as well as in explaining ED-related psychopathology, which may be targeted with cognitive restructuring, the primary mechanism of cognitive change in traditional second-wave CBT (Ellis, 1994; Beck & Haigh, 2014; Kazantzis et al., 2018). Such results might be clinically important in supporting the notion promoted by clinicians of working towards an increasngly optimal transtheoretical approach in CBT rather than persuing a fragmentation of CBT approaches (Ellard, Fairholme, Boisseau, Farchione, & Barlow, 2010).

While metacognitions may not warrant integration in CBT models of EDs in directly predicting cognitive rappraisal and ED-related psychopathology above and beyond the contribution of IBs, on the other hand, metacognitions pertaining to attempts to control and suppress thoughts may offer incremental validity to CBT models of EDs given their important contribution to ED symptom severity. For example, within the CBT-E model (Fairburn et al., 2003), which introduces to the traditional CBT model for EDs four crucial maintenance mechanisms of core low self-esteem, clinical perfectionism, mood intolerance and interpersonal difficulties, metacognitions about the need to control thoughts might be integrated as an additional maintenance mechanism, to

be considered as a transdiagnostic feature (Vann, Strodl, & Anderson, 2014). Interventions on metacognitions may include cognitive restructuring, a technique of traditional CBT approaches, of such metacognitions (Wells, 2009). Especially in EDs, the metacognitions that should be targeted concern the need to control thoughts, independently of the content of such thoughts. Additional interventions for RNT through metacognitive therapy (MT) techniques (Wells, 2009) or through rumination-focused CBT techniques (Watkins, 2016) may be warranted to further enhance ED symptom reduction. Thus far, an integration of CBT with MT has been proposed for bulimia nervosa (Cooper et al., 2009), however a transdiagnostic MT model for EDs has not yet been formulated or tested in an randomized controlled trial (Vann et al., 2014).

Limitations of the current study include a small sample size and not considering ED diagnostic differences. The findings may also be due to the ABS-2 instrument's focus on contextual areas of life regarding achievement, approval and comfort rather than focusing on specific ED themes of food, body weight and shape as well as the MCQ-65 measuring general metacognitions rather than specific ED-related metacognitions. Future research should further explore irrational beliefs pertaining to ED themes in relation to metacognitions over time, as well as retesting the 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±10.71 | 30.87±13.81 | 32.08±13.56 | 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±12.11 | 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±11.11 | 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±11.31 | 34.87±10.06 | 31.54±8.80 | 33.56±7.85 |
| MCQ Negative beliefs about worry | 42.73±9.28 | 42.32±10.41 | 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 |

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<br>p<0.0001 | 0.461<br>p<0.0001 | 0.165<br>p=0.160 | 0.641<br>p<0.0001 | 0.306<br>p=0.008 |
| ABS-2 Irrational Demandingness | 0.423<br>p<0.001 | 0.388<br>p=0.001 | 0.186<br>p=0.112 | 0.579<br>p<0.0001 | 0.354<br>p=0.002 |
| ABS-2 Irrational Negative global evaluations | 0.532<br>p<0.0001 | 0.497<br>p<0.0001 | 0.216<br>p=0.065 | 0.624<br>p<0.0001 | 0.362<br>p=0.002 |
| ABS-2 | 0.469 | 0.457 | 0.114 | 0.586 | 0.337 |

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

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

Figure 1.Mediation models

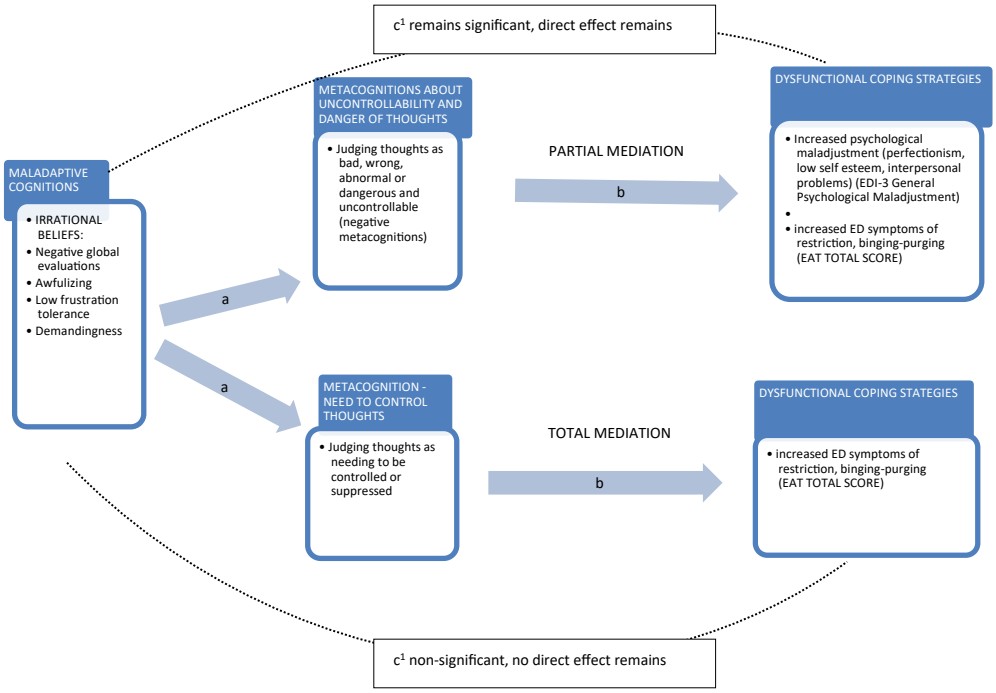
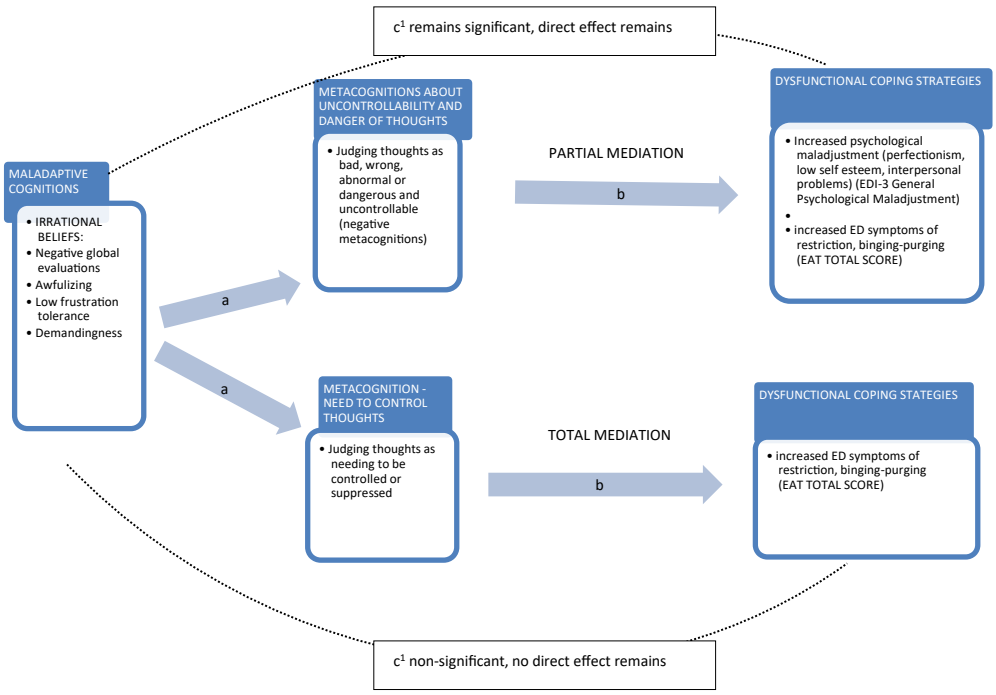
Figure 1.Mediation models