

Metacognitions about desire thinking predict the severity of binge eating in a sample of Italian women

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Abstract In this study, our principal aim was to investigate whether metacognitions about desire thinking predict the severity of binge eating in women and, if so, whether this relationship is independent of age, self-reported body mass index (BMI), negative affect, irrational food beliefs and craving. One hundred and four women, consisting of 32 consecutive patients with binge eating disorder undergoing initial assessment for cognitive therapy for eating disorders, 39 moderate binge eaters, and 33 non-binge eaters (both from the general population), completed the following measures: Self-reported BMI, Hospital Anxiety and Depression Scale, Irrational Food Beliefs Scale, General Craving Scale, Metacognitions about Desire Thinking Questionnaire, and Binge Eating Scale. A series of Spearman's rho correlation analyses revealed that self-reported BMI, anxiety, depression, irrational food beliefs, craving, and all three factors of the metacognitions about desire thinking questionnaire were significantly associated with the severity of binge eating. A stepwise regression

analysis identified self-reported BMI, craving, and negative metacognitions about desire thinking as significant predictors of the severity of binge eating. These results, taken together, highlight the possible role of metacognitions about desire thinking in predicting the severity of binge eating. The clinical implications of these findings are discussed.

Keywords Binge eating · Binge eating disorder · Craving · Irrational food beliefs · Metacognitions about desire thinking · Negative affect, self-reported body mass index

Introduction

Binge eating, negative affect and irrational food beliefs

Binge eating, which is defined as a discrete episode of overeating with loss of control [44], is highly prevalent in the general population and particularly so in women (lifetime prevalence of approximately 1–5–2.0 % for men and 3–3.5 % for women; [25, 26, 28]). A variety of risk factors typically combine in predicting binge eating. For example, Andres and Saldana [2], using structural equation modelling, have observed that body dissatisfaction is linked to dietary restraint which in turn is linked to binge eating. Research on similar lines has shown that body dissatisfaction predicts binge eating with dietary restraint and negative affect as mediators of this relationship [23]. Negative affect appears to be an important predictor of binge eating (e.g. [15, 32, 38, 43]) with several theorists hypothesizing that binge eating functions as a coping strategy for reducing aversive states by providing

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temporary relief and distraction [3, 22, 37, 51]. In support of this view, Leehr et al.'s [27] recent review on this subject area found evidence that negative affect serves as a trigger for binge eating in Binge Eating Disorder providing a short-term improvement of mood through food intake, irrespective of body weight.

It has also been postulated that irrational food beliefs may drive the activation of binge eating as a coping strategy for regulating negative affect [36]. These beliefs are characterized by distorted patterns of thinking which reflect unhealthy, unrealistic and extreme attitudes pertaining to food (e.g. “food is my only source of pleasure” and “food is a good way to lift depression”). Osberg et al. [36] have found that the degree of endorsement of irrational food beliefs is a predictor of first semester weight gain, recent weight gain, and poor weight loss maintenance in university students. Irrational food beliefs have also been found to be correlated with bulimic symptoms in non-clinical samples [36, 46]. More recently, it has been suggested that the priming of irrational food beliefs may mediate binge eaters' tendencies to select high fat foods when under stress [35].

Desire thinking and metacognitions

Desire thinking, a fast emerging construct in the arena of psychopathology, describes a voluntary thinking process characterized by the orientation to prefigure images, information, and memories about positive desired target-related experience [8, 10, 24]. Evidence indicates that desire thinking consists of two sub-components: imaginal prefiguration and verbal perseveration [9]. The imaginal prefiguration component refers to the allocation of attentional resources to target-related information and multi-sensory elaboration in the form of anticipatory positive imagery or positive target-related memories recall. The verbal perseveration component refers to prolonged self-talk regarding worthwhile reasons for engaging in target-related activities and their achievement. It has been argued [10] that desire thinking is a form of extended thinking which shares common features with worry and rumination (such as self-focused attentional orientation and perseveration) but is also distinct from these constructs because of its salient features of a greater degree of imagery-based elaboration, a more concrete focus on decision-making and planning instrumental behaviour, and different emotional (e.g. craving vs. anxiety or depression) and behavioural (e.g. approach vs. avoidance) outcomes.

Though correlated to craving, desire thinking differs from this construct because it is a form of perseverative, conscious, and intentional target-related activity while craving describes an internal motivational experience [7–9]. Desire thinking has been found to predict various appetitive and addictive behaviours including alcohol, food, gambling,

nicotine, and soft drinks controlling for craving and negative affect (e.g. [5, 6, 8, 11, 18, 29, 41]). Recent research has also suggested that desire thinking predicts the severity of binge eating controlling for self-reported BMI, negative affect and irrational food beliefs [40].

In their metacognitive model of addictive behaviours, Spada, Caselli and Wells [39, 42] argue that metacognitions play a central role in understanding dysregulation in desire thinking. Metacognitions refer to knowledge or beliefs about one's own cognitive system and factors that affect its functioning and regulation [47]. According to Wells [48], metacognitions can be usefully divided into two broad sets: (1) positive metacognitions about control strategies that impact on inner events and (2) negative metacognitions concerning the significance, controllability and danger of inner events.

In the case of desire thinking, positive metacognitions about desire thinking concern the usefulness of desire thinking in controlling negative thoughts and emotion, in increasing positive sensations, in improving executive control over behaviour, and in planning how to reach goals. These metacognitions are thought to be involved in the initiation of desire thinking, in particular its imaginal prefiguration component. Examples of such positive metacognitions about desire thinking include: “Imagining something I desire helps me to feel better” and “Imagining what I desire helps me to have greater control over my choices”. Negative metacognitions about desire thinking concern the uncontrollability of desire thinking, and its negative impact on executive control over behaviour, self-image, and cognitive performance. These metacognitions may play a role in propagating negative affect once a desire thinking episode begins, leading to its escalation [8, 10, 39] in the form of verbal perseveration. Examples of such negative metacognitions about desire thinking include: (1) “When I begin thinking about a desired activity/object I cannot stop” and “The images of what I desire persist not matter what I do to try to stop them” which concern negative metacognitions about the uncontrollability of the desire thinking process and its capacity to damage control over one's own behaviour; and (2) “Thoughts about certain desires should be always avoided” and “Not being able to control my thoughts about what I desire is a sign of weakness” which concern metacognitions about the impact and need to control desire-related thoughts and includes.

Caselli and Spada [11] argue that the escalation of desire thinking to pathological levels, predominantly characterized by verbal perseveration (which prolongs conscious self-talk about reaching the desired target), is associated with the activation of negative metacognitions about desire thinking. The presence of such metacognitions should thus be a key marker of a maladaptive desire thinking process associated with the severity of binge eating.

Aims of the current study

To date, no research has investigated the possible link between metacognitions about desire thinking and binge eating. Recent research would suggest that metacognitions about desire thinking should be associated to binge eating because levels of desire thinking have been linked to levels of binge eating; however, we do not know which types of metacognitions about desire thinking may be relevant to the severity of binge eating. In addition, Binge Eating Disorder shares many similarities with other psychological problems where metacognitions are central [50]. We thus hypothesized that metacognitions about desire thinking would be associated to the severity of binge eating and that this association would be independent of several key predictors of binge eating including self-reported BMI, negative affect, irrational food beliefs and craving. We proceeded first by examining the association between the predictor variables and the severity of binge eating and then by examining which of the predictor variables would best predict the severity of binge eating.

Methods

Participants

One hundred and four women (mean age = 29.7; SD = 9.5; range 18–57) were recruited into this study from two sources: 32 consecutive patients (mean age = 32.3; SD = 10.3; range 18–51) diagnosed with Binge Eating Disorder (DSM-5 [1]) were recruited from a population which was undergoing initial assessment for cognitive therapy for eating disorders at the NOSCAE Hospital in Baggiovara, Modena, Italy, and at the Servizio Disturbi Alimentari dell’Azienda Ospedaliera C. Poma, Mantova, Italy; a further 72 participants were recruited through leaflets and advertisements in work environments and public places in Modena, Italy. According to the Binge Eating Scale (BES; [20], of these 72, 39 (mean age = 25.5; SD = 9.6; range 19–57) were classified as ‘moderate binge-eaters’ and 33 (mean age = 28.5; SD = 8.2; range 20–54) were classified as ‘non-binge eaters’. The BES classifies individuals as moderate or non-binge eaters using, respectively, score ranges of 18–26 and 17 or below. All participants who were diagnosed with Binge Eating Disorder were classified as ‘severe binge-eaters’ using the BES (i.e. a score of 27 or over). Table 1 presents the means for self-reported BMI, anxiety, depression, irrational food beliefs, craving, metacognitions about desire thinking, and binge eating scores.

Procedure

Ethics approval for the study was granted from the research institute where the second author works. The study was described to participants as an investigation of the role of emotion and thinking in eating behaviour. All participants were informed that data provided in the study would be treated with the strictest confidence and that participation in the research project was entirely voluntary. Following a brief introduction to the project and the granting of informed consent participants were instructed, both verbally and in written form, to complete the measures. All participants were debriefed following completion and scoring of the measures.

Measures

Self-reported Body Mass Index (SR-BMI) SR-BMI scores (weight in Kg/height in m²) were calculated by asking the participants to provide their height in centimetres and weight in kilograms.

Hospital Anxiety and Depression Scale (HADS; [52]) The HADS consists of 14 items, seven assessing anxiety and seven assessing depression. Higher scores represent higher levels of anxiety and depression. Overall, the scale possesses good validity and reliability ([33, 52]). The scale has been validated in Italian [14].

Irrational Food Beliefs Scale (IFBS; [36]) The IFBS consists of 57 items, 41 of which are contained in the irrational food beliefs subscale, assessing cognitive distortions as well as inappropriate attitudes and beliefs about food. We administered only the irrational food beliefs subscale. Higher scores represent higher levels of irrational food beliefs. Overall, the scale possesses good validity and reliability [36]. The Italian version of the scale employed in the present study was back translated and shown to possess good internal consistency (Cronbach alpha = .83).

General Craving Scale (GCS; [19]) The GCS is a modified version of the Penn Alcohol Craving Scale (PACS; [19]). The PACS includes five items that measure the duration, frequency, and intensity of craving. Each question is scaled from 0 to 6. In the general version adopted in this study, the five-item structure was maintained but items were rephrased so as to refer to eating food. For Example, item 1 of PACS “How often have you thought about drinking or how good a drink would make you feel?” was modified to: “How often have you thought about eating food or how good doing this would make you feel?” Higher scores represent higher levels of craving. The Italian version of the scale employed in the present study was back translated and shown to possess good internal consistency (Cronbach alpha = .80).

Table 1 Means, standard deviations, ranges and correlation matrix of the study variables

Measures	X	SD	Range	1	2	3	4	5	6	7	8	9	10
1. Age	29.7	9.5	18–57		.36**	−.27**	−.04	.08	−.23*	.01	.02	−.05	.02
2. SR-BMI	25.5	7.7	16–52			−.06	.13	.30**	−.01	.20*	.27**	.06	.23*
3. HADS-A	9.4	4.6	1–21				.69**	.32**	.47**	.27**	.36**	.39**	.44**
4. HADS-D	6.9	4.3	0–16					.42**	.50**	.50**	.50**	.51**	.59**
5. IFBS	83.8	16.1	41–119						.27**	.33**	.37**	.37**	.45**
6. GCS	19.9	6.8	5–35							.46**	.65**	.47**	.73**
7. MDTQ-1	10.7	3.4	8–27								.63**	.46**	.48**
8. MDTQ-2	12.5	5.5	6–24									.65**	.72**
9. MDTQ-3	10.1	3.9	4–22										.59**
10. BES	20.5	11.6	0–42										

SR-BMI self-reported body mass index, *HADS-A* Hospital Anxiety and Depression Scale-Anxiety; *HADS-D* Hospital Anxiety and Depression Scale-Depression; *IFBS* Irrational Food Beliefs Scale, *GCS* General Craving Scale, *MDTQ-1* Metacognitions about Desire Thinking Questionnaire—Positive Metacognitions about Desire Thinking, *MDTQ-2* Metacognitions about Desire Thinking Questionnaire—Negative Metacognitions about Desire Thinking; *MDTQ-3* Metacognitions about Desire Thinking Questionnaire—Negative Metacognitions about the Need to Control Desire-Related Thoughts, *BES* Binge Eating Scale

$n = 104$, * $p < .05$; ** $p < .01$

Metacognitions about Desire Thinking Questionnaire (*MDTQ*; [10]). The MDTQ consists of three factors. The first factor (eight items) concerns positive metacognitions about the usefulness of desire thinking as a strategy to enhance motivation and to distract from extended negative thinking and includes items such as: “Imagining something I desire helps me to feel better” and “Imagining what I desire helps me to have greater control over my choices”. The second factor (six items) concerns negative metacognitions about the uncontrollability of the desire thinking process and its capacity to damage control over one’s own behaviour and includes items such as: “When I begin thinking about a desired activity/object I cannot stop” and “The images of what I desire persist not matter what I do to try to stop them”. The third factor (four items) concerns metacognitions about the impact and need to control desire-related thoughts and includes items such as: “Thoughts about certain desires should be always avoided” and “Not being able to control my thoughts about what I desire is a sign of weakness”. The MDTQ total score and factor scores have shown good factor structure, internal consistency, test–retest reliability, and both predictive and discriminative validity [10]. This scale has been validated in Italian [10]. For the purposes of the current study, we asked participants to think about when they feel a desire to eat with a moderate or high intensity.

Binge Eating Scale (*BES*; [20]). The BES consists of 16 items assessing binge eating on the basis of behavioural characteristics (e.g. amount of food consumed) and the emotional and cognitive responses. Higher scores represent higher levels of binge eating. The scale has three scoring categories: 17 or below, 18–26, and 27 and higher. These,

respectively, correspond to: non-bingeing, moderate bingeing, and severe bingeing. Overall, the scale possesses good validity and reliability [20] and has been widely used in both clinical and non-clinical research samples [12]. The scale has been validated in Italian [16].

Results

Correlation analyses

A series of Kolmogorov–Smirnov tests revealed that the majority of study variables’ distributions were significantly different than normal, except for anxiety, irrational food beliefs, and craving. As a result, a Spearman’s rho correlation matrix was generated to explore the relationship between the predictor variables (including age) and the severity of binge eating (Table 1). These revealed that self-reported BMI, anxiety, depression, irrational food beliefs, craving, and all three factors of the metacognitions about desire thinking questionnaire were significantly associated with severity of binge eating. Table 1 also shows the means, standard deviations, and ranges for all study variables.

Data configuration and stepwise regression analysis

The data were tested against the assumptions of multiple linear regression analysis. No evidence of multicollinearity in the dataset was observed (no correlations greater than $r = 0.9$, no Tolerance Indexes below 0.10, and all Variance Inflation Factors of less than 10). Additionally, the Durbin–Watson test suggested that the assumption of

Table 2 Stepwise multiple linear regression statistics with Binge Eating Scale scores as the outcome variable and self-reported BMI, negative affect, irrational food beliefs, craving and metacognitions about desire thinking as predictor variables

Predictor	R^2	Adjusted R^2	B	SE	β	95 % Confidence interval	
						LL	UL
<i>Step 1</i>							
MDTQ-2			1.63	.13	.75**	1.36	1.89
	.56**	.55**					
<i>Step 2</i>							
MDTQ-2			.98	.16	.45**	.66	1.30
GCS			.75	.13	.44**	.50	1.00
	.66**	.65**					
<i>Step 3</i>							
MDTQ-2			.74	.16	.34**	.42	1.07
GCS			.88	.12	.51**	.64	1.13
SR-BMI			.33	.09	.21**	.16	.51
	.70**	.69**					
<i>Step 4</i>							
MDTQ-2			.53	.18	.24**	.17	.89
GCS			.88	.12	.51**	.64	1.12
SR-BMI			.32	.09	.20**	.15	.49
MDTQ-3			.49	.19	.16*	.11	.87
	.71**	.70*					

SR-BMI self-reported body mass index, GCS General Craving Scale, MDTQ-2 Metacognitions about Desire Thinking Questionnaire—Negative Metacognitions about Desire Thinking, MDTQ-3 Metacognitions about Desire Thinking Questionnaire—Negative Metacognitions about the Need to Control Desire-Related Thoughts, LL lower limit, UL upper limit

$n = 104$; * $p < .05$; ** $p < .01$

independent errors was tenable. Histograms and normality plots indicated that residuals were normally distributed and plots of the regression-standardized residuals against the regression-standardized predicted values suggested that the assumptions of linearity and homoscedasticity were met (Table 2).

Variables that were significantly associated with the severity of binge eating were entered into a stepwise regression analysis with the severity of binge eating as the outcome variable. Following a four-step iteration self-reported BMI, craving, and both negative metacognitions about desire thinking factors were found to be significant predictors of the severity of binge eating. The final model accounted for 71.2 % of the variance.

Discussion

Our findings demonstrated that, controlling for age, self-reported BMI, negative affect, irrational food beliefs and craving, negative metacognitions about desire thinking predicted the severity of binge eating. These findings align themselves with those observed across addictive and appetitive behaviours in highlighting the importance of

metacognitions about desire thinking in predicting problem severity (for a review see [11]).

Why would negative metacognitions about desire thinking be an independent predictor of the severity of binge eating? The likely explanation, in line with existing theoretical understanding and empirical findings, is that they drive the perseveration of desire thinking [11]. In other words, the activation of these metacognitions signals that there is no possibility of actively controlling intrusions related to desire thinking (MDTQ-2) or discontinuing desire thinking (MDTQ-1). This will likely lead to the perseveration of desire thinking and the escalation of craving and negative affect, as the desired target (eating) is repeatedly elaborated upon but not achieved, leaving the option of eating as the primary route to obtain a degree of self-regulation ([8, 9, 39, 42]. In support of this view, findings from correlated areas of psychopathology have repeatedly identified metacognitions about the uncontrollability of perseverative thinking processes (such as rumination and worry) as fundamental factors in predicting psychological distress and relapse following treatment (for a review see [50]). Our findings also align themselves with recent research showing links between general metacognitions and eating disorders (e.g. [13, 31, 34].

The results of this study have several potentially useful applications in the psychological treatment of binge eating. Current Cognitive Behaviour Therapy (CBT; e.g. [17] protocols may, for example, be potentiated by focusing on desire thinking and its key belief drivers (metacognitions). Evidence suggests that though CBT is an effective treatment, relapse rates remain moderately high (e.g. [4]). Within the CBT model, focus on treatment remains rooted in challenging and modifying content-based beliefs (core beliefs, beliefs about self-worth, and irrational food beliefs) and extreme dietary restraint. Focusing on modifying metacognitions would address a higher order set of beliefs (metacognitions) involved in the control and regulation of cognition [50]. In particular, tackling metacognitions about the uncontrollability of desire thinking may add a novel dimension to the understanding of the mechanics driving the escalation of craving/urges for food and consequently the initiation and frequency of binge eating.

If this were the case, assessment data could be gathered not only in relation to content-based belief (such as irrational food beliefs) but also metacognitions related to the activation and perseveration of desire thinking. Interventions could also actively target the interruption of desire thinking and the modification of associated metacognitions. This could be achieved by shifting to a metacognitive mode of processing by gaining a flexible control over attention and thinking style and developing new plans of processing. Metacognitive Therapy techniques such as attention training technique (ATT), detached mindfulness, situational attentional refocusing [49] as well as visuospatial tasks [30] may help to improve attentional and general cognitive flexibility, as well as provide disconfirmatory evidence of metacognitions: That is that desire thinking is subject to control and that metacognitions driving its perseveration are redundant.

This study has several limitations that need acknowledgement. First, it relies exclusively on self-report data which will inevitably be subject to errors in measurement (e.g. self-reported binge eating may be more reliant on the experience of a loss of control than having objectively consumed a large amount of food; [45] and social desirability. Second, the cross-sectional nature of the design employed precludes causal inferences. Third, both dietary restraint and body dissatisfaction were not assessed as additional predictor variables and these have been associated with increased binge eating (e.g. [2, 21]). Fourth, the presence of both Binge Eating Disorder and concurrent psychological disorder was not formally assessed in the non-clinical samples. Fifth, previous treatment may have exposed individuals to the identification and the exploration of cognitive constructs, nevertheless due to the novelty of the desire thinking construct it is unlikely that it will have been explicitly addressed as part of standard

treatment for binge eating. Sixth, the study utilized a stepwise method to the regression analysis and therefore is vulnerable to the ‘over-fitting’ of models. Finally, desire thinking was not measured because the primary objective of the current study was to investigate the relative contribution of cognitive (irrational food beliefs) and metacognitive (metacognitions about desire thinking) belief domains to the severity of binge eating. However, measuring desire thinking would have allowed testing, for example, of whether the effects of belief domains (e.g. metacognitions about desire thinking or irrational food beliefs) on the severity of binge eating are mediated by desire thinking, potentially providing additional insights into the inter-relationships between these constructs and processes.

Directions for future research include investigating the role of metacognitions as longitudinal predictors of binge eating together with examining whether changes in metacognitions occur during treatment for binge eating. In conclusion, metacognitions about desire thinking appear to predict the severity of binge eating. If future research confirms this, then psychological interventions for treating binge eating may benefit from specifically targeting these belief domains.

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Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval Ethical approval for this study was granted by Studi Cognitivi, Milan, Italy. All participants were informed that data provided in the study would be treated in the strictest confidence and that participation was entirely voluntary.

Informed consent All participants provided informed consent.

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