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Abstract

Impulsivity, Body Mass Index, negative emotions and irrational food beliefs are often reported as predictors of binge eating. In the current study we explored the role played by two thinking styles, namely food thought suppression and desire thinking, in predicting binge eating among young adults controlling for established predictors of this condition. A total of 338 university students (268 females) participated in this study by completing a battery of questionnaires measuring the study variables. Path analysis revealed that impulsivity was not associated with binge eating, that Body Mass Index and negative emotions predicted binge eating, and that irrational food beliefs only influenced binge eating via food thought suppression and desire thinking. In conclusion, thinking styles appear an important predictor of binge eating and they should be taken into consideration when developing clinical interventions for binge eating.

Key words: binge eating; desire thinking; impulsivity; food thought suppression; irrational food beliefs; negative emotions; self-reported Body Mass Index.

1. Introduction

Binge eating disorder is characterized by “recurring episodes of eating significantly more food in a short period of time than most people would eat under similar circumstances, with episodes marked by feelings of lack of control” (DSM-V, 2013). Binge eating entails eating too quickly, even when not hungry, and eating alone to hide the behaviour. Binge eaters may also experience feelings of guilt, embarrassment, impairment regarding uncontrollability of such behaviour, and perceived weight-related consequences (Fairburn et al., 2007; Lavender, De Young & Anderson, 2010; Striegel, Bedrosian, Wang & Schwartz, 2012).

1.1. Binge eating: Established predictors

Binge eating has been frequently associated with several antecedents, such as Body Mass Index (BMI), impulsivity, negative emotions and irrational food beliefs. The most common antecedent of binge eating has been identified in negative emotions, especially depression (e.g., Deaver, Miltenberger, Smyth, Meidinger & Crosby, 2003; Haedt-Matt & Keel, 2011; Meno, Hannum, Espelage & Douglas, 2008; Saules et al., 2009; Spoor et al., 2006; Stice, 2001; Stice, Akutagawa, Gaggar & Agras, 2000). Functioning as a negative reinforcement factor, binge eating has been hypothesized to represent a maladaptive strategy to cope with aversive states by providing temporary relief and distraction (Arnou, Kenardy & Agras, 1992; Heatherton & Baumeister, 1991; Polivy & Herman, 1993; Wisner & Telch, 1999). Moreover, research has shown that the tendency to act rashly in response to negative emotions is positively correlated with impulsivity (Leitch, Morgan & Yeomans, 2013) as well as binge eating symptoms (Kelly, Cotter & Mazzeo, 2014). It appears that those who are high in impulsivity and who find their distress intolerable could potentially be seeking relief and comfort through eating (Anestis, Selby, Fink & Joiner, 2007). Additionally, research supports the notion that irrational food beliefs people hold are associated with bulimic symptoms (Osberg & Eggert, 2012; Osberg, Poland, Aguayo & MacDougall, 2008; Wang, Worsley &

Cunningham, 2009). Irrational food beliefs comprise distorted cognitions such as food rules, eating behaviours, dichotomous thinking in diets and attitudes towards food, and they have been found to be associated with first semester weight gain, recent weight gain, and poor weight loss maintenance in university students (Osberg et al., 2008).

1.2. Binge eating: The potential importance of food thought suppression and desire thinking

Along with the aforementioned established antecedents of binge eating, recent research has indicated that two types of thinking styles, namely food thought suppression and desire thinking (Barnes, Masheb & Grilo, 2011; Martin & Davidson, 2014; Spada, Caselli, Fernie et al., 2015), may be linked to binge eating. This emerging literature suggests that food thought suppression, as a form of rejection and avoidance of aversive affective states and cognitions, may be associated with disordered eating behaviors, such as binge eating, bulimia, and obesity (Lavender, Jardin & Anderson, 2009; Oliver & Huon, 2001). Efforts to suppress thoughts about food appear to be maladaptive and ultimately ineffective because of the paradoxical increase or rebound in the unwanted cognitions that often occur when suppression attempts fail (O'Connell, Larkin, Mizes & Fremouw, 2005; Wegner, Schneider, Carter & White, 1987). More recently, the way people react to the urge to eat in response to negative emotions has also been highlighted as a risk factor for binge eating (Spada, Caselli, Fernie et al., 2015). Spada and colleagues (2015) have found that desire thinking predicts binge eating controlling for Body Mass Index, negative emotions and irrational food beliefs. Desire thinking involves the active and controlled processing of the pleasant consequences of achieving a desired target, reviewing good reasons for reaching it, and mentally planning how to do so (Caselli & Spada, 2010; 2011; 2015). Desire thinking is activated as a self-regulatory strategy that is reinforcing, in the short term, as it can help minimize the impact of sense of deprivation and negative affect by shifting attention, temporarily, away from unwanted

experiences (e.g. craving) and onto the elaboration of the desired target and ways of achieving it (Caselli & Spada, 2010; 2011). In parallel, however, desire thinking brings to a gradual increase of sense of deprivation, as the desired target (for example eating) is perseveratively elaborated upon but not achieved. Consequently, the sense of deprivation may persist and be amplified to the extent that the desired target becomes the only, and increasingly urgent, route to attain relief from the escalating sense of deprivation.

1.3. Aim of the current study

In the current study we explored the role played by two thinking styles, namely food thought suppression and desire thinking, in predicting binge eating among young adults controlling for established predictors of this condition. While a few studies have researched some of the current variables under investigation, to date, no attempt has been made to examine them contemporaneously. The present study therefore sought to test a single model, in which the contribution of each variable to binge eating would be considered above and beyond that of the other variables.

The model was tested in young adults, in whom eating disorders are particularly frequent (Mustelin, Raevuori, Hoek, Kaprio & Keski-Rahkonen, 2015). University students are considered a particularly at risk population because of the high prevalence of eating disorders, low rates of treatment-seeking (Eisenberg, Nicklett, Roeder & Kirz, 2011), seriousness of medical consequences and psychosocial morbidity (Darcy, Hardy, Lock, Hill & Peebles, 2013; Fairburn & Harrison, 2003).

2. Methods

2.1. Procedure and participants

A sample of 354 students from a London University was recruited through the University's Research Participation Scheme and adverts placed at around the campus, to complete the on-line study. Upon signing upon the website, participants were directed to a study link and

received compensatory credits for their participation. After agreeing to participate in the study and giving informed consent, participants completed the online study. Upon completion they were provided with a debrief sheet listing web site sources of healthy eating habits as well as support both within and outside of the University. The ethical approval of the project was obtained by the University Ethics Committee.

The sample comprised of 286 females and 68 males, with a mean age of 22.15 years ($SD = 4.39$; range = 18-44 years). The majority of participants were White (57.1%), with approximately a quarter Asian (20.1%), followed by Black (13.6%), mixed race and “other” ethnicities (5.4%).

2.2. Measures

2.2.1. Binge eating

Binge eating was assessed using the Binge Eating Scale (BES; Gormally, Black, Daston & Rardin, 1982). The BES consists of 16 set of items assessing binge eating on the basis of behavioural characteristics (e.g., amount of food consumed) and emotional and cognitive responses. Item examples include “I can control my impulses towards food”, “I am always either binge eating or fasting”. Participants are invited to tick the answer which best describes how they feel. Higher scores represent higher levels of binge eating. Overall, the scale possesses good validity and reliability (Gormally, Black, Daston & Rardin, 1982) and has been widely used in both clinical and non-clinical research samples (Celio, Wilfley, Crow, Mitchell & Walsh, 2004). The Cronbach’s alpha for the scale in the present sample was .90 (95% CI .88-.91).

2.2.2. Self-Reported Body Mass Index

Self-reported Body Mass Index (SR-BMI) scores (weight in Kg/height in m^2) were calculated with height in centimetres and weight in kilograms provided by participants.

2.2.3. *Impulsivity*

Impulsivity was assessed using the Barratt Impulsiveness Scale (BIS; Patton, Stanford & Barratt, 1995). The BIS-I consists of 30 items assessing three factors: attentional impulsivity (referring to the inability or lack of concentration and attention, (e.g. “I don’t pay attention”), non-planning impulsivity (referring to a lack of future fore thought, e.g. “I plan tasks carefully”), and motor impulsivity (referring to one’s tendency to act without thinking, e.g. “I make up my mind quickly”). The participants express their agreement with the item statement on a Likert scale ranging from “rarely/never” (1) to “Always/Almost always” (4). Higher scores represent higher levels of impulsivity. The BIS was found to possess high levels of internal consistency among psychology students (Patton, Stanford & Barratt, 1995). The Cronbach’s alpha for the scale in the present sample was .81 (95% CI .78-.84).

2.2.4. *Negative emotions*

Negative emotions were assessed using the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The HADS consists of 14 items, 7 assessing anxiety (e.g. “I feel tense or ‘wound up’”) and 7 assessing depression (e.g. “I feel cheerful”). Participants express their agreement with the statement, by choosing one of the four answer options in terms of how they have been feeling over the past week (e.g. from most of the time (3) to not at all (0)). Higher scores represent higher levels of anxiety and depression. Overall, the scale possesses good validity and reliability (Caci et al., 2003; Herrmann, 1997; Mykletun, Stordal & Dahl, 2001; Zigmond & Snaith, 1983). The HADS was chosen as a measure of negative emotions because it has been widely used in both clinical and non-clinical research samples across a variety of domains in psychopathology (e.g. Wagena et al., 2005; Alati et al., 2004). The Cronbach’s alpha for the scale in the present study was .87 (95% CI .85-.89).

2.2.5. Irrational food beliefs

Irrational food beliefs were assessed using the Irrational Food Beliefs Scale (IFBS; Osberg et al., 2008). The IFBS consists of 57 items, 41 of which are contained in the irrational food beliefs subscale, assessing cognitive distortions and inappropriate attitudes and beliefs about food such as “Food is my only source of pleasure” and “Food is a good way to lift depression”. We administered only the irrational food beliefs subscale. The participants expressed how much they agreed with each statement using a four point Likert scale, with 1 being “Strongly Disagree” and 4 being “Strongly Agree. Higher scores represent higher levels of irrational food beliefs. Overall, the scale possesses good validity and reliability (Lobera & Bolanos, 2010; Osberg et al., 2008). The Cronbach’s alpha for the scale in the present sample was .93 (95% CI .92-.94).

2.2.6. Food thought suppression

Food thought suppression was assessed using the Food Thought Suppression Inventory (FTSI; Barnes, Fisak & Tantleff-Dunn, 2010) which is a validated adaptation of the White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994). Similarly to the original, the FTSI consists of 15 items assessing food-related thought suppression (e.g. “There are foods I prefer not to think about”; “I have thoughts about food that I cannot stop”), which participants respond to on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores represent higher levels of food thought suppression. The FTSI has been found to be a valid, reliable, single factor measure of food-related thought suppression (Barnes, Fisak & Tantleff-Dunn, 2010). The Cronbach’s alpha for the scale in the present study was .95 (95% CI .94-.96).

2.2.7. Desire thinking

Desire thinking was assessed using the Desire Thinking Questionnaire (DTQ; Caselli & Spada, 2011). The DTQ consists of two factors of five items each. The first factor concerns

the perseveration of verbal thoughts about desire-related content and experience (verbal perseveration). Items are originally general in content but for the purposes of this study the desired activity was specified as “*eating*”. Example items for verbal perseveration about food and eating include: “I begin to think more about eating every time it comes to my mind”, “When I begin to think about eating I find it difficult to stop”. The second factor concerns the tendency to prefigure images about desire-related content and experience (imaginal prefiguration). Example items for imaginal prefiguration about food/eating include: “I imagine myself eating”, “I imagine how I would feel like if I were eating”. Participants express their agreement with the statement on a Likert scale ranging from “Almost never” (1) to “Almost always” (4). Higher scores represent higher levels of desire thinking. The total score and factor scores of the Italian version of DTQ have shown good factor structure, internal consistency, test-retest reliability, predictive and discriminative validity (Caselli & Spada, 2011). The Cronbach’s alpha for the scale in the present study was .93 (95% CI .91-.94).

2.3. Analyses

Correlation analyses were conducted in order to test the associations between the variables of interest. Path analysis was used to examine the pattern of relationships observed, using the Lavaan package (Rosseel, 2012) of software R (R Core Team 2013). A single observed score for each construct was included in the model. Specifically, the covariance matrix of the observed variable was analyzed with the Maximum Likelihood method estimator. A bootstrap approach (1000 bootstrap samples) was used to calculate bootstrapped confidence intervals to test for mediation. To evaluate the goodness of fit of the model we considered the R^2 of each endogenous variable and the total coefficient of determination (TCD; Bollen, 1989; Jöreskog & Sörbom, 1996).

3. Results

Table 1 shows the means, standard deviations and bivariate correlations between the variables included in the study. All of the predictor variables were correlated with binge eating in the directions observed in the literature. In particular, a strong positive correlation was found between binge eating and negative emotions, food thought suppression and desire thinking.

We tested a model including all the variables of interest as stand-alone predictors of binge eating. In this model, all path coefficients were found to be significant at the $p < .001$ level, with the exception of the link between impulsivity and binge eating. As shown in Figure 1, SR-BMI and negative emotions were found to be positively and directly associated with binge eating, whereas impulsivity was not significantly associated with binge eating. Moreover, food thought suppression and desire thinking were directly associated with binge eating. Along with the direct paths, as shown in Table 2, two indirect relationships were found significant at the .05 alpha level. These indirect links were between irrational food beliefs and binge eating via food thought suppression and desire thinking.

The squared multiple correlations for the endogenous variables indicate that the model accounted for 47% of the variance of binge eating, and for less variance of mediators (i.e. 29% for desire thinking and 25% for food thought suppression). Finally, the total amount of variance explained by the model (TCD = .56) indicated a good fit to the observed data. In terms of effect size, TCD = .57 corresponds to a correlation of $r = .75$. According to Cohen's (1988) traditional criteria, this is a very large effect size.

4. Discussion

In the current study we explored the role played by two thinking styles, namely food thought suppression and desire thinking, in predicting binge eating among young adults controlling for established predictors of this condition.

Correlational analyses revealed that all predictor variables were positively associated with binge eating, in line with observations in the literature. However, when our predictor variables were entered in the model contemporaneously, path analysis revealed that impulsivity lost its link to binge eating, that negative emotions and SR-BMI remained significant predictors of binge eating, and that irrational food beliefs only indirectly predicted binge eating via food thought suppression and desire thinking. These findings support previously reported observations that binge eating may in part arise from an emotional vulnerability (e.g. Whiteside et al., 2007). The loss of impulsivity as a predictor of binge eating, however, suggests that the impulsive nature of binge eating may be a by-product of the interplay between other predictors rather than the presence of a trait or tendency towards impulsivity. This could be explained through two possible pathways. Firstly, binge eating could be a focused ‘impulsive-type strategy’ adopted to prevent or interrupt desire thinking or thought suppression and their negative consequences (Caselli & Spada, 2016). Secondly, binge eating may arise from a depletion in self-regulatory capabilities as a consequence of the activation of thought suppression and desire thinking (Baumeister, Heatherton & Tice, 1993). The finding that thinking styles, in the form of food thought suppression and desire thinking, fully mediate the relationship between irrational food beliefs and binge eating may be explained from a metacognitive perspective on psychological dysfunction (Wells, 2000). From this perspective the main driver of psychological dysfunction is maladaptive thinking styles (in the form of rumination, worry, desire thinking, food thought suppression and threat monitoring). Though content of thinking (e.g. irrational food beliefs) may play a role in worsening negative emotions and unwanted internal states (e.g. craving), the ‘translation’ of these into worsening outcomes (e.g. binge eating) would primarily arise through the activation of unhelpful thinking styles.

The clinical implications of these findings are that tackling both food thought suppression and desire thinking may reduce the risk of binge eating. For example, in terms of assessment it may be helpful to gather information not only in relation to negative affect and irrational food beliefs but also the tendency to engage in both food thought suppression and desire thinking with the aim of highlighting that the latter processes worsen negative affect and exacerbate the possibility of binge eating. At the intervention stage, the development of strategies focused on promoting a direct modification of food thought suppression and desire thinking may have utility. This may include increasing the level of flexible control over attention, for example using attention training and detached mindfulness, as well as questioning beliefs about the benefits of food thought suppression and desire thinking (Spada, Caselli & Wells, 2013; Spada, Caselli, Nikčević & Wells, 2015).

The current study suffers from several limitations which need acknowledgement. First, although eating disordered behaviours are a significant problem for university students (Luce, Crowther & Pole, 2008), participants were drawn from a general, non-clinical, population. Second, a cross-sectional design was adopted entailing possible errors in measurement (e.g. self-reported binge eating may be more reliant on the experience of a loss of control than having eaten an objectively large amount of food; Telch, Pratt & Niego, 1998), the preclusion of causal inferences, and the possibility that demand characteristics may have affected outcomes. Third, the presence of concurrent psychological disorder was not assessed, however controlling for anxiety and depression using the HADS should provide a degree of confidence in the specificity of the results. Fourth, because the sample was predominantly female, the results may not generalize to males. Fifth, participants received compensatory credit for their participation which may have affected responses (and it should also be noted that there is a tendency for participants to misrepresent on self-report instruments). Finally, as is the case with all studies of this kind, previous treatment may have

exposed individuals to the exploration of cognitive constructs (particularly irrational food beliefs), nevertheless food thought suppression and desire thinking are relatively new constructs and standard treatment for binge eating does not typically include their examination.

Directions for future research include replicating results in a clinical sample, particularly employing longitudinal designs. Explicating the nature of the observed relationships using ecological momentary assessment and experimental designs may also help disentangle antecedents from consequences. Moreover, the same predictors examined in the current study could be investigated in participants who present with a diagnosis of binge eating disorders. Finally, in view of the fact that rumination and worry have been linked to eating disorders (e.g. Meyer, Miller, Metzger & Borkovec, 1990; Startup et al., 2013; Sternheim et al., 2012) these important variables should be included in future studies.

In conclusion, thinking styles (in the form of food thought suppression and desire thinking) appear to be a potential risk factor for binge eating. If future research confirms this, then psychological interventions for treating binge eating may benefit from targeting specifically food thought suppression and desire thinking.

ACCEPT

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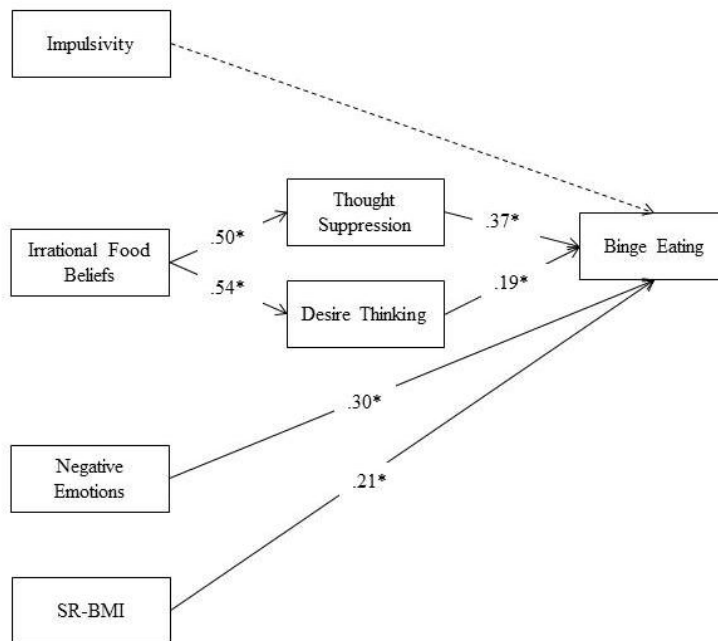
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Figure 1: Model of the inter-relationships between the predictor variables and outcome variable

Notes: n=354; * $p < 0.001$.

Thinking style predicts binge eating

Table 1: Correlation matrix for the study variables

	Mean	SD	1	2	3	4	5	6	7
1. BES	10.27	8.97	1	.29**	.26**	.55**	.40**	.63**	.55**
2. SR-BMI	23.42	4.49		1	.10	.05	.06	.19**	.05
3. BIS	65.38	9.81			1	.22**	.30**	.13*	.20**
4. HADS	13.31	7.02				1	.39**	.46**	.48**
5. IFBS	84.18	16.65					1	.50**	.54**
6. WBSI	34.43	13.54						1	.62**
7. DTQ	19.03	6.63							1

Notes: BES= Binge Eating Scale; SR-BMI = Self-reported Body Mass Index; BIS = Barratt Impulsiveness Scale; HADS = Hospital Anxiety and Depression Scale; IFBS = Irrational Food Beliefs Scale; WBSI = White Bear Suppression Inventory; DTQ = Desire Thinking Questionnaire; n=354; * $p < .05$; ** $p < .01$.

Table 2: Standardized bootstrapped estimates of the indirect effects (with 95% confidence intervals) of independent (irrational food beliefs) on the dependent (binge eating) variables through the proposed mediators (thought suppression and desire thinking) linked to the dependent variable

Independent variable	Mediators	Dependent variable	Estimate	Confidence intervals	
				Lower bound	Upper bound
IFBS	WBIS	BES	.092*	.059	.125
IFBS	DTQ	BES	.052*	.023	.081

Notes: * Significant indirect relationships at 5% level; that is, their 95% confidence intervals did not include the zero value; BES = Binge Eating Scale; IFBS = Irrational Food Beliefs Scale; WBIS = White Bear Suppression Inventory; DTQ = Desire Thinking Questionnaire.

The importance of thinking styles in predicting binge eating

Highlights

- Food thought suppression and desire thinking were found to be independent predictors of binge eating.
- Thinking styles appear more important than content of thinking in predicting binge eating.
- Addressing thinking styles in binge eating may be of clinical utility.