ORIGINAL RESEARCH PAPER

Thought-shape fusion in bulimia nervosa: An experimental investigation

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ABSTRACT. *The aim of the present study was to experimentally investigate a cognitive distortion, 'Thought Shape Fusion' (TSF), in patients with bulimia nervosa (BN). TSF has been postulated as a specific distortion in patients with eating disorders and occurs when the thought about eating a forbidden food increases a person's estimate of her weight / shape, elicits a perception of moral wrongdoing and makes her feel fat. Previous psychometric measures of TSF in clinical and control groups, experiments eliciting TSF in a student sample and in patients with anorexia nervosa, all confirm a strong association between TSF and eating disorder psychopathology. Twenty patients diagnosed with BN participated in a within-participants experimental design with the aim of eliciting TSF and investigating further the possible effects of corrective behaviours (checking and mental neutralizing). Verbal analogue scales constituted the main outcome measures. TSF triggered a perception of moral wrongdoing, heightened levels of body dissatisfaction, elevated feelings of anxiety and guilt and prompted urges to engage in checking and mental neutralizing. Corrective behaviours significantly reduced the effects of the experimental procedure. Components of TSF are present in BN and are likely to play a mediating role in the maintenance of the disorder. The precise connection between TSF and BN remains to be explored in future clinical trials.*

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INTRODUCTION

Eating disorders (EDs) are frequent psychiatric problems that affect mostly teenage and young adolescent girls and are characterized by chronicity, comorbidity, high relapse rates and even death (1-4). They are maintained by a range of dysfunctional cognitive distortions (5-7) i.e. inaccurate thought processes which reinforce the patients' underlying maladaptive beliefs, emotions and behaviours. These cognitive distortions are believed to reflect a consistent, non-veridical and skewed thinking style (8) and are found in other common clinical disorders such as depression (9), obsessive-compulsive disorder (OCD) (10, 11), hypochondriasis (12) and panic disorder (13). Cognitive-behavioural therapy, which is considered to be the treatment of choice in bulimia nervosa (BN) (14-18), achieves its advantageous therapeutic effects partly through the elimination of patients' cognitive distortions (19).

'Thought Shape Fusion' (TSF) constitutes a specific and distinct cognitive distortion present in patients with eating disorders. It was originally conceptualized as a variation of 'Thought Action Fusion', a distortion common in OCD, where thinking about a negative event increases the probability of its occurrence and is morally equivalent to carrying out a negative action (11, 20-26). The authors (26) identified three TSF components in a sample of undergraduate students: (a) 'likelihood TSF', which is the belief that thinking about eating a forbidden food increases the probability that the person will gain weight or change shape, (b) 'moral TSF', where thoughts about eating a forbidden food are perceived as morally equivalent to actually eating it, and (c) 'feeling TSF', where the person feels fatter as a result of the thought that she has eaten a forbidden food. TSF was found to be associated with eating psychopathology and its experimental elicitation led to negative emotional reactions and to urges to engage in corrective behaviours aimed at cancelling out the effects of thinking about eating a forbidden food (e.g. checking in the mirror or having a 'corrective image' such as imagining eating celery etc.). In a similar study (27), TSF was identified in a group of patients with anorexia nervosa. In a later study using a group of patients diag-

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Eating disorders, cognitive distortions, thought-shape fusion, bulimia nervosa, within-participants experimental design.

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nosed with EDs (22), TSF was strongly associated with the severity of ED symptoms and its levels were higher in patients with EDs compared to a control group. The presence of TSF specifically in patients with BN has not yet been experimentally identified.

The objective of the present study was to experimentally induce and study TSF in patients with BN. We did not use a control group since TSF has been postulated as a specific clinical distortion in EDs (26) and a strong association has been confirmed between ED psychopathology and the degree of TSF (22, 27). An experimental paradigm extended from Shafran's study (26) was applied in order to trigger the distortion. The following three predictions were made: (i) the experimental procedure will elicit TSF in a group of patients with BN, (ii) TSF will increase the patients' anxiety and guilt levels, their perception of their actual weight and their subjective levels of body image dissatisfaction, and it will reduce their perceptions of their control over eating a forbidden food both during the experiment ('direct control') and 24 hours later ('indirect control'), and (iii) eliciting TSF will further prompt an urge to engage in corrective behaviours aimed at cancelling out the effects of the distortion, and these corrective behaviours will indeed reduce the effects of the experimental procedure.

MATERIALS AND METHODS

Participants

Twenty women with a mean age of 25.3 years (SD=5.56, age range=17-27 yrs) and a mean Body Mass Index (BMI) of 21.24 (SD=2.57), meeting diagnostic criteria for BN (28) participated in the study. The sample constituted of women only, since 90% of ED patients are teenage and young adolescent women (28). All participants were recruited from the Outpatient Eating Disorders Unit of the Athens University Psychiatric Clinic and at the time they were being treated for their ED. The psychiatrist among the authors, who was head of the Outpatient Eating Disorders Unit, conducted the psychiatric assessment and diagnosis for each participant using clinical interviews. All patients had been weighed and measured for diagnostic purposes. To eliminate confounding effects of comorbidity influences and to enhance the study's internal validity, potential patients were excluded from the study if, according to DSM-IV criteria (28), they had a history of, or current comorbid psychotic disorder, if they had been diagnosed with comorbid borderline personality disorder, addiction disorder or impulse control disorder or if they were being treated as inpatients.

This study was approved by the Ethical Committee of the Athens University Psychiatric Clinic at Eginition Hospital.

Measures

Verbal analogue scales: Participants were asked to verbally rate their responses on all experimental variables on a scale from 0 to 100 (0= 'not at all', 100= 'very high'). Participants' responses were written down by the experimenter (who was female and referred to throughout the procedure as "she").

Body Dissatisfaction Rating Scale (BDRS): As a shorter variant of the original 'Body Image Assessment' (BIA) (29-32) which has shown a test-retest reliability between 0.71 and 0.90 (33), the BDRS was developed specifically for this study to assess levels of body dissatisfaction. The BDRS consisted of five female body shapes ranging from 'very thin' to 'very fat' (1= 'very thin', 2= 'thin', 3= 'medium', 4= 'fat' and 5= 'very fat') to which participants were asked to rate their (a) current, and (b) ideal body shape, choosing a number between 1 and 5. The difference between ideal and current body shape equaled the 'Body Dissatisfaction Score' (BDS). Higher scores reflected greater discrepancies between actual and ideal ratings of body shape, indicating a higher level of body dissatisfaction. Test-retest reliability of this measure calculated from an independent sample of 50 college students was found to be 0.83, its internal consistency was high (alpha=0.82) and its discriminant validity was found to be satisfactory.

Procedure

Participants were asked to take part in a study investigating the way in which thinking about food affects the way we feel about ourselves. They then signed a written informed consent form. They took part in the experiment individually at the Athens University Psychiatric Clinic, Outpatient Eating Disorders Unit and the duration of the procedure was approximately 30 minutes. The experiment was conducted in three consecutive assessment times, 'Baseline assessment' (Time 1, duration 5 min), 'Experimental provocation' (Time 2, duration 15 min), 'Checking/neutralization' (Time 3, duration 10 min).

Baseline assessment (Time 1). Using verbal analogue scales, participants were asked to state their weight, to rate how fat they felt at that particular moment, their level of anxiety and guilt, and the control they believed they had over not eating a forbidden food at that exact time and 24 hours later. All answers were written down by the experimenter. They were

then required to rate their current and ideal body shape using the BDRS. At the end of Time 1, the experimenter instructed the participants to close their eyes for two minutes and to think of something that made them feel relaxed, or that triggered positive feelings (e.g., an image, thought, memory, wish).

Experimental provocation (Time 2). Participants were asked to think of a food or a combination of foods that they considered to be fattening or forbidden, and that would make them gain weight if they actually ate it, and to complete the sentence 'I am eating_____', in writing. The experimenter used low pace instructions and guided them to conjure up an image of themselves eating, in very large quantities, the food(s) they had thought of. To enhance the vividness of the image, participants were prompted to visualize relevant details (e.g., colour of the food(s), taste, texture, smell, surrounding environment, pace of eating and swallowing) and then to continue thinking about eating the forbidden food(s) as long as they needed, up to a point where they felt elevated anxiety and dysphoria. They were instructed to inform the experimenter when they had reached this point, and the experimenter in turn told the participants that the importance of the study was to elicit responses that had an emotional rather than a rational / right or wrong content. To measure TSF, participants were asked to state if they felt fatter after thinking about eating, if they believed they had gained weight or changed shape and if this thought was morally unacceptable to them. Then, using verbal analogue scales they were asked to rate how fat they felt after thinking about eating the forbidden food(s), an estimate of the likelihood that they had gained weight or changed shape as a result of the previous thought, and of how morally unacceptable it was for them to have thought that they had eaten the forbidden food(s). They were then asked to rate their current weight, their levels of anxiety and guilt, current subjective feelings of control over not eating the forbidden food at that specific time ('direct control'), and estimated levels of control over not eating it 24 hours after the experiment ('indirect control'). Their current and ideal body image was measured using the BDRS. The experimenter asked them whether they felt the urge to do something to minimize or cancel out the effects of the thought that they had eaten a forbidden food. She then used verbal analogue scales to assess ratings of the participants' urge to check that they had not gained weight or changed shape and urge to erase the sentence they initially wrote during the experimental provocation time ('I am eating…'). She then informed them that she would leave the experimental room for 5 minutes. Upon returning, she asked them if they had used any corrective thoughts or behaviours and if so, she noted them down.

Checking/ Neutralization (Time 3). After the type of corrective behaviour was recorded, the same TSF ratings and all the other experimental variables assessed in Time 2, were retaken. At the end of the experiment, participants were instructed to close their eyes and to think of something that made them feel good and relaxed. The experimenter ensured that anxiety levels had decreased to tolerable levels, then debriefed the participants and thanked them for their participation in the study.

RESULTS

Prediction I. Mean ratings and standard deviations of TSF components are depicted in Table 1. Chi-square analyses indicated statistically significant results for the level of moral unacceptability pertaining to patients' thoughts about eating a forbidden food. Of the 20 participants, 16 stated that it was morally unacceptable to have thought about eating a forbidden food (χ^2=7.26, p<0.01), a result that reached statistical significance. Eight of the 20 participants (40%) reported the belief that the experimental procedure had made them gain weight (χ^2=2.61, p>0.05), 10 of the 20 participants (50%) believed that it had changed their body shape (χ^2=0.81, p>0.05), and 11 participants reported feeling fatter after having had the same thought (χ^2=0.03, p>0.05). These results did not reach statistical significance, possibly due to the small sample size.

TABLE 1
Experimental elicitation of TSF components in a group of patients with bulimia nervosa (N=20).

TSF components	Participants reporting TSF		Ratings after provocation[a]		χ^2 (d.f.)
	n	% of N	Mean	SD	
Belief that one has gained weight	8	40	27.75	39.69	2.61 (1)
Belief in likelihood of shape change	10	50	29.50	40.74	0.81 (1)
Feeling morally unacceptable	16	80	57.25	40.33	7.26 (1)**
Feeling fatter	11	55	70.00	30.95	0.03 (1)

[a]All scores are on a 0-100 scale. *p<0.05; **p<0.01.

TABLE 2
Mean levels of experimental variables before and after TSF provocation[a] (N=20).

	Baseline		Experimental		
	Mean	SD	Mean	SD	t (d.f.)
Anxiety	71.50	23.51	84.25	22.02	2.23[b]*
Guilt	69.00	33.55	85.75	27.40	2.13[c]*
Weight	59.23	8.25	62.10	12.39	1.28 (19)
Body dissatisfaction	1.35	1.04	1.75	1.16	2.99 (19)**
Current body image	3.30	0.80	3.60	0.88	2.86 (19)**
Ideal body image	1.95	0.39	1.85	0.37	1.45 (19)
Direct control	52.75	36.26	63.75	32.96	1.62 (19)
Indirect control	39.75	30.84	42.50	33.85	0.63 (19)

[a]All scores are on a 0-100 scale, except 'weight' (in kg) and 'body dissatisfaction' (1-5 scale). [b,c]Z-value using Wilcoxon signed-rank test. *p<0.05; **p≤0.01.

Prediction II. Paired samples t-tests were performed for all analyses except for the ones on the variables 'anxiety' and 'guilt', which, due to their skewed distributions prompted for the use of a non-parametric test (Wilcoxon signed-rank test). As depicted in Table 2, TSF elicitation led to significant increases in anxiety and feelings of guilt. Another observation was a significant increase in participants' body dissatisfaction, which was the result of an observed increase in patients' perception of their current body image while their ideal body image remained stable between baseline and experimental timings. No significant changes were observed in participants' subjective levels of direct and indirect control over eating a forbidden food, or in their perceptions of how much they weighed.

Prediction III. Table 3 presents the experimental effects after the checking/neutralization stage. All participants used some corrective action in order to rule out the thought that they had eaten a forbidden food. Seventeen participants used mental neutralizations and three used checking behaviours. Mental neutralizations included the creation of general positive mental images or thoughts, the content of which was not directly related to the thought about eating (e.g., "I am lying on the beach") or new thoughts/ mental images which directly aimed at cancelling-out the previous thought (e.g., "I will only eat little", "I am thin", images of oneself eating a small quantity of food). Related samples t-tests were used to test possible effects of the corrective behaviours. After checking/neutralization, significant reductions were observed in the majority of the experimental variables: the belief that they had gained weight, that their body shape had changed, their subjective feelings of fatness, their levels of anxiety, guilt and body dissatisfaction. The reduction in levels of body dissatisfaction after checking/neutralization was the result of a reduction in participants' perceptions of their current body image ($t(19)=2.35$, $p<0.05$), given that their ideal body image remained stable before and after checking/neutralization ($t(19)=1.71$, $p>0.05$). Participants' perceptions of direct and indirect control over not eating a forbidden food increased after checking/neutralization. Significant reductions were further observed in the patients' urge to further use corrective behaviours ($t(19)=2.35$, $p<0.05$). Finally, no statistically significant changes were observed in participants' feelings of moral wrongdoing and in mean estimates of their weight.

DISCUSSION

The present study experimentally investigated TSF in a clinical sample of patients with BN. The results indicate that the majority of the BN patients significantly perceived that it was morally wrong to think that they had eaten a

TABLE 3
Mean levels of urge to correct and changes in experimental effects after checking/neutralization[a] (N=20).

	Before checking/ neutralization		After checking/ neutralization		
	Mean	SD	Mean	SD	t (d.f.)
Urge to correct	83.00	30.06	60.00	39.47	2.35 (19)*
Urge to weigh	31.25	43.16	11.50	29.25	2.40 (19)*
Urge to check shape	37.00	45.43	5.00	17.92	3.21(19)**
Urge to erase+	63.68	42.06	57.89	47.09	0.51 (18)
Likelihood of weight gain	27.75	39.69	4.50	13.95	2.91(19)**
Likelihood of shape change	29.50	40.75	8.50	21.59	2.71 (19)*
Moral unacceptability	57.25	40.51	48.00	40.47	1.20 (19)
Feelings of fatness	70.00	30.95	49.25	29.92	2.71 (19)*
Anxiety	84.25	22.02	48.75	28.65	5.20 (19)**
Guilt	85.75	27.40	40.00	34.18	5.25 (19)**
Weight	62.10	12.39	59.78	8.33	1.15 (19)
Body dissatisfaction	1.75	1.16	1.25	0.97	2.70 (19)*
Direct control	63.75	32.96	75.50	28.74	2.05[b]*
Indirect control	42.50	33.85	56.00	31.40	2.22 (19)*

[a]All scores are on a 0-100 scale, except 'weight' (in kg) and 'body dissatisfaction' (1-5 scale). [b]Z-value using Wilcoxon signed-rank test. *p<0.05; **p<0.01. +Urge to erase the sentence patients initially wrote during the experimental provocation time, as a response to TSF effects (increased anxiety, guilt, etc.)

forbidden food. The experimental provocation further increased patients' levels of anxiety, guilt and body dissatisfaction, and prompted urges to correct thoughts about eating, which mainly took the form of mental neutralizing and to a lesser extent checking. Corrective behaviours reduced the effects of the experimental procedure.

TSF has been conceptualized as the reflection of a person's underlying tendency to place undue importance on thoughts about eating, shape and weight and to interpret such thoughts as personally significant (22). If a person believes that it is morally wrong to think that she has eaten a forbidden food, then the focus on shape and weight for self-evaluation is likely to persist. Such thoughts may lower mood and induce repeated shape checking (25), self-criticism or unsuccessful attempts at thought suppression (22). TSF may thus act as a maintaining mechanism in the core psychopathology of bulimia nervosa.

A central finding of the present study is that in patients with BN, TSF was mainly expressed as a perception of personal moral wrongdoing. Previous literature suggests that bulimic episodes are often related to threats in the patients' self-image (34). If the patient perceives the thought about eating to be morally wrong, then this could constitute a threat to her self-image (e.g., "I am immoral since I thought of myself eating") thereby increasing the probability of a bulimic episode taking place as a response to the thought. The associated increased anxiety, guilt and feelings of fatness that we observed as a consequence of TSF may further reinforce bulimic episodes as emotional compensating mechanisms. This is in line with previous literature, which suggests that under negative emotional states a person's responsiveness to the food's stimuli and properties is increased (35), and thus bulimic episodes are more likely to occur (36-38), especially when the patient is anxious (39). Bulimic episodes in turn decrease negative emotions (40) and are thereby negatively reinforced due to their potential to achieve emotional regulation (41). Furthermore, the observed increased levels of body dissatisfaction could serve to lower mood and control over eating and lead to bulimic episodes, in line with previous research which shows that body dissatisfaction predicts dysfunctional behaviours related to eating and weight control (42, 43).

Corrective behaviours induced by TSF led to significant reductions in most of the effects of the experimental procedure. Mental neutralizations and body checking may maintain TSF by offering patients a short-term emotional relief, but at the same time preventing them from realizing the irrationality of their thoughts, in line with the counterproductive effects of cognitive strategies such as thought suppression (44). Body checking has recently been found to increase body dissatisfaction, feelings of fatness and the strength of body related self-critical thinking, contributing to the maintenance of shape concerns (45). The reduction of such TSF-related corrective behaviours may have therapeutic advantages for patients with BN.

We last observed that TSF had no significant effect on the patients' perceptions of their actual weight, and future studies could investigate this hypothetical connection in a larger clinical sample. An unexpected finding was that neutralization did not reduce patients' feelings of moral wrongdoing, despite the fact that their levels of guilt were significantly reduced. We interpreted this finding to mean that a person's emotional appraisal of her morally wrong behaviour may decrease in time after the occurrence of a negative event contrary to her cognitive appraisal, which may reflect endurable beliefs about the moral unacceptability of an action. Previous research suggests that while feelings of guilt and anxiety about a past event can change with future events, it is unlikely that a belief in the moral unacceptability of an action will undergo change with a single new action (27). Such moral appraisals related to thoughts about eating may require more intensive cognitive interventions when a patient with BN is being treated with CBT.

One limitation of the present study was the assessment of experimental variables solely through verbal analogue scales. This choice was based on our goal to achieve an immediate and direct assessment of the experimental effects, and as is the case with all analogue scales, we assessed the subjective evaluation of each participant and not the objective rating of her experience. Finally, the absence of a control group during the neutralization/checking stage did not permit controlling for the effects of a possible spontaneous decline in urges to neutralize, a phenomenon found in previous experiments (21, 46).

The results of the present study provide some empirical support to the presence of TSF in BN, and to existing cognitive models of EDs which emphasize the maintaining role of cognitive distortions (6, 7, 38, 47-51). Future cognitive interventions that will focus on eliminating TSF and associated feelings of moral unacceptability may be promising treatment options for patients with BN that have high TSF. The precise role of TSF in BN remains to be explored in future studies.

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