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Experimental induction of thought-shape fusion in eating disorder patients: the role of coping strategies

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Abstract

Objective: The aim was to induce the thought-shape fusion (TSF) distortion experimentally, testing: a) Whether the TSF distortion could be induced by anxiety in general or if it had a specific relationship with thoughts related to the intake of fattening foods; b) Whether the TSF could be induced in non-clinical participants as well as in the eating disorder patients; c) Whether participants with more appropriate coping strategies would experience less TSF than those who showed inadequate coping strategies; and d) That TSF could have behavioural effects (e.g., neutralization of TSF and food intake) related to emotions.

Methods: The sample comprised two groups (eating disorder patients and students), with 45 participants each, aged between 18 and 25 years, 92.50% and 86.7% of women in the eating disorders group and the students group respectively. The two groups underwent three experimental conditions (TSF, anxiety, and control), measuring the results with regards to the emotional and behavioural responses.

Results: Participants in the TSF induction condition reported more guilt, more feelings of fatness, more likelihood of weight gain, and higher degree of moral wrongdoing compared with participants in both the anxiety and control induction conditions. The effect of the adequate coping strategies in decreasing the strength of the TSF bias was confirmed in both eating disorder patients and non-clinical participants.

Discussion: The study of the TSF distortion may have relevant implications in terms of treatment and prognosis of eating disorders. This distortion may be involved in the development and maintenance of eating disorder psychopathology.

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Key words: Thought-shape fusion. Eating disorders. Experimental induction. Coping strategies.

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INDUCCIÓN EXPERIMENTAL DE LA FUSIÓN PENSAMIENTO-FORMA EN PACIENTES CON TRASTORNOS ALIMENTARIOS: EL PAPEL DE LAS ESTRATEGIAS DE AFRONTAMIENTO

Resumen

Objetivo: El objetivo fue inducir la distorsión fusión pensamiento-forma (TSF) experimentalmente, comprobando: a) Si la distorsión TSF puede ser inducida por la ansiedad en general o si hay una relación específica con pensamientos relacionados con la ingesta de alimentos que engordan; b) Si la TSF se podría inducir en los participantes no clínicos, así como en los pacientes con trastornos alimentarios, c) Si los participantes con estrategias de afrontamiento más apropiada experimentarían menos TSF que los que muestran inadecuadas estrategias de afrontamiento, y d) Que la TSF podría tener efectos conductuales (por ejemplo, la neutralización de la TSF y la ingesta de alimentos) en relación con las emociones.

Métodos: La muestra estaba compuesta por dos grupos (pacientes con trastornos alimentarios y estudiantes), con 45 participantes cada uno, de edades comprendidas entre 18 y 25 años, con 92,50% y el 86,7% de mujeres en el grupo de trastornos alimentarios y en el de estudiantes, respectivamente. Los dos grupos se sometieron a tres condiciones experimentales (TSF, ansiedad y control), midiendo los resultados con respecto a las respuestas emocionales y conductuales.

Resultados: Los participantes en la condición de inducción TSF presentaron más culpa, más sentimientos de gordura, más probabilidad de aumento de peso y un mayor sentimiento de haber hecho algo moralmente incorrecto, comparando con las condiciones de ansiedad y control. El efecto de unas adecuadas estrategias de afrontamiento en la disminución de la fuerza de la distorsión TSF fue confirmado tanto en pacientes con trastornos alimentarios como en los participantes no clínicos.

Discusión: El estudio de la distorsión TSF puede tener implicaciones relevantes en términos de tratamiento y pronóstico de los trastornos alimentarios. Esta distorsión puede estar involucrada en el desarrollo y mantenimiento de la psicopatología de estos trastornos.

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Palabras clave: Fusión pensamiento forma. Trastornos de la conducta alimentaria. Provocación experimental. Estrategias de afrontamiento.

Abbreviations

ANOVA: Analyses of variance.
BDI: Beck Depression Inventory.
CSI: Coping Strategies Inventory.
DSM IV-RT: Diagnostic and Statistical Manual of Mental Disorders IV-Revised Text.
ED: Eating Disorders.
M: Mean.
SPSS: Statistical Package for Social Sciences.
STAI: State-Trait Anxiety Inventory.
TAF: Thought Action Fusion.
TSF-Q: Thought Shape Fusion-Questionnaire.
TSF: Thought Shape Fusion.
Tukey's HSD test: Tukey's Honestly Significant Difference.
VAS: Visual Analogue Scales.

Introduction

A cognitive distortion associated with an excessive sense of responsibility was described for obsessive-compulsive disorders and was termed thought-action fusion (TAF).^{1,2} The concept of TAF refers to the belief that having a specific thought makes it more likely that a given behaviour will actually occur (likelihood TAF), and even the belief that having such thought is as immoral as actually doing something forbidden (moral TAF).^{2,4} In the context of eating disorders (ED) some cognitive distortions have been reported to affect body image and increase the fear of weight gain,^{5,6} and a similar distortion to TAF has been proposed in the context of eating disorders and has been termed thought-shape fusion (TSF).⁷

This concept of TSF comprises three components related to beliefs about the consequences of thinking about forbidden foods: a) the belief that having such thoughts makes it more likely that the person will actually gain weight or change his or her shape (likelihood TSF); b) the belief that having such thoughts is as immoral as actually eating the food (moral TSF); and c) the belief that having such thoughts makes the person feel fat (feeling TSF). In the original description of TSF the authors started from the hypothesis that people who have this distortion know rationally that thinking about forbidden foods does not really cause weight gain or changes in body shape, although this does not stop them from feeling it is so on an emotional level.

The Thought-Shape Fusion Questionnaire (TSF-Q)⁷ was developed in order to measure this distortion and has shown good reliability and predictive validity. The Spanish version of the TSF-Q⁸ has shown adequate psychometric properties, with good reliability and predictive validity too.

In addition to the psychometric measurement of TSF, this cognitive distortion has been induced experimentally. Based on a previous work about thought-action fusion,⁹ it has been hypothesized that the TSF distortion could be made explicit in a laboratory setting

by asking people who report this distortion in the questionnaire to write a sentence about eating a forbidden food and then to imagine themselves eating the forbidden food to the point that it is aversive. In order to prove that hypothesis, in a pioneer study,⁷ the authors predicted that an experimental procedure could elicit the TSF distortion leading to: participants estimating that it was likely that they had gained weight or changed shape solely from thinking about eating the forbidden food; participants reporting a feeling of moral wrongdoing after thinking about eating the forbidden food; participants reporting feeling fatter after thinking about eating the forbidden food. Moreover they hypothesized that the experimental procedure would elicit anxiety, guilt and the urge to perform some corrective behaviour (e.g. checking in the mirror or having a "corrective image" such as imagining themselves to be eating celery or writing a sentence that they are eating carrots).

Forbush and Watson¹⁰ supported the "body displacement" hypothesis by demonstrating that individuals with eating disorders exhibited higher levels of emotional inhibition than did non-clinical controls. These researchers suggested that emotional inhibition may lead to hand emotional distress by turning it inwards, and confusing "real" affect with "body" affect, thereby experiencing increased feelings of fatness when in emotional distress. Taking into account this hypothesis, Coelho et al.¹¹ designed an experiment to test the body displacement hypothesis, and to investigate whether the experience of TSF could be induced by anxiety in general, or whether it is specific to thoughts of eating fattening foods. Due to the fact that in the pioneer study⁷ there were not included non-clinical participants, Coelho et al.¹¹ compared the reactions of the eating disorder patients with those of a non-clinical control sample, hypothesizing that, although individuals with eating disorders should exhibit higher levels of TSF than will non-clinical participants, it might also be possible to induce TSF in non-clinical participants without pre-selecting those high in TSF. In addition, they investigated whether induction of TSF would have behavioural effects. The experimental induction of TSF distortion has been developed on anorectic patients¹² with similar results with respect to the pioneer work of Shafran et al.⁷ More recently, the experience of TSF has been tested among bulimic patients in a laboratory setting.¹³

The aim of this study was to induce the TSF distortion experimentally by means of the following hypothesis: a) The psychodynamic hypothesis of body displacement was tested experimentally, analysing whether the TSF distortion could be induced by anxiety in general or if it had a specific relationship with thoughts related to the intake of fattening foods. The TSF distortion was induced in patients with ED and a nonclinical control group, hoping that the specific induction of TSF phenomenon gives rise to a greater effect than the experimental condition of anxiety induction; b) A second hypothesis established that although ED patients should show higher levels of

TSF, it is possible to induce such a cognitive bias in nonclinical participants (without a prior selection based on the scores in the TSF-Q); c) The third hypothesis was that people (patients and control group) with more appropriate coping strategies (with regards to problems and emotions), would experience less TSF distortion than those who showed inadequate coping strategies; d) The last hypothesis was that TSF induction could have behavioural effects (e.g., neutralization of TSF distortion and food intake) related to emotions. It was hypothesized that participants (both patients and control group) exposed to TSF induction, would be more likely to neutralize and have a lower intake compared with those not exposed to such induction.

Method

Participants

The sample comprised two groups, clinical (outpatients with eating disorders, according to DSM IV-RT criteria)¹⁴ and nonclinical (students), with 45 participants each, aged between 18 and 25 years (mean age 21.37 and 22.43 for clinical and non-clinical group respectively). There were 92.50% and 86.7% of women in the eating disorders group and the students group respectively. In the clinical group, the following inclusion and exclusion criteria were used: a) No patient had comorbid psychopathology, which by their gravity would make an outpatient treatment at the time of the study impossible, so that all patients who met criteria for hospitalization or day unit treatment were excluded; b) Patients whose psychopharmacological treatment could have skewed the test results were also excluded. In turn, three experimental conditions were established in each group.

Variables

1. Independent Variables

1.1. Experimental induction

- a) Induction of thought-shape fusion (TSF induction): Following the general previous procedure,^{7,11,12} participants were asked to think of a food (or foods) that they consider extremely fattening and imagine vividly, in detail, they were eating a great amount of that food. At that time they should write one sentence: "I'm eating _____", inserting the name of the food they imagined eating.
- b) Induction of anxiety: Participants were asked to think of a book or movie that they had read or seen recently. They were asked, then, to imagine vividly, in detail, they were giving a speech about the book or the movie to their therapists or to other patients (or teachers or other students in the

case of students). They should then imagine being evaluated on the quality of their speech and to what extent did it right. At that time they should write one sentence: "I'm giving a speech about _____", inserting the name of the book or film that have been imagined to be giving this speech.

- c) Control: Participants were asked to think of a book or movie that they had read or seen recently. They were asked, then, to imagine vividly, in detail, they were talking about the book or movie with a friend. They should then write a sentence: "I'm talking about _____", inserting the name of the book or film that have been imagined to be chatting with a friend.

For each condition (a, b, and c) 15 participants of each group were randomly assigned.

1.2. Coping strategies: Two conditions were established: a) "high/not high problem-focused engagement" (Percentile $> 50/ \leq 50$) and b) "high/not high emotion-focused engagement" (Percentile $> 50/ \leq 50$). These two conditions were established by means of the scores on the Coping Strategies Inventory (CSI), Spanish version.¹⁵ This instrument consists of a test in which eight primary strategies, four secondary and two tertiary are explored, on the basis of the description of a stressful situation. After that, the individual answers 40 items, following a Likert scale consisting of five points so that they tell how often, in the described situation, they did what is expressed in each item. At the end they answer, in an item, about the perceived coping self-efficacy.

2. Dependent variables were the scores on the following instruments:

- a) Visual Analogue Scale (VAS) on mood (0-100), from 0 = very negative mood to 100 = very positive mood.
- b) TSF State Questionnaire, consisting of the following VAS: anxiety, guilt, likely of weight gain, feelings of fatness, and moral wrong-doing, all of them scoring from 0 to 100 (0 = the lowest level on each variable, 100 = the highest level on each variable).
- c) Other questionnaires:
 - *Thought-Shape Fusion Questionnaire (TSF-Q)*:⁷ It is a 34-item, self-report questionnaire, which measures the fusion between thought and body shape or image. TSF-Q comprises two sections, identified by its authors as conceptual (TSF conceptual) and interpretative (TSF interpretative). The Spanish version was used,⁸ which has shown adequate psychometric properties.
 - *State Trait Anxiety Inventory, Spanish version (STAI)*:¹⁶ A well-known 40-item self-report questionnaire, which measures state anxiety (STAI-S) and trait anxiety (STAI-T).

- *Beck Depression Inventory, Spanish version (BDI)*:¹⁷ This measures the intensity of depression and is used as a screening test in the general population. It is a self-report instrument comprising 21 items. Once again the Spanish version was used.

Furthermore, in connection with the fourth hypothesis, and in order to assess the behavioural effects of TSF induction was determined:

- Presence or absence of neutralizing the effect TSF.
- The cake slice that participants considered they would have taken after having displayed a photo of the cake in real size.

Design and Procedure

Patients were under treatment in the ED Unit of the Behavioural Sciences Institute of Seville, and the non-clinical group comprised volunteer students (all with no history of psychopathological interest) at the Pablo de Olavide University (Seville). In the case of patients, individual sessions were performed, coinciding with their regular appointments. In the case of students, individual sessions were performed by previous appointment specifically established for the experiment. Before beginning this experiment, in all cases participants completed a Visual Analogue Scale on mood (0-100). This scale was also completed after the experimental session. Moreover, before the experimental session, they completed the CSI. After that each participant underwent the experimental session (TSF induction, anxiety induction or control). Then, each participant completed a “TSF state questionnaire” based on above-mentioned VAS. After this task, a photo of a cake was displayed in real size, following the procedure of Coelho et al.¹¹ Then, participants had to choose the portion that they would take at that time. The design permitted to calculate the actual amount (in grams) they had wished to take. At that time participants had the opportunity to neutralize or negate the effects of the sentence they had written previously (crossing it out or writing another one in its place). Depending on whether they did it or not, participants were classified as “neutralizers” or “non-neutralizers”. Finally, all participants completed all the above-mentioned questionnaires (TSF-Q, STAI, BDI). The statistical analyses were performed by means of SPSS v. 18.0.¹⁸

Results

Effect of experimental conditions on mood scores

In order to ensure that the anxiety and TSF (but not the control) inductions induced a decrease in the VAS-Mood scores, participants’ responses on that scale were

analysed using a mixed ANOVA with participant group (eating disorder patients and students) and induction conditions (TSF, anxiety, and control) entered as independent variables, and pre- and post-induction scores on the VAS-Mood entered as within-subjects variables. There was a significant interaction between moment (pre- and post-induction) and induction conditions on VAS-Mood score ($F_{(2,84)} = 3.78$; $MSe = 5430.07$; $p < 0.05$; $\eta^2 = 0.10$). After having tested the homogeneity of variance (Levene’s test for VAS-Mood pre-induction: $F_{(2,87)} = 1.87$; $p = 0.27$; Levene’s test for VAS-Mood post-induction: $F_{(2,87)} = 1.95$; $p = 0.22$), post hoc Tukey’s HSD test indicated that participants in the TSF condition reported significantly lower scores in VAS-Mood post-induction ($M = 48.96$; $SD = 29.87$) compared with pre-induction ($M = 55.17$; $SD = 23.54$, *Mean difference* = -6.21, $p < 0.01$). Similarly, those exposed to an anxiety induction reported lower scores in VAS-Mood post-induction ($M = 50.85$; $SD = 26.24$) compared with pre-induction ($M = 56.12$; $SD = 26.59$, *Mean difference* = -5.27, $p < 0.01$). In contrast, those exposed to the neutral control induction did not exhibit any change in VAS-Mood scores from pre-induction ($M = 57.05$; $SD = 27.07$) to post-induction ($M = 55.65$; $SD = 26.23$, *Mean difference* = -1.4, $p = 0.81$). No other significant effects were found.

Measure of “State” TSF

An analysis of variance was conducted in order to assess the “state” experience of TSF for each of the five questions of interest (i.e., anxiety, guilt, perceived likelihood of weight gain, feelings of fatness and feelings of moral wrong-doing). Participant group, induction condition, high coping perceived efficacy (participants in 3th and 4th quartiles), high problem-focused engagement (participants in 3th and 4th quartiles), and high emotion-focused engagement (participants in 3th and 4th quartiles) were entered as independent variables. Pair-wise comparisons were explored by means of the Tukey’s HSD test. With regards to the group and induction condition, participants’ mean responses on this state TSF measure are summarized in Figure 1.

Anxiety

There was a significant main effect of induction condition on anxiety levels ($F_{(2,84)} = 4.22$; $MSe = 3763.34$; $p < 0.05$; $\eta^2 = 0.09$). Anxiety levels were the highest after the anxiety induction ($M = 44.00$; $SD = 33.12$), followed by the TSF induction ($M = 37.14$; $SD = 32.33$) and finally the control induction ($M = 33.22$; $SD = 29.07$). All means differed significantly from one another ($p < 0.05$). There was also a significant main effect of participant group on anxiety ($F_{(1,84)} = 4.15$; $MSe = 3757.63$; $p < 0.05$; $\eta^2 = 0.09$), with eating disorder participants ($M = 50.79$; $SD = 23.76$) reporting

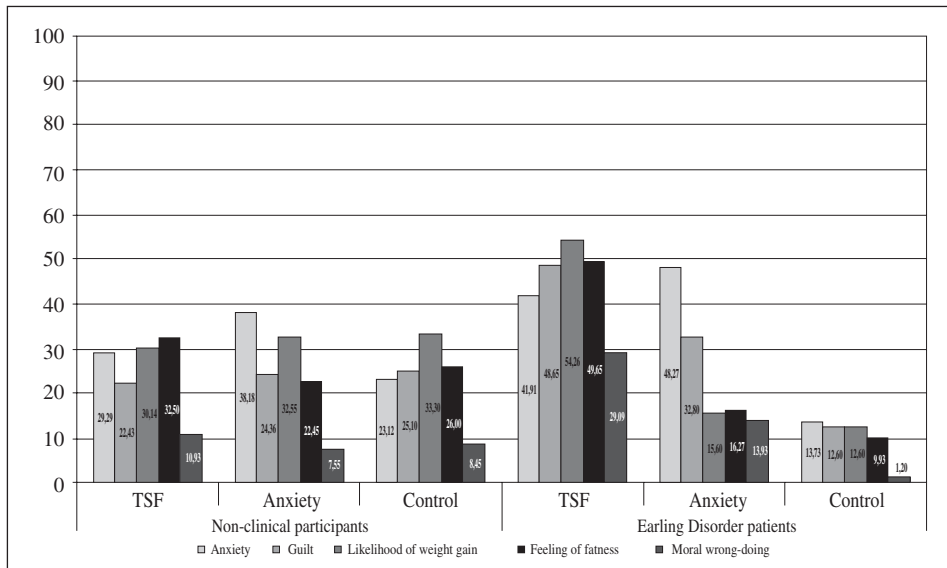


Fig. 1.—Participants' mean responses on "state" TSF.

higher levels of anxiety than non-clinical participants ($M = 43.25$; $SD = 25.67$). There was a significant interaction between the participant group and induction condition ($F_{(2,84)} = 4.78$; $MSe = 3927.77$; $p < 0.01$; $\eta^2 = 0.21$). Post-hoc tests indicated that for both non-clinical participants and eating disorder patients, anxiety levels were significantly higher after the anxiety induction than either the TSF or control induction ($p < 0.05$). Figure 2 shows the significant results with respect to anxiety and coping strategies.

Guilt

There was a significant main effect of induction condition on guilt ($F_{(2,84)} = 4.47$; $MSe = 3856.88$; $p < 0.05$;

$\eta^2 = 0.09$), with participants in the TSF induction condition ($M = 62.11$; $SD = 32.38$) reporting significantly more guilt than those in both the anxiety ($M = 27.33$; $SD = 22.57$) and control induction ($M = 26.76$; $SD = 23.54$) conditions. There was also a significant main effect of participant group on guilt ($F_{(1,84)} = 4.34$; $MSe = 3798.51$; $p < 0.05$; $\eta^2 = 0.09$), with eating disorder participants ($M = 52.64$; $SD = 27.87$) reporting more guilt than non-clinical participants ($M = 46.50$; $SD = 22.98$). There was a significant interaction between induction condition and group ($F_{(2,84)} = 4.92$; $MSe = 3989.98$; $p < 0.01$; $\eta^2 = 0.19$), post-hoc tests indicating that for eating disorder patients, the TSF induction resulted in more guilt ($M = 48.65$; $SD = 38.24$) than did the anxiety ($M = 32.80$; $SD = 31.43$) and control conditions ($M = 8.60$; $SD = 7.92$) ($p < 0.01$). For non-clinical participants,

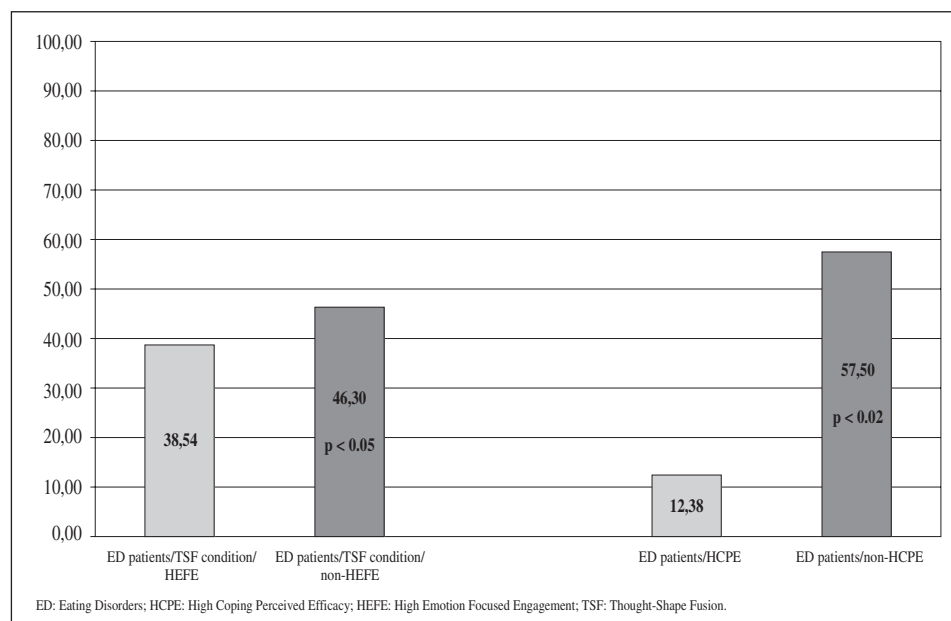


Fig. 2.—Anxiety and coping strategies.

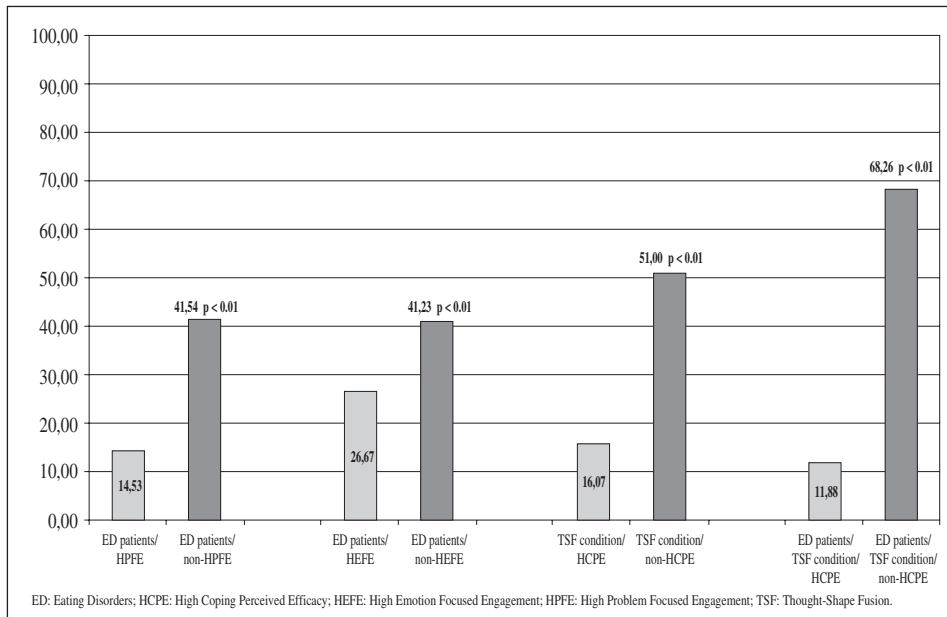


Fig. 3.—Guilt and coping strategies.

there were not significant differences among the three conditions. Figure 3 shows the significant results with respect to guilt and coping strategies.

Weight gain likelihood

There was a significant main effect of induction condition on perceived likelihood of weight gain ($F_{(2,84)} = 3.38$; $MSe = 3568.16$; $p < 0.05$; $\eta^2 = 0.08$), with participants in the TSF induction condition ($M = 64.67$; $SD = 36.04$) reporting a higher likelihood of weight gain than those in the anxiety ($M = 20.88$; $SD = 12.77$) and control ($M = 8.83$; $SD = 7.97$) condi-

tions. No significant main effect of participant group was detected. There was a significant interaction between induction condition and group ($F_{(2,84)} = 4.560$; $MSe = 4716.36$; $p < 0.05$; $\eta^2 = 0.09$). Post-hoc tests demonstrated that eating disorder patients reported a higher likelihood of weight gain after the TSF induction ($M = 69.47$; $SD = 28.51$) compared with the anxiety ($M = 15.60$; $SD = 13.95$) or control inductions ($M = 12.60$; $SD = 11.67$; $p < 0.01$), while there were not significant differences among the three experimental conditions in the non-clinical group. Figure 4 shows the significant results with respect to likelihood of weight gain and coping strategies.

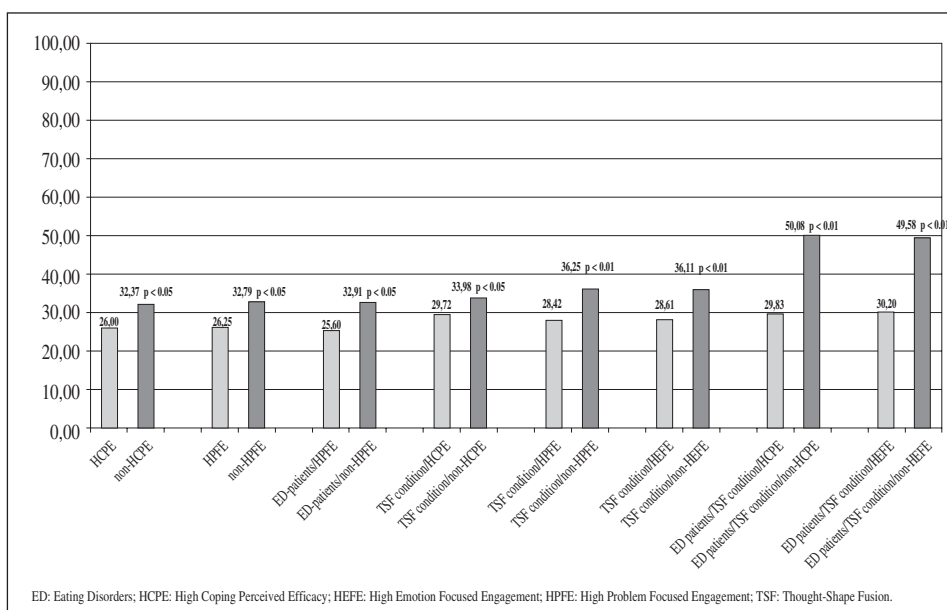


Fig. 4.—Weight gain likelihood and coping strategies.

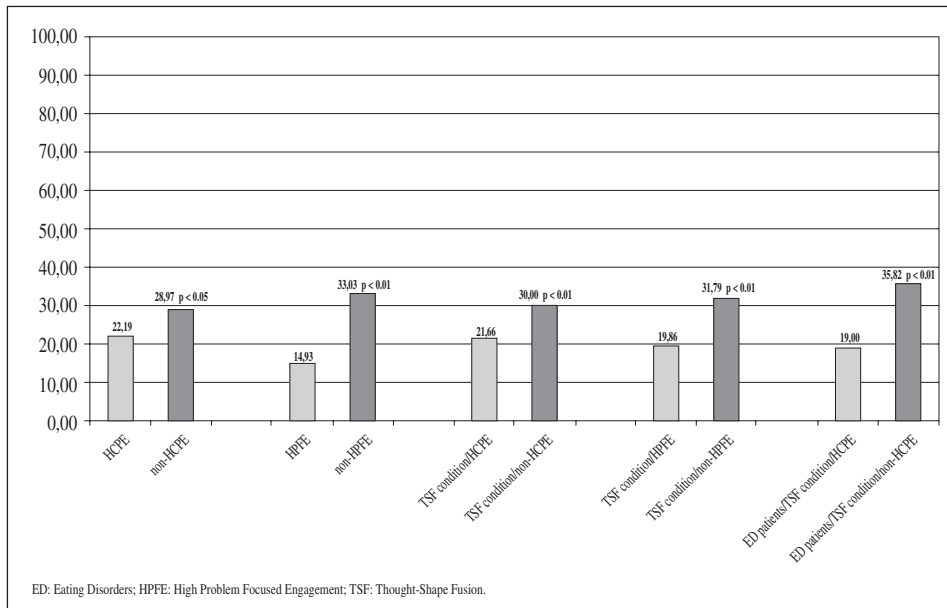


Fig. 5.—Feelings of fatness and coping strategies.

Feelings of fatness

There was a significant main effect of induction condition on reported feelings of fatness ($F_{(2,84)} = 5.37$; $MSe = 5131.26$; $p < 0.01$; $\eta^2 = 0.32$), with participants in the TSF induction condition ($M = 43.16$; $SD = 36.25$) reporting feeling fatter than those in the anxiety ($M = 18.88$; $SD = 17.07$) and control induction ($M = 16.36 \pm 14.99$) conditions. There were not significant effects, neither of participant group nor of interaction between group and condition. Post-hoc tests demonstrated that both eating disorder patients and non-clinical participants felt fatter after the TSF

induction than either the anxiety ($p < 0.01$) or control inductions ($p < 0.01$). Figure 5 shows the significant results with respect to feelings of fatness and coping strategies.

Moral wrong-doing

There was a significant main effect of induction condition on reported feelings of moral wrong-doing ($F_{(2,84)} = 3.86$; $MSe = 3689.34$; $p < 0.01$; $\eta^2 = 0.17$), with participants in the TSF induction condition ($M = 22.22$; $SD = 19.69$) reporting higher levels of wrong-doing

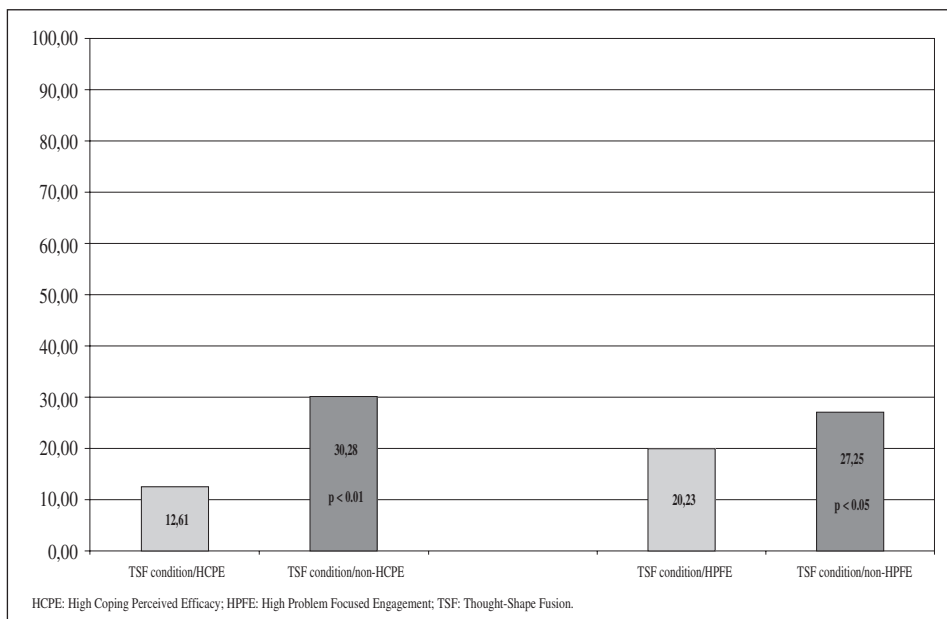


Fig. 6.—Moral wrong-doing and coping strategies.

than those in either the anxiety ($M = 11.23$; $SD = 9.89$) or control ($M = 8.12$; $SD = 7.56$) inductions. A significant main effect of participant group also emerged ($F_{(1,84)} = 3.57$; $MSe = 3563.45$; $p < 0.05$; $\eta^2 = 0.08$), in which eating disorder participants ($M = 16.62$; $SD = 8.99$) reported higher levels of wrong-doing than non-clinical participants ($M = 12.46$; $SD = 9.75$). These main effects were qualified by a significant interaction between group and induction condition ($F_{(2,84)} = 4.64$; $MSe = 2689.97$; $p < 0.01$; $\eta^2 = 0.27$). Figure 6 shows the significant results with respect to moral wrong-doing and coping strategies.

Measure of "Trait" TSF (TSF-Q)

In order to test the hypothesis that eating disorder patients would exhibit higher scores on the TSF-Q than students, those scores were compared between the two groups. As predicted, it was found that there were significant differences in TSF-conceptual ($M = 21.22$; $SD = 12.76$ vs. $M = 5.80$; $SD = 4.56$; $F_{(1,88)} = 9.60$; $MSe = 1417.22$; $p < 0.05$; $\eta^2 = 0.08$), TSF-interpretative ($M = 24.29$; $SD = 16.28$ vs. $M = 7.20$; $SD = 6.80$; $F_{(1,88)} = 9.90$; $MSe = 1568.28$; $p < 0.01$; $\eta^2 = 0.14$) and TSF-total ($M = 45.51$; $SD = 27.75$ vs. $M = 13.00$; $SD = 8.43$; $F_{(1,88)} = 10.6$; $MSe = 1598.99$; $p < 0.01$; $\eta^2 = 0.12$) with eating disorders patients having higher scores than students.

Behavioural measures

Neutralization

In order to explore the percentage of the participants who neutralized, χ^2 -test was performed in the two different groups. While in the students group there were not significant differences among the three experimental conditions (42.8%, 36.36%, and 40% of participants neutralizing in the TSF, anxiety, and control condition respectively), there were significant differences in the eating disorder group. Thus, 43.47% of the participants neutralized in the TSF condition, 6.66% neutralized in the anxiety condition, and 15.38% neutralized in the control condition ($\chi^2 = 8.06$; $df = 2$; $p < 0.01$).

Cake portion size (measure of theoretical Intake)

The differences of participants' portion size of cake, was assessed by means of an ANOVA, taking into account the size of the cake slice that participants indicated that they would take. A main effect of participant group on portion sizes was found ($F_{1,84} = 4.36$; $p < 0.01$), the eating disorder participants having a smaller portion size ($M = 185.58$ g) than did the non-clinical participants ($M = 216.45$ g). There was no significant main effect of induction condition on portion size, and there was a significant interaction between induction

condition and participant group ($F_{2,84} = 3.87$; $p < 0.05$), eating disorder participants indicating the smallest cake slice ($M = 124.43$ g) under TSF condition.

Discussion

As in previous research, the results of this study showed that participants in the TSF induction condition reported more guilt, more feelings of fatness, more likelihood of weight gain, and higher degree of moral wrong-doing compared with participants in both the anxiety and control induction conditions.^{7,11-13} Adding this results to the previous works, our first hypothesis about the experimental induction of TSF is confirmed. Due to the fact that TSF distortion not only appeared in participants with eating disorders but also in non-clinical participants, our second hypothesis was confirmed too. With respect to our third hypothesis, the effect of the adequate coping strategies in decreasing the strength of the TSF bias was confirmed in both eating disorder patients and non-clinical participants. The final hypothesis referred to the behavioural effects of the TSF induction, and it was confirmed too. The percentage of neutralizers was higher in the group of eating disorder patients than in the non-clinical group, and with respect to the cake portion size, eating disorder patients chose the smallest portion, mainly under TSF condition.

Generally, the findings of this study show that TSF induction causes both emotional and behavioural changes, which appear to be specific to thinking about eating fattening foods, as opposed to anxiety-inducing thoughts in general. The pattern of these results seems similar to those previously reported, with regards to eating disorder patients and non-clinical participants.¹¹

In the current study eating disorder patients not only showed a higher degree of TSF state (guilt, more feelings of fatness, more likelihood of weight gain, and higher degree of moral wrong-doing) under the TSF condition, but also showed higher scores in "trait" levels of TSF. Therefore eating disorder patients seem to be more susceptible to the TSF induction than non-eating disorder participants. Among eating disorder patients, the only measure of "state" TSF in which TSF induction did not cause the highest level was anxiety. Anxiety level was higher under anxiety induction in both clinical and non-clinical participants. This result seems to confirm the fact that "state" TSF is particularly related to specific eating disorder related variables (as guilt, feelings of fatness, likelihood of weight gain or moral wrong-doing), being TSF induction a type of food cue exposure (i.e., thinking about food). Considering previous research,¹¹ there are equivocal results with respect to the relevance of some characteristics of the participants undergoing the TSF induction. It has been reported that restrained eaters were not more susceptible to the TSF induction than unrestrained eaters, while other studies have reported that

restrained eaters are more reactive to food cue exposure than are unrestrained eaters.¹⁹ On the other hand, it has been shown that unrestrained, but not restrained, eaters had increased physiological reactivity to food cue exposure.²⁰ For the current study, non eating disorder participants were not divided into restrain and non-restrain eaters, but in both clinical and non-clinical group the strategies to cope with the cue exposure were taken into account.

People cope with stress through coping styles and strategies.²¹ Styles are stable forms of coping with stress while strategies are specific actions depending on a particular situation (in the current study, the experimental condition). However, although styles lead to a greater consideration of the dispositional,²² it doesn't seem reasonable to separate the way in which someone copes with stress from the characteristics of his personality. Thus there is a great amount of studies that link styles and strategies.²³ Higher levels of coping perceived efficacy, problem-focused engagement, and emotion-focused engagement contribute to decrease the state TSF, mainly among eating disorder patients under the TSF experimental induction. Taking into account the theoretical relevance of the TSF distortion, the presence of patients who show negative coping strategies could contribute to establish different subgroups based on the maintenance of the TSF bias and therefore with respect to the treatment and prognostic. In fact, considering coping strategies, hypothetical different subgroups of eating disorder patients have been suggested.²⁴

As in previous research, for this study the confrontation with food was not "in vivo", but merely imagining the food. A photograph of a cake was used as a behavioural measure, taking into account that food photographs are useful tools for estimating portion sizes.²⁵ Considering the behavioural responses, there were significant effects of the induction condition on the reported portion sizes, a result, which is different from previous findings. In contrast with a previous design, in our case eating disorder participant were in treatment and were following a supervised meal plan but not a prescribed meal plan.

As other authors,¹¹ we consider that future studies on the experimental induction of TSF might take into account changing the TSF induction to include a more direct coping with food (e.g., the sight of food) as opposed to mere imagination of food, in order to control for potential differences in the extent to which participant groups actually imagine the scenario. The same applies to use more direct behavioural measures (e.g., assessing actual food intake).

As in previous studies, the sample comprised eating disorder patients, without having taken into account different subgroups, following the approach taken by Shafran and Robinson,²⁶ who suggest that the experience of TSF should be similar regardless of eating disorder diagnosis. This suggestion is related to the transdiagnostic approach²⁷ in which it is postulated that

there is similar underlying psychopathology amongst the different subtypes of eating disorders. Moreover, in other studies on TSF distortion there were not found any differences with regards to specific types of eating disorders.⁸ Recently, in a study based on bulimic patients,¹³ it has been shown that TSF triggers a perception of moral wrongdoing, heightened levels of body dissatisfaction, elevated feelings of anxiety and guilt and prompts urges to engage in checking and mental neutralizing, which are similar results to those obtained among eating disorder patients and non-clinical samples in previous studies.

Given the shortage of research into the behavioural effects of TSF inductions, and the small numbers of patients with each subtype of eating disorder in the present sample as well as in the former studies, it is premature to conclude that there are no differential responses to TSF across different subtypes of eating disorders.

The study of the TSF distortion may have relevant implications in terms of treatment and prognostic of eating disorders. This distortion may be involved in the development and maintenance of eating disorder psychopathology. In the field of study on cognitive distortions, studies on thought-action fusion² suggest that these cognitive distortions may play a causal role in the development of distressing intrusive thoughts.²⁸ It has been proven that educational interventions about cognitive distortions can reduce the anxiety resulting from the induction of thought-action fusion comparing with the anxiety of those who receive a control intervention.²⁹ Alternatively, despite it would be possible that it is not necessary to directly cope with TSF bias during treatment for eating disorders, the TSF could diminish on its own with the appropriate treatment. In order to prove that, it is necessary to develop longitudinal studies to explore possible changes in the experience of TSF during the treatment of eating disorder patients. In addition, improving the patients' coping strategies could contribute to decrease the weight of the TSF bias on the maintenance of the eating disorders.

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