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Attentional bias for body and food in eating disorders: Increased distraction, speeded detection, or both?

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Abstract

Previous research suggests that eating disorder patients show an attentional bias for body- and food-related information. However, so far little is known about the mechanisms that underlie the attentional favoring of this particular information in eating disorder patients. In the present study, we used both a body and a food visual search task to study speeded detection and increased distraction in eating disorder patients ($n = 67$) and healthy controls ($n = 60$). Compared with controls, eating disorder patients showed evidence of speeded detection of body-related information, and increased distraction by food information. These results suggest that the mechanism underlying the biased attentional allocation of eating disorder patients varies, and is dependent upon the type of information they are presented with.

Keywords: Attentional bias; Eating disorders; Speeded detection; Increased distraction

Introduction

It has been only two decades since researchers have begun to acknowledge the relevance of cognitive biases in the etiology and maintenance of eating disorders (EDs) (for reviews see Faunce, 2002; Lee & Shafran, 2004; Williamson, White, York-Crowe, & Stewart, 2004). Cognitive models point out that eating pathology arises from maladaptive knowledge structures (e.g., schemas) that are involved in the allocation of attention, in memory and in the interpretation of incoming information (Hargreaves & Tiggemann, 2002; Williamson et al., 2004). Activation of these knowledge structures causes disorder-relevant information to be processed in a biased manner, resulting in a range of cognitive biases in attention, judgment and memory (Williamson et al., 2004). The focus of the current study is on one of these biases: the exact nature of the attentional bias in EDs.

An attentional bias refers to the tendency to selectively attend to disorder-relevant stimuli (e.g., Mathews & MacLeod, 2005; Williamson et al., 2004). According to cognitive models, individuals suffering from EDs are more likely to give priority to cues pertaining to body and food-related information than to neutral cues, in comparison

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to healthy people. Indeed, the great majority of studies employing the emotional Stroop paradigm (e.g., Williams, Mathews, & MacLeod, 1996) found that ED patients show increased interference when naming the color of disorder-relevant word stimuli as compared with neutral stimuli (for reviews see: Dobson & Dozois, 2004; Lee & Shafran, 2004). Although these interference effects have generally been interpreted as direct evidence for an attentional bias, alternative explanations have been put forward (Jansen, Nederkoorn, & Mulkens, 2005; Lee & Shafran, 2004; Macleod, 2005). For example, De Ruiter and Brosschot (1994) have argued that attempts to cognitively avoid the processing of disorder-relevant word stimuli might also result in increased interference scores. Given this uncertainty about the meaning of increased interference scores, no firm conclusions can be drawn about the existence of an attentional bias in ED patients on the basis of results in the emotional Stroop paradigm.

A better alternative for studying attentional biases is the dot-probe paradigm (Macleod, Mathews, & Tata, 1986), because it allows for the differentiation between attention directed towards or away from a particular type of information. To date, two studies have investigated attentional processes in ED patients using the dot-probe paradigm. Rieger et al. (1998) demonstrated that ED patients showed a tendency to direct their attention towards words denoting a large physique and away from words denoting a thin physique. More recently, using a pictorial version of the dot-probe paradigm, Shafran, Lee, Cooper, Palmer, and Fairburn (2007) found robust attentional bias effects for eating and weight-related stimuli in ED patients in comparison to controls, but less consistent effects for shape-related stimuli.

Although it is possible to use the dot-probe paradigm to distinguish engagement and disengagement subcomponents of attention, either by manipulating the presentation duration (Mogg, Bradley, Miles, & Dixon, 2004) or by including neutral trials (Koster, Crombez, Verschuere, & De Houwer, 2004; Salemink, van den Hout, & Kindt, 2007), the dot-probe paradigm has not been used in this way in EDs research. It thus remains an unresolved issue as to how the attentional bias in ED patients can be understood in terms of facilitated attention to or slowed withdrawal from the disorder-relevant information.

Though possibly reflecting a somewhat different distinction, in this study we use a paradigm that is able to distinguish two subcomponents of attention: speeded detection (i.e., increased orienting towards relevant stimuli) and distraction (i.e., increased distraction by relevant stimuli). Like Rinck, Reinecke, Ellwart, Heuer, and Becker (2005) we use the odd-one-out variant of the visual search paradigm (Hansen & Hansen, 1988). Rinck et al. (2005) studied the nature of attentional bias in spider-fearful individuals. Participants were presented with matrices of 20 pictures and they were instructed to indicate whether the matrix consisted of 20 animal pictures of the same category or whether it included one animal picture from a different category. Results indicated that both speeded detection of threatening target pictures (i.e., faster detection of a spider picture among 19 neutral pictures than a neutral picture among 19 neutral pictures from another category) and increased distraction by threatening distractors (i.e., slower detection of a neutral image among 19 spider pictures than a neutral image among 19 neutral images from another category) were involved in the attentional processing of spider-fearful participants.

To sum up, given both the controversy concerning the interpretation of increased interference scores in the emotional Stroop research and the lack of knowledge about which mechanism underlies an attentional bias in EDs, it is of interest to investigate more precisely the attentional bias for body and food stimuli in ED patients. Inspired by the visual search methodology as adopted by Rinck et al. (2005), we designed a body- and a food-related version of the odd-one-out visual search task to study both speeded detection and increased distraction. Speeded detection of disorder-relevant concepts (i.e., body- or food-related words) is studied by comparing response latencies to detect a disorder-relevant target word vs. a neutral target word among neutral distractor words from another category. Increased distraction is studied by comparing response latencies to detect a neutral target word among disorder-relevant vs. neutral distractor words from another category. It is hypothesized that ED patients show evidence of speeded detection of and increased distraction by body- and food-related information, in comparison to controls.

Method

Participants

A total of 128 participants took part in the experiment. Sixty-eight female ED patients were recruited at the national Centre for Eating Disorders Ursula in Leidschendam, the Netherlands. At the time of intake, all patients fulfilled the DSM-IV diagnostic criteria for either anorexia nervosa (AN) or bulimia nervosa (BN). The ED group consisted of 22 AN patients restrictive type, 24 AN patients purging type and 22 BN patients. The control group consisted of 60 female undergraduates of Maastricht University, the Netherlands. Inclusion criteria for the control group were no past history of EDs, a body mass index (BMI = weight/height in m^2) within the normal range (18.5–25), and an unrestrained eating style, represented by a score below 15 on the Restraint Scale (Herman & Polivy, 1980). Control participants scored on average 8.58 (standard deviation (SD) = 4.17) on the Restraint Scale. All participants received a financial compensation of €7.50 for their participation. The study was approved by the medical ethical committee of the Academic Hospital Maastricht.

One control participant and two ED patients were excluded from the analyses due to a high percentage of outliers responses and errors ($> M + 3SD = 25\%$). This left us with a total of 125 participants. At the time of testing, all patients were receiving inpatient treatment and part of the treatment is the obliged consumption of three meals a day. As a consequence their BMI had significantly increased from the time of intake to the testing day, t (65) = 6.49, $p < .001$. There was no diagnostic interview repeated at testing day, but the patients completed the Eating Disorders Examination Questionnaire (EDE-Q). Their scores still seem to be in the pathological range, not being different from clinical ED samples (see e.g., Fairburn & Cooper, 1993).

Analyses of variance (ANOVA) revealed that subgroups did not differ significantly on age, but the ED groups differed significantly from the controls on all questionnaires. Post-hoc analyses indicated that ED patients showed more eating pathology and were more body dissatisfied than controls. Moreover, it was shown that ED patients were more depressed than control participants. The three ED groups did not differ significantly from one another on these variables measuring more general aspects of psychopathology. See Table 1 for means, F-values and post-hoc comparisons.

Materials

General description odd-one-out visual search task

Each trial started with a brief tone, after which the participant was shown a fixation cross for 500 ms in the middle of the computer screen. Thereafter, she was presented with a 5 × 4 matrix of 20 words and was instructed to indicate whether the matrix contained 20 words of the same category or whether it contained one word from a different category (the odd-one-out). In the participant instructions, information was given about the possible categories stimuli could come from. If there was an odd-one-out word (henceforth called the *target word*) in the matrix, she had to press the right button of a response box. If the matrix was made up of

Table 1
Participant characteristics

Measure	AN restrictive, $n = 21$ M (SD)	AN purging, $n = 23$ M (SD)	BN, $n = 22$ M (SD)	Controls, $n = 59$ M (SD)	F (3, 121)
Age (years)	25.0_a (9.0)	25.7_a (6.9)	25.1_a (5.5)	25.7_a (7.72)	.17
BMI at intake	15.0_a (1.5)	16.7_b (1.8)	21.8_c (3.6)	–	42.1*#
BMI at testing day	16.7_a (2.2)	18.8_b (1.3)	22.5_c (3.0)	22.0_c (2.7)	30.6*
Eating Psychopathology (EDE-Q global)	3.3_a (1.6)	3.3_a (1.4)	3.5_a (1.2)	0.8_b (0.6)	58.0*
Eating concern (EDE-Q EC)	3.0_a (1.4)	2.7_a (1.4)	3.0_a (1.3)	0.3_b (0.3)	67.0*
Shape concern (EDE-Q SC)	4.2_a (1.8)	4.5_a (1.6)	4.6_a (1.1)	1.0_b (0.9)	76.2*
Weight concern (EDE-Q W)	3.7_a (1.9)	3.8_a (1.6)	4.1_a (1.3)	1.0_b (0.8)	52.6*
Restraint (EDE-Q R)	2.4_a (1.7)	2.2_a (1.4)	2.5_a (1.6)	0.9_b (0.8)	13.5*
Body dissatisfaction (EDI-II B)	4.5_a (1.1)	4.7_a (0.8)	4.7_a (1.0)	3.1_b (1.0)	27.4*
Body dissatisfaction (BSQ)	59.6_a (30.3)	62.2_a (15.7)	61.0_a (14.7)	26.3_b (8.8)	46.2*
Depression (BDI)	29.2_a (14.4)	29.5_a (11.0)	28.3_a (12.6)	4.2_b (4.6)	67.7*

Note: BMI = body mass index = weight in kg/height in m^2; EDE-Q global = Eating Disorder Examination Questionnaire, global score; EDE-Q EC = Eating Disorder Examination Questionnaire, eating concern subscale; EDE-Q SC = Eating Disorder Examination Questionnaire, shape concern subscale; EDE-Q WC = Eating Disorder Examination Questionnaire, weight concern subscale; EDE-Q R = Eating Disorder Examination Questionnaire, restraint subscale; EDI-II BD = Eating Disorders Inventory, body dissatisfaction subscale; BSQ = Body Shape Questionnaire; BDI = Beck Depression Inventory. Means with different subscripts differ significantly at $p < .001$, as indicated by Bonferroni-corrected post-hoc tests. *$p < .001$. # df (2, 62).

20 words of the same category, she had to press the left button. The matrix remained on screen until response or for a maximum of 20 s. Immediately after the participant responded, a new trial began.

The matrix was either made up of one disorder-relevant target word among 19 neutral distractor words, one neutral target word among 19 disorder-relevant distractor words, one neutral target word among 19 neutral distractor words of a different category, or of 20 words of the same category (i.e., target-absent trials). In line with Rinck et al. (2005), the majority of the trials were target-present trials, because only this type of trial is relevant for testing the hypotheses. The location of each word in each matrix was chosen randomly for each trial and for each participant. However, the target word never appeared directly above or below the location of the fixation cross to avoid facilitated detection. Each of the visual search tasks lasted approximately 15 min, divided over two blocks of trials of 7.5 min. The participant was given a brief break between blocks and tasks. The distance between participant and screen was approximately 60 cm.

Body-related visual search task

Word stimuli from three categories were used: body, countries (neutral), and musical instruments (neutral). Matrices on target-*present* trials consisted of one body-related word among 19 countries or 19 musical instruments, one musical instrument or country among 19 body-related words, one musical instrument among 19 countries or one country among 19 musical instruments. Each of these six types of matrices was shown 19 times to each participant. Matrices on target-absent trials consisted of 20 countries, 20 musical instruments, or of 20 body-related words. There were 114 target-present trials, 30 target-absent trials, and 12 practice trials.

Food-related visual search task

Word stimuli from four categories were used: high-caloric food, low-caloric food, colors (neutral), and names (neutral). The function (i.e., target or distractor) of the neutral categories (colors and names) was counterbalanced over participants. Matrices on target-*present* trials consisted of one high-caloric or low-caloric food word among 19 names/colors, one name/color among 19 high-caloric or low-caloric food words, one name among 19 colors one color among 19 names. Each of the six types of matrices was shown 19 times to each participant. Matrices on target-*absent* trials consisted of 20 high-caloric food words, 20 low-caloric food words, 20 colors or of 20 names. There were 114 target-present trials, 40 target-absent trials, and 12 practice trials.

Stimulus material

For the current study, 140 words were selected to create 20-item word lists from disorder-relevant (i.e., body, high-caloric food, low-caloric food) and neutral (i.e., music, countries, colors, names) categories. Stimulus words of the seven categories did not differ significantly in length, all t's $< .119$, all p's $> .05$. Within the frame of the matrix, words were horizontally separated by 6.76 cm and vertically by 6.5 cm (measured from the middle point of the stimulus word). All words were displayed on a light-gray background on a 17-inch monitor with a resolution of 1280×1024 pixels.

Questionnaires

Participants filled out Dutch versions of four questionnaires. (1) The EDE-Q (Fairburn & Beglin, 1994), a 36-item self-report measure of eating attitudes and behaviors, was used to measure the presence and severity of eating pathology. The EDE-Q has excellent test–retest reliability and internal consistency (Luce & Crowther, 1999). (2) The Body Dissatisfaction subscale of the Eating Disorders Inventory (EDI-II BD; Gardner, 1991) was used to measure overall satisfaction with body and shape. The psychometric qualities of the EDI-II have been well established (Espelage, Mazzeo, Aggen, & Quittner, 2003). (3) The Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987) was used to measure shape and weight concerns, and is a psychometrically sound 16-item self-report measure (Rosen, Jones, Ramirez, & Waxman, 1996). (4) Depression was measured by the Beck Depression Inventory (BDI; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961), which has very good construct validity and reliability (Beck, Steer, & Garbin, 1988). Control participants filled out one additional questionnaire: the Restraint Scale (RS; Herman & Polivy, 1980). This scale measures the extent to which participants try to restrain their food intake and show weight fluctuations. All participants were weighed and their height was measured to calculate their BMI.

Procedure

All participants were tested individually between 9 and 12 am or 1 and 4 pm. On entering the experimental room, the participant was told that the study consisted of a computer task and some questionnaires. After signing the informed consent, she was given instructions about the visual search task. She then completed both the body- and the food-related version of the visual search task. The order in which participants completed both versions of the task was counterbalanced. After the visual search task, the participant was asked to complete the EDE-Q, the EDI-II BD, the BSQ and the BDI. Control participants were asked to also fill out the RS. Hereafter, height and weight were measured. Finally, they received a financial compensation for their participation. All participants were debriefed in writing after the experiment was completed.

Results

Data reduction and target-absent trials

The main analyses were done on the target-present trials. For both tasks, errors (i.e., misses; food: 8.60%; body: 8.93% of the target-present trials) and responses faster than 200 ms and slower than 20.000 ms (food: 0.03%; body: 0.06% of the target-present trials) were discarded. Furthermore, response latencies higher than three SD above the overall mean of the remaining response latencies were excluded (body: 1.0%; food: 1.0% of the target-present trials). None of the response latencies was lower than three SD below the mean.

False alarm rates to the target-absent trials in the body visual search task were low (body: 4.96%; country: 3.92%; music: 5.20%). A 3 (stimulus category: body vs. music vs. country) × 2 (group: ED vs. controls) repeated measures ANOVA, revealed that the stimulus category × group interaction was not significant, $F\,(2, 121) = 0.35$, ns, indicating no significant differences between ED and controls on the false alarm rates for body (ED: 5.45%; controls: 4.40%), country (ED: 3.94%; controls: 3.90%) and music (ED: 5.9%; controls: 4.41%) target-absent trials. Main effects of stimulus category, $F\,(2, 122) = .35$, ns, and of group, $F\,(1, 123) = .61$, ns, were also non-significant.

False alarm rates to the target-absent trials in the food visual search task were also low (HCF: 2.48%; LCF: 3.68%; colors: 2.32%; names: 4.48%). A 4 (stimulus category: HCF vs. LCF vs. colors vs. names) × 2 (group: ED vs. controls) repeated measures ANOVA, revealed a significant main effect of stimulus category, $F\,(3, 121) = 4.53$, $p < .01$, but not of group, $F\,(1, 123) = 0.05$, ns. The stimulus category × group interaction was not significant, $F\,(3, 120) = 0.42$, ns, indicating no significant differences between ED and controls on the false alarm rates for HCF (ED: 2.73%; controls: 2.20%), LCF (ED: 3.48%; controls: 3.90%), colors (ED: 2.42%; controls: 2.20%) and names (ED: 3.94%; controls: 4.92%) target-absent trials.

Hypothesis 1. ED patients show evidence of speeded detection of body-related information in comparison to controls.

Results were analyzed in a 2 (group: ED vs. controls) × 2 (target type: body vs. neutral) repeated measures ANOVA. Consistent with our hypothesis, a significant group × target type interaction, $F\,(1, 123) = 11.98$, $p < .01$, $\eta^2_p = .09$, was found, qualifying main effects of target type, $F\,(1, 123) = 30.95$, $p < .001$, $\eta^2_p = .20$, and group, $F\,(1, 123) = 15.03$, $p < .001$, $\eta^2_p = .11$. See Fig. 1a for means and SEs. Additional independent samples t-tests indicated that ED patients were significantly slower than controls at detecting body-related target words, $t\,(123) = 2.69$, $p < .01$, $d = .62$, and neutral target words, $t\,(123) = 4.62$, $p < .001$, $d = .83$. Even though ED patients were slower than controls on both types of trials, the significant group × target type interaction shows that ED patients, relative to controls, did show a benefit in the speed with which they detected a body-related target word as compared with a neutral target word. In other words, the difference in detection speed between ED patients and controls was less pronounced for body target words than for neutral target words, proving the relative benefit for body-related words in ED.

Hypothesis 2. ED patients show evidence of increased distraction by body-related information in comparison to controls.

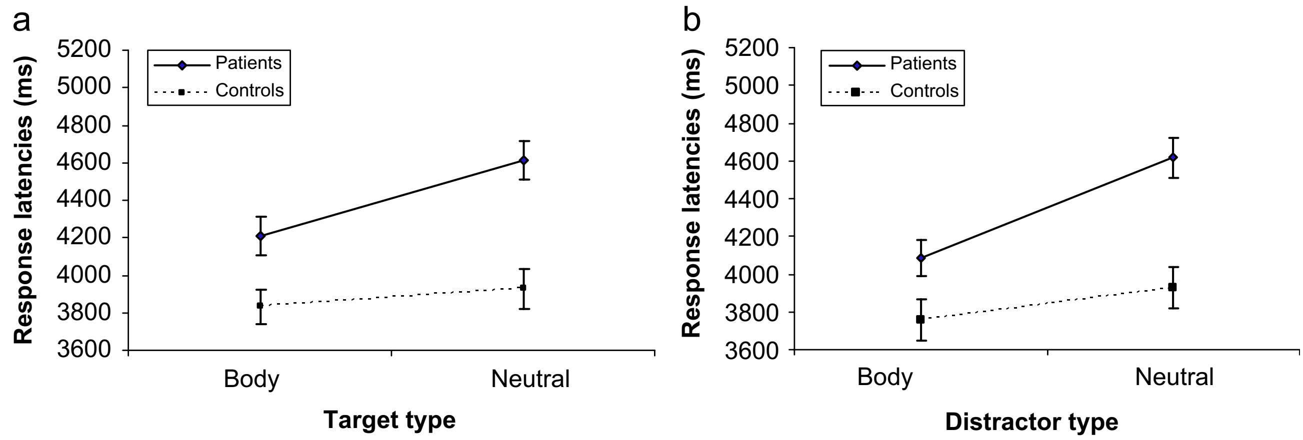

Fig. 1. (a) Mean response latencies for trials in which participants searched for one body target word among 19 neutral words (target type = body), and for trials in which participants searched for one neutral target word of one category among 19 neutral words of another category (target type = neutral). Results are presented separately for ED patients and healthy controls. Error bars represent one standard error. This graph shows that ED patients show evidence of speeded detection of body-related information, compared with controls. (b) Mean response latencies for trials in which participants searched for one neutral target word among 19 body-related distractor words (distractor type = body), and for trials in which participants searched for one neutral target word of one category among 19 neutral distractor words of another category (distractor type = neutral). Results are presented separately for ED patients and healthy controls. Error bars represent one standard error. This graph shows that ED patients are not more distracted by body-related information, compared with controls.

Results were analyzed in a 2 (group: ED vs. controls) × 2 (distractor type: body vs. neutral) repeated measures ANOVA. Of main interest to our hypothesis, a significant group × distractor type interaction, $F\,(1, 123) = 15.81$, $p<.001$, $\eta_p^2 = .11$, was found, qualifying main effects of distractor type, $F\,(1, 123) = 60.17$, $p<.001$, $\eta_p^2 = .33$, and of group, $F\,(1, 123) = 13.51$, $p<.001$, $\eta_p^2 = .10$.

See Fig. 1b for means and SEs. Additional independent samples *t*-tests indicated that ED patients were significantly slower than controls with neutral distractors, $t\,(123) = 4.62$, $p<.001$, $d = .83$, and with body-related distractors, $t\,(123) = 2.31$, $p<.05$, $d = .42$. Even though ED patients were slower than controls on both types of trials, the significant group × distractor type interaction shows that, relative to controls, they did show a benefit for the body-related distractors as compared with the neutral distractors. In contrast to our hypothesis, the difference in distraction between ED patients and controls was less pronounced for body distractor words than for neutral distractor words.

Hypothesis 3. ED patients show evidence of speeded detection of high-caloric food information in comparison to controls.

Results were analyzed in a 2 (group: ED vs. controls) × 3 (target type: high-caloric food vs. low-caloric food vs. neutral) repeated measures ANOVA, which yielded a significant main effect of group, $F\,(1, 123) = 5.71$, $p<.05$, $\eta_p^2 = .05$, and a marginal significant effect of target type, $F\,(1.9, 231.24) = 2.64$, $p = .07$, $\eta_p^2 = .02$. However, the group × target type interaction, $F\,(1.9, 231.24) = 0.77$, ns, was not significant. See Fig. 2a for means and SEs. Taken together, no evidence was found for speeded detection of high-caloric food words in ED.

Hypothesis 4. ED patients show evidence of increased distraction by high-caloric food information in comparison to controls.

Results were analyzed in a 2 (group: ED vs. controls) × 3 (distractor type: high-caloric food vs. low-caloric food vs. neutral) repeated measures ANOVA. Of main interest to our hypothesis, a marginally significant group × distractor type interaction was found, F (2.0, 243.50[1]) $= 2.91$, $p = .06$, $\eta_p^2 = .02$, qualifying main effects of distractor type, F (2.0, 243.50[1]) $= 2919$, $p<.001$, $\eta_p^2 = .19$, and of group, $F\,(1, 123) = 7.27$, $p<.001$,

[1]Greenhouse Geisser degrees of freedom were reported.

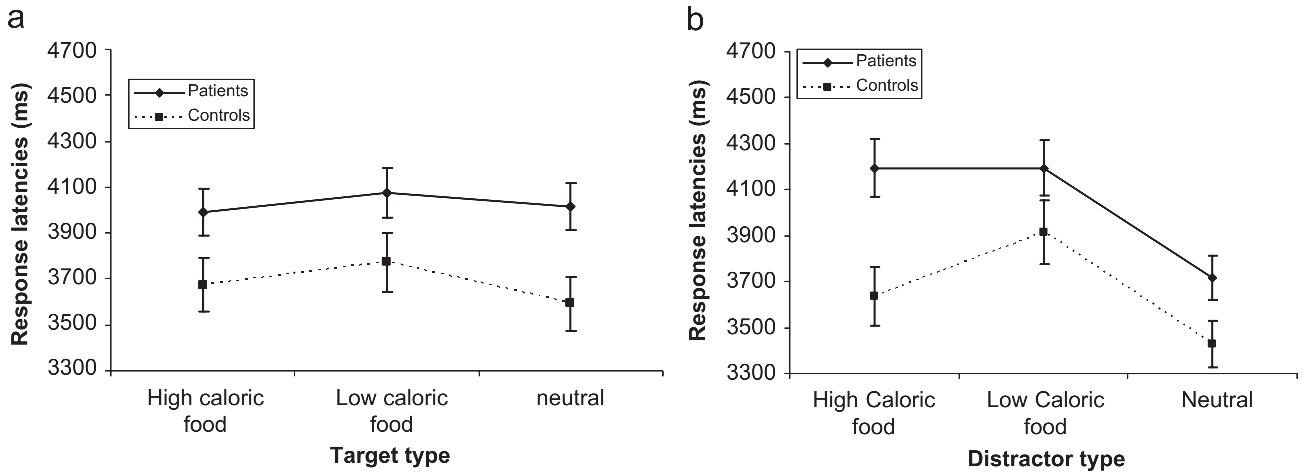

Fig. 2. (a) Mean response latencies for trials in which participants searched for one high-caloric food target word among 19 neutral words (target type = high-caloric food), for one low-caloric food target word among 19 neutral words (target type = low-caloric food), and for trials in which participants searched for one neutral target word of one category among 19 neutral words of another category (target type = neutral). Results are presented separately for ED patients and healthy controls. Error bars represent one standard error. This graph shows that ED patients are not faster at detecting high-caloric food information, compared with controls. (b) Mean response latencies for trials in which participants searched for one neutral target word among 19 high-caloric food distractor words (distractor type = high-caloric food), for one neutral target word among 19 low-caloric food distractor words (distractor type = low-caloric food) and for trials in which participants searched for one neutral target word of one category among 19 neutral distractor words of another category (distractor type = neutral). Results are presented separately for ED patients and healthy controls. Error bars represent one standard error. This graph shows that ED patients are more distracted by high-caloric food information, compared with controls. Error bar represents one standard error.

$\eta_p^2 = .06$. See Fig. 2b for means and SEs. Additional independent samples *t*-tests indicated that ED patients were significantly slower than controls at detecting neutral target words among high-caloric food distractors, $t\ (123) = 3.25$, $p < .01$, $d = .64$, and among neutral distractors of another category, $t\ (123) = 2.20$, $p < .05$, $d = .40$. In contrast, both groups were equally slow at detecting a neutral target word among low-caloric food distractors, $t\ (123) = 1.75$, $p = .08$.

To test whether the difference between ED patients and controls was larger for high-caloric foods than for neutral distractors, an additional 2 (group: ED vs. controls) × 2 (distractor type: high-caloric food, vs. neutral) repeated measures ANOVA was conducted. Importantly, we found a significant group × distractor type interaction, $F\ (1, 123) = 4.94$, $p = .03$, $\eta_p^2 = .04$, qualifying main effects of distractor type, $F\ (1, 123) = 30.51$, $p < .001$, $\eta_p^2 = .20$, and of group, $F\ (1, 123) = 9.08$, $p < .001$, $\eta_p^2 = .07$. The group × distractor type interaction shows that the difference between ED patients and controls was more pronounced for high-caloric food distractors than for neutral distractors. These results provide clear evidence for increased distraction by high-caloric food words in ED patients.

Discussion

The present study sought to confirm the assumed existence of an attentional bias for body and food stimuli, and to investigate how the attentional bias can be understood in terms of speeded detection of or increased distraction by the disorder-relevant information. Compared with controls, ED patients showed evidence of speeded detection of body-related information. However, our hypothesis of increased distraction by body-related information was not confirmed; the ED patients were not more distracted by body-related information. Considering the food-related information, it was found that compared with controls ED patients showed evidence of increased distraction by high-caloric food words, but there was no evidence of a speeded detection of high-caloric food words.

Taken together, speeded detection accounted for the attentional favoring of body-related information, whereas increased distraction accounted for the attentional favoring of food-related information in ED.

Elaborating on the findings of Shafran et al. (2007), these findings suggest that the exact nature of the attentional bias in ED patients is dependent upon the type of information they are presented with.

The current findings support cognitive–behavioral theories of ED, in that they underline the importance of attentional biases in ED psychopathology. By establishing the presence and exact nature of the attentional bias in ED patients, our findings help illuminate the general nature of biased cognitive processes that are involved in ED. If the attentional bias acts as a maintaining factor in ED pathology, it would be worthwhile to investigate in future research whether reducing the attentional bias for body- and food-related information might lead to a reduction in ED pathology. Reducing biases by e.g., cognitive therapy or retraining might be different for biases related to speeded detection (body) and biases related to increased distraction (food). If body information is threatening and therefore elicits an attentional bias, behavioral experiments and cognitive restructuring might be focused on the extinction of anxiety and anxiety-related cognitions. If food information elicits a craving response, and therefore an attentional bias, behavioral experiments and cognitive restructuring might be focused on the extinction of craving and craving-related cognitions.

Our idea that body cues might elicit an attentional bias because they are threatening stems from anxiety studies. The results of the body visual search task in the present study are in line with several studies using the odd-one-out visual search task in spider-fearful individuals and individuals suffering from social phobia (Gilbao-Schechtman, Foa, & Amir, 1999; Öhman, Flykt, & Esteves, 2001; Rinck & Becker, 2006). More specifically, these studies on anxiety showed speeded detection of threatening information in the absence of increased distraction. In the present study, a same pattern was found: ED patients were faster at detecting body-related information (i.e., speeded detection), whereas they were not more distracted by this type of information (i.e., no increased distraction), relative to neutral information. Quite the opposite, ED patients were more distracted by neutral distractors than by body-related distractors. This is particularly interesting because it suggests that ED patients exhibit vigilance for body information (speeded detection) but are not more distracted by it, which may point to an avoidance response. In this line, one might speculate as to why ED patients exhibit this particular attentional bias for body-related information in their environment. One possibility is that ED patients experience body-related information as highly negative or even threatening, since they suffer from intense body concerns (Cash & Deagle, 1997). Consequently, it can be hypothesized that the confrontation with negative stimuli in the body visual search task might have accounted for the present pattern of results.

Nonetheless, other studies from the field of anxiety seem to contradict this line of reasoning. Using the visual search task, Rinck, Becker, Kellermann, and Roth (2003) and Rinck et al. (2005) showed that the confrontation with threatening information does not only attract attention (i.e., speeded detection), but might also hold attention (i.e., increased distraction) in spider phobics. Given this inconsistency, the question as to whether an attentional bias for body-related information reflects increased anxiety remains intriguing and warrants further investigation. Also of interest is to test whether decreased levels of body dissatisfaction (e.g., after treatment) are related to a slower detection of body cues, suggesting that the visual search paradigm might be a useful and implicit index of body image change.

Our idea that food cues elicit an attentional bias because they elicit an appetitive or craving response stems from appetitive studies. With regard to the food visual search task, we found evidence for increased distraction by high-caloric food words in ED patients without speeded detection. In other words, ED patients do not search for food information in the environment, but are distracted by these cues when they are confronted with an environment that is filled with high-caloric food items. One might interpret this food attentional bias in two ways. On the one hand, one can hypothesize that food-related information is experienced as highly negative by ED patients, because they suffer from an intense fear of gaining weight. In this line, the observed increased distraction effects might have been the consequence of a fear response, as has been documented in anxiety research (Rinck et al., 2003, 2005). On the other hand, one can hypothesize that in an early stage of information processing, food-related information might be experienced as positive instead of negative by ED patients. In this line, increased distraction might resemble a craving response for food. Research from the field of addiction seems to support this link. Mogg, Field, and Bradley (2005) found that greater maintained attention, which may resemble the distraction component in the visual search task, for smoking cues in smokers was associated with higher levels of craving. In the present study, we did not measure levels of craving or anxiety; it would be of interest to further study whether the increased distraction by high-caloric food cues in ED is anxiety- or craving-driven.

In the present study, the slower detection of a neutral target word among high-caloric food distractors is interpreted as a difficulty to withdraw attention away from the food distractors, as we compare our findings with those of Mogg et al. (2005). It might however also be possible that it was not a difficulty to shift attention away from distracting stimuli (increased distraction), but successive attraction of the participants' attention by the diverse food stimuli. It is of great theoretical interest to find out in further studies, for example by using methods of eye tracking, whether the slower detection of a neutral target word among high-caloric food distractors points to this difficulty to shift attention away from the high-caloric food distractors or to distractors successively attracting the participants' attention.

In sum, this study investigated the mechanisms underlying the preferential processing of body- and food-related information in ED. It is concluded that the attentional biases in ED can be explained by two different components: speeded detection and increased distraction. The type of information with which ED patients are presented determines which of both components is involved in the bias. The attentional favoring of body-related words can be explained by speeded detection of body-related information, whereas the attentional favoring of high-caloric food-related information can be explained by the difficulty to shift attention away from high-calorie foods once detected.

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