



## Research report

# Attentional bias in restrictive eating disorders. Stronger attentional avoidance of high-fat food compared to healthy controls? ☆

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## ABSTRACT

A striking feature of the restricting subtype of anorexia nervosa (AN) is that these patients are extremely successful in restricting their food intake. Possibly, they are highly efficient in avoiding attentional engagement of food cues, thereby preventing more elaborate processing of food cues and thus subsequent craving. This study examined whether patients diagnosed with restrictive eating disorders ('restricting AN-like patients';  $N = 88$ ) indeed show stronger attentional avoidance of visual food stimuli than healthy controls ( $N = 76$ ). Attentional engagement and disengagement were assessed by means of a pictorial exogenous cueing task, and (food and neutral) pictures were presented for 300, 500, or 1000 ms. In the 500 ms condition, both restricting AN-like patients and healthy controls demonstrated attentional avoidance of high-fat food as indexed by a negative cue-validity effect and impaired attentional engagement with high-fat food, whereas no evidence was found for facilitated disengagement from high-fat food. Within the group of restricting AN-like patients, patients with relatively severe eating pathology showed relatively strong attentional engagement with low-fat food. There was no evidence for attentional bias in the 300 and 1000 ms condition. The pattern of findings indicate that attentional avoidance of high-fat food is a common phenomenon that may become counterproductive in restricting AN-like patients, as it could facilitate their restricted food intake.

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## Introduction

According to the cognitive-behavioral theory of eating disorders, patients with anorexia nervosa (AN) are characterized by self-schemata that relate to body shape and eating. These self-schemata are presumed to lead to a preoccupation with body- and food-related information, and affect several cognitive processes, like the allocation of attention for body parts and food types (Williamson, White, York-Crowe, & Stewart, 2004). Attentional avoidance of body- and food-related information could help AN patients to restrict their food intake. Accordingly, a considerable amount of research regarding disturbed information processing focuses on attentional bias for food (see for a review: Dobson & Dozois, 2004; Faunce, 2002).

Attentional bias for food in AN has been studied using several techniques. Previous studies using the emotional Stroop task found mixed evidence for color-naming interference for food words compared to neutral words in AN patients and restrained eaters (see for a review: Brooks, Prince, Stahl, Campbell, & Treasure, 2011; Dobson & Dozois, 2004; Johansson, Ghaderi, & Andersson, 2005). However, the use of Stroop tasks in research for attentional bias is debatable, because the Stroop task does not provide an adequate measure of attentional allocation. Color-naming interference effects for food can be the result of both heightened attention for food-related material as well as avoidance of food-related material (De Ruiter & Brosschot, 1994), which make Stroop studies difficult to interpret in terms of attentional bias.

More recent studies used the visual probe strategy that provides more straightforward indices of spatial attention. In a typical visual probe study the participant is presented with two stimuli, followed by a target stimulus (i.e., probe) on the location of one of the stimuli. The participant has to respond to the location of the probe. The basic idea is that the response is facilitated when the participant's attention was allocated to the location of the probe. Attentional bias for food can be measured by reaction times to the target in which relatively fast reactions to targets that replace food words compared to targets that replace neutral words are indicative of attentional bias for food. Furthermore, the presentation time of

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the stimuli can be modified to examine the role of enhanced engagement (short presentation duration, e.g., 300 ms) and maintained attention (long presentation duration, e.g., 1000 ms).

Only two visual probe studies are conducted on attentional bias for food in patients with clinically diagnosed eating disorders (Shafran, Lee, Cooper, Palmer, & Fairburn, 2007, 2008), and used a presentation duration of 1000 ms. Both studies consistently found that eating disorder patients showed a tendency to direct their attention towards negative eating pictures (i.e., high calorie food in uncontrolled circumstances) and a tendency to direct attention away from positive eating pictures (i.e., low calorie food in controlled circumstances). However, the previous studies on attentional bias for food in eating disorders did not differentiate between different eating disorder diagnoses (e.g., AN purging type, AN restricting type, BN, Binge Eating Disorder (BED), or other ED-NOS). Due to the relatively small number of AN patients it cannot yet be decided whether the pattern of an attentional bias for negative eating pictures also applies for (restrictive) AN. Possibly, attentional avoidance could be found in a restrictive AN sample.

Furthermore, current definitions suggest that attentional bias consists of three critical components: initial shift of attention, attentional engagement, and attentional disengagement (Posner, 1980). An initial shift of attention or attentional engagement could be involved in attentional bias by an earlier allocation of attention towards food (early vigilance and faster detection) compared to neutral objects. Attentional disengagement could be involved in attentional bias by a difficulty to disengage from food compared to neutral objects. Early vigilance and attentional engagement would particularly be found in early stages of attention (e.g., 300 ms after exposure to food cues). A difficulty to disengage from food could occur directly after attentional engagement took place. Biases in all of these components may add to eating disordered individuals' preoccupation with food and may inadvertently influence the restriction of food intake. Possibly, patients diagnosed with the restrictive subtype of AN show initial attentional avoidance and/or weak engagement of (high-fat) food, and a facilitated disengagement from (high-fat) food, which may jointly contribute to their restricted eating pattern. Unfortunately, the visual probe paradigm that was used in previous studies on attentional bias does not allow to differentiate between these components of attentional bias. Therefore, a recent attentional bias study used a visual search task to measure speeded detection and increased distraction in eating disordered patients. On part of the trials, participants had to search for the single food-related word in an array of neutral words (i.e., speeded detection), whereas on the other part of the trials they had to search for the single neutral word in an array of food-related words (i.e., increased distraction). Results indicated that eating disordered patients were relatively slow on trials where they had to find the neutral word among high-caloric food words (increased distraction), compared to controls (Smeets, Roefs, van Furth, & Jansen, 2008). No differences were found between different eating disorder diagnoses (22 AN-restrictive, 24 AN-purging, 22 BN patients). Unfortunately, speeded detection and attentional engagement as well as increased distraction and attentional disengagement are not exactly the same constructs. For example, during the critical trials of the visual search task a neutral word is always presented in an array of food-related words, so the relatively slow detection of a neutral word in a food-array might not so much be caused by a difficulty to disengage, but by a repeated distraction by the food-related words (i.e., multiple attentional shifts).

Together the available evidence seem to suggest that eating disorder patients are characterized by heightened attention for food (see for a review: Brooks et al., 2011). However, it is still unclear whether these results also apply to AN, and how the components of attentional bias for food are involved within this group. Perhaps similar to attentional bias studies in phobic anxiety (e.g., Mogg,

Bradley, Miles, & Dixon, 2004), AN patients may show a vigilance-avoidance pattern related to food items, in which vigilance for food contributes to detect food in an early stage combined with avoidance of thorough processing of food aspects that might help to subsequently avoid (the intake of) food. In support of this, functional imaging studies showed down regulation of cerebral areas in AN (and BN) patients when they viewed food pictures, which can be interpreted as disengagement from food (see for a review: Giel et al., 2011). To test further the role of attentional bias in AN, the present study focused on restricting AN-like patients who were referred to a specialized clinic for eating disordered patients.

The present study used the modified exogenous cueing task (ECT) originally developed by Posner (1980). The ECT is well-suited to differentiate between processes of attentional engagement with and attentional disengagement from emotionally relevant stimuli and has been shown to be sensitive to individual differences (Koster, Crombez, Van Damme, Verschuere, & De Houwer, 2005). The original ECT employed verbal stimuli. In the present study, however, we used pictures instead of words to improve the ecological validity of the task.

In the pictorial version of the ECT, the participant is continuously presented with a fixation point in the middle of a computer screen. During the task, a cue (i.e., picture) appears on the left or the right side of the computer screen. The picture disappears and a target (i.e., small square figure) appears on the left or the right side. The participant is instructed to fixate the eyes on the fixation dot in the middle of the screen and to respond as quickly as possible to the location of the target by pressing the left or the right key on a response box. When the target and the cue appear on the same location, it is called a valid trial. When the target and the cue appear at different locations, it is called an invalid trial (see Fig. 1 for an example of a valid and an invalid trial). Typically, participants respond faster to valid trials than to invalid trials, because the attention is still on the side of the cue, which facilitate the response to the target. This effect is called a normal cue validity effect. In the modified ECT, however, the participant is presented with neutral cues as well as emotionally relevant cues (i.e., body shape or food in the context of eating disorders), which enables a comparison between attention for this emotionally relevant and neutral information. The use of both neutral and emotionally relevant cues provides the opportunity to measure the processes of attentional engagement and disengagement. Attentional engagement comprises facilitated responses to emotionally relevant cues compared to neutral cues on valid trials, and slowed disengagement comprises delayed responses to emotionally relevant cues compared to neutral cues on invalid trials.

As mentioned before, the pattern of attentional deployment can vary over time, and various presentation times have to be used to distinguish between early vigilance and more maintained attention. Therefore, pictures were presented for 300, 500, or 1000 ms duration to allow for a more detailed investigation of the attentional deployment over time. A previous study using the ECT to examine attentional bias for food showed that when pictures were presented for 500 ms, relatively strong avoidance of high-fat food was found in unsuccessful dieters (Veenstra, de Jong, Koster, & Roefs, 2010). We hypothesized that restricting AN-like patients initially (i.e., 300 ms) would show heightened attention for food as indexed by a positive cue-validity effect, enhanced engagement and/or a difficulty to disengage, and subsequently (i.e., 500 and 1000 ms) a pattern of avoidance of food as indexed by a negative cue-validity effect, impaired engagement and facilitated disengagement. As high-fat food is most relevant when it comes to the restriction of caloric intake, we examined whether the attentional bias would be restricted to high-fat food or would also be evident for low-fat food items.

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