REGULAR ARTICLE

Body Checking Induces an Attentional Bias for Body-Related Cues

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ABSTRACT

Objective: Theoretical models suggest that body checking is linked to biased cognitive processing. However, this link has not been investigated in any systematic way. The present study examined the influence of body checking on attentional bias for body-related cues by manipulating body checking behaviors in nonclinical participants.

Method: 66 women were randomly assigned to one of three conditions: body checking, body exposure, or control. A body visual search task was used to measure attentional bias.

Results: Participants in the body checking condition showed speeded detection of body-related information compared to participants in the exposure and control conditions. No evidence was found for increased distraction by body-related information. Furthermore, participants in the body checking condition reported more body dissatisfaction after the manipulation than participants in the body exposure and control conditions.

Discussion: These results are the first to experimentally establish the link between body checking and attentional bias toward body-related cues.

Keywords: body checking; attentional bias; body image; speeded detection

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Body Checking Induces an Attentional Bias for Body-Related Cues

Body checking is an important component of eating disorders and can be defined as the repeated and ritualistic monitoring of several aspects of the body.[1] Specific examples of body checking include the intense scrutiny of specific body parts in the mirror, frequent weighing, pinching certain body parts to measure fatness, and using the fit of clothes to check for any slight change in shape or weight.[2]

Although body checking behaviors have been frequently observed in clinical settings, only in the last decade have researchers given the concept of body checking empirical attention. Research focussing on the phenomenology of body checking has shown that eating disorder individuals engage in body checking significantly more often than do normal controls.[3,4] In addition, a positive association between the severity of the eating disorder and the frequency of body checking behaviors has been found.[4] Furthermore, Mountford et al.[5] have identified a range of dysfunctional beliefs related to body checking behaviors in women with eating disorders, such as the beliefs that body checking serves to maintain control over eating and weight, decreases anxiety and helps one to feel better.

In general, there are two views on the role of body checking in eating disorders. On the one hand, body checking has been conceptualized as a behavioral response to the over-evaluation of shape and weight characteristic of eating disorder individuals.[3,4,6] On the other hand, it has been conceptualized as an independent factor in maintaining eating disorder psychopathology.[6,7] In support of the proposition that body checking is a behavioral expression of the core psychopathology of eating disorders, body checking has been shown to be associated with increased shape and weight concerns in individuals with anorexia nervosa and bulimia nervosa,[3] and in overweight individuals with binge eating disorder.[4] With regard to the view that body checking operates as a maintaining factor, two different cognitive-behavioral theoretical accounts have been formulated.[6,7] Firstly, Fairburn et al.[6] hypothesized that the constant monitoring

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of weight and shape as a manifestation of extreme body concerns will serve to intensify patients' efforts to restrict eating. As individuals with eating disorders use the information they obtain from body checking as a measure of self-control, even the slightest perceived (negative) change in weight or shape is interpreted as a failure in self-control, leading to reinvigorated dietary restraint, shape concerns, and drive for thinness. In the first study to explicitly address the maintenance role of body checking in eating disorder psychopathology, Shafran et al.[8] experimentally investigated the impact of body checking behaviors on body dissatisfaction. Healthy participants standing in front of a mirror were randomly assigned to a "high body checking condition," in which they were instructed to focus on and look carefully at their most disliked body parts (without describing them), or to a "low body checking condition," in which they were instructed to look at and describe in a neutral way all parts of their body. Results showed that participants in the high body checking condition experienced an increase in body dissatisfaction, self-critical thought, and feelings of fatness immediately after the manipulation, in comparison to participants in the low body checking condition. These findings support the role of body checking in body dissatisfaction.

Secondly, a somewhat different account by Williamson attributes the maintenance role of body checking in eating disorder psychopathology to cognitive biases, such as selective attention for body-related information.[7,9] A large number of studies using either the modified Stroop paradigm,[10,11] the dot-probe paradigm,[12,13] or the visual search paradigm,[14] have consistently demonstrated that individuals with eating disorders show an attentional bias for body-related information in their environment. However, these biases were not studied in relation to body checking. Recent research from our laboratory has shown that, when looking at their bodies (body checking), individuals with eating disorders have an attentional bias for their disliked body parts.[15] Similarly, it has been demonstrated that individuals with eating disorders[3] and women with high levels of body shape concern[16] report attending more to their self-defined problem zones (i.e., stomach, thighs) than normal controls.

Although the existence of an attentional bias in eating disorders has been well-established, as yet there has not been any research investigating whether the act of body checking itself biases the attentional processing of body- and shape-related information as hypothesized by Williamson.[7,9] Thus, the current study aimed to investigate the impact of experimentally induced body checking behaviors on the attentional processing of body-related information. We used the visual search paradigm[14] which is able to distinguish two subcomponents of attention: speeded detection (i.e., hyper vigilance for relevant stimuli) and distraction (i.e., increased distraction by relevant stimuli). Previously Smeets et al.[14] studied the nature of attentional bias for body-related information in individuals with eating disorders using the body visual search paradigm. Results indicated that individuals with eating disorders showed evidence of speeded detection of, but not increased distraction by, body-related information in comparison to normal controls.

Given that body checking is a naturally occurring phenomenon in individuals with eating disorders, its manipulation in a clinical group cannot offer a direct test of its causal effect on attentional processing. Instead, to test experimentally whether body checking leads to attentional bias, one needs to manipulate it in non-clinical participants (with low initial levels of body checking). Thus the current study was designed as an experimental analog to the body checking of individuals with eating disorders.

Specifically our aim was to induce one particular aspect of body checking (focusing on and inspecting the size of different parts of the body) in a sample of nonclinical participants and to examine the direct impact on the attentional processing of body-related information as assessed by the body visual search paradigm.[14] Participants were randomly assigned to one of three conditions: a body checking condition, a body exposure condition, and a control condition. The body exposure condition was included to investigate whether it is the active act of body checking or merely passive exposure to the body which influences the attentional processing of body-related information. In line with our previous findings on the attentional processing of body-related information in individuals with eating disorders,[14] it was hypothesized that participants assigned to the body checking condition would show evidence of speeded detection, but not increased distraction by body-related information, in comparison to participants assigned to the exposure or control conditions. This result would signify hypervigilance to body-related information as a result of body checking. We predicted no difference in attentional processing between the body exposure and control conditions, as it was reasoned that passive exposure

would not lead to an attentional bias for body-related information.

Method

Participants

A total of 66 female undergraduate students from Flinders University, Australia, were invited to participate in a study ostensibly investigating the relationship between personality, cognition, and female perception. Participants were randomly assigned (subject to equal numbers per cell) to either the body checking condition (n = 22), the body exposure condition (n = 22), or the control condition (n = 22). Participants had an average BMI (BMI = weight/height^2) of 23.1 (SD = 4.5), and were on average 20.45 (SD = 3.3) years-old. One control participant was excluded from the analyzes due to a high percentage of outlier responses and errors on the body visual search task (>M + 3SD = 25%), leaving a total of 21 participants in the control condition. All participants received course credit for their participation.

Materials

Body-related 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. She was then 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). If the matrix contained an odd-one-out word (henceforth called the target word), she was instructed to press the right button of a response-box. If the matrix did not contain an odd-one-out word, she was instructed to press the left button. The matrix remained on screen until response or for a maximum of 20 seconds, upon which the next trial commenced. The location of each word in each matrix was randomized 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.

Word stimuli (translated into English from Smeets et al.[14]) came from three categories: body, countries (neutral), and musical instruments (neutral). Participants were informed of these categories. Stimulus words in the three categories did not differ significantly in length, all t's = 0.00, all p's > .05. 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 matrix was shown 19 times to each participant. Matrices on target absent trials consisted of 20 countries, 20 musical instruments, or 20 body-related words. There were 114 target present trials, 30 target absent trials and 12 practice trials. In line with Smeets et al.,[14] the majority of the trials were target present because only this type of trial is relevant for testing speeded detection and increased distraction. Speeded detection of body-related words is calculated by comparing response latencies to detect a body-related target word vs. a neutral target word among neutral distractor words from another category. Increased distraction is calculated by comparing response latencies to detect a neutral target word among body-related words vs. neutral distractor words from another category.

The visual search task lasted ∼15 min, divided into two blocks of trials of 7.5 minutes. The participant was given a brief break between blocks. The distance between the participant and the monitor was ∼90 cm. Within the frame of the matrix, words were horizontally separated by 6.76 cm and vertically by 6.50 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.

Trait Body Checking. The Body Checking Questionnaire (BCQ) was used to measure habitual body checking behaviors.[3] This self-report measure consists of 23 items, e.g., "I look to see if I have cellulite on my thighs when I am sitting," "I pinch my stomach to measure fatness." Items are rated on a 5-point likert scale, ranging from 1 = never to 5 = very often. The BCQ has good test-retest reliability (0.94) and internal consistency (0.87).[3]

Experimental Manipulation

As we were concerned that attentional processing might be susceptible to demand characteristics, we chose a more subtle body checking manipulation than that of Shafran et al.[8] In this way we wanted to: (1) prevent our participants from unraveling the true purpose of our study, and (2) minimize the risk of confounding body checking with other symptoms and personality traits that are associated with eating disorders. Accordingly, we endeavored to induce one particular aspect of body checking behavior (viz., focusing on and inspecting the size of different body parts) by having participants complete a perceptual estimation task in which they were asked to make a series of length estimations (in centimeters). They were informed that the experimenter would indicate the objects of which they had to estimate the length. For the first part of the task, participants in all conditions were asked to estimate the length of three different parts of a table. For the second part of the task, participants in the body exposure and control conditions were asked to estimate the length of three different parts of a chair. In contrast, participants in the body checking condition

were asked to estimate the length of three different parts of their body: (1) collarbone to waist, (2) hips to knees, and (3) shoulder to elbow. The body parts to be estimated were indicated by the experimenter on the participant's body, rather than spoken out loud, to avoid the potential facilitated detection of these words in the subsequent body visual search task. Participants were told to carefully focus on and inspect the size of the body parts whose length they had to estimate.

In the body exposure and body checking conditions, participants performed the perceptual estimation tasks in front of a mirror, positioned to ensure that all participants were facing the mirror from the same distance and to maximize body exposure. Participants in these conditions were instructed to look in the mirror when performing the perceptual estimation task and were told that using the mirror would help them make an accurate perceptual judgment. The experimenter monitored compliance with this instruction during the task. After the manipulation, the experimenter moved the mirror out of sight to ensure that participants would not be distracted while completing the body visual search task. In the control condition, there was no mirror in the laboratory.

Manipulation Check. To check whether the manipulation was successful, participants were asked to think back to the thoughts and feelings they had during the perceptual estimation task (i.e., the manipulation). Specifically participants rated their response to the question "To what extent did you focus on and inspect the size of your body parts during the perceptual estimation task" on a 10 cm scale ranging from 0 ("not at all") to 10 ("very much").

Body Dissatisfaction. Although the main focus of the present study was not on the influence of body checking on body dissatisfaction, we included an additional measure to find out whether the manipulation had any effect on body dissatisfaction. Participants were asked to think back to the thoughts and feelings they had during the perceptual estimation task (i.e., the manipulation), and to rate their response to the question "To what extent were you satisfied with your body during the perceptual estimation task" on a 10 cm scale ranging from 0 ("not at all") to 10 ("very much"). Finally, to assess whether the groups differed in trait body dissatisfaction, we used the Body Shape Questionnaire (BSQ).[17] The BSQ is a psychometrically sound 16-item self-report measure that assesses shape and weight concerns over a period of four weeks.[2] Items, e.g., "In the past four weeks have you felt so bad about your shape that you have cried," are rated on a 6-point likert scale ranging from 1 = never to 6 = always.

Procedure

All participants were tested individually. On entering the experimental room, participants were informed that the study consisted of a perceptual estimation task, a computer task and some questionnaires. After signing the informed consent form, participants completed the perceptual estimation task. They then completed the body visual search task, followed by the manipulation check and measure of state body dissatisfaction. Finally, they completed the trait BCQ, the BSQ, and reported their height, weight, and age. Self-reported height and weight have been shown to be reasonably accurate in nonclinical samples.[18] The trait measures were administered last, after the visual search task, to ensure that these could not affect either the experimental manipulation or performance on the visual search task. Although the trait measures would ideally have been collected in a separate session, in the event, there was no effect of the manipulation on them (see later). All participants were debriefed in writing after the experiment was completed. This procedure was approved by the local research ethics committee.

Results

Participant Characteristics

Preliminary analysis confirmed that participants in the three conditions did not differ significantly on age (body checking: $M = 20.05$, SD = 3.11; body exposure: $M = 20.68$, SD = 3.37; control: $M = 20.62$, SD = 3.57), body mass index (body checking: $M = 23.39$, SD = 4.80; body exposure: $M = 21.98$, SD = 3.27; control: $M = 23.80$, SD = 5.31), trait body dissatisfaction (i.e., BSQ; body checking: $M = 49.68$, SD = 18.61; body exposure: $M = 44.32$, SD = 16.25; control: $M = 43.48$, SD = 16.91), or on the trait measure of body checking (i.e., BCQ; body checking: $M = 56.04$, SD = 15.89; body exposure: $M = 51.77$, SD = 16.90; control: $M = 49.57$, SD = 13.12). All F's (2, 62) <1.00, ns.

Manipulation Check

Analysis of variance (ANOVA) showed that participants in the body checking condition ($M = 5.70$, SD = 2.80) reported focussing significantly more on their body during the perceptual estimation task, F (2, 62) = 27.56, $p < .001$, than did participants in the exposure condition ($M = 1.00$, SD = 1.60) or the control condition ($M = 1.70$, SD = 2.20). Additional post-hoc analyzes with Bonferoni correction ($\alpha = 0.017$) revealed that participants in the body checking condition differed significantly from both participants in the body exposure condition, t (42) = 6.82, $p < .001$, and participants in the control condition, t (41) = 5.18, $p < .001$. There was

no significant difference between participants in the body exposure and control conditions, t (41) = 1.20, ns. Consequently, it was concluded that the experimental manipulation had been successful.

Body Dissatisfaction

ANOVA showed that participants in the body checking condition (M = 4.06, SD = 2.15) reported feeling significantly less satisfied with their body, F (2, 62) = 5.05, $p < .01$, than did participants in the body exposure condition (M = 5.86, SD = 2.51) and control condition (M = 6.03, SD = 2.11). Additional follow-up analyzes with Bonferoni correction (α = 0.017) showed that participants in the body checking condition differed significantly from both participants in the body exposure condition, t (42) = 2.55, p = .014, and participants in the control condition, t (41) = 3.02, p = .004. There was no significant difference between participants in the body exposure and control conditions, t (41) = 0.24, ns.

Data Reduction and Target-Absent Trials

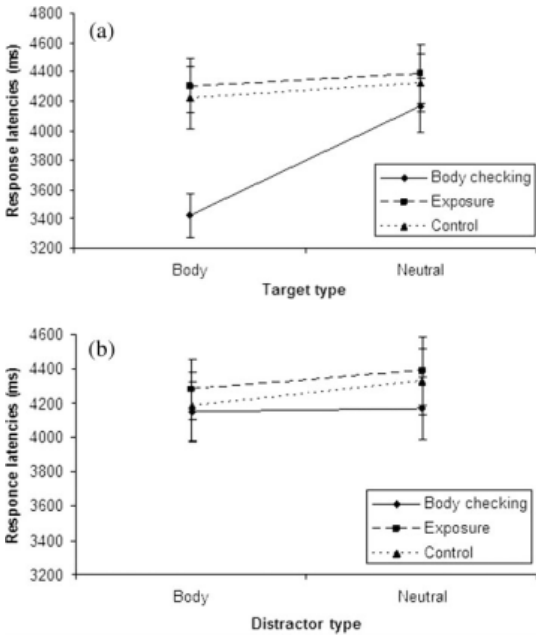
The main analyzes were conducted on the target-present trials. Errors (i.e., misses: 8.35% of the target-present trials) and responses faster than 200 ms and slower than 20.000 ms were discarded, as were response latencies higher than three standard deviations (SD) above the overall mean of all participants (0.86% 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: 6.77 %; country: 6.46 %; music: 4.92 %). A 3 (Stimulus category: body vs. music vs. country) × 3 (Group: body checking vs. body exposure vs. control) repeated measures ANOVA of false alarms revealed that the Stimulus category × Group interaction was not significant, F (4, 124) = 1.50, ns, indicating that there were no significant differences between participants in the three conditions on the false alarm rates for body, country, and music target-absent trials. Main effects of Stimulus category, F (2,124) = 1.04, ns, and Group, F (2, 62) = 0.15, ns, were also nonsignificant.

Effects of Condition on Speeded Detection of Body-Related Information

Results were analyzed in a 3 (Condition: body checking vs. body exposure vs. control) × 2 (Target type: body vs. neutral) repeated measures ANOVA of the response latencies on target-present trials. In support of our prediction, a significant condition × target type interaction was found, F (2, 62) = 7.29, p = 001, qualifying a main effect of target type, F (1, 62) = 14.54, $p < .001$, and a near-significant main effect of Condition, F (2, 62) = 2.95, p = .06. See **Figure 1a** for means and SEs. Additional post-hoc analyzes with Bonferoni correction (α = 0.017) revealed that participants in the body checking condition were significantly faster at detecting a body-related target word among neutral distractors, than a neutral target word among neutral distractors from another category, t (21) = 4.57, $p < .001$. This difference was not significant for participants in the body exposure condition, t (21) = 0.68, ns, or control condition, t (20) = 0.75, ns. In other words, participants in the body checking condition showed speeded detection of body-related information in the body visual search task, whereas participants in the body exposure and control conditions did not. Level of attentional bias (i.e., mean response latency to a body target among neutral distractors minus mean response latency to a neutral target among neutral distractors of another category) was correlated with state body dissatisfaction as experienced during the perceptual estimation task, r = .31, p = .01. Thus our manipulation

FIGURE 1. **(a) Mean response latencies for trials in which participants searched for 1 body target-word or one neutral target word among 19 neutral words of one other category. Error bars represent one standard error. (b) Mean response latencies for trials in which participants searched for one neutral target-word among 19 body related distractor-words or 19 neutral distractor-words of one other category. Error bars represent one standard error.**



led to correlated changes in both attentional bias and state body dissatisfaction.

Effects of Condition on Increased Distraction by Body-Related Information

Results were analyzed in a 3 (Condition: body checking vs. body exposure vs. control) × 2 (Distractor type: body vs. neutral) repeated measures ANOVA of the response latencies on target-present trials. Consistent with our prediction, no significant condition × distractor type interaction was found, $F(2, 62) = 0.25$, ns. Nor were there significant main effects of distractor type, $F(1, 62) = 1.65$, $p = .20$, or Condition, $F(2, 62) = 0.23$, ns. Thus participants assigned to the body checking condition were not significantly more distracted by body-related information than participants assigned to the body exposure or control conditions. See **Figure 1b** for means and SEs.

Discussion

The present study aimed to experimentally examine the impact of induced body checking behaviors on the attentional processing of body-related information in nonclinical participants. In support of our hypothesis, it was found that experimentally induced body checking behaviors led to an attentional bias for body-related information in the environment. In particular, participants in the body checking condition were faster at detecting body-related target words than neutral target words among neutral distractors of another category (i.e., they demonstrated speeded detection), relative to participants in the exposure and control conditions. This attentional bias for body-related information was itself correlated with body dissatisfaction. There was no evidence of increased distraction; participants in the body checking condition were not more distracted by body-related distractors as compared to neutral distractors when searching for a neutral target word, relative to participants in the body exposure and control conditions.

Results confirmed that the experimental manipulation was successful, as participants in the body checking condition reported focussing significantly more on their body during the perceptual estimation task than participants in the body exposure or control conditions. Participants in the body checking condition also reported feeling less satisfied with their body than participants in the body exposure or control conditions. As no pre-existing differences were found between groups on trait measures of body checking and body dissatisfaction the observed effects on attentional bias and body dissatisfaction can be attributed to the manipulation.

Taken together, these results experimentally show that the act of body checking biases the attentional processing of body-related information. Moreover, they show that body checking, over and above mere exposure to one's body in the mirror (as in the body exposure condition), is necessary to produce an attentional bias. The present findings parallel previous findings from our laboratory showing evidence of speeded detection but not increased distraction for body-related information in eating disorder individuals.[14] Thus it appears that experimentally inducing in non-clinical participants one of the central characteristics of eating disorders, namely body checking, results in a pattern of information processing that generally resembles that of eating disorder individuals.

In addition to inducing an attentional bias for body-related information, our body checking manipulation led to increased feelings of body dissatisfaction (see[8]) which were correlated with the attentional bias for body-related information. This suggests an interesting yet complex relationship between body checking, body dissatisfaction, and attentional bias. From the current study we know that body checking induces both an attentional bias and body dissatisfaction. At this point no conclusion can be drawn about the direction of the relationship between these latter variables. One possibility is that body checking leads to an attentional bias which then leads to body dissatisfaction. This is consistent with recent research supporting the causal role of attentional biases in the development of body dissatisfaction. Smith and Rieger[19] and Engel et al.[20] showed that training an attentional bias for body-related information in healthy participants results in more body dissatisfaction. Extending these findings, Smeets et al. Submitted showed that inducing selective attention for self-defined unattractive body parts in healthy participants also causes increased feelings of body dissatisfaction. Another possibility, however, is that body checking leads to body dissatisfaction which then leads to an attentional bias, and a third is that body checking leads to both body dissatisfaction and attentional bias independently. Future research is necessary to establish the exact roles of body checking, body dissatisfaction, and attentional biases in the maintenance of eating disorders.

The overall pattern of results is consistent with some research from the field of anxiety, indicating that confrontation with threatening information is associated with speeded detection in the absence of increased distraction in spider-fearful individuals and individuals suffering from social phobia.[21–23] As participants in the body checking condition were faster at detecting body-related information (i.e., speeded detection), but were not more distracted by this type of information (i.e., no increased distraction), it is possible that confrontation with body-related information in the body visual search task may have led them to experience threat, e.g., fear of being or becoming fat. Future research might usefully assess levels of anxiety to test this explanation.

The present findings are consistent with Williamson's theoretical model.[7,9] More specifically, the finding that body checking leads to an attentional bias for body-related information provides strong experimental support for the hypothesized link between body checking and cognitive biases. Future research should determine whether such "body-checking induced" attentional biases actually maintain eating disorders. More generally, there is some current debate as to whether attentional biases act as independent maintaining mechanisms in eating disorder psychopathology, (Smeets et al. Submitted)[7,9,19–20] or whether they are merely an expression of this pathology which disappears with effective treatment.[24] Recent research by Shafran et al.[24] supports the latter option, although more research is needed to determine the exact clinical significance of attentional biases.

Assuming that attentional bias is an issue to be tackled in treatment, this study offers some clinical implications. Specifically, as poorer treatment outcomes have been associated with remaining body checking behaviours[25] and negative body image at the end of treatment,[26] the present findings raise the possibility of targeting body checking in treatment programs. Given that body checking might maintain eating disorder psychopathology through an attentional bias for body-related information, the present findings suggest that specifically targeting attentional bias might be a beneficial addition to body exposure therapy with response prevention. This suggestion needs empirical test.

In the present study, attentional bias and body checking were interpreted as independent maintaining mechanisms for eating disorders. However, another possibility which cannot be ruled out is that body checking and attentional bias are two different expressions of the same underlying overevaluation of shape and weight. If so, body checking and attentional biases may simply go together, so that if one manipulates body checking, an accompanying attentional bias is inevitable.

On a related matter, we found no evidence for an attentional bias in participants who were assigned to the body exposure condition. We reasoned that this finding shows that merely being exposed to the body does not bias attentional processing. However, an alternative explanation may be that the task instructions led body exposure participants to direct less attention to their body than the body checking participants. Thus our observed attentional bias in the body checking condition may reflect increased salience as a result of the task demands. Future research might include exposure conditions with greater attentional demands, e.g., asking participants to describe what they see in the mirror in neutral terms without estimating size (see also[8]).

Another limitation of the current study is that we induced only one particular aspect of body checking (viz., focusing on and inspecting the size of different body parts), whereas the clinical definition of body checking is considerably more elaborate. Nevertheless, even though the current body checking manipulation differs from clinically observed body checking behaviors, this kind of experimental control is necessary to draw conclusions about the causal role of body checking in attentional processing. If, as demonstrated, even a subtle body checking manipulation leads to biased information processing, it is very likely that clinically observed body checking behaviors will lead to stronger effects. Future research should investigate responses in men as well as women.

In sum, the present study represents the first experimental investigation of the impact of induced body checking behaviors on the attentional processing of body-related information in the environment. It is concluded that active body checking, as opposed to passive body exposure, leads to an attentional bias for body-related information through the speeded detection of this type of information.

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