# Looking good. BMI, attractiveness bias and visual attention

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Research report

# Looking good. BMI, attractiveness bias and visual attention

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ABSTRACT

The aim of this study was to study attentional bias when viewing one's own and a control body, and to relate this bias to body-weight and attractiveness ratings. Participants were 51 normal-weight female students with an unrestrained eating style. They were successively shown pictures of their own and a control body for 30 s each, while their eye movements (overt attention) were being measured. Afterwards, participants were asked to identify the most attractive and most unattractive body part of both their own and a control body. The results show that with increasing BMI and where an individual has given a relatively low rating of attractiveness to their own body, participants attended relatively more to their self-identified most unattractive body part and the control body's most attractive body part. This increasingly negative bias in visual attention for bodies may maintain and/or exacerbate body dissatisfaction.



## Introduction

Body dissatisfaction has been shown to play an important role in eating disorders (Cash & Deagle, 1997; Stice & Shaw, 2002). It can be defined as a "negative subjective evaluation of one's physical body, such as figure, weight, stomach, and hips" (Stice & Shaw, 2002, p. 985). It has been proposed (Cash & Deagle, 1997; Williamson, Muller, Reas, & Thaw, 1999) that a negative body image is best "conceptualized as a complex form of a cognitive bias" (Williamson et al., 1999, p. 568). One domain of cognitive bias is attention, and a frequently used paradigm to study this bias is the modified Stroop task. On a body Stroop task, eating disorder patients consistently show an increased interference effect (Dobson & Dozois, 2004). However, it is important to note that the Stroop effect does not *necessarily* reflect an attentional bias (see Williams, Mathews, & MacLeod, 1996). The current study aims to study attentional bias for the body in a more direct way and relates this bias to body-weight (body mass index, BMI) and attractiveness ratings.

Jansen, Nederkoorn, and Mulkens (2005) studied what female eating disorder symptomatic and normal participants look at when they are presented with their own or someone else's body. Each participant was shown a picture of her own body and of someone else's body for 30 s each, while eye movements were registered. Eye movements are generally considered to closely follow visual attention and to be guided by attention (Kowler, 1995; Mogg, Millar, & Bradley, 2000). When looking at their *own body*, eating symptomatic women attended more to their self-identified most unattractive body part than to their self-identified most attractive body part, whereas lean controls showed the opposite pattern: they attended more to their most attractive body part than to their most unattractive body part. When looking at the *other body*, eating symptomatic women attended more to the perceived most attractive body part than to the perceived most unattractive body part, whereas lean controls showed the opposite pattern: they attended more to the most unattractive body part than to the most attractive body part. Thus, eating symptomatic women appeared to have a dysfunctional way of looking at their own and another woman's body (see also Freeman et al., 1991; Janelle, Hausenblas, Fallon, & Gardner, 2003), which may be a causal and/or a maintenance factor in their body dissatisfaction. Note that causal status can only be determined in an experiment in which the visual attentional bias is manipulated.

In the current experiment, we build on the above findings by examining whether women with a relatively high BMI show a dysfunctional way of looking at their own and another's body, even when their BMI is within the normal range. It was found in previous studies that BMI is related to body dissatisfaction (Annis, Cash, & Hrabosky, 2004; Faith, Leone, & Allison, 1997; Schwartz & Brownell, 2004). Therefore, we hypothesize that with increasing BMI, participants attend relatively more to the perceived most unattractive part of their own body, and the perceived most

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attractive part of a control body. Further, we examine whether this dysfunctional way of looking is also associated with relatively low ratings of their own body.

## Method

### Participants

Participants were 51 female undergraduate students. Inclusion criteria were a BMI (=body mass index = weight (kg)/height (m)$^2$) within the normal range (18.5–25) and a score on the Restraint Scale (Herman & Polivy, 1980) below 15, which is indicative of an unrestrained eating style. Participants had an average BMI of 20.9 (S.D. = 1.45), were on average 19.7 (S.D. = 1.44) years old, and scored on average 8.14 (S.D. = 3.10) on the Restraint Scale. Three additional participants were tested but were excluded from the final sample because of measurement problems ($n = 2$), or because of suspicion about the experimental procedure ($n = 1$). Participants were given €10 or course credit for their participation. This study was approved by the local committee for research ethics.

### Materials

#### Pictures

Pictures were taken with a Canon Powershot A520 digital camera. Each participant was dressed in a standard dark and light blue Adidas sports bikini, and was photographed from the neck to the toes (i.e., without her head), against a light grey background. Pictures were taken from the front and the participant held her arms loosely besides her body.

#### Control body

Pictures of all participants were rated on appearance by 15 independent female judges not taking part in the current experiment (age: $M = 26.6$, S.D. = 6.0), on a scale from 1 (very negative) to 10 (very positive). We selected a participant with the average rating (6.53, S.D. = 0.56) to function as the control body. Her BMI was 21.8. She was not a participant in the second part of the experiment in which participants viewed their own and the control body and she was not included in the description of our sample (see section 'Participants').

#### Body ratings

Black-and-white prints of the pictures of the participant's own body and the control body were given to the participant, while at the same time color-versions of these pictures were presented on the computer monitor (one after the other). For both the picture of her own body and the control body, the participant was asked to select the perceived most attractive and most unattractive body part, by naming the body part and by color marking it on the picture. For each picture, she was also asked to give a mark (1, very negative; 10, very positive) for the perceived most attractive body part (self: $M = 7.7 \pm 0.67$; other: $M = 7.9 \pm 0.56$), the perceived most unattractive body part (self: $M = 4.6 \pm 1.36$; other: $M = 5.35 \pm 1.04$), and the body as a whole (self: $M = 7.0 \pm 0.93$; other: $M = 7.3 \pm 0.59$).

#### Restraint Scale

Each participant filled out a Dutch version of the Restraint Scale (Cronbach's $\alpha$ current sample = .57), which measures "the extent to which participants show evidence of dieting and concern about their weight" (Herman & Polivy, 1980, p. 212). The maximum score on this scale is 35, whereas the minimum score is 0. Higher scores indicate higher levels of restrained eating.

### Apparatus

Eye movements were registered by the EyeLink I eyetracker from SensoMotoric Instruments (SMI, Germany) and SR Research (Canada), with a 250 Hz temporal resolution, a 0.005° gaze and eye position resolution, and a gaze position accuracy with 0.5–1.0° average error. It is a headband-mounted infrared video-based tracking system that can track both eyes. The system corrects for head-motion by means of an additional infrared camera. The participant's head rests on a chin-rest at an approximate distance of 57 cm of a computer monitor (19 in. flat panel Dell monitor). Monitor resolution was set to 1024 × 768 pixels. A Dell Optiplex GX110 Pentium III computer controlled the stimulus presentation, which was programmed in Matlab 6.5.

### Procedure

Participants were invited to participate in a study ostensibly testing the relation between sports and cognition, to disguise the real purpose of the experiment. In a first session, the participant read and signed the informed consent form, changed into one of the standard sports bikinis, and her picture was taken for use during the second session of the experiment.

The second session took place approximately 4–12 weeks later. The participant was seated in front of a computer monitor and the EyeLink system was installed on her head, with her head resting on a chin-rest. After the system had been calibrated, the experiment began. The participant was instructed that she would view a picture of her own body and of someone else's body, and that she should just look at the pictures. Before each picture presentation a message appeared on the screen mentioning which picture would appear, then a fixation dot appeared, which disappeared upon correct fixation.[1] Each picture (self and control body) was presented for 30 s each. The order of presentation of pictures was counterbalanced over participants. During picture presentation, eye movements were registered. The participant was told that the purpose of the EyeLink device was to measure pupil size.

After viewing the pictures, the equipment was taken off. The participant was asked to rate her own body and the control body (see section 'Body ratings'), and pick the perceived most attractive and most unattractive part of each body. Then the participant was asked to fill out the Restraint Scale, and was given a suspicion probe in which we asked what she thought the goal of the experiment was. During this second session, height and weight were measured as well.[2]

## Results

The results reported for the eye-movement registration data are for the left eye, and areas of interest (i.e., perceived most attractive and most unattractive body parts indicated by each participant for both their own and the control body) were drawn by the first author. The fifth and sixth author – as a team – analyzed results for the right eye and also drew the areas of interest for their analyses. Correlations between the two sets of results (left and right eye)

[1] For the first two participants the order of the fixation dot and the message indicating which picture would appear was accidentally reversed. It was decided to leave these two participants in because the short message appeared on the location of the fixation mark, and the picture was presented for a long time (30 s).

[2] Originally, the experiment manipulated participants' perceived weight by providing them with false weight feedback. As part of this manipulation, the height and weight of 34 participants were determined prior to assessing visual attention, while the remaining 17 participants had their height and weight measured at the very end of the experiment. There was no main effect of this manipulation on visual attention (all $F$'s $(2, 48) < 1.65$, all $p$'s $> .20$), nor was there an interaction with BMI (all $F$'s $(2, 45) < 1.40$, all $p$'s $> .25$). Therefore, the results that are presented are collapsed across this manipulation.

were calculated for each dependent variable (number of fixations and dwell time in the area of interest during picture exposure) per area of interest. These correlations ranged between $r = .64$ and $r = .94$ (*all* $p$'s $< .001$), with most correlations being higher than .85. The fixation duration threshold was set at 50 ms.

The eye-movement data were analyzed by means of correlations. As a first step, we computed bias-scores for visual attention for both dependent variables: dwell time and number of fixations. Each *total* bias score was computed as follows: ((unattractive other + attractive self) − (unattractive self + attractive other)). A positive bias score means that relatively more attention was paid to the perceived most unattractive part of the control body and the most attractive part of the own body. A negative bias score means that relatively more attention was paid to the perceived most unattractive part of the own body and the most attractive part of the control body. Two separate bias scores were computed for the *own body* and the *control body*: (attractive − unattractive). A positive score means more attention for the perceived most attractive body part than the most unattractive body part, whereas a negative score means more attention for the perceived most unattractive body part than the most attractive body part. For the ratings of their own and the control body, a bias score (own - − control) was computed as well (*attractiveness bias*), with higher scores reflecting a preference for own body over the control body and lower scores a preference for the control body over own body. Zero-order correlations between the visual attention biases on the one hand, and BMI and the attractiveness bias on the other, were computed. See Table 1 for results. Note that this approach is equivalent to a within-subjects design with body (own vs. other) and evaluation (attractive vs. unattractive) as factors and BMI as a centered covariate. The three-way body × evaluation × BMI interaction is statistically exactly the same as the correlation between BMI and our total bias score. The advantage of our correlation approach is that results can be presented more efficiently and that the correlation coefficients provide a measure of effect size.

Some body parts are larger than other body parts, and this may affect the amount of visual attention paid to these body parts. To control for this, similar bias scores as for *dwell time* and *number of fixations* were computed for the *size* of the selected most attractive and unattractive body parts. Partial correlations, controlling for the bias in the size of the body parts, are also reported in Table 1.

BMI and the attractiveness bias correlated significantly ($r = -.29^{*}$). To look at the unique variance they explain in the visual attention biases, partial correlations were computed. Correlations between BMI and the visual attention biases when controlling for 'body rating bias' remained significant for the total bias (dwelltime: $r_p = -.33^{*}$; fixations: $r_p = -.37^{**}$), and the bias for the control body (dwelltime: $r_p = .35^{*}$; fixations: $r_p = .36^{**}$), whereas correlations with the bias for the own body were nonsignificant (both $p$'s $> .19$). When computing the partial correlations between the attractiveness bias and the visual attention biases controlling for BMI, only the correlation with the total bias for fixations ($r_p = .25^{\#}$) was trend significant. All other correlations were nonsignificant (all $p$'s $> .16$). Interestingly, the correlation between BMI and the attractiveness bias became nonsignificant when controlling for total bias fixations ($r = -.17$, $p = .24$) or for total bias dwelltime ($r = -.20$, $p = .17$).

**Table 1**
Zero-order ($r$) and partial ($r_p$) correlations between visual attention bias scores on the one hand, and BMI and the attractiveness bias on the other. The partial correlations control for the bias in the size of the selected body parts (attractive and unattractive)

| Visual attention biases | BMI | | Attractiveness bias | |
|---|---|---|---|---|
| | $r$ | $r_p$ | $r$ | $r_p$ |
| Total bias | | | | |
| Dwell time | $-.39^{**}$ | $-.39^{**}$ | $.29^{*}$ | $.37^{**}$ |
| Fixations | $-.43^{**}$ | $-.46^{***}$ | $.34^{*}$ | $.46^{***}$ |
| Bias own body | | | | |
| Dwell time | −.22 | $-.26^{\#}$ | .21 | $.33^{*}$ |
| Fixations | $-.24^{\#}$ | $-.31^{*}$ | $.24^{\#}$ | $.39^{**}$ |
| Bias control body | | | | |
| Dwell time | $.40^{**}$ | $.35^{*}$ | $-.26^{\#}$ | $-.28^{\#}$ |
| Fixations | $.41^{**}$ | $.35^{*}$ | $-.27^{\#}$ | $-.29^{*}$ |

*Note*: See section 'Results' for details on the computation of the visual attention biases (total bias, bias own body, bias control body) and the attractiveness bias.
* Significant at the .05 level.
** Significant at the .01 level.
*** Significant at the .001 level.
\# $p < .10$.

## Discussion

The results of this study confirm the hypothesis that BMI and the rating a woman gives her own body as compared to another body are related to the way women attend to bodies. With an increasing BMI and with a decreasing rating of one's own body as compared to the control body, participants looked more at their own perceived most unattractive body part and the other's perceived most attractive body part relative to their own perceived most attractive body part and the other's perceived most unattractive body part. The pattern of visual attention displayed by the participants with a higher BMI and by those with a relatively low rating of their own body might maintain and/or exacerbate their body dissatisfaction. On a more positive note, the pattern of visual attention of people with a lower BMI or a relatively high rating of their own body may keep their body satisfaction at a good level. They see their bodies in a favorable light, paying relatively more attention to the attractive parts of their own body and the unattractive parts of the control body. Interestingly, though BMI was negatively related to the attractiveness bias, this relationship became nonsignificant when controlling for the body visual attention bias. This suggests that having a higher BMI is not problematic unless a woman has a dysfunctional way of looking at her own and another's body.

The obtained results add to research showing that people with body image concerns report trait social comparison tendencies (Corning, Krumm, & Smitham, 2006; Faith et al., 1997). The way people attend to their own and someone else's body may contribute to the outcome of a social comparison process (Festinger, 1954). Directing relatively *more* attention to other women's attractive body parts and relatively *less* attention to your own attractive body parts, increases the perceived relative attractiveness of the comparison target, thereby resulting in a more upward comparison. This may then negatively affect the outcome of the social comparison process (negative attractiveness bias), and thereby possibly increase body dissatisfaction. Thus, a factor explaining the variation in body ratings could be the difference in visual attention for attractive and unattractive body parts of the own and the control body. From this study it is unclear what comes first, a negative body visual attention bias or the negative attractiveness bias.

Interestingly, the relationship between BMI and this visual attention bias was somewhat more pronounced when participants looked at the *other* body. A bias in attention for other women is a relatively unexplored area of research. One study addressing this issue (Maner et al., 2006) found that participants with bulimic symptoms showed an attentional bias for attractive faces of *other* women. Quite surprisingly, this attentional bias was not related to a measure of body dissatisfaction, which may have been due to the fact that faces – not bodies – were used as stimuli in that study.

A possible intervention could be to teach women with a somewhat higher BMI or a relatively low rating of their own body, to direct attention more toward other women's less attractive body parts, and thereby realizing that other women also have less attractive body parts. This may result in a downward comparison, and may diminish body image concerns of these women. Similarly, as a relationship was also found between BMI and visual attention for the *own* body, it may also be beneficial to teach them to direct more attention to their own attractive body parts to decrease their body dissatisfaction.

Note that the BMIs of all participants were within the normal range. The effects may be different for people outside this normal BMI range. This remains an issue for further study. Jansen et al. (2005) found that eating disorder symptomatic women resemble the higher BMI women from the current study. Eating disorder symptomatic women *feel* overweight, but they do not actually have a higher BMI. It would be interesting to test the idea that the degree to which people *feel* overweight may be more strongly related to the bias in visual attention for bodies than *actual* BMI is.

In addition, this study cannot determine how the BMI of a comparison body influences the pattern of visual attention because there was only one comparison body. Just as evaluations are influenced by the standard or norm that is applied (Mussweiler, 2003), the way people look at their own and someone else's body might be influenced by characteristics of that other body, like BMI. Trampe, Stapel, and Siero (2007) recently showed that the effect that media images of physically attractive females have on women's self-evaluation is determined both by characteristics of the perceiver and the person who is perceived. To test these ideas, a study should be conducted in which bodies of other people with varying BMIs are included.

In sum, BMI and the rating given for one's own body in comparison to that of a control body were found to be related to the way people look at their own and a control body. The increasingly dysfunctional bias in people with a higher BMI and with a relatively low rating of their own body might negatively affect the outcomes of social comparison processes, and maintain and/or exacerbate body dissatisfaction.

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