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The causal role of selective attention for thin-ideal images on negative affect and rumination

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Abstract

Background and Objectives

Attentional bias towards thin-ideal body images has been implicated as a vulnerability factor for eating disorder symptomatology. However, the nature and causal basis of its relationship with other cognitive vulnerability factors, namely, eating disorder-specific rumination and negative mood, remains unclear. Accordingly, the current study investigated the causal influence of attentional bias towards thin-ideal images on emotional and ruminative vulnerability, in response to a body image-related stressor.

Methods

An established attentional bias modification (ABM) procedure, the modified dot probe task, was used for the assessment and manipulation of attentional bias. Female undergraduate students (N = 110) aged between 17 and 24 years were randomly assigned to either ‘attend’ towards or ‘avoid’ thin-ideal images. Pre- and post-attentional training, participants completed the dot probe task, as well as state measures of rumination and negative mood. Additionally, following post-ABM assessment of attentional bias, participants were given a body image-related stressor.

Results

Results showed that participants trained to attend to thin bodies reported heightened negative mood, in response to the stressor, compared with participants trained to avoid thin bodies. On the other hand, groups did not demonstrate a differential increase in eating disorder-specific rumination in response to the stressor.
Limitations

The current findings will require replication with clinical samples. Additionally, state rumination and negative mood were assessed via single items.

Conclusions

These results provide the first causal evidence for the role of attentional bias towards thin-ideal images in negative emotional vulnerability. Importantly, these results suggest attentional bias may serve as a risk factor for mood reactivity and a potential target for strategies designed to enhance emotional resilience.

*Keywords:* Attentional Bias, Selective Attention, Dot Probe Task, Rumination, Negative Affect
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Empirical evidence suggests selective attentional processing of thin-ideal bodies is a key vulnerability factor for eating disorder symptomatology in females. For example, studies using eye-tracking technology have shown attentional biases towards images of thin-ideal female bodies in a non-clinical sample of women with high levels of body dissatisfaction (Cho & Lee, 2013) as well as in those diagnosed with bulimia nervosa (Blechert, Nickert, Caffier, & Tuschen-Caffier, 2009) or anorexia nervosa (Pinhas et al., 2014). Moreover, recent research has found an association between selective attention for thin female bodies/body parts and body dissatisfaction in non-clinical samples of women using a behavioural assessment of selection attention (i.e., the widely-used dot probe task) (Dondzilo, Rieger, Palermo, Byrne, & Bell, 2017; Joseph et al., 2016; Moussally, Brosch, & Van der Linden, 2016). In the dot probe task used by Dondzilo et al. (2017), a pair of stimuli (i.e., a thin body image and a neutral stimulus) were briefly presented on a computer screen, which was followed by a probe (i.e., a letter ‘p’ or ‘q’ to which the participant responded by indicating the corresponding letter on a computer keyboard) replacing one of the stimuli. Faster responding to probes that replaced thin body stimuli, relative to neutral stimuli, indicated an attentional bias to thin bodies. Collectively, these studies implicate the maladaptive role of attentional bias towards thin-ideal bodies on body image and eating pathology.

Despite significant progress in the understanding of the pathological consequences of attentional bias towards thin-ideal bodies, there is less clarity regarding its relationship with other eating disorder-related cognitive vulnerabilities. One such vulnerability is eating disorder-specific rumination, which has been conceptualized as preoccupation with eating, shape, and weight concerns (Park, Dunn, & Barnard, 2011). Some researchers have argued, on theoretical
grounds, that attentional bias and depressive rumination work together to influence vulnerability to depression (De Raedt & Koster, 2010; Koster, De Lissnyder, Derakshan, & De Raedt, 2011). In support of this notion, there is substantial research showing an association between depressive rumination and an attentional bias for negative information (Donaldson, Lam, & Mathews, 2007; Grafton, Southworth, Watkins, & MacLeod, 2016; Joormann, Dkane, & Gotlib, 2006; Owens & Gibb, 2016; Southworth, Grafton, MacLeod, & Watkins, 2016) and preliminary evidence to suggest that attentional bias plays a causal role in depressive symptoms, via the mediating role of depressive rumination (Yang, Ding, Dai, Peng, & Zhang, 2015).

Extending on this work, Dondzilo et al. (2017) showed that eating disorder-specific rumination mediated the relationship between attentional bias towards images of thin female bodies and both body dissatisfaction and dietary restraint in young women. These findings suggest that an attentional bias towards thin-ideal images may lead to further elaborative processing, by ruminating about eating, body shape, and/or weight concerns. In turn, this may serve to develop and/or exacerbate dietary restraint and body dissatisfaction. However, the correlational nature of the data does not permit firm conclusions to be drawn about the causal relationship between attentional bias to thin bodies and eating disorder-specific rumination.

In addition to eating disorder-specific rumination, negative affect comprises a risk factor for eating disorder symptomatology (Leehr et al., 2015; Stice, 2001, 2002; Stice, Gau, Rohde, & Shaw, 2017; Stice, Marti, & Durant, 2011). It is possible that selective attention for thin-ideal bodies serves to trigger negative affect, in addition to eating disorder-specific rumination. This is based on a compelling body of evidence indicating that attentional bias causally influences emotional vulnerability or reactivity to subsequent induced or real life stress (Beevers & Carver, 2003; Dandeneau & Baldwin, 2004; Dandeneau, Baldwin, Baccus, Sakellaropoulos, & Pruessner,
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For example, an induced attentional bias towards threat words led to greater increases in negative mood, in response to a stress-inducing task, compared with a induced attentional bias towards neutral words (MacLeod et al., 2002). In another study, undergraduate students trained to avoid rejection-related information reported less exam-related stress and anxiety after having experienced their exam (Dandeneau et al., 2007). Thus, in considering the aforementioned evidence it is plausible that selectively attending to thin bodies may increase susceptibility to both heightened negative mood and rumination on eating, shape, and weight concerns.

Accordingly, the aim of the current study was to determine whether attentional bias towards thin female images causally contributes to emotional and ruminative vulnerability in young women. It was hypothesised that individuals trained to attend to thin bodies would demonstrate increased negative mood and eating disorder-specific rumination, in response to a body image-related stressor, compared with individuals trained to avoid thin bodies.

Method

Participants

Female undergraduate students \((N = 110)\) participated in the study in exchange for course credit. Sample size was determined beforehand based on previous studies reporting effects using the current methodology (Kemps, Tiggemann, & Hollitt, 2016; Kemps, Tiggemann, Orr, & Grear, 2014; MacLeod et al., 2002; Smith & Rieger, 2006). A sample of female undergraduate students, rather than clinical participants, was utilised to avoid the ethical issue of inducing potentially maladaptive attentional biases in highly vulnerable individuals. Participants were between the ages of 17 and 24 \((M = 19.08, SD = 1.43)\) with a mean BMI of 22.06 \((SD = 3.64,\)
range = 16.41 to 39.13). Ethics approval for this study was granted in accordance with the requirements of the National Statement on Ethical Conduct in Human Research and the policies and procedures of the University of Western Australia.

**Measures**

**Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995).** The DASS-21 is a 21-item self-report questionnaire that assesses three components of negative affect: depression, anxiety, and stress. These subscale scores are summed to yield a total score of negative affect, with higher scores indicative of greater disturbance. Items refer to the past week; and scores range from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). Support for the psychometric properties of the DASS-21 includes high internal consistency and adequate construct validity (Henry & Crawford, 2005). The Cronbach’s alpha for the total score in the present study was $\alpha = .94$.

**Ruminative Response Scale for Eating Disorders (RRS-ED; Cowdrey & Park, 2011).** The nine-item RRS-ED assesses ruminative thinking about eating, body shape, and/or weight. Participants rate their tendency to experience ruminative symptoms on a four-point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). Thus, higher scores indicate higher levels of eating disorder-specific rumination. The RRS-ED has demonstrated both strong internal consistency and validity (Cowdrey & Park, 2011, 2012). Researchers have also distinguished two RRS-ED subscales: brooding and reflection (Cowdrey & Park, 2011; Dondzilo et al., 2016). For the purposes of the present investigation, only the composite score of the RRS-ED was relevant. Cronbach’s alpha for the composite score in the current sample was $\alpha = .91$.

**Subjective state ratings.** Subjective state ratings of negative mood and eating disorder-specific rumination *at the moment* were assessed using the following 100-point visual analogue
scales (VAS) ranging from “not at all” to “very much”, respectively: At the moment 1) I am feeling sad, 2) I am thinking about my feelings concerning my eating and body shape and/or weight. These items were informed by previous research investigating the effect of induced rumination on eating disorder symptoms (Naumann, Tuschen-Caffier, Voderholzer, Caffier, & Svaldi, 2015). Support for the construct validity of these state rumination and negative mood items was evident in terms of their associations with validated measures of trait eating disorder-specific rumination and negative affect. Specifically, the state rumination item correlated with the RRS-ED at $r = .62$, $p < .001$ and the state negative mood item correlated with the DASS at $r = .49$, $p < .001$.

**Materials**

In line with previous research assessing attentional bias towards images of female bodies (Dondzilo et al., 2017), thin body shape images of a positive emotional valence were paired with abstract art images of a neutral emotional valence for the purpose of modification and assessment of attentional bias. Thin body images comprised of 20 previously rated thin images (Dondzilo et al., 2017) and 20 additional images which were sourced from the internet and cropped as per the original 20, to focus on specific weight-relevant body regions (e.g., abdomen and thighs). The 20 new thin body images were selected from an initial pool of 70 thin body images, which were rated by 19 independent judges using the 10-point Self-Assessment Manikin affective rating system (Lang, 1980), from 0 (*unpleasant*) to 9 (*pleasant*). On the basis of these ratings, 20 thin body images rated to be strongest in positive valence ($M = 5.87$, $SD = .35$) were chosen. These images were found to be statistically equivalent to the valence of the 20 previously rated thin images based on a non-significant unpaired $t$-test [$t(74) = 1.91$, $p = .06$]. Stimuli also consisted of cropped segments of abstract art, which were of a neutral valence ($M = 4.77$, $SD = 0.23$). In
total, there were 40 stimulus pairs, which always included a thin body image and an abstract art image. A subset of 24 stimulus pairs was used at training. The remaining 16 stimulus pairs were used at pre- and post-training. The independence of test and training pairs was done to ensure that training effects were related to the selective attention for thin bodies and not the specific stimuli themselves.

The images were approximately 11cm high and 7.3cm wide on the screen. The stimuli were displayed on a 1024 x 768 Dell CRT monitor running at 85Hz, driven by a Dell PC and using Matlab (2012b) and the Psychophysics Toolbox (Brainard, 1997) to control stimulus presentations. The monitor was positioned at a distance of approximately 125 cm from the participant.

**Modified dot probe task.** A modified dot probe task, adapted from MacLeod et al., (2002), was used to assess and manipulate attentional bias towards thin female bodies. Each trial commenced with the presentation of a fixation cross in the centre of the screen for 1,000 ms. This was followed by the presentation of two images, which were centred three degrees above or below the fixation cross, for 500 ms. Subsequently, a probe stimulus (i.e., the letter “p” or “q”) appeared in the position previously occupied by one of the images. Participants were instructed to identify the letter as quickly and accurately as possible, by pressing the appropriate keys (“p” or “q”) on the computer keyboard. After a response was made, the next trial commenced. In total, 489 trials were presented across the modified dot probe task. Assessment of pre-training attentional bias commenced with nine practice trials, followed by 96 experimental trials. There were 288 attentional training trials and a further 96 post-training trials. The distinction between assessment and training trials is described below.
Attentional assessment trials. In the attentional assessment trials (pre- and post-training), the probes replaced previously presented thin body or neutral images with equal probability. Additionally, the letter shown (p, q) and the location of the probe (top, bottom) was randomized. Within each block (pre or post) of attentional assessment trials, each stimulus pair was presented six times.

Attentional training trials. In the attentional training trials, the position of the probe stimulus was contingent on the allocated condition. For participants in the “attend thin bodies” condition, probes consistently (100% probability) replaced the previously presented thin body image. Conversely for the “avoid thin bodies” condition, probes consistently (100%) replaced the previously presented neutral (abstract art) image. Each stimulus pairs was presented 12 times.

Body image-related stressor. The stressor consisted of an adaptation of the body image-related scenario used by Etu and Gray (2010) to elicit body dissatisfaction and negative mood. Participants were instructed to imagine how they would feel and what they would think and do if a specific scenario was actually happening to them. For example, part of the scenario stated that, “You wake up…pause at the mirror and sigh. You feel unattractive and fat…You start to cry…You had promised yourself you would lose weight within the last month but haven’t been able to do it.”

Procedure

After providing informed consent, all participants completed the dot probe task to assess pre-training attentional bias. Following this, participants completed state (i.e., VAS ratings) and trait measures (i.e., DASS-21 and RRS-ED) of eating disorder-specific rumination and negative mood. These materials were presented online via Qualtrics, an advanced online survey system that was hosted on the University of Western Australia servers.
Next, participants were randomly allocated to either the ‘attend’ or ‘avoid’ training condition. The attentional training trials were immediately followed by post-training assessment trials. Subsequently, the body image-related stressor was administered. Immediately following the stressor, participants completed state measures of eating disorder-specific rumination and negative mood. Finally, participants’ height and weight were measured for the calculation of body mass index (BMI = kg/m²). All participants were then fully debriefed and the experimenter monitored all participants for residual distress.

Statistical Analysis

An alpha level of .05 was the criterion for statistical significance. The effect size measures used were partial $\eta^2$ for ANOVA and Cohen’s $d$ for $t$-tests. Partial $\eta^2$ values of .01, .06, and .14 and Cohen’s $d$ values of .20, .50, and .80 reflect small, medium, and large effect sizes, respectively (Cohen, 1992). Finally, 95% confidence intervals were reported for the $t$-values.

Specifically, the values constrained by the 95% confidence intervals represent the estimated range of mean difference scores.

Results

Sample Characteristics

Means and standard deviations for BMI and trait levels of eating disorder-related rumination and negative affect are displayed in Table 1. The descriptive statistics associated with state levels of negative mood and eating disorder-specific rumination are displayed in Figures 2 and 3, respectively. There were no pre-existing differences between the two training conditions on state or trait levels of eating disorder-specific rumination, negative affect, and BMI (all $ps > .05$).
Attentional bias and thin-ideal images

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Attend (N = 55)</th>
<th>Avoid (N = 55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>22.56 (4.27)</td>
<td>21.56 (2.84)</td>
</tr>
<tr>
<td>RRS-ED</td>
<td>16.33 (5.76)</td>
<td>15.65 (6.52)</td>
</tr>
<tr>
<td>DASS</td>
<td>17.60 (12.01)</td>
<td>17.00 (10.84)</td>
</tr>
</tbody>
</table>

*Note.* BMI, Body Mass Index (kg/m²); RRS-ED, Ruminative Response Scale for Eating Disorders; BSQ, DASS, Depression Anxiety Stress Scales.

Attentional Bias Modification

To assess the efficacy of the ABM, the probe discrimination reaction times (RTs) on the pre-training trials were compared with those at post-training. Given that probe RTs are indicative of attention to the task at hand only when probes are discriminated correctly, the data analysis was based on correct trials only. The overall accuracy rate was 95.09% and thus a very small percentage of data is lost through this strategy. Following previous studies (Carters, Rieger, & Bell, 2015; Dondzilo et al., 2017), probe discrimination RTs less than 200 ms or more than 2.5 standard deviations above each individual’s mean were eliminated as outliers. Mean probe discrimination RTs were used to compute an attentional bias difference score at each time point (pre- and post-training assessment phases) and for each experimental group (attend and avoid).

In order to calculate these scores, the appropriate RTs were substituted into the following formula of MacLeod and Mathews (1988): \[(\text{upper probe/lower target} - \text{upper probe/upper target}) + (\text{lower probe/upper target} - \text{lower probe/lower target})\]/2. Specifically, upper probe/lower target corresponds to RTs when the probe appears in the upper area but the body image appears in the lower area, and so on. Thus, the calculation provides a single index of the
speed difference when detecting probes in the same area as thin bodies versus when detecting probes in a different location to the bodies. In other words, the attentional bias difference score suggests the degree to which probe discrimination was facilitated or inhibited by images of thin bodies, such that positive values reflect an attentional bias towards thin body images.

An independent \( t \)-test indicated that the baseline attentional bias scores did not significantly differ by condition, \( t(101.02) = -1.04, p = .30, d = .20, 95\% \text{ CI} [-10.66, 3.33] \). To determine whether the training successfully modified attentional bias, a 2 (training condition: attend, avoid) \( \times \) 2 (time: pre-training, post-training) mixed model ANOVA was performed. As expected, the interaction between training condition and time was significant, \( F(1,108) = 9.56, p = .003, \eta^2 = .08 \). As can be seen in Figure 1, simple main effect analyses showed a significant increase in attentional bias to thin body images, from pre- to post-training, in the attend thin group, \( t(54) = -2.57, p = .01, d = .49, 95\% \text{ CI} [1.87, 14.43] \). Although participants in the avoid group showed an increase in avoidance of thin bodies, this change was non-significant, \( t(54) = 1.80, p = .08, d = -.34, 95\% \text{ CI} [-.58, 11.97] \). The change in attentional bias was small in the avoid group and moderate in the attend group. Nevertheless, there was no significant difference in attentional bias between the two experimental groups at post-training, \( t(108) = 2.84, p = .005, d = .54, 95\% \text{ CI} [3.07, 17.26] \). Additionally, there was no main effect of time, \( F(1,108) = .30, p = .59, \eta^2 = .003 \), or of condition, \( F(1,108) = 1.38, p = .24, \eta^2 = .01 \). These results indicate that the attentional training successfully induced differential changes in attentional bias towards thin bodies in the expected directions.
Figure 1. Mean attentional bias difference scores for attend and avoid conditions at pre- and post-attentional training. Standard errors are represented by the error bars. A positive attentional bias score represents an attentional bias towards thin bodies whereas a negative attentional bias score represents avoidance of thin bodies.

**Affective Reactions to the Body Image-related Stressor**

A 2 (training condition: attend, avoid) × 2 (time: pre-stressor, post-stressor) mixed model ANOVA was performed to evaluate the effect of the body image-related stressor on negative mood. To reiterate, each group of participants underwent the exact same stressor. A significant main effect of time was obtained, \( F(1,108) = 44.15, p < .001, \eta^2 = .29 \), indicating the stressor was effective in inducing negative mood, whereas the main effect of training condition was not significant, \( F(1,108) = 1.57, p = .21, \eta^2 = .01 \).

As predicted, the interaction between training condition and time was also significant, \( F(1,108) = 8.34, p = .005, \eta^2 = .07 \). To explore the interaction further, simple main effect
analyses showed that negative mood significantly increased from pre- to post-stressor induction in both the attend group, $t(54) = 6.74, p < .001, d = 1.29, 95\% \text{ CI} [18.05, 33.08]$, and the avoid group, $t(54) = 2.66, p = .009, d = .51, 95\% \text{ CI} [2.56, 17.59]$. Both experimental groups showed a large increase in negative mood, based on effect size. However, as can be seen in Figure 2, post stressor, negative mood was increased significantly more in the attend group relative to the avoid group, $t(104.67) = 2.23, p = .03, d = .43, 95\% \text{ CI} [1.57, 26.36]$. This difference in negative mood, post stressor, was relatively moderate. Therefore, it can be concluded that participants who were trained to attend to thin bodies were significantly more susceptible to the body image-related stressor.

Figure 2. Mean analogue negative mood scale score for the attend and avoid conditions at pre- and post-stressor. Standard errors are represented by the error bars.
Ruminative Reactions to Stressor

A 2 (training condition) \( \times \) 2 (time) mixed model ANOVA was conducted to determine the effects of the negative body image-related stressor on eating disorder-specific rumination. The predicted interaction between training condition and time was not significant, \( F(1,108) = .20, p = .66, \eta^2 = .002 \). Additionally, the main effect of training condition was not significant, \( F(1,108) = .78, p = .38, \eta^2 = .01 \).

There was, however, a significant main effect of time, \( F(1,108) = 18.76, p < .001, \eta^2 = .15 \). As can be seen in Figure 3, simple main effect analyses showed that rumination significantly increased from pre- to post-stressor induction in both the attend group, \( t(54) = 3.38, p = .001, \; d = .64, 95\% \; CI \; [5.37, 20.63] \), and the avoid group, \( t(54) = 2.75, p = .007, \; d = .52, 95\% \; CI \; [2.94, 18.19] \). Both experimental groups demonstrated a moderate increase in rumination. Thus, both groups experienced greater levels of rumination on eating, shape, and weight concerns in response to a body image-related stressor but, unlike the findings for state negative mood, the change in rumination was not influenced by attentional training condition.
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Figure 3. Mean analogue eating disorder-specific rumination scale score for the attend and avoid conditions at pre- and post-stressor. Standard errors are represented by the error bars.

Discussion

The current study represents a first attempt to understand the causal role of selective attention for images of thin women on emotional and ruminative vulnerability, in response to a body image-related stressor. Findings revealed that the ABM was effective in manipulating participants’ attentional bias towards or away from thin-ideal images. Furthermore, participants trained to attend to thin bodies subsequently reported a larger increased negative mood, in response to the body image-related stressor, relative to participants trained to avoid thin bodies. In other words, it was shown that selective attention for thin bodies causes vulnerability for heightened negative mood. Conversely, induced attentional bias towards thin bodies did not differentially influence rumination on eating, shape, and weight concerns in response to the stressor.
The current finding of a causal relationship between attentional bias and emotional vulnerability is consistent with previous findings (Beevers & Carver, 2003; Dandeneau & Baldwin, 2004; Dandeneau et al., 2007; Fox et al., 2010; MacLeod et al., 2002) and theoretical accounts which implicate attentional biases in increasing vulnerability for depression (Beck, 1976, 2008; De Raedt & Koster, 2010; Koster et al., 2011). In addition, this causal relationship contributes to work showing exposure to thin-ideal images serves to exacerbate negative mood in females (Harper & Tiggemann, 2008; Hawkins, Richards, Granley, & Stein, 2004; Stice & Shaw, 1994; Tiggemann & McGill, 2004). One potential mechanism, by which attending to thin-ideal bodies may elicit negative mood is upward appearance-focused social comparisons, whereby women compare themselves with other thin and attractive women. In support of this notion, numerous studies have shown that engaging in appearance-related comparisons, in response to thin-ideal images, is an important contributor to negative affect (Tiggemann & McGill, 2004; Tiggemann, Polivy, & Hargreaves, 2009).

An important implication of the current finding is that attentional bias for thin-ideal bodies may serve as a risk factor for mood reactivity in young women. In turn, this mood reactivity may predispose to body image and eating disturbances, given evidence linking the emergence of such disturbances and negative affect (Leehr et al., 2015; Stice, 2001, 2002, Stice et al., 2017, 2011). Thus, attentional bias towards thin-ideal images might be an appropriate target for strategies designed to promote emotional resilience in young women. As a result, increased emotional resilience may serve to protect against the development of body image and eating disturbances.

On the other hand, the findings did not support the hypothesis that attentional bias causally influences ruminative vulnerability. Instead, both experimental groups showed near
identical and moderate increases in state rumination following the attentional training and immediately subsequent to the stressor. One potential reason for this similarity is that both groups were given equal exposure to thin-ideal body images and thus simple exposure may have exacerbated state rumination. Whilst the avoid group were being trained away from thin-ideal images, both groups were exposed to thin-ideal images on every trial. Another possible explanation is that the body-related stressor (which both groups were exposed to) had a fixed influence on state rumination, despite the opposite, preceding attentional training conditions. Ultimately, the present finding for a difference in state mood but not state rumination following ABM warrants further investigation.

Further, this result contrasts with previous evidence indicating an association between attentional bias towards thin bodies and eating disorder-specific rumination (Dondzilo et al., 2017). There are several reasons which could account for this discrepancy. Firstly, it could be that attentional bias directly influences rumination, but only for individuals who consistently attend to thin bodies. For example, in the study by Yang et al. (2015), a direct causal effect of attentional bias on depressive rumination was only seen after two weeks of repetitive ABM training. Alternatively, it could be that the single VAS item used to measure state eating disorder-specific rumination did not adequately capture this multifaceted construct. More specifically, eating disorder-specific rumination consists of a reflective and brooding component (Cowdrey & Park, 2011; Dondzilo et al., 2016), which have both shown associations with attentional bias to thin-ideal images (Dondzilo et al., 2017). Therefore, future studies should ensure that the assessment of state eating disorder-specific rumination consists of multiple items that represent both reflective and brooding rumination. Despite the promising theoretical and practical implications of the current research, a number of methodological issues must be
considered in interpreting the findings. Firstly, assessment of state negative mood and rumination occurred immediately prior to the ABM and directly after the stressor. Thus, it is unknown whether attentional bias had a direct effect on state mood and rumination. To more precisely assess the emotional and ruminative changes triggered by attentional bias, future studies should assess state mood and rumination prior to and directly after the ABM. Secondly, the current findings are based on a non-clinical sample. Therefore, it would be valuable to test whether the results generalize to individuals with a clinically diagnosed eating disorder. Furthermore, given the assessment of state rumination and negative mood were measured by single items only, the current results should be interpreted with caution. However, it should be noted that these one-item measures demonstrated excellent construct validity via strong correlations with their counterpart trait measures. Moreover, numerous studies have demonstrated acceptable reliability and validity of single VAS items (Abend, Dan, Maoz, Raz, & Bar-Haim, 2014; de Boer et al., 2004; Williams, Morlock, & Feltner, 2010). Nonetheless, to further improve the assessment of state levels of specific constructs, future studies should use multi-item self-report measures.

Conclusions

Overall, this study provides the first demonstration that attentional bias towards thin-ideal images plays a causal role in negative emotional vulnerability. This result contributes to the growing body of literature and cognitive theories of depression which implicate attentional bias as an important cognitive vulnerability for depression. Importantly, the findings hold therapeutic potential for the development of novel cognitive procedures designed to modify attentional biases, which could in turn promote emotional resilience in young women.
Conflict of interest statement

The authors declare no conflict of interest.

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Highlights

- Young females were trained to attend towards or away from thin bodies.
- Dot-probe training effectively modified attentional biases.
- Attention for thin bodies increased vulnerability for heightened negative mood.
- There was no causal link between attention for thin bodies and rumination.