



Approach and avoidance: Relations with the thin body ideal in women with disordered eating behavior



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ABSTRACT

Recent research suggests that automatic cognitive biases are linked to body dissatisfaction and disordered eating behavior. However, little is known about automatic action tendencies in the field of body image research. The aim of the present study was to examine approach and avoidance biases toward the thin body ideal and normal weight bodies and whether these are pronounced in individuals showing disordered eating behavior. Participants were divided into a group with disordered eating behavior ($n = 55$) and without disordered eating behavior ($n = 45$). To assess approach and avoidance tendencies, the Approach-Avoidance Task was used during which the participants were instructed to approach or avoid thin and normal weight body pictures. Our results indicated faster push than pull movements towards thin and normal weight body pictures. However, participants with and without disordered eating behavior did not differ with regard to their reactions. Furthermore, we found positive associations between the avoidance of normal weight body pictures and perceived pressure to conform to media ideals. Future research is warranted to replicate our findings and to extend our knowledge on approach and avoidance biases toward body pictures in patients suffering from eating disorders.

1. Introduction

Women in the western world are exposed to images of attractiveness, beauty, and ideal body shape and size by daily mass media. As early as 1999, Malkin and colleagues reported that the beauty ideal is young and especially thin (Malkin et al., 1999). Today, models presented by the mass media usually have a body weight 15% below their healthy weight (Martin, 2010), and a high drive for thinness (Swami and Szmigielska, 2013) which are known as core symptoms of eating disorders. Nevertheless, this ideal is associated with beauty, fitness, and health (Hassel, 2002) and a lot of women strive for that “perfect body”. Previous research has shown that exposure to the thin body ideal might provoke body dissatisfaction and in turn a feeling of inadequacy and low self-esteem (Dittmar et al., 2006).

Research on the body image has grown steadily. According to Cash (2004) body image “encompasses one's body-related self-perceptions and self-attitudes, including thoughts, beliefs, feelings, and behaviors” (Cash, 2004, p.1–2). Research in this field highlighted different aspects, especially body dissatisfaction in women, which is important because body dissatisfaction and associated unhealthy shape and weight management issues (e.g., dieting or restrained eating) are

known as core symptoms of eating disorders such as anorexia nervosa, bulimia nervosa and binge eating disorder (e.g., Stice et al., 2011).

In addition to media influences, contemporary cognitive-behavioral body image models discuss several important influences on body dissatisfaction. The Tripartite Influence Model by Thompson and colleagues (1999) assumes that in addition to the important factor media, influence by family and peers affects body dissatisfaction and eating behavior. Furthermore, they underlined comparison processes related to appearance and the internalization of the thin body ideal as mediating variables and thus as an important risk factor for body dissatisfaction as well as disordered eating behavior (Thompson et al., 1999). Internalization of the thin body ideal refers to the extent of approximation on this ideal (Thompson and Stice, 2001). In line with this, the dual pathway model by Stice (2001), emphasized the importance of the internalization of the thin body ideal. Stice (2001) assumed that the internalization of the thin body ideal as well as perceived pressure to be thin increase body dissatisfaction. Body dissatisfaction in turn predicts dieting and negative affect, and dieting as well as negative affect predict the development of eating disorders. Accordingly, a lot of researchers found a moderately negative effect of the exposure to the thin body ideal on body dissatisfaction, disordered

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eating behavior, and even eating disorders (Grabe et al., 2008; Green and Pritchard, 2003; Groesz et al., 2002; Hausenblas et al., 2013; Levine and Murnen, 2009; Nouri et al., 2011; Owen and Spencer, 2013).

Most of the studies in the field of body image research used direct measures like questionnaires or interviews which have good validity (Woud et al., 2011). However, to deal with well-known problems like social desirability (Klein et al., 2011), indirect measures could be used as supplements (Woud et al., 2011). Furthermore, not all cognitive processes can be reliably assessed by direct measures (Klein et al., 2011). Thus, indirect measures often focused on automatic, unconscious processes, for example by evaluating reaction times (RTs). Importantly, as early as 1996, Williamson underlined that body image related cognitive processes in persons with disordered eating behavior occurred automatically and might be out of their conscious awareness (Williamson, 1996). Furthermore, in their transdiagnostic theory, Fairburn and colleagues (2003) highlighted automatic cognitive biases such as an over-evaluation of shape and weight in eating disorders. Consequently, body dissatisfaction can be understood as a type of cognitive bias (Williamson, 1996) and could be better captured by indirect measures.

The majority of studies in body image research have focused on cognitive biases by measuring words as stimuli (Schuck et al., 2015). However, according to Schuck and colleagues (2015), the use of pictures as stimuli is closer to real life, especially when focusing on the thin body ideal. One well known cognitive bias in body image research is the attentional bias (Starzomska, 2017). The most appropriate task to measure attentional biases is the dot probe task (MacLeod et al., 1986) in which participants are asked to react as quickly as possible to a dot replacing either a picture of a salient stimulus or a control picture (for more detail see Starzomska, 2017). Using such a dot probe task, Shafran et al. (2007) found a greater attentional bias to weight-related or shape-related pictures with negative connotations (e.g., plumper bodies) in patients with eating disorders compared to controls.

The interpretation bias is another important bias in the field of body image research (Williamson, 1996). Williamson et al. (2000) found an interpretation bias toward fatness when recalling body-related situations in women with eating disorders and women with high body dissatisfaction compared to healthy controls.

Further cognitive biases are the approach and the avoidance bias which are assumed to represent action tendencies toward salient stimuli and are therefore important additional measures to attentional and interpretation bias. However, to the best of our knowledge the approach and the avoidance bias are less investigated in the field of body image research and there is only one study that examined approach and avoidance tendencies toward the thin body ideal using pictorial stimuli. By using a modified Stimulus Response Compatibility Task (SRCT) where participants were asked to move a manikin toward thin or overweight models or away for the pictures (for details see Mogg et al., 2003), Woud and colleagues (2011) found an approach bias toward pictures of thin models compared to overweight models in healthy females which was positively correlated with the internalization of the thin media body ideal and body dissatisfaction. This result supports the assumption that body dissatisfaction is not only associated with attentional or interpretation bias but also with indirect action tendencies.

A prominent paradigm to assess approach and avoidance biases to motivationally salient stimuli is the Approach-Avoidance Task (AAT; Rinck and Becker, 2007). In this task, participants are instructed that they will see different pictorial stimuli on a computer screen and that they should use a joystick to either push these stimuli away from themselves or to pull them toward themselves. In comparison to the SRCT, a crucial aspect in the AAT is the zooming effect. The zooming effect can represent the preoccupation with thin models in magazines. When participants push the joystick away, the stimulus decreases in size. When participants pull the joystick toward themselves, the stimulus increases in size. So it is possible to evoke approach and

avoidance tendencies with growing and shrinking stimuli which is not possible in the SRCT. Another important feature in the AAT is the arm movement when pulling or pushing the joystick toward or away from oneself (Eder and Dignath, 2013). According to the authors, arm movements simulate behavioral tendencies. The interaction of movement and visual feedback by the zooming effect creates a strong impression of pulling the pictorial stimuli closer (approach) or pushing them away (avoidance). Studies using the AAT found faster RTs when approaching positively valenced stimuli (approach bias) as well as faster RTs when avoiding negatively valenced stimuli (avoidance bias). Especially in the fields of addiction, anxiety and depression research the approach and avoidance biases have been studied by using the AAT (Cousijn et al., 2011; Eberl et al., 2013; Heuer et al., 2007; Phaf et al., 2014; Radke et al., 2014; Rinck and Becker, 2007). For example, Wiers et al. (2009) presented alcohol-associated pictures to heavy drinking young men and found approach biases toward the alcohol-associated stimuli. Rinck and Becker (2007) measured avoidance tendencies in individuals with a fear of spiders and found faster RTs in avoiding spider pictures. In addition to addiction, anxiety and depression research, there are some studies dealing with approach and avoidance biases toward food-associated cues. For example, in participants with high food craving, Brockmeyer et al. (2015) found a relative approach bias toward food-associated stimuli compared to low food cravers. Pslakis et al. (2016) found a relative approach bias toward food-associated cues in healthy controls which was not observed in patients with anorexia nervosa.

Taken together, cognitive biases are important in the maintenance of eating disorders (Fairburn et al., 2003; Williamson, 1996) and recent research suggests that there seems to be a relation between body dissatisfaction and indirect action tendencies toward thin models (Woud et al., 2011). However, although body dissatisfaction is known as a core symptom in eating disorders (Stice et al., 2011) only little is known about approach and avoidance biases toward body pictures.

Thus, the present study aims to examine differences with regard to approach and avoidance biases toward pictorial body stimuli in women with disordered eating behavior and in women without disordered eating behavior using the AAT. In addition, we extend previous research by examining approach and avoidance biases by comparing thin and normal weight body pictures (instead of overweight body pictures). According to Stice (2001) women with disordered eating behavior show body dissatisfaction and a high internalization of the thin body ideal. Therefore it can be assumed that these women already show an avoidance bias toward normal weight body pictures which could be important for treatment of patients with eating disorders. Based on Woud et al. (2011) we expected an approach bias (as indicated by faster approach responses than avoidance responses) toward stimuli displaying the thin body ideal for both groups with a stronger approach bias for the group with disordered eating behavior compared to the group without disordered eating behavior. With regard to stimuli displaying normal weight body shapes we expected an avoidance bias (avoidance responses are faster than approach responses) for the group with disordered eating behavior and no bias for the group without disordered eating behavior. An approach bias towards the thin body picture as well as an avoidance bias towards normal weight body pictures can be interpreted as a stronger and even dysfunctional preoccupation with the thin body ideal. Furthermore, according to the dual pathway model by Stice (2001), we expected positive associations between the internalization of the thin media body ideal, perceived pressure to conform to media ideals, body dissatisfaction, and an approach bias toward the thin body pictures. In contrast, according to Woud et al. (2011) we expected that the BMI, as an important measure with regard to body image concerns, would be negatively associated with an avoidance bias toward the normal weight body pictures.

2. Methods

2.1. Participants

Female participants aged between 18 and 30 with and without disordered eating behavior (see below for a definition) were recruited among the student population of a German University, via social networks and in local gyms. For all study participants, exclusion criteria were psychotic disorders and pregnancy. Additional exclusion criteria for participants showing no disordered eating behaviour were current mental disorders (self-report) or BMI under 18.5 kg/m² or above 24.9 kg/m².

A total of 165 participants responded to the study advertisements and were asked to fill in the Eating Disorder Examination-Questionnaire (EDE-Q; German version by Hilbert and Tuschen-Caffier, 2006). Following the suggestions of Mond et al. (2004) participants with a total score equal to or higher than 2.30 and bulimic episodes (loss of control over eating or eating of a large amount of food) and/or the use of exercise to control weight (as indicated in the EDE-Q) were classified as showing disordered eating behavior and were invited for the test-session (group with disordered eating behavior, $n = 55$). All other participants were classified as not showing disordered eating behavior and with the first 55 participants of this group who registered for study participation a test-session was scheduled. Of this group, ten participants met at least one exclusion criterion and were excluded from further analysis. The final sample thus consisted of 100 women (group with disordered eating behavior; $n = 55$ and group without disordered eating behavior; $n = 45$).

The study was approved by the local ethics committee and adhered to the Declaration of Helsinki. Participants were informed about the content of the study, confidentiality and their freedom to discontinue participation at any time; all participants gave their informed consent. For study participation, participants received course credits or remuneration of 10€. All participants were offered feedback about their individual EDE-Q result after completion of all assessments by a member of the research team with clinical expertise with regard to eating disorders.

2.2. Procedure

The study took place between October 2015 and May 2016 and included two steps. At first, all participants who were interested in the study were sent a link to an online survey and asked to complete the EDE-Q (Hilbert and Tuschen-Caffier, 2006) at home. After completing the EDE-Q, participants were invited to the laboratory for individual test-sessions. The time period between completion of the EDE-Q and the laboratory test-session did not exceed two weeks. At the start of the test-session, participants' height and weight was measured. After that, they performed the AAT (Rinck and Becker, 2007) in which pictures displaying two bodies of different shapes and weights were shown. At the end they were asked to fill in questionnaire measures on demographic variables, sociocultural attitudes towards appearance and body satisfaction. The test session lasted about one hour. Results from the EDE-Q and the laboratory test-session were matched (100%) through an individual code.

2.3. Materials

2.3.1. Stimulus materials

Forty-eight colored, computer-generated pictures displaying either a thin or a normal weight woman in different poses (see Fig. 1) were used as body stimuli for the AAT (Rinck and Becker, 2007). To ensure an evaluation only of the body, they were presented without head. The two body templates from which these pictures were rendered were selected based on the results of a pilot study. In this pilot study, 66 female participants not participating in the current study rated 32 pictures



Fig. 1. Example of pictures used in the Approach-Avoidance Task (thin body picture and normal weight body picture).

displaying computer generated women with regard to weight (ultra-thin, thin, normal weight, overweight, obese) and desirability of the shape on a 7-point Likert-scale ranging from 'strongly agree' to 'strongly disagree'. The two templates selected for the present study were the one that was rated as the most desirable thin body picture and the one whose weight was rated as normal and as moderately desirable. Based on these two pictures, twelve thin and twelve normal weight body stimuli were created by differing their pose and illumination with the software DAZ studio 4.6. Each picture was rendered with dark- and light-colored underwear which was used in the AAT as a reaction cue, with the color (anthracite-grey vs. light grey) informing participants about the expected reaction (push vs. pull). To allow for the zooming effect, seven different sizes of each picture were constructed.

2.3.2. Approach-Avoidance Task (AAT)

In the AAT (Rinck and Becker, 2007), participants were instructed that they would see different pictures of women in underwear and that they should use a joystick to either push these pictures away from them or to pull them toward themselves depending on the color of briefs and bra. Half of the participants were instructed to pull light grey underwear and push dark grey underwear and the other half vice versa. Pushing the pictures resulted in a reduction of the size of the picture while pulling resulted in an increase. The pictures were presented on a 24" monitor and a joystick (Thrustmaster T.16000 M) was positioned on the table between the participant and the monitor. To ensure that the participants take the introduction in, they run a practice trial with twelve pictures of men with light grey and dark grey clothes. The pictures of women were arranged in three blocks with each block comprising 48 trials. Each block included twelve pictures showing thin women with light grey underwear, twelve pictures showing thin women with dark grey underwear, twelve pictures showing normal weight women with light grey underwear, and twelve pictures showing normal weight women with dark grey underwear. In sum each participant performed 144 trials. Each trial started by pushing the start button while the joystick was positioned in the middle position. This made a medium-sized picture appear in the center of the screen. The

Table 1

Demographic characteristics and eating-disorder-related psychopathology for women with disordered eating behavior and women without disordered eating behavior.

	Women with disordered eating behavior (n = 55)	Women without disordered eating behavior (n = 45)	Statistics (t/p)	Effect size (d)
Age (years) [Mean (SD)]	22.55 (2.47)	21.93 (4.55)	0.86/0.39	0.29
BMI [Mean (SD)]	23.24 (3.97)	21.48 (1.65)	3.00/0.004*	0.60
SATAQ-G (awareness) [Mean (SD)]	19.69 (3.29)	17.62 (3.67)	2.97/0.004*	0.60
SATAQ-G (internalization) [Mean (SD)]	23.05 (4.87)	15.24 (5.43)	7.58/ < 0.001*	1.51
SATAQ-G (pressure) [Mean (SD)]	19.44 (3.82)	14.16 (5.04)	5.80/ < 0.001*	1.17
FFB (total score) [Mean (SD)]	132.93 (24.37)	72.53 (22.14)	12.84/ < 0.001*	2.61
EDE-Q (total score) [Mean (SD)]	3.49 (0.81)	0.82 (0.55)	19.50/ < 0.001*	3.93

Note: BMI = Body Mass Index (kg/m²); SATAQ-G = German version of the Sociocultural Attitudes Towards Appearance Questionnaire; FFB = German version of the Body Shape Questionnaire; EDE-Q = Eating Disorder Examination-Questionnaire; Cohens d statistics for effect size.

* p < .05

picture disappeared as soon as the joystick was moved completely in the correct direction. The time needed to make the picture disappear served as the participant’s RT. A compatibility effect score for the thin body pictures was calculated by subtracting each participants median RT in the thin-pull condition from the median RT in the thin-push condition. Furthermore, a compatibility effect score for the normal weight body pictures was calculated by subtracting each participants median RT in the normal weight-pull condition from the median RT in the normal weight-push condition. Thus, positive scores indicate faster pull than push movements, while negative scores indicate that participants are faster in pushing than pulling the joystick.

2.3.3. Questionnaire measures

In order to assess behaviors and symptoms related to eating behavior, the EDE-Q; (German version by Hilbert and Tuschen-Caffier, 2006) was used. The EDE-Q is a 28-item questionnaire with the subscales Restraint Eating, Eating Concern, Weight Concern, and Shape Concern, which also allows for the calculation of a total score. The EDE-Q focuses on the last 28 days and includes items like ‘Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?’ or ‘Have you had a definite fear of losing control over eating?’ In the present study participants with a total score equal to or greater than 2.30 and who also reported a bulimic episode and/or the use of exercise to control weight were classified as belonging to the group with disordered eating behavior following the suggestion of Mond et al. (2004). All other participants were classified as the group without disordered eating behavior. According to Hilbert and Tuschen-Caffier (2006) patients of the norm sample with anorexia nervosa achieved in the total scale a mean of 3.81 (SD = 1.43), patients with bulimia nervosa a mean of 3.18 (SD = 1.57), patients with atypical eating disorders a mean of 3.39 (SD = 1.38) and participant without an eating disorder a mean of 1.44 (SD = 1.22). Cronbach’s alpha was 0.97 in the present sample.

To assess awareness of the existence of the thin body ideal, internalization of this ideal and the perceived pressure to conform to media ideals, the German version of the extended Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-G; German version by Knauss et al., 2008) was administered. The SATAQ-G includes 16-items such as ‘I tend to compare my body to the body of women in magazines and on TV’ or ‘People think that the thinner you are, the better you look.’ on a 5-point Likert-scale ranging from ‘strongly disagree’ to ‘strongly agree’. In the current sample, Cronbach’s alpha ranged from 0.78 to 0.87 for the different subscales.

To measure the satisfaction with one’s own body, the adapted German version of the Body Shape Questionnaire (German version by Waadt et al., 1992) was administered. This questionnaire includes 34-items which assesses body dissatisfaction with items such as ‘Have you felt so bad about your shape that you cried’ or ‘Has being with thin women made you feel self-conscious about your body’. Each item was

scored from 1 to 6 with ‘never’ = 1 and ‘always’ = 6, where the participants were asked to rate with regard to the last 4 weeks. According to Pook et al. (2002) the norm sample scored as follows on their total score: patients with bulimia nervosa achieved a mean of 129.29 (SD = 29.59), patients with binge eating a mean of 119.45 (SD = 30.37), and participant without an eating disorder a mean of 58.76 (SD = 21.66). In the current sample, Cronbach’s alpha was 0.98.

2.4. Statistical analysis

Two-sided t-tests were used to examine differences between women with disordered eating behavior and women without disordered eating behavior with regard to demographic variables, eating behavior, body dissatisfaction, awareness of the existence of the thin body ideal, internalization of this media body ideal and perceived pressure to conform to media ideals. After testing the assumptions, a three way mixed ANOVA was used for between-group analysis with group (with disordered eating behavior vs. without disordered eating behavior) as between-subject factor and body (thin vs. normal) as well as direction (pull vs. push) as within-subject factors. Partial η² is reported as effect size for the three way mixed ANOVA. Previous research has reported medium-to-large effect sizes (η² between 0.08 and 0.18) (Brockmeyer et al., 2015; Rinck and Becker, 2007; Woud et al., 2011). Using a medium effect size, a priori power analysis showed a total sample size of 98 participants will have 80% power with a 0.05 significance level. Correlation analysis was used to identify associations between approach and avoidance (as indicated by the compatibility effect scores) and body dissatisfaction, internalization of this ideal, the perceived pressure to conform to media ideals, and BMI. For all analyses, a significance level of p < .05 was considered as significant. IBM SPSS Statistics (Statistical Package of the Social Science, 24.0) was used for all analyses.

3. Results

3.1. Sample characteristics

Table 1 shows the sample characteristics for both groups. Women with disordered eating behavior (n = 55) and women without disordered eating behavior (n = 45) did not differ with regard to age, current level of education χ²(1) = 2.23, p = .79 or relationship status χ²(1) = 2.34, p = .29. However, as expected, women with disordered eating behavior showed a significantly stronger awareness of the existence of the thin body ideal, a stronger internalization of this media body ideal and a higher perceived pressure to conform to media ideals as well as higher body dissatisfaction, more disordered eating behavior and a higher BMI (see Table 1 for details). Additional analysis of the group with disordered eating behavior with regard to the different subscales of the EDE-Q (Hilbert and Tuschen-Caffier, 2006) showed that

Table 2
AAT mean reaction times (ms) and standard deviations separately for groups and body-weight-related stimuli.

Group	Thin body		Normal weight body	
	Pull	Push	Pull	Push
Women with disordered eating behavior (N = 55)	671 (67)	658 (67)	667 (66)	654 (62)
Women without disordered eating behavior (N = 45)	660 (89)	647 (76)	658 (87)	645 (82)

shape concerns were most prominent (M = 4.40, SD = 0.83) followed by weight concerns (M = 4.02, SD = 0.96), restraint eating (M = 3.02, SD = 1.27), and eating concerns (M = 2.54, SD = 1.12).

3.2. Approach and avoidance

Mean AAT scores are presented in Table 2. With regard to the compatibility effect score of the thin body picture the analysis showed negative values for the group with disordered eating behavior (M = -13.25, SD = 42.83) as well as for the group without disordered eating behavior (M = -12.72, SD = 37.99). Also with regard to the compatibility effect score of the normal weight body picture the analysis showed negative values for the group with disordered eating behavior (M = -12.91, SD = 41.69) as well as for the group without disordered eating behavior (M = -13.21, SD = 37.14).

The three way mixed ANOVA showed a significant main effect of the factor direction $F(1,98) = 12.59, p = .001, \eta^2 = 0.11$ but neither a main effect of the factor body $F(1,98) = 2.69, p = .10, \eta^2 = 0.03$ nor of the factor group $F(1,98) = 0.50, p = .48, \eta^2 = 0.005$. Neither the interaction body by group $F(1,98) = 0.12, p = .73, \eta^2 = 0.001$ nor the interaction direction by group $F(1,98) < 0.01, p = .99, \eta^2 < 0.001$ or the interaction body by direction $F(1,98) < 0.01, p = .98, \eta^2 < 0.001$ reached significance. There was no significant body by direction by group interaction $F(1,98) = 0.02, p = .90, \eta^2 < 0.001$. Thus, the results indicated faster push than pull movements independent of group or picture content.

3.3. Correlations

Table 3 illustrates the correlations between the compatibility effect score of the thin body picture, compatibility effect score of the normal weight body picture, and internalization of the thin body ideal, perceived pressure to conform to thin body ideals, body dissatisfaction, and BMI for the whole sample. Faster push than pull movements for the thin body picture were related to faster push than pull movements for the normal weight body picture. Furthermore, faster push than pull movements for the normal weight body picture were associated with more perceived pressure to conform to media ideals. In addition, we found a significant positive association between BMI and body

Table 3
Correlation matrix showing associations between all measures.

	(1)	(2)	(3)	(4)	(5)
(1) CES (thin)					
(2) CES (normal)	0.65*				
(3) SATAQ-G internalization	0.13	0.14			
(4) SATAQ-G pressure	0.15	0.22*	0.69*		
(5) FFB total score	0.03	0.08	0.73*	0.59*	
(6) BMI	0.14	-0.02	0.05	0.15	0.34*

Note: CES = compatibility effect score; SATAQ-G = German version of the Sociocultural Attitudes Towards Appearance Questionnaire; FFB = German version of the Body Shape Questionnaire

* $p < .05$

dissatisfaction and significant positive correlations between body dissatisfaction, internalization of the thin body ideal, and perceived pressure to conform to media ideals.

4. Discussion

The present study examined approach and avoidance biases towards the thin body ideal in a sample of women with disordered eating behavior according to the total score achieved in the EDE-Q (Hilbert and Tuschen-Caffier, 2006) and women without disordered eating behavior. Furthermore, we assessed relations between internalization of the thin media body ideal, perceived pressure to conform to media ideals, body dissatisfaction, BMI, and the compatibility effect score for the thin as well as for the normal weight body pictures. Indirect responses to body pictures were assessed with the AAT (Rinck and Becker, 2007) in which pictures of a thin female body and pictures of a normal weight female body were displayed. A compatibility effect score was calculated as an outcome parameter by subtracting each participants median RT in the thin-pull / normal-pull condition from the median RT in the thin-push / normal-pull condition. Eating-related behavior, body dissatisfaction, awareness of the existence of the thin body ideal, internalization of this thin ideal, and perceived pressure to conform to media ideals were assessed by questionnaires.

We found significantly higher body dissatisfaction, stronger awareness of the existence and internalization of the thin media body ideal, significantly stronger perceived pressure to conform to media ideals, and higher BMI in women with disordered eating behavior compared to women without disordered eating behavior. Contrary to our hypothesis, both groups showed faster push than pull joystick movements to the thin body picture and no approach bias toward the thin body picture was observed. With regard to the normal weight body we found, as expected for women with disordered eating behavior, faster push than pull joystick movements but, contrary to our hypothesis, also for women without disordered eating behavior. While our results suggest a general avoidance tendency for female body pictures in women, we found negative values for both groups and both body pictures. Although other studies (e.g. Brockmeyer et al., 2015; Paslakis et al., 2016) found that reaction times for pulling and pushing differed depending on the picture content presented and were not generally faster for pushing than pulling, we cannot exclude that our findings are due to motoric-mechanical reasons with pushing the joystick being easier and thus faster than pulling the joystick (for details see Rinck and Becker, 2007). Thus, the interpretation that women show an avoidance tendency when confronted with female body pictures should be made with caution and future studies are warranted to replicate this finding. Thereby it would be important to include a picture category for which no push versus pull advantage is observed.

Interestingly, we found a significant relation between the compatibility effect score of the normal weight body picture and perceived pressure to conform to media ideals, which means that women who felt more pressure to conform to media ideals showed even faster push than pull movements to the normal weight body picture. However, the correlation between the compatibility effect score of the thin body picture and perceived pressure to conform to media ideals also nearly reached significance. Thus, the differences between the two body pictures may be small. Contrary to our hypothesis, we found no relations between BMI and the compatibility effect score of the normal weight body picture or the internalization of the thin media body ideal, perceived pressure to conform to media ideals, body dissatisfaction, and a positive compatibility effect score of the thin body picture. A significant correlation between the compatibility effect score of the thin body picture and the compatibility effect score of the normal weight body picture indicated that negative values of one stimulus category are associated with negative values of the other stimulus category.

It is important to consider that in contrast to our findings, Woud and colleagues (2011) found an approach bias toward thin body pictures.

There are two important differences between the studies that might explain divergent findings. Firstly, the stimulus material used in the tasks were different. While Woud and colleagues (2011) used pictures of models, in our study we used computer generated body pictures. It is quite possible that pictures of well-known models from the media with a beautiful face and clothes induce an approach bias whereas computer generated body stimuli do not. This assumption is supported by the findings of Shafran et al. (2007), who supposed that a bias can only be found when the body related pictures are personally relevant. The Tripartite Influence Model by Thompson and colleagues (1999) mentioned comparison processes related to appearance as an important risk factor. Maybe the comparison with computer generated stimuli is not strong enough. A second difference was the explicit vs. implicit nature of task instruction. Woud and colleagues (2011) instructed their participants to move the manikin toward thin models and away from overweight models (or vice versa). In the current study, the participants were asked to react to the color of the underwear and to push bodies with light grey underwear away from them and to pull bodies in dark grey underwear toward them (and vice versa). It can be hypothesized that an approach bias to thin body pictures is influenced by social pressure to conform to the thin ideal and that this influence is not confounding behavior of study participants when using a more implicit assessment strategy. This would mean that the thin ideal is actually not perceived as attractively as assumed when relying on the results of studies using more explicit assessment tools. Another explanation for the missing approach bias, especially in the group with disordered eating behavior, relates to the definition of disordered eating behavior in the present study. The EDE-Q (Hilbert and Tuschen-Caffier, 2006) total score includes different aspects of symptoms like restraint eating or the fear of getting fat as well as typical bulimic or binge eating symptoms like loss of control or over-eating. Our group with disordered eating behavior thus comprised participants with completely different problems with regard to eating behavior. This is also reflected in the BMI of this group which ranged from extreme underweight (15.0 kg/m²) to obesity (42.7 kg/m²). We cannot exclude that the general heterogeneity of our group with disordered eating behavior might have confounded our findings. Bleichert et al. (2010) for instance suggested that patients with anorexia nervosa center their body-related attention on themselves whereas patients with bulimia nervosa center their body-related attention on other people in order to compare themselves with these other people. Aspects like this could also impact our results. While the heterogeneity of our group with disordered eating behavior may thus be one reason for a lack of approach bias toward thin body pictures, it is also important to consider that, in general, differences between women with and without disordered eating behavior might have been too small to detect group differences. While there is one previous study by Glauert et al. (2010), who assessed the attentional bias toward body pictures of different weight using a visual dot probe task and also reported no influence of body dissatisfaction or the BMI on the attentional bias, it is important to replicate these findings in clinical samples showing strong body dissatisfaction. Interestingly, although we found, contrary to previous studies, no approach bias toward thin body pictures, we observed an association between the compatibility effect score of the normal weight body picture and perceived pressure to conform to the thin body ideal. This supports the validity of the AAT as an implicit assessment tool. In addition, while these results are in line with the findings of Woud and colleagues (2011), who reported a relation between the avoidance of overweight models and drive for thinness, it is important to acknowledge that our findings suggest that the perceived pressure to conform to the thin body ideal might result in the perception of even normal weight bodies, and not only overweight or obese bodies, as undesirable. Thus, it might be important for future prevention strategies with regard to eating disorders to carefully address not only the appraisal of obese weight, but also of normal weight.

When interpreting our findings, some limitations should be acknowledged. The assessment of eating disorder symptoms and the

division into a group of women with disordered eating behavior and a group of women without disordered eating behavior were based on the EDE-Q (Hilbert and Tuschen-Caffier, 2006) as a self-reported questionnaire. The administration of a structured diagnostic interview would have improved the validity of our group differentiation and also provided information on mental disorders which could have confounded our findings. In addition, although the EDE-Q is known as a very well established questionnaire with good validity in the clinical diagnostics of eating disorders, it should be acknowledged that in the present study no clinical participants were recruited. A further limitation of our study is that no ratings of the stimulus material with regard to weight and desirability of the bodies displayed are available from the participants of the present sample.

For future research it would also be important to take into account some further aspects that the current study did not address. For example, distinguishing between anorectic and bulimic symptoms or compare patients with diagnosed anorexia nervosa and bulimia nervosa. In addition, potential confounding variables like mental disorders, or the amount of daily media consumption and use of social platforms as indicators of preoccupation with the thin ideal should be taken into account as they might affect perceived pressure to conform to the thin ideal. Furthermore, Loeber et al. (2016) found that the exposure to a fashion magazine in an experimental waiting room situation does not lead to an increase in body dissatisfaction, while the imagination of the thin ideal does. Thus, it can be hypothesized that the preoccupation with the thin ideal is an important aspect that the current study with a relatively short exposure to thin bodies did not focus on. Thus, future research is needed in which approach and avoidance biases toward thin body pictures should be investigated with a longer exposure to the thin ideal shortly before the AAT (Rinck and Becker, 2007), for example, by showing video clips from model casting shows that promote the thin ideal. Finally, as Shafran et al. (2007) supposed that a bias can only be found when the body related pictures are personally relevant, it would be interesting to replicate our findings using personally relevant stimuli like photographs of the participant's own body.

In conclusion, our findings indicated no approach bias toward thin body pictures. Faster push than pull movements towards thin and normal weight body pictures suggest an avoidance bias toward body pictures in general although we cannot exclude that this effect might be due to motoric-mechanical aspects of the joystick movement. A positive association was found between perceived pressure to conform to media ideals and faster push than pull movements to normal weight body pictures. No differences were observed between women who showed disordered eating behavior and women without disordered eating behavior. Future research is warranted to replicate our findings and to extend our knowledge on approach and avoidance biases towards body pictures in patients suffering from eating disorders. This will be important to enhance our understanding of approach and avoidance tendencies and their role in the development of body dissatisfaction and eating disorders.

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Conflict of interest

We declare that there are no conflicts of interest. None of the data has been previously reported.

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Supplementary materials

Supplementary material associated with this article can be found, in

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