Is implicit self-esteem linked to shape and weight concerns in restrained and unrestrained eaters?

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ARTICLE INFO

ABSTRACT

Implicit self-esteem and its link to body shape and weight concerns were examined among restrained ($n = 32$) and unrestrained eaters ($n = 39$). Implicit self-esteem was assessed in an Implicit Association Test before and after increasing the participants' awareness of their own body shape and weight. The results showed a differential direction of change of implicit self-esteem in both groups: Whereas implicit self-esteem increased for unrestrained eaters, it decreased descriptively for restrained eaters. This suggests that restrained eating status and/or initial level of body dissatisfaction might determine whether implicit self-esteem decreases or increases as a result of an activation of body schema.

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1. Introduction

The degree to which self-esteem is influenced by body shape and weight has been described to be a core characteristic of eating disorder (ED) patients (e.g., Cooper & Fairburn, 1993; Fairburn, Shafran, & Cooper, 1999; Vitousek & Hollon, 1990). This feature has also become part of ED nosology since it was included in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association [APA], 1994). The DSM-IV defines the undue influence of body weight and shape on self-evaluation as one diagnostic criterion of bulimia nervosa (BN) and one possible manifestation of body image disturbance in anorexia nervosa (AN).

Numerous studies have shown that excessive shape and weight concerns are typical of individuals with AN and BN (see Mizes & Christiano, 1995, for a review). It has been criticized, however, that research on the postulated link between self-evaluation on the one hand and shape and weight on the other hand is sparse (cf. Goldfein, Walsh, & Midlarsky, 2000) suggesting that the described DSM-IV AN and BN criteria on disturbed self-evaluation may be based on clinical observation rather than on empirical studies. Research

therefore concentrated on the postulated link using self-report questionnaires and semi-structured interviews (e.g., Geller et al., 1998; Goldfein et al., 2000). These studies found that ED patients base their self-esteem on shape and weight to a larger extent than controls.

There have also been first studies which investigated the influence of body shape and weight on self-esteem in restrained eaters (e.g., Meijboom, Jansen, Kampman, & Schouten, 1999; Morris, Goldsmith, Roll, & Smith, 2001). Dietary restraint is one of the most frequently investigated and best confirmed risk factors for EDs (cf. Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004). Although some experimental studies indicate that dieting rather attenuates overeating tendencies than being a risk factor for eating pathology (see Stice, 2002), several longitudinal studies show its power to predict the onset of EDs and ED symptomatology (e.g., Patton, Johnson-Sabine, Wood, Mann, & Wakeling, 1990; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999; Stice, 2001; Stice, Presnell, & Spangler, 2002). Thus, restrained eaters have frequently been studied as an important analogue sample in the EDs field (e.g., Goldfein et al., 2000; Meijboom et al., 1999).

Restrained eaters' self-schemas have been shown to center more around weight- and food-related concepts and to comprise stronger associations between self-evaluative and weight-/food-related concepts than the self-schemas of controls (Morris et al., 2001). This finding suggests that there might already be a strong association between body shape and weight and self-esteem in individuals at risk for developing an ED.

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However, empirical studies investigating the influence of body shape and weight on self-esteem in ED patients and ED risk groups are still rare and need to be supplemented in important aspects. Most of the existing studies in this field are based on self-report (Cooper, 2005), which is known to suffer from two main problems: susceptibility to response biases, such as self-presentation and social desirability (Paulhus, 1984), as well as introspective limits (Nisbett & Wilson, 1977). In addition, no study has yet experimentally demonstrated whether the implicit self-esteem of restrained eaters is influenced by body shape and weight. Taking these aspects into consideration, the present study aimed to investigate implicit self-esteem and its link to shape and weight concerns in restrained and unrestrained eaters.

The differentiation between explicit and implicit self-esteem is based on the assumption that two modes of information processing can be distinguished: rule-based, deliberate processing and associative processing as proposed by several dual-process models (e.g., Gawronski & Bodenhausen, 2006; Smith & DeCoster, 2000; Strack & Deutsch, 2004). According to this dual-process perspective, "explicit" attitudes can be described as relying on reflective or propositional processes whereas "implicit" attitudes are thought to rely on associative processes. Propositional information processing corresponds to higher-order processes or reasoning and operates consciously, but slowly. Associative information processing corresponds to spread-of-activation processes and operates fast and effortlessly, but with limited conscious accessibility (see Strack & Deutsch, 2004). Although there is a considerable debate on the adequate use of the terms implicit and explicit (see De Houwer & Moors, 2007; De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009), implicit self-esteem may be defined as the ensemble of associations between self and positive contents and evaluations in memory (Greenwald & Banaji, 1995). Explicit self-esteem, on the other hand, is assumed to result from conscious and reflected processing of self-relevant information.

The assumption that explicit and implicit self-esteem represent different aspects of the self is supported by studies showing that explicit and implicit self-esteem are usually only weakly correlated (Greenwald & Farnham, 2000; Rudolph, Schröder, & Schütz, 2006; but see Payne, Burkley, & Stokes, 2008 for the controversy on how to interpret implicit-explicit correlations), and predict different behavior, with implicit self-esteem being a better predictor of spontaneous and affectively driven behavior (Bosson, Swann, & Pennebaker, 2000). Thus, it is an intriguing question whether implicit self-esteem plays a role in ED psychopathology and whether body shape and weight are not only linked to explicit but also to implicit self-esteem in ED patients and restrained eaters. Whereas explicit self-esteem is consistently found to be lower in ED patients and restrained eaters than in controls (e.g., Cooper & Fairburn, 1993; Polivy, Heatherton, & Herman, 1988), research on implicit self-esteem in these groups has just started. To our knowledge, only one study has investigated the implicit self-esteem of ED patients, and there is no study assessing restrained eaters' implicit self-esteem. Note however, that there has been some research on implicit cognitions in restrained eaters which showed that certain weight-related behaviors and attitudes are supported by implicit cognitions (see Vartanian, Polivy, & Herman, 2004). Concerning implicit self-esteem, Cockerham, Stopa, Bell, and Gregg (2009) examined implicit and explicit self-esteem in participants with BN and binge eating disorder as compared to healthy controls. Interestingly, their findings showed that the ED patients exhibited lower explicit, but higher implicit self-esteem than controls, which appears to be counterintuitive at first. However, Cockerham and colleagues argued that these findings might point to self-esteem discrepancies in the ED group. Self-esteem discrepancies refer to high explicit and low implicit self-

esteem or low explicit and high implicit self-esteem. Recent studies have shown interesting links between discrepant self-esteem and dysfunctional behavior (e.g., anger suppression), a depressive attributional style as well as impaired psychological health (e.g., Schröder-Abé, Rudolph, & Schütz, 2007). These findings emphasize the importance of measuring implicit self-esteem in addition to explicit self-esteem and its potential to yield valuable information for current cognitive models of restrained eating and ED psychopathology. Furthermore, examining the influence of body shape and weight on implicit self-esteem might yield an increased understanding of a core feature of ED psychopathology.

Taken together, the present study had two primary aims: The first aim was to examine implicit self-esteem in restrained eaters as compared to unrestrained eaters. The second aim was to investigate the influence of body shape and weight on implicit self-esteem through a manipulation designed to increase the salience of body shape and weight. Specifically, we reassessed implicit self-esteem in both groups after increasing the salience of weight and shape through weighing participants and applying a body image exposure task (Tuschen-Caffier & Florin, 2002). We assumed that if body shape and weight are linked to implicit self-esteem in restrained eaters, increasing the salience of shape and weight will lower their implicit self-esteem, whereas unrestrained eaters' implicit self-esteem will remain stable. In addition, we assessed explicit self-esteem to permit a comparison of implicit and explicit self-esteem measures.

2. Method

2.1. Participants

Participants were female students selected on the basis of their score on the Restraint Scale (RS; Dinkel, Berth, Exner, Rief, & Balck, 2005; Herman & Polivy, 1980) which was administered as part of an online screening four to six weeks before the study. Of the 128 participants who completed the screening, those in the lowest and highest three deciles of the Restraint Scale were invited to take part in the study ($N = 80$). This criterion led to a cut-off of 10 for unrestrained eaters and 16 for restrained eaters on a scale ranging from 0 to 35 concordant with established cut-offs for restrained eating (Dinkel et al., 2005). From those invited, 39 unrestrained eaters and 32 restrained eaters (42.3% psychology students, 57.7% other) agreed to participate in the study and took part for course credit or 10€.

All participants were German native speakers. Data of one participant were excluded from all analyses due to being an extreme outlier in the distribution of the total sample in the first assessment of implicit self-esteem according to Tukey's criterion (Tukey, 1977)[1]. This led to a total sample size of 70 with 38 unrestrained eaters and 32 restrained eaters. The two groups did not differ significantly in age. However, restrained eaters had a significantly higher body mass index (BMI; ratio of weight to squared height in kg/m^2) and showed significantly higher depression scores on the BDI than unrestrained eaters, both of which are prevalent differences between restrained and unrestrained eaters (e.g., Dinkel et al., 2005; Meijboom et al., 1999). Note, however, that both groups' BMI scores were in the normal range and that mean depression scores were below established BDI cut-off scores for clinically significant depression (Hautzinger, Bailer, Worall, & Keller, 1995). As would be expected, restrained eaters had

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[1] According to Tukey (1977), outliers are three interquartile ranges below the first quartile or above the third quartile. All analyses were also conducted including the discarded data and revealed a similar pattern of results.

significantly higher scores in all ED psychopathology measures indicating higher body dissatisfaction, a stronger drive for thinness as well as more concerns about weight, shape, and eating (see Table 1).

2.2. Measures

2.2.1. Restraint scale

The German version of the restraint scale (RS; Dinkel et al., 2005; Herman & Polivy, 1980) was used to screen restrained and unrestrained eaters (see above) as well as to measure the extent of dietary restraint. The RS is a 10-item measure with a minimum score of 0 and a maximum score of 35. The RS has been demonstrated to have sufficient psychometric properties with satisfactory internal consistency ($\alpha = .83$), good test-retest reliability over two weeks ($r_{tt} = .95$), and has been proven to discriminate between restrained and unrestrained eaters (Allison, Kalinsky, & Gorman, 1992).

2.2.2. Implicit Association Test (IAT)

A self-esteem IAT was applied as a measure of implicit self-esteem (Greenwald, McGhee, & Schwartz, 1998) as it has been shown to be context-sensitive (Blair, 2002; Franck, De Raedt, & De Houwer, 2008) and to have good psychometric properties (Bosson et al., 2000). The self-esteem IAT is a response time task in which participants are to categorize four categories of stimuli using only two response keys. In the present study, the categories "me", "not-me", "positive" and "negative" were applied. They comprised six me-stimuli (e.g., me, self) and six not-me-stimuli (e.g., you, them) as target stimuli, six positive self-descriptive adjectives (e.g., competent, loved) and six negative self-descriptive adjectives (e.g., incompetent, worthless) as attribute stimuli as well as one additional word in each category for use in warm-up trials (my, your, smart, stupid). The stimuli were selected from self-esteem IATs used in other studies (Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008; Franck, De Raedt, Dereu, & Van den Abbeele, 2007; Greenwald & Farnham, 2000; Schröder-Abé et al., 2007; Tanner, Stopa, & De Houwer, 2006).

As can be seen in Table 2, the self-esteem IAT involved seven blocks (cf. Greenwald & Farnham, 2000). All participants received the blocks in the same order. First, participants were to classify exemplars of the two target concepts "me" and "not-me" according to their category membership (block 1). Subsequently, negative versus positive stimuli were to be classified into "positive" and "negative" categories (block 2). In the two critical phases of the IAT, these two tasks were combined and to be performed in alternation. In the initial combined task (blocks 3 and 4), participants were to assign stimuli of the "not-me" or "negative" category to the left

Table 1
Characteristics of restrained eaters (RES) and unrestrained eaters (UNRES).

	α	RES ($n = 32$) Mean (SD)	UNRES ($n = 38$) Mean (SD)	$t(68)$	p
Age	n.a.	22.78 (3.30)	24.08 (4.97)	−1.34	.19
RS	.86	18.75 (2.30)	6.66 (2.33)	21.78	<.001
BMI	n.a.	23.21 (3.45)	20.32 (1.97)	4.16	<.001
BSQ	.97	92.94 (23.56)	53.45 (16.49)	8.22	<.001
EDI-2 DT	.95	25.53 (7.53)	12.50 (5.18)	8.28	<.001
EDI-2 BD	.94	34.44 (8.66)	21.24 (8.78)	6.31	<.001
EDI-2 B	.86	16.13 (4.55)	9.53 (2.49)	7.33	<.001
EDE-Q	.94	1.98 (1.02)	.51(.58)	7.15	<.001
BDI	.80	7.31 (5.31)	4.68 (4,75)	2.45	.017

Note. SD = Standard deviation; RS = Restraint Scale; BMI = Body mass index; BSQ = Body shape questionnaire; EDI-2 = Eating disorder inventory 2; DT = Drive for thinness; BD = Body dissatisfaction; B = Bulimia; EDE-Q = Eating disorder examination-questionnaire; BDI = Beck depression inventory; α = Internal consistency (Cronbach's Alpha).

Table 2
The self-esteem Implicit Association Test (self-esteem IAT).

Block	No. of trials	Task	Response key assignment	
			Left	Right
1	26[a]	Target discrimination	Not-me	Me
2	26[a]	Attribute discrimination	Negative	Positive
3	28[b]	Initial combined task (practice block)	Not-me or Negative	Me or Positive
4	52[b]	Initial combined task (test block)	Not-me or Negative	Me or Positive
5	26[a]	Reversed target discrimination	Me	Not-me
6	28[b]	Reversed combined task (practice block)	Me or Negative	Not-me or Positive
7	52[b]	Reversed combined task (test block)	Me or Negative	Not-me or Positive

[a] The first two trials were warm-up trials.
[b] The first four trials were warm-up trials; the original German stimuli may be obtained from the authors.

response key and stimuli of the "me" or "positive" categories to the right response key. Participants then practiced to discriminate me versus not-me stimuli (block 5) with reversed response mapping to block 1. Finally, in the reversed combined task, participants were to assign me and negative stimuli to the left and not-me and positive stimuli to the right response key (blocks 6 and 7). The performance difference between the two critical combined phases is known as the IAT effect, which is assumed to measure "how much easier it is for subjects to categorize self items with pleasant items than self items with unpleasant items" (Greenwald & Farnham, 2000, p. 1024). The rationale is that response times are faster when two associated concepts are assigned to the same key (i.e., the so-called compatible task) than when two less strongly associated concepts share one key (i.e., the so-called incompatible task). Thus, individuals with positive self-esteem are thought to be faster when self-referent words and positive attributes are mapped together on the same key and non-self-referent words and negative attributes share the other key than with the reversed mapping. Self-esteem IAT scores were coded such that higher scores indicated a higher implicit self-esteem.

During each block, the response assignments were displayed on the computer screen. In the combined blocks, target and attribute stimuli were presented in an alternating, otherwise randomized order. Responses were made using two marked buttons on two computer mice positioned left and right of the keyboard (see Voss, Leonhart, & Stahl, 2007). Participants were to respond with their index fingers using the right button of the left-hand mouse for categories on the left side and the left button of the right-hand mouse for categories on the right side. If a participant entered a wrong response, a red "X" appeared below the word until the participant entered the correct response. The next trial started 500 ms after the participant pressed the correct key. Stimuli were presented in a sans serif font and had a height of 7 mm and a width of 12 mm to 85 mm. Target stimuli were shown in black and attribute stimuli in dark gray on a white background. Participants were seated at a distance of approximately 60 cm from the screen. The self-esteem IAT was presented on a 43 cm VGA color monitor with a resolution of 1280×1024 pixels, and data were recorded using Inquisit Millisecond software version 2.0 (Inquisit, 2004).

2.2.3. Explicit self-esteem

Three scales served as measures of explicit self-esteem. The Rosenberg Self-Esteem Scale (RSE; Ferring & Filipp, 1996; Rosenberg, 1979) was administered to assess trait self-esteem. The RSE consists of 10 items with a 4-point scale (0–3) and is a widely used, well-validated measure of global self-esteem (Blaskovich & Tomaka, 1991).

The State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991; Hohler, 1997) was used to measure state self-esteem. The SSES consists of 20 items rated on a scale from 1 (never) to 5 (extremely) and comprises three subscales (performance, social, appearance self-esteem). It has been proven to have good psychometric properties (Heatherton & Polivy, 1991).

Furthermore, participants completed the 10 items of the two Physical Self-Esteem (PSE) subscales of the Multidimensional Self-Esteem Scale (MSES; Fleming & Courtney, 1984; Schütz & Sellin, 2006). These scales were included in order to assess trait physical self-esteem in addition to the SSES which is a state measure. Responses on the MSES are made on 7-point scales with endpoints labelled not at all (1) and very much (7) or never (1) and always (7). The PSE scales of the German adaptation have been shown to have good internal consistencies (Schütz & Sellin, 2006) ($\alpha = .87$ and $\alpha = .80$ in the norm student sample). On all three explicit self-esteem measures, higher scores indicate higher self-esteem.

2.2.4. ED psychopathology

Three measures were administered to assess the degree of ED psychopathology and body image disturbance: the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994; Hilbert, Tuschen-Caffier, Karwautz, Niederhofer, & Munsch, 2007), the Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987; Waadt, Laessle, & Pirke, 1992), and the three primary symptomatology subscales of the Eating Disorder Inventory-2 (EDI-2; Garner, 1991; Paul & Thiel, 2005).

The EDE-Q assesses relevant ED features occurring during the past 28 days. It consists of 28 items and four subscales (Restraint, Eating Concerns, Weight Concerns, Shape Concerns). Participants give frequency and intensity ratings on a 7-point scale. Psychometric properties of the German version have been shown to be good (Hilbert et al., 2007).

The BSQ is a widely used 34-item scale to assess body dissatisfaction. Psychometric evaluations have shown its unifactorial structure as well as good test-retest reliability, internal consistency, construct validity, and discriminant validity (Pook, Tuschen-Caffier, & Brähler, 2008).

The EDI-2 subscales Drive for Thinness, Body Dissatisfaction, and Bulimia comprise 23 items. Participants rate their responses on a 6-point scale from 1 ('never') to 6 ('always') with higher scores indicating a more severe ED psychopathology. The three subscales have proven to have reliable psychometric properties (Paul & Thiel, 2005).

2.2.5. Beck Depression Inventory

The German version of the Beck Depression Inventory (BDI; Hautzinger et al., 1995) The BDI is a widely used reliable and valid 21-item self-report measure. The total score can range from 0 to 63 with higher scores indicating a higher symptom severity.

2.2.6. Manipulation checks

A mood rating, a body image measure, and a question on participants' viewing behavior during the body exposure task served as manipulation checks. The mood rating assessed affective reactions to the body exposure and asked participants to indicate how strongly they experienced 11 different emotional states during the past few minutes on a scale ranging from 1 (not at all) to 6 (very strongly). Based on earlier studies on reactions to body exposure, sadness, anxiety, insecurity, disgust, anger, and tension were included (Hilbert, Tuschen-Caffier, & Vögele, 2002; Vocks, Legenbauer, Wächter, Wucherer, & Kosfelder, 2007). Feelings of shame, frustration as well as the positive emotions happy, relaxed, and confident were added to the present study as it is not clear yet which emotions are activated by body exposure. The order of the

emotional states was randomized. A total negative mood score was used as a composite mean score of all mood items recoding the positive emotions so that higher scores indicated a more negative mood.

Furthermore, the Body Image States Scale (BISS; Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002; Vocks, Legenbauer, & Heil, 2007) was used to measure participants' state body image before and after body exposure. Its six items assess various aspects of current evaluative and affective experiences of one's physical appearance such as momentary dissatisfaction with one's shape and weight. Responses are made on 9-point bipolar Likert scales with lower scores indicating higher body dissatisfaction. The BISS has been shown to be internally consistent in various contexts (Cronbach's $\alpha = .77$ to .90 for women) and to be sensitive to different contexts (Cash et al., 2002).

In addition, participants were asked to report the percentage of time they looked in the mirror during the body image exposure task.

2.3. Procedure

Participants were informed that the experiment would investigate several aspects of self-awareness including body perception. One week before the first laboratory appointment, participants completed a set of questionnaires online including the BSQ, EDI-2, EDE-Q, and BDI. The experimental part was conducted in two separate sessions three weeks apart. Participants were tested individually by two female experimenters.

2.3.1. First session

After signing the informed consent form, the self-esteem IAT was administered. Written instructions on the computer screen informed participants to respond as fast and accurately as possible without making too many mistakes. After the self-esteem IAT, participants completed three measures of explicit self-esteem (SSES, RSE, MSES Physical Self-Esteem subscales). Finally, two other procedures irrelevant to the present investigation were applied: the first was the Trail Making Test A and B, which intended to measure motor speed skills and cognitive flexibility (Bowie & Harvey, 2006), the second was a lexical decision task (Wittenbrink, Judd, & Park, 2001) which intended to measure implicit stereotypes about thin and overweight people.

2.3.2. Second session

At the beginning of the second session, participants completed the mood rating and BISS. Afterwards, participants moved to a separate room, containing a mirror, where they were asked to put on a tight beige tank top in order to achieve partly standardized clothing as well as to accentuate body shape. After having changed, the participants' height was measured. The manipulation increasing the salience of body shape and weight was implemented by weighing participants with a diagnostic scale as well as by a four-minute body image exposure task adapted from Tuschen-Caffier and Florin (2002) to increase the salience of body shape and weight. For the exposure task, participants were instructed to stand in front of a mirror at a 1 m-distance which allowed a full view of the body. Participants were guided through their body and received instructions to carefully look at their head, neck, shoulders, arms, cleavage, breasts, stomach, waist, hips, and legs as well as their whole body at the end. The prerecorded instructions were played to the participants through computer speakers to ensure a standardized procedure. After having turned on the instructions, the experimenter left the room so that participants were alone during the task. Subsequently, the mood rating and the BISS were reassessed, and participants were asked to report the percentage of

time they looked into the mirror during the body exposure task. Then, the self-esteem IAT was administered as in the first session. Following the IAT, participants completed the SSES, the RSE as well as the MSES Physical Self-Esteem subscales. Finally, participants were debriefed, thanked, and they received their compensation. As part of debriefing, the experimenter interviewed the participants about their experience of the body image exposure task to provide the possibility of counseling for any stress responses that the task might have caused. This interview was already used successfully in other studies on body exposure (e.g., Tuschen-Caffier, Vögele, Bracht, & Hilbert, 2003).

2.4. Data analysis

Statistical procedures included two types of two-way analyses of variance (ANOVAs) for repeated-measures designs: Session (1, 2) X Group (restrained eaters, unrestrained eaters) ANOVAs as well as Time (pre-post body exposure at session 2) X Group ANOVAs. Significance level was set at $p < .05$ for all tests and two-tailed tests were used throughout. Effect sizes are reported using partial eta-squared.

IAT data were analyzed using the D_2 measure as proposed by Greenwald, Nosek, and Banaji (2003). Scores were computed so that higher IAT scores indicate higher implicit self-esteem.

3. Results

3.1. Manipulation checks

The means, standard deviations, and internal consistencies of the three manipulation checks are summarized in Table 3 for both groups.

A Time X Group mixed ANOVA with the overall negative mood score as the dependent variable revealed a significant main effect of Group, $F(1, 68) = 13.51$, $p < .001$, $\eta_p^2 = 17$. Thus, restrained eaters had higher negative mood scores than unrestrained eaters pre and post body exposure. Further, a marginally significant interaction of Time and Group was obtained, $F(1, 68) = 3.93$, $p = 05$, $\eta_p^2 = .06$, indicating that the two groups' mood changed differentially in reaction to the body exposure task. There was no main effect of Time, $F(1,68) = 1.21$, $p = 28$.

A Time X Group mixed ANOVA with the BISS means scores as the dependent variable yielded a significant main effect of Group, $F(1, 68) = 21.78$, $p < .001$, indicating higher scores for unrestrained eaters and lower scores for restrained eaters pre and post body exposure. There was no main effect of Time and no interaction of Time and Group, $F < 1$. Thus, we surprisingly found no differential group reactions to body image exposure in BISS scores.

The percentage of time participants reported to have looked into the mirror during the exposure task was high and did not differ between groups, $t < 1$.

Table 3
Means (standard deviations) and internal consistencies of the three manipulation checks.

		RES ($n = 32$) Mean (SD)	UNRES ($n = 38$) Mean (SD)	α
Negative Mood	Pre-Exposure	2.30 (.58)	2.00 (.57)	.77
	Post-Exposure	2.37 (.90)	1.70 (.59)	.93
BISS scores	Pre-Exposure	5.46 (1.34)	6.85 (.87)	.86
	Post-Exposure	5.43 (1.77)	6.83 (1.26)	.93
Percentage of time participants looked into the mirror		93.59 (6.29)	95.12 (7.09)	n.a.

Note. RES = Restrained eaters; UNRES = Unrestrained eaters; SD = Standard deviation; BISS = Body image states scale; α = Internal consistency (Cronbach's Alpha).

Table 4
Means (standard deviations) and internal consistencies of the self-esteem IAT for both sessions.

	RES ($n = 32$) Mean (SD)	UNRES ($n = 38$) Mean (SD)	α
IAT D_2 scores Session 1	.72 (.26)	.64 (.26)	.64
IAT D_2 scores Session 2	.66 (.25)	.75 (.23)	.66

Note. RES = Restrained eaters; UNRES = Unrestrained eaters; SD = Standard deviation; α = Internal Consistency (Cronbach's Alpha).

3.2. Implicit self-esteem

Descriptive statistics and internal consistencies for implicit self-esteem are shown in Table 4. To compute internal consistencies, the IAT was split into four subtests of equal length with each subtest containing equal numbers of target and attribute stimuli. Internal consistencies for both sessions were calculated by computing Cronbach's Alpha with the four IAT subtests, respectively. The overall average IAT error rate was 9.31% ($SD = 4.91$) in the first session and 8.69% ($SD = 4.78$) in the second session, and error rates did not differ between groups, $ts(68) < 1$, $ps > .70$. The overall average IAT response times were 721.70 ms ($SD = 151.26$) in the first session and 668.83 ms ($SD = 117.58$) in the second session, and they did not differ between groups, $ts(68) < 1$, $ps > .85$. Consistent with other studies, implicit and explicit self-esteem measures were not correlated significantly (e.g., Greenwald & Farnham, 2000), $rs < .12$, $ps > .30$.

Restrained eaters had slightly, but not significantly, higher implicit self-esteem than unrestrained eaters in the first session, $t(68) = 1.36$, $p = 18$. In order to examine whether the two groups' implicit self-esteem changed differentially in reaction to the body image exposure task, a Session X Group mixed ANOVA with the IAT D_2-scores as the dependent variable was performed. As predicted, we found a significant interaction of Session and Group, $F(1, 68) = 6.24$, $p = 02$, $\eta_p^2 = 08$, and no significant main effect of Session, $F < 1$, or Group, $F < 1$ (see Fig. 1)[2]. To further examine the interaction, we conducted separate analyses for both groups. For restrained eaters, there was a decrease of implicit self-esteem after body exposure that did not reach significance, $t(31) = 1.21$, $p = 24$, whereas unrestrained eaters' implicit self-esteem increased significantly, $t(37) = -2.37$, $p = 02$.

3.3. Explicit self-esteem

Table 5 presents the means, standard deviations, and internal consistencies of all explicit self-esteem measures.

We examined whether restrained and unrestrained eaters' explicit self-esteem changed after the body image exposure task as assessed subsequently to the self-esteem IAT. A series of Session X Group mixed ANOVAs with the three explicit self-esteem measures as the dependent variables revealed no significant main effects of

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[2] IAT analyses were also computed with the conventional IAT score based on log-transformed latencies and the IAT score based on errors (Greenwald et al., 1998). For the latency-based scores, latencies below 300 ms were recoded to 300 ms and latencies over 3000 ms were recoded to 3000 ms. The critical IAT-score was the difference between the average scores of the two critical combined phases (3/4 and 6/7). Both latency-based and error-based IAT scores descriptively exhibited the crucial interaction effect of Session X Group shown in Fig. 1 for the D score. The interaction was significant for the IAT algorithm based only on errors when tested one-tailed, but did not reach significance for the latency-based score. The D score integrates latencies and errors, leading to a boost in statistical power for revealing this interaction. As the D measure has been shown to have better psychometric properties than the conventional IAT algorithm and is, therefore, recommended to be used (Greenwald et al., 2003), we report analyses from hereon using the D measure.
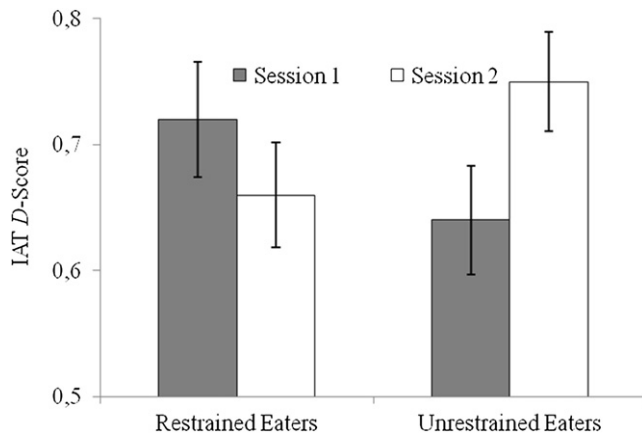
Fig. 1. Self-esteem IAT D_2-scores for restrained and unrestrained eaters in session 1 (baseline) and session 2 (after body exposure).

Session, $Fs(1, 68) < 1.30$, $ps > .25$, and no significant interactions of Session and Group, $Fs < 1$. Thus, restrained and unrestrained eaters showed no change in explicit self-esteem after body exposure as assessed after the self-esteem IAT. There were, however, significant main effects of Group in all analyses, $Fs(1, 68) > 18.00$, $ps < .01$, $\eta_p^2 > .21$, with restrained eaters consistently exhibiting lower explicit self-esteem scores both before and after exposure.

4. Discussion

The purpose of the present study was to investigate implicit self-esteem and its link to body shape and weight in restrained and unrestrained eaters. We therefore assessed baseline implicit self-esteem in session 1 and increased the salience of body shape and weight in a targeted manipulation before reassessing implicit self-esteem in session 2 three weeks apart. In order to permit a comparison of implicit and explicit self-esteem, we also assessed explicit self-esteem.

Regarding implicit self-esteem, we found no significant differences between both groups' implicit self-esteem when assessed prior to the salience manipulation. Interestingly, however, restrained eaters' mean scores were descriptively higher than those of unrestrained eaters. Considering the findings of Cockerham et al. (2009) of higher implicit self-esteem in ED patients, it is plausible to assume that as ED psychopathology increases (i.e., from healthy to restraint to full-syndrome ED) implicit self-esteem might increase as well. What also follows from this line of thinking is that restrained eaters might be characterized by a discrepant self-esteem pattern: High implicit self-esteem and low explicit self-

Table 5
Means (standard deviations) and internal consistencies of explicit self-esteem measures for both sessions.

	Session 1			Session 2		
	RES ($n = 32$) Mean (SD)	UNRES ($n = 38$) Mean (SD)	α	RES ($n = 32$) Mean (SD)	UNRES ($n = 38$) Mean (SD)	α
SSES	67.06 (11.12)	79.53 (8.69)	.92	67.65 (11.12)	80.66 (9.15)	.92
SSES APP	18.62 (3.80)	23.42 (3.03)	.85	18.41 (3.77)	23.34 (3.22)	.82
SSES PER	25.69 (4.23)	28.61 (2.89)	.81	25.90 (3.93)	29.13 (2.99)	.82
SSES SOC	22.75 (5.30)	27.50 (4.38)	.88	23.34 (5.30)	28.18 (4.89)	.88
RSES	22.66 (4.32)	26.39 (3.12)	.82	22.47 (4.19)	26.61 (4.13)	.84
PSE	40.52 (9.64)	50.74 (9.21)	.87	40.53 (9.51)	50.79 (9.00)	.86

Note. RES = Restrained eaters; UNRES = Unrestrained eaters; SD = Standard deviation; RSES = Rosenberg Self-Esteem Scale; SSES = State Self-Esteem Scale; APP = Appearance; PER = Performance; SOC = Social; PSE = Physical Self-Esteem Score of the Multidimensional Self-Esteem Scale; α = Internal Consistency (Cronbach's Alpha).

esteem, which is also known as "damaged self-esteem", has been shown to be maladaptive and associated with impaired psychological health (Schröder-Abé et al., 2007). Interestingly, similar to EDs, research on depression has shown that both currently and formerly depressed patients exhibit self-esteem discrepancies with high implicit and low explicit self-esteem (Franck et al., 2008). Franck and colleagues argued that this heightened implicit self-esteem might either indicate a motivational tendency to restore early positive self-evaluations (cf. Jordan, Spencer, Zanna, Hoshino-Browne, & Correll, 2003) or represent a buffer against experienced self-esteem threats (cf., Bosson, Brown, Zeigler-Hill, & Swann, 2003). It is noteworthy that most of these studies rely on single measurements of implicit self-esteem and do not take state fluctuations into account. Only two studies have previously investigated changes in implicit self-esteem in response to targeted manipulations with clinical populations (Franck et al., 2008; Gemar, Segal, Sagrati, & Kennedy, 2001). These studies compared implicit self-esteem between formerly depressed participants and never depressed controls before and after a negative mood induction. In both studies, the formerly depressed individuals' implicit self-esteem decreased significantly in response to the negative mood manipulation relative to controls which was due to higher implicit self-esteem before the mood induction. These findings emphasize the importance of explicitly manipulating the psychopathological mechanisms (here shape and weight concerns) in question when investigating the implicit self-esteem of clinical samples.

As hypothesized, restrained and unrestrained eaters' implicit self-esteem was differentially affected by the mirror exposure task that intended to increase the salience of body shape and weight. Thus, relative to unrestrained eaters, being confronted with one's body even has a different impact on restrained eaters' self-esteem on a rather spontaneous level. Interestingly, the direction of implicit self-esteem changes after the body image exposure task differed between groups: Whereas there was a nonsignificant decrease of implicit self-esteem in the restraint group, it significantly increased in the unrestraint group. One could speculate that the failure to find a significant decrease of implicit self-esteem in the restraint group could be due to their body related self schema being activated rather chronically, making acute activations less effective. Although a direct test of this idea is unavailable, indirect evidence supports this line of thinking: Restrained eaters' self-schemas center more around weight- and food-related concepts than those of non-restrained eaters (Morris et al., 2001). This implies that a very broad range of self relevant concepts would be able to activate restrained eaters' body schema while in unrestrained eaters this would only be the case for more circumscribed body related stimuli as, for example, a mirror task.

Unexpectedly, unrestrained eaters' implicit self-esteem did not remain stable but increased in response to the body exposure task (salience manipulation). Thus, associations between body shape and weight concerns on the one hand and implicit self-esteem on the other hand might represent a more general connection which is not unique to ED psychopathology. One might speculate that the level of body satisfaction or dissatisfaction determines the direction of implicit self-esteem changes after body exposure. The fact that our unrestraint group – being defined by scores at the lower end of the Restraint Scale – is particularly satisfied with their body shape and weight may explain the increase of their implicit self-esteem after body exposure as the confrontation with one's body is likely to influence women who are satisfied with their bodies in a positive way.

Although it was not the focus of our study, we also investigated explicit self-esteem changes after the body image exposure task as assessed subsequently to the self-esteem IAT. Interestingly, we did not find changes in state or trait measures of explicit self-esteem in both groups. Since our study primarily focused on implicit self-

esteem, we administered the self-esteem IAT, which takes approximately 10 to 15 minutes to complete, directly after the exposure task. Explicit self-esteem questionnaires were completed thereafter, possibly missing fleeting fluctuations in explicit self-esteem. This post-hoc explanation would be in line with Hilbert, et al. (2002). They investigated the effects of body image exposure in binge-eating disorder patients and found that appearance self-esteem decreased during body exposure in both patients and controls, but increased again during follow-up (five minutes later).

There are some notable limitations of the present study which need to be considered when interpreting the results. Firstly, our unrestraint group was an extreme group rather than a representative control group. In a group of unselected women, the confrontation with their bodies might lead to no change in implicit self-esteem or possibly even to a decrease (see Hilbert et al., 2002, for a similar finding on explicit self-esteem). Although it is common to use extreme groups when exploring aspects of psychopathology not studied before in order to decrease within-group heterogeneity and maximize group differences initially (Morris et al., 2001), future studies should compare at-risk samples with more representative control groups.

A second limitation was that we did not assess implicit and explicit self-esteem before and after body exposure in one session, but in two separate sessions. We decided upon this design as the IAT effect is known to decrease with repeated administrations (Nosek, Greenwald, & Banaji, 2007). Thus, we aimed to minimize effects of repeated IAT measures by not using multiple IATs in a single session. Nonetheless, this design limits interpretation as it remains unknown how implicit and explicit self-esteem changed between the two sessions. In order to be able to control for effects of prior experience with the IAT, future studies should include two control groups which repeat the IAT without being exposed to the salience manipulation. We are, however, still confident in the interpretations of our results as the implicit self-esteem of both groups showed different patterns after the exposure supporting the effect of the manipulation. In addition, it is unlikely that any influences between the two sessions would have affected the two groups differentially.

Thirdly, our manipulation check on state body image did not detect any changes from pre to post body exposure in either group. Instead, strong group differences before the exposure carried over to the post assessment which might be due to the anticipation of the task. A similar pre-exposure difference on negative emotions was found by Vocks et al. (2007) who investigated ED patients and healthy controls before and after body exposure.

Overall, this study provides first insight in implicit self-esteem and its link to body shape and weight concerns among restrained and unrestrained eaters: Activation of the body schema increased implicit self-esteem in unrestrained eaters while restrained eaters' implicit self-esteem decreased descriptively. Future research should explore in more detail what determines the direction of change in implicit self-esteem. Our results indicate that restrained eating status and/or initial level of body dissatisfaction might determine whether implicit self-esteem decreases or increases as a result of an activation of body schema.

Acknowledgments

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