

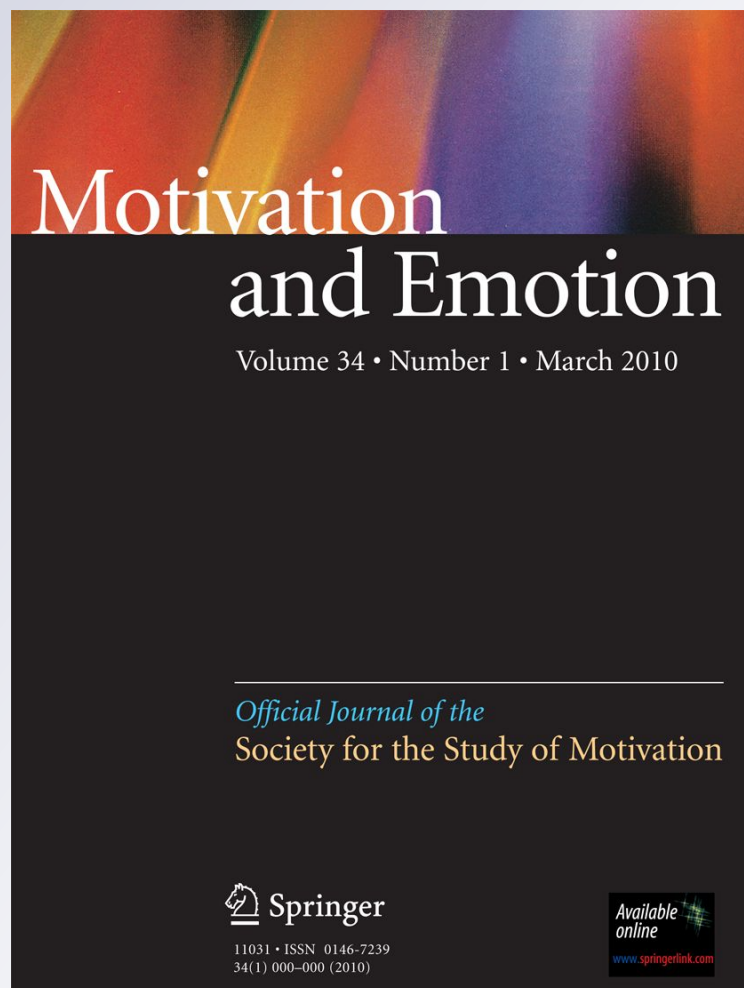
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Abstract In this study, we investigated the associations between body image and psychological well-being, exploring the mediating role of controlled regulation for entering obesity treatment. In addition, we analyzed whether investment body image was more strongly associated with controlled regulation (and subsequent well-being) compared to evaluative body image. These analyses were performed controlling for baseline BMI effects. Participants were 139 overweight women (age: 38.0 ± 6.7 year; BMI: 32.0 ± 4.1 kg/m²) entering treatment. Evaluative and investment body image, controlled regulation, and psychological well-being were assessed. Body image investment was positively associated with controlled regulation; evaluative body image was not. Controlled regulation was negatively associated with self-esteem and psychological functioning. Controlled regulation partially mediated the effects of body image investment on self-esteem, but did not mediate its effects on psychological functioning. Results suggest that dysfunctional body image investment might undermine well-being within overweight women, partly by increasing controlled regulation for entering obesity treatment. Discussion focuses on the

importance of enhancing body image and autonomy during treatment to improve well-being and weight outcomes.

Keywords Body image · Self-determination · Treatment Motivation · Well-being · Obesity

Introduction

Body-related concerns and dissatisfaction with the physique are becoming increasingly prevalent in Western societies (Cash 2002b). Due to the high emphasis modern culture places on the pursuit of a slim body-ideal, and to the existing stigmatization and discrimination towards obesity (Puhl and Heuer 2009), it is not surprising that many overweight people dislike their appearance and develop a negative body image (Cooper et al. 2003). Prior research has shown not only that obese individuals consistently differ from their non-obese counterparts regarding body image (Cash et al. 2004a; Stunkard and Wadden 1992), but also that those seeking weight loss treatment are the most affected, experiencing higher levels of appearance-related concerns and dissatisfaction (Cash 1993; Foster et al. 1997; Sarwer et al. 1998). This is particularly important given that body image problems seem to constitute an additional obstacle to successful weight management, predicting poorer outcomes and increasing chances of relapse (Cooper et al. 2003; Schwartz and Brownell 2002; Teixeira et al. 2002, 2004). Part of the explanation for these effects might come from the psychological suffering and distress frequently associated with negative body image (see Cash and Pruzinsky 2002). Thus, it is important to better understand the role of poor body image on the psychological functioning of obese individuals seeking treatment, and also to identify possible factors

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that might mediate this association. This will allow professionals to provide better care and develop more effective interventions.

One of these mediating factors might be motivational in nature. Ultra-slender body ideals are not only widely portrayed as highly important, but are difficult or nearly impossible to achieve (Dittmar 2007). This dissatisfaction, in turn, could be experienced as imposed pressure to lose weight, fostering controlled regulations for enrolling in weight loss treatment. A detrimental effect on psychological well-being is likely to follow. Self-determination theory (SDT; Deci and Ryan 1985, 2000) offers a motivational framework that may explain the relation between body image and well-being by proposing how controlled forms of regulation could be detrimental to psychological well-being. Therefore, the first main purpose of the present study is to investigate how SDT may contribute to the explanation of the associations between body image and psychological well-being, by exploring the mediating role of controlled regulation for enrolling in obesity treatment. The next section provides a definition of body image and evidence for its relation with well-being, followed by a brief description of SDT and some studies relating controlled regulations with body image or well-being. Finally, hypotheses are presented.

Body image and well-being

Body image is a multidimensional construct that refers to an individual's mental representation of body-related perceptions and attitudes (i.e., thoughts, feelings, and behaviors), especially focused on but not limited to physical appearance (Cash 2004). According to Cash et al. (2004b), body image attitudes consist of two sub-dimensions. Evaluative body image pertains to cognitive appraisals and associated emotions about one's appearance, including self-ideal discrepancies and body satisfaction-dissatisfaction evaluations. In contrast, investment body image refers to the cognitive-behavioral importance of appearance in one's personal life and sense of self, reflecting a dysfunctional investment in appearance, as opposed to more adaptive valuing and managing of one's appearance (Cash et al. 2004b). Further, this dimension comprises appearance-related self-schemas, that is, cognitive structures derived from past experience that summarize one's thoughts and beliefs about appearance and its centrality to one's self (Markus 1977; Stein 1996). These are thought to be actively triggered by appearance-related internal or environmental events and cues (Cash 2002a). The structure of attitudinal body image, especially the distinction between evaluative and cognitive-behavioral investment components, has been empirically supported (e.g., Cash 1994). Findings indicated that, although the optimal

prediction of poor/negative body image requires both evaluative and investment aspects of body image, the former is not sufficient per se to produce poor body image (Cash 1994).

Extensive previous research has established significant and substantial relations between body image attitudes and psychosocial functioning and well-being. A negative body image (i.e., body dissatisfaction and dysfunctional body image investment) can have adverse psychosocial consequences, including poor psychological adjustment, poor self-esteem, increased depression and anxiety, emotional instability, impaired sexual functioning, and inadequate eating and exercise behaviors (Cash and Pruzinsky 2002; Donaghue 2009; Grilo and Masheb 2005; Matz et al. 2002).

Research findings highlight the growing prevalence of a negative body image; however such discontent may vary in its impact on an individual's psychological well-being. For some individuals being dissatisfied with their body weight, or shape, or some facial feature, can have minimal or even benign implications; for others, the negative implications can be severe. Dysfunctional investment body image seems to have more adverse consequences to psychological well-being than evaluative body dissatisfaction, which per se is not considered a valid indicator of emotional distress and psychosocial impairment (Cash et al. 2004c). Indeed, prior studies have confirmed that dysfunctional investment in appearance considerably exceeds the contribution of body dissatisfaction to the prediction of psychosocial functioning (e.g., Cash et al. 2004b, c; Jakatdar et al. 2006). For example, Cash et al. (2004c) found that the Body Image Disturbance Questionnaire (an investment measure) predicted social anxiety, depressive symptoms, and eating disturbance, above and beyond a simple index of body dissatisfaction. In another study, Cash et al. (2004b) obtained similar results using a different measure of body image investment (the Appearance Schemas Inventory—revised). Jakatdar et al. (2006) also found that body image investment, measured as cognitive errors or distortions related to body image thoughts, predicted quality of life and disturbed eating attitudes above and beyond evaluative body image. This notwithstanding, much of the literature on body image has focused on the evaluative component, neglecting body image investment (Cash and Pruzinsky 2002). To fill this gap, in the present study we differentiated evaluative and dysfunctional investment components of body image in an attempt to further understand these constructs and their consequences for the psychological well-being of overweight and obese women.

Self-determination: Body image and well-being

Self-determination theory (SDT; Deci and Ryan 1985, 2000) proposes that individuals go through a natural

process of internalization in which they assimilate and attempt to transform social norms and demands into personally endorsed values and self-regulations. According to SDT, the regulation of behavior can take many forms corresponding to qualitatively different styles of behavioral regulation, that can be differentiated along a continuum of self-determination ranging from non self-determined or controlled forms of behavioral regulation (i.e., amotivation, external and introjected regulations) to self-determined or autonomous forms of behavioral regulation (i.e., identification, integration, and intrinsic motivation). Behaviors are autonomously regulated to the extent to which they are experienced as chosen and are personally relevant (e.g., entering weight loss treatment to improve health or because it is consistent with one's valued lifestyle). Conversely, behaviors are considered controlled when performed due to pressure or coercion, either by external or internal forces (e.g., entering weight loss treatment following a doctor's orders or to avoid feelings of guilt or shame).

SDT postulates that greater self-determination is associated with enhanced psychological functioning (Deci and Ryan 2000). Accordingly, when autonomous forms of regulation guide behavior, more adaptive behavioral, cognitive, and well-being outcomes are expected to ensue. In contrast, controlled forms of regulation are expected to result in maladaptive outcomes. Considerable evidence, conducted in several life domains, attests to the qualitative advantages of autonomous, relative to controlled, behavioral regulations, supporting this proposition (see Deci and Ryan 2000, 2008, for reviews). In summary, autonomous regulations are associated with higher self-esteem, increased life satisfaction, greater happiness and self-realization, and enhanced mental health, whereas controlled regulations undermine these outcomes.

From a SDT perspective, the sociocultural demands to conform to the ideal physique that result in high body dissatisfaction and investment could be experienced as controlling and overchallenging, fostering controlled regulations to engage in health-related behaviors. Prior studies, although in exercise contexts, have found consistent associations positively linking poor body image with non self-determined regulations (e.g., Markland 2009; Thøgersen-Ntoumani and Ntoumanis 2006, 2007), and lower levels of relative autonomy (Markland and Ingledew 2007). For example, Markland (2009) found that body self-ideal discrepancy (an evaluative measure) was positively correlated with amotivation and external regulation for exercise (r 's .30 and .20, $p < .05$, respectively), while Markland and Ingledew (2007) found positive correlations between body size discrepancies and both external and introjected regulations (r 's .47 and .55, $p < .01$, respectively). In a similar context, Thøgersen-Ntoumani and Ntoumanis (2006) found that social physique anxiety (a measure of body image

investment) was positively associated with external and introjected regulations (r .26, $p < .01$, for both). Finally, after testing a motivational model of regulation toward eating behaviors, Pelletier and Dion (2007) found that body dissatisfaction derived from the internalization of socio-cultural pressures and messages related to thinness was strongly associated with controlled regulations for eating. Furthermore, these authors showed that controlled regulations for eating led to worse psychological adjustment by promoting dysfunctional eating behaviors (Pelletier and Dion 2007). In the overweight and obese population, especially in women seeking obesity treatment, poor body image is highly prevalent due to the current sociocultural *milieu* (Cooper et al. 2003); thus, seeking weight loss for controlling body-related reasons is likely to be particularly salient and could provide a significant barrier to successful outcomes and ultimately to psychological well-being.

The distinct roles of evaluative and investment body image on controlled regulations has not been studied before. Considering the results from previous studies (e.g., Cash et al. 2004b) which showed more adverse consequences of body image investment on psychosocial functioning, this dimension might also present a greater influence on controlled motivation than evaluative body image. Moreover, prior research has shown that body dissatisfaction is not sufficient per se to produce poor body image (Cash 1994) or emotional distress and psychosocial impairment (Cash et al. 2004c). Thus it can be hypothesized that evaluative body image would be less strongly associated with controlled regulation for enrolling in obesity treatment and subsequent well-being.

Present study

The purpose of this study was to investigate the mediating role of controlled regulation for entering obesity treatment between body image and psychological well-being, by testing a three-level model in which body image (i.e., evaluative and dysfunctional investment components) would be associated with controlled regulation for engaging in obesity treatment, which in turn would be related to psychological well-being (see the top of Fig. 1). In addition, a second purpose of this study was to test the distinct role of investment and evaluative body image on controlled regulation and subsequent well-being.

The model tested included the following specific hypotheses. First, it was hypothesized that both components of body image would be positively associated with controlled regulation for enrolling in weight loss treatment; yet, dysfunctional body investment was expected to present stronger associations. Second, controlled regulation was expected to have a detrimental effect on psychological well-being (i.e., self-esteem and psychological functioning). Finally, it was hypothesized that controlled regulation

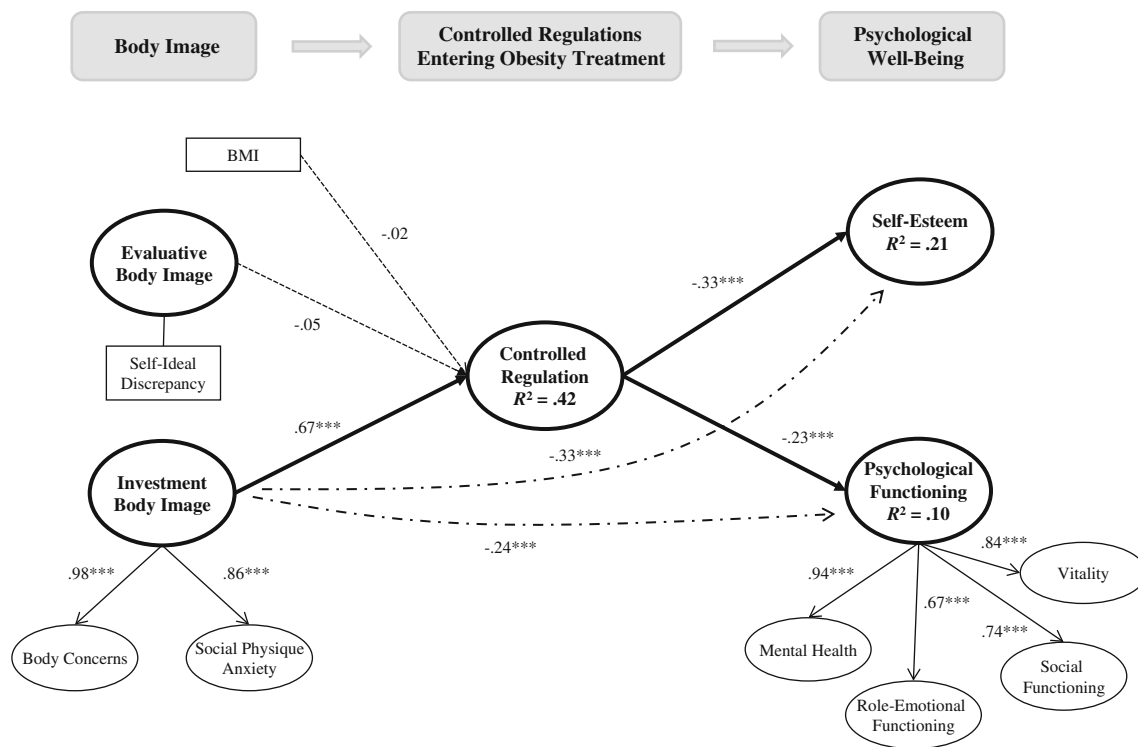


Fig. 1 Partial least squares model. Paths between latent variables inside bold circles represent the structural model. Remaining paths connect first-order and second-order (in bold) latent variables. Dashed

lines represent the significant indirect effects between distal latent variables. Values in the paths represent the PLS estimates; * $p < .05$; ** $p < .01$; *** $p < .001$

for engaging in obesity treatment would mediate both the associations between each body image component and psychological well-being. All analyses were performed controlling for baseline BMI.

Method

Design and participants

This was a cross-sectional study. Overweight and obese women were recruited from the community through web and media advertisements and announcement flyers to participate in a university-based behavioral weight management program. To be included, respondents had to fulfill the following criteria: to be between 25 and 50 years old, pre-menopausal, with a BMI between 25 and 40 kg/m²; be willing to attend weekly meetings (during 1 year) and be tested regularly (during 3 years); be free from major illnesses and not taking medication known to interfere with weight regulation. Of the 481 women who met the inclusion criteria, 258 women completed initial assessments. Nineteen women were subsequently excluded from all analyses because they started taking medicine susceptible to affect weight ($n = 10$), or because they were diagnosed with serious chronic disease or severe illness/injury

($n = 4$). Others were excluded due to pregnancy ($n = 2$) or because they entered menopause ($n = 3$). These 19 women were of similar age ($p = .575$) and BMI ($p = .418$) to the 239 who were considered as the initial valid sample. These participants were between 23 and 50 years old (37.6 ± 7.1 years), overweight or mildly obese (BMI: 31.5 ± 4.1 kg/m²); 67% had at least some college education, 23% had 10–12 years of school, and 10% had less than 10 years of school; 32% of the women were unmarried, 56% married, and 12% divorced or widowed.

Participants entered the program in three annual cohorts; however, the first cohort ($n = 96$) did not complete all measurements analyzed herein and was not included. After listwise deletion of missing data, the effective sample size considered for the present study was 139. The mean age was 38.0 (SD 6.7 years) and the mean BMI was 32.0 (SD 4.1 kg/m²). T-tests comparing the valid dataset group vs. the missing dataset group were performed. Concerning the main demographic characteristics (e.g. age, BMI) and all body image measures included in this study, no significant differences were found between the two groups ($p > .05$), which suggests analyses should likely yield unbiased parameter estimates (Schafer and Graham 2002).

The broader purpose of this study was to understand the associations between body image and psychological well-being at the start of a weight management intervention.

Hence, the present analyses were performed using data from baseline assessments.

Measures

Body image

Several psychometric instruments recommended in the literature (Thompson 1996) were used to assess the evaluation and investment dimensions of body image attitudes. Regarding the evaluative component, the Figure Rating Scale (FRS; Stunkard et al. 1983) was used to measure self-ideal discrepancy. The scale comprises a set of 9 silhouettes of increasing body size, numbered from 1 (very thin) to 9 (very heavy), from which respondents are asked to indicate the figure they believed represented their current (i.e., perceived body size) and ideal body size. Self-ideal discrepancy was calculated by subtracting the score for ideal body size from the perceived body size score. Higher values indicate higher discrepancies.

Dysfunctional investment in appearance was represented by a higher-order variable, reflecting an over-preoccupation with weight and shape, their antecedents and consequences, and also an overconcern for how others judge our appearance and the subsequent social impairment. The Body Shape Questionnaire (BSQ; Cooper et al. 1987; Rosen et al. 1996), a 34-item instrument scored on a 6-point Likert-type scale (from 'never' to 'always'), was developed to measure concern about body weight and shape, in particular the experience of "feeling fat" (e.g., "Has being naked, such as when taking a bath, made you feel fat?"), together with the assessment of their antecedents (e.g., "eating sweets, cakes, or other high calorie food made you feel fat") and behavioral consequences (e.g., "Has thinking about your shape interfered with your ability to concentrate?", "Have you avoided wearing clothes that make you aware of your body?"). Higher values represent greater body shape concerns and, thus, greater salience of body image in one's personal life. The Social Physique Anxiety Scale (SPAS; Hart et al. 1989) was used to measure the degree to which people become anxious and concerned when others observe or evaluate their physiques, thereby reflecting the attentional focus on one's appearance. This scale assesses body image affective, cognitive, and behavioral avoidant features in a social environment, comprising 12 items (e.g., "Unattractive features of my physique make me nervous in certain social settings") rated on a 5-point Likert-type scale (from 'not at all' to 'extremely'). Items 1, 5, 8, and 11 are reversed scored. These measures do not evaluate appearance self-schemas, a core facet of investment body image, but do tap into the other facets of this dimension—disturbed thoughts, emotions, and behaviors—which also reflect the attentional,

cognitive, and behavioral salience of appearance in one's personal life and sense of self.

Controlled regulation

Controlled regulation for entering obesity treatment was measured with the Treatment Self-Regulations Questionnaire (TSRQ; Williams et al. 1996), an 18-item scale designed to assess reasons for entering a weight loss program, and thus to assess the degree to which a person's motivation is autonomous or controlled. The instrument has two subscales, autonomous and controlled, and it presents participants with items such as: "I want others to see that I am really trying to lose weight" for more controlled reasons, and "It's important to me that my efforts succeed" for more autonomous reasons. Each reason is rated on a 7-point Likert-type scale. Considering the goals of the present study, only the controlled subscale was used. The internal consistency found in the present study for this subscale was acceptable (see "Results").

Psychological well-being

To evaluate psychological well-being, five measures were used: self-esteem, mental health, role-emotional functioning, social functioning, and vitality. Self-esteem, expressing the value or worth individuals attach to themselves, was assessed with the Rosenberg Self-Esteem Scale (RSES; Rosenberg 1965), a 10-item instrument answered on a 4-point Likert-type scale. Some items refer to negatively worded feelings of self-worth or self-acceptance and are consequently reverse scored. The other four measures of psychological well-being were assessed with the SF-36 (Ware and Sherbourne 1992). This instrument consists of a multi-item scale that assesses eight health concepts, of which four refer to psychological health: general mental health (psychological distress and well-being), role limitations due to emotional problems (role-emotional functioning), limitations in social activities because of physical or emotional problems (social functioning), and vitality (energy and fatigue). These four measures were modeled as first-order components of a higher-order latent variable named psychological functioning and reflecting general mental health.

Anthropometry

Measurements took place in the laboratory and were performed in the morning, after fasting for a minimum of 3 h. Body weight was measured twice, using an electronic scale calibrated onsite and accurate to 0.1 kg (SECA, Hamburg, Germany). Vertex height was measured with a balance-mounted stadiometer to the nearest 0.1 cm. Body mass

index (BMI) was calculated from weight (kg) and height (m).

Analytical procedure

Model testing was performed using partial least squares (PLS) analysis with the SmartPLS Version 2.0 (M3) software (Ringle et al. 2005). PLS is a prediction-oriented structural equation modeling approach that estimates path models involving latent (i.e., unobservable) variables indirectly measured by a block of observable indicators. PLS uses a partial least squares estimation method to produce factor loadings for each latent variable's block of indicators, as well as standardized regression coefficients for the structural paths linking latent variables. Three reasons justify the use of PLS in this study. First, PLS is especially suitable for prediction purposes (Fornell and Bookstein 1982), since it explicitly estimates the latent variables as exact linear aggregates of their respective observed indicators. Second, PLS uses non-parametric procedures making no restrictive assumptions about the distributions of the data while estimating parameters (Frank and Miller 1992). Third, in comparison to the covariance-based approach to latent variable modeling, PLS is appropriate for use with small sample sizes (Chin 1998), due to the partial nature of the estimation procedure, with only one part of the model being estimated at each time. According to Chin and Newsted (1999), sample size for PLS analysis should be estimated by conducting a power analysis based on the largest portion of the model (i.e., the portion with the dependent latent variable with the largest number of predictors). For the model tested here this was three predictors. With a medium effect size (Cohen's $f^2 = .15$), a sample size of 76 would be required to detect significant effects at the .05 level with power = .80 (Cohen 1988).

The PLS model was analyzed in two stages, following Hulland's (1999) recommendations. In the first stage, the measurement model was tested (i.e., the relationships between latent variables and their indicators), and secondly, the structural paths were evaluated (i.e., the theoretical relationships among latent variables). PLS path modeling lacks indices comparable to those available in covariance-based SEM that allow for a global assessment of model fit. Instead, in PLS model evaluation relies on an examination of the reliability, convergent and discriminant validity of the measurement model and the predictive capacity of the structural model. To test the measurement model: (1) item reliability was assessed by checking the loadings of the items on their respective latent variables. (2) The internal consistency of each scale was assessed by examining their composite reliability (CR), a coefficient that is considered superior to Cronbach's alpha because it does not assume equal weightings of items (Fornell and

Larcker 1981). A CR of .70 or higher represents acceptable internal consistency, according to Fornell and Larcker (1981). (3) Convergent and discriminant validity were assessed by examining the average variance extracted (AVE), that is, the average variance explained in a block of indicators by its latent variable. Convergent validity exists when the latent variable explains on average 50% or more of the variance in its indicators, that is, when the AVE is at least .50 (Fornell and Larcker 1981). Discriminant validity between latent variables is satisfied when a construct shares more variance with its indicators than it shares with other latent variables in a given model, that is to say, when a latent variable's AVE is greater than its squared bivariate correlation with any other latent variable (Fornell and Larcker 1981).

To test the structural model, the standardized path coefficients (β) and the variance explained in the endogenous variables (R^2) were examined. SmartPLS does not provide significance tests for the R^2 values for dependent latent variables. Therefore, the effect sizes of the R^2 values [Cohen's $f^2 = R^2/(1 - R^2)$] were calculated to determine whether the amount of variance explained was negligible ($f^2 < .02$), small ($f^2 \geq .02$), medium ($f^2 \geq .15$), or large ($f^2 \geq .35$; Cohen 1988). Given that SmartPLS does not make data distribution assumptions, a bootstrapping procedure is used to assess the significance of the parameter estimates. In the present analyses 5,000 bootstrap samples with replacement were requested. To test the difference in the path coefficients for evaluative and investment body image, the method described by Maruyama (1998) by which a t -score is calculated for the difference in coefficients [$t = (b_1 - b_2)/((SE_1^2 + SE_2^2)^{0.5})$] was adopted.

Tests of mediation were conducted where there were significant intervening paths between distal variables. Full mediation is present when a significant direct effect in the absence of the intervening variable (C path) becomes non-significant in its presence (C' path), and there is a significant indirect effect. Partial mediation is present when the C' path is reduced but remains significant and there is a significant indirect effect (Baron and Kenny 1986). According to Shrout and Bolger (2002), it is useful to consider also the strength of the mediating effects. Hence, the ratio of the indirect effect to the direct effect (i.e., the proportion of the total effect explained by the indirect effect) was also calculated.

Results

Measurement model

PLS path analysis showed that some observed indicators had low factor loadings ($< .40$). In general, items with

loadings of less than .40 (a threshold commonly used in factor analysis) should be dropped (Hulland 1999). However, to keep the integrity of the constructs/scales used in this study, and to facilitate comparisons with the prior literature, all items were retained. Factor loadings for all the indicators included in the model are available from the first author on request. Table 1 shows the CRs, AVEs, and correlations among the latent variables. Composite reliabilities (CRs) for all scales were greater than .70, suggesting an acceptable internal consistency. The average variance extracted (AVE) was below acceptable levels for body-shape concerns, self-esteem and controlled regulation (.34 to .44). The other variables showed acceptable AVEs (.50 or larger). Regarding the assessment of discriminant validity, an examination of first-order latent variables' relationships showed that AVEs for each latent variable were greater than the squared bivariate correlations with all the other latent variables, with the exception of the associations between controlled regulation, body concerns and social physique anxiety. However, an inspection of the cross-loadings between these variables showed they were not substantial in magnitude compared to each variable's respective loadings, providing some support for discriminant validity (Hulland 1999). As expected, because the lower-order variables were modelled as indicators of their higher-order LV's, AVEs for each lower-order LV were below the squared bivariate correlations between lower and higher-order variables. Thus this was not problematic. Taken together, these findings suggest that the measurement model had acceptable internal consistency, although the convergent validity and discriminant validity were limited. Nevertheless, it should be noted that although elimination of poor items improved the measurement model properties, it led to no substantive differences in the structural relations between the latent variables (results not presented).

Structural model

Figure 1 shows the structural model, including the PLS bootstrap estimates for the structural paths, the variance accounted for in the dependent variables (R^2), and the loadings of first order latent variables on their second-order variables for investment and psychological functioning. The model explained between 10 and 42% of the variance in the dependent variables. Effect size was small for psychological functioning ($f^2 = .11$) and medium for self-esteem ($f^2 = .29$). Large amounts of variance were explained in controlled regulation ($f^2 = .90$).

Regarding the structural paths linking body image components to controlled regulation for entering obesity treatment, results show that only the path between body image investment and controlled regulation was

Table 1 Composite reliability (CR), average variance extracted (AVE) and correlations among factors in the measurement model

Factor	Correlations										
	CR	AVE	1	2	3	4	5	6	7	8	9
1. BMI	1	1	–								
2. Evaluative body image	1	1	.46***	–							
3. Investment BI	.92	.96	.12	.27**	–						
4. Body concerns	.37	.95	.12	.25**	.98***	–					
5. Social physique anxiety	.46	.90	.11	.24**	.86***	.73***	–				
6. Controlled regulations	.34	.85	.04	.12	.65***	.61***	.59***	–			
7. Self-esteem	.44	.88	.06	–.13	–.51***	–.50***	–.45***	–.46***	–		
8. Psychological functioning	.80	.92	–.02	–.14	–.45***	–.43***	–.40***	–.32***	.56***	–	
9. Mental health	.69	.92	.00	–.11	–.44***	–.42***	–.40***	–.28***	.56***	.94***	–
10. Role-emotional functioning	.67	.86	.03	–.07	–.23**	–.23**	–.17*	–.28***	.42***	.67***	.49***
11. Social functioning	.71	.83	.04	–.06	–.41***	–.40***	–.37***	–.32***	.43***	.74***	.62***
12. Vitality	.64	.88	–.09	–.17*	–.36***	–.34***	–.33***	–.20*	.36***	.84***	.73***

N = 139

* $p < .05$; ** $p < .01$; *** $p < .001$

significant. Evaluative body image was not associated with controlled regulation. These results were observed controlling for the effects of baseline BMI. Regarding the paths between controlled regulation and psychological well-being, controlled regulation presented significant negative associations with both self-esteem and psychological functioning.

Figure 1 also shows the significant indirect effects between distal independent and dependent variables within the structural model. Dysfunctional body image investment had significant indirect effects on self-esteem and psychological functioning. However, evaluative body image did not have significant indirect effects on the dependent variables. These findings were also independent of participants' baseline BMI.

Tests of mediation were performed only for the significant indirect paths (see Table 2), and were also controlled for baseline body weight. Results show that the indirect effect of body image investment on self-esteem was significant ($p < 0.05$), while the direct effect of investment on self-esteem (C path) decreased but remained significant when in the presence of the mediator (C' path; $p < .001$). Thus, controlled regulation partially mediated this relationship (effect ratio .27). In contrast, no mediation was found for the association between body image investment and psychological functioning. Specifically, when the direct path from dysfunctional investment to psychological functioning was added to the model, the indirect path via the mediator (i.e., controlled regulation) was no longer significant.

Finally, we had intended to determine whether the effects of dysfunctional investment in appearance on controlled regulation for enrolling in obesity treatment were stronger than the effects of evaluative body image. Since the path between evaluative body image and controlled regulation was not significant, a test of the difference in the path coefficients for evaluative and investment body image would be redundant. In face of these results, it is clear that the effect of investment body image was ipso facto stronger.

Discussion

Many overweight people dislike their appearance and develop a negative body image (Z. Cooper et al. 2003). Concomitantly, there is a growing body of research reporting on body image problems amongst the obese and on associated consequences for psychological functioning and weight management (e.g., Cash and Pruzinsky 2002). However, very few studies have specifically focused on determining mediators of the relationships between poor body image and psychological suffering and distress. The sociocultural pressures to achieve a slim-body ideal, which can lead to poor body image (e.g., Stice 2002), could be experienced as imposed pressure to lose weight, fostering controlled regulations for enrolling in weight loss treatment, and in turn, undermining psychological well-being. In the current study, we tested a three-level model to explore the mediating role of controlled regulation for enrolling in weight loss treatment between body image and well-being. Further, we distinguished body image dimensions, seeking to investigate whether dysfunctional investment was more strongly related than evaluative body image to controlled regulation and subsequent psychological well-being. Body weight effects were controlled for by including baseline BMI in the model.

The conceptualized paths within the structural model were generally supported by the study's findings, accounting for a substantial portion of the variance in controlled regulation and self-esteem. However, the study predictions were only partially supported. Specifically, results revealed that body image investment was positively associated with controlled regulation for enrolling in obesity treatment, but failed to show significant associations for evaluative body image. As expected, controlled regulation for entering treatment was negatively associated with psychological outcomes. Results showed significant indirect effects of dysfunctional body image investment on both psychological outcomes and controlled regulation partially mediated the association between investment and self-esteem. In contrast, results did not show significant

Table 2 Tests of mediation for the significant indirect effects identified in the structural model, adjusting for BMI

Relationship		Indirect effect (ab path)		Total effect (C path)		Direct effect ^a (C' path)		Effect ratio
From	To	PLS estimate	Bootstrap estimate	PLS estimate	Bootstrap estimate	PLS estimate	Bootstrap estimate	
Investment Body image	Self-Esteem	-.12	-.14*	-.53	.54***	-.40	-.40***	.27
Investment Body image	Psychological Functioning	.03	.04	-.46	.46***	-.43	-.42***	.09

$N = 139$

* $p < .05$; ** $p < .01$; *** $p < .001$

^a Direct effect controlling for the mediator

associations between evaluative body image and controlled regulation and psychological outcomes. These results suggest that the investment dimension of body image is more detrimental to the psychological well-being of overweight and obese women, partly by encouraging the adoption of controlled regulation for enrolling in obesity treatment. Results also suggest the existence of a direct and independent association between dysfunctional investment in appearance and psychological functioning, given that no mediating effects were found. These findings were independent of participants' baseline body weight.

The absence of significant associations between evaluative body image (measured as self-ideal discrepancy) and controlled regulation partially contradicts previous findings (Markland 2009; Markland and Ingledew 2007). For example, in Markland's study (2009), body image discrepancies were positively related to external regulation but not related to introjections, suggesting different associations for different types of controlled regulations. Methodological differences (e.g., sample, measurements) could help explain, at least in part, the discrepancies in these results. In Markland (2009), the sample was composed of healthy weight women recruited from a worksite and church community and specific forms of regulation for exercise participation were (separately) measured. In the current study, the sample was composed of overweight women seeking weight loss, and controlled regulations for entering treatment were evaluated, with an undifferentiated, composite score.

The present findings provide empirical support for the contention that a high level of dysfunctional investment in appearance rather than body dissatisfaction is more likely to encourage the adoption of controlled regulations to lose weight, and subsequently contribute to worsened psychological well-being. We observed a strong association between body image investment and controlled regulation (large f^2). Further, it was hypothesized that dysfunctional body image investment would be more strongly related to controlled regulation for entering treatment than evaluative body image. Given the absence of associations between evaluative body image and controlled regulation, this was ipso facto the case. Appearance-related self-schemas, a nuclear facet of body image investment that was not assessed in the present study, might help understand these findings. These cognitive structures "reflect one's core, affect-laden assumptions or beliefs about the importance and influence of one's appearance in life, including the centrality of appearance to one's sense of self" (Cash 2002a; pp. 42). Appearance self-schemas derive from one's personal and social experiences (Stein 1996), and are activated by and used to process self-relevant events and cues (Cash 2002a). According to Cash's cognitive-behavioral perspective (2002a), the resultant body image

thoughts and emotions, in turn, prompt adjustive, self-regulatory activities (2004). Results from this study seem to suggest that seeking weight loss treatment for controlled reasons might be one of these self-regulatory activities.

As predicted, controlled motivation for entering a weight management program was associated with decreased psychological well-being. This finding is not only consistent with SDT theoretical premises and prior SDT research in several domains (see Deci and Ryan 2000, 2008, for reviews) but, more importantly, it suggests that when overweight women enter into treatment for controlled reasons, it may be related to poor psychological adjustment—including low self-esteem, reduced life satisfaction, symptoms of depression and helplessness (e.g., Georgiadis et al. 2006; Pelletier et al. 2004)—that predisposes them to less successful outcomes (e.g., Teixeira et al. 2010). Thus, this is a risk factor clinicians should consider in their practice when evaluating patients' readiness to lose weight.

Results revealed that the pathway connecting body image investment to self esteem was in part mediated by controlled reasons for entering treatment. On the other hand, investment had only a direct relationship with psychological functioning. These findings suggest that the associations between dysfunctional investment in appearance and different psychological outcomes may be explained by distinct processes. According to SDT when one's self esteem is contingent on positive regard from others, one is prone to more controlled regulation of behavior (Ryan and Brown 2003). This in turn leaves one susceptible to external social pressures. In the context of entering a weight loss program, participants' self esteem may be associated with controlled motivation because it is dependent upon reaching socially imposed standards about the ideal appearance. In contrast, the individual's general psychological functioning in everyday life and work-related activities (as measured by the SF-36; Ware and Sherbourne 1992) may be less dependent upon such context-specific motivation. Future research should explore this hypothesis further.

Previous studies (Cuntz et al. 2001; Linde et al. 2004; Williams et al. 1996) suggest that being regulated by controlled reasons to lose weight and presenting poorer psychological profiles predict poorer weight outcomes and lower treatment adherence. In this context, some practical implications can be drawn from our findings. First, when implementing interventions, health professionals would do well to consider the reasons regulating people's engagement in obesity treatment. Self-determination theory suggests that by maximizing patients' experience of autonomy, competence, and relatedness in health-care settings, the regulation of health-related behaviors is more likely to be internalized, behavior change will be better maintained

(Silva et al. 2011; Williams et al. 1998), and greater psychological well-being will be experienced (Deci and Ryan 2008). Hence, health professionals should also consider the inclusion of strategies to promote autonomy and reduce controlled regulations when implementing weight management interventions (Silva et al. 2008, 2010). Specifically, interventions should be designed in order to provide structure and create an autonomy-supportive environment. Additionally, we believe interventions would benefit from including strategies to work on the investment component of body image, by encouraging individuals to question and gradually deconstruct their beliefs, interpretations, and thoughts about the importance of appearance in their lives and sense of self. Improving body image, body satisfaction and acceptance might progressively reduce controlled body-related motives to lose weight, favoring the adoption of more autonomous regulations, and consequently facilitate well-being and long-term health behavior adherence and weight maintenance.

The study has a number of limitations. First, it was cross-sectional in nature and we cannot exclude the possibility of an alternative causal ordering of the observed relationships, where regulations are not mediators, but might lead people to internalize social pressures to a lesser extent, or have independent effects on well-being. This would imply a causal effect of controlled regulation on body image and psychological well-being rather than a mediating effect. Future longitudinal studies could help elucidate the causal directionality of these relationships. Second, we investigated a particular population in this study, overweight women seeking obesity treatment. Thus, these results cannot be generalized to the overall overweight and obese population, or to the general population. Third, the psychometric instruments used herein to measure investment body image were only able to capture some facets of this construct, the over-preoccupation with body image and appearance and its behavioral consequences, failing to capture a core facet of body image investment, the appearance-related self-schemas. Future studies should confirm the study's findings by measuring body image investment with comprehensive, empirically validated instruments, able to capture the meaning and significance of one's physical appearance for one's sense of self and self-worth (i.e., appearance-related self-schemas). Finally, to keep the integrity of all the constructs included in the model, we retained low-reliability items within the measures of body-shape concerns, controlled regulation, and self-esteem. As recommended by Hulland (1999), these findings should be interpreted with caution, given that low-reliability items can attenuate the estimated relationships between constructs. Nevertheless, an additional evaluation of the model after eliminating these poor items

led to no substantive differences in the structural relations, offering greater confidence to the present findings.

In conclusion, this study builds on previous research findings (e.g., Markland and Ingledew 2007; Pelletier and Dion 2007; Ratelle et al. 2004), integrating them in a model of psychological well-being and for the first time extending them into the context of obesity treatment. A strength of the current study is the discrimination between evaluative and investment dimensions of body image, which allowed the opportunity to shed some light into the different motivational and psychological consequences of each component in overweight participants. These results are largely in line with prior research, highlighting the importance of dysfunctional investment in appearance, rather than body dissatisfaction, for psychological well-being. Body dissatisfaction is important, but the salience or meaning of appearance to one's personal self may be pivotal. Additionally, these findings extend the existing data by showing that controlled regulations might be one of the mechanisms behind the detrimental effect of poor body image on psychological well-being (specifically on self-esteem). Future work should explore these findings using longitudinal designs and using psychometric instruments more able to capture the whole body image investment dimension.

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