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**Motivation and Emotion**

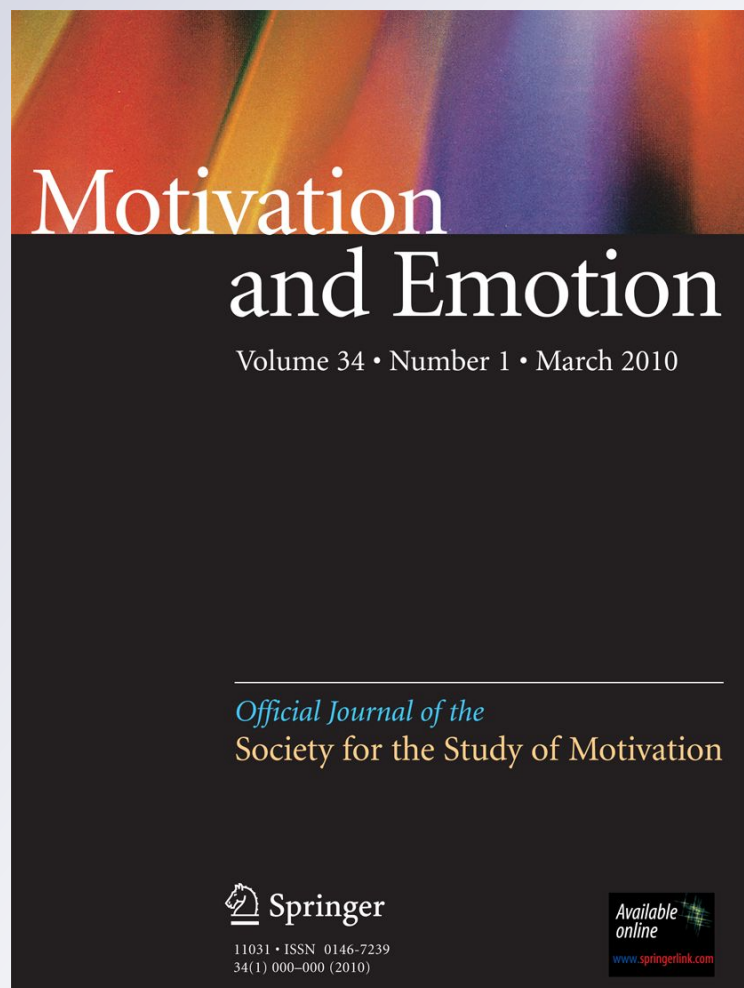
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# When feeling attractive matters too much to women: A process underpinning the relation between psychological need satisfaction and unhealthy weight control behaviors

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**Abstract** This study examined a process model linking psychological need satisfaction to unhealthy weight control behaviors. Female University students ( $N = 220$ ;  $M$  age = 20.47;  $SD = 5.07$ ) completed questionnaires measuring need satisfaction, appearance-contingent self-worth, weight-related appearance anxiety and unhealthy weight control behaviors. Structural equation modeling revealed that need satisfaction indirectly related to engagement in unhealthy weight control behaviors through appearance-contingent self-worth and weight-related appearance anxiety. The results indicate that appearance-contingent self-worth might help to explain how low levels of psychological need satisfaction are related to maladaptive weight-related outcomes in young women.

**Keywords** Appearance-contingent self-worth · Appearance anxiety · Disordered eating · Self-determination theory

## Introduction

Appearance and looks have become central foci in an increasingly image-oriented society, especially among young females. Having the right “look” (characterized by a

lean, slender physique) is highly desirable and is an indicator of social status (Coie et al. 1983). However, standards of ‘ideal appearance’ are becoming increasingly unrealistic and difficult to attain. As a consequence, many young women are dissatisfied with their appearance even if they are normal- or under-weight (Cash and Henry 1995). In turn, body appearance concerns have negative repercussions for individual health and psycho-social functioning as such concerns have been associated with excessive dieting (Stice et al. 1998), other disordered eating behaviors (Thompson et al. 1995), lower self-esteem (Furnham et al. 2002), and depression (Tiggemann 1997). The purpose of this study is to examine a process model that tests direct and indirect relationships between psychological variables and unhealthy weight control behaviors in a sample of young adult females. In this section we review current work on proximal predictors of such behaviors and subsequently argue how basic needs theory (Deci and Ryan 2000) can be utilized to investigate distal underlying psychological mechanisms that foster versus undermine personal growth and development and can lead to appearance contingencies and insecurities as well as unhealthy weight control behaviors.

Excessive dieting and unhealthy weight control behaviors are fairly common practices among college-aged females. One study identified that 82% of females reported using at least one dieting behavior daily (e.g., eating low calorie diets or skipping meals), with 19% indicating that they used more extreme weight control practices at least once a month, such as laxatives and vomiting to lose weight (Mintz and Betz 1988). More recently, a US survey indicated that up to 10% of college females reported vomiting, taking laxatives or taking diet pills within the previous month as a means of losing weight (Wharton et al. 2008).

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### Appearance-contingent self-worth

Given the negative repercussions and connotations of perceived lack of attractiveness in women, it is perhaps not surprising that many young women engage in unhealthy weight control behaviors. These women come to base their sense of self-worth on how well they think they live up to externally-defined beauty standards and ideals (Sanchez and Crocker 2005). Such self-worth is contingent and needs to be continually validated by other people. Thus, the individual feels worthwhile only when she is admired or respected by others with regard to her physical attractiveness (Crocker 2002). While such positive regard can increase levels of positive emotions momentarily (Pyszczynski et al. 2004), contingent areas of the self are prone to fluctuations. This is because any rejections and failures in the domain of contingency is damaging to self-worth (Crocker et al. 2003a) and may lead to chronic anxiety specific to that domain. Thus, we suggest (and test in this study) that someone whose self-worth is to a large extent contingent on meeting cultural appearance ideals is likely to be chronically anxious about her appearance being negatively evaluated. This person will be more likely to engage in unhealthy weight control behaviors that might help her approximate externally-defined beauty ideals and standards.

Previous research supports the aforementioned arguments. For example, in a sample of college students, Crocker et al. (2003a) found that, after controlling for the effects of disordered eating in the first semester and a range of potential confounders (such as demographic and personality variables), appearance-contingent self-worth significantly predicted disordered eating in the second semester. Further, in a longitudinal study also spanning one college semester, Sanchez and Crocker (2005) showed that students striving to resemble ideal appearance standards reported greater external contingencies of self-worth. The latter was in turn related to higher levels of disordered eating symptomatology and lower levels of self-esteem. Similarly, Grossbard, Lee, Neighbors and Larimer (2009) found that for female college students external contingencies was a good predictor ( $\beta = .45$ ) of weight concerns, after controlling for Body Mass Index (BMI).

The aforementioned studies suggest that contingent self-worth may act as a risk factor in the development of body appearance concerns and unhealthy eating behaviors. However, both Sanchez and Crocker (2005) and Grossbard et al. (2009) examined *general* external contingencies rather than those within specific domains. We take the position that the role of contingencies that are specific to appearance should be more closely associated with body appearance concerns and unhealthy weight control behaviors than general external contingencies. Our position echoes that of Strahan et al. (2008) who similarly argued that research examining the

impact of socio-cultural norms for appearance on body image-related outcomes should focus on appearance-related contingencies. This argument is conceptually grounded in that success and failure in personally valued domains are more likely to influence self-worth than outcomes in domains that are less pertinent to the individual (Kernis 2003).

### Weight-related appearance anxiety

Body dissatisfaction is considered one of the major risk factors in the development of eating pathology (Stice and Shaw 2002) and as such this variable has received a large amount of research attention. However, Stice (2002) argued for the examination of less established risk factors. One such risk factor could be appearance anxiety. Limited evidence suggests that weight-related appearance anxiety (e.g., anxiety about hips, waist or about generally appearing overweight) explains unique variance in eating disturbance beyond the effect of established risk factors such as body dissatisfaction (Reed et al. 1991). In examining the relationship between dispositional (or trait) levels of weight-related appearance anxiety and eating disturbance, Reed et al. also found support for the ability of this affective construct to distinguish between individuals with high versus low levels of eating disturbance. In our process model, weight-related appearance anxiety is proposed as a direct predictor of unhealthy weight-control behaviors.

Contingent self-worth and weight-related appearance anxiety are proximal predictors of unhealthy weight control behaviors. However, it is not clear why certain individuals are likely to base their self-worth on appearance contingencies and feel more anxious about their body appearance. Thus, it is important to examine distal but underlying psychological mechanisms that foster versus undermine personal growth and development and can lead to appearance contingencies, feelings of insecurity about appearance and unhealthy weight control behaviors. To this end, the purpose of the present study is to extend current literature by utilizing basic needs theory, one of the mini-theories of self-determination theory (SDT; Deci and Ryan 2000), to provide an account of such deeper psychological factors.

### Basic psychological need satisfaction

According to basic needs theory, people strive to fulfill three basic psychological needs, those for competence, autonomy (self-determination) and relatedness. These needs are global, complimentary, innate and essential for optimal human functioning, so that none can be thwarted without significant negative consequences (Deci and Ryan 2000). When these needs are satisfied, individuals experience a wide range of positive outcomes (e.g., more adaptive motivation, increased well-being) in different life

domains (Vallerand 1997). For example, in the health domain need satisfaction has been associated with exercise behavior (Edmunds et al. 2008), glycemic control in diabetic patients (Williams et al. 2005) and oral health behaviors such as brushing and flossing (e.g., Halvari and Halvari 2006). More recently, SDT has also been used as a theoretical framework to understand engagement in health risk behaviors, such as the use of alcohol, tobacco and marijuana (Neighbors et al. 2007; Williams et al. 2000). Deci and Ryan (2000) suggested that lack of psychological need satisfaction in one's life can lead to psychological ill-being and the development of compensatory rigid or self-defeating behaviors. One such behavior is the struggle for body control which is often manifested in body appearance concerns and unhealthy weight control behaviors.

Empirical research supports the link between psychological needs and struggle for body control. Women's global levels of autonomy appear to protect against body image pressures (Pelletier and Dion 2007) and have been negatively associated with bulimic behaviors (Pelletier et al. 2004). Further, autonomy need satisfaction negatively predicted body appearance concerns (i.e., body dissatisfaction and drive for thinness) in a sample of (mainly female) aerobics instructors (Thøgersen-Ntoumani and Ntoumanis 2007). Lastly, Thøgersen-Ntoumani et al. (2010) found an indirect link between composite psychological need satisfaction (indexed by all three needs) and unhealthy weight control behaviors via body image concerns. Although such evidence is cross-sectional, it suggests the possibility that perceptions of ownership over one's life may be important in protecting against the development of body appearance concerns and unhealthy weight control behaviors.

It is likely that psychological need satisfaction might be indirectly and negatively associated with body image concerns and unhealthy weight control behaviors through appearance-contingent self-worth. According to SDT, basic need satisfaction facilitates the development of non-contingent self-esteem, also referred to as genuine or true self-esteem (Deci and Ryan 1995; Reis et al. 2000; Ryan and Deci 2004). However, when individuals feel lack of competence, relatedness and autonomy in their lives, they are more likely to compensate by developing need substitutes (Deci and Ryan 2000), for example, by gaining approval or a sense of self-worth from pursuing image-related goals. Thus, low psychological need satisfaction may lead to the development of contingent self-worth. Kernis, Paradise, Whitaker, Wheatman, and Goldman (2000) have offered indirect evidence for this hypothesis by showing that unstable self-esteem is related to less self-determined personal strivings in university students compared to stable self-esteem.

While previous research adopting an SDT framework in examining the role of need satisfaction to body-image

related outcomes has largely examined the role of each of the individual needs in predicting such outcomes, Deci and Ryan (2000) suggest that the three needs are complementary. As such, Hagger et al. (2006a) provided evidence to demonstrate the existence of a higher-order factor of psychological need satisfaction. This highlights the potential use of a composite measure of need satisfaction, an approach which has been previously been adopted in this area of work to study dietary behaviors (Hagger et al. 2006b; Harris and Hagger 2007). We also employed the same approach in this study as we were interested in overall psychological need satisfaction and not the satisfaction of individual needs.

### Aim and hypotheses

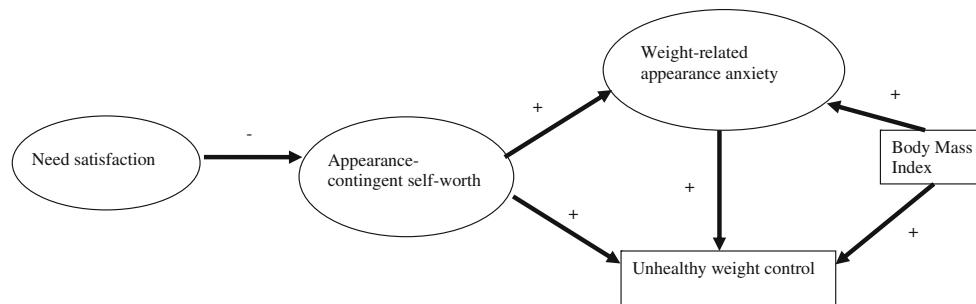
Taken together, the evidence presented above provide suggestions for an, as yet unidentified, indirect process involving appearance-contingent self-worth in the relationship between psychological need satisfaction and maladaptive weight-related outcomes. Therefore, the main aim of the present study was to test a process model that examines the inter-relationships between psychological need satisfaction, appearance-contingent self-worth, and weight-related outcomes (i.e., weight-related appearance anxiety and unhealthy weight control behaviors). Based on theoretical propositions put forward by SDT and research by Crocker et al. (2003a), we proposed a process model (see Fig. 1). We hypothesized that psychological need satisfaction would negatively predict appearance-contingent self-worth (Hypothesis 1), which in turn would be positively related to both weight-related appearance anxiety (H2) and unhealthy weight control behaviors (H3). Further, we also expected that weight-related appearance anxiety would positively predict unhealthy weight control behaviors (H4). Further, we predicted significant indirect effects from need satisfaction to weight-related appearance anxiety (H5) and unhealthy weight control behaviors (H6) via appearance-contingent self-worth. We controlled for the influence of BMI because this variable is known to be associated with body appearance concerns and weight control behaviors (e.g., Tiggemann and Lynch 2001).

## Method

### Participants

Two hundred and twenty British female University students took part in the present study. Their mean age was 20.47 (SD = 5.07; ranging from 18 to 64 years), and on average, they had a BMI of 21.92 (SD = 2.68; ranging from 15.37 to 34.25), calculated based on self-reported





**Fig. 1** Modeling the hypothesized process by which psychological need satisfaction is related to unhealthy weight control behaviors

height and weight. Further, 92.3% described themselves as White British, 2.7% as south-east Asian, 2.3% as mixed, 1% as White Other, 0.9% as Black and 0.8% as “Other”.

## Measures

### *Psychological need satisfaction*

The Basic Need Satisfaction in Life scale (Gagné 2003) was used to measure satisfaction of the needs for autonomy (7 items), competence (8 items) and relatedness (6 items). The scale comprises 21 items measured on a scale ranging from 1 (*not true at all*) to 7 (*definitely true*). Example items include: “I feel like I am free to decide how to live my life” (autonomy), “Most days I feel a sense of accomplishment from what I do” (competence), and “I really like the people I interact with” (relatedness). High scores are indicative of high levels of need satisfaction. Gagné has reported adequate Cronbach alpha reliability coefficients ( $\alpha > .70$ ) for all three subscales. The Basic Need Satisfaction in Life scale has been shown to have good predictive validity by predicting important outcomes such as general self-esteem, engagement, anxiety, and prosocial behavior (e.g., Deci et al. 2001; Gagné 2003). In the present study, the alpha coefficient for a composite measure comprising all three psychological needs was .84.

### *Appearance-contingent self-worth*

The five-item appearance contingent self-worth subscale from the contingencies of self-worth questionnaire (Crocker et al. 2003b) was used. The response scale ranges from 1 (*strongly disagree*) to 7 (*strongly agree*), and the participants are asked to indicate the degree to which they agree with statements such as “My sense of self-worth suffers whenever I think I don’t look good”. Higher scores indicate greater levels of appearance-contingent self-worth. Crocker, Luhtanen et al. showed via using confirmatory factor analyses that the 7-factor model proposed by the questionnaire fitted the data well and significantly better than several plausible alternative models. All factors had high internal consistencies and

test–retest reliabilities. In the same study, the appearance subscale predicted partying, socializing, shopping, and grooming during the first semester at college as well as increases in exercising from the first to second semester. In the present study, the alpha coefficient for this subscale was .72.

### *Weight-related appearance anxiety*

The trait version of the Physical Appearance State and Trait Anxiety Scale (PASTAS; Reed et al. 1991) was used to measure appearance anxiety. In the development of the PASTAS, Reed et al. identified a weight (W) and a non-weight (NW) component. The W component (8 items) was used in this study. The participants are asked to respond to the question stem “In general I feel anxious, tense or nervous about...”, followed by the items “the extent to which I look overweight”, “my thighs”, “my buttocks”, “my hips”, “my stomach (abdomen)”, “my legs”, “my waist” and “my muscle tone”. The response scale ranges from 0 (*not at all*) to 4 (*exceptionally so*) with higher scores indicating higher levels of weight-related appearance anxiety. Empirical evidence supports the psychometric properties of the scale (e.g., Reed et al. 1991; Tiggemann and McGill 2004). For example, Reed et al. showed excellent internal consistencies and test–retest reliabilities, as well as a clear factorial structure. Further, the W component (but not the NW) correlated highly with measures of body dissatisfaction, appearance evaluation, and eating disturbance. In the present study, the alpha coefficient for the trait version of the W component was .91.

### *Unhealthy weight control behaviors*

Based on previous research by Neumark-Sztainer et al. (2002) and Neumark-Sztainer et al. (2006), the participants in our study were asked how often they had engaged in any of the following behaviors *in order to lose weight* in the last year: “taking laxatives or water pills”, “taken diet pills”, “skipped meals”, “fasted (not eaten) for a day or more”, and “made yourself throw up”. The participants were asked to rate the extent to which they had engaged in

each behavior using a scale ranging from 1 (*never*) to 5 (*always*). Neumark-Sztainer et al. used a yes/no response format. All five behaviors were significantly intercorrelated at the  $p < .01$  level ( $r$ 's ranged from .35 to .73; *Mdn*  $r = .55$ ). Although not as extreme as the rest, skipping meals and fasting are widely considered as unhealthy weight control behaviors (e.g., American Psychological Association 2010; Grigg et al. 1996; Mellin et al. 2004). In fact, longitudinal data by Neumark-Sztainer et al. (2006) show that dieting in adolescence predicts outcomes related to obesity and eating disorders 5 years later. Neumark-Sztainer et al. (2004) provided evidence for the validity of all behaviors by showing that females using unhealthful weight-control behaviors had significantly lower intakes of fruit, vegetables, grains, calcium; iron, vitamins A, C, and B-6, foliate; and zinc than girls using only healthful weight-control behaviors. Preliminary analysis showed that the distribution for most behaviors was highly skewed (see Table 1). For this reason and to retain parsimony in the hypothesized model given the number of behaviors measured, we decided to include in the model one dichotomous outcome variable that indicated whether the participants had engaged (i.e. had a frequency score of 2 or above;  $n = 103$ ) or not (i.e. had a frequency score of 1;  $n = 117$ ) in any of the five behaviors (for a similar approach, see Thøgersen-Ntoumani et al. 2010).

Procedure

Following approval by a University Ethics Committee, consent forms and questionnaire packs were distributed to undergraduate female students who then completed these under research assistant supervision in lecture theatres and returned them anonymously in sealed envelopes. Males were told that the study was about “women’s opinions about attractiveness”.

Analysis

We used structural equation modeling (SEM) analysis to test the hypothesized model. We used the EQS software (version 6.1; Bentler 2003) to carry out the analysis. According to Hu and Bentler (1999), a value close to .08 for SRMR, combined with a value close to .95 for the

Comparative Fit Index (CFI) and a value close to .06 for the Root Mean Square Error of Approximation (RMSEA), are indicative of good model fit. We employed the robust maximum likelihood estimation method because for models containing categorical variables (such as the dichotomous variable in our study), EQS uses the analytical approach, developed by Lee et al. (1995), to provide appropriate standard errors and fit indexes.

The hypothesized model (see Fig. 1) proposed a process by which psychological need satisfaction indirectly related to weight-related appearance anxiety and unhealthy weight control behaviors (controlling for BMI) via appearance contingent self-worth. BMI and unhealthy weight control behaviors were observed variables in the model. The remaining constructs were tested as latent factors. We did not model all individual items from all scales in order to increase the stability of parameter estimates and keep an acceptable ratio of sample size to estimated parameters in studies involving relatively low sample sizes (Bandalos and Finney 2001). Need satisfaction was modeled as a latent factor indexed by the composite scores of autonomy, competence and relatedness need satisfaction scores, respectively (for a similar approach, see Deci et al. 2001; Gagné 2003). Appearance-contingent self-worth was indexed by its five indicators items, and weight-related appearance anxiety was indexed by four indicators. These indicators represented unweighted average scores which were created by pairing up items with the strongest loadings with items with weaker loadings from the same scale (Little et al. 2002).

Results

Preliminary analysis

Descriptive statistics, internal reliability coefficients and bivariate correlations among psychological need satisfaction, appearance-contingent self-worth and weight-related appearance anxiety are presented in Table 2. The mean values for psychological need satisfaction and appearance-contingent self-worth were fairly high while the mean score for appearance-related anxiety was small. The mean BMI was within the normal weight range. Most correlations were significant and in the expected direction.

**Table 1** Frequency counts of engagement in each unhealthy weight control behavior in the past year

Total  $n = 220$  (some rows do not add up to 220 due to missing responses)

	Never	A little	Sometimes	A lot	Always
Laxatives and/or water pills	210	3	1	5	0
Diet pills	211	3	3	3	0
Skipping meals	118	51	37	9	4
Fasting	194	12	7	3	3
Vomiting	200	9	3	5	2

**Table 2** Descriptive statistics, cronbach alpha coefficients, and bivariate correlations

Scales (scale range)	<i>M</i>	<i>SD</i>	Data range	$\alpha$	2	3	4	5
1. Psychological need satisfaction (1–7)	5.31	.59	3.32–6.46	.84	-.28**	-.26**	-.08	-.01
2. Appearance-contingent self-worth (1–7)	5.14	.96	2.00–7.00	.70		.31**	.26**	-.15*
3. Weight-related appearance anxiety (0–4)	1.33	.93	0.00–3.88	.91			.34**	.21**
4. Unhealthy weight control behaviors (1 = no, 2 = yes)	–	–	–	–				-.06
5. BMI	21.91	2.68	15.37–34.25	–				

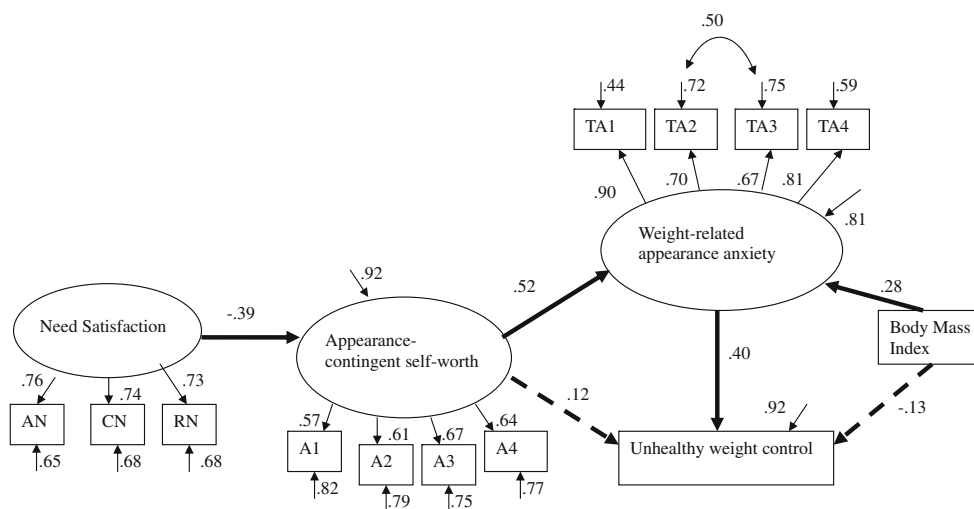
\*  $p < .05$ ; \*\*  $p < .01$

The statistics for the appearance contingent self-worth scale are based on a four-item composite (see CFA results)

Testing the hypothesized model

We first tested a measurement model that included the latent factors of psychological need satisfaction, appearance contingent self-worth, and weight-related appearance anxiety with their respective indicators (Anderson and Gerbing 1988). The hypothesized measurement model did not fit the data well: Satorra-Bentler  $\chi^2$  (51) = 139.54,  $p < .01$ , robust CFI = .89, robust RMSEA = .09 (95% CI = .07–.11), SRMR = .09. Modification indexes suggested that we remove one item from the appearance-contingent self-worth scale (i.e., “When I think I look attractive, I feel good about myself”). This is considered a justifiable process in measurement evaluation as it preserves the general structure of the hypothesized factor model, but only with the best available indicators (Hoffmann 1995). Further, Crocker et al. (2003a, b) found this item to have substantially lower loading than all other items on the scale. Modification indexes also suggested that the residuals of two parcel indicators for weight-related appearance anxiety should be allowed to correlate. Such correlations imply that there is shared variance among

items (e.g., due to methodological reasons, such as similarity in the wording; Gerbing and Anderson 1984) that cannot be accounted for by the underlying factor. In such cases, modeling the covariance removes this method artifact and decreases Type I error (poor goodness of fit; Lenox and Dennis 1994). We implemented these changes after which the revised measurement model fit the data very well: Satorra-Bentler  $\chi^2$  (40) = 63.67,  $p < .05$ , robust CFI = .97, robust RMSEA = .05 (95% CI = .03–.08), SRMR = .06. We then tested the structural model (see Fig. 2) which showed a good fit to the data: Satorra-Bentler  $\chi^2$  (59) = 98.92,  $p < .01$ , robust CFI = .96, robust RMSEA = .06 (95% CI = .04–.07), SRMR = .06. Figure 2 shows that psychological need satisfaction negatively predicted appearance-contingent self-worth (H1), which in turn predicted weight-related appearance anxiety (H2), controlling for the significant effect of BMI. Unhealthy weight control behaviors were positively predicted by weight-related appearance anxiety (H4). Not aligned with our hypotheses, the path between appearance-contingent self-worth and unhealthy weight control behaviors (H3) was not significant.



**Fig. 2** Modeling the process by which psychological need satisfaction is related to unhealthy weight control behaviors. The two dotted lines indicate non-significant (at  $p > .05$ ) parameters. Ovals indicate

latent factors and rectangles represent observed variables.  $R^2$  values equal 1-residual squared (e.g., for weight-related appearance anxiety it is  $1 - .81^2 = .34$ )



Given that appearance contingent self-worth did not predict unhealthy weight control behaviors, we could not test for mediation in the relationship between need satisfaction and these behaviors via contingent self-worth (incidentally, we also tested a model with a direct effect of needs on these behaviors, but the path coefficient was not significant;  $\beta = -.07$ ). However, we tested for mediation in the relationship between need satisfaction and weight-related appearance anxiety via contingent self-worth. We did that by comparing the total effects of need satisfaction on appearance anxiety (in a model that included a direct path from need satisfaction on anxiety) against the indirect effect on need satisfaction on appearance anxiety. The total effect was  $\beta = -.32$  ( $p < .01$ ) of which about half was indirect ( $\beta = -.15$ ;  $p < .05$ ), supporting H5. In partial support of H6, there were also significant indirect effects from need satisfaction on unhealthy weight control behaviors via appearance contingent self-worth and weight-related anxiety ( $\beta = -.11$ ;  $p < .05$ ). Indirect effects were also found from BMI on unhealthy weight control behaviors via weight-related appearance anxiety ( $\beta = .11$ ;  $p < .05$ ) and from appearance contingent self-worth on unhealthy weight control behaviors via also weight-related appearance anxiety ( $\beta = .20$ ;  $p < .01$ ).

We also tested two models as alternative to our modified model in Fig. 2. In the first model, unhealthy weight control behaviors were antecedents of need satisfaction. The rationale behind this model was that engaging in such behaviors will undermine the individuals' psychological functioning. The path coefficient between these behaviors and need satisfaction was not significant ( $\beta = -.07$ ) and the fit of the model was not as good as the one of the revised model: Satorra-Bentler  $\chi^2(60) = 120.26$ ,  $p < .01$ , robust CFI = .93, robust RMSEA = .07 (95% CI = .05–.09), SRMR = .11. In the second alternative model weight-related appearance anxiety was an antecedent of need satisfaction which in turn predicted unhealthy weight control behaviors. The rationale behind this model was that feelings of anxiety about one's appearance will impact on one's psychological functioning which in turn will affect their behaviors. The path coefficient between anxiety and psychological needs was significant ( $\beta = -.34$ ;  $p < .01$ ), but the path from need satisfaction to unhealthy weight control behaviors was not ( $\beta = .01$ ). Further, the fit of this second alternative model was not as good as that of the revised model: Satorra-Bentler  $\chi^2(60) = 121.59$ ,  $p < .01$ , robust CFI = .93, robust RMSEA = .07 (95% CI = .05–.09), SRMR = .08.

## Discussion

The present study sought to make a unique contribution to the literature by investigating underlying psychological

mechanisms that are associated with appearance contingencies, feelings of insecurity about appearance and unhealthy weight control behaviors. Specifically, this study examined a process by which low basic psychological need satisfaction, as defined by SDT (Deci and Ryan 2000), may relate to unhealthy weight control behaviors in young women. SDT argues that the thwarting of the needs for autonomy, competence and relatedness in one's life can give rise to a struggle for body control as a need substitute mechanism (Deci and Ryan 2000). The struggle for body control is likely to manifest itself in high levels of body image concerns and unhealthy weight control behaviors (Pelletier et al. 2004; Thøgersen-Ntoumani and Ntoumani 2007).

The results of our SEM analysis suggest that the relationship between psychological need satisfaction and weight-related appearance anxiety may be indirect via appearance-contingent self-worth. This finding makes conceptual sense. SDT research suggests that basic need satisfaction facilitates the development of non-contingent (true), as opposed to contingent self-worth (Deci and Ryan 1995; Reis et al. 2000; Ryan and Deci 2004). Our results show that need satisfaction is negatively related to appearance-contingent self-worth among young women, supporting H1. In turn, those who are highly dependent upon their appearance to feel good about themselves are more likely to feel anxious with regard to weight-related aspects of their appearance, supporting H2. This finding corroborates results of previous studies illustrating that external contingencies, including those specifically related to appearance, predict weight concerns (Crocker et al. 2003a; Grossbard et al. 2009; Sanchez and Crocker 2005). The link in our model between contingent self-worth and appearance related anxiety was significant, after controlling for BMI. This finding supports previous research showing that external contingencies are positively associated with body appearance concerns among females irrespective of their body shape or size (Grossbard et al. 2009).

Contrary to H3, in the SEM appearance-contingent self-worth was not a direct predictor of unhealthy weight control behaviors. This null finding could be because the relationship between these constructs is indirect via weight-related appearance anxiety. This indirect effect was significant in our study. The direct link between weight-related appearance anxiety and unhealthy weight control behaviors was of moderate size ( $\beta = .40$ ), supporting H4. Taken together, these findings suggest that appearance-contingent self-worth may foster unhealthy weight control behaviors by making young women feel more anxious about weight-related aspects of their appearance. Future qualitative work is needed to delineate the potential micro-mediational processes involved in this process (e.g., rumination, ego-involving comparisons, etc.).

Our SEM analysis also suggests that psychological need satisfaction is indirectly and negatively associated with weight-related appearance anxiety, supporting H5. We also found psychological need satisfaction not to be significantly related to unhealthy weight control behaviors. This lack of a direct relationship could reflect distal mediation. This in fact seems to have been the case in our study given that psychological need satisfaction predicted unhealthy weight control behaviors indirectly via a sequence involving both appearance contingent self-worth (see H6) and weight-related appearance anxiety. Previous research guided by SDT has shown that women's global autonomy levels and global need satisfaction are negatively related to concerns about body image and disordered eating such as bulimic behaviors (Pelletier and Dion 2007; Pelletier et al. 2004; Thøgersen-Ntoumani and Ntoumanis 2007; Thøgersen-Ntoumani et al. 2010). The results of the present study add further credence to the suggestion that the satisfaction of the psychological needs for autonomy, competence and relatedness may shield individuals from appearance-related contingencies and anxieties as well as associated unhealthy weight control behaviors. When such needs are thwarted, individuals are likely to perceive lack of ownership over their behavior, feelings of incompetence and isolation in their lives (Pelletier et al. 2004; Thøgersen-Ntoumani and Ntoumanis 2007). Some women may compensate for such feelings by engaging in unhealthy eating behaviors in an attempt to (a) re-establish feelings of ownership over one aspect of their life, (b) increase feelings of effectance (competence), and c) feel related to others by gaining social approval from reaching socially prescribed ideals of physique.

Unhealthy weight control behaviors, when successful, can provide a temporary boost to well-being. However, the increase in well-being is often short-lived (Crocker 2002) and fluctuates as a result of success and failure (e.g., negative appearance-related remarks by other people) in the domain of contingency (Crocker and Park 2004). This fluctuation in itself has been shown to lead to increases in depressive symptoms in the academic domain (Crocker et al. 2003a). Further, according to SDT, the attainment of extrinsic aspirations (such as image and appearance goals) does not lead to increases in eudemonic well-being, in contrast to the attainment of intrinsic aspirations (e.g., health, personal growth; Sheldon and Kasser 1998). In the present study, we did not measure goal aspirations but it would be interesting if future studies examined the relationship between image-related life goals, appearance-contingent self-worth and psychological well-being.

In addition to our hypothesized model which was based on basic needs theory (Deci and Ryan 2000), we tested two alternative models in which need satisfaction did not serve as an antecedent variable. The first model suggested that

low need satisfaction is an outcome of unhealthy weight control behaviors. In the second alternative model, appearance anxiety was an antecedent of need satisfaction which in turn predicted unhealthy weight control behaviors. Neither of the two alternative models fitted as well as the model in Fig. 2. Although our data are cross-sectional, the findings imply that psychological need satisfaction might serve an important antecedent function in the development of weight-related appearance anxiety and unhealthy weight control behaviors. However, it is possible that, over time, individuals with higher levels of appearance anxiety and those who engage in unhealthy weight control behaviors will develop a sense of self which is largely dependent on the degree to which they are successful in attaining current beauty ideals; this contingent sense of self-worth in turn might further undermine levels of psychological need satisfaction. Clearly, longitudinal designs are needed to examine these hypotheses.

#### Limitations and future research directions

Limitations of this study should be taken into consideration when interpreting its findings. As with all survey research, the design does not allow us to establish causal effects, although it is difficult to envisage how experimental work in this area could be ethically viable. It should also be noted that lack of psychological need satisfaction is not an ideal indicator of need thwarting (cf., Bartholomew et al. 2010) which, according to Deci and Ryan (2000), is associated with the struggle for body control. A measure of psychological need thwarting is needed to account for more variance in the predicted outcomes. Another limitation of our study is that the sample consisted of an ethnically homogenous group of women attending a university, and thus the generalizability of our findings to other groups of young adult women is unknown. Previous research has indicated ethnic differences in body image disturbance scores (Altabe 1998). Thus, it is possible that the strength of the antecedent effects (or even the type of antecedents) on body and weight-related variables might differ among ethnic groups. Further, our study included predominantly normal weight females. In a more diverse sample of underweight, normal weight and overweight females, both the number and the frequency of unhealthy weight control behaviors might increase in comparison to those from our data (which primarily reflect mild and not extreme behaviors). It would be also interesting to test our model with young males who are also becoming more frequently engaged in unhealthy eating behaviors (e.g., Haines et al. 2006). Further, appearance contingent self-worth and body-related appearance anxiety in males are more likely to relate to muscular appearance and less to thinness. Despite these potential gender differences, we still expect

psychological need satisfaction to play an antecedent role in such processes. Including a more diverse sample could also facilitate group comparisons in terms of the invariance of the intercepts and structural coefficients in our model.

In conclusion, our findings provide preliminary support for the assertion that (a) overall basic psychological need satisfaction may serve a protective function in the development of appearance-contingent self-worth, and (b) appearance-contingent self-worth may help to explain why low levels of psychological need satisfaction are related to weight-related appearance anxiety and unhealthy weight control behaviors in young women. Future research should expand our proposed model by examining psychological environments (e.g., parental, spousal, educational) that foster intrinsic goal striving and overall psychological need satisfaction, and thus promote true (non-contingent) self-worth. To date, although there have been intervention studies fostering such autonomy-supportive environments to promote healthy eating and support weight loss efforts of overweight and obese individuals (e.g., Silva et al. 2008), there have been no interventions examining the effects of autonomy support on reducing dysfunctional weight control behaviors. According to SDT, such autonomy supportive-environments (see Reeve and Jang 2006) should encourage volition and personal choice, allow individuals to experience successful mastery attempts, and promote secure interpersonal attachments.

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