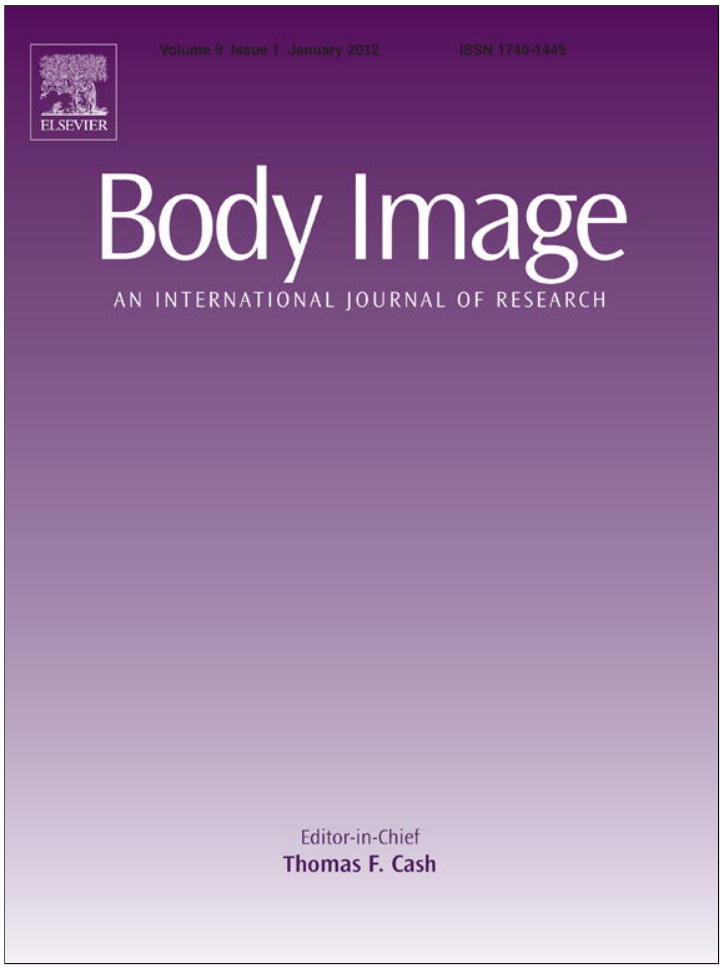

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Eating regulation and bulimic symptoms: The differential correlates of health-focused and appearance-focused eating regulation

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ABSTRACT

Based on Self-Determination Theory, this study aimed to gain further insight in the pathway from eating regulation to bulimic symptoms by (a) examining diet-specific need frustration as an intervening mechanism, (b) investigating the associations between different types of goals underlying eating regulation and diet-specific need frustration and bulimic symptoms, and (c) considering body dissatisfaction as an antecedent of eating regulation and eating regulation goals. In a sample of 244 female adolescents, SEM analyses showed that (a) the association between eating regulation and bulimic symptoms can be accounted for by need frustration, (b) appearance-focused and health-focused eating regulation are associated differentially with need frustration and bulimic symptoms, and (c) body dissatisfaction is related positively to eating regulation and appearance-focused eating regulation. These findings suggest that the goals underlying one's eating regulation and the concept of need frustration help to understand when and why eating regulation is associated with bulimic symptoms.

Introduction

In contemporary Western society, there is a strong focus on body appearance and eating regulation. Many girls and women are dissatisfied with their body and engage in dietary behaviours to lose weight (e.g., Striegel-Moore et al., 2009). At the same time, prevalence rates of overweight and obesity have increased strongly (Ogden, Yanovski, Carroll, & Flegal, 2007). Because of these trends, eating regulation has become part of our cultural identity (Bacon, Stern, Van Loan, & Keim, 2005).

Unfortunately, research has shown that most people who regulate their food intake fail to do so effectively in spite of their well-meant intentions (e.g., Heatherton, Herman, Polivy, King, & McGree, 1988). The Dietary Restraint Model (Polivy & Herman, 1985) and the Dual-Pathway Model (Stice, 2001) even state that restraining one's food intake through dieting represents a pathway toward the development of bulimic symptoms. Past research has, however, produced mixed evidence for this claim, with some studies suggesting a positive association between eating regulation and bulimic symptoms (e.g., Ouwens, van Strien, van Leeuwe, & van der Staak, 2009) and others finding no association (e.g., Cooley & Toray, 2001) or even a negative association (e.g., Groesz & Stice, 2007). Further, this research mainly focused on body dissatisfaction as a motive for eating regulation and less attention has been given to other motivational forces that can contribute to or undermine successful eating regulation. Drawing upon Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000a), a well-validated theory of motivation, we examined whether the type of goals (i.e., physical appeal vs. health and fitness; Kasser & Ryan, 1996; Vansteenkiste, Soenens, & Duriez, 2008) adolescent girls aim to achieve when regulating their food intake is related to bulimic symptoms. In addition, we examined whether the frustration of one's basic psychological needs can account for the associations of eating regulation per se and the goals underlying one's eating regulation with bulimic symptoms.

Dietary Restraint and Bulimic Symptoms

In a society where the dieting industry was booming, Herman and Polivy (1980) advanced the controversial hypothesis that dieting may have adverse effects on food intake. When body dissatisfied people start dieting to change their body shape and weight, a cognitive boundary would replace the more physiological regulation of food intake. This cognitive focus would reduce people's sensitivity toward physiological signs of satiety and hunger and instead increase a preoccupation with psychological, cultural, or social signs to eat. In line with this claim, experimental research (e.g., Herman & Mack, 1975) showed that individuals high in dietary restraint are more likely to indulge in overeating after having violated their cognitive rules about food intake (e.g., after eating a

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small amount of high caloric food). The process where dieters lose control over their food intake came to be known as the disinhibition effect (Herman & Mack, 1975). Later, the dietary restraint hypothesis was incorporated within the Dual Pathway Theory (Stice, 2001) as one of the pathways toward the development of bulimic symptoms.

Although the dietary restraint hypothesis stimulated abundant research on the pathway from restraint to bulimic symptoms, the results from this body of work are rather inconsistent. Findings seemed to depend on several factors, including study design (Stice, Fisher, & Lowe, 2004) and the way restraint is assessed (Van Strien, 1999). For instance, although prospective studies showed that self-reported restraint predicted increases in overeating (e.g., Ouwens et al., 2009; Stice, 2001), experimental research showed that imposing a low-calorie diet on participants results in lower (instead of higher) levels of overeating and bulimic symptoms (e.g., Burton & Stice, 2006; Groesz & Stice, 2007). Also, studies that used self-report measures of dietary restraint yielded different results depending upon the scale that was used to measure dietary restraint (e.g., Stunkard & Messick, 1985; Van Strien, Frijters, Bergers, & Defares, 1986). From these studies we can conclude that although dietary restraint can be a risk factor for bulimic symptoms, this association does not always hold (e.g., Van Strien, 1999). However, it is not clear exactly which factor differentiates between successful versus unsuccessful eating regulation.

In this respect, we believe that introducing a motivational perspective to eating regulation can help clarify when and why eating regulation will be more or less likely to fail. To date, little attention has been given to the goals underlying individuals' eating regulation attempts. In fact, most researchers seem to assume that individuals who regulate their eating behaviours are driven by body dissatisfaction and aim to alter their physical appearance. However, another type of eating regulation might occur in which one does not necessarily restrain food intake to become more attractive but rather regulates eating behaviours to have a good health. In this study we draw upon the motivational perspective of SDT (Deci & Ryan, 2000; Ryan & Deci, 2000a), to examine whether appearance-focused and health-focused eating regulation yield differential associations with diet-specific need frustration and bulimic symptoms.

Self-Determination Theory: Not All Eating Regulation Goals are Equally Frustrating

Within SDT, three basic psychological needs are distinguished: the needs for autonomy (i.e., experiencing a sense of volition and psychological freedom), competence (i.e., experiencing a sense of effectiveness), and relatedness (i.e., feeling cared for by others). If these needs are satisfied, people feel energized and vital to take on new activities, whereas need frustration would engender less effective functioning, as indexed by ill-being and passivity (Deci & Ryan, 2000). Research has shown that satisfaction of these three needs is associated with general well-being and vitality (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000) as well as with adjustment in more specific behavioural contexts, such as health, education, work, sports and exercise (Vansteenkiste, Niemiec, & Soenens, 2010). For instance, elite female athletes reported feeling more energetic and vital after practice on days their basic needs had been satisfied during the practice, even though the practice had been physically demanding and calorie-draining (Gagné, Ryan, & Bargmann, 2003). Also, Sebire, Standage, and Vansteenkiste (2009) found in a group of adults that more need satisfaction while exercising predicted more physical self-worth, exercise behaviours, and wellbeing.

In this study, we aimed to examine associations between eating regulation, bulimic symptoms, and need frustration rather than need satisfaction. Recent evidence suggests that a lack of need satisfaction is not the same as need frustration (Sheldon, Abad, & Hinsch, 2011). For instance, low satisfaction of the need for autonomy does not automatically imply that people experience a sense of pressure. Similarly, low satisfaction of the needs for competence and relatedness is distinct from feeling like a failure (i.e., competence frustration) and feeling disrespected and rejected by other people (i.e., relatedness frustration). Research shows that experiences of need satisfaction and experiences of need frustration do not represent perfect opposites. Further, it has been shown that whereas need satisfaction is more strongly predictive of psychosocial adjustment and well-being, need frustration is more strongly related to maladjustment and psychopathology (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011). Because the main outcome variable in this study was bulimic symptoms, we decided to focus on need frustration rather than need satisfaction.

In line with extant SDT-based research on need satisfaction, we expect that need frustration during the eating regulation process (i.e., diet-specific need frustration) will be associated with more bulimic symptoms. Also, we reasoned that the association between eating regulation and bulimic symptoms, if any, might be accounted for by need frustration. Eating regulation has been described as a rather challenging type of behaviour (Baumeister & Heatherton, 1996) that, on average, may result in need frustrating experiences. For instance, because eating regulation may involve that people change old eating habits or try to inhibit social cues to eat, eating regulation may come with feelings of social tension and pressure to adhere to one's eating regulation standards (i.e., relatedness and autonomy frustration). Also, inevitably attempts to regulate one's eating pattern sometimes will fail, thus giving rise to feelings of incompetence and failure (i.e., competence frustration).

A second aim of this study was to examine whether the goals people pursue during the process of eating regulation matters in predicting diet-specific need frustration and subsequent bulimic symptoms. According to SDT, one important influence on processes of need satisfaction is the types of goals people pursue (Ryan, Sheldon, Kasser, & Deci, 1996). Kasser and Ryan (1996) distinguished between intrinsic goals, such as affiliation, community contribution, and health, and extrinsic goals, such as wealth, image, and physical appearance. Extrinsic goals are very salient in a consumer culture, where fame, money, and good looks are often portrayed as signs of success (Vansteenkiste et al., 2008). The appeal of these goals lies in the anticipated power, social approval, or sense of worth that would result from attaining them (Kasser, Ryan, Couchman, & Sheldon, 2004). Therefore, it has been argued that individuals with a focus on extrinsic goals tend to be more oriented toward interpersonal comparison, contingent approval, and garnering of external signs of worth (Kasser et al., 2004; for an overview see Vansteenkiste et al., 2008). In contrast, the pursuit and attainment of intrinsic goals is said to be more inherently satisfying as intrinsic goals have a focus on the development of one's own interests and values (Sheldon & Kasser, 2001). As a consequence, the pursuit of intrinsic, relative to extrinsic, goals is more likely to result in experiences that can satisfy people's basic psychological needs (Vansteenkiste et al., 2008).

Whereas intrinsic goals would engender basic need satisfaction, the pursuit of extrinsic goals would frustrate these needs. In line with this hypothesis, intrinsic, relative to extrinsic, goal pursuit was found to be positively associated with need satisfaction in domains such as work (Vansteenkiste, Matos, Lens, & Soenens, 2007) and exercise (Sebire et al., 2009). Building on this research, the current study aimed to examine whether extrinsic (i.e., becoming more physically attractive) and intrinsic (i.e., become more healthy and fit) eating regulation goals are associated differentially with diet-specific need frustration and bulimic symptoms. We hypothesized that appearance-focused, and not health-focused, eating

regulation would be associated with more diet-specific need frustration, which in turn, would relate positively to bulimic symptoms. Some recent research provides support for several parts of this hypothesized sequence of events. First, a number of studies examined associations between goal pursuit and eating disorder symptoms. Putterman and Linden (2004), for instance, found that dieters who were motivated to change their appearance through dieting were more likely to use drastic dieting strategies and to score higher on disinhibited eating compared to dieters who were dieting out of health concerns. de Souza, Mussap, and Cummins (2010) found that engagement with the goal of altering appearance was related to more problematic weight control behaviours. Second, other studies have addressed associations between need satisfaction and eating disorder symptoms. Schüler and Kuster (2011), for instance, showed that unfulfilled basic needs are associated with more binge-eating symptoms in a group of adults (Schüler & Kuster, 2011). Third, studies have examined associations between goal pursuit and processes of need satisfaction. Thogerson-Ntoumani, Ntoumanis, and Nikitaras (2010) showed that the general importance attached to health was positively associated with global need satisfaction in adolescent girls, whereas importance attached to image was unrelated to need satisfaction. Although several parts of the mediation sequence developed here have been tested before, this study is the first to test the full sequence of events. Specifically, this study is the first to examine whether the type of goals people have in mind while regulating their food intake is related to bulimic symptoms through its association with diet-specific need frustration.

The Present Research

The current research aimed to gain further insight in the pathway from eating regulation to bulimic symptoms by adopting a motivational perspective, that is, by considering the goals underlying one's eating regulation. It is important to note that, in this study, we define and measure eating regulation somewhat more broadly than is the case in many studies on dietary restraint. We reasoned that, by measuring 'dietary restraint' only, there would be relatively little variance in individuals' goals for eating regulation because dietary restraint, with its focus on decreasing intake of food and calories, would be primarily driven by an appearance-focus rather than by a health-focus. This confound of dietary restraint with an appearance focus is particularly likely to occur in normal-weight youngsters, who have little other reason to go on a diet but to look more attractive. Accordingly, we chose to assess eating regulation more broadly as all efforts to regulate one's eating behaviours. In doing so, we used a brief and face-valid, yet relatively rarely used, measure of eating regulation developed by Pelletier, Dion, and Lévesque (2004) rather than a more frequently used measure of dietary restraint. Because the current measure contains items like "To what extent are you trying to regulate your eating behaviour", participants who aim to reduce their food intake or eat more healthily might both endorse this item. This is in contrast with the available restraint measures, which only tap into the restriction of food intake. Moreover, at least some of the restraint questionnaires, such as the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien et al., 1986) seem to represent a mixture of eating regulation and an appearance focus (e.g., 'How often do you try to eat nothing between meals because you think about your shape?'). Because the latter type of measure does not allow one to disentangle the effects of eating regulation per se and the goals behind eating regulation, it was deemed important to use a broader and goal-neutral measure of eating regulation.

Using such a measure of eating regulation, we pursued three aims. We began by examining the association between intensity of eating regulation and bulimic symptoms. Given that a stronger concern with eating regulation might be associated with more feelings of diet-specific need frustration, we expected intensity of eating regulation to be associated with more bulimic symptoms.

The second aim of this study was to examine whether the type of goals one pursues while regulating eating behaviours plays a role in understanding when eating regulation yields maladaptive correlates beyond intensity of eating regulation per se. Based on SDT, we expected appearance-focused eating regulation to be positively related to diet-specific need frustration, whereas health-focused eating regulation would be negatively related to diet-specific need frustration, which in turn would be associated with more bulimic symptoms. An additional aim was to examine whether intensity of eating regulation would yield a unique relation to diet-specific need frustration and bulimic symptoms after taking into account eating regulation goals.

Finally, consistent with previous models of dietary restraint and bulimia (Stice, 2001), we examined the role of body dissatisfaction as a motivating force behind one's efforts to regulate one's food intake. Further, the assessment of eating regulation goals opened the possibility to examine whether body dissatisfaction would be related to *any kind* of eating regulation goals or rather relate to a *specific* type of eating regulation goals. Because body dissatisfaction is more likely to involve appearance than health concerns, we expected that body dissatisfaction would be more strongly related to appearance-focused than to health-focused eating regulation. Finally, we examined whether the association between body dissatisfaction and bulimic symptoms (Stice, 2002) could be accounted for by intensity of eating regulation, the goals behind eating regulation, and diet-specific need frustration.

Method

Participants and Procedure

Three hundred Belgian teenage girls, following an academic (53%) or technical track at school (47%), participated in the study. Their age ranged between 13 and 19 years ($M = 14.6$ years). Prior to the study, informed consents of school administrators, parents, and adolescents were obtained. Participants filled out the questionnaires during school hours under supervision of their teacher and were reassured that the responses to the questionnaires would be anonymous and confidential. Only adolescents who indicated that they regulate their food intake at least sometimes were selected for the current study. This resulted in an effective sample size of 244 girls. On a scale from 1 to 7, the average score on eating regulation was 4.31, indicating that most participants in our sample were involved in at least some degree of eating regulation.

Measures

Body dissatisfaction and bulimia. Participants completed the body dissatisfaction (9 items) and bulimia (7 items) subscales of the Dutch version (Van Strien, 2002) of the Eating Disorders Inventory-II (EDI-II; Garner, 1991). The Body Dissatisfaction subscale measures "dissatisfaction with the overall shape and with the size of those regions of the body that are of greatest concern to those with eating disorders (i.e., stomach, hips, thighs, buttocks)" (Garner, 1991, p. 5). The Bulimia subscale assesses "the tendencies to think about and engage in bouts of uncontrollable overeating" (Garner, 1991, p. 5). One item was not included in the computation of the scale score (i.e., "I have thought of trying to vomit in order to lose weight") since we were mainly interested in assessing binge eating rather than compensatory bulimic behaviours (see also Woods, Racine, & Klump, 2010). Each item was rated on 6-point frequency scale, ranging from 1 (*never*) to 6 (*always*). Item-mean

scores were created with higher scores representing higher levels of body dissatisfaction and bulimic symptoms. Previous studies indicated excellent validity for both subscales and adequate internal consistency in samples of nonclinical adolescent girls (Rosen, Silberg, & Gross, 1988; Shore & Porter, 1990). Also in a sample of Belgian adolescents, good validity and internal consistencies were reported (e.g., Soenens, Vansteenkiste, Vandereycken, Luyten, Sierens, & Goossens, 2008). In the current sample, Cronbach's alpha was .93 and .79 for body dissatisfaction and bulimia, respectively.

Eating regulation. Three items were taken from Pelletier et al. (2004) to tap into participants' general eating regulation efforts. The following items were used: 'To what extent are you trying to regulate your eating behaviours?', 'To what extent do you find it important to regulate your eating behaviours?', and 'To what extent do you intend to regulate your eating behaviours in the future?'. These items were rated on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*). A higher score on these items indicates a stronger intention to regulate eating behaviours apart from the goals underlying the regulatory efforts and, thus, can be considered as a measure of the quantity or intensity of eating regulation. Cronbach's alpha of this three-item scale was .88. Participants who indicated that they had no intention at all to regulate their eating behaviour (i.e., scoring lower than 2) were not included in the analyses. We did so because it is irrelevant for these participants to rate the type of goals they pursue through their eating regulation.

Eating regulation goals. An adapted version of the Aspiration Index (AI; Kasser & Ryan, 1996) was created to measure participants' goals for eating regulation. The original AI assesses people's extrinsic (i.e., wealth, fame, and image) and intrinsic (i.e., meaningful relationships, personal growth, community contributions, and good health) aspirations (Kasser & Ryan, 1996). Previous research demonstrated high reliability and validity for this questionnaire (e.g., Kasser & Ryan, 1996). Grouzet et al. (2005) demonstrated that the distinction between extrinsic and intrinsic goals is consistent across 15 cultures around the world in samples of undergraduate students. In a sample of Belgian adolescents, good validity and internal consistencies (i.e., from .70 to .84) were reported (Duriez, Soenens, & Vansteenkiste, 2007). In the current study we assessed two types of goals, that is, the intrinsic goal of physical fitness and health (3 items) and the extrinsic goal of physical appeal and beauty (3 items). After reading the stem 'I regulate my food intake because.', participants indicated on a 7-point Likert scale ranging from 1 (*not at all important*) to 7 (*very important*) how strongly they valued each of the eating regulation goals. Items referring to health-focused eating regulation were 'I want to keep fit', 'I want to be healthy', and 'I want to have a good physical condition'. Items referring to appearance-focused eating regulation were 'I want to have more muscles or be thinner to look more attractive', 'others would find me more attractive', and, 'I want to improve the shape of my body'. Exploratory factor analysis using promax rotation indicated that the items fell apart into two factors, together explaining 66% of the variance; all the items loaded on their intended factor, with no cross-loading exceeding .40. Cronbach's alpha was .83 and .87 for health-focused and appearance-focused eating regulation, respectively.

Diet-specific need frustration. To measure need frustration in the context of regulating eating behaviours, we created a new scale because such items were not available in the SDT literature when this study was conducted. Formulation of items was inspired by existing context-specific need satisfaction scales in other domains (e.g., Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010). Further, most studies have assessed (lack of) need satisfaction to examine associations with the goals or outcomes. Given recent evidence that lack of need satisfaction is not the same as need frustration (Sheldon et al., 2011) and the focus on the maladaptive side of eating regulation (i.e., bulimic symptoms), we chose to specifically measure need frustration in the context of eating regulation.

Two items were formulated for each need: competence frustration (i.e., 'Sometimes I have the feeling that I'll never be able to regulate my food intake', 'Regulating my eating behaviours sometimes seems an impossible task'), autonomy frustration (i.e., 'The fact that I cannot choose what I eat frustrates me', 'I have the feeling I have no other choice or am under pressure to regulate my eating behaviours'), and relatedness frustration (i.e., 'Regulating my food intake sometimes is a cause of tension with people who are important to me', 'Regulating my eating behaviours sometimes creates distance to other people'). Exploratory factor analysis revealed one factor explaining 48% of the variance and all items had a minimal loading of .70. Therefore, we created a need frustration composite score by averaging the six items (Cronbach's alpha = .86). A similar approach has been used in other studies (e.g., Bartholomew et al., 2011; Niemiec, Ryan, & Deci, 2009; Sebire et al., 2009).

Results

Preliminary Analyses

Table 1 presents descriptive statistics and bivariate correlations among the study variables. As can be noted, significant positive relations emerged between participants' Body Mass Index (BMI) and body dissatisfaction, intensity of eating regulation, appearance-related eating regulation, and diet-specific need frustration. No significant correlations were found between age and the study variables. To investigate the association between educational level and the study variables a multivariate analysis of variance (MANOVA) with educational level as independent variable was performed, revealing a significant multivariate effect, $F(6, 260) = 4.64$, $p < .001$, $\eta^2 = .10$. Participants following the academic track scored lower on body dissatisfaction [$M = 3.54$, $SD = 1.24$; $F(1, 265) = 8.49$, $p < .01$, $\eta^2 = .03$], diet-specific need frustration [$M = 2.26$, $SD = 0.94$; $F(1, 265) = 15.05$, $p < .01$, $\eta^2 = .05$], and bulimic symptoms [$M = 1.89$, $SD = 0.70$; $F(1, 265) = 15.80$, $p < .01$, $\eta^2 = .06$] compared to participants following a technical track ($M = 3.97$, $SD = 1.21$ for body dissatisfaction; $M = 2.65$, $SD = 0.91$ for need frustration and $M = 2.29$, $SD = 0.91$ for bulimic symptoms). Given the significant associations between educational level and BMI and various study variables, we included them as covariates in further analyses.

Inspection of the correlations between our key study variables (see Table 1) revealed that body dissatisfaction was correlated positively with intensity of eating regulation, appearance-focused eating regulation, diet-specific need frustration, and bulimic symptoms, but was unrelated to health-focused eating regulation. Intensity of eating regulation was correlated positively with diet-specific need frustration and with both eating regulation goals. Further, whereas appearance-focused eating regulation was associated positively with diet-specific need frustration and bulimic symptoms, health-focused eating regulation was unrelated to these variables. Finally, diet-specific need frustration was associated positively with bulimic symptoms.

Primary Analyses

Measurement model. Before testing structural relations among the study variables, we created and inspected the quality of a measurement model representing each of the six study variables as latent variables. Body dissatisfaction and bulimic symptoms were indexed by three randomly created parcels. Diet-specific need frustration was indexed by three subscale scores (i.e., frustration of competence, relatedness, and autonomy). Intensity of eating regulation, and health-focused and appearance-focused eating

Table 1
Means, standard deviations, and bivariate correlations between measured variables.

	Mean	*SD*	1	2	3	4	5	6	7	8
1. BMI	19.65	2.70	1							
2. Age	14.59	1.29	.31**	1						
3. Body dissatisfaction	3.73	1.22	.41**	−.04	1					
4. Intensity of eating regulation	4.58	1.22	.19**	.02	.31**	1				
5. Health-focused eating regulation	5.42	1.18	−.09	−.02	.01	.39**	1			
6. Appearance-focused eating regulation	4.60	1.49	.23**	.05	.55**	.58**	.32**	1		
7. Diet-specific need frustration	2.44	0.83	.25**	−.03	.52**	.29**	.04	.43**	1	
8. Bulimic symptoms	2.08	0.84	.09	−.03	.22**	.12	−.00	.20**	.37**	1

** $p < .001$.

regulation were represented by their respective items. In addition to these six latent constructs, the background variables BMI and educational level were represented as a latent dichotomous indicator by fixing the error variance of the indicator to 0.

As data screening indicated that assumptions of normality were violated in terms of skewness and kurtosis, $\chi^2 = 347.67$, $p < .001$, we used the asymptomatic covariance matrix as input and checked the Satorra-Bentler (SB)χ^2 to evaluate model fit. Other fit indices were the root-mean-square error of approximation (RMSEA), the standardized root-mean-square residual (SRMR), and the comparative fit index (CFI). Combined cut-off values of .06 or lower for the RMSEA, and .09 or lower for the SRMR are considered a good model fit (Hu & Bentler, 1999). In addition, a CFI with values of .90 or higher reflects an acceptable fit (Bentler, 1990). Our measurement model, including 20 observed and 8 latent variables, had an excellent fit to the data, SB$\chi^2(42) = 229.98$, $p < .01$, RMSEA = 0.05, SRMR = 0.05, and CFI = 0.99. The factor loadings of the indicator variables were high, ranging from 0.65 to 0.96, all *p*s < .001.

Structural models. Next, we proceeded by estimating three structural models to test our main hypotheses. In each of these models, BMI and educational level were entered as control variables by allowing correlations with the exogenous latent factors and by drawing paths to each of the endogenous factors.

In the first model we examined the associations between intensity of eating regulation, diet-specific need frustration, and bulimic symptoms. In the first step we included intensity of eating regulation as a predictor of bulimic symptoms. Estimation of this model (SB$\chi^2(16) = 35.92$, $p < .01$, RMSEA = 0.07, SRMR = 0.04, CFI = 0.97) showed that the association between intensity of eating regulation and bulimic symptoms was significant ($\beta = 0.28$, $p < .05$). Second, we examined whether this association was mediated by diet-specific need frustration by modelling diet-specific need frustration as an intervening variable. Fit indices were satisfactory; SB$\chi^2(37) = 70.80$, $p < .001$, RMSEA = 0.06, SRMR = 0.05, CFI = 0.97. Intensity of eating regulation was related positively to diet-specific need frustration ($\beta = 0.29$, $p < .001$) which, in turn, was related positively to bulimic symptoms ($\beta = 0.43$, $p < .001$). Finally, allowing a direct path from intensity of eating regulation to bulimic symptoms ($\beta = 0.07$, *ns*) did not improve model fit (ΔSB$\chi^2(1) = 0.80$, *ns*). Sobel's *z* indicated a significant indirect path from intensity of eating regulation to bulimic symptoms through diet-specific need frustration ($z = 2.57$, $p < .01$).

In the second model (Figure 1), we examined the associations between intensity of eating regulation, the two eating regulation goals, diet-specific need frustration, and bulimic symptoms. This model allowed us to examine the SDT-based hypothesis that the goals behind eating regulation would add to the prediction of diet-specific need frustration and bulimic symptoms in addition to the intensity of eating regulation per se.[1] The fit indices of the model in which intensity of eating regulation and the two eating regulation goals served as simultaneous predictors of diet-specific need frustration, which, in turn, was related to bulimic symptoms were good: SB$\chi^2(103) = 149.97$, $p < .001$, RMSEA = 0.04, SRMR = 0.05, and CFI = 0.98. The path from intensity of eating regulation to diet-specific need frustration was not significant ($\beta = 0.04$, *ns*), while the two eating regulation goals yielded an independent association with diet-specific need frustration: appearance-focused eating regulation was related positively to diet-specific need frustration ($\beta = 0.51$, $p < .001$) and health-focused eating regulation was related negatively to diet-specific need frustration ($\beta = -0.17$, $p < .05$). Diet-specific need frustration was related significantly to bulimic symptoms ($\beta = 0.38$, $p < .001$). Allowing direct paths from intensity of eating regulation ($\beta = 0.11$, *ns*), health-focused eating regulation ($\beta = 0.05$, *ns*) and appearance-focused eating regulation ($\beta = -0.05$, *ns*) *to* bulimic symptoms did not improve the model fit, ΔSB$\chi^2(3) = 1.54$, *ns*. Moreover, Sobel's *z* revealed that appearance-focused eating regulation ($z = 3.80$, $p < .001$) and health-focused eating regulation ($z = -1.87$, $p = .05$) both yielded a significant indirect relation to bulimic symptoms.

In the third model we included body dissatisfaction as a predictor of intensity of eating regulation and both eating regulation goals. In this model [SB$\chi^2(149) = 211.25$, $p < .001$, RMSEA = 0.04, SRMR = 0.06, and CFI = 0.98] body dissatisfaction was positively related to intensity of eating regulation ($\beta = 0.31$, $p < .001$) and appearance-focused eating regulation ($\beta = 0.65$, $p < .001$) and was unrelated to health-focused eating regulation ($\beta = 0.09$, *ns*). Next, we tested whether allowing direct paths from body dissatisfaction to diet-specific need frustration and bulimic symptoms would improve the model fit. Allowing both paths simultaneously resulted in a significantly improved model fit, ΔSB$\chi^2(2) = 10.88$, $p < .001$, with body dissatisfaction relating positively to diet-specific need frustration ($\beta = 0.33$, $p < .001$), while being unrelated to bulimic symptoms ($\beta = -0.10$, *ns*). By including the direct path from body dissatisfaction to diet-specific need frustration, the association between health-focused eating regulation and diet-specific need frustration became non-significant ($\beta = -0.11$, *ns*). Finally, as for the indirect effects, Sobel's *z* indicated an indirect association between body dissatisfaction and diet-specific need frustration ($z = 2.03$, $p < .05$) through appearance-focused eating regulation as well as an indirect association between body dissatisfaction and bulimic symptoms ($z = 2.32$, $p < .05$) through diet-specific need frustration. Together, these findings suggest that body dissatisfaction has a direct positive association with diet-specific need frustration but also an indirect association through appearance-focused eating

[1] As suggested by one of the reviewers, we tested interaction effects between the eating regulation goals and intensity of eating regulation. The interaction effect between health-focused eating regulation and intensity of eating regulation on diet-specific need frustration ($\beta = 0.01$, *ns*) and bulimic symptoms ($\beta = 0.02$, *ns*) was not significant. Also the interaction effects between appearance-focused eating regulation and intensity of eating regulation on diet-specific need frustration ($\beta = 0.08$, *ns*) and bulimic symptoms ($\beta = -0.01$, *ns*) were not significant. This suggests that the eating regulation goals yield a similar relation to need frustration and bulimic symptoms, regardless of participants' level of eating regulation.

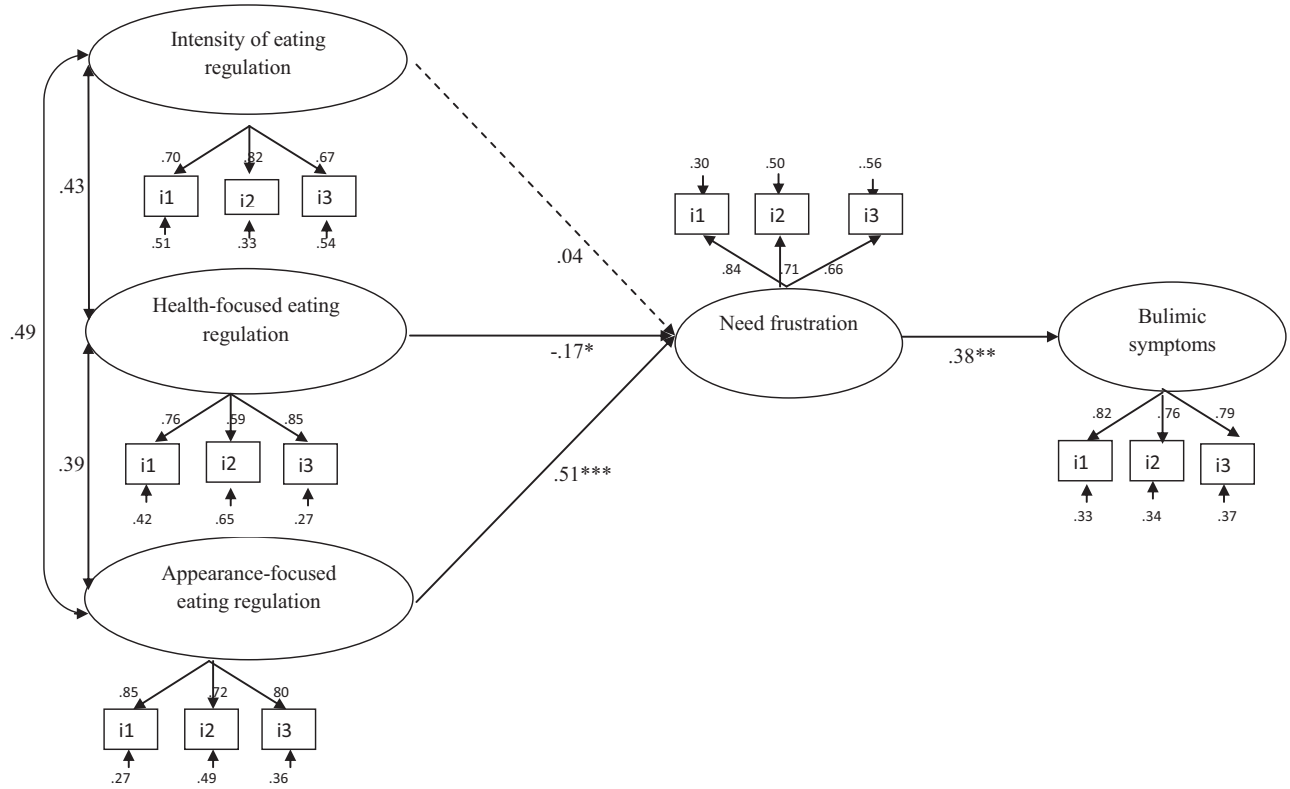

Figure 1. Structural model of the relationships between intenstity of eating regualtion, health- and appearance-related eating regulation, diet-specific need frustration, and bulimic symptoms. For the clarity of presentation, the effects of educational level and BMI are not shown. $^{**}p < .01$; $^{***}p < .001$.

regulation. After inclusion of body dissatisfaction as a predictor, the indirect effect of health-focused eating regulation on bulimic symptoms became non-significant ($z = -1.32$, *ns*), whereas the indirect effect of appearance-focused eating regulation on bulimic symptoms remained significant ($z = 1.96$, $p < .05$). This final model, which had an excellent fit [SB$\chi^2(148) = 201.223$, $p < .001$, RMSEA = 0.04, SRMR = 0.05, and CFI = 0.99], is graphically displayed in Figure 2.

Discussion

The central tenet within the Dietary Restraint Theory (Herman & Polivy, 1980) is that restraining food intake contributes to disinhibited eating. A multitude of studies have addressed this question, with some studies supporting the dietary restraint hypothesis (e.g., Ouwens et al., 2009), but others finding no evidence (e.g., Cooley & Toray, 2001) or even opposite evidence (e.g., Groesz & Stice, 2007).

In this study, we found that eating regulation was related positively to bulimic symptoms, thereby confirming Dietary Restraint Theory. On the basis of SDT, we expected that any association between eating regulation and bulimic symptoms might be due to experiences of need frustration and the data confirmed this expectation. Apparently, regulating one's eating pattern, on average, relates to experiences of diet-specific need frustration that, in turn, relate to bulimic symptoms. Possibly, regulating one's eating pattern might bring about feelings of pressure because it may be hard to ignore physiological cues and resist the temptation of old eating habits. Also, it may bring about feelings of incompetence and disappointment because eating regulation is considered a challenging endeavour that almost inevitably sometimes leads to failure. Such feelings of need frustration might in turn relate to bulimic symptoms because, when people's needs are frustrated, they might experience more negative affect while simultaneously having less energy available to deal with stressors in a constructive fashion. Instead, they may look for short-cuts to obtain a sense of well-being and they may engage in binge eating as a compensatory, yet derivative, way to restore positive affect and deal with stress (Heatherton & Baumeister, 1991; Ryan, Deci, Grolnick, & La Guardia, 2006; Stice, 2001).

Having established this average association between eating regulation, need frustration, and bulimic symptoms, a next aim was to examine whether two goals behind eating regulation would relate differentially to diet-specific need frustration and bulimic symptoms.

Understanding the Frustrating Effect of Eating Regulation: The Quality of Goals Matters

To date, little attention has been given to the goals underlying individuals' eating regulation attempts. Most studies assessed dietary restraint without considering the motivational basis for restraining food intake. In the current study we found that (a) appearance-focused eating regulation and health-focused eating regulation have different correlates with diet-specific need frustration and bulimic symptoms and (b) the quality of these goals seems to be more strongly related to diet-specific need frustration and bulimic symptoms than the intensity of eating regulation per se.

In line with our hypothesis, appearance-focused eating regulation was related positively to diet-specific need frustration and bulimic symptoms, while health-focused eating regulation was either unrelated or even related negatively to diet-specific need frustration and bulimic symptoms. These findings are in line with the findings of de Souza et al. (2010) that engagement with the goal of appearance is associated with more problematic weight control and with the findings of Putterman and Linden (2004) that appearance-focused dieting is associated with more disinhibited eating compared to health-focused dieting. These findings are also consistent with SDT's differentiation between intrinsic (such as

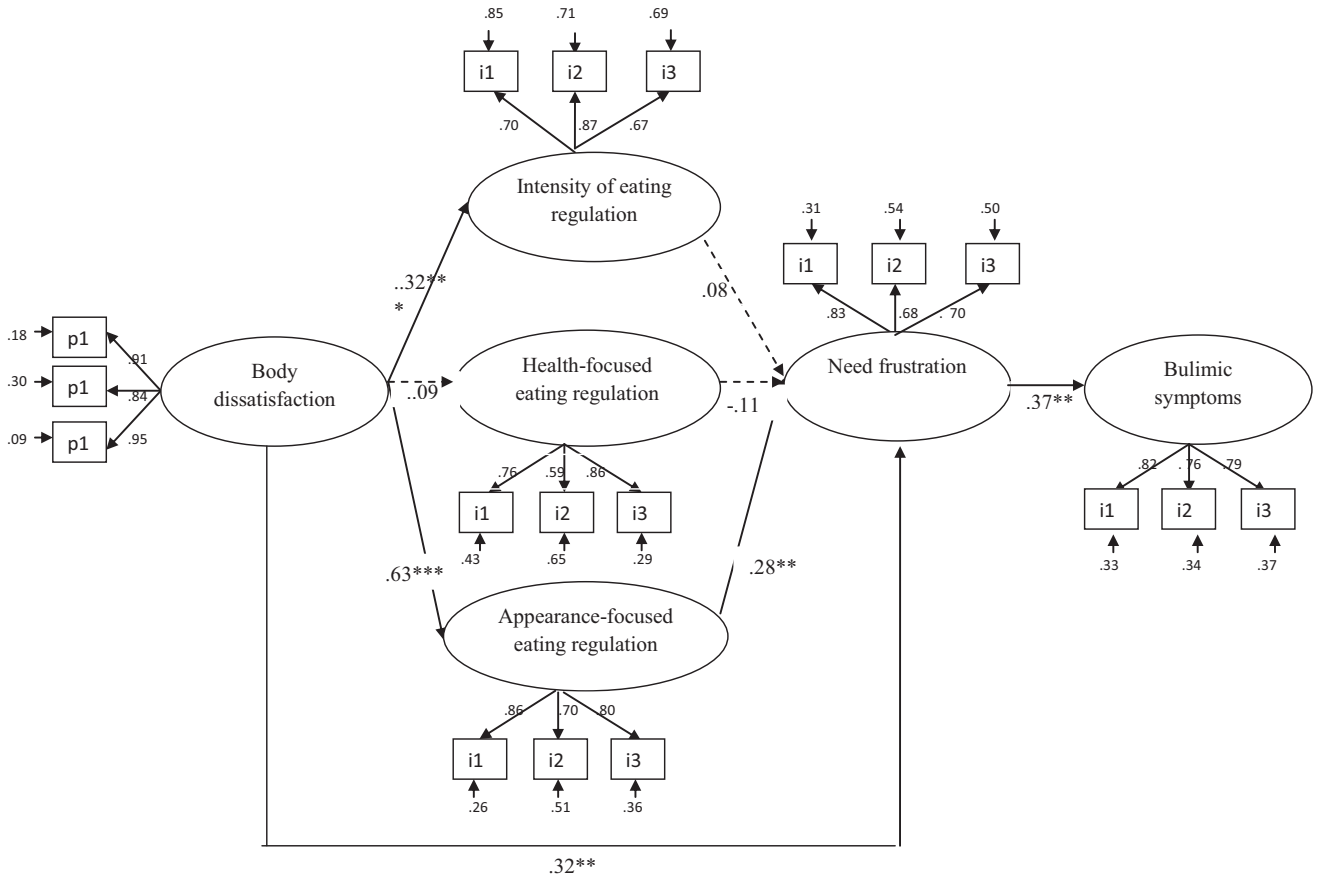

Figure 2. Structural model of the relationships between body dissatisfaction, intenstity of eating regualtion, health- and appearance-related eating regulation, need frustration, and bulimic symptoms. For the clarity of presentation, the effects of educational level and BMI are not shown. $^{**}p < .01$; $^{***}p < .001$.

health) and extrinsic goals (such as appearance), which are said to be differently linked to basic need satisfaction and frustration (Kasser & Ryan, 1996).

Our study suggests that appearance-focused eating regulation is associated with bulimic symptoms because of its associations with feelings of pressure (i.e., having no choice in what one eats), incompetence (feeling unable to control eating behaviours) and interpersonal tension (feeling unsupported by others in the eating regulation efforts). A number of speculative explanations can be provided as to why appearance-focused eating regulation is associated with more diet-specific need frustration compared to health-focused eating regulation. In the current society the ideal for physical attractiveness is extremely thin and unachievable for most women (e.g., Thompson & Stice, 2001). Therefore, adolescents who focus on appearance might have more rigid or strict dietary rules to achieve this thin-ideal and, thus, feel more incompetent or pressured in their regulatory attempts. Furthermore, studies within the context of exercising suggest that appearance-focused exercising is associated with a stronger focus on outcome and performance, whereas health-focused exercisers are more focused on the process of exercising (Crawford & Eklund, 1994; Vansteenkiste et al., 2007). In a similar vein, the outcome of achieving a desired weight and figure could be central in case of appearance-focused eating regulation (e.g., weighing themselves more often and comparing their looks with other girls), whereas the process of moving toward a different lifestyle might be central to health-focused eating regulation (e.g., Vansteenkiste et al., 2008). Compared to a process focus, an outcome focus might be relatively more stressful and might more easily give rise to feelings of need frustration such as pressure and incompetence (Vansteenkiste et al., 2008). Further research is needed to explain whether these or other processes can account for the association between appearance-focused eating regulation and diet-specific need frustration.

The positive association between appearance-focused eating regulation and diet-specific need frustration adds to previous SDT-based research on the association between goals and needs. Most previous studies within SDT focused on the associations between intrinsic goals and need satisfaction (e.g., Vansteenkiste et al., 2008). This is probably because SDT grew from a positive approach to human functioning with a strong focus on positive outcomes such as wellbeing and vitality. Although SDT also maintains it can explain the more 'dark side' of human functioning (Ryan & Deci, 2000b), relatively few studies have focused on need frustration to understand individuals' maladaptive functioning (e.g., Sheldon et al., 2011). The current findings suggest that the basic needs can indeed explain more maladaptive processes and outcomes as appearance-focused eating regulation (i.e., an extrinsic goal) was associated with more diet-specific need frustration and bulimic symptoms. Future research would do well to also include measures of need satisfaction and more adaptive outcomes, such as healthy eating. We anticipate that health-focused eating regulation might be more strongly related to need satisfaction and such positive outcomes than to need frustration and pathological outcomes.

The importance of examining eating regulation goals was underscored by the finding that the goals were more strongly and more consistently related to diet-specific need frustration and bulimic symptoms than the intensity of eating regulation per se. After taking into account participants' eating regulation goals, the initially observed association between intensity of eating regulation and diet-specific need frustration even turned out to be non-significant.

This is presumably the case because a strong focus on eating regulation in a group of normal-weight youngsters is often motivated by the pursuit of physical appeal and attractiveness. When controlling for the shared variance between both, it appears that it is not so much intensity of eating regulation in itself that is need frustrating, but the strong focus on physical appearance. Put simply, not the degree but the type of goals underlying eating regulation determines whether eating regulation is associated with more diet-specific need frustration and, hence, with more bulimic symptoms.

We would like to note that, different from previous work (e.g., Van Strien, 1999), our eating regulation measure (Pelletier et al., 2004) tapped into the general regulation of one's eating pattern rather than into the more narrow construct of restraint. Restriction of food intake represents only one mean to regulate one's food intake as one can also regulate one's eating pattern by developing a different eating style. We chose to use this more general measure of eating regulation because we believe that this measure can be more easily tied to different types of goals one may want to achieve through regulating one's eating pattern. However, it is possible that dietary restraint is inherently more need frustrating compared to eating regulation in general. Therefore, it is possible that dietary restraint would have had an independent association with diet-specific need frustration and bulimic symptoms beyond the type of goals underlying restraint.

Body Dissatisfaction as an Antecedent of Dietary Goals

Another aim of this study was to investigate body dissatisfaction as an antecedent of intensity of eating regulation and both eating regulation goals. Although it is often assumed that body dissatisfaction is the motivating force of eating regulation, we wanted to investigate whether it is related to any kind of eating regulation, or rather to a more specific kind of eating regulation. In addition, we examined whether the association between body dissatisfaction and bulimic symptoms (Stice, 2002) would be mediated by associations with the eating regulation goals and diet-specific need frustration.

As expected, a strong positive association emerged between body dissatisfaction and appearance-focused eating regulation. This indicates that adolescents who are dissatisfied with their body more often regulate their eating behaviours to improve their appearance. Also, a strong positive association emerged with intensity of eating regulation. This is in line with other studies revealing a positive association between body dissatisfaction and intensity of eating regulation (Stice, 2002). In contrast, we found that body dissatisfaction was not significantly associated with health-focused eating regulation. This suggests that body dissatisfaction is predominantly related to one type eating regulation, that is, eating regulation based on the goal of physical appearance.

Further, we found that the association between body dissatisfaction and diet-specific need frustration and bulimic symptoms is not fully accounted for by the eating regulation goals. Allowing a direct relation from body dissatisfaction to diet-specific need frustration significantly improved the model fit, which indicates that body dissatisfaction has an association with diet-specific need frustration beyond its associations with eating regulation goals. In other words, the results indicate that individuals who are dissatisfied with their body size and shape experience more need frustration in the context of eating regulation independent of the type of goals they pursue. We speculate that other motivational processes could explain this path. For instance, body dissatisfied individuals might regulate their eating pattern for more pressuring or demanding reasons, which in turn explains more diet-specific need frustration (e.g., Pelletier et al., 2004). Also, body dissatisfied individuals might disengage from any eating regulation goal as they feel discouraged in their pursuit of a more attractive appearance through dieting. This sense of amotivation and helplessness could, however, still trigger more diet-specific need frustration as people remain feeling incompetent about their eating behaviours.

Body dissatisfaction was related indirectly to bulimic symptoms through its associations with appearance-focused eating regulation and diet-specific need frustration. These findings suggest that body dissatisfied adolescents are vulnerable to bulimic symptoms because they directly and indirectly (i.e., through the type of goals they pursue) feel frustrated in their needs in the context of eating regulation.

Limitations and Future Research Suggestions

Although our study reveals some interesting results, some limitations need to be mentioned. First, because of the cross-sectional design of our study, no conclusion concerning causality and direction of effects in the models can be drawn. Possibly, the variables depicted in Figures. 1 and 2 have a reciprocal association with one another. For instance, although body dissatisfaction is depicted as an antecedent in the path models it might also be a consequence of eating regulation goals. Adolescents with a strong focus on appearance while regulating their eating behaviours might feel more dissatisfied with their body because their focus on appearance triggers body dissatisfaction (e.g., through using more social comparison). The direct path from body dissatisfaction to diet-specific need frustration might also be reversed. After feeling incompetent or pressured in one's eating behaviours or after receiving a critical remark about what one eats, body dissatisfaction might be triggered.

Another limitation is the sample of our study. Participants were not selected based upon their active engagement with eating regulation, but were part of a secondary school in Belgium. This is not problematic in itself as eating regulation and weight control are very salient issues for many adolescent girls (Neumark-Sztainer & Hannan, 2000). Indeed, the mean on the scale for intensity of eating regulation was above the midpoint in this sample. In spite of this, our group might not be representative for the population of adolescent girls who are actively trying to restrict their eating behaviours, for example through low-calorie diets. Therefore, it is necessary to include more diverse samples, including clinically overweight individuals, in future studies in order to generalize these findings to other groups.

A third methodological limitation is that no well-validated existing scales were available for the measurement of a number of study constructs such as diet-specific need frustration and eating regulation goals. Accordingly, we had to adjust extant measures for our research purposes. In doing so we based ourselves strongly on existing scales with sound psychometric characteristics (e.g., the AI) and our scales had a good structure validity and internal consistency. Nevertheless, more information about the validity of these scales would have been useful. As for the measure of intensity of eating regulation, more information is needed about the relationship of this scale to prevailing dietary restraint scales. Although we intended to measure eating regulation more broadly than dietary restriction alone in order to have a 'goal-neutral' measurement, the disadvantage of this scale is that it is rather unclear exactly how these items were perceived by participants. That is, did they interpret the scale spontaneously in terms of dietary restriction or in terms of adopting a different eating style?

A fourth, more conceptual, limitation was our focus on bulimic symptoms as an outcome. We focused upon this outcome because the relationship between eating regulation and bulimic symptoms has received a lot of attention in the literature and has yielded inconsistent results. We believe that implementing a motivational perspective in the study of this particular outcome represents a starting point for developing a more systematic research line

dealing with a diversity of both healthy and unhealthy eating behaviours. Future research may want to examine the link between need satisfaction and a more diverse range of eating behaviours to arrive at a more comprehensive understanding of the importance of motivational concepts in this area. In doing so, it would be critical to not limit oneself to the goals or the 'what' of eating regulation, but also to study people's motives underlying their eating regulation (e.g., because my partner expects me to do so; because I would feel guilty if I wouldn't do so; Pelletier et al., 2004).

Practical Implications

In spite of the aforementioned limitations, our study yields some interesting findings that might have implications for health policy and health care providers working with adolescent girls. First, because of inconsistent findings in previous studies, no clear guidelines for health policy related to dieting or eating regulation are available (e.g., Groesz & Stice, 2007; Herman, Polivy, & Leone, 2005). The present study suggests that appearance-focused eating regulation in particular, rather than eating regulation per se, may be discouraged in adolescent girls. Second, our study suggests that health-focused eating regulation represents a more positive alternative to appearance-focused eating regulation. This type of goal was not associated or even negatively related to diet-specific need frustration, meaning that it did not engender feelings of pressure, incompetence, and social tension. This suggests that, rather than motivating adolescents to change their eating habits to feel good about their body appearance, more attention could be devoted to the importance of health and physical fitness. Now, preventive campaigns for overweight and commercial weight-loss programs (e.g., WeightWatchers) seem to motivate people to eat more healthily by emphasizing the benefits for their health, but often also by emphasizing the benefits for one's appearance and shape (e.g., 'enhance your self-esteem by looking better'). Although not investigated in the context of eating regulation, studies in the context of exercising suggest that promoting appearance-goals, rather than health-goals, has an effect on adolescents' absorption during exercising, their performance and subsequent persistence (Vansteenkiste, Simons, Lens, Soenens, Matos, & Lacante, 2004). In a similar vein, prevention campaigns focused on promoting health-focused eating regulation, rather than on appearance-focused eating regulation, might stimulate a less problematic and more flexible type of eating regulation which in turn could have longstanding effects on one's eating behaviours. However, more research is needed to confirm these hypotheses and provide evidence-based guidelines.

A third finding concerns the importance of body dissatisfaction, which was both directly and indirectly (through appearance-focused eating regulation) related to diet-specific need frustration. This suggests that body dissatisfied adolescents are particularly vulnerable for the adverse effects of eating regulation. This finding is in line with many other studies pointing to the role of body dissatisfaction as a risk factor for bulimic symptoms (Stice, 2002) and thus confirms the importance of improving body esteem in adolescent girls. Decreasing the adoption of the thin-ideal (e.g., Stice, Rohde, Gau, & Shaw, 2009) and challenging the message that having an attractive appearance is essential for one's happiness (e.g., Evans, 2003) could be one path toward a less need-frustrating eating style.

Conclusion

The Dietary Restraint Model, which deals with the association between eating regulation and bulimic symptoms, has attracted a lot of attention in the literature. We believe that by applying well-validated motivation theories, like SDT, to the study of eating regulation, a refreshing light can be shed on this topic. Indeed, the findings of the present study suggest that it is critical to move beyond the study of intensity of eating regulation per se and to consider the goals underlying eating regulation to understand when eating regulation is associated with diet-specific need frustration and bulimic symptoms. Appearance-focused eating regulation seems to be rooted in dissatisfaction with one's body, seems to be experienced as need frustrating, and is associated with bulimic symptomatology. Practitioners may consider discouraging an appearance focus during eating regulation and instead promote health-focused eating regulation.

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