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Cecilie Thøgersen-Ntoumani and Nikos Ntoumanis

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CECILIE THØGERSEN-NTOUMANI
University of Birmingham, UK

NIKOS NTOUMANIS
University of Birmingham, UK

JHP

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Abstract

This study examined motivational predictors of body image concerns, self-presentation and self-perceptions using Self-determination Theory as a guiding framework. Aerobic instructors ($N = 149$) completed questionnaires measuring general need satisfaction, exercise motivational regulations, body image concerns, social physique anxiety and self-perceptions. Introjected regulation predicted all outcome variables in the expected direction. Intrinsic motivation positively predicted physical self-worth. Further, autonomy need satisfaction negatively predicted body image concerns. Finally, differences existed in need satisfaction, introjected regulation, self-perceptions and social physique anxiety between those at risk of developing eating disorders and those not at risk. The results underline the importance of overall and exercise-specific feelings of self-determination in dealing with body image concerns and low self-perceptions of aerobics instructors.

Keywords

- *motivational regulations*
- *need satisfaction*
- *the physical self*

COMPETING INTERESTS: None declared.

ADDRESS. Correspondence should be directed to:
DR NIKOS NTOUMANIS, School of Sport and Exercise Sciences, University of Birmingham, Birmingham, B15 2TT, UK. [email: N.Ntoumanis@bham.ac.uk]

ENGAGING in regular physical activity has been consistently linked to improved physical (Pate et al., 1995) and mental well-being (Biddle, Fox, & Boutcher, 2000) in the general population. For example, research has shown that moderate intensity physical activity may lead to improved levels of positive affect (Biddle, 2000), increase self-esteem and physical self-worth (Fox, 2000) and enhance levels of life satisfaction (Grant, Todd, Aitchison, Kelly, & Stoddart, 2004). However, the relationship between physical activity participation and body image concerns is more complex. For example, a large-scale randomized controlled trial with university students carried out by Zabinski, Calfas, Gehrman, Wilfley and Sallis (2001), which was designed to increase the use of behavioral skills necessary for maintaining or increasing physical activity levels, found that women in the intervention group, as opposed to those in the control group, significantly increased their scores for drive for thinness. No change was found in body dissatisfaction following the intervention. Likewise, a qualitative study by Markula (1995) with female aerobics participants found that the participants reported persistent body image dissatisfaction despite their high levels of physical activity participation. Thus, physical activity participation does not always help people feel better about their bodies; in fact, it can sometimes exacerbate concerns about body image.

One group of people who may be particularly concerned with self-presentation and how their bodies appear to others are aerobic instructors. As a function of their jobs, they are expected to portray the 'body beautiful' and work hard to achieve it (Hausenblas & Martin, 2000). Further, participants in their classes often aspire to acquire similar body shapes. It therefore seems reasonable to expect that aerobic instructors are perhaps particularly prone to be concerned about their body image since their body is constantly 'on display'. Such a preoccupation may be problematic, as high levels of body image concerns constitute a risk factor for eating disorders (Garner & Olmstead, 1984). Somewhat surprisingly, few studies have examined body image concerns and symptoms of eating disorders in aerobic dance instructors. A study by Olson, Williford, Richards, Brown and Pugh (1996), employing the Eating Disorder Inventory, found that the mean scores on symptoms such as body dissatisfaction and drive for thinness in a small sample of aerobics instructors were comparable to those of anorexia patients. In contrast, Martin and Hausenblas (1998) found that their sample of aerobic instructors displayed significantly lower scores on body dissatisfaction and drive for thinness compared to an eating disordered sample and a control group. Clearly, further research on this issue is needed, in particular to identify the motivational mechanisms that drive such body image concerns in aerobics instructors. In addition to body image concerns, it would also be useful to examine the motivational determinants of related variables, such as social physique anxiety and physical self-perceptions. This is an important task because, according to Self-determination Theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000), motivational regulations that vary in their degree of self-determination are likely to relate differently to body image concerns, self-presentation and self-perceptions.

Self-determination Theory and motivational regulations

SDT suggests that motivation toward any given behavior may be extrinsically motivated, intrinsically motivated or amotivated. These classifications of motivation represent different degrees of internalization of external values and goals and thus differ in the degree to which they are self-determined or autonomous (Deci & Ryan, 1985; Ryan & Deci, 2000). Specifically, amotivation refers to a lack of either extrinsic or intrinsic motivation; people who are amotivated toward a behavior do not value the activity, or do not believe that engaging in the behavior will result in any personally meaningful outcomes. Extrinsic motivation is comprised of four different types of behavioral regulation: external; introjected; identified; and integrated (Deci & Ryan, 1985; Ryan & Deci, 2000). Behaviors that are regulated through external means are said to be externally regulated and to lack self-determination. Thus, some individuals might engage in a behavior to receive a reward or because they are being somehow coerced into it. An example from the exercise setting would be when an aerobics instructor exercises in order to obtain external recognition. In contrast, behaviors that are regulated in an introjected manner are only partially internalized. These behaviors are performed in order to avoid internal pressure and negative feelings, to gain social approval or to support conditional self-worth (e.g. when someone exercises to improve physical appearance, upon which self-worth is reliant). Identified regulation is a more self-determined type of motivation. With this regulation the outcomes of the behavior are highly valued by the individual, and the behavior is performed without any pressure, even

though it might not be particularly pleasant. An example is when an aerobics instructor performs a highly repetitive exercise to improve his/her physical strength. Finally, integrated regulation represents the most self-determined form of extrinsic motivation. With this regulation, behaviors are performed in order to bring coherence to, and harmonize, different aspects of the self (Deci & Ryan, 1985, 1995). As an example, some people will exercise because they see exercise as an important component of a healthy lifestyle, along with healthy eating and limited or no alcohol intake. Thus, integrated regulation lies at the higher end of the self-determination continuum. However, even when behaviors are performed in an integrated manner, they are still performed for instrumental reasons (i.e. for outcomes separable from the activity), and thus they are still extrinsically regulated. Only when individuals perform a behavior because they enjoy the process of engaging in that behavior, is the behavior said to be fully self-determined or intrinsically motivated. In summary, intrinsic motivation, integrated regulation and identified regulation represent self-determined (or autonomous) regulations, whereas introjected and external regulation signify controlling motivational regulations.

A comprehensive review of self-determination research across different life domains demonstrated that the different motivational regulations can predict a number of behavioral, cognitive and affective outcomes (Vallerand, 1997). Specifically, Vallerand showed that self-determined motivational regulations are related to more adaptive outcomes compared to controlling regulations and amotivation. In the exercise domain, SDT has mainly been used as a theoretical framework to predict exercise behavior (e.g. Mullan & Markland, 1997; Thøgersen-Ntoumani & Ntoumanis, 2006) and intentions to engage in physical activity (e.g. Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003; Edmunds, Ntoumanis, & Duda, 2005; Wilson & Rodgers, 2004).

Motivational regulations, social physique anxiety and self-perceptions

In the exercise domain, self-presentation has most often been studied in terms of social physique anxiety. Social physique anxiety is defined as the concern one has that other people are negatively evaluating one's physical appearance (Hart, Leary, & Rejeski, 1989). Perhaps not surprisingly, social physique anxiety is considered a risk factor in the development of eating disorders (Diehl, Johnson, Rogers, & Petrie, 1998; Leary, Tchividjian, & Kraxberger, 1994), and studies have shown that social physique anxiety is related to eating disorder symptomatology (Hausenblas & Mack, 1999; Monsma & Malina, 2004).

Previous work examining the motivational determinants of social physique anxiety suggests that exercising to enhance appearance (an extrinsic motive according to SDT) is associated with social physique anxiety (Crawford & Eklund, 1994). This research has used descriptive motives and not the motivational regulations underpinning the self-determination continuum. However, a recent study by Thøgersen-Ntoumani and Ntoumanis (2006) with a diverse sample of exercisers found that social physique anxiety was positively predicted by introjected regulation and negatively by intrinsic motivation. In discussing their results, Thøgersen-Ntoumani and Ntoumanis suggested that because intrinsic exercise motivation is characterized by enjoyment of exercise, this feeling may downplay social evaluations and alleviate concerns about one's physique. Extrapolating from this finding, it could be hypothesized that self-determined exercise motivation is also negatively related to body image concerns (i.e. drive for thinness and body dissatisfaction), whereas being motivated to exercise due to internal pressures and guilt should be linked with higher levels of body image concerns. Indeed, Deci and Ryan (2000) argued that the struggle for body control may be the outcome of lack of self-determination. Arguably, social physique anxiety and body image concerns are all characterized by the desire to control the appearance of one's body. However, there is no empirical evidence to support this hypothesis. Therefore, research is needed to examine how motivational regulations predict social physique anxiety and other related body image concerns using SDT as a guiding theoretical framework.

High levels of self-esteem are considered to protect against the development of body image concerns and eating disorders (O'Dea, 2004). Indirect evidence for this argument has been provided, in a four-year prospective study, by Leon, Keel, Klump and Fulkerson (1997) who found that low self-esteem and negative affect at baseline predicted risk scores of eating disorders in adolescents at follow-up four years later on. However, most studies in this area have been carried out with children, adolescents or college students. One study that sampled adults showed that low levels of self-esteem significantly predicted body image dissatisfaction in both men

and women (Green & Pritchard, 2003). This is perhaps not surprising given that self-esteem and body image have demonstrated consistently high correlations (Fox, 1997). One important sub-domain of self-esteem is the physical self. People who are concerned about how their bodies are judged by others are less likely to feel a sense of physical self-worth. In support of this argument, Crocker et al. (2003) found in a study with adolescent girls that changes in body appearance self-perceptions and social physique anxiety over a 12-month period were moderately and negatively associated.

Although many research studies have examined the relationships between physical activity participation and physical self-worth (see Fox, 2000), few studies have examined the relationship between physical self-worth and the motivational regulations underlying physical activity behavior. This is despite Fox (1997) suggesting that self-determination or autonomy may be an important process by which people can enhance physical self-perceptions in exercise settings. In a study with young female exercisers, Wilson and Rodgers (2002) found that self-determined exercise motivation (i.e. identified regulation and intrinsic motivation) discriminated between those participants with high versus low physical self-esteem, whereas controlling exercise regulations (i.e. external and introjected) did not. In a different study with a diverse sample of exercisers, Thøgersen-Ntoumani and Ntoumanis (2006) found that intrinsic motivation significantly predicted physical self-worth, after controlling for age and gender. However, the generalizability of these findings should be tested with other populations.

SDT and need satisfaction

Deci and Ryan (1991) suggested that self-determined motivation results from the satisfaction of three fundamental needs: autonomy (feelings of volition or free will); competence (feeling able to control outcomes and experience effectance); and relatedness (feeling attached to, and accepted by, significant others). In contrast, controlling or amotivated behavior may be displayed when these needs are not satisfied. Importantly to the context of the present study, Ryan and Deci (2000) have suggested that the thwarting of need satisfaction in one's life may lead to distress and psychopathology. For example, they argued that the struggle for body control may be the outcome of a lack of self-determination. A study by Strauss and Ryan (1987) has offered some support to this assertion. The authors found that women diagnosed with anorexia nervosa had significantly higher scores on the impersonal subscale of the General Causality Orientations Scale (which assesses the extent of autonomy orientation in one's life) and intrapsychic autonomy, compared to a matched control group.

In line with suggestions made by Ryan and Deci (2000), it is reasonable to hypothesize that people who have not satisfied their needs for autonomy, competence and relatedness are more likely to suffer from body image concerns, including drive for thinness and body dissatisfaction, compared to those who have fulfilled these needs. However, to the authors' knowledge, this question has not been addressed yet in an exercise setting.

Purposes and hypotheses of the study

Based on the Self-determination Theory framework, the present study had three purposes. The first one was to examine how exercise regulations predicted physical self-worth, social physique anxiety, drive for thinness and body dissatisfaction. We did not examine integrated regulation and amotivation because the questionnaire we used does not tap these two motivational regulations. In our analysis we controlled for the influence of age and BMI because previous research has shown that older people tend to have lower levels of body dissatisfaction (Kjaerbye-Thygesen, Munk, Ottesen, & Kjaer, 2004), and other studies have found that Body Mass Index (BMI), measured as weight (kg)/height (m^2), relates positively to body dissatisfaction (Bailey, Goldberg, Swap, Chomitz, & Houser, 1990), 'feelings of fatness' (Strauman, Vookles, Berenstein, Chaiken, & Higgins, 1991) and social physique anxiety (Hausenblas & Fallon, 2002) in women. The second purpose was based on Deci and Ryan's (2000) argument that the struggle for body control may be the outcome of a lack of self-determination. Therefore, we sought to explore whether need satisfaction predicted negatively body image concerns (i.e. drive for thinness and body dissatisfaction) and social physique anxiety when controlling for age and BMI. The final purpose was to examine differences between those characterized as at risk of developing eating disorders (based on drive for thinness and body dissatisfaction scores), versus those not at risk, in terms of age, BMI, need satisfaction, exercise regulations, self-perceptions and social physique anxiety.

In view of the above, the following hypotheses were made:

1. External and introjected regulation would negatively predict physical self-worth, and positively social physique anxiety, drive for thinness and body dissatisfaction. In contrast, identified regulation and intrinsic motivation would positively predict physical self-worth, and negatively social physique anxiety, drive for thinness and body dissatisfaction.
2. Need satisfaction in one's life (i.e. satisfaction of the needs for autonomy, competence and relatedness) would negatively predict drive for thinness, body dissatisfaction and social physique anxiety.
3. Those participants characterized as at risk of developing an eating disorder would be significantly younger, have lower levels of need satisfaction, identified regulation, intrinsic motivation, self-esteem and physical self-worth, and significantly higher levels of BMI, external regulation, introjected regulation and social physique anxiety, compared to participants not at risk of developing an eating disorder.

Method

Participants

Participants were 149 (119 females and 26 males; four participants did not report their gender) aerobic instructors teaching a combination of aerobics/step/fitness, weight/body condition and yoga/pilates/stretch, who attended a national fitness congress in the West Midlands of the UK. Their mean age was 33.94 (SD = 9.76). The participants had been exercise instructors for an average of 6.68 years (SD = 6.16), and were teaching an average of 8.25 classes per week (SD = 6.34). Most (87.2%) of the participants also indicated, by responding to a single-item question, that they engaged in some form of moderate or vigorous intensity physical activity in their leisure-time for an average of 4.60 hours per week (SD = 3.71). Mean Body Mass Index (BMI) was 22.78 (SD = 2.84; range 18.07–33.31).

Measures

Need satisfaction

The Basic Need Satisfaction in Life Scale (Gagné, 2003) was used to measure satisfaction of the needs for autonomy (seven items), competence (six items) and relatedness (eight items). The scale consists of 21 items measured on a scale from one (*not true at all*) to seven (*definitely true*). Example items are: '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). Gagné reported alphas of .69, .86 and .71 for autonomy, relatedness and competence, respectively.

Exercise regulations

The Behavioral Regulation in Exercise Questionnaire (BREQ; Mullan, Markland, & Ingledew, 1997) was used to measure exercise regulations. This is a 15-item questionnaire that assesses external (four items), introjected (three items), identified (four items) and intrinsic (four items) regulations of exercise behavior. Similar to other motivation scales based on SDT (e.g. Sport Motivation Scale; Pelletier et al., 1995) it does not measure integrated regulation, because in the initial stages of development of the questionnaire, this regulation could not be empirically distinguished from identified regulation and intrinsic motivation. It does also not measure amotivation because in the initial stages of development of the questionnaire amotivation exhibited very high levels of skewness. Example items from the questionnaire include: 'I exercise because other people say I should' (external regulation); 'I exercise because I feel guilty when I don't' (introjected regulation); 'I exercise because I value the benefits of exercise' (identified regulation); and 'I exercise because it's fun' (intrinsic motivation). Each of the items was scored on a scale ranging from one (*Not true for me*) to five (*Very true for m*e). Mullan et al. (1997) used a zero to four scale, however, to be consistent with the other scales in the questionnaire pack, we changed the minimum score from zero to one. Mullan et al. (1997) and Wilson, Rodgers and Fraser (2002) have provided support for the questionnaire's construct validity and internal reliability (i.e. αs ranged from .76 to .90).

Body image concerns

Two subscales from the Eating Disorder Inventory—2 (EDI-2; Garner, 1991) were used to measure body image concerns: drive for thinness, which consists of seven items, and body dissatisfaction consisting of nine items. The drive for thinness subscale measures excessive concern with dieting, pursuit of thinness and weight preoccupation. The body dissatisfaction subscale assesses dissatisfaction with a range of body parts, such as the buttocks and the hips, as well as the degree to which these body parts are perceived to be too large/fat. Each item is measured on six-point scales ranging from one (*Never*) to six (*Always*). High scores on the two subscales indicate a risk for eating disorders. Support for the adequate validity

and reliability of the EDI-2 has been reported by Garner (1991). In testing the internal reliability of the questionnaire, Garner (1991) reported internal consistency coefficients between .80 and .92.

Social physique anxiety The Social Physical Anxiety Scale (SPAS; Hart et al., 1989) was used as an indicator of self-presentation concerns. The scale consists of 12 items and measures the degree of anxiety people experience when they perceive their physique to be evaluated by other people. Example items from the scale include: 'In the presence of others, I feel apprehensive about my figure'; and 'I wish I wasn't so uptight about my figure'. Participants rate each item on a scale ranging from one (*Not at all*) to five (*Extremely true*). Hart et al. (1989) have reported an internal consistency coefficient of .90 and minimal social desirability bias.

Self-perceptions The physical self-worth subscale (six items) from the Physical Self-perception Profile (PSPP; Fox & Corbin, 1989) was used to measure physical self-perceptions. The PSPP employs a forced-choice structured alternative format in order to minimize socially desirable responding. For each item, two alternative statements are provided. The participants must first decide which of two statements is more indicative of them, and then indicate if that statement is '*Sort of true*' or '*Really true*' for them. An example item is: 'Some people feel extremely proud of who they are and what they can do physically BUT Others are sometimes not quite as proud of who they are physically'. Internal reliability coefficients of the PSPP typically range between .84 and .92 (Sonstroem, Harlow, & Josephs, 1994; Sonstroem, Speliotis, & Fava, 1992). Also, Fox and Corbin (1989) found Pearson *r* test–retest reliability coefficients of between .81 and .88.

The six-item global self-worth subscale of the Adult Self-perception Profile (ASPP; Messer & Harter, 1986) was employed as another indicator of self-perceptions. Similar to the PSPP, the items in the ASPP are presented in a structured alternative format. An example item is: 'Some adults like the kind of person they are BUT Other adults would like to be someone else'. Messer and Harter (1986) found internal reliability coefficients for the global self-worth subscale to range between .87 and .92.

Procedure

Prior to the fitness convention, the nature of the study was explained to the organizers and permission was sought to hand out questionnaires to the participants. Written permission was secured, and three research assistants were granted access to the convention premises to hand out questionnaires to the participants during the two-day convention. Participants were asked to hand in the questionnaires later during the convention to one of the research assistants or via drop-off collection boxes that were located at the premises. Anonymity was guaranteed and participants were ensured that their responses would remain confidential. The study had the approval of the ethics committee of a British university.

Results

Descriptive statistics, internal reliability coefficients and bivariate correlations

Descriptive statistics, internal reliability coefficients and correlations among age, BMI and all psychological variables are presented in Table 1. The results revealed that the need for competence subscale had a low Cronbach's alpha coefficient ($\alpha = .60$). None the less, this subscale was retained because it was important in this study to examine the satisfaction of all three psychological needs. Results pertaining to this variable should be interpreted with some caution.

Results from the correlation analysis revealed that all three needs were moderately negatively related to drive for thinness, body dissatisfaction and social physique anxiety. Further, and as predicted, controlling types of exercise motivation were negatively related to physical self-worth and positively associated with social physique anxiety, drive for thinness and body dissatisfaction. In contrast, identified regulation did not display any significant relationships with any of these variables. Intrinsic motivation was significantly and positively associated only with physical self-worth.

Predicting physical self-worth, social physique anxiety and body image concerns from age, BMI and motivational regulations

To test our first two hypotheses, we carried out several multiple hierarchical regression analyses. Before these tests were conducted, we examined some of the assumptions associated with regression analysis. To test for linearity, we plotted each independent variable against the dependent variable in each regression (Norušis, 2002). No evidence was found for a curvilinear pattern of residuals. To check for

Table 1. Descriptive statistics, internal reliability coefficients and correlation coefficients for age, BMI and all psychological variables

	M	*SD*	α	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1. Age	33.94	9.76	–													
2. BMI	22.78	2.84	–	−.10												
3. Aut	5.27	.85	.76	−.12	.06											
4. Com	5.36	.76	.60	−.03	.06	.54**										
5. Rel	5.65	.77	.75	−.07	−.01	.48**	.49**									
6. EX	1.20	.41	.73	−.22*	.09	−.20*	−.26**	−.11								
7. IJ	2.39	.99	.80	−.17	.06	−.29**	−.36**	−.26**	.38**							
8. ID	4.39	.64	.76	.16	.19*	.05	.13	.16	−.06	.26**						
9. IM	4.32	.70	.89	.13	.03	.16	.21*	.29**	−.11	−.09	.44**					
10. SE	3.07	.71	.92	−.09	.01	.58**	.57**	.44**	−.16	−.28**	.08	.26**				
11. PSW	2.87	.70	.92	−.06	−.03	.60**	.55**	.43**	−.24**	−.39**	.03	.24**	.73**			
12. SPA	2.50	.89	.93	−.05	.12	−.57**	−.52**	−.36**	.26**	.51**	−.003	−.10	−.62**	−.79**		
13. BD	3.32	1.23	.92	.03	.15	−.46**	−.36**	−.29**	.23**	.46**	.07	−.08	−.40**	−.69**	.78**	
14. DT	2.66	1.19	.91	−.03	−.01	−.51**	−.46**	−.39**	.31**	.58**	.10	−.09	−.47**	−.64**	.77**	.74**

Aut = Autonomy (range: 1–7), Com = Competence (1–7), Rel = Relatedness (1–7), EX = External regulation (1–5), IJ = Introjected regulation (1–5), ID = Identified regulation (1–5), IM = Intrinsic motivation (1–5), SE = Self-esteem (1–4), PSW = Physical Self-worth (1–4), SPA = Social Physique Anxiety (1–5), BD = Body dissatisfaction (1–6), DT = Drive for thinness (1–6)

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

homoscedasticity, we plotted the studentized residuals against the predicted values. There was no obvious evidence of a triangle-shaped pattern. To check for normality, we produced Q-Q plots of standardized residuals. Most points fell close to the straight line. To check the independence assumption we looked at the Durbin-Watson test, which ranges from zero to four. If there is no correlation between successive residuals, this statistic should be close to two (Norušis, 2002). All values were in the region of 1.9 to 2.3. To test for influential cases, we examined Cook's D. All values were close to zero and none approached one (Norušis, 2002). We also examined whether there was evidence for multicollinearity by inspecting the variance inflation values. According to Hair, Anderson, Tatham and Black (1998), a common cutoff threshold is a value of 10 and above. Our values were in the region of one to 1.5.

All missing data were treated with listwise deletion. We consulted Cohen, Cohen, West and Aiken (2003) to determine the effect sizes in our regressions and to calculate statistical power based on these effect sizes, and an alpha level of .05. For the smallest R-squared value (.20) we report in our tables, the *L* value (see Cohen et al., 2003, p. 92) is 26.5, which corresponds to a power value close to .99 (see Cohen et al., 2003, p. 651). Therefore, our analysis was not affected by low statistical power.

In our regressions we first examined whether the different exercise regulations could predict physical self-worth, social physique anxiety, drive for thinness and body dissatisfaction, after controlling for age and BMI. The results revealed that the set of motivational regulations significantly predicted all of the dependent variables, whereas age only predicted physical self-worth (see Table 2). Specifically, physical self-worth was predicted negatively by age and introjected regulation and positively by intrinsic motivation. Only introjected regulation predicted social physique anxiety, drive for thinness and body dissatisfaction, all in a positive direction.

Predicting body image concerns and social physique anxiety from age, BMI and need satisfaction

Additional multiple regression analyses were carried out to examine how general need satisfaction predicted drive for thinness, body dissatisfaction and social physique anxiety, after controlling for age and BMI. The results showed that all regressions were significant. With regard to drive for thinness, it was negatively predicted by the satisfaction of the needs for autonomy and competence. In contrast, for body dissatisfaction, only autonomy need satisfaction was a significant and negative predictor. Finally, social physique anxiety was positively predicted by BMI and negatively by the satisfaction of the needs for autonomy and competence (see Table 3).

Differences between participants at risk for eating disorders and those not at risk in age, BMI, need satisfaction, motivational regulations, self-perceptions and social physique anxiety

Independent sample *t*-tests were carried out to examine differences in age, BMI, need satisfaction, motivational regulations, self-esteem, physical self-worth and social physique anxiety between those characterized as being at risk for an eating disorder and those not considered at risk. The instructors were classified as at risk or at no risk according to their drive for thinness and body dissatisfaction scores. Garner and Olmstead (1984) reported that when these scales are converted into scales ranging from zero to three, total scores of 10 or above on the body dissatisfaction scale and total scores of 15 or above on the drive for thinness scale indicate a risk for developing an eating disorder. Our analyses indicated that only eight female (5.4% of the total sample) and no male participants were at risk based on their drive for thinness scores. In contrast, a total of 46 participants (30.9%; $n = 42$ females; $n =$ three males) had elevated risks for developing an eating disorder due to high scores on the body dissatisfaction scale. Due to the very small number of participants who were at risk due to high scores on the drive for thinness subscale, this variable was excluded from the subsequent analyses. To examine differences between those with elevated risks for developing an eating disorder (based on body dissatisfaction scores) and those who were not at risk, a categorical variable was created (one = participants at no risk; two = participants at risk).

Results of the independent samples *t*-tests are presented in Table 4. To protect against Type I error, we adopted a more conservative *p* value by dividing .05 with the number of *t*-tests (12). Therefore, the *p* level we used to evaluate the results was $p = .004$. The results show that the two groups differed significantly in a number of variables. Specifically, those at risk reported lower need satisfaction and self-perceptions, and higher introjected regulation and social physique anxiety.

Table 2. Multiple hierarchical regression analyses predicting physical self-worth, social physique anxiety, drive for thinness and body dissatisfaction from age, BMI and motivational regulations

Variable	*Adj* R^2	β	*t*
Physical self-worth F (6, 105) = 5.48; $p < .001$	.20		
Age		−.18	−2.02*
BMI		−.02	−.25
External regulation		−.14	−1.42
Introjected regulation		−.34	−3.32**
Identified regulation		.00	−.001
Intrinsic motivation		.22	2.29*
Social physique anxiety F (6, 109) = 8.08; $p < .001$	.27		
Age		.08	1.01
BMI		.13	1.59
External regulation		.09	.94
Introjected regulation		.52	5.54***
Identified regulation		−.13	−1.35
Intrinsic motivation		−.02	−.18
Drive for thinness F (6, 110) = 11.64; $p < .001$	.36		
Age		.15	1.94
BMI		.02	.23
External regulation		.15	1.81
Introjected regulation		.55	6.27***
Identified regulation		−.004	−.05
Intrinsic motivation		−.06	−.70
Body dissatisfaction F (6, 110) = 6.03; $p < .001$	.21		
Age		.17	1.89
BMI		.10	1.17
External regulation		.11	1.17
Introjected regulation		.44	4.49***
Identified regulation		−.05	−.44
Intrinsic motivation		−.04	−.46

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

Discussion

The overall purpose of the present study was to examine the role of motivational regulations to exercise and general need satisfaction in predicting body image concerns, self-presentation and self-perceptions in aerobic instructors, using the SDT framework.

The first specific aim of the study was to examine how exercise regulations predicted physical self-worth, social physique anxiety, drive for thinness and body dissatisfaction. The results of regression analyses revealed that introjected regulation was the only controlling form of motivation that significantly predicted all the outcome variables. Specifically, introjected regulation negatively predicted physical self-worth, and positively social physique anxiety, drive for thinness and body dissatisfaction. Thus, exercising due to internal pressure, in order to achieve self-worth which is contingent on a socially defined ideal body type, may be detrimental to perceptions of one's physical self and body image evaluations. Contingent self-worth has been shown to be problematic in various studies. For example, Patrick, Neighbors and Knee (2004) showed that women who were higher in contingent self-worth were more likely to compare themselves with ideal models and experience greater increases in surveillance and body shame across a number of experimental conditions. Plant and Ryan (1985) have also shown a relationship between introjected regulation and public self-consciousness.

The negative relationship between introjected regulation and self-evaluations supports SDT (Ryan & Deci, 2000) and previous empirical work in the exercise context (e.g. Thøgersen-Ntoumani & Ntoumanis, 2006). Contrary to our first hypothesis, external regulation did not uniquely predict any of the outcome variables. At first glance, this is surprising given that

Table 3. Multiple hierarchical regression analyses predicting drive for thinness, body dissatisfaction and social physique anxiety from age, BMI and need satisfaction

Variable	*Adj* R^2	β	*t*
Drive for thinness F (5, 121) = 11.03; $p < .001$	.29		
Age		−.03	−.33
BMI		.06	.75
Autonomy		−.34	−3.58***
Competence		−.27	−2.64**
Relatedness		−.04	−.38
Body dissatisfaction F (5, 121) = 8.07; $p < .001$	.22		
Age		.004	.05
BMI		.14	1.81
Autonomy		−.38	−3.78***
Competence		−.20	−1.87
Relatedness		.06	.63
Social physique anxiety F (5, 120) = 17.25; $p < .001$	.39		
Age		−.10	−1.36
BMI		.15	2.16*
Autonomy		−.44	−4.93***
Competence		−.29	−3.02**
Relatedness		.04	.47

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

Table 4. Differences between those characterized at risk and those at no risk of developing an eating disorder in age, BMI need satisfaction, motivational regulations, self-esteem, physical self-worth and social physique anxiety

	Not at risk		*At risk*			
	M	*SD*	*M*	*SD*	*t*	*Cohen's d*
Age	33.85	10.03	33.98	9.24	−.07	−.01
BMI	22.74	2.89	23.01	2.77	−.50	−.09
Autonomy	5.49	.76	4.72	.77	5.61***	1.01
Competence	5.53	.73	4.96	.67	4.45***	.81
Relatedness	5.77	.69	5.33	.85	3.07**	.56
External regulation	1.15	.31	1.29	.53	−1.64	−.32
Introjected regulation	2.18	.90	2.88	1.06	−3.91***	−.71
Identified regulation	4.42	.59	4.41	.57	.10	.02
Intrinsic motivation	4.34	.71	4.27	.70	.51	.10
Self-esteem	3.23	.61	2.67	.76	4.62***	.81
Physical self-worth	3.14	.53	2.25	.65	8.58***	1.50
Social physique anxiety	2.12	.63	3.33	.76	−10.06***	−1.73

***$p < .001$

external regulation is an even less self-determined form of motivation than introjected regulation (Deci & Ryan, 1985; Ryan & Deci, 2000). However, an explanation could be sought by looking at the role of exercise in the lives of the study participants. Due to the nature of their job, exercise is central to the lives of aerobic instructors. Therefore, they are likely to be highly active beyond the classes they teach (indeed, they exercised at a moderate or vigorous level for an average of 4.60 hours per week beyond the classes they taught). As a consequence, they are not likely to feel controlled to exercise by outside forces or rewards, which may explain why external regulation did not predict any of the outcome variables.

Interestingly, and in contrast to our first hypothesis, self-determined motivation (identified regulation and

intrinsic motivation) did not predict either social physique anxiety or body image concerns. This result is in contrast to the findings of a previous study by Thøgersen-Ntoumani and Ntoumanis (2006) who found that social physique anxiety was negatively predicted by intrinsic motivation. The authors suggested that self-determined motivation can increase enjoyment to exercise, downplay social comparisons and alleviate concerns about body appearance. However, Thøgersen-Ntoumani and Ntoumanis' study was carried out with a sample of exercisers with diverse exercise history and age, some of whom exercised on their own. In contrast, the present study used a sample of aerobic instructors for whom the body is constantly on display; such situations might exacerbate body-related concerns. It is possible that in this sample, self-determined motivation might not be sufficient to protect against such concerns or against the development of eating disorders risk factors. In contrast, our results show that autonomy need satisfaction (which gives rise to self-determined motivation) in one's life negatively predicts body image concerns and risk factors for eating disorders. Therefore, it seems that perceptions of autonomy at a more global level are better predictors of such maladaptive outcomes as opposed to perceptions of autonomy confined to exercise settings only.

As expected, physical self-worth was predicted positively by intrinsic motivation, in line with findings of previous research with different exercising populations (Thøgersen-Ntoumani & Ntoumanis, 2006; Wilson & Rodgers, 2002). This result further provides support to the argument by Fox (1997) that self-determination may be an important process by which people improve physical self-perceptions in exercise settings. This finding has implications for mental health in that physical self-worth is related to indicators of mental health beyond the influence of global self-esteem (Sonstroem & Potts, 1996; van de Vliet et al., 2002). Further, in view of the high negative correlations between physical self-worth and body-related concerns and social physique anxiety reported in this study, it is possible that the improvement of physical self-worth could alleviate body-related concerns. Future experimental research designs can establish whether this is indeed the case.

The second hypothesis was partly supported in that satisfaction of the need for autonomy was a negative predictor of body image concerns and social physique anxiety, when controlling for the influence of age and BMI, while competence need satisfaction was a negative predictor of drive for thinness and social physique anxiety. Relatedness need satisfaction did not predict drive for thinness, body dissatisfaction or social physique anxiety. From a conceptual standpoint, SDT suggests that people who have high perceptions of autonomy feel they have a sense of choice and control of their behaviors (Deci & Ryan, 1991). In turn, perceptions of control over one's life and the expression of the true self are negatively related to eating disturbances (Lam & Lee, 2000; Surgenor, Horn, & Hudson, 2003), and the struggle for body control (Deci & Ryan, 2000). The present findings seem to suggest that autonomy need satisfaction might be more important than competence and relatedness need satisfaction in predicting indicators of body image concerns and social physique anxiety. However, Deci and Ryan (2000) postulate an important role for all three needs. Before any conclusions are drawn, future research should examine the role of the three needs by employing longitudinal designs that investigate within-person fluctuations in needs (La Guardia, Ryan, Couchman, & Deci, 2000). Such designs are more likely to capture the dynamic role of need satisfaction and consider individual differences in predicting body image concerns and social physique anxiety.

None the less, the *t*-tests revealed that those who were at risk for developing eating disorders (based on their high scores on the body dissatisfaction scale) had significantly lower satisfaction of all three needs compared to those who were not at risk (the associated effect sizes were moderate to high). However, the group considered 'at risk' still displayed moderately high levels of need satisfaction. Although these results do not directly test Ryan and Deci's (2000) proposition that need thwarting may be a contributing factor to the development of psychopathology (such as eating disorders), they do demonstrate that high need satisfaction is less likely to be related to the development of such risk factors. However, the presented evidence is not causal. Therefore, future research should attempt to explore causal mechanisms implicated in need satisfaction, need thwarting and the development of risk factors for eating disorders.

The *t*-tests also showed that, in line with the results of the regression analysis reported earlier, those at risk for eating disorders reported significantly greater levels of introjected regulation compared to those who were not at risk. This finding provides further corroboration to Deci and Ryan's (2000) suggestion that the struggle for body control is the outcome of low self-determination. Further differences between those at risk and those not at risk were also found.

Specifically, and as hypothesized, self-esteem and physical self-worth was significantly lower in the at risk group (the associated effect size was large). This finding is in agreement with results from previous studies carried out with both adolescents and adults, which have shown that low self-esteem predicts eating disorder symptomatology and body image dissatisfaction (Green & Pritchard, 2003; Leon et al., 1997). Further, differences in social physique anxiety between the two groups were highly significant, with those at risk for developing eating disorders displaying higher levels of self-presentation concerns compared to the not at risk group (the associated effect size was again large). Again, this result supports previous findings that social physique anxiety is associated with eating disorder symptomatology (Diehl et al., 1998; Hausenblas & Mack, 1999; Monsma & Malina, 2004). Social physique anxiety may be a particular problem for aerobic instructors who feel they are expected to portray the ideal body. The often revealing bodysuits they wear may exacerbate their concerns about how their bodies appear to others. However, the mean score for the not at risk group demonstrates that social physique anxiety is less likely to be a problem for aerobic instructors in this group.

In the regression analyses we controlled for the effects of age and BMI. The results showed that age was a significant and negative predictor of physical self-worth. This is probably due to deteriorations in one's physique with the passage of time. Further, BMI positively predicted social physique anxiety. This result is in line with previous research by Hausenblas and Fallon (2002) who found that BMI was the strongest positive predictor of social physique anxiety in female university students. However, BMI did not significantly predict any of the other outcome variables in the present study. This finding goes in contrast with previous research showing that BMI is significantly and positively related to body dissatisfaction (Bailey et al., 1990) and 'feelings of fatness' (Strauman et al., 1991). However, these studies were carried out with different samples whose physique was not constantly 'on display'. Further, there was very little variation in the BMI scores of the aerobics instructors, which might have had an impact on the strength of the path coefficients.

There are some limitations associated with the present study that should be considered in the interpretation of its findings. First the sample consisted mainly of female aerobic instructors and this makes the generalization of the findings to male aerobic instructors difficult. However, this gender imbalance is not surprising considering that there is evidence in the UK to indicate that there are substantially more female than male aerobic instructors (Laird, Campbell-Jack, & Clapto, 2004). Further, it is possible that there is a difference in body image concerns, social physique anxiety and physical self-worth between those instructors who teach few hours per week, compared to those who teach full time. It was not possible to address this question in the present study, due to the limited sample size and the great variation in hours taught. Another limitation pertains to the cross-sectional nature of the present study. It is possible that the relationship among the variables examined is reciprocal in nature. Future research should examine the size of the cross-lagged effects between the motivational variables and the other variables assessed in this study. Lastly, the psychometric properties of the Basic Need Satisfaction in Life Scale should be further tested, and if needed, modifications should be made, in particular with regard to the competence subscale, which exhibited low internal reliability in this study. However, despite its low internal reliability, competence need satisfaction was a significant predictor in two of the three regressions. Further, examining its correlations with the other variables in Table 1, one can see that most of them were significant and in the expected direction. In addition, the *t*-test involving competence in Table 4 was also in accordance with our hypothesis. Therefore, we believe that our decision to keep this subscale in our study was justified.

There are practical implications that can be drawn from the findings of the present study. For example, the results suggest that aerobic instructors who are motivated to exercise mainly because their self-worth is contingent upon exercise and its associated outcomes (such as improved physical appearance) are more likely to have high levels of body image concerns and social physique anxiety, as well as lower levels of physical self-worth. Thus, it may be essential for this population to engage in additional meaningful pursuits in other life contexts that will enhance their self-worth, in order that their self-worth is not primarily contingent on exercise-related outcomes. Further, the results suggest that the satisfaction of the need for autonomy in one's life plays a central role in predicting body image concerns. Therefore, aerobic instructors should engage, where possible, in autonomy-supportive contexts across different life domains.

References

Bailey, S. M., Goldberg, J. P., Swap, W. C., Chomitz, V. R., & Houser, R. F., Jr. (1990). Relationships between body dissatisfaction and physical measurements. *International Journal of Eating Disorders*, *9*, 457–461.

Biddle, S. J. H. (2000). Emotion, mood and physical activity. In S. J. H. Biddle, K. R. Fox, & S. H. Boutcher (Eds.), *Physical activity and psychological well-being* (pp. 63–87). London: Routledge.

Biddle, S. J. H., Fox, K. R., & Boutcher, S. H. (2000). *Physical activity and psychological well-being*. London: Routledge.

Chatzisarantis, N. L. D., Hagger, M. S., Biddle, S. J. H., Smith, B., & Wang, J. C. K. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. *Journal of Sport and Exercise Psychology*, *25*, 284–306.

Cohen, J., Cohen, P., West, S., & Aiken, L. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*, 3rd edn. Hillsdale, NJ: Lawrence Erlbaum Associates.

Crawford, S., & Eklund, R. C. (1994). Social physique anxiety, reasons for exercise, and attitudes toward exercise settings. *Journal of Sport and Exercise Psychology*, *16*, 70–82.

Crocker, P., Sabiston, C., Forrestor, S., Kowalski, N., Kowalski, K., & McDonough, M. (2003). Predicting change in physical activity, dietary restraint, and physique anxiety in adolescent girls: Examining covariance in physical self-perceptions. *Canadian Journal of Public Health*, *94*, 332–337.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska symposium on motivation, vol. 38: Perspectives on motivation* (pp. 237–288). Lincoln, NE: University of Nebraska Press.

Deci, E. L., & Ryan, R. M. (1995). Human autonomy: The basis for true self-esteem. In M. H. Kernis (Ed.), *Efficacy, agency, and self-esteem* (pp. 31–49). New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (2000). The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*, 227–268.

Diehl, N. S., Johnson, C. E., Rogers, R. L., & Petrie, T. A. (1998). Social physique anxiety and disordered eating: What's the connection? *Addictive Behaviors*, *23*, 1–6.

Edmunds, J., Ntoumanis, N., & Duda, J. L. D. (2005). Testing a Self-determination Theory based teaching style in the exercise domain. Manuscript submitted for publication.

Fox, K. R. (2000). The effects of exercise on self-perceptions and self-esteem. In S. J. H. Biddle, K. R. Fox, & S. H. Boutcher (Ed.), *Physical activity and psychological well-being*. London: Routledge.

Fox, K. R. (1997). The physical self and processes in self-esteem development. In K. R. Fox (Ed.), *The physical self: From motivation to well-being* (pp. 111–139). Champaign, IL: Human Kinetics.

Fox, K. R., & Corbin, C. B. (1989). The Physical Self-perception Profile: Development of preliminary validation. *Journal of Sport and Exercise Psychology*, *11*, 408–430.

Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion*, *27*, 199–223.

Garner, D. M. (1991). *Eating Disorder Inventory—2*. Professional Manual. Odessa, FL: Psychological Assessment Resources.

Garner, D. M., & Olmstead, M. P. (1984). *Manual for eating disorder inventory*. Odessa, FL: Psychological Assessment Resources.

Grant, S., Todd, K., Aitchison, T. C., Kelly, P., & Stoddart, D. (2004). The effects of a 12-week group exercise programme on physiological and psychological variables and function in overweight women. *Public Health*, *118*, 31–42.

Green, S. P., & Pritchard, M. E. (2003). Predictors of body image dissatisfaction in adult men and women. *Social Behavior and Personality*, *31*, 215–222.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis*, 5th edn. Upper Saddle River, NJ: Prentice Hall.

Hart, E. A., Leary, M. R., & Rejeski, W. J. (1989). The measurement of social physique anxiety. *Journal of Sport and Exercise Psychology*, *11*, 94–104.

Hausenblas, H. A., & Fallon, E. A. (2002). Relationships among body image, exercise behaviour, and exercise dependence symptoms. *International Journal of Eating Disorders*, *32*, 179–185.

Hausenblas, H. A., & Mack, D. E. (1999). Social physique anxiety and eating disorder correlates among female athletic and nonathletic populations. *Journal of Sport Behavior*, *22*, 502–513.

Hausenblas, H. A., & Martin, K. A. (2000). Bodies on display: Female aerobic instructors and social physique anxiety. *Women in Sport and Physical Activity Journal*, *9*, 1–14.

Kjaerbye-Thygesen, A., Munk, C., Ottesen, B., & Kjaer, S. K. (2004). Why do slim women consider themselves too heavy? A characterization of adult women considering their body weight as too heavy. *International Journal of Eating Disorders*, *35*, 275–285.

La Guardia, J. G., Ryan, R. M., Couchman, C. E., & Deci, E. L. (2000). Within-person variation in security of attachment: A Self-determination Theory perspective on attachment, need fulfilment, and well-being. *Journal of Personality and Social Psychology*, *79*, 367–384.

Laird, A., Campbell-Jack, D., & Clapto, R. (2004). *Women in sport leadership: A research study for Sportscotland by George Street Research*. Research Report no. 91. Edinburgh: Sportscotland.

Lam, M., & Lee, S. (2000). Three different presentations of bulimia nervosa. *Hong Kong Medical Journal*, *6*, 227–230.

Leary, M. R., Tchividjian, L. R., & Kraxberger, B. E. (1994). Self-presentation can be hazardous to your health: Impression management and health risk. *Health Psychology*, *13*, 461–470.

Leon, G. R., Keel, P. K., Klump, K. L., & Fulkerson, J. A. (1997). The future of risk factor research in understanding the etiology of eating disorders. *Psychopharmacology Bulletin*, *33*, 405–411.

Markula, P. (1995). Firm but shapely, fit but sexy, strong but thin: The postmodern aerobicizing female bodies. *Sociology of Sport Journal*, *12*, 424–453.

Martin, K. A., & Hausenblas, H. A. (1998). Psychological commitment to exercise and eating disorder symptomatology among female aerobic instructors. *The Sport Psychologist*, *12*, 180–190.

Messer, B., & Harter, S. (1986). *Manual for the Adult Self-perception Profile*. Denver, CO: University of Denver.

Monsma, E. V., & Malina, R. M. (2004). Correlates of eating disorder risk among female figure skaters: A profile of adolescent competitors. *Psychology of Sport and Exercise*, *5*, 447–460.

Mullan, E., & Markland, D. (1997). Variations in self-determination across the stages of change for exercise in adults. *Motivation and Emotion*, *21*, 349–362.

Mullan, E., Markland, D., & Ingledew, D. K. (1997). A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analytic procedures. *Personality and Individual Differences*, *23*, 745–752.

Norušis, M. J. (2002). *SPSS 11.0: Guide to data analysis*. Upper Saddle River, NJ: Prentice Hall.

O'Dea, J. A. (2004). Evidence for a self-esteem approach in the prevention of body image and eating problems among children and adolescents. *Eating Disorders*, *12*, 225–239.

Olson, M. S., Williford, H. N., Richards, L. A., Brown, J. A., & Pugh, S. (1996). Self-reports on the Eating Disorder Inventory by female aerobic instructors. *Perceptual and Motor Skills*, *82*, 1051–1058.

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C. et al. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association*, *273*, 402–407.

Patrick, H., Neighbors, C., & Knee, C. R. (2004). Appearance-related social comparisons: The role of contingent self-esteem and self-perceptions of attractiveness. *Personality and Social Psychology Bulletin*, *30*, 501–514.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M, Brière, N. M., & Blais, M. R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sports Motivation Scale (SMS). *Journal of Sport and Exercise Psychology*, *17*, 35–53.

Plant, R., & Ryan, R. M. (1985). Intrinsic motivation and the effects of self-consciousness, self-awareness, and ego-involvement: An investigation of internally controlling styles. *Journal of Personality*, *53*, 435–449.

Ryan, R. M., & Deci, E. L. (2000). Self-determination Theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68–78.

Sonstroem, R. J., Harlow, L. L., & Josephs, L. (1994). Exercise and self-esteem: Validity of model expansion and exercise associations. *Journal of Sport and Exercise Psychology*, *16*, 29–42.

Sonstroem, R. J., & Potts, S. A. (1996). Life adjustment correlates of physical self-concepts. *Medicine & Science in Sports and Exercise*, *28*, 619–625.

Sonstroem, R. J., Speliotis, E. D., & Fava, J. L. (1992). Perceived physical competence in adults: An examination of the Physical Self-perception Profile. *Journal of Sport and Exercise Psychology*, *14*, 207–221.

Strauman, T. J., Vookles, J., Berenstein, V., Chaiken, S., & Higgins, E. T. (1991). Self-discrepancies and vulnerability to body dissatisfaction and disordered eating. *Journal of Personality and Social Psychology*, *61*, 946–956.

Strauss, J., & Ryan, R. M. (1987). Autonomy disturbances in subtypes of anorexia nervosa. *Journal of Abnormal Psychology*, *96*, 254–258.

Surgenor, L. J., Horn, J., & Hudson, S. M. (2003). Empirical scrutiny of a familiar narrative: Sense of control in anorexia nervosa. *European Eating Disorders Review*, *11*, 291–305.

Thøgersen-Ntoumani, C., & Ntoumanis, N. (2006). The role of self-determined motivation to the understanding of exercise-related behaviours, cognitions and physical self-evaluations. *Journal of Sports Sciences, 24*, 393–404.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (vol. 29, pp. 271–360). New York: Academic Press.

Van de Vliet, P., Knapen, J., Onghena, P., Fox, K. R., David, A., Morres, I. et al. (2002). Relationships between self-perceptions and negative affect in adult Flemish psychiatric in-patients suffering from mood disorders. *Psychology of Sport and Exercise*, *3*, 309–322.

Wilson, P. M., & Rodgers, W. M. (2002). The relationship between exercise motives and physical self-esteem in female exercise participants: An application of Self-determination Theory. *Journal of Applied Biobehavioral Research*, *7*, 30–43.

Wilson, P. M., & Rodgers, W. M. (2004). The relationship between perceived autonomy support, exercise regulations and behavioral intentions in women. *Psychology of Sport and Exercise*, *5*, 229–242.

Wilson, P. M., Rodgers, W. M., & Fraser, S. N. (2002). Examining the psychometric properties of the Behavioral Regulation in Exercise Questionnaire. *Measurement in Physical Education and Exercise Science*, *6*, 1–21.

Zabinski, M. F., Calfas, K. J., Gehrman, C. A., Wilfley, D. E., & Sallis, J. F. (2001). Effects of a physical activity intervention on body image in university seniors: Project GRAD. *Annals of Behavioral Medicine*, *23*, 247–252.

Author biographies

CECILIE THØGERSEN-NTOUMANI has been a Roberts Research Fellow at the University of Birmingham since December 2006, and her research interests encompass motivation for physical activity, self-perceptions and mental well-being.

NIKOS NTOUMANIS has been a lecturer at the University of Birmingham since 2001 and his research interests lie in the area of motivation for physical activity.