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Psychology of Sport and Exercise 8 (2007) 836–853

Psychology
OF SPORT AND EXERCISE

www.elsevier.com/locate/psychsport

The relationships between body mass and body image and relative autonomy for exercise among adolescent males and females

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Received 31 May 2006; received in revised form 18 October 2006; accepted 3 November 2006
Available online 16 January 2007

Abstract

Objectives: This study examined the impact of body mass and body image on autonomous motivation for exercise among adolescents. It was predicted that body mass and body size discrepancies would be curvilinearly related to relative autonomy because, from a self-determination theory perspective, being or perceiving that one is under- or over-sized would be experienced as pressure to conform to culturally transmitted standards of an ideal physique, undermining one's sense of autonomy.
Design: Cross-sectional comparative study.
Methods: Fifty males (mean age 16.90) and 48 females (mean age 16.88) completed measures of relative autonomy for exercise, discrepancies between perceived and ideal body size, body mass index and physical activity.
Results: Hierarchical polynomial regression analyses showed that among males relative autonomy was predicted by both body mass and body size discrepancies. The relationships took an inverted-u form: autonomy was at its maximum when body mass index was around 18.50 and when body size discrepancies were zero. Among females, relative autonomy was predicted by body size discrepancies alone and the relationship was r-shaped: autonomy increased as body size discrepancies became less negative, reaching a maximum and leveling off when the discrepancy was +1.
Conclusions: The gender difference in the effect of body mass and perceived body size discrepancies on autonomous motivation for exercise could be explained by different socio-cultural expectations for males

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doi:10.1016/j.psychsport.2006.11.002

and females in Western societies. For females the cultural norm is a thin and toned physique whereas for males it is a muscular mesomorphic build that is neither thin nor fat.

Keywords: Self-determination; Body size; Discrepancies; Physical activity

Introduction

Self-determination theory (SDT) has become a popular framework for understanding exercise and physical activity participation. Most of the research that has applied the theory to this domain has focussed on either the consequences of self-determined versus controlled motivation (e.g., Hagger, Chatzisarantis, & Biddle, 2002) or on the socio-environmental factors that promote perceptions of self-determination (e.g., Wilson & Rodgers, 2004). Some research has examined the effects of psychological need satisfaction on self-determination for exercise (e.g., Wilson, Rodgers, Blanchard, & Gesell, 2003) but the literature on other intrapersonal influences on self-determination for physical activity is noticeably lacking. Body-related concerns are becoming increasingly prevalent in Western societies (McCabe & Ricciardelli, 2001, 2003a) and the media promotes exercise as a means of achieving the ideal physique (Lindeman, 1999). Thus concerns about the body represent intrapersonal factors that are likely to have motivational consequences. The aim of the present study was to extend previous research by Ingledew, Hardy, and de Sousa (1995) and Ingledew and Sullivan (2002) on the effects of body mass and body image on exercise participation motives in order to examine gender differences in the influence of actual body size and perceived body size discrepancies on self-determined motivation for physical activity among adolescents.

There is considerable research evidence that participation in physical activity decreases during adolescence (e.g., Kimm et al., 2000; Kristjansdottir & Vilhjalmsson, 2001; Telama & Yang, 2000). In parallel to this decrease in exercise behaviour, there is evidence for a significant increase among young people in concerns about their weight and an increase in negative body image as adolescents get older (Berg, 1999; Cash & Pruzinsky, 1990; Ingledew & Sullivan, 2002; Smolak & Levine, 2001). It has been found that both boys and girls who have a larger body mass index desire to be thinner (Ricciardelli & McCabe, 2001). Negative body image during adolescence places both sexes at risk of a number of problems, including depression (Noles, Cash, & Winstead, 1985) and disordered eating behaviours (Rosen, 1990).

Dissatisfaction with body size has been shown to be related to exercising for weight management reasons (Cash, Novy, & Grant, 1994; Ingledew et al., 1995; Ingledew & Sullivan, 2002; McDonald & Thompson, 1992; Smith, Handley, & Eldredge, 1998). However, being motivated to exercise for such extrinsic reasons as losing weight could be experienced as self-imposed pressure to engage in physical activity, robbing the person of a sense of autonomy and ultimately leading to a reduced likelihood of long-term engagement. According to SDT (Deci & Ryan, 1985, 1991), there are various forms of extrinsic motivation that can be described as lying along a continuum of relative autonomy, or self-determination, reflecting the extent to which the regulation of a behaviour has become internalised and integrated into the person's sense of self so that they feel that they are engaging in the behaviour freely, with no sense of compulsion and in accordance with their personal values.

At the least autonomous end of this continuum is behaviour that is motivated by *external regulations*, such as to obtain rewards or to avoid punishments administered by significant others. Somewhat more autonomous is *introjected regulation* where a person is motivated by internally imposed controls and self-esteem related contingencies. *Identified regulation* is a much more autonomous form of regulation, involving a conscious acceptance that the behaviour is important in order to achieve personally valued outcomes. The most autonomous form of extrinsic motivation is *integrated regulation*. Here the person not only identifies with the behaviour but also has co-ordinated that identification with their more central values and beliefs. Finally, SDT contrasts these extrinsic regulations with *intrinsic motivation* and *amotivation*. Intrinsically motivated behaviours are engaged in for the inherent interest and enjoyment of participating and are fully self-determined. Amotivation refers to a lack of any intention to engage in a behaviour, reflecting a sense of personal incompetence and/or a failure to value the behaviour or its outcomes, and is completely non-self-determined.

A substantial body of research using this continuum framework has shown that variations in relative autonomy predict more adaptive behaviour and greater well being in many life domains including education, work, sport, health and exercise (see Deci & Ryan, 2000; Ryan & Deci, 2000 for reviews). With respect to exercise, research has shown that more autonomous forms of behavioural regulation are associated with greater participation in physical activity in a variety of contexts (e.g., Mullan & Markland, 1997; Wilson et al., 2003; Wilson, Rodgers, & Fraser, 2002).

According to SDT, the internalisation and integration of cultural values and behavioural regulations is facilitated when the social environment provides for the satisfaction of the basic psychological needs for relatedness, competence and autonomy. To the extent that these needs are satisfied the person will develop the personal resources for autonomous self-regulation of their behaviour (Deci & Ryan, 1991, 2000). On the other hand, a social environment that is excessively controlling and evaluative, pressurizing individuals to act in certain ways, thwarts the process of internalisation and is associated with less autonomous functioning (Deci & Ryan, 2000). Cusumano and Thompson (1997) describe how in Western societies social pressures and culturally endorsed aesthetic standards of a thin and toned physique for females and a lean and muscular physique for males are ubiquitous whilst being almost impossible for individuals to achieve without excessive dieting, extreme exercise or both. It has been shown that adolescents are particularly vulnerable to such pressures and to suffer from the impact of appearance-related social evaluations (Rosenblum & Lewis, 1999). Thus the social and cultural demands to conform to an ideal body shape (Presnell, Bearman, & Stice, 2004; Stice, 1994) could be a major source of externally controlling influences likely to negatively influence adolescents' perceptions of autonomy for engaging in physique-relevant behaviours such as exercise.

The form of the regulation underpinning a behaviour and its degree of relative autonomy may be a reflection of the specific participation motives that individuals adopt for a given activity (Markland & Ingledew, 1997, 2007; Mullan, Markland, & Ingledew, 1997). Markland (1999) found that exercising for enjoyment and social affiliation reasons were related to greater self-determination for exercise whereas exercising for weight management and externally imposed health pressures undermined self-determination. Ingledew and Markland (2006) examined the effects of exercise participation motives on behavioural regulations and exercise participation. They found that appearance/weight motives were associated with more external regulation which in turn was associated with less participation. Appearance/weight motives were also associated with greater introjected regulation. Health/fitness motives were associated with greater identified regulation, which in turn was associated with more participation. Finally, social engagement motives were associated with more intrinsic regulation.

In order to examine potential intrapersonal antecedents of exercise participation motives, Ingledew et al. (1995) investigated the relationships between body mass and body size discrepancies and exercise motives among adults. They found that body mass predicted exercising for weight management among men whereas body size discrepancies predicted the weight management motive among women. This reflects a similar gender difference noted by Field et al. (2001) who found that body mass was more strongly related to weight concerns among boys than among girls: girls were dissatisfied with their bodies regardless of their actual mass whereas boys were only dissatisfied when they were actually overweight. In a follow-up to the Ingledew et al. (1995) study, Ingledew and Sullivan (2002) examined both age and gender differences in the relationships between body mass and body size discrepancies and exercise motives. They replicated the earlier findings with regard to gender differences in the prediction of the weight management motive among older adolescents (17–19 year olds). Exercising for weight management was positively predicted by body mass index in males but by body size discrepancies in females. Conversely, among older males more intrinsic motives (challenge and stress management) were negatively predicted by perceived body size whilst among females more intrinsic motives (social affiliation and enjoyment) were negatively predicted by body mass. Among males exercising for social recognition was negatively predicted by perceived body size whereas among females exercising for competitive reasons was negatively predicted by body mass.

Ingledew et al.'s (1995) and Ingledew and Sullivan's (2002) findings showed that individual differences in actual body size and perceived body size or body size discrepancies have potential negative consequences for exercise motivation and that these relationships differ among males and females, but that it is not simply a case of males' participation motives being predicted by body mass whereas females' motives are predicted by perceptions of the body. However, as noted by Ingledew and Sullivan (2002), whilst some exercise participation motives can be characterised as predominantly either intrinsically or extrinsically oriented, others are not so easy to categorise (Ingledew, Markland, & Medley, 1998; Markland & Ingledew, 1997, 2007). Furthermore, examining motivation at the participation motives level does not take into account the more differentiated conception of extrinsic motivation proposed by SDT and the idea that extrinsic motivation can vary in its degree of relative autonomy. An individual exercising for weight management, for example, could be doing so because they have internalised externally imposed (e.g., culturally transmitted) pressures to be slim (their behavioural regulation is introjected), or because they place personal value on being slimmer (their regulation is identified). Thus different individuals might hold the same participation motive but differ in their relative autonomy for exercise. Given this, and the lack of consistency among males and females in the relationships between body mass and body perceptions with regard to intrinsic and extrinsic participation motives found by Ingledew and Sullivan (2002), the present study was designed to further explore gender differences in the motivational impact of body mass and body image, but with respect to relative autonomy for exercise.

Furthermore, the specific form of the relationships between body mass and body size discrepancies and relative autonomy was examined. Previous research suggests that higher body mass indices are associated with greater dissatisfaction with weight and the likelihood of engaging in weight-loss behaviours (Gardner, Sorter, & Friedman, 1997; McCabe & Ricciardelli, 2003b; Rolland, Farnill, &

Griffiths, 1996). On the other hand, rather than wanting to lose weight, many adolescent males want to increase their bulk in order to achieve a more muscular ideal body (e.g., Furnham & Calnan, 1998; McCabe & Ricciardelli, 2001, 2003b). According to McCabe and Ricciardelli (2003b), although between 17% and 30% of boys want to be slimmer, between 13% and 48% desire a larger body size. Cohn and Adler (1992) and Raudenbush and Zellner (1997) reported that the rates of wanting to lose versus gain weight were almost equal among boys. Some research also suggests that many young women favour a slim but more mesomorphic body build (Lenart, Goldberg, Bailey, & Dallal, 1995; Polivy, Garner, & Garfinkel, 1986; Ryckman, Robbins, Kazcor, & Gold, 1989).

If being or perceiving that one is either undersized or oversized compared to one's ideal size or social norms has negative motivational consequences, then one would not expect a simple linear relationship between body mass or body size discrepancies and relative autonomy for weight management strategies such as exercise. Rather, one would expect that perceptions of autonomy would be highest at some optimal level of body mass and when there are minimal discrepancies between how one perceives one's body to be and how one would like it to be. Thus the relationships between body mass and body size discrepancies and relative autonomy should be curvilinear, taking an inverted-u form. Such curvilinear relationships have been found in studies examining the association between body weight and body satisfaction. Richards, Boxer, Petersen, and Albrecht (1990) found that boys were dissatisfied with their bodies when they were either under- or overweight, and most satisfied when they were of average weight. Similarly, Muth and Cash (1997) found that body weight had a curvilinear relationship with both body-image evaluation and affect among adult males, although among females the relationships were linear, findings that were replicated among adolescents by Presnell et al. (2004). In the present study we predicted that the relationships between both body mass and body size discrepancies and relative autonomy would exhibit an invert-u shaped relationship. Given the lack of consistent relationships across males and females between body mass and body image and exercise participation motives reported by Ingledew and Sullivan (2002), specific gender differences in the effects of body mass and body size discrepancies were not predicted a priori.

Methods

Participants

The participants were 99 adolescents recruited from a sixth form college situated within a British secondary school. Initial data screening indicated one extreme multivariate outlier among the females (Mahalanobis distance = 23.80, $p < .001$) and this case was removed prior to the data analyses. The resultant sample comprised 50 males (mean age = 16.90, SD = .74) and 48 females (mean age = 16.88, SD = .79). There was no significant difference between males and females by age ($t_{96} = .28$, $p = .78$).

Measures

Body mass index

Height and weight were measured for each participant in order to calculate their body mass index (BMI: weight in kilograms divided by the square of height in meters).

Body size discrepancies

Body size discrepancies were measured using Stunkard, Sorenson, and Schlusinger's (1983) Figure Rating Scale. The scale comprises a set of nine figures depicting individuals ranging in body size from very thin to very heavy (male figures for male respondents and female figures for female respondents), and numbered from one to nine. Respondents were asked to indicate which figure they believed looked most like their body now (perceived body size) and then to indicate which figure showed the way they would like their body to look (ideal body size). Body size discrepancy was calculated by subtracting the score for perceived body size from the ideal body size score. A positive discrepancy indicates that the participant's ideal size is greater than their perceived size (i.e., they want to increase in size); a negative discrepancy indicates that the participant's ideal size is less than their perceived size (i.e., they want to decrease in size). Thompson and Altabe (1991) found that the Figure Rating Scale had good test–retest reliability and scores correlated with other measures of body image dissatisfaction, eating disturbance and self-esteem. Thompson, Altabe, Johnson, and Stormer (1994) found that the Figure Rating Scale scores correlated strongly with questionnaire measures of body image disturbance.

Relative autonomy for exercise

The extent to which the regulation of exercise behaviour was autonomous was assessed using an index of relative autonomy derived from scores on the Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2: Markland & Tobin, 2004). The BREQ-2 measures amotivated, external, introjected, identified, and intrinsic regulation of exercise behaviour, based on Deci and Ryan's (1991) continuum conception of relative autonomy. In common with some other behavioural regulation instruments for different contexts the BREQ-2 does not include an integrated regulation subscale. The instrument consists of 19 items scored on a five-point scale ranging from 0 (not true for me) to 4 (very true for me). The BREQ-2 has been shown to have good factorial validity (e.g., Markland & Tobin, 2004). A number of studies using an earlier version of the instrument (BREQ: Mullan et al., 1997), which did not include an assessment of amotivation, have found evidence attesting to its construct validity (Landry & Solmon, 2004; Mullan & Markland, 1997; Rose, Markland, & Parfitt, 2001; Wilson et al., 2002, 2003). Cronbach's alpha reliability coefficients for the BREQ-2 subscales in the present study were as follows: amotivation .90; external regulation .82; introjected regulation .91; identified regulation .88; intrinsic regulation .84. Scores on the five subscales of the BREQ-2 were integrated into a single index known as the Relative Autonomy Index (RAI: Connell & Ryan, 1985; Grolnick & Ryan, 1987). The RAI has been widely applied with different contextual measures of the self-determination continuum and is calculated by differentially weighting each subscale and summing the weighted scores such that the final index represents the overall degree of relative autonomy in the regulation of a behaviour. Using this single index has the advantage that it considerably reduces the number of variables required to represent variations in autonomy (Vallerand & Ratelle, 2002). For the BREQ-2, negative weightings were applied to the less autonomous regulations and positive weightings to the more autonomous regulations, as follows: amotivation -3; external regulation -2; introjected regulation -1; identified regulation $+2$; intrinsic regulation $+3$. Higher positive scores for the RAI indicate more autonomous motivation whereas lower negative scores indicate less autonomous motivation. The maximum possible score when applying this formula to the BREQ-2 is 20 and the minimum is −24.[1]

Exercise participation

Physical activity was assessed by a modification of the Leisure Time Exercise Questionnaire (LTEQ: Godin & Shephard, 1985). This three-item scale asks respondents to indicate the frequency of mild, moderate, and strenuous exercise undertaken in a typical week. These scores are weighted by approximate metabolic equivalents for the different levels of activity (3, 5, and 9, respectively) and summed to produce an overall weekly physical activity score. Studies have shown the LTEQ to have adequate reliability and validity with respect to objective assessments of exercise behaviour and indices of fitness (e.g., Jacobs, Ainsworth, Hartman, & Leon, 1993).

Procedures

Data were collected over a 5-day period. Ethical approval for the study was obtained from the first author's Departmental Ethics Committee. Approval to request the students' participation was obtained from their college Principal. Students were asked to volunteer to be participants in a study of motivation for exercise and body image through the college news update and announcements made during registration. The procedures were described to the students beforehand and it was explained that the study was designed to better understand motivation to exercise with regard to body size and body image. Students were assured that all information obtained would be held in confidence and informed consent was obtained. Height and weight were measured by a female research assistant in a private room in the presence of a teacher of the same sex as the participants. Participants were clothed but shoes were removed prior to measuring height and weight. After height and weight had been recorded the participants completed the BREQ-2 and LTEQ and the measure of body size discrepancy. Order of presentation of the scales was counterbalanced.

Data analyses

Initial analyses were conducted to determine whether there were any significant differences between males and females with respect to physical activity, body mass, body size discrepancy, the BREQ-2 subscales and relative autonomy for exercise. Bivariate correlations among the variables were examined separately by sex. The effects of body mass and body image on relative autonomy for exercise were analysed by hierarchical polynomial regression analyses, separately for males and females. The predictor variables were centred prior to analysis (Aiken & West, 1991, p. 35). Given that in both sexes physical activity was strongly and significantly associated with RAI

[1]Most similar self-regulation instruments have four subscales that are weighted from −2 to +2. The weightings we chose here are driven by the fact that the BREQ-2 has an odd number of subscales. What is important is that the pattern of assigning positive weightings to the more self-determined forms of regulation and negative weightings to the less self-determined forms is adhered to. Because the different forms of behavioural regulation are held to lie along a continuum of relative autonomy, the weighted scoring system used to calculate the RAI is predicated on the assumption that the correlations among subscales measuring these forms conform to a simplex-like pattern. This was the case in the present data (see Table 2).

(males $r = .62$, $p < .001$; females $r = .61$, $p < .001$) and BMI (males $r = -.54$; females $r = -.31$, $p < .05$), and that these bivariate relationships are likely to reflect complex and reciprocal causal dynamics, physical activity was entered first in the regression analyses to control for physical activity levels. In order to test for a quadratic curvilinear relationship, a predictor variable is entered first into the analysis, followed by the predictor variable raised to its second power (the quadratic term). A significant increase in R^2 when the powered vector of the predictor variable is entered shows that it contributes significantly to the prediction of the criterion variable over and above the linear component, indicating a quadratic relationship. Regression plots of the predicted values for the criterion variable on the predictor variable reveal the form of the curve. For the present analyses, after entering physical activity at the first step, body mass index was entered, followed by the quadratic term for body mass index. Body size discrepancy was entered at the fourth step, followed by its quadratic term. In the final polynomial model, the significance tests for the regression coefficients are tests of the significance of the increment in R^2 due to each variable if it was entered last into the equation (i.e., controlling for all the other variables). It is important to determine the significant effects in the final stage because a variable might account for a significant increment in R^2 when entered earlier in the hierarchy, but no longer be significant when all the variables are entered. However, the test of the significance of a regression coefficient for a given linear component when controlling for the effects of its powered term is redundant because of the hierarchical variable entry procedure (Pedhazur & Schmelkin, 1991, p. 456). Consequently, although we report the standardised regression coefficients for all the variables in the final equations, tests of significant linear components should be ignored in the presence of significant coefficients for their respective quadratic components. It should be noted that when independent variables are highly correlated, as is inevitably the case when including powered vectors of linear terms, the standardised regression coefficients will not necessarily have an upper limit of 1.0 (Pedhazur & Schmelkin, 1991, p. 455).

Results

Table 1 shows the means and SDs for all the variables. Independent sample t-tests showed that there were no significant differences between males and females in physical activity, body mass index, amotivation, external, introjected or intrinsic regulations, or in relative autonomy (ps$>.05$). Males scored significantly higher on identified regulation ($t_{96} = 2.16$, $p < .05$) and were significantly different to females in terms of body size discrepancy ($t_{96} = 4.43$, $p < .001$). Among the males, 10% showed a negative discrepancy (i.e., wanting to decrease in size) whilst 64% had a positive discrepancy. Of the latter, 100% reported a perceived actual body size of 4 or less whilst the majority (67%) reported an ideal size of 5 or less. Among females 35.5% had a negative discrepancy. Of these, 53% rated their current size as 6 or more and 94% rated their ideal size as 5 or less. Twenty three percent of females had a positive discrepancy with 100% of these rating their current size as 4 or less and 73% rating their ideal size as between 3 and 5. Means and standard deviations for BMI were comparable to those found in other studies using similar age groups (e.g., Ingledew & Sullivan, 2002; Presnell et al., 2004) and to population norms (Department of Health, 2002). For both sexes BMI scores fell between the third and 90th percentiles for this age group. An individual with a BMI-for-age falling below the fifth percentile is considered underweight and

Table 1
Means and SDs for physical activity, body mass index, body size discrepancy, behavioural regulations and relative autonomy by sex

Variable	Males				Females			
	M	SD	Min	Max	*M*	SD	Min	Max
Physical activity	27.74	31.29	5.00	89.00	27.98	28.68	5.00	89.00
Body mass index	20.54	2.83	14.00	27.10	21.36	2.38	15.5	27.00
Body size discrepancy	1.14	1.37	−2.00	3.00	−.02***	1.17	−3.00	2.00
Amotivation	1.31	1.36	0.00	4.25	1.71	1.47	0.00	3.75
External regulation	1.87	1.12	0.00	4.00	1.71	1.19	0.00	4.00
Introjected regulation	1.71	1.47	0.00	4.00	1.44	1.06	0.00	3.67
Identified regulation	2.40	1.23	0.00	4.00	1.91*	1.02	.25	4.00
Intrinsic regulation	2.20	1.35	0.00	4.00	2.38	1.49	0.00	4.00
Relative autonomy	2.39	10.26	−18.83	17.67	.21	9.16	−17.08	16.83

Note: * = males significantly different to females at $p<.05$; *** = males significantly different to females at $p<.001$.

one falling between the 85th and 95th percentiles is considered at risk of overweight (Centers for Disease Control and Prevention, 2000). Low but positive mean RAI scores in both sexes indicated that on average participants were somewhat autonomous in their behavioural regulation. However, there was considerable variability in RAI scores.

Table 2 shows the bivariate correlations between physical activity, body mass index, body size discrepancies, behavioural regulations and relative autonomy for both males and females. Physical activity was significantly negatively related to body mass index in both males and females and not significantly associated with body size discrepancies in either sex. In both sexes physical activity was significantly positively related to relative autonomy. Body mass and body size discrepancies were significantly negatively associated in females but significantly positively related in males. Body mass was significantly negatively related to relative autonomy in both sexes. Among females, body size discrepancy was significantly positively associated with relative autonomy whereas among males the direction of the relationships between these variables was reversed.

Table 3 shows the results of the regression analyses for males and females. For males, physical activity accounted for a significant 39% of the variance in relative autonomy. Body mass index accounted for a further significant 7% of the variance explained. The quadratic term for body mass index accounted for a further significant 14% of the variance explained. Body size discrepancy accounted for a further significant 6% and the quadratic term for body size discrepancy for a further significant 8% of the variance in relative autonomy. In the final equation, physical activity and the quadratic terms for both body mass and discrepancies remained significant. Collectively, the results show that among males the relationships between both body mass index and body size discrepancies and relative autonomy are significant and curvilinear.

Fig. 1 shows the regression curve for relative autonomy on body mass index for males. This indicates that relative autonomy increases as body mass increases when body mass is less than ~18.5. Beyond the inflection point there is an accelerating decline in relative autonomy as body

Table 2
Correlations among physical activity, body mass index, body size discrepancy, behavioural regulations and relative autonomy among males (below diagonal) and females (above diagonal)

	1	2	3	4	5	6	7	8	9	10	11
1 Physical activity	—	−.32*	−.34*	−.07	−.04	−.68***	−.06	.53***	.79***	.39**	.61***
2 Body mass index	−.54**	—	.99***	−.62***	.33*	.54***	.30*	.07	−.28*	−.46**	−.55***
3 BMI^2	−.54**	.99***	—	−.64***	.37*	.57***	.31*	.06	−.30*	−.48**	−.57**
4 Body size discrepancy	−.08	.30*	.31*	—	−.58***	−.51***	−.37*	−.30*	.14	.54***	.54***
5 BSD^2	−.12	.28*	.29*	.77***	—	.30*	.39**	.34*	−.11	−.44**	−.47**
6 Amotivation	−.73***	.62***	.64***	.18	.34*	—	.32*	−.25	−.72***	−.82***	−.87**
7 External regulation	−.02	.28*	.33*	.47**	.44**	.26	—	.44**	−.17	−.47**	−.55***
8 Introjected regulation	.37**	−.29*	−.28*	.55***	.46**	−.23	.49***	—	.50**	−.06	.02
9 Identified regulation	.64***	−.57***	−.57***	.04	−.09	−.71***	−.03	.55**	—	.57***	.77***
10 Intrinsic regulation	.58***	−.37**	−.40**	−.38**	−.50***	−.77***	−.34*	−.04	.56***	—	.78***
11 Relative autonomy	.62***	−.55***	−.58***	−.39*	−.51***	−.90***	−.53***	−.04	.67***	.92***	—

Note: BMI^2 = body mass index raised to second power; BSD^2 = body size discrepancy raised to second power. *$p < .05$; **$p < .01$; ***$p < .001$.

Table 3
Summary of regression analyses: prediction of relative autonomy

Predictor variables in order of entry	Males			Females		
	R^2	ΔR^2	β	R^2	ΔR^2	β
1 Physical activity	.39***		.46***	.37***		.65***
2 Body mass index	.46***	.07*	3.07**	.51***	.14**	−2.69
3 BMI^2	.60***	.14**	−3.28**	.53***	.02	2.69
4 Body size discrepancy	.66***	.06*	.04	.64***	.11**	.39**
5 BSD^2	.74***	.08**	−.43**	.69***	.05**	−.32**

Note: ΔR^2 = increment in variance explained. β = standardized regression coefficient for final equations. BMI^2 = body mass index raised to second power; BSD^2 = body size discrepancy raised to second power.
*$p < .05$; **$p < .01$; ***$p < .001$.

mass increases. Fig. 2 shows the regression curve for relative autonomy on body size discrepancies for males. Relative autonomy is at its maximum when there are zero discrepancies. As discrepancies increase in either direction relative autonomy is reduced.

For females, physical activity accounted for a significant 37% of the variance in relative autonomy. Body mass index accounted for a further significant 14% of the variance explained. The quadratic term for body mass index did not add significantly to the prediction of relative autonomy. Body size discrepancy accounted for a further significant 11% and its quadratic term accounted for a further significant 5% of the variance explained. Whilst body mass index added significantly to the variance explained when entered at the second step, in the final equation its regression coefficient was not significant. The results show that among females body size discrepancy, but not body mass, is significantly associated with relative autonomy and the

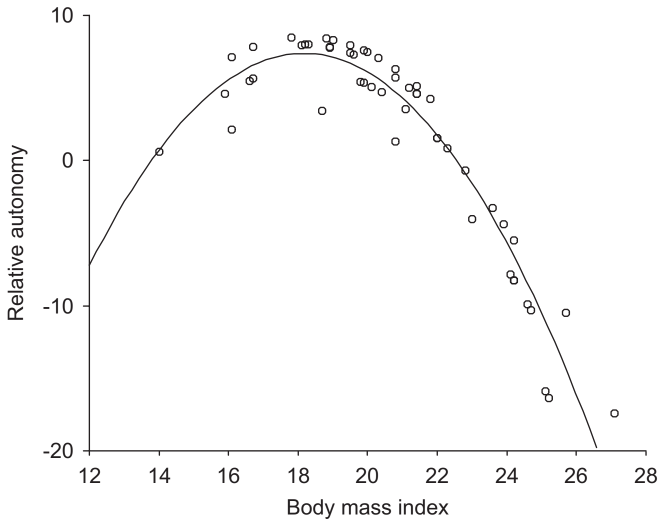

Fig. 1. Curvilinear regression of relative autonomy on body mass index for males.

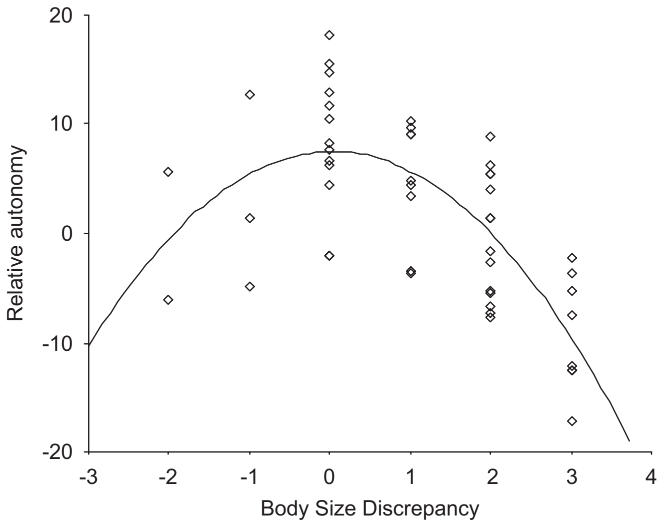

Fig. 2. Curvilinear regression of relative autonomy on body size discrepancy for males.

relationship is curvilinear. Fig. 3 shows a slight trend towards an r-shaped curvilinear relationship. Relative autonomy increases as body discrepancies become less negative, reaching a maximum and then leveling off when the discrepancy is + 1[2].

[2]Two anonymous reviewers pointed out that although the quadratic term for BSD was statistically significant, there were relatively few cases in the positive discrepancy region and the plot shows only a slight curvilinear trend. As noted

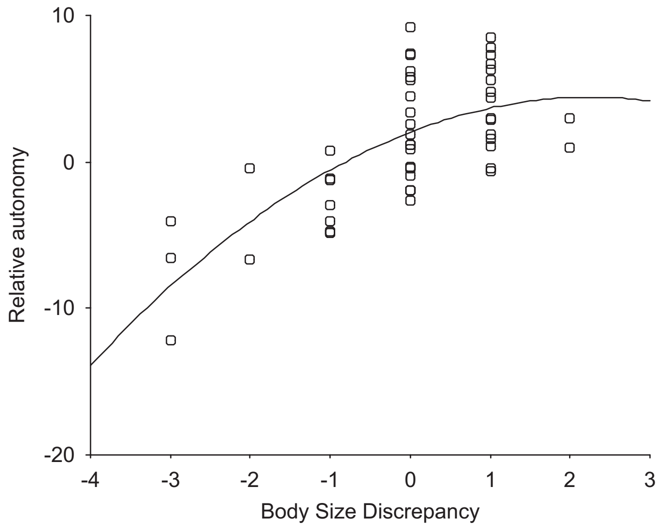

Fig. 3. Curvilinear regression of relative autonomy on body size discrepancy for females.

Discussion

The aim of this study was to examine the relationships between body mass and body size discrepancies and relative autonomy for exercise among adolescent males and females. Initial analyses showed no significant differences between males and females by physical activity, body mass index, or relative autonomy, but males were significantly different to females in terms of body size discrepancy, with males tending to want to increase in size whilst more females wanted to decrease in size. This fits with previous findings that both younger and older females tend to desire a smaller body size (e.g., Fallon & Rozin, 1985; McCabe & Ricciardelli, 2003b; McCreary, Sasse, Saucier, & Dorsch, 2004; Rolland et al., 1996) whereas young males often wish to be larger and more muscular than their current size (McCabe & Ricciardelli, 2003b; McCreary & Sasse, 2000; Pope et al., 2004). On the other hand a notable proportion of the females in this study indicated a preference for a larger ideal body size whilst some males wanted a smaller body size.

Figure Rating Scales such as the one used in the present study have been criticized because they assess body perceptions along a dimension of fatness but not along a dimension of muscle mass (e.g., Lynch & Zellner, 1999). However, in the Stunkard et al. (1983) Figure Rating Scales used here, for both males and females the figures corresponding to ratings of 1 to 5 range from extremely thin to a moderately mesomorphic build. It is only the figures corresponding to a rating of 6 or more that show increasing levels of fatness. Among the males in the study who indicated that they wanted to increase in size, all reported a perceived actual body size of 4 or less whilst the majority reported an ideal size of 5 or less. Thus, most of these males perceived themselves as

(*footnote continued*)
in the Results, 23% of the females had a positive discrepancy. However, only two had a discrepancy of +2. The analysis was re-run with these two cases removed and produced the same results: the quadratic term for BSD remained significant, and the plotted trend r-shaped.

being relatively thin and wanted a somewhat more mesomorphic build. Among the females, the balance between those who wanted to decrease in size and those who wanted more bulk was more even. Nevertheless, among those who wanted to increase in bulk, all rated their current size as 4 or less and the majority rated their ideal size as between 3 and 5. This would concur with previous findings that many young women aspire to a slim but more mesomorphic body build (Lenart et al., 1995; Polivy et al., 1986; Ryckman et al., 1989), as noted in the Introduction. Consequently, the Stunkard et al. Figure Rating Scale does appear capable of tapping both a desire to lose fat and a desire to increase in muscle mass, at least within fairly normal limits (i.e., it could not tap a desire to be extremely muscular). Nevertheless it is recognised that we did not have a more direct measure of discrepancies with regard to muscle mass.

The bivariate correlations showed, as would be expected from previous studies (e.g., Mullan & Markland, 1997; Wilson et al., 2002, 2003), that among both males and females physical activity was positively associated with relative autonomy. Body mass was inversely related to physical activity in both sexes. There were gender differences in the relationship between body mass and body size discrepancies, but these need to be interpreted in the light of the fact that the majority of males wished to increase in bulk whilst more females wanted to be thinner than their perceived current size. Among males, body mass and body size discrepancies were positively related: the thinner the males were the more they wanted to increase in size, presumably reflecting a desire to increase muscle mass. Among females body mass and discrepancies were negatively related: the larger the females were the more they wanted to be thinner, presumably reflecting a desire to be less fat.

Bivariate correlations also showed gender differences in the relationships between body mass and body discrepancies and relative autonomy. Again, these differences need to be interpreted in the light of the different meaning of discrepancies for males and females and furthermore these bivariate linear relationships are rendered somewhat redundant by the subsequent regression analyses which controlled for the shared variance among the predictor variables and allowed for curvilinear relationships. Body discrepancies were associated with more controlled and less autonomous motivation among males but with less controlled and more autonomous motivation among females. Specifically, the more that males wanted to increase in size, the lower their relative autonomy. Among females, the more they wished to lose weight the lower their relative autonomy.

The results of the regression analyses partially supported the study predictions of curvilinear relationships between body mass and body discrepancies and relative autonomy, and reflected the findings of Ingledew and Sullivan (2002) to some extent. Among males, after adjusting for physical activity levels both body mass and body size discrepancies were significantly related to relative autonomy. Furthermore, in both cases the relationships were curvilinear. For body mass, relative autonomy was at its highest when body mass index was around 18.5. This value is towards the lower end of the normal range for males of this age (between 17.6 and 24.8: Centers for Disease Control and Prevention, 2000). Relative autonomy was reduced as body mass reduced or increased. For body size discrepancies relative autonomy was highest among males when there was no discrepancy between perceived current and ideal body size and progressively lower the more individuals desired to either increase or decrease their body size. The results show that for adolescent males being or wanting to be less bulky (presumably less fat) or more bulky (presumably gain muscle) is associated with less autonomous motivation for exercise, suggesting that a failure to live up to a slim but muscular ideal is detrimental to exercise motivation.

Among females, in contrast, body mass did not predict relative autonomy but there was a significant curvilinear relationship between body size discrepancies and relative autonomy. Unlike among males, however, the trend was towards an r-shaped form. Relative autonomy became progressively higher as discrepancies became less negative and leveled out when the discrepancy was positive. Thus among females wanting to lose bulk (presumably fat) was associated with less autonomous motivation, whereas wanting to increase in bulk was not detrimental to autonomous motivation for exercise.

The finding that body mass was related to relative autonomy in males but not in females reflects the findings of Ingledew et al. (1995) and Ingledew and Sullivan (2002) with respect to the weight management motive for exercise and the findings by Field et al. (2001) noted earlier that body mass is more strongly related to weight concerns among boys than among girls. Why actual body size has an impact among males but not among females warrants further investigation. The gender difference found here in the form of the relationship between body size discrepancies and relative autonomy also raises further questions. It appears that adolescent males are subject to a 'double whammy' in comparison to their female counterparts: their autonomy is undermined whether they desire to increase in bulk or lose weight. Among the females, however, autonomy is undermined only when they want to lose weight. An explanation of these gender differences might lie in the different socio-cultural expectations for males and females. Whereas for females this means a thin and toned physique (Wiseman, Gray, Mosimann, & Ahrens, 1992), for males it means a muscular mesomorphic build that is neither thin nor fat (Morrison, Morrison, Hopkins, & Rowan, 2004). Thus being undersized (i.e., not muscular enough) or oversized (too fat) compared to one's ideals has negative motivational consequences for males but for females it is perceiving that one is oversized that has such negative effects.

In both sexes relative autonomy was positively related to exercise behaviour. This suggests that, far from motivating action that might reduce negative perceptions of body image, being over- or underweight (for males) and perceiving that one does not match one's ideal size (for both sexes) would paradoxically lead to less exercise behaviour. Anton, Perri, and Riley (2000) found that among young women body size discrepancies were negatively related to physical activity levels. The present results suggest a mechanism by which this negative relationship could be explained: a negative body image leads to less autonomous motivation for exercise, perhaps by increasing the felt pressure to conform to socio-cultural norms, which in turn leads to less exercise.

One potential limitation of the study has already been noted: that perceived body discrepancies with regard to muscularity were not directly assessed. In addition, BMI does not distinguish between fat and fat-free mass (Prentice & Jebb, 2001). Individuals with a low body fat but high lean body mass can have a high body mass index. However, this is typically only the case for highly trained individuals and BMI is significantly correlated with subcutaneous and total body fatness in adolescents (Mei et al., 2002). A further limitation is that the sample size in the study was relatively small and self-selected. It is likely that individuals with more extreme body size discrepancies would not have volunteered to take part. Replication with larger samples and greater discrepancies, and indeed with different age groups is clearly warranted. Finally, the data were cross-sectional so one must be cautious in drawing causal inferences. Longitudinal studies are required to determine whether body size and body size discrepancies impact on motivation, and in turn exercise behaviour over time.

In conclusion, most of the exercise motivation research using the SDT framework has examined socio-environmental antecedents of autonomous versus controlled regulation of behaviour, or the cognitive, emotional and behavioural consequences of feeling autonomous versus controlled. Little previous research has explored the influence of intrapersonal variables on autonomous motivation, and in particular biological influences such as body mass. The present study suggests that individual differences in body mass and perceived body size discrepancies can impact upon relative autonomy for exercise, which is likely to lead to less participation in physical activity, and that these effects are moderated by gender. Future studies should examine the different processes by which males and females internalise socio-cultural pressures towards the ideal physique and how this affects exercise motivation and in turn exercise behaviour.

Acknowledgements

The authors wish to thank Lisa Edge for her efforts with the data collection.

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