



Effects of body mass and body image on exercise motives in adolescence

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Abstract

Objective. The objective was to examine age and gender differences in the effects of body mass and body image on exercise motives in adolescents. It was specifically predicted that weight management motive would be explained by body mass index in males, and by body size discrepancy in females, but this pattern would be less pronounced in younger than in older adolescents.

Design. The design was a cross-sectional comparative study.

Method. Participants comprised younger (11–13 years) and older (17–19 years) males and females ($N=180$). They completed measures of exercise participation, exercise motives, and perceived and ideal body size. Height and weight were also measured. Hierarchical regression analyses were conducted, separately for younger males, younger females, older males and older females. In each analysis, the dependent variable was an exercise motive, and the independent variables were, in order of entry, exercise level, body mass index, perceived body size, and ideal body size.

Results. Weight management motive was positively predicted by body mass index in older males, and by perceived and ideal body size in older females. Other, more intrinsic, motives were negatively predicted by body mass index or perceived body size in older males or females. Such relationships were not significant in younger adolescents.

Conclusion. Effects of body mass and body image on exercise motives emerge in adolescence, with gender differences. Such effects may influence exercise adherence and should be taken into account in exercise promotion programmes. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Motivation; Physical exercise; Body mass; Body image; Adolescents

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Introduction

The aim of this study was to examine, in adolescents, the effects of body mass and body image on exercise motives, especially weight management motive. In this literature review, we consider evidence that motives are important determinants of exercise participation. We then consider evidence that, in adults, body mass and body image influence weight management motive, differently in men and women. We consider grounds for hypothesising that such gender differences first emerge during adolescence. This leads us to make specific predictions regarding age and gender differences in the effect of body mass and body image on weight management motive in adolescents.

Physical exercise is engaged in for diverse motives. This diversity is illustrated by the various instruments that have been developed to measure exercise motives (e.g. Frederick & Ryan, 1993; Markland & Hardy, 1993; Markland & Ingledew, 1997; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997; Silberstein, Striegel-Moore, Timko, & Rodin, 1988). Frederick and Ryan (1993) reported the development of a Motivation for Physical Activity Measure, distinguishing between interest/enjoyment, competence and body-related motives. Ryan et al. refined this measure, distinguishing between enjoyment, competence, appearance, fitness, and social motives. Markland and Hardy developed an Exercise Motivation Inventory. Markland and Ingledew refined this measure, assessing 14 distinct motives: affiliation, appearance, challenge, competition, enjoyment, health pressures, ill-health avoidance, nimbleness, positive health, revitalisation, social recognition, strength and endurance, stress management, and weight management.

Such exercise motives are important determinants of type and extent of exercise participation. For example, Frederick and Ryan (1993) compared individuals whose primary physical activity was a sport with individuals whose primary physical activity was a non-sport fitness activity. The sport participants had higher interest/enjoyment and competence motives whereas the fitness participants had higher body-related motives. Ryan et al. (1997) found, in new users of a fitness centre, that high adherers (attending at least one day in every five over the first ten weeks) and low adherers (attending less than this) differed significantly on enjoyment, competence, and social motives (adherers being higher) but not on fitness or appearance motives. Ingledew, Markland, and Medley (1998) found, in a longitudinal study of British government employees, that whereas appearance and weight management motives were prominent during early stages of change, enjoyment and revitalisation motives were important for progression to and maintenance of actual activity.

Such findings can be interpreted in terms of Self-Determination Theory (Deci & Ryan 1985, 1991) as applied to exercise participation (e.g. Frederick & Ryan, 1993; Frederick & Ryan, 1995; Ingledew et al., 1998; Markland & Ingledew, 1997). According to this theory, when intrinsically motivated, individuals engage in an activity apparently for the inherent pleasures that they derive from the activity (although they are, in fact, meeting innate psychological needs of autonomy, competence, and relatedness). When extrinsically motivated, individuals engage in an activity primarily for the external rewards that they attain through the activity. Different motivational orientations have different cognitive, emotional, and behavioural consequences. In particular, intrinsic but not extrinsic motives are likely to sustain long-term participation.

Given the evidence that motives are important determinants of exercise participation, it is important to consider possible determinants of motives. Prompted by the prominence of body-

related concerns in contemporary societies (e.g. Rolls, Federoff, & Guthrie, 1991), Ingledew, Hardy, and de Sousa (1995) examined the effects of body mass and body image on exercise motives in adults. The participants were 50 men and 50 women, recruited at exercise sessions in the community. Each participant rated his/her perceived body size and then ideal body size on a figure rating scale. From this was calculated a measure of body image through body size discrepancy (perceived minus ideal body size). Participants also completed Markland and Hardy's (Markland & Hardy, 1993) Exercise Motivations Inventory. Among men, body mass index predicted weight management motive (positively), but body size discrepancy did not add to this prediction. Among women, body mass index did not predict weight management motive, but body size discrepancy did. There was also a negative effect of body mass index on fitness motive in men. Other motives were not predicted by body mass index or body size discrepancy in either men or women. These results suggested that men were likely to exercise for weight management reasons if they were actually overweight, whereas women were likely to exercise for weight management reasons if they were dissatisfied with their body size, regardless of whether they were actually overweight. Since weight management is predominantly an extrinsic motive (Markland & Ingledew, 1997; Ingledew et al., 1998), this could have implications for exercise adherence.

Other studies have found weight-related motives for exercise to be positively associated with measures of body-related dissatisfaction (Cash, Novy, & Grant, 1994; McDonald & Thompson, 1992), body-related negative affect (Cash et al., 1994; Crawford & Eklund, 1994; Eklund & Crawford, 1994; Frederick & Morrison, 1996; Smith, Handley, & Eldredge, 1998), and eating disturbance (McDonald & Thompson, 1992; Silberstein et al., 1988). Some of these studied females only or did not analyse separately for males and females. Some did not control for body mass. McDonald and Thompson found associations in women and in men, but did not control for body mass. Eklund and Crawford found an association in women, after controlling for percent body fat, but did not study men. Cash et al. found an association in women, after controlling for body mass index, but did not study men. Smith et al. (following up Cash et al.) found an association between weight-related motive and body-related negative affect in women but not in men, whilst also reporting that body mass index was not associated with weight-related motive in either gender.

Rolls et al. (1991) reviewed gender differences in eating- and weight-related variables in adults. They found that women compared with men tend to be more dissatisfied with their body weight and shape (wanting to lose weight and become slimmer), to have a different eating style and experience more food-related conflict, and to be more likely to diet and more likely to develop eating disorders. Importantly, Rolls et al. also noted that such gender differences tend to emerge in adolescence. In this regard, the gender difference in body size discrepancy that is manifest in adulthood (e.g. Ingledew et al., 1995; Fallon & Rozin, 1985; Silberstein et al., 1988; Tiggeman & Pennington, 1990) is also discernible in adolescence (e.g. Parkinson, Tovée, & Cohen-Tovée, 1998; Tiggeman & Pennington, 1990). It is during adolescence that boys gain more muscle, taking them towards the muscular male idealised figure, whilst girls gain more fat, taking them away from the slim female idealised figure (Striegel-Moore, Silberstein, & Rodin, 1986).

The findings of Ingledew et al. (1995), together with the conclusions of Rolls et al. (1991), led us to a general hypothesis that gender differences in the effects of body mass and body image on exercise motives first emerge during adolescence. We specifically predicted that weight management motive would be explained by body mass index in males, and by body size discrepancy

in females, but this pattern would be less pronounced in younger than in older adolescents. Whilst making these specific predictions for weight management motive, we also examined the effect of body mass and body image on other motives. This was to ensure that we considered weight management motive in the context of the full range of motives.

Method

Participants

The participants were recruited from one secondary school in a small city in Germany. Selecting participants from a single school increased the likelihood that the sample would be reasonably homogeneous in terms of background. The sample comprised four age–gender categories: younger males, younger females, older males and older females. The younger pupils were aged 11 to 13 years, the older 17 to 19 years. A quota of 50 pupils in each category was sought. However, satisfactory data were obtained from 49 younger males, 50 younger females, 45 older males, and 49 older females. For the purposes of analysis, the groups were equalised at 45 per group by randomly deleting individuals from the dataset. This was to ensure that statistical power was equal across subgroup analyses (total $N=180$). The 90 younger pupils comprised 32 11-year-olds, 53 12-year-olds, and 5 13-year-olds. The 90 older pupils comprised 32 17-year-olds, 56 18-year-olds, and two 19-year-olds.

Measures

Questionnaire booklet

Measures were administered using a booklet entitled ‘Why do you exercise?’ The opening instructions were: ‘In answering this questionnaire, please think about physical exercise *in your free time*. This could be during the day or in the evening, during the week or at weekends. It does not include compulsory lessons at school’. Examples were given of what was meant by physical exercise. These instructions were followed by the measures in the following order.

Exercise participation

Two questions were taken from a pan-European World Health Organisation survey of 11- to 16-year-old children (Wold, Aarø & Smith, 1994). The first (exercise frequency) asked ‘How many *times* a week do you usually exercise *in your free time* so much that you get out of breath or sweat?’: *never, less than once a month, once a month, once a week, 2–3 times a week, 4–6 times a week, every day*. The second (exercise length) asked ‘How many *hours* a week do you usually exercise *in your free time* so much that you get out of breath or sweat?’: *none, about half an hour, about 1 hour, about 2–3 hours, about 4–6 hours, 7 hours or more*. These simple questions had the advantage of having been used extensively with European adolescents.

Exercise motives

Motives for participating in free-time exercise were measured using the Exercise Motivations Inventory version 2 (EMI2) (Markland & Ingledew, 1997). The items for the Weight Management

scale — the focus of our specific predictions — were ‘to stay slim’, ‘to lose weight’, ‘to help control my weight’, and ‘because exercise helps me to burn calories’. The items for other EMI2 scales are listed in Markland and Ingledew’s paper. However, for the present study, one of the Appearance items was changed, from ‘To help me look younger’ to ‘To help me look better’. The Health Pressures scale was omitted entirely because the items seemed inappropriate for adolescents. It was replaced with an ad hoc Social Pressures scale, which seemed more pertinent to adolescents. Each EMI2 item was rated from 0 (*not at all true for me*) to 5 (*very true for me*). An individual’s scale score was computed as the mean of his/her non-missing item scores, thereby allowing for the fact that the scales had differing numbers of items. The scales are listed in Table 2.

Perceived and ideal body size

Each participant rated both their perceived and ideal body size on a figure rating scale. There were separate scales for males and females, but not separate scales for younger and older. The scales ranged from 1 (slimmest) to 7 (bulkiest). Of the many available scales (Thompson, 1995), we adopted those used by Collins (1991) to depict ‘adults’. We judged that both younger and older teenagers would be able to identify with these scales, and so it proved in practice. Collins created her scales in order to ask pre-adolescent children about their ideal ‘grown up’ figures, which may explain why the ‘adults’ look so youthful. Byrne and Hills (1996) caution against using adult figure rating scales with adolescents. However, Sherman, Iacono, and Donnelly (1995) found for 11-year-old females that the pattern of results was much the same whether they rated themselves on a scale designed for 11-year-olds or a scale designed for 17-year-olds. Body size discrepancy assessed by the figure rating method has been found to be strongly related to questionnaire measures of body image disturbance (e.g. Thompson, Altabe, Johnson, & Stormer, 1994), attesting to its construct validity.

Height and weight

Height and weight were measured by a research assistant and recorded on the questionnaire. Body mass index was calculated as weight in kilograms divided by square of height in metres. Body mass index has been found to be strongly related to various physiological measures of fatness (e.g. Pietrobelli et al., 1998), attesting to its construct validity.

Translation of booklet

The questionnaire booklet was compiled originally in English and was translated into German by one individual. The German version was then translated back into English by a second individual who had no sight of, or familiarity with, the English original. This English back translation was compared with the English original by a third individual. Discrepancies were noted and resolved through discussion, and appropriate amendments made. The German version was then piloted on 20 pupils (five in each age–gender category), to check that it was intelligible and acceptable. These pupils were not part of the main study sample.

Data collection

Data were collected in group sessions ranging from 10 to 30 individuals. Data were collected over one month.

Analysis

The first stage of analysis was to examine the psychometric properties and descriptive statistics of the variables. Exercise length was recoded into a dichotomous variable, named exercise level. The internal consistency of each EMI2 scale was tested using Cronbach's alpha. However, a scale can show high alpha even though it is not unidimensional (Schmitt, 1996). Therefore, in addition, confirmatory factor analysis was used to test each EMI2 scale as a single-factor model.

The second stage was to examine age-group and gender differences in exercise level, body mass index, body image, and exercise motives. Differences in exercise level were tested using Fisher's exact tests. Differences in body mass index were tested using ANOVA, in which the factors were age-group and gender. Differences in body image were tested using repeated-measures ANOVA, in which the between-participants factors were age-group and gender and the within-participants factor was discrepancy (perceived versus ideal body size). In these ANOVAs, significant interactive effects were followed up with analyses of simple effects (Keppel, 1991). Differences in exercise motives were tested using MANOVA.

The third stage was to examine the bivariate associations between exercise level, body mass index, body image, and exercise motives. This was done using correlations, separately for each age–gender category.

The fourth and final stage was to examine the effects of body mass and body image on exercise motives. This was done using hierarchical regression analyses, separately for each age–gender category. In each analysis, the dependent variable was an exercise motive. The independent variables were, in order of entry, exercise level, body mass index, perceived body size, and ideal body size. By entering exercise level, we controlled for it as a possible confounding variable. By then entering body mass index, we tested its effect on motive. By then entering perceived body size, we tested its effect on motive (independent of body mass index). By then entering ideal body size, we effectively tested the effect of body size discrepancy on motive (because we had already entered perceived body size). For each variable entered, the size of effect was the increment in variance explained on entry (R^2 change), and the direction of effect was the sign of the standardised regression coefficient in the final equation (β).

The ratio of participants to predictor variables in these regression analyses was just over 11 to 1. This was less than the ratio of 15 to 1 desired for a reliable prediction equation (Stevens, 1996). However, several factors would increase the power of the tests of the effects of the theoretically important variables, that is to say body mass, perceived body size, and ideal body size. First, each subgroup was fairly homogeneous, being of the same age and sex, and from the same school; second, exercise level was effectively a covariate, entered before the theoretically important variables; third, current and ideal body image were effectively repeated measures.

For this study, alpha was set at 0.01, rather than 0.05, in recognition of the fact that there were to be multiple tests of significance.

Results

Psychometric properties and descriptive statistics

Being measured at the ordinal level, neither the exercise frequency nor the exercise length variables were suitable for use in correlation or regression analysis. Therefore, the exercise length

variable was recoded into an *exercise level* variable. Those exercising *about 1 hour* or less per week were coded as lower exercise level, those exercising *about 2–3 hours* or more as higher exercise level. The higher level would be health promoting according to recent public health advice (e.g. Sallis & Patrick, 1994). This exercise level variable correlated ($r_s=0.81$, $p<0.001$) with the exercise length variable from which it was created, and ($r_s=0.60$, $p<0.001$) with the exercise frequency variable. Table 1 shows numbers of participants by exercise level and age–gender category.

Table 2 shows the psychometric properties and descriptive statistics of the continuous variables. Cronbach's alpha was 0.70 or above for all EMI2 scales except Revitalisation (0.56). For this scale there was no item whose deletion would increase alpha. In single-factor confirmatory factor analyses, the p value for χ^2 was above 0.01 for all EMI2 scales except Positive Health and Social Pressure. This cast some doubt on whether these two scales were truly unidimensional.

Age-group and gender differences on variables

The association between age-group and exercise level was not significant (Fisher's exact test, $p=0.02$), nor was that between gender and exercise level ($p=1.00$). In the ANOVA of body mass index, the interactive effect of age-group and gender was significant ($F(1,176)=8.82$, $p=0.003$). In follow-up analyses, older males were significantly bulkier than younger males ($F(1,88)=94.23$, $p<0.001$); older females were significantly bulkier than younger females ($F(1,88)=37.60$, $p<0.001$); older males were significantly bulkier than older females ($F(1,88)=22.11$, $p<0.001$); whereas younger males and younger females were not significantly different ($F(1,88)=0.62$, $p=0.43$).

In the repeated-measures ANOVA of body image, the three-way interactive effect of age-group, gender and discrepancy was not significant ($F(1,176)=3.01$, $p=0.09$); nor was the two-way interactive effect of age-group and discrepancy ($F(1,176)=0.01$, $p=0.92$); but the two-way interactive effect of gender and discrepancy was significant ($F(1,176)=23.41$, $p<0.001$). This was followed up with separate analysis for males and females (repeated measures ANOVA in which the between-participants factor was age-group and the within-participants factor was discrepancy). In males, the interactive effect of age-group and discrepancy was not significant ($F(1,88)=1.04$, $p=0.31$); the main effect of age-group was significant ($F(1,88)=11.87$, $p=0.001$); and the main effect of discrepancy was not significant ($F(1,88)=0.35$, $p=0.56$). In other words, at the group level, older males perceived themselves as bulkier than younger males, but neither older nor younger males wanted to be a different size. In females, the interactive effect of age-group and discrepancy was not significant ($F(1,88)=2.34$, $p=0.13$); the main effect of age-group was not significant ($F(1,88)=0.18$, $p=0.67$); and the main effect of discrepancy was significant

Table 1
Number of participants by exercise level and age–gender category

	Younger males	Younger females	Older males	Older females
Lower exercise	8	10	18	15
Higher exercise	37	35	27	30

Table 2
Psychometric properties and descriptive statistics^a

Variable	No. of items	Cronbach's alpha	χ^2 goodness of fit for single factor ^b	Younger males		Younger females		Older males		Older females	
				M	SD	M	SD	M	SD	M	SD
Body mass index	–	–	–	17.92	2.43	17.54	2.20	23.13	2.66	20.57	2.49
Perceived body size	–	–	–	3.44	0.92	3.49	0.87	3.76	0.85	3.66	0.82
Ideal body size	–	–	–	3.40	0.69	3.07	0.58	3.92	0.41	3.02	0.56
EMI2 Affiliation	4	0.81	$\chi^2(2)=0.15, p=0.93$	3.29	1.24	3.27	1.31	3.08	1.31	2.86	1.48
EMI2 Appearance	4	0.85	$\chi^2(2)=4.35, p=0.11$	2.69	1.47	2.76	1.24	2.90	1.42	3.23	1.41
EMI2 Challenge	4	0.76	$\chi^2(2)=2.46, p=0.29$	2.42	1.00	2.40	1.13	2.90	1.12	2.68	1.25
EMI2 Competition	4	0.90	$\chi^2(2)=1.81, p=0.40$	3.03	1.55	2.93	1.53	2.82	1.56	2.12	1.57
EMI2 Enjoyment	4	0.71	$\chi^2(2)=2.62, p=0.27$	3.17	0.94	3.11	1.14	3.25	1.11	2.93	1.36
EMI2 Ill-Health	3	0.84	$\chi^2(2)=2.56, p=0.28$	1.91	1.29	1.98	1.56	2.37	1.23	2.49	1.31
Avoidance											
EMI2 Nimbleness	3	0.81	$\chi^2(2)=4.71, p=0.09$	2.32	1.22	2.21	1.20	2.41	1.45	2.48	1.23
EMI2 Positive Health	3	0.87	$\chi^2(2)=19.76, p=0.00$	3.44	1.50	3.77	1.23	3.62	1.31	3.81	1.22
EMI2 Revitalisation	3	0.56	$\chi^2(2)=0.16, p=0.93$	2.94	0.98	3.05	1.12	3.07	0.96	3.10	1.03
EMI2 Social Pressure	6	0.79	$\chi^2(9)=69.12, p=0.00$	1.11	1.16	1.15	0.99	1.04	1.09	0.66	0.69
EMI2 Social Recognition	4	0.70	$\chi^2(2)=2.34, p=0.31$	1.89	1.07	1.83	1.10	2.11	1.20	1.57	1.07
EMI2 Strength	4	0.82	$\chi^2(2)=0.71, p=0.70$	3.82	1.04	3.20	1.16	3.67	1.29	3.22	0.93
EMI2 Stress Management	4	0.88	$\chi^2(2)=3.60, p=0.17$	2.01	1.23	2.00	1.17	2.94	1.34	2.80	1.17
EMI2 Weight Management	4	0.92	$\chi^2(2)=1.76, p=0.42$	2.11	1.47	2.80	1.44	2.16	1.65	3.23	1.46

^a Note: N=180, 45 in each category. EMI2=Exercise Motivations Inventory version 2.

^b For scales with only three items, the factor loadings were constrained to be equal in order that the model be identified.

($F(1,88)=53.04, p<0.001$). In other words, older females and younger females had similar perceptions of their size, and wanted to be slimmer, to the same extent.

In the MANOVA of exercise motives, the interactive effect of age-group and gender was not significant ($F(14,163)=0.58, p=0.88$). The main effect of age-group was significant ($F(14,163)=7.82, p<0.001$). Follow-up discriminant function analysis indicated that this was mainly attributable to the older group being higher on Stress Management (this being the only scale whose correlation with the discriminant function was 0.30 or greater). The main effect of gender was also significant ($F(14,163)=3.73, p<0.001$). This was mainly attributable to the males being higher on Strength and the females higher on Weight Management.

Bivariate associations

Table 3 shows, for each age–gender category, the correlations between exercise level, body mass index, perceived body size, and ideal body size. The correlations of these variables with the EMI2 scales and of the EMI2 scales with each other are not shown for reasons of space (but are available from the first author on request). Exercise level did not correlate significantly with body mass index, or perceived body size, or ideal body size, in any category. Body mass index correlated significantly and positively with perceived body size in all of the categories, but did not correlate significantly with ideal body size. Perceived body size and ideal body size correlated significantly and positively in the younger and older females, but not the younger or older males. Some of the correlations were substantial, but not so large as to portend multicollinearity problems in the regression analyses (Licht, 1995).

Effects of body mass and body image on exercise motives

Table 4 shows the results of the regression analyses. In the older males, body mass index was associated positively ($\Delta R^2=0.22, p<0.01$) with Weight Management. In the older females, perceived body size was associated positively ($\Delta R^2=0.12$) and ideal body size was associated negatively ($\Delta R^2=0.14$) with Weight Management.

In the older males, perceived body size was associated negatively with Challenge ($\Delta R^2=0.15$), Social Recognition ($\Delta R^2=0.15$), and Stress Management ($\Delta R^2=0.16$). In the older females, body mass index was associated negatively with Affiliation ($\Delta R^2=0.37$), Competition ($\Delta R^2=0.17$), and Enjoyment ($\Delta R^2=0.24$); and perceived body size was associated positively with Positive Health ($\Delta R^2=0.17$). However, we wished to be sure that these findings were not merely the result of associations between these motives and Weight Management motive. Therefore, we repeated the regression analyses while controlling for Weight Management (entered before all other independent variables). In the older males, perceived body size was still associated negatively with Challenge ($\Delta R^2=0.22$), Social Recognition ($\Delta R^2=0.22$), and Stress Management ($\Delta R^2=0.25$). In the older females, body mass index was still associated negatively with Affiliation ($\Delta R^2=0.36$), Competition ($\Delta R^2=0.15$), and Enjoyment ($\Delta R^2=0.20$), but perceived body size was no longer significantly associated with Positive Health.

Table 3
Correlations between exercise level, body mass index, perceived body size, and ideal body size^a

Variable	Younger males			Younger females			Older males			Older females		
	1	2	3	1	2	3	1	2	3	1	2	3
1. Exercise level	–			–			–			–		
2. Body Mass Index	0.12	–		–0.09	–		–0.37*	–		0.08	–	
3. Perceived body size	0.12	0.56**	–	0.06	0.58**	–	–0.14	0.51**	–	0.00	0.63**	–
4. Ideal body size	–0.08	0.08	0.36*	0.07	0.19	0.58**	–0.23	0.11	0.03	0.13	0.18	0.57**

^a Note: N=180, 45 in each category. * $p < 0.05$; ** $p < 0.01$.

Table 4
Regression analyses^a

Dependent variable (motive)	Independent variables in order of entry	Younger males		Younger females		Older males		Older females	
		ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Affiliation	1. Exercise level	0.00	-0.04	0.08	0.30	0.02	0.14	0.00	0.08
	2. Body mass index	0.00	0.04	0.03	0.22	0.01	0.12	0.37**	-0.69**
	3. Perceived body size	0.03	-0.19	0.00	-0.11	0.13*	-0.42*	0.03	0.05
	4. Ideal body size	0.00	-0.01	0.01	0.11	0.00	0.05	0.03	0.24
Appearance	1. Exercise level	0.14*	-0.43**	0.03	0.17	0.00	-0.08	0.17**	-0.37*
	2. Body mass index	0.04	0.05	0.00	0.01	0.00	-0.05	0.00	-0.28
	3. Perceived body size	0.03	0.27	0.01	0.05	0.00	0.07	0.12*	0.55*
	4. Ideal body size	0.01	-0.13	0.01	0.09	0.00	-0.06	0.011	-0.14
Challenge	1. Exercise level	0.00	-0.02	0.02	0.12	0.08	0.25	0.13*	0.38**
	2. Body mass index	0.00	-0.11	0.01	-0.08	0.00	0.22	0.12*	-0.48*
	3. Perceived body size	0.01	0.08	0.00	-0.08	0.15**	-0.45**	0.04	0.18
	4. Ideal body size	0.00	0.01	0.01	0.13	0.04	-0.20	0.01	0.11
Competition	1. Exercise level	0.04	-0.16	0.08	0.32*	0.04	0.24	0.06	0.28*
	2. Body mass index	0.03	0.00	0.00	0.20	0.01	0.12	0.17**	-0.64**
	3. Perceived body size	0.06	-0.28	0.03	-0.27	0.13*	-0.41*	0.11*	0.32
	4. Ideal body size	0.00	-0.04	0.00	0.07	0.07	0.27	0.01	0.14
Enjoyment	1. Exercise level	0.00	-0.02	0.15**	0.41**	0.05	0.23	0.08	0.29*
	2. Body mass index	0.06	-0.20	0.00	0.13	0.00	0.17	0.24**	-0.58**
	3. Perceived body size	0.02	-0.04	0.01	-0.19	0.10**	-0.38*	0.05	0.07
	4. Ideal body size	0.07	-0.30	0.01	0.10	0.00	0.01	0.05	0.30
Ill-Health Avoidance	1. Exercise level	0.01	-0.10	0.00	-0.05	0.01	-0.05	0.01	-0.09
	2. Body mass index	0.00	-0.07	0.00	0.05	0.02	0.27	0.01	-0.11
	3. Perceived body size	0.01	0.16	0.00	-0.25	0.03	-0.21	0.04	0.33
	4. Ideal body size	0.02	-0.16	0.05	0.27	0.02	-0.13	0.01	-0.10
Nimbleness	1. Exercise level	0.01	-0.06	0.02	0.10	0.06	0.25	0.12*	0.40**
	2. Body mass index	0.02	-0.25	0.02	-0.18	0.01	0.23	0.03	0.01
	3. Perceived body size	0.03	0.20	0.04	-0.05	0.02	-0.18	0.00	0.37
	4. Ideal body size	0.00	0.00	0.10*	0.40*	0.05	-0.23	0.13*	-0.46*

(continued on next page)

Table 4 (continued)

Dependent variable (motive)	Independent variables in order of entry	Younger males		Younger females		Older males		Older females	
		ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Positive Health	1. Exercise level	0.05	-0.24	0.02	0.15	0.00	0.06	0.00	-0.01
	2. Body mass index	0.01	-0.01	0.00	0.13	0.00	0.19	0.01	-0.22
	3. Perceived body size	0.01	0.18	0.01	-0.24	0.04	-0.22	0.17**	0.51*
	4. Ideal body size	0.01	-0.08	0.02	0.20	0.03	-0.18	0.00	0.03
Revitalisation	1. Exercise level	0.01	0.11	0.01	0.09	0.00	0.07	0.00	0.07
	2. Body mass index	0.00	-0.12	0.00	0.12	0.00	0.25	0.06	-0.41*
	3. Perceived body size	0.00	0.11	0.00	-0.18	0.10*	-0.37*	0.09*	0.22
	4. Ideal body size	0.00	-0.07	0.04	0.26	0.02	-0.16	0.03	0.22
Social Pressure	1. Exercise level	0.04	-0.22	0.01	-0.10	0.00	0.09	0.01	0.13
	2. Body mass index	0.08	0.42*	0.00	-0.01	0.08	0.31	0.01	-0.22
	3. Perceived body size	0.04	-0.24	0.00	-0.06	0.00	-0.01	0.02	0.15
	4. Ideal body size	0.00	0.02	0.00	-0.03	0.00	-0.02	0.00	0.06
Social Recognition	1. Exercise level	0.02	-0.09	0.04	0.20	0.06	0.30	0.16**	0.41**
	2. Body mass index	0.02	-0.08	0.02	-0.15	0.01	0.35*	0.06	-0.40*
	3. Perceived body size	0.00	-0.13	0.00	0.01	0.15**	-0.46**	0.05	0.22
	4. Ideal body size	0.02	0.16	0.01	-0.02	0.00	-0.04	0.01	0.09
Strength	1. Exercise level	0.00	-0.08	0.03	0.16	0.02	0.11	0.01	0.14
	2. Body mass index	0.02	0.09	0.00	0.00	0.00	0.09	0.02	-0.43*
	3. Perceived body size	0.01	0.08	0.00	-0.16	0.02	-0.16	0.12*	0.48
	4. Ideal body size	0.00	0.06	0.02	0.20	0.05	-0.24	0.00	-0.04
Stress Management	1. Exercise level	0.00	0.00	0.00	0.05	0.02	-0.09	0.06	0.26
	2. Body mass index	0.00	0.07	0.01	0.03	0.00	0.30	0.06	-0.42*
	3. Perceived body size	0.05	-0.21	0.00	-0.11	0.16**	-0.46**	0.08*	0.24
	4. Ideal body size	0.01	-0.12	0.01	0.13	0.00	-0.03	0.02	0.16
Weight Management	1. Exercise level	0.00	-0.13	0.00	0.02	0.00	0.09	0.18**	-0.35**
	2. Body mass index	0.10*	0.08	0.05	-0.02	0.22**	0.36*	0.06	-0.20
	3. Perceived body size	0.11*	0.44*	0.11*	0.43	0.07	0.30	0.12**	0.82**
	4. Ideal body size	0.01	-0.10	0.00	-0.02	0.02	-0.14	0.14**	-0.48**

^a Note: N=180, 45 in each category. ΔR^2 =increment in variance explained. β =standardised regression coefficient in final equation. * $p<0.05$, ** $p<0.01$.

Discussion

For older males, those who were bulkier (body mass index) had higher weight management motive. In contrast, for older females, those who perceived themselves to be bulkier (perceived body size) or wanted to be slimmer (ideal body size), had higher weight management motive. Such relationships were not significant in the younger males or younger females. These results were consistent with our predictions. The gender differences in the younger adolescents were not merely less pronounced but were non-significant.

For older males, those who perceived themselves to be bulkier were less motivated by challenge, social recognition, and stress management. Among the older females, those who were bulkier were less motivated by affiliation, competition, and enjoyment. Such relationships were not significant in the younger adolescents. Thus, overall, the results were consistent with the general hypothesis that gender differences in the effects of body mass and body image on exercise motives first emerge during adolescence.

It should be emphasised that perceived body size was positively associated with body mass index in all four age–gender categories. Other researchers have also found perceived body size to be associated with body mass index (e.g. Parkinson et al., 1998; Sherman et al., 1995). Thus, perceptions of body size reflected actual body size to some extent. Nevertheless, perceived body size could explain variance in motives not explained by body mass index. Ideal body size was positively associated with perceived body size in females (younger and older) but not males. Thus, only in females was ideal body size reflected in perceived body size to some extent. However, in older females, ideal body size could explain variance in weight management motive not explained by perceived body size.

These gender differences in the association between perceived and ideal body size should be considered alongside gender differences in the group means. Older males were bulkier than younger males, and perceived themselves to be bulkier, but neither older nor younger males wanted to be a different size. Older females were bulkier than younger females, but perceived themselves to be the same size; and older and younger females wanted to be slimmer, to the same extent. In this regard, Brodie, Bagley, and Slade (1994) found that pre-adolescent and adolescent girls did not differ significantly from each other on perceived or on ideal body size. Of course, group means are made up of individual differences. Males were divided between those who wanted to be slimmer (presumably lose fat), stay the same, and be bulkier (presumably gain muscle), whereas very few females (only two younger and one older) wanted to be bulkier. Thus, we have added to the existing evidence that gender differences in body size dissatisfaction are discernible in adolescence.

There were also age and gender differences in exercise motives. The older adolescents compared with the younger were more motivated by stress management. This is consistent with exercise being identified as a proactive coping strategy in adults (Ingledew & McDonagh, 1998). Females compared with males were more motivated by weight management and less motivated by strength. Such a gender difference on weight management motive has been found repeatedly in adults (e.g. Ingledew et al., 1995; Ingledew et al., 1998; Markland & Hardy, 1993; McDonald & Thompson, 1992; Silberstein et al., 1988; Smith et al., 1998). Thus, we have provided further evidence that gender differences in weight-related variables are apparent in adolescence.

The general hypothesis and main findings of this study referred to the effects of body mass

and body image upon motives. Thus the study comprised both biological (body mass) and psychological (body image and exercise motives) variables. Dishman and Gettman (1980) found that biological and psychological variables (specifically body weight, body fat and self-motivation) had additive effects on exercise adherence. Such a psychobiological model has not garnered much subsequent support (Biddle & Mutrie, 2001). Our hypothesis and findings might be fitted within such a psychobiological mould. However, we have not suggested that biological and psychological variables have merely additive effects. Rather, we have proposed a possible *path* by which such variables might influence participation, specifically, body image (reflecting body mass to some extent) influencing motives (and hence ultimately adherence).

Our preference is to interpret our main findings in terms of Self-Determination Theory (Deci & Ryan 1985, 1991) as applied to exercise participation (e.g. Frederick & Ryan, 1993; Frederick & Ryan, 1995; Ingledew et al., 1998; Markland & Ingledew, 1997). These findings are that, by late adolescence, females are likely to exercise for weight management reasons if they perceive themselves to be overweight and if they want to slimmer whereas males are likely to exercise for weight management reasons if they are overweight. In addition, by late adolescence, females are less likely to exercise for certain other motives (affiliation, competition, and enjoyment) if they are overweight, and males are less likely to exercise for certain other motives (challenge, social recognition, and stress management) if they perceive themselves to be overweight. We would characterise weight management as predominantly an extrinsic motive, and the other motives as more intrinsic (see Ingledew et al., 1998; Markland & Ingledew, 1997). In that case, the study can be characterised as demonstrating that being overweight, or the perception that one is overweight even if one is not, can engender extrinsic motivation and undermine intrinsic motivation. This would be expected to have an adverse effect on long-term exercise adherence.

It is necessary to qualify this conclusion, however. Although, on theoretical grounds, certain motives (e.g. weight management) can be characterised as predominantly extrinsic and certain motives (e.g. enjoyment) as predominantly intrinsic, other motives (e.g. social recognition) are more difficult to classify (Ingledew et al., 1998; Markland & Ingledew, 1997). Ultimately, it may be better not to think in dichotomous terms. Deci and Ryan (1985, 1991) have suggested that extrinsic motivation is better conceptualised as a continuum ranging from completely non-self-determined to completely self-determined forms of behavioural regulation (external regulation, introjected regulation, identified regulation, integrated regulation). Through a process of internalisation, individuals can move along this continuum. Thus individuals who are initially externally regulated can eventually feel self-determined, even if they are never truly intrinsically motivated. In health promotion terms, this means accepting rather than bemoaning the fact that many individuals, prompted by body dissatisfaction, begin exercise for weight management reasons. The role of health promotion is then to facilitate the process of internalisation (see Deci & Ryan 1985, 1991).

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