

Relationships among adolescents' weight perceptions, exercise goals, exercise motivation, quality of life and leisure-time exercise behaviour: a self-determination theory approach

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Abstract

Exercise has an important role to play in the prevention of child and adolescent obesity. Recent school-based interventions have struggled to achieve meaningful and lasting changes to exercise levels. Theorists have suggested that this may, in part, be due to the failure to incorporate psychosocial mediators as they relate to behaviour change. Using a sample of 580 British school-children, a model grounded in self-determination theory was explored to examine the effects of exercise goals on exercise motivation, leisure-time exercise behaviour and quality of life (QoL). Results of structural equation modelling revealed that adolescents perceiving themselves to be overweight and pressurized to lose weight, endorsed extrinsic weight-related goals for exercise. Extrinsic goals negatively predicted, whereas intrinsic goals positively predicted, self-determined motivation, which in turn positively predicted QoL and exercise behaviour. Furthermore, self-determined motivation partially mediated the effects of exercise goals on reported exercise behaviour and QoL. Multi-sample invariance testing revealed the proposed model to be largely invariant across gender. Results suggest that holding extrinsic exercise goals could compromise exercise participation levels and QoL. A role for

teachers and parents is proposed with the aim of orienting young people towards intrinsic goals in an attempt to enhance future exercise behaviour and QoL.

Introduction

Child and adolescent obesity is an increasing problem in the United Kingdom, considered to be reaching epidemic proportions [1–3]. Not only does obesity have profound effects on health during childhood and adolescence itself (e.g. raised blood pressure [4], poor blood lipid profile [5] and insulin resistance [6]), but also past work has shown childhood obesity to track into adulthood, exposing the individual to long-term health risks [7–9]. Although exercise alone has not been found sufficiently powerful to significantly reduce existing obesity [10], it has been associated with the prevention of weight gain over the lifespan [11, 12] and better long-term maintenance of weight loss following dietary treatment [13].

UK government guidelines set specific responsibilities to schools in tackling obesity [14, 15]; however, even the most extensive school-based exercise programmes rarely show maintenance of improvements beyond the duration of the intervention [16–20]. Furthermore, the degree of change achieved is often of limited practical significance [16, 20]. Recent debate in the field [21–23] has argued that this lack of effectiveness may result from the failure to apply theory to practice. Specifically, critics [24, 25] suggest a more detailed examination of psychosocial mediators of change (e.g. self-efficacy, outcome expectations) is needed to better understand how the modification of the social environment

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relates to behaviour change. Such work would lead to the isolation of ‘active ingredients’ within interventions, allowing future programmes to be streamlined to include only those elements proven to contribute significantly towards positive outcomes [24, 25].

Self-determination theory

A motivational framework that can be readily applied to the science of behaviour change through an explicit set of psychosocial mediators is self-determination theory (SDT) [26, 27]. SDT proposes that motivation is multidimensional and resides along a continuum of self-determination ranging from amotivation (i.e. when a person lacks the motivation to act) through extrinsic motivation (i.e. when a person acts in response to external cues) to intrinsic motivation (i.e. when a person acts for the inherent pleasure derived from that particular activity) [26]. In short, SDT proposes that self-determined motivation leads to positive behavioural (e.g. persistence) [28, 29], cognitive (e.g. interest and enjoyment) [30] and psychological (e.g. well-being) [27, 31] outcomes. In contrast, behaviour low in self-determination (i.e. actions controlled by external contingencies) has been shown to result in negative psychological (e.g. ill-being), cognitive (e.g. attention [32]) and behavioural (e.g. drop-out) [33, 34] outcomes (see Deci and Ryan [35] for an overview). Promising findings in the field of adolescent physical activity have reported that many of the psychosocial mediators proposed by SDT (e.g. motivation) are predictive of changes in exercise level in a school setting [36].

In line with SDT’s theoretical hypothesis that self-determined motivation will affect both behavioural and psychosocial outcomes, we chose to examine two dependent variables representing each of these, namely, leisure-time exercise and quality of life (QoL). Leisure-time exercise is a commonly used behavioural indicator of volitional motivation (e.g. Hagger *et al.* [37], Chatzisarantis *et al.* [38]), selected as it represents activities over which adolescents have a choice, rather than mandatory forms of exercise such as physical education (PE) or daily chores. QoL is a global construct that reflects a person’s view of how their own life is going

in line with their values and expectations [39], selected as it represents a construct not unduly susceptible to daily fluctuations. Aligned with the tenets of SDT, we hypothesized that self-determined motivation would positively predict participants’ leisure-time exercise and reported QoL.

In addition to the importance of motivation (that is why a person takes part), SDT also considers that what goal a person holds for the activity will be important for a number of outcomes [40]. The content of goals can be classified as either intrinsic or extrinsic [41]. Intrinsic goals, such as the formation of social relationships and self-development, stem from a person’s core values and are inherently rewarding to pursue. As such, they promote self-determined behaviour and well-being [42, 43]. Conversely, extrinsic goals stem from aims to achieve outcomes separable from the activity itself, such as wealth and status, and are usually formed in response to external pressures. Extrinsic goals foster more controlling forms of regulation. Intrinsic goals (as opposed to extrinsic goals) have been shown to be positively associated with self-determined motivation in past research [44]. In addition, SDT proposes that goals have independent effects on those same outcome variables influenced by the level of self-determined motivation, such as learning, behaviour and well-being. That is, self-determined motivation partially mediates the associations between goal content and dependent variables. Recent research has supported these hypothesized associations in the context of classroom education [45] and PE [43].

In line with these proposed relationships, in the present work, we hypothesized that self-determined motivation would partially mediate the relationship between intrinsic and extrinsic goal content and the dependent variables of QoL and leisure-time exercise.

Exercise goal content and physical self-perceptions

In exercise settings, the goals of health, fitness, social relationships and enjoyment have all been categorized as intrinsic goals, whereas exercising to improve physical appearance and to lose weight are

characteristic of extrinsic goals [32, 46]. Intrinsic exercise goals have been associated with increased effort, performance and persistence [32], whereas extrinsic exercise goals have been related to indicators of psychosocial distress such as body dissatisfaction and dysfunctional eating [42].

Past work has demonstrated that some of the precursors to the extrinsic goals of weight management and appearance begin to emerge at or around puberty [47, 48], largely as a result of the biological and associated social changes occurring at this time and the increasing importance of physical appearance to peer acceptance and social status [46, 49]. A variable indicative of this is ‘social physique anxiety’ (SPA), that is, the degree to which a person becomes anxious in social settings when they perceive their physique is being negatively evaluated by others [50]. Previous studies have demonstrated a link between SPA, exercise goals [51] and motivation [52] in adults; exercisers high in SPA are more likely to endorse extrinsic motives and controlled forms of motivation for exercise than those low in SPA. We have found no such work carried out with adolescents. Because SPA directs the individual’s focus towards external indicators of worth, in the present study, we hypothesized that SPA would be positively associated with external goals and negatively related to intrinsic goals.

A final but important consideration in research relating to leisure-time exercise and self-perceptions in adolescence is that of gender. Significant gender differences would be expected for a number of variables assessed in our study, for example boys

would be expected to report greater leisure-time exercise [13], and girls to report greater weight dissatisfaction [53]. However, while mean values may differ, it is of greater interest to establish whether the pattern of relationships between the constructs remains similar. Previous work suggests this would be the case, as, for example, although high levels of SPA are less common in boys, the consequences for boys who report this experience are similar [54]. Consistent with past work [55, 56], we therefore hypothesized that the mean values of constructs would differ as a function of gender, but that the pattern of associations would be consistent. Such a finding is important when examining theoretical models of motivation such as SDT which assumes universality, and for the practical implications that would follow.

In summary, the present study aims to assess the prevalence of extrinsic exercise goals in an adolescent sample, and examines a model of psychological processes aligned with SDT, linking these to leisure-time exercise and QoL (Fig. 1). The model predicts that (i) individuals who perceive both that they are overweight and pressure from others to lose weight will experience greater SPA, (ii) perceived pressure to lose weight and SPA will positively predict extrinsic exercise goals and negatively predict intrinsic exercise goals, (iii) more self-determined forms of motivation will positively predict leisure-time exercise behaviour and quality of life, and (iv) the impact of goals on the outcomes of leisure-time exercise and QoL will be partially mediated by self-determined motivation.

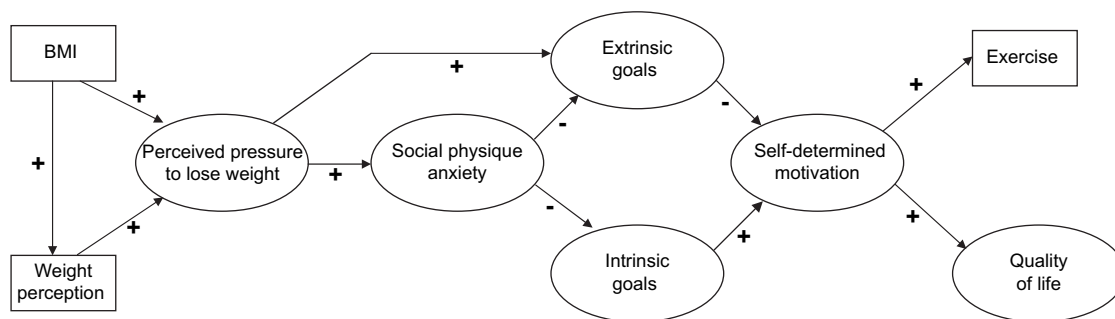


Fig. 1. Hypothesized model.

Method

Participants

Participants were 580 [M age = 14.06 years (range 13.05–15.33), SD = 0.32, 300 males, 280 females] pupils from four coeducational comprehensive schools located in South-West England. Schools within a single education authority were approached through contacting consecutive entries on a published list. Approval to conduct the study was received from the local research ethics committee. All schools in the final sample were situated in small rural towns, with low representation from ethnic minorities (<1%), and of size ranging from 855 to 1431 pupils. Two schools served pupils of below-average socio-economic status [e.g. entitlement to free school meals (FSM) at 13 and 9%], and two served areas of above-average socio-economic status (FSM 6%). All Year 9 pupils were eligible to take part. Written consent was obtained from the head teachers acting in *loco parentis*, and all parents were informed of the research by post, and asked to contact the school/researchers if they did not wish their child to take part. Twelve parents withdrew their children at this stage. Finally, verbal consent was obtained from pupils, 87% of whom provided complete data.

Measures

Weight status

Weight status was approximated through body mass index (BMI, kg m^{-2}), classifying participants as either not overweight or overweight as defined by sex- and age (in months)-adjusted international BMI percentiles [57]. Weight was measured without shoes in light clothing on portable electronic scales (Omega 873, Seca Ltd), and height measured with a portable stadiometer (Leicester Height Measure, Seca Ltd).

Weight perceptions

Participants were asked to rate their perceived weight status using a single item taken from the US National Longitudinal Study of Adolescent Health [58]. Participants classified their current weight as underweight, slightly underweight, about right, slightly overweight or overweight.

Perceived pressure to lose weight

Perceived pressure to lose weight was measured through six items relating to perceived pressure from parents, friends and the media to (i) be thin and (ii) lose weight [59]. The scale has been validated through factor analysis [60], reported to have adequate test–retest reliability ($\alpha = 0.84$ for girls and 0.80 for boys), and to correlate significantly with related constructs of body dissatisfaction ($r = 0.38$) and weight loss attempts ($r = 0.67$) [59].

Social physique anxiety

SPA was assessed using a seven-item version of the SPA scale [61], reported to have good internal consistency with an adolescent population (female $\alpha = 0.87$, male $\alpha = 0.85$) [54]. Responses were indicated on a five-point Likert-type scale anchored by (1) ‘not at all’ to (5) ‘extremely’. In the present work, $\alpha = 0.80$.

Intrinsic/extrinsic goals

Exercise goal content was measured using the Reasons for Exercise Inventory [62] which consists of 23 items, distributed between seven factors: fitness, mood, health, enjoyment, weight control, to be more attractive and to improve body tone. In line with previous research [45, 46], items within the first four factors were categorized as intrinsic (e.g. ‘to have fun’), and those in the final three factors classified as extrinsic (e.g. ‘to lose weight’). Responses were indicated on a seven-point Likert-type scale anchored by (1) ‘not at all’ to (7) ‘extremely important’. Internal consistency of the two-factor solution was reported as acceptable ($\alpha = 0.94$ and 0.84) with a UK adolescent sample (M age = 16.8) [46]. Construct validity was supported through confirmation of significant correlations between body dissatisfaction and extrinsic (weight, tone and attractiveness) but not intrinsic goal factors. The α coefficients in the present work were 0.90 and 0.88 for the intrinsic and extrinsic subscales, respectively.

Behavioural regulations

Motivation towards exercise was measured using the Behavioural Regulation in Exercise Questionnaire-2 [63]. This scale comprises 19 items relating

to the five types of regulation identified by SDT (from least to most self-determined: amotivation, external regulation, introjected regulation, identified regulation and intrinsic motivation). Responses were indicated on a five-point Likert-type scale anchored by (0) 'not true for me' to (4) 'very true for me'. Adequate factorial validity and reliability has been reported for this measure in an adolescent sample [64]. In the present work, the α coefficients were 0.82, 0.76, 0.74, 0.74 and 0.87 for amotivation, external regulation, introjected regulation, identified regulation and intrinsic motivation, respectively.

For the purpose of examining the hypothesized model, and consistent with past work [33, 34], we assigned weights to each sub-scale to form a single index labelled 'self-determined motivation': (amotivation $\times -3$) + (external regulation $\times -2$) + (introjected regulation $\times -1$) + (identified regulation $\times 2$) + (intrinsic regulation $\times 3$).

Quality of life

QoL was assessed using the KIDSCREEN self-report questionnaire [65]. The measure consists of 52 items assessing 10 dimensions of QoL established following consultation with adolescents, their parents and their carers in >13 European countries: physical well-being, psychological well-being, mood and emotions, self-perceptions, autonomy, family relationships, relationships with friends, school environment, bullying and financial resources. Responses were indicated on a five-point Likert-type scale anchored by (1) 'never' to (5) 'always'. Trials in a sample of >20 000 children reported adequate internal reliability ($\alpha = 0.77\text{--}0.89$) [65]. In the present work, the α coefficients ranged from 0.78 to 0.90.

Leisure-time exercise behaviour

A short self-report activity questionnaire was chosen to limit response burden for participants, in the form of the Leisure-Time Exercise Questionnaire (LTEQ [66]). This scale assesses the frequency of weekly physical activity at mild, moderate and strenuous intensities. Test-retest reliability of the LTEQ has been established with

adolescents, and found to be consistent regardless of delayed recall ability [67]. While only low-to-moderate associations have been reported with adolescents in a validation trial with the Caltrac accelerometer [68], such findings are of a comparable magnitude to other self-report measures in this population [69].

Procedure

The study was introduced by the principal investigator, reminding participants that there were no right or wrong answers, and of their right to withdraw at any time. Pupils were guided through the LTEQ to ensure correct understanding, and subsequently completed the remaining questionnaire packet at their own pace. Pupils were asked to bring their completed questionnaires to a separate room/partitioned area where weight and height were measured privately to avoid embarrassment. To ensure confidentiality, all measurement and assistance with questionnaires were provided by the research team and not teachers.

Analysis

Descriptive statistics were calculated separately for males and females, and gender differences explored using *t*-tests and χ^2 tests. The adequacy of the theoretical model was tested via structural equation modelling using the maximum likelihood estimation method in conjunction with the bootstrapping procedure, using AMOS Version 6.0 [70]. In view of the complex model to be tested, and consistent with past work (e.g. Reinboth *et al.* [71]), the number of parameters to be estimated was reduced by using a parcelling technique. The adequacy of the fit of the proposed model to the data was examined using the standardized root mean square residual (SRMR), along with one or more incremental or absolute fit index. In the present study we used the comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA). A good fitting model is indicated by values close to or >0.95 for the CFI and IFI, and values of (or less than) 0.08 and 0.06 for the SRMR and RMSEA, respectively [72].

Multi-sample invariance analysis was conducted to test for equality of constraints across gender [73] through examining the differences in the absolute and incremental fit indices following the sequential addition of constraints on the model. Constraints were applied in line with the procedure outlined by Byrne, 2001 [74].

Results

Descriptive statistics

Descriptive statistics are summarized in Table I. Boys engaged in significantly more exercise per week than girls ($t(578) = 6.59, P < 0.001$), averaging 10 sessions of moderate or strenuous exercise per week, compared with six to seven sessions for girls. There was no gender difference in the proportion of overweight individuals (19% boys, 20% girls); however, a significantly greater proportion of girls perceived themselves to be overweight than did boys (43 versus 26%, $\chi^2(1) = 21.8, P < 0.001$). Girls experienced greater SPA ($t(578) = -8.5, P < 0.001$) and greater perceived pressure from the media to lose weight ($t(578) = -6.6, P < 0.001$) but not from friends or family. Girls were also less self-determined in their motivation for exercise

($t(578) = 3.0, P < 0.005$), and reported poorer QoL than boys ($t(578) = 3.0, P < 0.005$).

Participants were classified as holding a particular exercise goal if they responded with ‘very’ or ‘extremely’ on the seven-point rating scale. The most commonly reported goals for boys were fitness (36%) and health (33%), and for girls body tone (27%), health (26%) and attractiveness (26%). Girls reported exercising for extrinsic goals more frequently than boys, and intrinsic goals less frequently. Specifically, they were significantly more likely to report goals of weight control (22 versus 10%, $\chi^2(1) = 17.0, P < 0.001$) and body tone (27 versus 20%, $\chi^2(1) = 4.1, P < 0.05$), but significantly less likely to report goals of fitness (17 versus 36%, $\chi^2(1) = 25.9, P < 0.001$) and mood regulation (5 versus 10%, $\chi^2(1) = 5.2, P < 0.05$).

Structural equation modelling

The results for the hypothesized model showed a reasonable fit to the data [$\chi^2(96) = 684.5, P < 0.01$, CFI = 0.90, IFI = 0.90, SRMR = 0.158, RMSEA = 0.103 (0.096–0.110)]. However, modification indices suggested that the disturbance terms of intrinsic and extrinsic goals be allowed to covary, and the addition of a path between SPA and QoL. This path was added to the model as it is in accordance

Table I. Gender comparison of baseline variables

	Male		Female		Difference
	Mean	SD	Mean	SD	
Leisure-time exercise (expressed as energy expenditure, in METs)	88.78	66.33	58.82	38.51	$P < 0.001$
Intrinsic goals	4.59	1.09	4.29	1.19	$P < 0.005$
Extrinsic goals	4.27	1.26	4.44	1.47	NS
Self-determined motivation	11.64	6.03	10.02	6.90	$P < 0.005$
Level of SPA	2.31	0.66	2.81	0.78	$P < 0.001$
Perceived pressure to lose weight	1.55	0.72	1.83	0.81	$P < 0.001$
Overall QoL	73.75	10.25	71.11	11.06	$P < 0.005$
Proportion overweight (CDC growth chart)	19%		20%		NS
Proportion perceiving self as overweight	26%		43%		$P < 0.001$

METs, metabolic equivalents.

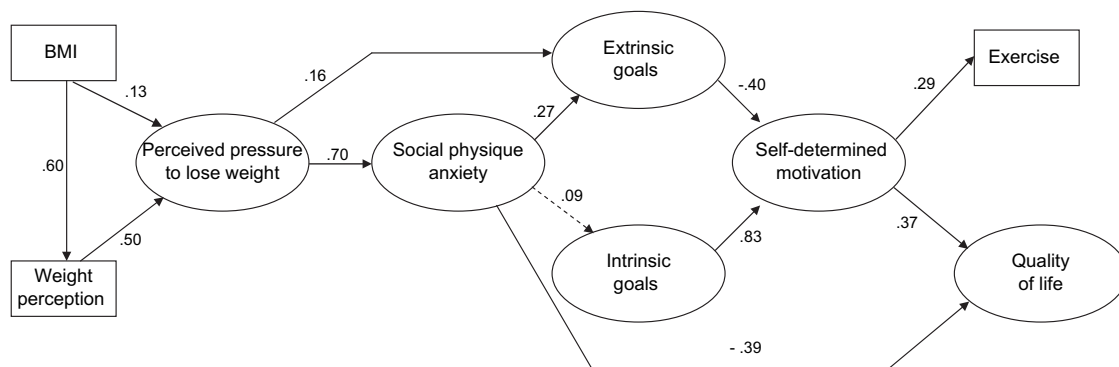


Fig. 2. Final model (standardized solution). For visual simplicity, measurement terms (thetas and epsilons) are not shown. All solid paths are significant (i.e. their z scores are >1.96).

with existing theory [75]. The re-specified model showed a marked improvement in fit to the data [$\chi^2(94) = 291.5$, $P < 0.01$, CFI = 0.97, IFI = 0.97, SRMR = 0.057, RMSEA = 0.060 (0.053–0.068)] (Fig. 2).

The re-specified model was then used as a baseline for the gender invariance analysis. The statistical indices showed acceptable fit for both sexes (Table II), and with the exception of the path between BMI and perceived pressure in girls, all individual paths remained significant (Table III). In line with the specification approach described by Byrne [74], this path was released, and instead estimated freely for boys, and constrained to zero for girls. The changes in fit indices following sequential constraints [76] were sufficiently small (Table II) for the invariance model to be retained with acceptable fit. Such findings support partial invariance.

Finally, our hypothesis that the effect of exercise goal content on activity levels and QoL would be partially mediated by self-determined motivation was explored using bootstrap-generated bias-corrected confidence intervals (CIs) (cf. MacKinnon *et al.* [77], MacKinnon *et al.* [78]). Results showed exercise goal content to have significant indirect effects on both activity levels and QoL via self-determined motivation (in addition to significant direct effects). Specifically, standardized indirect effects emerged for extrinsic goals on reported

leisure-time exercise behaviour [$\beta = -0.11$ (90% CI = -0.16 to -0.08)] and on QoL [$\beta = -0.15$ (90% CI = -0.19 to -0.11)]. Likewise, standardized indirect effects for intrinsic goals emerged on reported leisure-time exercise behaviour [$\beta = 0.24$ (90% CI = 0.19 to 0.30)] and QoL [$\beta = 0.31$ (90% CI = 0.25 to 0.38)].

Discussion

Pulling from the tenets of SDT, the primary purpose of this study was to test a hypothesized model of associations between goal content, leisure-time exercise and QoL. Following some minor modifications, the hypothesized model was supported (Fig. 2). A second aim was to test the model for measurement invariance across gender. Our results revealed the model to be partially invariant, with one path differing between groups; the path between BMI and perceived pressure to lose weight was significant for boys and not for girls. This finding is in line with inferences from previous work which has shown that weight perceptions, but not BMI, to predict perceived pressure to be slim in adolescent girls (e.g. Sweeting and West [53], Crocker *et al.* [74], Brener *et al.* [79]). All other paths advanced in the hypothesized model were supported across gender, supporting our hypothesis that the model fit was largely invariant.

Table II. Sequential fit indices for gender invariance model

Constraints imposed	χ^2	df	$\Delta\chi^2$	Δ df	CFI	IFI	SRMR	RMSEA (90% CI)
Unconstrained	372.05	188	–	–	0.97	0.97	0.059	0.041 (0.035–0.047)
Measurement weights	403.13	196	31.08	8	0.97	0.97	0.059	0.043 (0.037–0.049)
Measurement intercepts	514.33	210	142.28	22	0.95	0.95	0.074	0.050 (0.045–0.056)
Structural weights	643.12	221	271.08	33	0.93	0.93	0.065	0.057 (0.052–0.063)
Structural intercepts	662.53	223	290.49	35	0.93	0.93	0.065	0.058 (0.053–0.064)
Structural residuals	694.25	232	322.21	44	0.92	0.92	0.069	0.059 (0.054–0.064)

Table III. Standardized β weights for the final model separated by gender

	Male	Female
BMI → perceived weight status	0.67	0.51
BMI → perceived pressure	0.20	0.10 ^a
Perceived weight status → perceived pressure	0.33	0.60
Perceived pressure → SPA	0.61	0.77
Perceived pressure → extrinsic goals	0.19	0.20
SPA → extrinsic goals	0.14	0.36
SPA → QoL	–0.41	–0.38
Extrinsic goals → motivation	–0.41	–0.37
Intrinsic goals → motivation	0.85	0.80
Motivation → QoL	0.38	0.35
Motivation → exercise	0.22	0.37

^aDenotes a non-significant standardized β weight.

Perceptions of pressure to lose weight were an important antecedent to perceptions of SPA and the endorsement of extrinsic goals. This pathway makes conceptual sense, as one would expect individuals who perceive external pressures to experience increased evaluative threat, which manifests, for example, as SPA. The direct path from perceived pressure to lose weight to extrinsic exercise goals can be interpreted in light of SDT; individuals who perceive that they have been pressurized and/or coerced into action by others (e.g. parents, peers) would be expected to pursue goals focusing on external indicators (e.g. image, interpersonal comparison) [32, 35, 80].

Although contrary to our hypotheses, the lack of a significant negative path between SPA and intrinsic goals has positive implications, suggesting that intrinsic (and therefore more adaptive) goals for exercise can persist despite the presence of body-

related anxiety. The addition of a direct path between SPA and QoL was not included in the original hypotheses, but again is also logical as SPA indicates the presence of negative self-perceptions, and would thus be expected to have a direct negative impact on a number of QoL domains (e.g. self-perceptions, social relationships).

Finally, as hypothesized and consistent with theory (cf. Deci and Ryan [40]), extrinsic exercise goals negatively predicted, while intrinsic goals positively predicted, levels of self-determined motivation. In turn, greater self-determination in motivation predicted higher levels of leisure-time exercise, and better QoL.

In addition to direct paths, intrinsic goals had significant positive indirect effects, whereas extrinsic goals had significant negative indirect effects (albeit weak) on leisure-time exercise and QoL. The effects of goal content on our dependent variables were partially mediated by self-determined motivation. In showing the goal content dimensions to explain independent variance in the dependent variables, our findings are consistent with both the theoretical tenets of SDT [35] and recent empirical research in school [45] and adult exercise [43] settings. Collectively, the present findings support past work (cf. Vansteenkiste *et al.* [80]) in suggesting that fostering intrinsic goals could be beneficial for improving the mental health and exercise behaviour in adolescents, and reinforces the need to understand both the what and why of motivation.

Practical implications

The central implication from the present findings is that exercise goal content may prove a useful target for interventions aimed at promoting exercise

motivation and participation in adolescents. Previous research supports that this is a realistic aim in a school setting, as it has been demonstrated that goal content can be influenced by a simple script presented to students in the classroom [45], and preliminary evidence suggests that basic training is effective in helping even highly controlling teachers to alter their teaching style to become more autonomy supportive [81]. If parents and teachers are able to influence goal content by altering the social context, they may have the potential to significantly impact adolescent exercise motivation, QoL and physical activity.

However, at a public health level, we acknowledge that the primary role for goal content in exercise interventions lies in promoting the maintenance of activities, rather than in their initiation. Instruction and practice are needed to achieve a reasonable level of competence in any new activity before it can become self-determined [82], and thus, the structural changes that many large school-based interventions (e.g. Pate *et al.* [17], Dale *et al.* [18]) adopt may be essential to provide this initial discipline and experience. Therefore, we see the role for the manipulation of goal content as a component to supplement such programmes to increase the likelihood of their achieving longer term effects.

Limitations

There are a number of limitations to this study. First, self-report exercise measures can result in overestimates of activity level [83], and as such, the use of objective assessments of exercise would corroborate and add further validity to our findings. Second, we used only an approximation of the degree of overweight of participants in our model, as BMI is an inexact measure of body fatness, which does not take full account of maturation status. Greater accuracy could be achieved through measures such as skinfold thickness, twinned with an individual assessment of maturation status. Finally, due to the cross-sectional design employed, the direction of the observed relationships was not demonstrated. The model was specified aligned with theory, but future work adopting longitudinal and/or experi-

mental designs would provide a greater insight into the causal direction of these hypothesized associations.

Future directions

Future research is warranted to investigate whether the present findings can be usefully translated into practice. As a first step, given that this study can suggest only that goals are associated with motivation and outcomes, it would be informative to test whether it is more productive in practice to focus on promoting intrinsic goals or on reducing extrinsic goals. For example, the extrinsic goal of weight loss may prove not to be open to our influence, given the cultural and societal pressures over which practitioners have little if any control but to which teenagers are continually exposed (such as pressure to aspire to a societal thin ideal [84]). A further challenge lies in identifying specific intrinsic goals that would be perceived as meaningful and relevant to adolescents, given their many other priorities and changing values in this important life transition. Building on experimental research [82], it is our hope that such work would provide useful information on the translation of theory to practice in influencing the health behaviours that play a role in curbing the rising tide of child and adolescent obesity.

Conflict of interest statement

None declared.

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