

The role of self-determined motivation in the understanding of exercise-related behaviours, cognitions and physical self-evaluations

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Abstract

Grounded in self-determination theory (Deci & Ryan, 1985), the purpose of the present study was to examine whether amotivation, self-determined and controlling types of motivation could predict a range of exercise-related behaviours, cognitions and physical self-evaluations. Exercisers ($n = 375$) from ten health clubs in the North of England completed questionnaires measuring exercise motivation, exercise stages of change, number of relapses from exercise, future intention to exercise, barriers self-efficacy, physical self-worth and social physique anxiety. Controlling for age and sex, multiple and logistic regression analyses supported our hypotheses by showing self-determined motivation (i.e. intrinsic motivation and identified regulation) to predict more adaptive behavioural, cognitive and physical self-evaluation patterns than external regulation and amotivation. Introjected regulation was related to both adaptive and maladaptive outcomes. Furthermore, a multivariate analysis of variance revealed that exercisers in the maintenance stage of change displayed significantly more self-determined motivation to exercise than those in the preparation and action stages. The results illustrate the importance of promoting self-determined motivation in exercisers to improve the quality of their experiences, as well as to foster their exercise behaviour. Future research should examine the mechanisms that promote self-determined motivation in exercise.

Keywords: *Motivational regulations, stages of change, exercise relapse, barriers self-efficacy, physical self-worth, social physique anxiety*

Introduction

Despite the well-documented evidence supporting the physical (e.g. Blair, Cheng, & Holder, 2001) and psychological (e.g. Biddle, Fox, & Boutcher, 2000) benefits of exercise, approximately 50% of individuals who start an exercise programme will drop out within the first 6 months (Berger, Pargman, & Weinberg, 2002). Furthermore, individuals often experience lapses in trying to adhere to an exercise programme. For example, Sallis *et al.* (1990), using a sample of approximately 1800 exercisers, found that 20% had experienced one or two exercise relapses (defined as not exercising for three or more months) and 20% had experienced three or more relapses within the past 5 years. From a public health perspective, these statistics are discouraging, since any long-term physical and psychological benefits of exercise will only be achieved through persistent exercise participation.

Drop-out from exercise programmes could be partly attributed to the motivation underlying exercise

behaviour. Whereas some individuals exercise due to the enjoyment they get from working out, many others exercise to attain extrinsic or intrinsic rewards, such as to look more attractive, become fitter, or obtain recognition from significant others (Markland & Ingledew, 1997). Previous research has shown that individuals who exercise due to enjoyment as opposed to instrumental reasons are more likely to adhere to their exercise programmes (e.g. Wankel, 1993). Such findings demonstrate the importance of studying the motivation underlying exercise participation using multidimensional theoretical frameworks.

Self-determination theory

Self-determination theory (Deci & Ryan, 1985) is one contemporary framework that is increasingly being used to understand exercise motivation and adherence. Specifically, self-determination theory proposes that behavioural regulation towards an activity can be amotivated, extrinsically motivated, or intrinsically motivated. These overall classifications of motivation

differ in the extent to which they are self-determined (autonomous), because they represent different degrees of internalization of external values and goals.

Specifically, amotivation represents the lack of both extrinsic and intrinsic motivation and is characterized by the lack of value for an activity, or the belief that the activity will not result in desired outcomes. Extrinsically motivated behaviours are divided into four different types of behavioural regulation: external, introjected, identified and integrated (Deci & Ryan, 1985; Ryan & Deci, 2000). External regulation represents behaviours that are regulated through external means, such as rewards or fear of punishment (e.g. exercising because of pressure from significant others). Introjected regulation refers to behaviours that are partially internalized, but they are not fully self-determined. These behaviours are performed to gain social approval and self-worth or to avoid internal pressure and negative feelings (e.g. exercising to avoid feelings of guilt). Identified regulation represents a relatively self-determined regulation because the outcomes of the behaviour are highly valued (e.g. exercising to improve physical fitness), and the behaviour is performed with no pressure, even if it is not particularly enjoyable. Finally, integrated regulation represents the most self-determined form of the internalization process. It refers to behaviours that are performed out of choice to harmonize and bring coherence to different parts of the self (Deci & Ryan, 1985, 1995). For example, some individuals might view exercise, together with healthy eating and adequate rest, as important components of a healthy lifestyle. However, even at the higher end of the self-determination continuum, behaviours are engaged in for instrumental reasons, and thus they are extrinsically regulated. Only when individuals are intrinsically motivated towards an activity is the behaviour considered to be fully self-determined. When intrinsically motivated, individuals enjoy the process of engaging in the activity (e.g. exercising because it is fun) rather than the outcomes associated with the latter. In conclusion, intrinsic motivation, integrated regulation and identified regulation represent self-determined (autonomous) motivational regulations, whereas introjected and external regulation represent low self-determined or controlling motivational regulations.

According to Vallerand (1997), the different motivational regulations can directly predict a wide variety of behavioural, cognitive and affective outcomes. In a comprehensive review of self-determination research across a wide variety of life contexts, Vallerand (1997) outlined that self-determined motivation regulations are related to more adaptive outcomes compared with less self-determined regulations or amotivation.

Self-determination theory and exercise-related behaviours

Self-determination theory has recently been used by researchers to study motivation in exercise contexts. The results have been similar to those found in other life contexts in that self-determined motivation to exercise has been associated with more positive behavioural, cognitive and affective outcomes, compared with controlling motivational regulations or amotivation. For example, in terms of self-reported behaviour, Ingledew, Markland and Medley (1998) examined the relationship between different exercise motives and the stages of behavioural change proposed by the transtheoretical model (Prochaska & DiClemente, 1984). In the context of exercise adoption, the transtheoretical model argues that individuals move through five stages of behavioural change, starting from being physically inactive and ending up as regular exercisers. Ingledew *et al.* (1998) found that extrinsic, especially body-related, motives were more important in the early stages of behavioural change, whereas enjoyment (an intrinsic motive) was important for progression to regular exercise patterns. However, Ingledew *et al.* (1998) used a descriptive questionnaire that measures motives for exercise (some of which can be high or low in self-determination depending on how they are operationalized), but not the underlying motivational regulations that underpin exercise behaviour.

In contrast, Mullan and Markland (1997) assessed the variations in four motivational regulations (intrinsic motivation, identified, introjected and external regulation) across the different stages of change. Mullan and Markland (1997) found that those individuals who reported that they exercised infrequently (preparation stage) had significantly lower scores on intrinsic motivation and identified regulation to exercise than individuals who indicated that they exercised regularly but for less than 6 months (action stage), and those who exercised regularly for 6 or more months (maintenance stage). No stages of change differences were found in introjected regulation and external regulation. This is surprising given that controlling behavioural regulations are more likely to be associated with maladaptive behavioural outcomes (Ryan & Deci, 2000). Unfortunately, amotivation was not assessed by Mullan and Markland (1997). Clearly, more research is needed to examine whether there are significant variations in self-determination among the different stages of change. Such research is important to understand *why* (i.e. the underlying motivational mechanisms) as well as *how* individuals move across different stages of exercise behaviour.

One of the greatest challenges facing researchers and clinicians alike is how to prevent relapse for those individuals who have recently started exercising. There

is a clear need to use theoretical frameworks to study relapse behaviour, as previous research studying relapse in exercise settings has been mainly atheoretical (e.g. Sallis *et al.*, 1990). Self-determination theory can provide a potentially useful theoretical framework. For example, Mullan and Markland (1997) suggested that controlling exercise regulations may lead to a greater number of relapses from exercise compared with more self-determined types of exercise regulation. This is probably because those who are self-determined engage in exercise because they find it fun or because they consider it personally important. Therefore, they are less likely to experience motivational setbacks than individuals who exercise out of feelings of guilt or other extrinsic reasons. In line with this argument, Ryan, Frederick, Lepes, Rubio and Sheldon (1997) showed that adherence to an exercise programme was associated with enjoyment and competence motives (i.e. intrinsic motives) as opposed to body appearance motives (i.e. extrinsic motives). However, this study did not assess the motivational regulations that underpin exercise behaviour. Clearly, more studies are needed to examine whether different types of exercise regulation with varying degrees of self-determination can predict relapse from exercise. This is important in view of the high relapse rates of exercisers (Sallis *et al.*, 1990).

Self-determination theory and exercise-related cognitions

Intention to continue exercise is an important outcome variable when studying exercise behaviour. Indeed, a meta-analysis by Hausenblas, Carron and Mack (1997) showed that there was a moderate effect size between intention and behaviour in exercise settings. For the purposes of the present study, the question is whether amotivated, controlling and autonomously regulated motivation will differentially predict intention to continue exercising. Currently, there is some support for the positive role of self-determined motivation in predicting intentions of children to be physically active (e.g. Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2003). In a recent meta-analysis of a small number of studies, Chatzisarantis, Hagger, Biddle, Smith and Wang (2003) found that intentions to be physically active were negatively correlated with amotivation and external regulation, and positively associated with introjected regulation, identified regulation and intrinsic motivation. However, all studies in this meta-analysis were carried out with children or with sport participants. More research is needed to examine whether the findings from this meta-analysis will apply to adult exercisers. This is particularly important in view of the high drop-out rates from exercise programmes (Berger *et al.*, 2002).

Another cognitive variable, which is a key predictor of exercise behaviour and adherence, is self-efficacy (Biddle & Nigg, 2000; King *et al.*, 1992). In the context of exercise, self-efficacy has often been operationalized as barriers self-efficacy, which has been defined as the belief individuals have about their ability to overcome commonly identified barriers to regular exercise (McAuley, 1992). To our knowledge, there has been no research examining the relationship between barriers self-efficacy and exercise motivation using a self-determination theory framework. Our aim was to examine this relationship, bearing in mind the important role of barriers self-efficacy in predicting exercise behaviour (McAuley, 1992). From a conceptual standpoint, self-determination theory suggests that people with high perceptions of autonomy (self-determination) feel that they have a sense of choice and control of their behaviour (Deci & Ryan, 1991). As a consequence, great self-determination to exercise should positively predict self-efficacy to overcome barriers to regular exercise. At this point it is important to differentiate between the need for competence (viewed by self-determination theory as one of three innate psychological needs) and self-efficacy. Bandura (1989) viewed self-efficacy as a domain-specific perception of competence and an instrument for goal attainment, as opposed to an innate psychological need that transcends contexts. Furthermore, according to Deci and Ryan (2000), self-efficacy theory focuses on the satisfaction that results from the outcomes that competence might yield. In contrast, self-determination theory views the experience of competence *per se* as a source of satisfaction and a contributor to well-being over and above any satisfaction resulting from the outcomes that competence might bring.

Self-determination theory and physical self-evaluations

The physical self plays an important role in daily functioning and well-being. This is reflected in the consistently high correlations between aspects of the physical self, such as body image, with global self-esteem (Fox, 1997). Furthermore, research has shown that physical self-worth, a global indicator of feelings about salient aspects of the physical self, is significantly related to emotional adjustment and positive affect, even when global self-esteem and social desirability are statistically controlled (Sonstroem & Potts, 1996; Van de Vliet *et al.*, 2002). Self-determination theory discusses the relationship between global self-esteem and motivated behaviour and suggests that true self-esteem (a type of self-esteem that is stable and secure) may be developed through engaging in behaviours that are autonomously regulated, and that engender feelings of competence and relatedness (Deci & Ryan, 1995).

However, the theory does not discuss the relationship between physical self-worth and motivated behaviour. Nevertheless, we believe that self-determined motivational regulations may be positively related to physical self-worth. For example, engaging in exercise to achieve personally important goals is more likely to lead to feelings of accomplishment and subsequently to high physical self-worth, as opposed to engaging in exercise to avoid feelings of guilt or to appease significant others. Our exploratory prediction is further based on Fox's (1997) argument that self-determination may act as a mediator mechanism in the relationship between exercise and physical self-worth.

To our knowledge, the only study to have examined the association between exercise regulations and physical self-esteem is that carried out by Wilson and Rodgers (2002) with female exercisers. The results of this study showed that autonomously regulated exercise motivations (i.e. intrinsic motivation and identified regulation) discriminated between those with high and low physical self-esteem, whereas controlling exercise regulations (i.e. introjected and external regulation) did not. However, this study was conducted with young female exercisers and the generalizability of the findings to other populations has yet to be tested. Clearly, more research is needed to examine the extent to which different types of exercise motivation may be differentially related to the physical self.

Another construct related to the physical self is social physique anxiety, which has been defined as the apprehension that some individuals have about displaying their body in social settings (Hart, Leary, & Rejeski, 1989). Social physique anxiety is often salient in exercise classes where the body is "on display". Very few studies have examined the relationship between extrinsic/intrinsic motivation for exercise and social physique anxiety. Frederick and Morrison (1996) found that exercisers with high social physique anxiety were more likely to report extrinsic motives for exercising, such as appearance, than exercisers with lower social physique anxiety. Similarly, Crawford and Eklund (1994) found that motives to improve toning and physical attractiveness (i.e. extrinsic motives) were significant and positive predictors of social physique anxiety. However, since the previous studies were not based on the self-determination theory framework, the motives they assessed did not represent the whole continuum of self-determination.

It is important to extend this research by looking at how social physique anxiety relates to self-determined, controlling and amotivated behaviours. Self-determination theory does not directly discuss such links. However, Deci and Ryan (2000) talked about the struggle for body control (which is undeniably embedded in the concept of social

physique anxiety) and argued that this struggle is the outcome of deficiencies in self-determination. It is therefore reasonable to assume that if individuals exercise due to enjoyment or because they value the benefits of exercise, they are less likely to be focused on how their bodies appear to others. Therefore, exercise regulated by intrinsic or identified motivation should help individuals to reduce their preoccupation with appearance-related factors. In contrast, individuals whose exercise motivation is regulated by controlling motivation, such as the need to obtain social approval or avoid social disapproval, are more likely to report social physique anxiety symptoms in an exercise setting.

Hypotheses

The purpose of the present study was to examine the role of different motivational regulations in the understanding of exercise-related behaviours, cognitions and physical self-evaluations. It was hypothesized that self-determined exercise motivation (i.e. identified and intrinsic motivation) would be higher in more advanced stages of change and would be related to fewer cases of exercise relapse, greater barriers self-efficacy, stronger intentions to continue exercising, higher physical self-worth and lower social physique anxiety. In contrast, it was expected that controlling types of exercise regulation (i.e. external and introjected regulation), and in particular amotivation, would be lower in more advanced stages of change and would be related to more cases of exercise relapse, lower barriers self-efficacy, weaker intentions to continue exercising, lower physical self-worth and higher social physique anxiety.

Methods

Participants

Three hundred and seventy-five exercisers (121 males, 246 females; 8 did not indicate their gender) from ten fitness clubs (55% of the participants belonged to one club and a further 30% to four clubs) in the North of England took part in the study. Preliminary analyses showed no significant between-club differences in any of the study variables. The participants were aged 16–66 years (mean = 38.7, $s = 10.9$). The distribution of the participants across three age groups (16–24, 25–44 and 45–66 years; adapted from Spirduso, 1995) did not differ significantly by sex ($\chi^2 = 3.88$, $d.f. = 2$, $P = 0.144$). Most participants were aged 25–44 years (60 males, 146 females), followed by the 45–66 year age range (48 males, 73 females) and the 16–24 year age range (11 males, 24 females). The participants reported that they exercised at their fitness club on average 3 days per

week (mean = 2.96, $s = 1.16$) for approximately one hour on every visit (mean = 60.45 min, $s = 20.58$), working at an intensity perceived to be “somewhat hard” (mean = 3.10, $s = 0.73$) on a 5-point scale.

Measures

Behavioural Regulation in Exercise Questionnaire (Mullan, Markland, & Ingledew, 1997). The Behavioural Regulation in Exercise Questionnaire (BREQ) is a 15-item questionnaire that measures external, introjected, identified and intrinsic regulations of exercise behaviour. The BREQ does not measure integrated regulation because at the initial stages of the development of the questionnaire, integrated regulation was not empirically distinguishable from identified regulation and intrinsic motivation. In addition to the four subscales, we adapted to exercise four items that tap amotivation from the Academic Motivation Scale (Vallerand *et al.*, 1992). Example items are: “I exercise because it’s fun” (intrinsic motivation), “because I value the benefits of exercise” (identified regulation), “because I feel guilty when I don’t exercise” (introjected regulation), “because other people say I should” (external regulation), “but I really don’t know why” (amotivation). Each item is measured on a scale from 0 (“Not true for me”) to 4 (“Very true for me”). In our study we used a scale ranging from 1 to 5 to be compatible with the other scales included in the questionnaire pack. Mullan *et al.* (1997) and Wilson, Rodgers and Fraser (2002) have provided strong evidence for the construct validity and the reliability of the BREQ.

Relapse from exercise (Sallis *et al.*, 1990). We also assessed the number of times the participants had stopped exercising for 3 months or more in the past 5 years. We chose this time frame following the example of Sallis *et al.* (1990). The responses to this question were measured on an interval scale with the following options: “none”, “1–3 times”, “4–6 times”, “7–10 times” and “more than 10 times”. For those who had stopped exercising at least once, we also assessed the main reasons for their decision. We presented them with nine reasons that are frequently cited in the literature (e.g. lack of motivation, injury, family demands), as well as an “other” category, and we asked them to tick all those reasons that were applicable to them.

Stages of Change-Short Form (Marcus, Selby, Niaura, & Rossi, 1992). This is a 5-item scale that assesses the precontemplation, contemplation, preparation, action and maintenance stages of exercise behaviour change. Due to the nature of our sample (i.e. exercisers), only the last three stages were assessed.

The participants were given a definition of regular exercise and then they were asked to indicate whether, according to that definition, they had been exercising “a little, but not regularly” (preparation), “regularly but for less than 6 months” (action), or “regularly for more than 6 months” (maintenance). The questionnaire has been shown to relate with objective and self-report measures of physical activity. For example, Hausenblas, Dannecker, Connaughton and Lovins (1999), using a sample of 45 police officers, showed significant differences among the preparation, action and maintenance stages on the Leisure-Time Exercise Questionnaire (LTEQ; Godin, Jobin, & Bouillon, 1986). Furthermore, in the same study, significant differences in maximal oxygen uptake were found between the preparation and action stages. Similarly, Cardinal (1997), in a sample of 135 adults, reported decreases in body mass index and linear improvements in submaximal aerobic fitness and LTEQ scores across the stages of change.

Intention to continue exercise. Two items (“I am determined to continue to exercise in the next 6 months”, “I intend to exercise in the next 6 months”) were used to assess the participants’ intention to continue regular exercise over the next 6 months. These items tapped the participants’ motivation to continue regular exercise as opposed to their self-efficacy beliefs to overcome barriers to exercise. Both items were scored on a 6-point scale ranging from 1 (“strongly disagree”) to 6 (“strongly agree”).

Barriers self-efficacy. To assess the participants’ self-efficacy to overcome barriers to regular exercise, we chose 10 items from two relevant scales developed by Marcus *et al.* (1992) and McAuley (1992). The items reflected situations that have been listed in the literature as common reasons for preventing individuals from participating in exercise sessions or, in some cases, contributing to drop-out (e.g. lack of time, lack of social support, injuries, illness). Each item was measured on a 5-point scale ranging from 1 (“not at all confident”) to 5 (“completely confident”).

Physical Self-Worth (Fox & Corbin, 1989). This is a 6-item subscale from the Physical Self-Perception Profile (PSPP; Fox & Corbin, 1989). The PSPP is based on Fox and Corbin’s hierarchical conceptualization of physical self-perceptions, with physical self-worth at the apex underpinned by four subdomains of the physical self (i.e. sports competence, physical condition, body attractiveness and physical strength). The questionnaire employs a forced-choice structured alternative format to minimize socially desirable responses. For each item, two alternative statements are provided. The participants

must first decide which of the two statements relates to them best, and then indicate if the chosen statement is “sort of true” or “really true” for them. An example is “Some people feel extremely proud of who they are and what they can do physically, BUT Others are sometimes not quite as proud of who they are physically”. The PSPP is a widely used scale that has been shown to be reliable and valid across a wide range of populations (Byrne, 1996).

Social Physique Anxiety Scale (SPAS; Hart *et al.*, 1989). This is a 12-item questionnaire that assesses social physique anxiety. An example item is: “I wish I wasn’t so uptight about my figure”. Each item is assessed on a 5-point scale ranging from 1 (“Not at all”) to 5 (“Extremely”). A psychometric study by Eklund, Mack and Hart (1996) has disputed the unidimensional nature of the SPAS and suggested two higher-order factors. However, in two studies, Motl and Conroy (2000, 2001) showed that the two-factor model was a methodological artifact representing positively and negatively worded items. Motl and Conroy’s (2000, 2001) confirmatory factor analyses indicated that a 7-item unidimensional model had a very good fit to the data and was invariant across the sexes. We used these seven items in our analysis, although repeating the analysis with the 12 items gave essentially the same pattern of results.

Procedure

The questionnaires were distributed to the fitness clubs. The participants were asked to complete the questionnaires at a convenient time and location and return them via a collection box in each club. One might argue that it would have been preferable to ask the participants to complete the questionnaires in the presence of a research assistant. However, the vast majority of the participants were willing to participate in the study only on the condition that they would do so at a convenient time and place (i.e. at home). The

study had the approval of the ethics committee of a British university. All participants signed informed consent forms and were reassured that their responses would be confidential and anonymous.

Results

Preliminary analyses

Descriptive statistics, internal reliability coefficients and correlation coefficients are presented in Table I. In general, the participants had very low amotivation and external regulation, moderate introjected regulation, and relatively high self-determined motivation (in particular identified regulation). In addition, they had high intentions to continue their exercise activities in the future and felt very confident that they could overcome various barriers to exercise. Lastly, the participants generally reported moderate levels of physical self-worth and social physique anxiety. All subscales had acceptable internal reliabilities (Cronbach’s $\alpha > 0.70$). The significant correlation coefficients between the motivational regulations and the exercise-related variables ranged from small ($r = 0.15$) to moderate ($r = 0.51$) in size. More specifically, these coefficients showed that future intentions to exercise, barriers self-efficacy and physical self-worth were positively related to intrinsic motivation and identified regulation, and negatively related to external regulation and amotivation. The opposite pattern of relationships was observed between social physique anxiety and the four motivational regulations. Introjected regulation was positively related to social physique anxiety and unrelated to physical self-worth. However, and contrary to our hypotheses, introjected regulation was also positively related to future intentions and barriers self-efficacy.

Frequency analysis showed that 41 participants were at the preparation stage of exercise behaviour change, 65 were at the action stage and 258 at the

Table I. Descriptive statistics, internal reliability coefficients and correlation coefficients.

Variables	Mean \pm s	α	1	2	3	4	5	6	7	8
1. Amotivation	1.10 \pm 0.35	0.78								
2. External regulation	1.25 \pm 0.52	0.85	0.46**							
3. Introjected regulation	2.42 \pm 0.84	0.72	0.08	0.10*						
4. Identified regulation	4.09 \pm 0.72	0.78	-0.35**	-0.25**	0.35**					
5. Intrinsic motivation	3.62 \pm 0.88	0.91	-0.28**	-0.32**	0.28**	0.59**				
6. Future intention to exercise	5.55 \pm 0.68	0.83	-0.35**	-0.24**	0.24**	0.51**	0.39**			
7. Barriers self-efficacy	4.30 \pm 0.79	0.83	-0.15**	-0.25**	0.22**	0.41**	0.40**	0.31**		
8. Physical self-worth	2.41 \pm 0.78	0.91	-0.18**	-0.19**	0.01	0.24**	0.34**	0.10	0.30**	
9. Social physique anxiety	2.43 \pm 0.92	0.88	0.21**	0.26**	0.26**	-0.16**	-0.22**	-0.03	-0.18**	-0.56**

Note: All variables were measured with 5-point scales with the exception of future intention to exercise (6-point scale) and physical self-worth (4-point scale). Furthermore, the same pattern of correlations was observed when we controlled for age and sex. As future intention was measured with two items, the alpha score is essentially the correlation between the two items. * $P < 0.05$, ** $P < 0.01$.

maintenance stage. We also assessed the number of times the participants had stopped exercising for 3 months or more in the past 5 years. The results showed that 178 participants reported no relapse, 151 reported 1–3 relapses, 24 reported 4–6 relapses, 6 reported 7–10 relapses and 8 participants indicated more than 10 relapses. In addition, frequency analysis showed that the combined number of reasons given for exercise relapse ranged from 1 ($n=67$) to 6 ($n=2$). The most frequently chosen reason was work demands ($n=76$), followed by injury/illness ($n=67$) and lack of time ($n=62$). The least frequently chosen reasons for exercise relapse were lack of transportation ($n=9$) and lack of exercise partner ($n=12$). In the analyses reported below, looking at the relationship between exercise motivation and number of relapses, we excluded all relapses due to uncontrollable reasons (i.e. illness and injury).

Predicting exercise-related behaviours from age, sex and motivational regulations

With regard to exercise relapse, approximately 90% of the participants selected the first two (i.e. “no relapse”, “1–3 relapses”) of the five available relapse categories. As a consequence, we created a new binary variable (“no relapse”, “one or more relapses”) that served as the dependent variable in a binary logistic regression. Although one might consider the cut-off point between the two categories as stringent, one should bear in mind that we excluded from the analyses those individuals who indicated uncontrollable reasons for relapse. In the logistic regression, as well as in the other regression analyses reported below, we statistically controlled for age and sex due to the age and sex differences that have been reported in the literature with regard to both the independent and dependent variables of this study (e.g. Li, 1999; Motl & Conroy, 2001, Page & Fox, 1997; Sallis, 2000).

The results showed that the number of relapses in the past 5 years due to controllable reasons was positively predicted by external regulation and negatively predicted by identified regulation (see Table II). In relation to the stages of change, a multivariate analysis of variance indicated significant differences between the three stages of change (preparation, action, maintenance) in exercise motivation (Pillai's trace = 0.197; $F_{10,708} = 7.72$, $P < 0.001$, partial $\eta^2 = 0.10$). No cut-off values exist for partial eta-squared, but a value above 0.06 is considered a moderate effect size and a value above 0.14 is considered a large effect size (Cohen, 1988). Follow-up univariate analysis indicated significant differences in all types of exercise motivation (see Table III).

Table II. Binary logistic regression analysis predicting no exercise relapse (coded as 0) and one or more relapses (coded as 1) from age, sex and motivational regulations.

Exercise relapse	Unstandardized coefficients	Odds ratios	95% CI for odds ratios
Step 1			
Age	-0.03**	0.97	0.95–0.99
Sex	0.12	1.13	0.71–1.80
Step 2			
Amotivation	-0.51	0.60	0.29–1.25
External regulation	0.57*	1.77	1.05–2.96
Introjected regulation	0.00	1.00	0.75–1.34
Identified regulation	-0.44*	0.64	0.42–0.98
Intrinsic motivation	0.14	1.15	0.83–1.58

* $P < 0.05$, ** $P < 0.01$.

All differences among the three stages of change were in the expected direction with the exception of introjected regulation. Cohen's d index was calculated to provide an effect size estimation of the mean differences. According to Cohen (1988), d values of 0.2, 0.5 and 0.8 indicate small, medium and large effect sizes respectively. A *post hoc* Tukey test revealed that the participants in the maintenance stage had significantly higher intrinsic motivation ($d=1.10$), identified regulation ($d=1.12$) and introjected regulation ($d=0.56$), and significantly lower external regulation ($d=0.83$) and amotivation ($d=0.50$), than those in the preparation stage. Furthermore, the participants in the maintenance stage reported higher introjected regulation ($d=0.41$), identified regulation ($d=0.53$) and intrinsic motivation ($d=0.66$), and lower external regulation ($d=0.43$), than those in the action stage. Lastly, identified motivation was significantly higher in the action stage than in the preparation stage ($d=0.55$).

A separate one-way analysis of variance showed no significant age differences across the three stages of change ($F_{2,357} = 2.65$, $P > 0.05$, partial $\eta^2 = 0.02$). Lastly, a chi-square analysis showed that there were more males than females in the maintenance stage ($\chi^2 = 8.07$, d.f. = 2, $P < 0.05$).

Predicting exercise-related cognitions and physical self-evaluations from age, sex and motivational regulations

Multiple hierarchical regression analyses were employed to examine whether the different motivational regulations could predict exercise-related cognitions and physical self-evaluations. The results showed that all regressions were significant (see Table IV).

With regard to the cognitive variables, intention to continue exercise in the next 6 months was negatively predicted by amotivation and positively predicted by introjected regulation and identified motivation. In addition, barriers self-efficacy was

Table III. Mean differences among the three stages of change in exercise regulation (d.f. = 2,357).

	Stages of change						F	Partial η^2
	Preparation		Action		Maintenance			
	Mean	s	Mean	s	Mean	s		
Amotivation	1.25 ^a	0.08	1.13 ^{ab}	0.07	1.08 ^b	0.03	4.38*	0.02
External regulation	1.57 ^a	0.08	1.38 ^a	0.06	1.17 ^b	0.03	12.69***	0.07
Introjected regulation	2.10 ^a	0.13	2.19 ^a	0.11	2.54 ^b	0.05	8.01***	0.04
Identified regulation	3.48 ^a	0.11	3.88 ^b	0.09	4.23 ^c	0.04	25.14***	0.12
Intrinsic motivation	2.91 ^a	0.12	3.28 ^a	0.10	3.81 ^b	0.05	27.46***	0.13

Note: Stages of change with the same superscript letters in the same row do not differ significantly at $P < 0.05$. * $P < 0.05$, *** $P < 0.001$.

Table IV. Hierarchical multiple regression analyses predicting exercise-related behaviours, cognitions and physical self-evaluations from age, sex and motivational regulations.

Variables	β	t	R ² change
Future intention to exercise			
<i>Step 1</i>			
Age	0.07	1.30	0.01
Sex	-0.06	-1.20	
<i>Step 2</i>			
Amotivation	-0.20	-3.69***	0.31***
External regulation	-0.05	-0.96	
Introjected regulation	0.13	2.52*	
Identified regulation	0.32	5.28***	
Intrinsic motivation	0.10	1.69	
Barriers self-efficacy			
<i>Step 1</i>			
Age	0.03	0.61	0.03**
Sex	-0.16	-3.03**	
<i>Step 2</i>			
Amotivation	0.04	0.67	0.21***
External regulation	-0.15	-2.77*	
Introjected regulation	0.11	2.03*	
Identified regulation	0.23	3.51**	
Intrinsic motivation	0.18	3.04**	
Physical self-worth			
<i>Step 1</i>			
Age	-0.01	-0.10	0.11***
Sex	-0.33	-6.48***	
<i>Step 2</i>			
Amotivation	-0.08	-1.40	0.11***
External regulation	-0.02	-0.38	
Introjected regulation	-0.09	-1.67	
Identified regulation	0.08	1.26	
Intrinsic motivation	0.26	4.08***	
Social physique anxiety			
<i>Step 1</i>			
Age	-0.15	-3.20**	0.19***
Sex	0.39	8.05***	
<i>Step 2</i>			
Amotivation	0.08	1.61	0.15***
External regulation	0.06	1.11	
Introjected regulation	0.31	6.31***	
Identified regulation	-0.08	-1.30	
Intrinsic motivation	-0.19	-3.37***	

Note: Gender was coded as 1 = males and 2 = females. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

significantly predicted by sex, with males having a higher efficacy to overcome barriers than females. The motivational variables explained a much greater proportion of variance of the dependent variable compared with sex and age. More specifically, high barriers self-efficacy was predicted by high introjected regulation, identified regulation and intrinsic motivation, and low external regulation.

Two variables related to physical self-evaluations were assessed in this study: physical self-worth and social physique anxiety. Physical self-worth was significantly predicted by sex and intrinsic motivation. Sex explained a considerable amount of variance of physical self-worth, with women having lower scores than men. The motivational variables added an approximately equal amount of explained variance of physical self-worth. As expected, intrinsic motivation positively predicted physical self-worth. With regard to social physique anxiety, it was significantly predicted by age, with younger participants displaying significantly higher social physique anxiety than older ones. Furthermore, sex was a significant predictor, with women having higher scores than men. The motivational variables increased the explained variance of social physique anxiety, although more variance was accounted for by sex and age. Specifically, social physique anxiety was positively predicted by introjected regulation and negatively predicted by intrinsic motivation.

Discussion

The purpose of the present study was to examine whether different motivational regulations to exercise would significantly predict a range of exercise behaviours, cognitions and physical self-evaluations, using self-determination theory as an organizing framework. The results largely supported our hypotheses, which stated that compared with controlling and amotivated regulations, self-determined motivational regulations would be higher in more advanced stages of change and would predict fewer cases of exercise relapse, higher barriers self-efficacy, stronger intentions to continue exercising, higher physical self-worth, and

lower social physique anxiety. These results are generally in line with both the theoretical tenets of self-determination theory as well as with empirical findings in this area (e.g. Deci & Ryan, 1985; Mullan & Markland, 1997; Wilson & Rodgers, 2002).

Self-determination theory and exercise-related behaviours

Multivariate analyses of variance showed that exercisers in the maintenance stage displayed a more adaptive motivational profile (i.e. more self-determined and less controlling motivation and amotivation) than those in the action stage, but in particular those in the preparation stage. Effect sizes indicated that the largest between stages of change differences were found in intrinsic motivation and identified regulation, and in particular between the preparation and maintenance stages. Interestingly, introjected regulation was highest in the maintenance stage, although its mean value was considerably smaller than the mean values for the two self-determined motivation types. The increase in introjected regulation across the stages of change is an unexpected finding because, according to self-determination theory, introjected regulation is a controlling type of motivation that is often associated with maladaptive psychological functioning (Ryan & Deci, 2000). However, previous research in both academic (Vallerand, Fortier, & Guay, 1997) and physical education contexts (Ntoumanis, 2001; Standage *et al.*, 2003) has indicated that introjected regulation is sometimes associated with adaptive variables. In the context of the present study, the positive association between introjected regulation and exercise behaviour may be due to the messages delivered by national campaigns and the media about the importance of a physically active lifestyle. These persistent messages may be partly internalized and could motivate individuals to engage in exercise out of feelings of guilt or to achieve a socially desirable physique, despite their potential lack of interest and enjoyment in exercise activities. However, the long-term effects of introjected regulation have not been examined in the area of exercise. In sport settings, Pelletier, Fortier, Vallerand and Brière (2001) showed that introjected regulation was a positive predictor of persistence in competitive swimming in the short term (10 months) but became a non-significant predictor in the longer term (22 months).

With the exception of introjected regulation, the results pertaining to exercise motivation and stages of change are in line with those reported by Mullan and Markland (1997). However, due to the cross-sectional nature of our study, it cannot be determined whether self-determined motivation increased and controlling motivation decreased as the exercisers progressed through the stages of change, or if the

participants reached the maintenance stage because they had high self-determined motivation to start with. However, the latter explanation is less likely, since self-determined motivation is rarely very high when participants first engage in an exercise programme (Ingledeu *et al.*, 1998). Either way, future research should employ longitudinal designs to examine how motivational regulations fluctuate across the different stages of change, as well as provide potential explanations for such fluctuations (e.g. changes in need satisfaction).

According to the transtheoretical model, those in the preparation and action stages of change are at greater risk of relapse than those in the maintenance stage (Prochaska & Marcus, 1994). This may be because those in the maintenance stage are less likely to be motivated by controlling regulatory types. Although our evidence is not causal, we found that external regulation was significantly associated with exercise relapse over the previous 5 years. This indicates that not internalizing the value of exercising may result in motivational setbacks that are obviously not conducive to long-term adherence. Amotivation did not predict exercise relapse. This is not surprising, since those who are amotivated are more likely to drop out as opposed to alternate between physically active and sedentary states. Lastly, identified regulation was a negative predictor of exercise relapse. This finding makes sense, since those who have internalized the value of exercise and find it personally important are less likely to experience motivational setbacks.

Future studies might examine the relationship between exercise motivation and relapse using different time frames to define the latter. Furthermore, the scores for exercise relapse in this study were highly skewed, with most participants indicating no or very few relapses. Targeting participants outside organized exercise contexts (i.e. those who currently experience a relapse!) might help to obtain a more balanced distribution of exercise relapse scores, and perhaps reveal stronger links between relapse and different types of exercise motivation.

Self-determination theory and exercise-related cognitions

The importance of future intentions in predicting exercise behaviour is well established (e.g. Hausenblas *et al.*, 1997), but there is a paucity of research examining the motivational regulations that underpin future intentions in adult exercisers. The results from the present study are in line with those reported by a meta-analysis and previous empirical research with young people (Chatzisarantis *et al.*, 2003; Standage *et al.*, 2003). As expected, amotivation was a negative predictor of intentions to exercise. Both types of self-determined motivation (i.e. intrinsic motivation and identified regulation) were significantly correlated with future exercise

intentions, although intrinsic motivation was not a significant predictor of intentions in the regression analysis. The latter finding is due to the relatively high correlation between identified regulation and intrinsic motivation, which reduced the variance of intentions that could be accounted for by intrinsic motivation only. Interestingly, introjected regulation, a controlling type of motivation, was a significant positive predictor of future exercise intentions. In other words, internal pressure and feelings of guilt might have led some individuals to formulate positive exercise intentions. However, Chatzisarantis, Biddle and Meek (1997) showed that self-determined intentions are more likely to predict actual behaviour when compared with controlling intentions.

No previous research has examined the relationship between barriers self-efficacy and exercise regulations. The findings of our study support the hypothesis that more self-determined exercise regulations will be predictive of higher levels of barriers self-efficacy. Unexpectedly, introjected regulation was also a positive predictor, but its coefficient was smaller than those of the other predictors. The positive predictions from self-determined motivation regulations are in line with self-determination theory, which proposes that self-determined motivation indicates a high degree of self-control (Deci & Ryan, 1991). It is possible that the perception of high self-control is an important aspect of one's efficacy beliefs to overcome barriers to exercise.

Self-determination theory and physical self-evaluations

The motivational antecedents of global self-esteem have been discussed by self-determination theory; however, there is a scarcity of research linking physical self-worth with the motivational regulations advanced by the theory. The results of the present study showed that physical self-worth was positively correlated with self-determined types of motivation and negatively correlated with external regulation and amotivation. Furthermore, the regression analysis showed that intrinsic motivation was the only significant predictor of a unique amount of variance in physical self-worth. Our findings provide support to previous arguments suggesting that self-determination may be an important process by which individuals improve physical self-perceptions in exercise settings (Fox, 1997).

Deci and Ryan (1995) have distinguished between contingent self-esteem (i.e. dependent on reaching some extrinsic goals) and true self-esteem (i.e. a more secure, solid sense of self-acceptance), and argued that it is only the latter type of self-esteem that is related to self-determined motivational processes. Future research should examine whether physical self-worth can also be separated into contingent and

true types. If this is the case, it would be interesting to explore whether self-determined motivation relates to true physical self-worth only.

Physical self-worth is strongly related to the concept of social physique anxiety. Individuals with low physical self-worth are likely to be concerned with the adequacy of their physique as judged by some socially defined standards. However, the motivational predictors of social physique anxiety have received scarce empirical attention. The present study is the first to show an association between social physique anxiety and exercise motivation using self-determination theory as a theoretical framework. Introjected regulation positively predicted social physique anxiety. This finding suggests that being motivated to exercise due to internal pressure or guilt is linked with feelings of apprehension about one's social physique. In contrast, exercising due to the enjoyment of a particular activity (i.e. intrinsic motivation) or because one values the benefits of exercise (i.e. identified regulation) are not likely to be related to concerns about one's body appearance. It is possible that self-determined motivation can increase enjoyment of exercise, downplay social evaluations and alleviate concerns about one's physique. However, it is likely that, over time, social physique anxiety can also serve as a predictor of motivational regulations. For example, high social physique anxiety may predict amotivation to exercise or controlling regulations. Future research should examine how the relationships between social physique anxiety and motivational regulations unfold across time.

Age and sex effects

Our analyses showed some significant age and sex effects in the variables of interest. Age and sex were more instrumental in accounting for the variance of the two physical self-evaluation variables as opposed to the variance of the behavioural and cognitive variables assessed. However, in all cases, the exercise regulations accounted for a substantial proportion of variance beyond the contribution made by age and sex. Males were more likely to be in the maintenance stage, have higher barriers self-efficacy and physical self-worth, and lower social physique anxiety, than females. Furthermore, older participants reported lower social physique anxiety and more exercise relapses than younger exercisers. These findings are in line with previous findings reported in the literature (e.g. Fox & Corbin, 1989; Motl & Conroy, 2001; Page & Fox, 1997).

Limitations

There are some limitations in the present study that should be addressed by future research. First, the

relationships reported here are cross-sectional in nature and reciprocal effects over time cannot be excluded. For example, it is also possible that high self-efficacy to overcome barriers or high self-worth can predict self-determined motivation. Examining the size of the cross-lagged effects between the motivational regulations and the other variables assessed in this study would be an interesting avenue for future research. Second, although the stages of change measure employed in this study has been used as a behavioural measure of exercise participation in many previous studies, it has the same limitations as other self-report measures. It would be interesting to examine the relationship between different types of exercise motivation and exercise behaviour using more objective measures of the latter. Third, it is possible that the participants might not have estimated accurately the number of relapses in the last 5 years. However, by asking them to (a) indicate the number of relapses lasting for a considerable amount of time (i.e. 3 months or more), and (b) list the major reasons for their relapses, we probably facilitated their memory recall.

Finally, the present study did not examine the processes by which exercise becomes autonomously regulated. In his hierarchical model of motivation, Vallerand (1997) suggested that social factors (e.g. the motivational style of fitness leaders) play an important part in fostering self-determination in sport by satisfying the three fundamental needs for autonomy (volition in behaviour), competence (experience of effectance) and relatedness (attachment to significant others). In contrast, when these three needs are not satisfied, controlling or amotivated forms of behaviour are observed. In other words, the three needs are postulated to mediate the effects of social factors on motivational regulations. To extend the findings of the present study, future research should examine the motivational sequence proposed in Vallerand's (1997) model. This will facilitate our understanding of the mechanisms that foster self-determined motivation in exercise settings.

Conclusions

The present study provides support for our hypothesis that self-determined motivation may be associated with a range of adaptive exercise-related behaviours, cognitions and physical self-evaluations. Both intrinsic motivation and identified regulation play an important role, since some exercise activities are not inherently enjoyable, but nevertheless individuals value their importance. The complementary role of intrinsic motivation and identified regulation has also been highlighted by Koestner and Losier (2002). These authors argued that while intrinsic motivation promotes a focus on short-term goals and

enjoyment, identified regulation keeps one oriented towards the long-term significance of one's current pursuits. Since identified regulation represents a high degree of internalization, it is important that exercise interventions facilitate the internalization process using appropriate mechanisms (e.g. providing rationale, acknowledging negative feelings; see Deci & Ryan, 1991). We also found that introjected regulation was positively related to adaptive behavioural and cognitive outcomes; however, the long-term effects of this rigid form of persistence on well-being need to be examined by future research. This is important, since introjected regulation was associated in this study with maladaptive physical self-evaluations, which, according to Fox (1997), could be detrimental to one's well-being. In conclusion, our findings provide further evidence for the importance of promoting self-determined motivation in exercise contexts.

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