

Running head: SELF-DETERMINED MOTIVATION IN EXERCISE CONTEXTS

The Role of Self-Determined Motivation to the Understanding of Exercise-Related
Behaviours, Cognitions and Physical Self-Evaluations

Cecilie Thøgersen-Ntoumani*

Department of Sport and Exercise Science, University of Wales - Aberystwyth, UK

Nikos Ntoumanis

School of Sport and Exercise Sciences, University of Birmingham, UK

In press: Journal of Sports Sciences

Date of resubmission: 25/10/04

*Address for correspondence:

Dr. Cecilie Thøgersen-Ntoumani,
Department of Sport and Exercise Science,
University of Wales – Aberystwyth,
Carwyn James Building,
Penglais Campus,
Aberystwyth, Ceredigion,
SY23 3FD,
UK
E-mail: ect@aber.ac.uk
Tel: 0044 1970 628558
Fax: 0044 1970 628557

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

The Role of Self-Determined Motivation to the Understanding of Exercise-Related
Behaviours, Cognitions and Physical Self-Evaluations

Date of resubmission: 25/10/04

Abstract

Grounded in Self-Determination Theory (Deci and 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 gender, 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 compared to external regulation and amotivation. Introjected regulation was related to both adaptive and maladaptive outcomes. Furthermore, a MANOVA test revealed that exercisers in the maintenance stage of change displayed significantly more self-determined motivation to exercise compared to those in the preparation and action stages. In sum, the results illustrate the importance of promoting self-determined motivation in exercisers in order 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.

1 Despite the well documented evidence supporting the physical (e.g. Blair, Cheng and Holder,
2 2001) and psychological (e.g. Biddle, Fox and Boutcher, 2000) benefits of exercise,
3 approximately 50% of individuals who start an exercise programme will drop out within the
4 first six months (Berger, Pargman and Weinberg, 2002). Furthermore, individuals often
5 experience lapses in trying to adhere to an exercise programme. For example, Sallis *et al.*
6 (1990), using a sample of approximately 1,800 exercisers, found that 20% had experienced
7 one or two exercise relapses (defined as not exercising for three or more months) and 20%
8 had experienced three or more relapses within the past five years. From a public health
9 perspective, these statistics are discouraging since any long-term physical and psychological
10 benefits of exercise will only be achieved through persistent exercise participation.

11 Drop-out from exercise programmes could be partly attributed to the motivation
12 underlying exercise behaviour. Whereas some individuals exercise due to the enjoyment they
13 attain from working out, many others exercise to attain extrinsic or intrinsic rewards, such as
14 to look more attractive, become fitter, or obtain recognition from significant others
15 (Markland and Ingledew, 1997). Previous research has shown that individuals who exercise
16 due to enjoyment as opposed to instrumental reasons are more likely to adhere to their
17 exercise programmes (e.g. Wankel, 1993). Such findings demonstrate the importance of
18 studying the motivation underlying exercise participation using multidimensional theoretical
19 frameworks.

20

21 ***Self-Determination Theory***

22 Self-Determination Theory (SDT; Deci and Ryan, 1985) is one such contemporary
23 framework which is increasingly being used to understand exercise motivation and
24 adherence. Specifically, SDT proposes that behavioural regulation towards an activity can be

1 amotivated, extrinsically motivated, or intrinsically motivated. These overall classifications
2 of motivation differ in the extent to which they are self-determined (autonomous), because
3 they represent different degrees of internalisation of external values and goals.

4 Specifically, amotivation represents the lack of both extrinsic and intrinsic motivation
5 and is characterized by the lack of value for an activity, or the belief that the activity will not
6 result in desired outcomes. Extrinsically motivated behaviours are divided into four different
7 types of behavioural regulation: external, introjected, identified, and integrated (Deci and
8 Ryan, 1985; Ryan and Deci, 2000). External regulation represents behaviours which are
9 regulated through external means, such as rewards or fear of punishment (e.g. exercising
10 because of pressure from significant others). Introjected regulation refers to behaviours which
11 are partially internalized, but they are not fully self-determined. These behaviours are
12 performed in order to gain social approval and self-worth or to avoid internal pressure and
13 negative feelings (e.g. exercising to avoid feelings of guilt). Identified regulation represents a
14 relatively self-determined regulation because the outcomes of the behaviour are highly
15 valued (e.g. exercising to improve physical fitness), and the behaviour is performed with no
16 pressure, even if it is not particularly enjoyable. Finally, integrated regulation represents the
17 most self-determined form of the internalisation process. It refers to behaviours which are
18 performed out of choice in order to harmonize and bring coherence to different parts of the
19 self (Deci and Ryan, 1985, 1995). For example, some individuals might view exercise, along
20 with healthy eating and adequate rest, as important components of a healthy lifestyle.
21 However, even at the higher end of the self-determination continuum, behaviours are
22 engaged in for instrumental reasons, and thus, they are extrinsically regulated. Only when
23 individuals are intrinsically motivated towards an activity the behaviour is considered to be
24 fully self-determined. When intrinsically motivated, individuals enjoy the process of

1 engaging in the activity (e.g. exercising because it is fun) rather than the outcomes associated
2 with the latter. In conclusion, intrinsic motivation, integrated regulation and identified
3 regulation represent self-determined (autonomous) motivational regulations, whereas
4 introjected and external regulation represent low self-determined or controlling motivational
5 regulations.

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

11

12 ***SDT and exercise-related behaviours***

13 SDT has recently been used by researchers to study motivation in exercise contexts. The
14 results have been similar to those found in other life contexts in that self-determined
15 motivation to exercise has been associated with more positive behavioural, cognitive and
16 affective outcomes, compared to controlling motivational regulations or amotivation. For
17 example, in terms of self-reported behaviour, Ingledew, Markland and Medley (1998)
18 examined the relationship between different exercise motives and the stages of behavioural
19 change proposed by the Transtheoretical Model (Prochaska and DiClemente, 1984). In the
20 context of exercise adoption, the Transtheoretical Model argues that individuals move
21 through five stages of behavioural change, starting from being physically inactive and ending
22 up as regular exercisers. Ingledew *et al.* (1998) found that extrinsic, especially body-related,
23 motives were more important in the early stages of behavioural change, whereas enjoyment
24 (an intrinsic motive) was important for progression to regular exercise patterns. However,

1 Ingledew *et al.* (1998) used a descriptive questionnaire which measures motives for exercise
2 (some of which can be high or low in self-determination depending on how they are
3 operationalized), but not the underlying motivational regulations that underpin exercise
4 behaviour.

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

19 One of the greatest challenges facing researchers and clinicians alike is how to prevent
20 relapse for those individuals who have recently started exercising. There is a clear need to use
21 theoretical frameworks to study relapse behaviour, as previous research studying relapse in
22 exercise settings has been mainly atheoretical (e.g. Sallis *et al.*, 1990). SDT can provide a
23 potentially useful theoretical framework. For example, Mullan and Markland (1997)
24 suggested that controlling exercise regulations may lead to a greater number of relapses from

1 exercise compared to more self-determined types of exercise regulation. This is probably
2 because those who are self-determined engage in exercise because they find it fun or because
3 they consider it personally important. Therefore, they are less likely to experience
4 motivational setbacks as opposed to those who exercise out of feelings of guilt or other
5 extrinsic reasons. In corroboration to this argument, Ryan *et al.* (1997) showed that
6 adherence to an exercise programme was associated with enjoyment and competence motives
7 (considered to be intrinsic ones) as opposed to body appearance motives (i.e. extrinsic).
8 However, this study did not assess the motivational regulations that underpin exercise
9 behaviour. Clearly, more studies are needed to examine whether different types of exercise
10 regulation with varying degrees of self-determination can predict relapse from exercise. This
11 is important in view of the high relapse rates from exercise settings (Sallis *et al.*, 1990).

12

13 ***SDT and exercise-related cognitions***

14 Intention to continue exercise is an important outcome variable when studying exercise
15 behaviour. Indeed, a meta-analysis by Hausenblas, Carron and Mack (1997), showed that
16 there was a moderate effect size between intention and behaviour in exercise settings. For the
17 purposes of the present study, the question is whether amotivated, controlling and
18 autonomously regulated motivation will differentially predict intention to continue
19 exercising. Currently, there is some support for the positive role of self-determined
20 motivation in predicting intentions of children to be physically active (e.g. Ntoumanis, 2001,
21 Standage, Duda and Ntoumanis, 2003). In a recent meta-analysis of a small number of
22 studies, Chatzisarantis, Hagger, Biddle, Smith and Wang (2003) found that intentions to be
23 physically active were negatively correlated with amotivation and external regulation, and
24 positively associated with introjected regulation, identified regulation and intrinsic

1 motivation. However, all meta-analysed studies were carried out with children or with sport
2 participants. More research is needed to examine whether the findings from this meta-
3 analysis will apply to adult exercisers. This is particularly important in view of the high drop
4 out rates from exercise programmes (Berger *et al.*, 2002).

5 Another cognitive variable, which is a key predictor of exercise behaviour and
6 adherence, is self-efficacy (Biddle and Nigg, 2000; King *et al.*, 1992). In the context of
7 exercise, self-efficacy has often been operationalized as barriers self-efficacy, which has been
8 defined as the belief individuals have about their ability to overcome commonly identified
9 barriers to regular exercise (McAuley, 1992). To our knowledge, research examining the
10 relationship between barriers self-efficacy and exercise motivation using a self-determination
11 theory framework is non-existent. We, therefore, aim to examine this relationship in the
12 present study, bearing in mind the important role of barriers self-efficacy in predicting
13 exercise behaviour (McAuley, 1992). From a conceptual standpoint, SDT suggests that
14 people with high perceptions of autonomy (self-determination) feel that they have a sense of
15 choice and control of their behaviour (Deci and Ryan, 1991). As a consequence, high levels
16 of self-determination to exercise should positively predict self-efficacy to overcome barriers
17 to regular exercise. At this point it is important to differentiate between the need for
18 competence (viewed by SDT as one of three innate psychological needs) and self-efficacy.
19 Bandura (1989) viewed self-efficacy as a domain-specific perception of competence and an
20 instrument for goal attainment, as opposed to an innate psychological need that transcends
21 contexts. Furthermore, according to Deci and Ryan (2000), self-efficacy theory focuses on
22 the satisfaction that results from the outcomes that competence might yield. In contrast, SDT
23 views the experience of competence *per se* as a source of satisfaction and a contributor to

1 well-being over and above any satisfaction resulting from the outcomes that competence
2 might bring.

3

4 *SDT and physical self-evaluations*

5 The physical self plays an important role in daily functioning and well-being. This is
6 reflected in the consistently high correlations between aspects of the physical self, such as
7 body image, with global self-esteem (Fox, 1997). Furthermore, research has shown that
8 physical self-worth, a global indicator of feelings about salient aspects of the physical self, is
9 significantly related to emotional adjustment and positive affect, even when global self-
10 esteem and social desirability are statistically controlled (Sonstroem and Potts, 1996; Van de
11 Vliet *et al.*, 2002). SDT discusses the relationship between global self-esteem and motivated
12 behaviour and suggests that true self-esteem (a type of self-esteem that is stable and secure)
13 may be developed through engaging in behaviours which are autonomously regulated, and
14 which engender feelings of competence and relatedness (Deci and Ryan, 1995). However, the
15 theory does not discuss the relationship between physical self-worth and motivated
16 behaviour. Nevertheless, we believe that self-determined motivational regulations may be
17 positively related to physical self-worth. For example, engaging in exercise to achieve
18 personally important goals is more likely to lead to feelings of accomplishment and
19 subsequently to high physical self-worth, as opposed to engaging in exercise in order to avoid
20 feelings of guilt or to appease significant others. Our exploratory prediction is further based
21 on Fox's (1997) argument that self-determination may act as a mediator mechanism in the
22 relationship between exercise and physical self-worth.

23 To our knowledge, the only study that has examined the association between exercise
24 regulations and physical self-esteem is the one carried out by Wilson and Rodgers (2002)

1 with female exercisers. The results of this study showed that autonomously regulated
2 exercise motivations (i.e. intrinsic motivation and identified regulation) discriminated
3 between those with high and low physical self-esteem, whereas controlling exercise
4 regulations (i.e. introjected and external regulation) did not. However, this study was
5 conducted with young female exercisers and the generalisability of its findings to other
6 populations has yet to be tested. Clearly, more research is needed to examine the extent to
7 which different types of exercise motivation may be differentially related to the physical self.

8 Another construct related to the physical self is social physique anxiety, which has been
9 defined as the apprehension that some individuals have about displaying their body in social
10 settings (Hart, Leary and Rejeski, 1989). Social physique anxiety is often salient in exercise
11 classes where the body is “on display”. Very few studies have examined the relationship
12 between extrinsic/intrinsic motivation for exercise and social physique anxiety. A study by
13 Frederick and Morrison (1996) found that exercisers with high levels of social physique
14 anxiety were more likely to report extrinsic motives for exercising such as appearance,
15 compared to those with lower levels of social physique anxiety. Likewise, Crawford and
16 Eklund (1994) found that motives to improve toning and physical attractiveness (i.e. extrinsic
17 motives) were significant and positive predictors of social physique anxiety. However, since
18 the previous studies were not based on the SDT framework, the motives they assessed did not
19 represent the whole continuum of self-determination.

20 It would be important to extend this research by looking at how social physique anxiety
21 relates to self-determined, controlling and amotivated behaviours. SDT does not directly
22 discuss such links. However, Deci and Ryan (2000) talked about the struggle for body control
23 (which is undeniably embedded in the concept of social physique anxiety) and argued that
24 this struggle is the outcome of deficiencies in self-determination. It is, therefore, reasonable

1 to assume that if individuals exercise due to enjoyment or because they value the benefits of
2 exercise, they are less likely to be focused on how their bodies appear to others. Therefore,
3 exercise regulated by intrinsic or identified motivation should help individuals to reduce their
4 preoccupation with appearance-related factors. In contrast, individuals whose exercise
5 motivation is regulated by controlling motivation, such as the need to obtain social approval
6 or avoid social disapproval, are more likely to report social physique anxiety symptoms in an
7 exercise setting.

8

9 *Hypotheses*

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

21

22

Method

23 *Participants*

1 Three hundred and seventy five exercisers (males $n = 121$; females $n = 246$; 8 did not
2 indicate their gender) from ten fitness club (55% of the participants belonged to one club and
3 a further 30% to four clubs) in the north of England took part in this study. Preliminary
4 analyses showed no significant between club differences in any of the study variables. The
5 age of the participants ranged from 16 to 66 years ($M = 38.65$; $s = 10.93$). The distribution of
6 the participants across three age groups (16 to 24, 25 to 44 and 45 to 66-year-olds; adapted
7 from Spirduso, 1995) did not differ significantly by gender ($\chi^2 = 3.88$, $df = 2$, $P = 0.144$).
8 Most participants were between 25 to 44-years old (males = 60 females =146), followed by
9 the 45 to 66-year-olds (males = 48 females = 73), and the 16 to 24-year-olds (males = 11
10 females = 24). The participants reported that they exercised at their fitness club on average 3
11 days per week ($M = 2.96$; $s = 1.16$) for approximately one hour on every visit ($M = 60.45$
12 minutes, $s = 20.58$) working at an intensity level perceived as “somewhat hard” ($M = 3.10$; s
13 = 0.73) on a five-point scale.

14 **Measures**

15 *Behavioural Regulation in Exercise Questionnaire (BREQ*; Mullan, Markland and Ingledew,
16 1997). This is a 15-item questionnaire which measures external, introjected, identified and
17 intrinsic regulations of exercise behaviour. The BREQ does not measure integrated regulation
18 because at the initial stages of the development of the questionnaire integrated regulation was
19 not empirically distinguishable from identified regulation and intrinsic motivation. In
20 addition to the four subscales, we adapted to exercise four items that tap amotivation from the
21 Academic Motivation Scale by Vallerand, Pelletier, Blais, Brière, Sénécal and Vallières
22 (1992). Example items are: “I exercise because it’s fun” (intrinsic motivation), “because I
23 value the benefits of exercise” (identified regulation), “because I feel guilty when I don’t
24 exercise” (introjected regulation), “because other people say I should” (external regulation),

1 “but I really don’t know why” (amotivation). Each item is measured on a scale from 0 (“Not
2 true for me”) to 4 (“Very true for me”). In our study we used a scale ranging from 1 to 5 in
3 order to be compatible with the other scales included in the questionnaire pack. Mullan *et al.*
4 (1997) and Wilson, Rodgers and Fraser (2002) have provided strong evidence for the
5 construct validity and the reliability of the BREQ.

6 *Relapse from exercise* (Sallis *et al.*, 1990). We also assessed the number of times the
7 participants had stopped exercising for three months or more in the past five years. We chose
8 this time frame following the example of Sallis *et al.* (1990). The responses to this question
9 were measured on an interval scale with the following options: “none”, “1-3 times”, “4-6
10 times”, “7-10 times” and “more than 10 times”. For those who had stopped exercising at least
11 once, we also assessed the main reasons for their decision. We presented them with 9 reasons
12 that are frequently cited in the literature (e.g. lack of motivation, injury, family demands,
13 etc.), as well as an “other” category, and we asked them to tick all those reasons that were
14 applicable to them.

15 *Stages of Change-Short Form* (Marcus, Selby, Niaura and Rossi, 1992). This is a 5-
16 item scale that assesses the precontemplation, contemplation, preparation, action, and
17 maintenance stages of exercise behaviour change. Due to the nature of our sample (i.e.
18 exercisers), only the last three stages were assessed. The participants were given a definition
19 of regular exercise and then they were asked to indicate whether, according to that definition,
20 they had been exercising “a little, but not regularly” (preparation), “regularly but for less than
21 6 months” (action), and “regularly for more than 6 months” (maintenance). The questionnaire
22 has been shown to relate with objective and self-report measures of physical activity. For
23 example, Hausenblas, Dannecker, Connaughton and Lovins (1999) using a sample of 45
24 police officers showed significant differences among the preparation, action and maintenance

1 stages on the Leisure-Time Exercise Questionnaire (LTEQ; Godin, Jobin and Bouillon,
2 1986). Furthermore, in the same study significant differences in VO_{2max} were found between
3 the preparation and action stages. Similarly, Cardinal (1997), in a sample of 135 adults,
4 reported decreases in body mass index and linear improvement in submaximal aerobic fitness
5 and LTEQ scores across the stages of change.

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

12 *Barriers self-efficacy.* To assess the participants’ self-efficacy to overcome barriers to
13 regular exercise, we chose 10 items from two relevant scales developed by Marcus *et al.*
14 (1992) and McAuley (1992). The items reflected situations that have been listed in the
15 literature as common reasons for preventing individuals from participating in exercise
16 sessions or, in some cases, contributing to drop out (e.g. lack of time, lack of social support,
17 injuries, illness). Each item was measured on a five-point scale ranging from 1 “not at all
18 confident” to 5 “completely confident”.

19 *Physical Self-Worth (PSW; Fox and Corbin, 1989).* This is a six-item subscale from
20 the Physical Self-Perception Profile (PSPP; Fox and Corbin, 1989). The PSPP is based on
21 Fox and Corbin’s hierarchical conceptualisation of physical self-perceptions, with physical
22 self-worth at the apex underpinned by four subdomains of the physical self (i.e. sports
23 competence, physical condition, body attractiveness, and physical strength). The
24 questionnaire employs a force-choice structured alternative format in order to minimize

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

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

19

20 ***Procedure***

21 The questionnaires were distributed to the fitness clubs. The participants were asked to
22 complete the questionnaires at a convenient time and location and return them via a
23 collection box in each club. One might argue that it would have been preferable to ask the
24 participants to complete the questionnaires in the presence of a research assistant. However,

1 the vast majority of the participants were willing to participate in the study only on the
2 condition that they would do so at a convenient time and place (i.e. at home). The study had
3 the approval of the ethics committee of a British University. All participants signed informed
4 consent forms and were reassured that their responses would be confidential and anonymous.

5

6 **Results**

7 *Preliminary analyses*

8 Descriptive statistics, internal reliability coefficients and correlation coefficients are
9 presented in Table 1. In general, the participants had very low amotivation and external
10 regulation, moderate introjected regulation, and relatively high self-determined motivation
11 (in particular identified regulation). In addition, they had high intentions to continue their
12 exercise activities in the future and felt very confident that they could overcome various
13 barriers to exercise. Lastly, the participants generally reported moderate levels of physical
14 self-worth and social physique anxiety. All subscales had acceptable internal reliabilities
15 (Cronbach's $\alpha > 0.70$). The significant correlation coefficients between the motivational
16 regulations and the exercise-related variables ranged from small ($r = 0.15$) to moderate ($r =$
17 0.51) in size. More specifically, these coefficients showed that future intentions to exercise,
18 barriers self-efficacy and physical self-worth were positively related to intrinsic motivation
19 and identified regulation, and negatively related to external regulation and amotivation. The
20 opposite pattern of relationships was observed between social physique anxiety and the four
21 motivational regulations. Introjected regulation was positively related to social physique
22 anxiety and unrelated to physical self-worth. However, and contrary to our hypotheses,
23 introjected regulation was also positively related to future intentions and barriers self-
24 efficacy.

1
2 * Table 1 near here*

3 Frequency analysis showed that 41 participants were at the preparation stage of
4 exercise behaviour change, 65 were at the action stage and 258 at the maintenance stage. We
5 also assessed the number of times the participants had stopped exercising for three months or
6 more in the past five years. The results showed that 178 participants reported no relapse, 151
7 reported 1-3 relapses, 24 reported 4-6 relapses, 6 reported 7-10 relapses, and 8 participants
8 indicated more than 10 relapses. In addition, frequency analysis showed that the combined
9 number of reasons given for exercise relapse ranged from 1 ($n = 67$) to 6 ($n = 2$). The most
10 frequently chosen reason was work demands ($n = 76$), followed by injury/illness ($n = 67$) and
11 lack of time ($n = 62$). The least frequently chosen reasons for exercise relapse were lack of
12 transportation ($n = 9$) and lack of exercise partner ($n = 12$). In the analyses reported below,
13 looking at the relationship between exercise motivation and number of relapses, we excluded
14 all relapses due to uncontrollable reasons (i.e. illness and injury).

15
16 ***Predicting exercise-related behaviours from age, gender and motivational regulations***

17 With regard to exercise relapse, approximately 90% of the participants selected the first two
18 (i.e. “no relapse”, “1-3 relapses”) of the five available relapse categories. As a consequence,
19 we created a new binary variable (“no relapse”, “one or more relapses”) which served as the
20 dependent variable in a binary logistic regression. Although one might consider the cut-off
21 point between the two categories as stringent, one should bear in mind that we excluded from
22 the analyses those who indicated uncontrollable reasons for relapse. In the logistic regression,
23 as well as in the other regression analyses reported below, we statistically controlled for age
24 and gender due to the age and gender differences that have been reported in the literature

1 with regard to both the independent and dependent variables of this study (e.g. Li, 1999; Motl
2 and Conroy, 2001, Page and Fox, 1997; Sallis, 2000).

3 The results showed that the number of relapses in the past five years due to
4 controllable reasons was positively predicted by external regulation and negatively predicted
5 by identified regulation (see Table 2).

6 * Table 2 near here *

7 In relation to the stages of change, a MANOVA analysis indicated significant differences
8 between the three stages of change (preparation, action, maintenance) in exercise motivation
9 (Pillai's trace = 0.197; $F_{10, 708} = 7.72$; $P < 0.001$, partial $\eta^2 = 0.10$). No cut-off values exist for
10 partial η^2 , but as far as η^2 is concerned, a value above 0.06 is considered a moderate effect
11 size and a value above 0.14 is considered a large effect size (Cohen, 1988). Follow-up
12 univariate analysis indicated significant differences in all types of exercise motivation (see
13 Table 3).

14 * Table 3 near here *

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

1 motivation was significantly higher in the action stage compared to the preparation stage ($d =$
2 0.55).

3 A separate one-way ANOVA showed no significant age differences across the three
4 stages of change ($F_{2, 357} = 2.65$; $p > 0.05$; partial $\eta^2 = 0.02$). Lastly, a chi-square analysis
5 showed that there were more males than females in the maintenance stage ($\chi^2 = 8.07$; $df = 2$;
6 $P < 0.05$).

7

8 *Predicting exercise-related cognitions and physical self-evaluations from age, gender and* 9 *motivational regulations*

10 Multiple hierarchical regression analyses were employed to examine whether the different
11 motivational regulations could predict exercise-related cognitions and physical self-
12 evaluations. The results showed that all regressions were significant (see Table 4).

13 * Table 4 near here *

14 With regard to the cognitive variables, intention to continue exercise in the next 6
15 months was negatively predicted by amotivation and positively predicted by introjected
16 regulation and identified motivation. In addition, barriers self-efficacy was significantly
17 predicted by gender with males having a higher efficacy to overcome barriers than females.
18 The motivational variables explained a much greater proportion of variance of the dependent
19 variable compared to gender and age. More specifically, high barriers self-efficacy was
20 predicted by high introjected regulation, identified regulation and intrinsic motivation, and
21 low external regulation.

22 Two variables related to physical self-evaluations were assessed in this study:
23 physical self-worth and social physique anxiety. Physical self-worth was significantly
24 predicted by gender and intrinsic motivation. Gender explained a considerable amount of

1 variance of physical self-worth with women having lower scores than men. The motivational
2 variables added an approximately equal amount of explained variance of physical self-worth.
3 As expected, intrinsic motivation positively predicted physical self-worth. With regard to
4 social physique anxiety, it was significantly predicted by age with younger participants
5 displaying significantly higher social physique anxiety compared to the older ones.
6 Furthermore, gender was a significant predictor with women having higher scores compared
7 to men. The motivational variables increased the explained variance of social physique
8 anxiety, although more variance was accounted for by gender and age. Specifically, social
9 physique anxiety was positively predicted by introjected regulation and negatively by
10 intrinsic motivation.

11

12

Discussion

13 The purpose of the present study was to examine whether different motivational regulations
14 to exercise would significantly predict a range of exercise behaviours, cognitions and
15 physical self-evaluations, using SDT as an organising framework. The results largely
16 supported our hypotheses which stated that compared to controlling and amotivated
17 regulations, self-determined motivational regulations would be higher in more advanced
18 stages of change and would predict fewer cases of exercise relapse, higher barriers self-
19 efficacy, stronger intentions to continue exercising, higher physical self-worth, and lower
20 social physique anxiety. These results are generally in line with both the theoretical tenets of
21 SDT as well as with empirical findings in this area (e.g. Deci and Ryan, 1985; Mullan and
22 Markland, 1997; Wilson and Rodgers, 2002).

23

24 *SDT and exercise-related behaviours*

1 MANOVA tests showed that exercisers in the maintenance stage displayed a more adaptive
2 motivational profile (i.e. more self-determined and less controlling motivation and
3 amotivation) compared to those in the action stage, and in particular, to those in the
4 preparation stage. Effect sizes indicated that the largest between stages of change differences
5 were found in intrinsic motivation and identified regulation, and in particular between the
6 preparation and maintenance stages. Interestingly, introjected regulation was highest in the
7 maintenance stage, although its mean value was considerably smaller than the mean values
8 for the two self-determined motivation types. The increase in introjected regulation across the
9 stages of change is an unexpected finding because, according to SDT, introjected regulation
10 is a controlling type of motivation which is often associated with maladaptive psychological
11 functioning (Ryan and Deci, 2000). However, previous research in both academic (Vallerand,
12 Fortier and Guay, 1997) and physical education contexts (Ntoumanis, 2001; Standage *et al.*,
13 2003) has indicated that introjected regulation is sometimes associated with adaptive
14 variables. In the context of the present study, the positive association between introjected
15 regulation and exercise behaviour may be due to the messages delivered by national
16 campaigns and the media about the importance of a physically active lifestyle. These
17 persistent messages may be partly internalized and could motivate individuals to engage in
18 exercise out of feelings of guilt or in order to achieve a socially desirable body physique,
19 despite their potential lack of interest and enjoyment in exercise activities. However, the
20 long-term effects of introjected regulation have not been examined in the area of exercise. In
21 sport settings, Pelletier, Fortier, Vallerand and Brière (2002) showed that introjected
22 regulation was a positive predictor of persistence in competitive swimming in the short term
23 (10 months) but became a non-significant predictor in the longer term (22 months).

1 With the exception of introjected regulation, the results pertaining to exercise
2 motivation and stages of change are in line with those reported by Mullan and Markland
3 (1997). However, due to the cross-sectional nature of our study, it cannot be determined
4 whether self-determined motivation increased and controlling motivation decreased as the
5 exercisers progressed through the stages of change, or if the participants reached the
6 maintenance stage because they had high self-determined motivation to start with. However,
7 the latter explanation seems less likely since self-determined motivation is rarely very high
8 when participants first engage in an exercise programme (Ingledeew *et al.* 1998). Either way,
9 future research should employ longitudinal designs to examine how motivational regulations
10 fluctuate across the different stages of change as well as to provide potential explanations for
11 such fluctuations (e.g. changes in need satisfaction).

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

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

8

9 *SDT and exercise-related cognitions*

10 The importance of future intentions in predicting exercise behaviour is well established (e.g.
11 Hausenblas *et al.*, 1997), but there is a paucity of research examining the motivational
12 regulations that underpin future intentions in adult exercisers. The results from the present
13 study are in line with those reported by a meta-analysis and previous empirical research with
14 young people (Chatzisarantis *et al.*, 2003; Standage *et al.*, 2003). As expected, amotivation
15 was a negative predictor of intentions to exercise. Both types of self-determined motivation
16 (i.e. intrinsic motivation and identified regulation) were significantly correlated with future
17 exercise intentions, although intrinsic motivation was not a significant predictor of intentions
18 in the regression analysis. The latter finding is due to the relatively high correlation between
19 identified regulation and intrinsic motivation which reduced the variance of intentions that
20 could be accounted for by intrinsic motivation only. Interestingly, introjected regulation, a
21 controlling type of motivation, was a significant positive predictor of future exercise
22 intentions. In other words, internal pressure and feelings of guilt might have led some
23 individuals to formulate positive exercise intentions. However, Chatzisarantis, Biddle and

1 Meek (1997) showed that self-determined intentions are more likely to predict actual
2 behaviour when compared to controlling intentions.

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

12

13 *SDT and physical self-evaluations*

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

23 Deci and Ryan (1995) have distinguished between contingent self-esteem (i.e.
24 dependent on reaching some extrinsic goals) and true self-esteem (i.e. a more secure, solid

1 sense of self-acceptance), and argued that it is only the latter type of self-esteem that is
2 related to self-determined motivational processes. Future research should examine whether
3 physical self-worth can also be separated into contingent and true types. If this is the case, it
4 would be interesting to explore whether self-determined motivation relates to true physical
5 self-worth only.

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

23

24 *Age and gender effects*

1 Our analyses showed some significant age and gender effects in the variables of interest. Age
2 and gender were more instrumental in accounting for the variance of the two physical self-
3 evaluation variables as opposed to the variance of the behavioural and cognitive variables
4 assessed. However, in all cases the exercise regulations accounted for a substantial proportion
5 of variance beyond the contribution made by age and gender. Males were more likely to be in
6 the maintenance stage, have higher barriers self-efficacy and physical self-worth, and lower
7 social physique anxiety compared to females. Furthermore, older participants reported lower
8 social physique anxiety and more exercise relapses compared to younger exercisers. These
9 findings are in line with previous findings reported in the literature (e.g. Fox and Corbin,
10 1989; Motl and Conroy, 2001; Page and Fox, 1997).

11

12 *Limitations*

13 There are some limitations in the present study that should be addressed by future research.
14 First, the relationships reported here are cross-sectional in nature and reciprocal effects over
15 time cannot be excluded. For example, it is also possible that high self-efficacy to overcome
16 barriers or high self-worth can predict self-determined motivation. Examining the size of the
17 cross-lagged effects between the motivational regulations and the other variables assessed in
18 this study would be an interesting avenue for future research work. Second, although the
19 stages of change measure employed in this study has been used as a behavioural measure of
20 exercise participation in many previous studies, it has the same limitations as other self-report
21 measures. It would be interesting to examine the relationship between different types of
22 exercise motivation and exercise behaviour using more objective measures of the latter.
23 Third, it is possible that the participants might not have estimated accurately the number of
24 relapses in the last five years. However, by asking them to: a) indicate the number of relapses

1 lasting for a considerable amount of time (i.e. three months or more), and b) list the major
2 reasons for their relapses, we probably facilitated their memory recall.

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

14

15 **Conclusions**

16 In conclusion, the present study provided support for our hypothesis that self-determined
17 motivation may be associated with a range of adaptive exercise-related behaviours,
18 cognitions and physical self-evaluations. Both intrinsic motivation and identified regulation
19 play an important role since some exercise activities are not inherently enjoyable, but
20 nevertheless individuals value their importance. The complementary role of intrinsic
21 motivation and identified regulation has also been highlighted by Koestner and Losier
22 (2002). These authors argued that whilst intrinsic motivation promotes a focus on short-term
23 goals and enjoyment, identified regulation keeps one oriented toward the long-term
24 significance of one's current pursuits. Since identified regulation represents a high degree of

1 internalisation, it is important that exercise interventions facilitate the internalisation process
2 using appropriate mechanisms (e.g. providing rationale, acknowledging negative feelings,
3 etc.; see Deci and Ryan, 1991). We also found that introjected regulation was positively
4 related to adaptive behavioural and cognitive outcomes, however, the long-term effects of
5 this rigid form of persistence on well-being need to be examined by future research. This is
6 important since introjected regulation was associated in this study with maladaptive physical
7 self-evaluations which, according to Fox (1997), could be detrimental to one's well-being. In
8 conclusion, our findings provide further evidence for the importance of promoting self-
9 determined motivation in exercise contexts.

References

- Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, **44**, 1175–1184.
- Berger, B.G., Pargman, D. and Weinberg, R.S. (2002). *Foundations of Exercise Psychology*. Morgantown, WV: Fitness Information Technology.
- Biddle, S.J.H. and Nigg, C.R. (2000). Theories of exercise behavior. *International Journal of Sport Psychology*, **31**, 290-304.
- Biddle, S.J.H., Fox, K.R. and Boutcher, S.H. (eds) (2000). *Physical Activity and Psychological Well-Being*. London: Routledge.
- Blair, S.N., Cheng, Y. and Holder, J.S. (2001). Is physical activity or physical fitness more important in defining health benefits? *Medicine and Science in Sports and Exercise*, **33**, S379-S399.
- Byrne, B.M. (1996). *Measuring Self-Concept Across The Life Span: Issues and Instrumentation*. Washington, DC: American Psychological Association.
- Cardinal, B.J. (1997). Construct validity of stages of change for exercise behavior. *American Journal of Health Promotion*, **12**, 68-74.
- Chatzisarantis, N.L.D., Biddle, S.J.H. and Meek, G. A. (1997). A self-determination theory approach to the study of intentions and the intention-behaviour relationship in children's physical activity. *British Journal of Health Psychology*, **2**, 343-360.
- Chatzisarantis, N.L.D., Hagger, M.S., Biddle, S.J.H., Smith, B. and Wang J.C.K. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. *Journal of Sport and Exercise Psychology*, **25**, 284-306.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd edition). Hillsdale, NJ: Lawrence Erlbaum.

- Crawford, S. and Eklund, R.C. (1994). Social physique anxiety, reasons for exercise, and attitudes toward exercise settings. *Journal of Sport and Exercise Psychology*, **16**, 70-82.
- Deci, E.L. and Ryan, R.M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum.
- Deci, E.L. and Ryan, R.M. (1991). A motivational approach to self: Integration in personality. In *Nebraska Symposium on Motivation, vol. 38: Perspectives on Motivation* (edited by R. Deinstbier), pp. 237-288. Lincoln, NE: University of Nebraska Press.
- Deci, E.L. and Ryan, R.M. (1995). Human autonomy: The basis for true self-esteem. In *Efficacy, Agency, and Self-Esteem* (edited by M.H. Kernis), pp. 31-49. New York: Plenum Press.
- Deci, E.L. and Ryan, R.M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, **11**, 227-268.
- Eklund, R.C., Mack, D. and Hart, E. (1996). Factorial validity of the Social Physique Anxiety Scale for females. *Journal of Sport and Exercise Psychology*, **18**, 281-295.
- Fox, K.R. (1997). The physical self and processes in self-esteem development. In *The Physical Self: From Motivation to Well-Being*, (edited by K.R. Fox), pp. 111-139. Champaign, IL: Human Kinetics.
- Fox, K.R. and Corbin, C.B. (1989). The Physical Self-Perception Profile: Development of preliminary validation. *Journal of Exercise and Sport Psychology*, **11**, 408-430.
- Frederick, C.M. and Morrison, C.S. (1996). Social physique anxiety: Personality constructs, motivations, exercise attitudes, and behaviors. *Perceptual and Motor Skills*, **82**, 963-972.

- Godin, G., Jobin, J. and Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. *Canadian Journal of Public Health*, **77**, 359-361.
- Hart, E.A., Leary, M.R. and Rejeski, W.J. (1989). The measurement of social physique anxiety. *Journal of Sport and Exercise Psychology*, **11**, 94-104.
- Hausenblas, H. A., Carron, A.V. and Mack, D.E. (1997). Application of the Theories of Reasoned Action and Planned Behavior to exercise behavior: A meta-analysis. *Journal of Sport and Exercise Psychology*, **19**, 36-51.
- Hausenblas, H. A., Dannecker, E. A., Connaughton, D. P. and Lovins, T. R. (1999). Examining the validity of the stages of exercise change algorithm. *American Journal of Health Studies*, **15**, 94-99.
- Ingledeew, D.K., Markland, D. and Medley, A.R. (1998). Exercise motives and stages of change. *Journal of Health Psychology*, **3**, 477-489.
- King, A.C., Blair, S.N., Bild, D.E. *et al.* (1992). Determinants of physical activity and interventions in adults. *Medicine and Science in Sports and Exercise*, **24**, 221-236.
- Koestner, R. and Losier, G. F. (2002). Distinguishing three ways of being internally motivated: A closer look at introjection, identification, and intrinsic motivation. In *Handbook of Self-Determination Research* (edited by E. L. Deci and R. M. Ryan), pp. 101-121. Rochester, NY: The University of Rochester Press.
- Li, F. (1999). The exercise motivation scale: Its multifaceted structure and construct validity. *Journal of Applied Sport Psychology*, **11**, 97-115.
- Marcus, B. H. and Forsyth, L.A. (2003). *Motivating People to Be Physically Active*. Champaign, IL: Human Kinetics.

- Marcus, B.H., Selby, V.C., Niaura, R.S. and Rossi, J.S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport*, **63**, 60-66.
- Markland, D. and Ingledew, D.K. (1997). The measurement of exercise motives: Factorial validity and invariance across gender of a revised Exercise Motivations Inventory. *British Journal of Health Psychology*, **2**, 361-376.
- McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of Behavioral Medicine*, **15**, 65-88.
- Motl, R. W. and Conroy, D. E. (2000). Validity and factorial invariance of the Social Physique Anxiety Scale. *Medicine and Science in Sports and Exercise*, **32**, 1007-1017.
- Motl, R. W. and Conroy, D. E. (2001). The Social Physique Anxiety Scale: Cross-validation, factorial invariance, and latent mean structure. *Measurement in Physical Education and Exercise Science*, **5**, 81-95.
- Mullan, E. and Markland, D. (1997). Variations in self-determination across the stages of change for exercise in adults. *Motivation and Emotion*, **21**, 349-362.
- Mullan, E., Markland, D. and Ingledew, D.K. (1997). A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analytic procedures. *Personality and Individual Differences*, **23**, 745-752.
- Ntoumanis, N (2001). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology*, **71**, 225-242.
- Page, A. and Fox, K.R. (1997). Adolescent weight management and the physical self. In *The physical self: From motivation to well-being* (edited by K.R. Fox), pp. 229-256. Champaign, IL: Human Kinetics.

- Pelletier, L.G., Fortier, M.S., Vallerand, R.J. and Brière, N.M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion*, **25**, 279-306.
- Prochaska, J.O. and DiClemente, C.C. (1984). *The Transtheoretical Approach: Crossing Traditional Boundaries of Therapy*. Pacific Grove, CA: Brooks/Cole.
- Prochaska, J.O. and Marcus, B.H. (1994). The transtheoretical model: Applications to exercise. In *Advances in exercise adherence* (edited by R.K. Dishman), pp. 161-180. Champaign, IL: Human Kinetics.
- Ryan, R.M. and Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, **55**, 68-78.
- Ryan, R.M., Frederick, C.M., Lepes, D., Rubio, N. and Sheldon, K.M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology*, **28**, 335-354.
- Sallis, J.F. (2000). Age-related decline in physical activity: a synthesis of human and animal studies. *Medicine and Science in Sports and Exercise*, **32**, 1598-1600.
- Sallis, J.F., Hovell, M.F., Hofstetter, C.R. *et al.* (1990). Lifetime history of relapse from exercise. *Addictive Behaviors*, **15**, 573-579.
- Sonstroem, R.J. and Potts, S.A. (1996). Life adjustment correlates of physical self-concepts. *Medicine and Science in Sports and Exercise*, **28**, 619-625.
- Spiriduso, W.W. (1995). *Physical Dimensions of Aging*. Champaign, IL: Human Kinetics.
- Standage, M., Duda, J.L. and Ntoumanis, N. (2003). Predicting motivational regulations in physical education: the interplay between dispositional goal orientations, motivational climate and perceived competence. *Journal of Sports Sciences*, **21**, 631-647.

- Vallerand, R.J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In *Advances in Experimental Social Psychology: Vol 29*, (edited by M.P. Zanna), pp. 271-360. New York: Academic Press.
- Vallerand, R.J., Fortier, M.S. and Guay, F. (1997). Self-determination and persistence in a real-life setting: Toward a motivational model of high school dropout. *Journal of Personality and Social Psychology*, **72**, 1161-1176.
- Vallerand, R.J., Pelletier, L.G., Blais, M.R. *et al.* (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education. *Education and Psychological Measurement*, **52**, 1003-1017.
- Van de Vliet, P., Knapen, J., Onghena, P. *et al.* (2002). Relationships between self-perceptions and negative affect in adult Flemish psychiatric in-patients suffering from mood disorders. *Psychology of Sport and Exercise*, **3**, 309-322.
- Wankel, L.M. (1993). The importance of enjoyment to adherence and psychological benefits from physical activity. *International Journal of Sport Psychology*, **24**, 151-169.
- Wilson, P.M. and Rodgers, W.M. (2002). The relationship between exercise motives and physical self-esteem in female exercise participants: An application of Self-Determination Theory. *Journal of Applied Biobehavioral Research*, **7**, 30-43.
- Wilson, P. M., Rodgers, W. M. and Fraser, S. N. (2002). Examining the psychometric properties of the Behavioral Regulation in Exercise Questionnaire. *Measurement in Physical Education and Exercise Science*, **6**, 1–21.

Table 1

Descriptive statistics, internal reliability coefficients, and correlation coefficients

Variables	$M \pm s$	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 five-point scales with the exception of future intention to exercise (six-point scale) and physical self-worth (four-point scale). Furthermore, the same pattern of correlations was observed when we controlled for age and gender. As future intention was measured with two items, the alpha score is essentially the correlation between the two items. * = $P < 0.05$, ** = $P < 0.01$

Table 2

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

Exercise relapse	Unstandardized Coefficients	Odds Ratios	95% CI for Odds Ratios
<i>Step 1</i>			
Age	-0.03**	0.97	0.95 -0.99
Gender	0.12	1.13	0.71 -1.80
<i>Step 2</i>			
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

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

Table 3

Mean differences among the three stages of change in exercise regulation ($df = 2, 357$)

	Stages of change						<i>F</i>	Partial η^2
	Preparation		Action		Maintenance			
	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>	<i>M</i>	<i>s</i>		
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. * = $P < 0.05$, *** = $P < 0.001$

Note. Stages of change with the same subscripts in the same row do not differ significantly at $P < 0.05$

Table 4

Hierarchical multiple regression analyses predicting exercise-related behaviours, cognitions and physical self-evaluations from age, gender and motivational regulations

Variables	β	t	R^2 change
Future intention to exercise			
<i>Step 1</i>			0.01
Age	0.07	1.30	
Gender	-0.06	-1.20	
<i>Step 2</i>			0.31***
Amotivation	-0.20	-3.69***	
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>			0.03**
Age	0.03	0.61	
Gender	-0.16	-3.03**	
<i>Step 2</i>			0.21***
Amotivation	0.04	0.67	
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>			0.11***
Age	-0.01	-0.10	
Gender	-0.33	-6.48***	
<i>Step 2</i>			0.11***
Amotivation	-0.08	-1.40	
External regulation	-0.02	-0.38	
Introjected regulation	-0.09	-1.67	
Identified regulation	0.08	1.26	
Intrinsic motivation	0.26	4.08***	

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