Exploring exercise behavior and well-being of Swedish university students
A self-determination perspective

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Abstract: The purpose of this study was to investigate relationships between motivational profile, self-efficacy, basic needs satisfaction, exercise behavior, and well-being among Swedish university students. A set of the instruments including GLTEQ, SHIS, BPNES, BREQ-2 and BARSE was distributed at a university in southern Sweden. The respondents (n=260) included men (n=122) and women (n=138). For analysis and processing of the gathered data SPSS was used with Pearson's r and Multiple Regression Analysis. The results showed that competence, autonomy and relatedness were positive predictors of self-determined motivation, whilst identified regulation, intrinsic regulation and barrier self-efficacy were positive predictors for strenuous exercise. Moreover, a regression analysis showed that only competence was a significant predictor for well-being; however, positive correlations were shown between all the basic needs and well-being. Satisfaction of the basic needs seem to result in more self-determined motivation and higher levels of barrier self-efficacy, which in turn increases the number of strenuous exercise sessions per week. Furthermore, satisfaction of the basic needs, especially competence through exercise, appears to be important for university students' well-being. Strenuous exercise itself may also have the potential to positively influence well-being.

Introduction

Technological advances have led to a society where we today are increasingly physically inactive both at work and in our leisure time (Engström, 2010). Despite the growing body of research supporting the positive effects of physical activity and exercise on both psychological and physiological well-being (Physical activity in the prevention and treatment of disease, 2008), it is estimated that only about two-thirds of the adult population in Sweden meets the minimum requirements of performing physical activity of at least moderate physical exertion, thirty minutes a day, five days a week (The National Public Health Report, 2009).

Health and exercise psychology have gained considerable attention the last few decades when it comes to explaining and understanding exercise behaviors (Berger, Pargman, & Weinberg, 2007). Main findings within the area suggest that the most common barrier to perform exercise is perceived lack of time (Gómez-López, Granero Gallegos, & Baerna Extremera, 2010; Lovell, Ansari, & Parker, 2010; Tergerson & King, 2002), whilst some of the most common motives are weight management and improved health (Anshel, 2006). Theories within the field that has proven good in explaining and predicting exercise behavior are Deci and Ryan's (1985) Self-Determination Theory and Bandura's (1977) Self-Efficacy Theory. Self-Determination Theory conceptualizes motivation as multidimensional, and suggests different qualities of motivation, instead of looking at motivation with focus on quantity (Deci & Ryan, 2002b). Intrinsic motivation has proven to be positively correlated with exercise (Wilson & Rodgers, 2004). Self-efficacy is the individual's belief in their own competence to perform a specific task or certain duties in a satisfactory manner (Bandura, 1977). Research showed that the individual's self-efficacy has strong connections with regular exercise habits (Bandura, 1997; SBU, 2007).

Conceptual definitions

Physical activity (PA) includes all types of body movement as a result of contractions in skeletal muscle, resulting in increased energy consumption. *Exercise* is defined as planned PA with the intent to promote health or improve well-being (Physical activity in the prevention and treatment of disease, 2008).

W*ell-being* is defined as the positive subjective overall experience of oneself, which include the individuals' feelings of physiological, psychological and social well-being (Bringsén, Andersson, & Ejlertsson, 2009).

Motivation is often described using the effort's direction, intensity and duration, in which direction can be seen as the choice of activity, while intensity reflects how much effort you make and duration means how long a particular behavior is maintained (Roberts, 2001).

Motivational profile refers to the quality of motivation individuals perceive toward a certain behavior, ranging from non-regulation (amotivation) to fully self-determined (intrinsic regulation; Deci & Ryan, 2002b).

Barrier Self-Efficacy refers to the individual's confidence in their ability to exercise despite different types of obstacles/barriers (McAuley, 1992).

Correlation refers to a reciprocal relation between two or more things (Borg & Westerlund, 2006).

Prediction refers to reasoning about the future from a set of data (by knowing the value of one variable you can predict another; Borg & Westerlund, 2006).

Theoretical frameworks

Self-Determination Theory (SDT)

According to SDT, motivation is divided into self-determined (autonomous) and non self-determined (controlling) types of motivation, where self-determination is the individual's degree of free will, which means that the option is available (Deci & Ryan, 2000) and that the individuals take the initiative themselves (Edmunds, Ntoumanis, & Duda, 2006). Further, motivation is divided into three main types: intrinsic motivation, extrinsic motivation and amotivation (Deci & Ryan, 2000). The experience of intrinsic motivation involves performing an activity for the activity's own sake, that is, the activity itself is satisfactory and the individual does not set any requirements in terms of external rewards. Extrinsic motivation is characterized by external influences, often in the form of various types of rewards. Amotivation, finally, means that the individual finds no meaning in the task itself, and therefore does not see a reason to get involved (ibid).

SDT consists of several smaller subtheories: Cognitive Evaluation Theory (CET), Organismic Integration Theory (OIT), Causality Orientations Theory (COT), Goal Content Theory (GCT) and Basic Needs Theory (BNT; Deci & Ryan, 2002a). In the area of exercise, OIT has received considerable attention, which may be due to the conceptualization of motivation as multidimensional and suggesting different qualities of motivation, instead of looking at motivation as one-dimensional with focus on quantity. According to OIT, six motivational regulations has been identified (intrinsic, integrated, identified, introjected, external and amotivation) ranging from self-determination to non-regulation (see Figure 1; Deci & Ryan, 2002b).

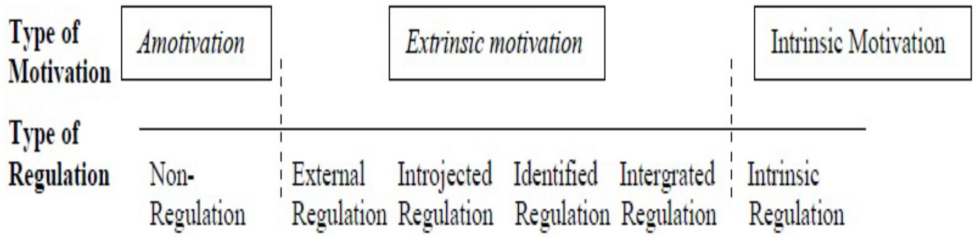

Figure 1 *Continuum of Self-determination (Deci & Ryan, 2002b)*

On the left is amotivation, which includes a lack of current intention of the behavior and also of personal causation. Amotivation also lacks autonomy since it has no regulation control. This is followed by the lowest form of external motivation, external regulation, which means that individuals are only motivated by the possibility to achieve rewards or to avoid punishments. Introjected regulation is also characterized by external factors, for example, to avoid guilt, anxiety and to feel pride. High levels of introjected regulation imply that the

individual has changed, but the individual has not accepted the change as its own. In identified regulation, the individual is identified with the change and has accepted the behavior. The activity also feels meaningful for the individual. Identified regulation is characterized by personal values such as learning new skills, it is also somewhat more autonomous than the previous regulations. The most autonomous form of external motivation is integration, which means that the behavior is fully incorporated into the repertoire of behaviors that meet the psychological needs; however, it is still a form of external regulation. The last form of regulation is intrinsic regulation, which includes total self-determination of behavior in which joy and inner satisfaction is experienced during performance while a genuine interest in the selected task exist (Deci & Ryan, 2002b). Within Self-Determination Theory, motivation that is highly self-determined is hypothesized to positively influence any behavioral engagement and psychological well-being (Ryan & Deci, 2000). Studies have shown that intrinsic and identified regulation have a strong connection with maintaining regular exercise (Brunet & Sabiston, 2011; Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Wilson & Rodgers, 2004).

Basic Needs Theory has been noted in the context of physical activity and exercise (Hagger & Chatzisarantis, 2007). BNT stipulates that the individual needs to satisfy three basic psychological needs: competence, autonomy and relatedness (Deci & Ryan, 2002b). The satisfactions of these psychological needs are essential for mental development, integrity and well-being. If they are not met, it will result in negative effects regarding both motivation and well-being, whereas if they are met, it will lead to positive changes in both motivation and well-being (Hagger & Chatzisarantis, 2007). Competence is about the feeling of effectively mastering challenging tasks and the exercise of personal capacity in a given domain. Autonomy involves the desire to control one's own actions and participate in self-chosen activities while relatedness is about the perception of having meaningful connections with others and feel comfortable and involved in a context. To achieve optimal performance requires that all these psychological needs are satisfied (ibid).

Self-Efficacy Theory (SET)

Self-efficacy is a person's belief in their ability to handle a specific task or certain duties in a satisfactory manner (Bandura, 1977). You cannot generalize an individual's self-efficacy for tasks that are not similar in nature. In other words, if a person has high self-efficacy regarding their performance in weight training it does not mean that the same person has high self-efficacy in cardiovascular training (Bandura, 1997). SET stipulates that if an individual has high self-efficacy regarding a specific activity, the likelihood increases that the individual begins or continues with the selected activity (ibid). High self-efficacy also affects the degree of effort in the activity itself and the ability to despite setbacks and failure, stick with the behavior (Lox, Martin, & Petruzzello, 2003). According to several studies, individuals' self-efficacy to exercise (*exercise efficacy*) is the strongest mediator for future participation in an active lifestyle (Bandura, 1997; Rovniak, Anderson, & Winett, 2002; SBU, 2007; Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004), while it also has been shown to have a connection with regular exercise habits (Bandura, 1997; SBU, 2007). There is also a connection between high self-efficacy and ability to attribute failure to something changeable, which in turn leads to continued exercise, while someone with low self-efficacy attributes failure to something they would not be able to change and therefore is more

likely to drop out (Bandura, 1997). There are various sources that form the basis of an individual's self-efficacy, and these are the individual's past experiences and accomplishments, modelling, verbal persuasion, physical and emotional state (ibid).

Previous research

Motivational profile

As previously mentioned, according to SDT, motivation can be divided into intrinsic motivation, extrinsic motivation and amotivation, where extrinsic motivation is further divided into external regulation, introjected regulation, identified regulation and integrated regulation (Deci & Ryan, 2000; 2002). Several studies have examined how these different regulations affects individuals' exercise behavior and the results indicate positive correlations between intrinsic and identified regulation and regular exercise habits (Buckworth, Lee, Regan, Schneider, & DiClemente, 2007; Jonsson & Lidén, 2012; Sabiston, Brunet, Kowalski, Wilson, Mack, & Crocker, 2010; Wilson & Rodgers, 2004). Similar results were also detected by Brunet and Sabiston (2011) who studied the relationship between motivational profile and exercise among three different age groups; younger adults (18-24), adults (25-44) and middle-aged adults (45-64). All age groups showed a positive correlation between intrinsic motivation, identified regulation and exercise. Among younger adults, there was also a positive correlation between introjected regulation and exercise as well as a negative relationship between external regulation and exercise (ibid). This positive correlation between introjected regulation and exercise is supported by previous research (e.g. Edmunds et al., 2006; Gillison, Osborn, Standage, & Skevington, 2008; Standage, Sebire, & Loney, 2008; Wilson & Rodgers, 2004). It appears that common motives for young adults to engage in exercise are weight control for appearance reasons, physical attractiveness, and social recognition (Ingledew & Sullivan, 2002; Sabiston, Crocker, & Munroe-Chandler, 2005; Strong, Martin Ginis, Mack, & Wilson, 2006). According to Cash and Pruzinsky (2002) these motives are likely due to an increased pressure to look good among young adults, which in turn might make them feel demands to meet the physical appearance ideals in society (Fogelholm & Kukkonen-Harjula, 2000). The important role of introjected regulation for young adults exercise behavior might partly be explained by this, since motives linked to appearance and weight have shown positive correlation with introjected regulation (Ingledew & Markland, 2008). Motives linked to weight control and appearance does not seem to be as important at later stages in life, where individuals rather look for challenges through PA. They value physical functioning and skills and other positive effects of PA, rather than appearance effects (Beck, Gillison, & Standage, 2010; Reboussin et al., 2000).

Basic psychological needs

As mentioned earlier, SDT stipulates that satisfaction of the basic psychological needs is essential for mental development, integrity and well-being (Deci & Ryan, 2002b). Previous research supports the positive relationship between satisfaction of the basic psychological needs and well-being (e.g. Ntoumanis, 2001; Reinboth & Duda, 2006; Reis, Sheldon, Ga-

ble, Roscoe, & Ryan, 2000; Wilson, Longley, Moun, Rodgers, & Murray, 2006). Previous findings also indicate positive correlations between identified regulation, intrinsic regulation and satisfaction of the basic psychological needs through exercise (Edmunds, Ntounamis, & Duda, 2006; Lindgren, 2010; Wilson & Rodgers, 2008) and negative correlations between introjected regulation and the basic psychological needs (Lindgren, 2010).

Summary, working model and research questions

SDT stipulates that fulfillment of the basic psychological needs is essential for mental development, well-being and development of intrinsic motivation (Deci & Ryan, 2002b; Hagger & Chatzisarantis, 2007), whilst SET stipulates that high self-efficacy regarding a certain behavior increases the likelihood that individuals begins or continue with selected activity (Bandura, 1997). One could therefore argue that it is of interest to study if such relationships exist among university students. If that is the case, the knowledge can be seen as essential for understanding university students exercise behavior and used for future interventions trying to increase their exercise as well as their well-being.

For the purpose of the study at hand, a working model was developed (see Figure 2). It is hypothesized that basic needs satisfaction positively will affect well-being, barrier self-efficacy and motivational profile, in terms of more self-determined motivation. Furthermore, it is hypothesized that barrier self-efficacy and a self-determined motivational profile will affect exercise behavior positively, whilst a controlling motivational profile will have a negative effect on exercise behavior.

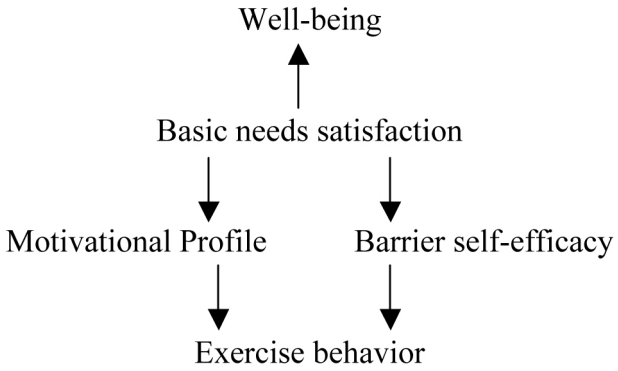

Figure 2 *Working model developed for the present study, including well-being, basic needs satisfaction, motivational profile barrier self-efficacy and exercise behavior.*

The purpose of this study is to examine relationships between motivational profile, self-efficacy, basic needs satisfaction, exercise behavior and well-being among Swedish university students. More specifically, four research questions as follows will be in the focus of the study:

(1). How does basic needs satisfaction affect motivational profile and barrier self-efficacy?
(2). How does motivational profile and self-efficacy affect exercise behavior?
(3). How does basic needs satisfaction affect well-being?
(4). Are there positive associations between exercise and well-being?

Method

Participants

The participants (*n*=260) of the present study were all students at a university in the south of Sweden, including both men (*n*=122) and women (*n*=138). The age range was between 18 and 39 (M=22.09; SD=3.43). Nine of the participants reported not to be engaged in any exercise at all, but they were included in the main sample to increase the number of participants.

Instruments

Godin Leisure-Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1997) measures weekly strenuous (e.g. running), moderate (e.g. fast walks) and light (e.g. light walks) exercise through three questions, answered with number of 15-minutes (minimum) bouts per week.

The Salutogenic Health Indicator Scale (SHIS; Bringsén, Andersson, & Ejlertsson, 2009) consists of twelve questions that measures two dimensions of health during the past four weeks, Intra Personal Characteristics (IPC; seven questions), ranging from 6 ("Felt well") to 1 ("Felt ill") and Inter Active Functioning (IAF; five questions), ranging from 6 ("Found it easy to concentrate") to 1 ("Had concentration difficulties").

The Basic Psychological Needs in Exercise Scale (BPNES; Vlachopoulos & Michailidou, 2006) measures fulfillment of three basic needs, autonomy, competence and relatedness through twelve questions answered on a five-point Likert-Scale, ranging from 1 ("I don't agree at all") to 5 ("I completely agree"). Example item: "The way I exercise is in agreement with my choices and interests"

The Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2 ; Markland & Tobin, 2004) measures an individual's motivational profile focused on exercise/training, through 19 questions which are answered on a five-point Likert-Scale, ranging from 0 ("Not true for me") to 4 ("Very true for me"). Example item: "I exercise because other people say I should".

Barrier Self-Efficacy Scale (BARSE ; McAuley, 1992) measures an individual's confidence in their ability to exercise despite different types of obstacles/barrier, through 13 questions. Participants is asked to take stance, given different conditions (e.g. if the weather is very bad), on the likelihood of doing exercise three times per week for the next three months, using a 0-100 Visual Analog Scale (VAS).

For the convenience of the participants, all the questionnaires were combined in one. In total, the combined questionnaire contains 61 questions, including background information, such as age and gender.

The instruments GLTEQ, BPNES, BREQ-2 and BARSE were translated from English to Swedish in a previous study by Josefsson and Ivarsson (2010). A bilingual (Swedish and

English) expert translated the instruments from English to Swedish. After which another bilingual expert translated the instruments back, from Swedish to English. Differences in the translated versions and original were discussed in the research group, and laid the basis for the final versions (for more information see Josefsson & Ivarsson, 2010). During the development of SHIS, both Swedish and English versions were created and tested (for more information see Bringsén, Andersson, & Ejlertsson, 2009). For reliability of the instrument see Table 1.

Table 1 *Reliability for the instruments*

Instrument	Cronbach alpha
BREQ-2	
Amotivation	.77
External regulation	.80
Introjected regulation	.75
Identified regulation	.81
Intrinsic regulation	.88
BPNES	
Autonomy	.84
Competence	.82
Releatedness	.91
BARSE	
Barrier self-efficacy	.84
SHIS	
IAF	.74
IPC	.83

Procedure

At an initial stage a pilot study was carried out to increase the clarity and construction of the questionnaire. Ten participants were asked to complete the questionnaire and to comment if there was something they thought needed to be changed. A few changes were made after the pilot study and the results from the ten participants were not used in the main study.

The participants were randomly selected, all from the same university in the south of Sweden. Contacts were made with their responsible teachers for inquiring their approval for distribution of questionnaires during lectures. When approvals were given, the lectures were attended. Before the questionnaires were handed out at the lectures, the participants were informed about the purpose of the study, that any participation was voluntary and that they could cease their participation at any moment and that all questionnaires would be treated confidentially. Informed consent was obtained through the first page, the participants were asked to tick a box. The questionnaires were handed out to the participants either at the beginning or the end of their lectures and collected when completed. The participants spent approximately fifteen to twenty minutes completing the questionnaires.

In total, 305 questionnaires was handed out, of which 260 were considered to be usable and 25 were either incomplete or difficult to interpret and 20 questionnaires were not filled out at all. This led to an internal falling of 8.2 per cent, a external falling of 6.6 per cent and a total falling of 14.8 per cent.

Analysis

For analysis and processing of the data collected, Statistical Package of Social Science 17 (SPSS 17) was used. The level of significance was set at $p < 0.05$.

At an initial stage, Descriptives were used to obtain mean values of the variables included in the working model.

Correlation analyses were used to gain an overview of the relationships between the variables included in the working model, and to answer research question 4.

To answer research question 1, six regression analyses (backward-method) were done, to examine how basic needs satisfaction (autonomy, competence, and relatedness) affects each motivational regulation (amotivation, external, introjected, identified, and intrinsic), and barrier self-efficacy.

To answer research question 2, one regression analysis (backward-method) were made, to examine how motivational profile and barrier self-efficacy affects strenuous exercise.

Research question 3 was also answered using a regression analysis (backward-method), examining how basic needs satisfaction affects well-being.

Results

Presentation of the emerged results follows the same logic as the performed analysis, starting with descriptive data and relationships within the working model, followed by the result for the four research questions.

Descriptive data

The participants engaged in general in two to three strenuous (M=2.27; SD=2.01), moderate (M=2.41; SD=2.71) and light (M=2.89; SD=2.84) exercise bouts per week. They showed high levels (*max score: 72*) of well-being (M=47.10; SD=10.04). The participants showed in general high values on the basic psychological needs (*scale 1-5*) autonomy (M=3.47; SD=0.99) competence (M=3.25; SD=0.96) relatedness (M=3.46; SD=1.11). Their motivational profiles showed high values (*scale 0-4*) in intrinsic regulation (M=2.83; SD=0.90) and identified regulation (M=2.72; SD=0.93), somewhat lower values in introjected regulation (M=1.77; SD=1.05) and low values in external regulation (M=0.39; SD=0.61) and amotivation (M=0.37; SD=0.64). The participants barrier self-efficacy (*max score: 1300*) showed medium high values (M=557.92; SD=247.18).

The initial analysis could not identify any significant correlations between light exercise, moderate exercise and the independent variables. The following analysis are therefore made only on strenuous exercise.

Relationships within the working model

The results indicate some positive correlation between introjected regulation (r=.31), identified regulation (r=.50), intrinsic regulation (r=.45), autonomy (r=.48), competence (r=.52), relatedness (r=.40), barriers self-efficacy (r=.47), well-being (r=.19) and strenuous exercise. The results also showed a negative correlation between amotivation (r=.-29) and strenuous exercise.

Some positive correlation between identified regulation (r=.12), intrinsic regulation (r=.18), autonomy (r=.30), competence (r=.37), relatedness (r=.30), barriers self-efficacy (r=.26), strenuous exercise (r=.19) and well-being was shown.

Research question 1: How does basic needs satisfaction affect motivational profile and barrier self-efficacy?

Five regression analyses were made to examine how basic needs satisfaction affects each motivational regulation (see Tables 2 to 6). One regression analysis was also made to examine how basic needs satisfaction affects barrier self-efficacy (see Table 7).

Autonomy, competence and relatedness were positive predictors for intrinsic regulation, accounting for 44 percent of the variance (see Table 2).

Table 2 *Significant predictors (basic psychological needs) for intrinsic regulation*

Category	R	R^2adj.	F	df	Beta	p
Autonomy	.67	.44	69.32	3	.24	.01
Competence	.67	.44	69.32	3	.22	.01
Relatedness	.67	.44	69.32	3	.30	.001

Competence was a positive predictor for identified regulation, accounting for 34 percent of the variance (see Table 3).

Table 3 *Significant predictors (basic psychological needs) for identified regulation*

Category	R	R^2adj.	F	df	Beta	p
Autonomy	-	-	-	-	-	-
Competence	.58	.34	131.01	1	.58	.001
Relatedness	-	-	-	-	-	-

Competence was a positive predictor for introjected regulation, accounting for 1 percent of the variance (see Table 4).

Table 4 *Significant predictors (basic psychological needs) for introjected regulation*

Category	R	R^2adj.	F	df	Beta	p
Autonomy	-	-	-	-	-	-
Competence	.13	.01	4.14	1	.13	.05
Relatedness	-	-	-	-	-	-

Relatedness was a negative predictor for external regulation, accounting for 2 percent of the variance (see Table 5).

Table 5 *Significant predictors (basic psychological needs) for external regulation*

Category	R	R^2adj.	F	df	Beta	p
Autonomy	-	-	-	-	-	-
Competence	-	-	-	-	-	-
Relatedness	.16	.02	6.40	1	-.16	.05

Relatedness and competence were negative predictors for amotivation, accounting for 10 percent of the variance (see Table 6).

Table 6 *Significant predictors (basic psychological needs) for amotivation*

Category	R	R^2adj.	F	df	Beta	p
Autonomy	-	-	-	-	-	-
Relatedness	.33	.10	15.13	2	-.16	.05
Competence	.33	.10	15.13	2	-.20	.05

Competence was a positive predictor for barrier self-efficacy, accounting for 32 percent of the variance (see Table 7).

Table 7 *Significant predictors (basic psychological needs) for barrier self-efficacy*

Category	R	R^2adj.	F	df	Beta	p
Autonomy	-	-	-	-	-	-
Competence	.57	.32	122.12	1	.57	.001
Relatedness	-	-	-	-	-	-

Research question 2: How does motivational profile and self-efficacy affect exercise behavior?

A regression analysis was made to examine how the different motivational regulations and barrier self-efficacy affect strenuous exercise (see Table 8). Identified regulation, intrinsic regulation and barrier self-efficacy were positive predictors for strenuous exercise, accounting for 32 percent of the variance.

Table 8 *Significant predictors (motivational profiles and self-efficacy) for strenuous exercise*

Category	R	R^2adj.	F	df	Beta	p
Intrinsic regulation	.56	.32	39.87	3	.15	.05
Identified regulation	.56	.32	39.87	3	.25	.01
Barrier self-efficacy	.56	.32	39.87	3	.27	.001

Research question 3: How does basic needs satisfaction affect well-being?

A regression analysis was made to examine how competence, autonomy, and relatedness in exercise affect well-being (see Table 9). Competence in exercise was a positive predictor for well-being, accounting for 14 percent of the variance.

Table 9 *Significant predictors (basic psychological needs) for well-being*

Category	R	R^2adj.	F	df	Beta	p
Competence	.37	.14	13.86	1	.37	.001
Autonomy	-	-	-	-	-	-
Relatedness	-	-	-	-	-	-

A degree of positive correlation between autonomy (r = 0.30), competence (r = 0.37), relatedness (r = 0.30) and well-being was also shown.

Research question 4: Are there positive associations between exercise and well-being?

Some positive correlation between strenuous exercise (r = 0.19) and well-being was shown. No correlations was shown between light exercise, moderate exercise and well-being.

Discussion

The purpose of the present study was to examine relationships between motivational profile, self-efficacy, basic needs satisfaction, exercise behavior and well-being among Swedish university students. The main findings suggest that the basic psychological needs are positive predictors for intrinsic motivation and positive correlations was shown between the basic needs and well-being. The results also showed identified regulation, intrinsic regulation and barrier self-efficacy to be positive predictors for strenuous exercise.

How does basic needs satisfaction affect motivational profile and barrier self-efficacy?

Self-Determination Theory stipulates that satisfaction of the basic needs is essential for developing intrinsic motivation (Hagger & Chatzisarantis, 2007). For the activity, in this case exercise, to be satisfactory by itself and produce a feeling of inner joy during performance, it requires that the basic needs must be met. The study at hand showed autonomy, competence and relatedness in exercise to be positive predictors for intrinsic motivation, which supports what SDT stipulates. These findings are also in line with previous research, where positive correlations have been found between the basic needs and intrinsic motivation (e.g. Edmunds, Ntounamis, & Duda, 2006; Lindgren, 2010; Wilson & Rodgers, 2008). With regard to identified regulation, only competence in exercise proved to be a positive predictor. These findings are in line with Lindgren's (2010) study, where competence in exercise had the strongest correlation with identified regulation. In the present study, competence in exercise also turned out to be a positive predictor for introjected regulation, although it only explained one percent of the variance. These findings contradict what SDT stipulates as well as previous studies (e.g. Lindgren, 2010). More specifically, SDT stipulates that fulfillment of the basic needs leads to more self-determined motivation (Hagger & Chatzisarantis, 2007), and previous studies have shown negative correlations between introjected regulation and competence (Lindgren, 2010).

Since more or less all the participants in the study are young adults, they might show relatively high levels of introjected regulation and still satisfy their competence need. This might be one possible explanation for the fact that competence in exercise was a positive predictor for introjected regulation. Also worth mentioning is that participants in Lindgren's (2010) study had a mean age of 45, whilst participants in the present study had a mean age of 22. The results from the study at hand showed relatedness in exercise to be a negative predictor for external regulation, whilst both relatedness and competence in exercise were negative predictors for amotivation. These findings supports what SDT stipulates, that is, fulfillment of the basic needs leads to more self-determined motivation (Hagger & Chatzisarantis, 2007). In other words, if the participants satisfy the basic needs, the likelihood that they will show high levels of external regulation and amotivation decreases.

A regression analysis showed competence in exercise to be a positive predictor for barrier self-efficacy, which might not be so surprising since the concepts are closely related. As mentioned earlier, competence is about the feeling of effectively mastering challenging tasks and the exercise of personal capacity in a given domain (Deci & Ryan, 2002b), whilst barrier self-efficacy refers to the individual's confidence in their ability to exercise despite different types of obstacles/barriers (McAuley, 1992), in other words, another concept of competence.

How does motivational profile and self-efficacy affect exercise behavior?

The study showed positive correlations between introjected regulation, identified regulation, intrinsic regulation and strenuous exercise which indicate that participants who

showed high levels of introjected, identified and intrinsic regulation were the ones that engaged in the most strenuous exercise sessions per week. These findings support what SDT stipulates, more specifically, that self-determined motivation positively influences any given behavioral engagement, in this case exercise, and the importance of both extrinsic and intrinsic motivation (Deci & Ryan, 2000). These positive relationships between identified regulation, intrinsic regulation and exercise are in line with previous research (Buckworth et al., 2007; Sabiston et al., 2010; Wilson & Rodgers, 2004), as well as the positive correlation between introjected regulation and exercise among young adults (Brunet & Sabiston, 2011; Edmunds, Ntoumanis, & Duda, 2006; Standage, Sebire, & Loney, 2008; Wilson & Rodgers, 2004). According to Deci and Ryan (2002b), intrinsic regulation includes total self-determined behavior, in which joy and inner satisfaction are experienced during performance while a genuine interest in the selected task exists. When the individual experience identified regulation, the individual has accepted the behavior and feels identified with it and the activity feels meaningful. Introjected regulation on the other hand is characterized by more external factors such as avoiding guilt or feeling pride.

As mentioned earlier, young adults are motivated to engage in exercise due to weight control for appearance reasons and physical attractiveness (Ingledew & Sullivan, 2002; Sabiston, Crocker, & Munroe-Chandler, 2005; Strong, Martin Ginis, Mack, & Wilson, 2006), and these motives have shown positive associations with introjected regulation (Ingledew & Markland, 2008). The importance of introjected regulation among young adults to engage in exercise might partly be explained by this. These findings suggest that it is of great importance for the individual to feel intrinsically motivated to engage in strenuous exercise, to feel joy and inner satisfaction during performance. But this does not seem to be enough, external motives also appear to be of importance for the participants to perform exercise, such as avoidance of guilt, feelings of pride, and to feel identified with the behavior. The study also revealed a negative correlation between amotivation and strenuous exercise, which is supportive of SDT and in line with previous studies (Jonsson & Lidén, 2012; Lindgren, 2010). According to SDT, individuals who experience amotivation towards a certain behavior, finds no meaning with the task itself, in this case exercise, and therefore sees no reason why they should bother to get involved (Deci & Ryan, 2002b). If the individual sees no reason to exercise, it is not surprising that they do not engage in any exercise behaviors.

The regression analysis only showed identified and intrinsic regulation, of the different motivational regulations, to be positive predictors for strenuous exercise, which is in line with previous studies (e.g. Lindgren, 2010). Some studies on the other hand have not showed intrinsic regulation to be a positive predictor for strenuous exercise (e.g. Edmunds, Ntounamis, & Duda, 2006). Instead Edmunds and colleagues (2006) found introjected and identified regulation to be positive predictors for strenuous exercise. They argue that their findings might depend on participants placing some value on the exercise itself and recognize the health and well-being benefits that exercise might bring. Participation in exercise behaviors for the fun of it might not be enough, according to Edmunds, Ntounamis and Duda (2006). It is worth noting that the motivational regulations existing within SDT were not correlated significantly with moderate or light exercise. These findings, however, are in line with previous studies, where no significant correlations have been found between light and moderate exercise and the motivational regulations within SDT (e.g. Edmunds, Ntou-

namis, & Duda, 2006; Lindgren, 2010). One possible explanation for this might be that the participants light and moderate exercise are for transportation reasons, such as walking or cycling to and from school, work and shopping for food. These types of activities might be more habitual in nature, and therefore may require less cognitive processing than structured strenuous exercise.

A study by Buckworth and colleagues (2007) concluded that individuals with high levels of extrinsic motivation, had a high drop-out rate, with regard to exercise. Furthermore, their results indicated intrinsic motivation to be important for adherence; in other words, for the individuals to continue their exercise behavior, they need to develop intrinsic motivation (ibid). Similar results were shown by Jonsson and Lidén (2012), who found high levels of extrinsic motivation among university students who were not regularly physically active. University students who had been regularly physically active for six months or more, showed high levels of intrinsic motivation, indicating the importance of intrinsic motivation for adherence (ibid). As seen by the result from this study, competence, autonomy and relatedness were all positive predictors for intrinsic regulation, indicating the importance of satisfying the basic needs in exercise to develop intrinsic motivation. Following this reasoning, it is possible to associate basic needs satisfaction with adherence to exercise. However, no direct relationship is shown, so more research is needed.

The current study showed a positive correlation between strenuous exercise and barrier self-efficacy, implying that barrier self-efficacy has a positive impact on exercise behavior. This is consistent with previous research, whereas positive associations between exercise and self-efficacy have been acknowledged (e.g. Rovniak et al., 2002; Von Ah et al., 2004). Self- efficacy has also been shown to be one of the strongest mediators for performing physical activity and establishing and maintaining a regular psysically active lifestyle (Bandura 1997; SBU, 2007). The results from the present study also identified self-efficacy to be the strongest predictor for strenuous exercise. According to Bandura (1997) and SET, the belief is that if an individual has high self-efficacy regarding a specific activity, the likelihood increases that this individual begins or continues with any selected activity. This is also demonstrated by the study at hand, since the individuals with the highest levels of self-efficacy (barrier self-efficacy) were the ones with the greatest levels of exercise.

How does basic needs satisfaction affect well-being?

The regression analysis showed only competence in exercise to be a positive predictor for well-being, indicating that the most important basic need for well-being is competence in exercise. This finding provides an interesting possibility to further investigate if creating a competence-supportive environment in the exercise context is enough to increase well-being among university students. The results also showed positive correlations between all the basic needs and well-being, which is supportive of previous research (e.g. Ntoumanis, 2001; Reinboth & Duda, 2006; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Wilson, Longley, Moun, Rodgers, & Murray, 2006).

The correlations between basic needs satisfaction in exercise and well-being were stronger than the correlation between strenuous exercise and well-being, indicating the importance of basic needs satisfaction in exercise for well-being. More specifically, it seems im-

portant that exercise provides meaningful connections with others and make the individual feel comfortable and involved in a context, and the individual should feel competent and master challenging tasks through the exercise. Moreover, the exercise should be self-chosen and make the individual feel in control of his or her own actions. These results support what STD stipulates, that is, satisfaction of the basic psychological needs is essential for mental development, integrity and well-being (Deci & Ryan, 2002b). These findings may provide some practical implications for instructors and other health practitioners that might have to reconsider their way of working and put more emphasis on creating an environment were the basic needs can be satisfied. However, more research is needed to further investigate the effects of basic needs satisfaction on well-being.

Are there positive associations between exercise and well-being?

The analysis revealed some positive correlation between strenuous exercise and well-being, which supports the growing body of research indicating positive effects of exercise on well-being and health (e.g. Physical activity in the prevention and treatment of disease, 2008). However, the results did not show any positive correlation between light or moderate exercise and well-being. These findings do not mean that light and/or moderate exercise cannot result in any positive effects regarding well-being; however, this study could not identify any positive associations. Nevertheless, light and moderate exercise and PA are important for preventing and treating a variety of physical and mental illnesses and therefore crucial for well-being (Physical activity in the prevention and treatment of disease, 2008).

One possible explanation for the absence of positive correlations between light or moderate exercise and well-being might be the sample. More specifically, university students are in general rather young of age, and participants in the current study had a mean age of 22. Light and moderate exercise is often suggested as a way of treating and preventing a variety of public health problems, such as cardiovascular disease, hypertension and diabetes, and therefore important for well-being (Physical activity in the prevention and treatment of disease, 2008). Seeing as these types of health problems are more common at an older age (The National Public Health Report, 2009), the light and moderate exercise might not have the same effect on young university students as it might have on older adults. To improve university students well-being, it seems as if they have to engage in exercise with high intensity.

From the working model to the empirical model

As mentioned earlier, for the purpose of this study, a working model was developed (see Figure 2). The analysis however, proved the model to be only partly true, so an empirical model was proposed (see Figure 3).

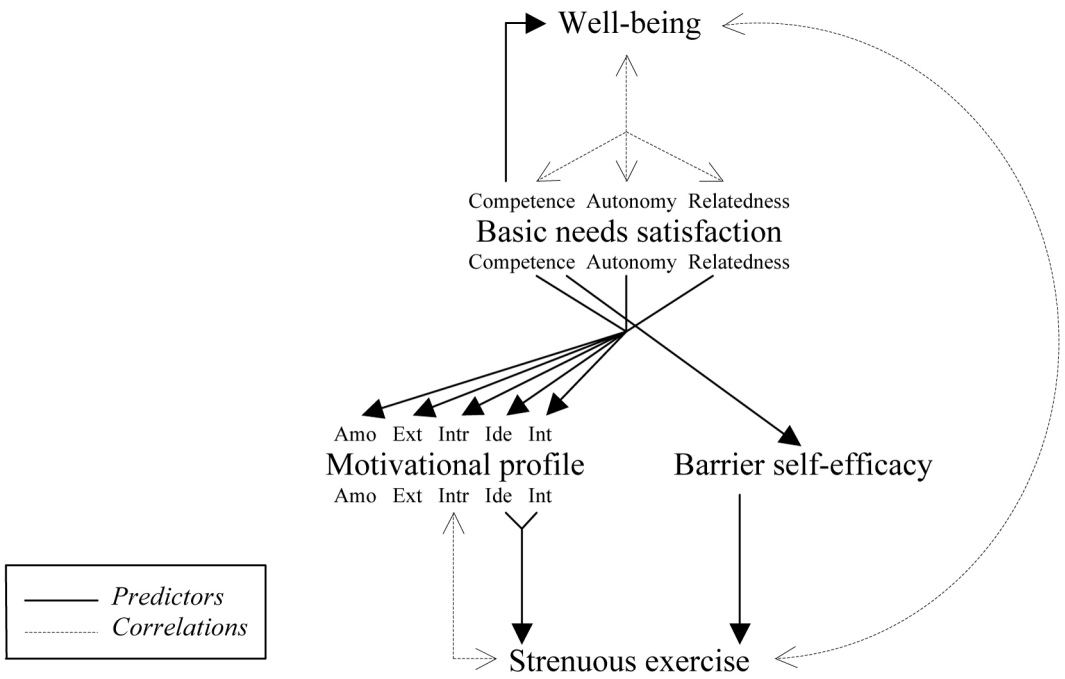

Figure 3. *Empirical model of the relationships between well-being, basic needs satisfaction, motivational profile, barrier self-efficacy and strenuous exercise.*

The model shows some positive correlations between autonomy (r=.30), competence (r=.37), relatedness (r=.30) and well-being, however, only competence (β=.37) proved to be a positive predictor for well-being, accounting for 14 percent of the variance. A weak positive correlation between well-being (r=.19) and strenuous exercise was also shown. Autonomy (β=.24), competence (β=.22) and relatedness (β=.30) proved to be positive predictors for intrinsic regulation, accounting for 44 percent of the variance. Only competence was a positive predictor for introjected and identified regulation (β=.58/.13), accounting for 34 and 1 percent of the variance respectively . Furthermore, relatedness (β=-.16) was a negative predictor for external regulation, accounting for 2 percent of the variance. Both relatedness (β=-.16) and competence (β=-.20) were negative predictors for amotivation, accounting for 10 percent of the variance. Competence (β=.57) was also a positive predictor for barrier self-efficacy, accounting for 32 percent of the variance. Identified regulation (β=.25) , intrinsic regulation (β=.15) and barrier self-efficacy (β=.27) proved to be positive predictors for strenuous exercise, accounting for 32 percent of the variance. A positive correlation was also shown between introjected regulation (r=.31) and strenuous exercise.

Methodological discussion

A pilot study was conducted at an initial stage, after which a few changes were made, improving the questionnaires legibility and in turn, its validity. The fact that the author was present at the implementation of the questionnaire probably contributed to the relatively low total falling off about fifteen percent. The internal falling were mainly due to incomplete questionnaires or that they were difficult to interpret, which is somewhat to be expected with questionnaires. The same goes for the external falling, which also is difficult to affect. With the author present, the participants had the chance to ask questions about

the questionnaire if something was unclear. The relatively low total falling can be seen as a strength of the study at hand.

For the purpose of the study a questionnaire was created which contained instruments with supported reliability and validity. The fact that validated instruments were used should also be seen as one of the present study's strengths. One could argue that the validity of the instruments is jeopardized since Swedish translations of the instruments were used; worth noticing though is the accurate and careful procedure of the translation (for more information see Josefsson & Ivarsson, 2010). The majority of results from the present study seem to be in line with previous research and supportive of the theoretical framework used for the study. One could therefore argue, albeit with some caution, that the results from the present study could be seen as generalisable to other university students, at least in Sweden. The relatively large sample of participants can also be seen as a contributing factor for the generalizability of the results. It is of importance to mention that the correlations and predictors acknowledged in the present study are just that; the causal relationships discussed above should therefore be seen merely as possible hypothesis.

Implications

This study could only identify positive correlations between strenuous exercise and well-being. These findings suggests that to promote Swedish university students' well-being through exercise, the exercise should be of high intensity. Structured exercise programs within Swedish universities should therefore focus more on high intensity exercise, and not only on light and/or moderate exercise.

All the basic needs in exercise showed positive correlations with the students well-being. However, only competence in exercise proved to be a positive predictor for well-being. This implies that it is essential for the students so satisfy their basic needs in exercise in order to improve well-being. More focus should be on making the students feel competent in the exercise domain, especially in high intensity exercise. These findings should be provided to personnel working at gyms and health centers, etc., so that they can help create an environment with focus on basic needs satisfaction, with special emphasis on competence in exercise.

As shown by the results, identified regulation, intrinsic regulation and barrier self-efficacy were positive predictors for strenuous exercise. These findings could be used in future interventions aiming to increase university students strenuous exercise, and already existing exercise programs. Focus should be on helping the students develop intrinsic motivation towards exercise, and as seen by the results, this could be done by satisfaction of the basic needs in exercise. Intrinsic motivation is especially important in exercise, since it has shown positive correlations with adherence (Buckworth et al., 2007; Jonsson & Lidén, 2012). Furthermore, the students barrier self-efficacy should be supported, which could be done by targeting one or more of the various sources (individual's past experiences and accomplishments, modelling, verbal persuasion, physical and emotional state) that form the basis of the individual's self-efficacy (Bandura, 1997).

Conclusion

In summary, the results from the present study provide further support for both Self-Determination Theory and Self-Efficacy Theory. For Swedish university students to engage in strenuous exercise, it appear important to satisfy the basic psychological needs through exercise. Satisfaction of the basic needs seem to result in more self-determined motivation and higher levels of barrier self-efficacy, which in turn increases the number of strenuous exercise sessions per week. Furthermore, satisfaction of the basic needs, especially competence through exercise, appears to be important for university students' well-being. Strenuous exercise itself may also have the potential to positively influence well-being.

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