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MAGISTERUPPSATS

Profiles of Exercise Dependence – A person centred approach to study potential mechanisms

Jenny Back

Sammanfattning
Syftet med denna studie var att undersöka om ångest, tvångsmässig passion och utseendeorienterad kroppsuppfattning kan förutsäga träningsberoende. Urvalet bestod av 206 motionärer (100 män och 106 kvinnor) från olika träningsgrupper, idrottsföreningar och studenter inom idrottsvetenskap, medelåldern var 28,50 år (SD = 9,97). I studien användes en personcentrerad analysmetod. Resultat från LPA indikerade att en modell med en 2-profillösning passade insamlad data bästa. Deltagare i Profil 1 rapporterade lägre nivåer av ångest, tvångsmässig passion och utseendeorienterad kroppsuppfattning jämfört med Profil 2. Profil 1 kallades "låg risk" och Profil 2 "hög risk" för att illustrera gruppernas relation till träningsberoende. Resultaten visade att det var möjligt att identifiera urskiljbara grupper bland deltagarna baserat på nivå av ångest, tvångsmässig passion och utseendeorienterad kroppsuppfattning vid T1 som kan förutsäga träningsberoende vid T2.

Abstract

The purpose of this study was to investigate the predictive ability of anxiety, obsessive passion and appearance orientation on exercise dependence. The sample consisted of 206 regular exercisers (100 males and 106 females) from different exercise groups, sport clubs and sport science classes. The mean age was 28,50 years (SD = 9,97). The study adopted a person-centred analysis. Results from the LPA indicated that the model with a 2-profile solution provided the best fit to the data. Participants in Profile 1 reported lower levels of anxiety, obsessive passion and appearance orientation compared to Profile 2. Profile 1 was labelled "low risk exercisers" and Profile 2 "high risk exercisers". The results showed that it was possible to identify discernible groups among participants based on level of anxiety, obsessive passion and appearance orientation at T1 that could predict measures of exercise dependence at T2.

Although exercise plays an important role in health maintenance and disease prevention (Statens Folkhälsoinstitut, 2015) dysfunctional exercise habits can have opposite effects and lead to both physical and psychological harm, for instance in the form of overuse injuries and withdrawal symptoms when unable to exercise (Hausenblas & Symons Downs, 2002a; Kerr, Lindner, & Blaydon, 2007; Landolfi, 2013).

The possibility that people could be considered addicted to exercise was first noticed in the 1970's when Baekeland (1970; ref in Hausenblas & Symons Downs, 2002b) investigated the effects of a one-month exercise deprivation on sleep among regular exercisers. Despite offering monetary compensation Baekeland could not recruit individuals who exercised regularly, five to six days per week that were willing to stop exercising for a month. Since then a vast amount of research regarding the prevalence, antecedents, and consequences of exercise dependence have been carried out, primarily through empirical studies of correlation between exercise dependence and other outcomes (Magee, Buchanan, & Barrie, 2015). Exercise dependence is described as a maladaptive pattern of exercise with a craving for physical activity that results in extreme exercise, which generates physical injuries and negative psychological symptoms such as anxiety and depression (Hausenblas & Symons Downs, 2002a). Furthermore, exercise dominates the afflicted individual's life, often at the expense of other areas in life, such as family, social life and work. If unable to exercise, withdrawal symptoms such as feelings of nervousness, guilt, anxiety, lowered self-esteem, headaches and physical discomfort have been documented (Kerr et al., 2007). Consequently, it is important to treat and prevent exercise dependence, and to identify individuals vulnerable to and at risk for developing the syndrome.

It has been suggested that individuals with certain personality traits are more prone to develop exercise dependence (Grandi, Clementi, Guidi, Benassi, & Tossani, 2011; Hausenblas & Giacobbi, 2004). People with obsessive-compulsive behaviour, anxiety, narcissistic personality traits and poor self-image are considered to be at greater risk (Hausenblas & Giacobbi, 2004; Landolfi, 2013; Schreiber & Hausenblas, 2015), but research about the relationship between different personality traits and exercise dependence is still limited (Miller & Mesango, 2014).

Exercise dependence – symptoms, prevalence and terminology
Exercise dependence is characterised by the presence of at least three of the following symptoms: (1) tolerance, (2) withdrawal, (3) the individual exercise more often and for longer periods of time than intended, (4) a lack of control over exercise habits, (5) excessive time spent exercising, (6) important social, occupational or recreational activities are given up or neglected in favour of exercise, and (7) exercise continues despite recurrent physical or psychological problems (Hausenblas & Symons Downs, 2002b). Individuals can exhibit either primary or secondary exercise dependence. Those with primary dependence engage in exercise for intrinsic reasons and do not use exercise to facilitate an eating disorder. In contrast, those exhibiting secondary dependence view physical activity as a means to an end, and use it to control and manipulate body composition (Coverley Veale, 1987; Veale, 1995). Exercise dependence afflicts individuals of all ages but it is considered more common among those younger than 35 years (Costa, Hausenblas, Olivia, Cuzzocrea, & Larcan, 2013). Research on prevalence has found that between 3% and 52% of regular exercisers can be considered at risk for exercise dependence. Among regular gym visitors, exercise dependence is assumed to afflict about 3% (Berczik et al., 2012; Sussman, Lisha, & Griffiths, 2011; Mónok et al., 2012), but in one study, as much as 42% of the clients in a French fitness centre could be categorised as exercise dependent (Lejoyeux, Guillot, Chalvi, Petit, & Lequen , 2012). Among Australian athletes across 25 sports 34,8% were at-risk for exercise dependence (McNamara & McCabe, 2012), and studies of triathletes have shown that

between 20% and 52% met the criteria for exercise dependence (Blaydon & Lindner, 2002; Youngman & Simpson, 2014). This wide range in prevalence can, in addition to different measures used, be attributed to sampling method, sample selection and sample size (Mónok et al., 2012). However, it indicates that symptoms of exercise dependence are relatively common among regular exercisers. Over the years, researchers have used several different terms to name the phenomenon of exercise dependence. Now the terms "exercise dependence" and "exercise addiction" are the most frequently used (Berczik et al., 2012). For the purpose of this study the term exercise dependence will be used, except when referring to results of studies that specifically have used other terms.

It has been suggested that exercise dependence might develop either as a coping mechanism to reduce worry about health, appearance or other stressors or as a result of irrational beliefs concerning how improvements in physical appearance may be used to gain increased attention, self esteem and expressions of love (Hausenblas & Giacobbi, 2004). These mechanisms implicate factors making individuals vulnerable to stress, promote excessive focus on appearance or stimulate a belief that appearance is important for self worth (Hill, Robson, & Stamp, 2015). Personality related factors such as anxiety (Spano, 2001; Grandi et al., 2011), obsessive-compulsive behaviour (Gulker, Laskis, & Cuba, 2001) neuroticism (Hausenblas & Giacobbi, 2004) and poor self-image (Grandi et al., 2011) have accordingly been found leave individuals at greater risk for developing exercise dependence.

Exercise dependence and anxiety
Anxiety is a psychological state that is characterized by feelings of uneasiness, panic or fear and is one of the most commonly experienced psychiatric symptoms (Stonerock, Hoffman, Smith, & Blumenthal, 2015). Regular exercise is generally believed to have positive effects on mood and anxiety (Ströhle, 2008) and there is a large body of literature examining the relationships between exercise and anxiety (Weinstein & Weinstein, 2016). Exercise has been found to give a moderate reduction of anxiety in highly anxious individuals (Petruzzello, Landers, Hatfield, Kubitz, & Salazar 1991). Other studies have shown that individuals with high trait anxiety or generalised anxiety disorder receive anxiety-reducing effects comparable to cognitive therapy from aerobic exercise training (Steptoe, Edwards, Moses, & Mathews, 1989). Recently, similar results have been reported, that physical exercise can reduce anxiety and symptoms of depression (Da Silva et al., 2012). The same study also showed that a lack of physical exercise is related to higher levels of anxiety and depression (Da Silva et al., 2012). However, research regarding the effects of exercise on anxiety is inconclusive. A recent meta-analysis showed that aerobic exercise demonstrated no significant, long-term effect for the treatment of anxiety disorders. Only trials that used placebo or waitlist controls showed benefits of exercise in reducing symptoms of anxiety disorders. These findings suggest that engaging in purposeful delay activities may lead to some reductions in symptoms of anxiety. Exercise, however, does not seem to have any special anxiety alleviating properties (Bartley, Hay, & Bloch, 2013).

Researchers studying the relationship between anxiety and exercise dependence have found that obligatory runners reported significantly higher levels of trait anxiety and perfectionism compared to non-obligatory runners (Coen & Ogles, 1993). Obligatory runners also reported feeling higher levels of anxiety when not running (Coen & Ogles, 1993). Similarly, Spano (2001) found associations between higher levels of trait anxiety and higher levels of commitment to exercise. More recently, Grandi et al. (2011) found that anxiety levels were higher in exercise dependent individuals compared to non-dependent exercisers. One possible explanation to the relationship between exercise dependence and anxiety is that exercise can serve as a means for coping with anxiety, anger or worries about appearance (Bamber, Cockerill, & Carroll, 2000).

Exercise dependence and obsessive passion

Several studies have demonstrated correlations between obsessive-compulsive personality traits and excessive exercise (Landolfi, 2013; Schreiber & Hausenblas, 2015; Young, Rhodes, Touyz, & Hay, 2013).

Vallerand and colleagues (2003) define passion as "a strong inclination toward an activity that people like, that they find important, and in which they invest time and energy" (Vallerand et al., 2003; p. 756). Passion can be either harmonious or obsessive. Harmonious passion serves as motivation, increases well-being and creates meaning in everyday life while obsessive passion elicits negative emotions and rigid patterns of behaviour that may prevent an individual from living a balanced and successful life (Vallerand et al., 2003).

Research about passion and exercise have shown correlations between both harmonious and obsessive passion regarding frequency of strenuous exercise and the total number of months an individual exercises (e.g. Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2012). Obsessive passion may have negative effects on both physical and mental well-being. For instance, obsessively passionate long-distance runners were more susceptible to suffer injuries compared to those without obsessive passion (Stephan, Deroche, Brewer, Caudroit, & Le Scnaff, 2009) Similarly, it has been established that obsessively passionate cyclists are more likely to continue to ride in unsafe conditions (Vallerand et al., 2003). Furthermore, levels of harmonious and obsessive passion affect the individual so that obsessively passionate experience more negative emotions on the days they do not engage in the activity compared to those with harmonious passion (Guerin, Fortier, & Williams, 2013).

Only a few studies so far have examined exercise dependence and passion but significant relationships between the two constructs have been found. Paradis, Martin and Hall (2013) have found that obsessive passion can predict all the symptoms of exercise dependence, i.e. tolerance, withdrawal, intention effects, lack of control, time, reduction in other activities and continuance (Hausenblas and Symons Downs 2002a). Those who have an obsessive passion for exercise may therefore, experience several symptoms of exercise dependence (Paradis et al., 2013). Obsessive passion is more strongly related to exercise dependence compared to harmonious passion (Parastatidou et al., 2014). Parastatidou et al. (2014) argue that exercise dependence can originate from negative feelings associated with exercise, and that obsessive passion thus may serve as a mechanism of exercise dependence.

Exercise dependence and body image

Body image is a multidimensional construct that reflects thoughts, beliefs, feelings and behaviours an individual have related to his or her own physical appearance (Cash, 2000). Body image covers cognitive, emotional and behavioural elements and is commonly divided in two parts. One is an attitudinal part that refers to how satisfied the individual is with specific body characteristics and/or his or her appearance in general, the other is a perceptual component which includes the individuals assessment of her or his own body size and body shape (Pruzinsky & Cash, 2002).

In the research of exercise dependence a poor self-image have been found to predict exercise dependence symptoms (Grandi et al., 2011). Furthermore, it is argued that individuals who exercise for the purpose of transforming their body shape are more prone to develop exercise addiction (Thornton & Scott, 1995). The desire to achieve body ideals, the rewards of being considered attractive, and the health benefits that come with a normal weight has led more people to try to change their body size and shape (Hausenblas & Fallon, 2006). However, changing one's physique is difficult. The difficulty of living up to appearance ideals has led to an increased prevalence in body image disturbances over the last three decades (Hausenblas & Fallon, 2006). Body image disturbance is a main component as well as a predictive factor for a variety of health problems such as depression, obesity and eating

disorders (Hausenblas & Fallon, 2006). Moreover, Landolfi (2013) states that people may become vulnerable to over-exercise when placing too much emphasis on their body. A recent study by Back (2015) supported this notion as it revealed significant correlations between exercise dependence and appearance orientation, reflecting how important an individual considers their appearance to be (Cash, 2000). The study also showed that exercise dependent individuals placed greater importance in their appearance compared to non-dependent (Back, 2015).

A person-centred approach
The amount of studies published using variable-centred analyses has generally been greater than studies relying on person-centred approaches (Morin, Morizot, Boudrias, & Madore, 2011). However, studies with person-centred analyses are increasingly proposed within the field of sport and exercise psychology (e.g. Wang, Morin, Liu, & Chian, 2016) but few studies of exercise dependence have applied this method (Magee et al., 2015). Person-centred approaches systematically analyse meaningful relationships in subgroups of individuals, clustering them into qualitatively and quantitatively distinct patterns or profiles (Morin et al., 2011). Exercise dependence is a complex phenomenon that includes and is influenced by an array of psychological, situational and personal factors (Egorov & Szabo, 2013). Hence it is plausible that adopting a person-centred approach could bring added value by searching for meaningful relationships in subgroups of individuals rather than just working with observed relationships between separate variables. Moreover, applying a person-centred approach could extend current knowledge, bring an increased understanding and be of practical importance for the design of effective interventions (Magee et al., 2015).

The present study
Previous research shows that certain personality related factors such as anxiety (Grandi et al., 2011), obsessive passion (Parastatidou et al. 2014) and appearance orientation (Back, 2015) are correlated with exercise dependence. However, research about the relationship between personality factors and exercise dependence is still limited (Miller & Mesango, 2014). Building on previous research it is anticipated that anxiety, obsessive passion and appearance orientation can predict exercise dependence (e.g. Back, 2015; Grandi et al., 2011; Hausenblas & Giacobbi, 2004; Parastatidou et al. 2014; Schreiber & Hausenblas, 2015). The purpose of this study is, therefore, to investigate the predictive ability of these personality related factors (anxiety, obsessive passion and appearance orientation) on exercise dependence. It was assumed that latent profile analysis (LPA) would provide a more comprehensive view of participants' level of exercise dependence compared to what would be possible with the factors anxiety, obsessive passion and body image as individual predictors.

Method
Participants
The participants were 206 regular exercisers (100 males and 106 females) from exercise groups, sport clubs and university sport science classes in the southwest of Sweden. Participants main sports included table tennis ($n = 1$), crossfit ($n = 2$), cycling ($n = 13$), dance ($n = 2$), soccer ($n = 7$), running ($n = 34$), golf ($n = 1$), gym training ($n = 40$), floor-ball ($n = 1$), orienteering ($n = 26$), swimming ($n = 5$) and triathlon ($n = 9$), the rest ($n = 65$) did not specify a main sport. Participants were between 18 and 60 years of age (M = 28,50, SD = 9,97).

Instruments

Participants were invited to complete a survey that collected information on demographics, exercise habits, exercise dependence, anxiety, obsessive passion and appearance orientation (see Appendix 1). The survey comprised the following instruments.

Godin Leisure-Time Exercise Questionnaire (GLTEQ)

The GLTEQ (Godin & Shepard, 1985), which consisted four questions that track the individual's leisure time physical activity. Frequency of activity per week with regards to strenuous, moderate and mild intensity and whether the individual exercises regularly is investigated (e.g., *"During a typical 7-Day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time?"*). Exercise frequency and intensity is calculated and analysed as a total score by summing the products of the separate components, as shown in the following formula; weekly leisure activity score = (9 × Strenuous) + (5 × Moderate) + (3 × Light). Strenuous exercise thus produces higher values than moderate exercise and moderate exercise gives higher values than mild exercise. Overall, high values indicate large amounts of exercise. Regularity of exercise is analysed separately (Godin & Shepard, 1985).

Exercise Dependence Scale Revised (EDS-R)

Exercise dependence was measured with the 21-item EDS-R (Symons Downs et al., 2004) which is a multidimensional measure of exercise dependence based on the criteria for substance dependence in the American Psychiatric Association's Diagnostic and Statistical Manual for Mental Disorders IV (DSM-IV). EDS-R differentiates between individuals that may be considered exercise dependent ("at-risk"), individuals who are not dependent but have symptoms of exercise-dependence ("nondependent symptomatic") and individuals without dependence and few or no symptoms ("nondependent asymptomatic") (Hausenblas & Symons Downs, 2002b). Classification into these groups are based on statements related to the seven DSM-IV criteria tolerance (e.g., *"I continually increase my exercise frequency to achieve the desired effects/benefits"*), withdrawal (e.g., *"I exercise to avoid feeling irritable"*), intention effect (e.g., *"I exercise longer than I intend"*), lack of control (e.g., *"I am unable to reduce how long I exercise"*), time (e.g., *"I spend most of my free time exercising"*), reductions in other activities (e.g., *"I would rather exercise than spend time with family/friends*), continuance (e.g., *"I exercise when injured"*). Each statement is ranked from 1 (*never*) to 6 (*always*) and higher scores indicate greater severity of exercise dependence. Individuals with scores of 5 or 6 for three or more subscales are considered to be "at-risk" for exercise dependence. Individuals with scores of 3 or 4 on three or more subscales are considered "nondependent symptomatic" and those with average scores of 1 or 2 are classed as "nondependent asymptomatic".

Hospital Anxiety and Depression (HAD)

General anxiety was measured with HAD (Zigmond & Snaith, 1983), a 14-item instrument developed for screening for clinically significant anxiety and depression among medical patients outside psychiatry. HAD consists of two subscales of anxiety (HAD-A) (e.g., *I feel tense or wound up*) and depression (HAD-D) (e.g., *I have lost interest in my appearance*) on a four-point scale with range 0 (*never*) to 3 (*always*). Total score on each subscale vary from 0-21, a higher score indicate more distress. In this study only the 7-item subscale for anxiety (HAD-A) was used.

The Passion Scale (TPS)

The Passion Scale (Vallerand et al., 2003) was used to measure participants' passion for exercise. TPS include two subscales measuring harmonious passion (e.g., *''Exercise is in harmony with other activities in my life''*) and obsessive passion (e.g., *''I have a tough time controlling my need to exercise'')*. Responses are provided on a scale ranging from 1 (*do not agree at all*) to 7 (*completely agree*). A higher score indicate higher levels of passion. In the present study only the sub-scale for obsessive passion was used.

Multidimensional Body-Self Relations Questionnaire (MBSRQ)

To assess body image, MBSRQ (Brown, Cash, & Mikulka, 1990; Cash, 2000) a 69-item instrument that measures the self-evaluative aspects of the concept of body image, was used. The instrument measures two dimensions, appraisal/evaluation and cognitive-behavioural orientation in relation to the three somatic areas of physical appearance, physical fitness and health/disease. MBSRQ consist of seven subscales (appearance evaluation, appearance orientation, fitness evaluation, fitness orientation, health evaluation, health orientation, illness orientation) that evaluate how good a person feel about their appearance, their physical shape and health, the importance of the various aspects and how much effort the individual puts into improving his or her appearance, physical shape and health (Brytek & Matera, 2015). For the purpose of this study only the appearance orientation subscale was used. Appearance orientation evaluates the individual's degree of investment in their appearance (e.g., *"It is important that I always look good."*). Participants respond on a five- point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*), a higher score denote a greater importance or investment in ones appearance. High scorers pay more attention to how they look and invest a lot of energy into taking care of their appearance. Low scorers are indifferent to their appearance, the way they look is not very important to them and they put no energy into their looks (Cash, 2000).

Procedure

A convenience sample of exercise groups, sport clubs and sport science classes was used. They were approached via e-mail with a short information about the study and asked if they would like to partake in the study. Time and place for data collection were scheduled with the groups who agreed to participate. To fit the purpose of the study, which was to investigate the predictive ability of anxiety, obsessive passion and appearance orientation on exercise dependence, a design with repeat measures was used. Using this type of design is motivated by the argument that it would be problematic to say that one variable could predict another when they are measured at the same time (Ivarsson, 2015). The first wave of data collection took place in the beginning of April 2016 (T1) and the second took place end of April 2016 (T2). The full questionnaire was administered at both measurements. During the first data collection meeting participants were informed about the purpose of the study, ethical considerations and were asked to complete the questionnaire. Each participant also got written information about the study, ethical considerations and a letter of informed consent to sign (see Appendix 2). The questionnaire took between 10 and 20 minutes for each participant to complete. The study was approved by Halmstad University local ethics committee.

Data analysis

First, descriptive statistics, and bivariate correlations were calculated with the IBM SPSS Statistics version 22 (SPSS Inc., Chicago, Illinois, USA). Then a latent profile analysis (LPA) was performed with M*plus* version 7.3 (Muthén & Muthén, 1998-2012). The LPA was conducted to identify subgroups in the sample, based on self-reports of personality related factors (anxiety, obsessive passion and appearance orientation) among participants' at T1.

Within the framework of LPA, posterior class probabilities are estimated to decide each participants profile belonging (Nylund, Asparouhov, & Muthén, 2007). Participants are directed towards the profile where they have the highest probability. A sequence of nested models, starting with one profile, is compared to investigate whether more complex models (i.e., a model containing one additional profile) fit the data better than previous models. In the present study, models with one to three profiles were tested to identify the optimal model based on statistical criteria and substantive meaning. First, the Bayesian Information Criterion (BIC; Henson, Reise, & Kim, 2007) and the sample-size adjusted BIC (SSA-BIC; Yang, 2006) were examined, with lower values indicating a better model fit. Then the Lo–Mendell–Rubin's adjusted likelihood ratio test (LRT: Lo & Rubin, 2001) and bootstrap likelihood ratio test (BLRT; Nylund et al., 2007) was used to compare the models. A test that is statistically significant (p < .05) indicates that the current model fit the data better than more parsimonious models. Third, the entropy criterion, which indicates how accurately participants are profiled into their respective profiles (Aldridge & Roesch, 2008), was inspected. Entropy values closer to one indicate greater accuracy in profiling the participants (Berlin, Williams, & Parra, 2014). To investigate whether participants in the identified latent profiles differed with regard to exercise dependence, the 3-step approach (BCH) was used (Asparouhov & Muthén, 2015). In the 3-step approach, an overall test of association using Wald's test is calculated together with pairwise profile comparison. Effect size (Cohen's *d*) for pair-wise comparisons between the two profiles was also calculated.

With regard to missing data 39 participants (19 %) dropped out and did not complete the second measure. Independent *t* test showed that there were no significant differences on the dependent variable (exercise dependence), between participants who completed both measures (T1 and T2) and those who did not; $t = 0.08$; $df = 204$; $p = 0.94$; Cohen's' $d = 0.00$. Since the missing and complete cases do not differ, the data can be considered missing completely at random (MCAR), in essence the missingness is likely haphazard (Enders, 2010). To deal with missing data full information maximum likelihood (FIML) was used. This missing data technique maximizes statistical power by using information from observed data (Enders, 2010).

Results

Descriptive statistics

Descriptive statistics are presented in Table 1. Participants reported that they exercise regularly, about five times a week. Average length of workout was stated to be around 70 minutes and average workout intensity estimated to around 70 % of a maximal 100%. Looking at the full sample, participants experienced fairly low levels of exercise dependence, anxiety, obsessive passion and appearance orientation. Statistically significant correlations were found between exercise dependence and GLTEQ; $r(206) = 0.31$, $p = 0.00$, workout frequency; $r(206) = 0.21$, $p = 0.00$, average number of workout/week; $r(206) = 0.24$, $p = 0.00$, average length of workout; $r(206) = 0.25$, $p = 0.00$, anxiety; $r(206) = 0.31$, $p = 0.00$ and obsessive passion; $r(206) = 0.47$, $p = 0.00$ (see Appendix 3, Table 2).

Table 1.
Descriptives and coefficient alphas of the study variables (n = 206).

Variable	M (SD)	α
1. GLTEQ	60.50 (26.28)	NA
2. Workout frequency	2.76 (0.49)	NA
3. Average number of workout/week	5.38 (2.86)	NA
4. Average lenght of workout (minutes)	72.06 (23.93)	NA
5. Average intensity of workout (%)	73.70 (10.37)	NA
6. Exercise dependence	15.69 (10.70)	0.86
7. Anxiety	6.66 (3.80)	0.82
8. Obsessive passion	19.58 (8.28)	0.86
9. Appearance orientation	2.93 (0.72)	0.86

Note: *p<0.05; ** p<0.1

GLTEQ, Godin Leisure-Time Exercise Questionnaire; Workout frequency; Frequency of exercise "long enough to work up a sweat" (1-never/rarely, 2-sometimes, 3-often)

Latent profile analysis (LPA)

Results from the LPA indicated that the model with a 2-profile solution provided the best fit to the data (see Appendix 3, Table 3, for model fit indices). The two profiles contained 156 (Profile 1), and 50 (Profile 2) participants, respectively. The profiles differed in terms of anxiety, obsessive passion and appearance orientation. Subscale scores are provided in Table 4. Participants in Profile 1 reported lower levels of anxiety, obsessive passion and appearance orientation compared to Profile 2. Mirroring the results and previous research indicating that anxiety (Grandi et al., 2011), obsessive passion (Parastatidou et al. 2014) and appearance orientation (Back, 2015) could be mechanisms behind exercise dependence. Profile 1 was labelled "low risk exercisers" and Profile 2 "high risk exercisers". Results from the 3-step approach were also used to analyse whether latent profile membership at T1 could predict measures of exercise dependence at T2. There were statistically significant differences between the two profiles for exercise dependence at T2, $\chi^2 (1) = 7.16$, $p = 0.01$, Cohen's' d effect size = 0.47. The results thus show that it was possible to identify discernible groups among participants based on level of anxiety, obsessive passion and appearance orientation that could predict measures of exercise dependence at T2.

Table 4.
An overview of the profiles.

	Profile 1 Low risk exercisers (*n*=156)		Profile 2 High risk exercisers (*n*=50)	
	M	*SD*	*M*	*SD*
Independent variables:				
Anxiety	5.09	3.75	11.40	6.51
Obsessive passion	17.45	10.99	26.06	11.03
Apperance orientation	2.79	0.87	3.35	0.71
Dependent variable:				
Exercise dependence	14.48	12.37	20.57	13.29

Discussion

The purpose of this study was to investigate the predictive ability of anxiety, obsessive passion and appearance orientation on exercise dependence. It was hypothesized that these personality related factors would predict exercise dependence. In summary the results of the present study was in line with the hypothesis, as it was possible to identify distinct groups of participants based on their level of anxiety, obsessive passion and appearance orientation at T1 that differed in terms of exercise dependence at T2. The LPA showed that a model with two profiles provided the best fit to the data. Profile 1 reported lower levels of exercise dependence, anxiety, obsessive passion and appearance orientation compared to Profile 2 and the two profiles where, extending on previous research, labelled "low risk exercisers" and "high risk exercisers" respectively.

The predictive ability of anxiety, obsessive passion and appearance orientation on exercise dependence
In previous studies (e.g., Grandi, et al., 2011; Hausenblas & Giacobbi, 2004) it has been suggested that people with certain personality traits are more prone to develop exercise dependence. Individuals with obsessive-compulsive behaviour, anxiety, narcissistic personality traits and poor self-image in particular are considered to be at greater risk (Hausenblas & Giacobbi, 2004; Landolfi, 2013; Schreiber & Hausenblas, 2015).
The results of this study are in line with previous research and shows that personality related factors such as anxiety, obsessive passion and appearance orientation may be considered important potential mechanisms explaining exercise dependence.
    Examining the study results more closely and in the light of previous research, several potential explanations to how and why these personality related characteristics may be mechanisms by which exercise dependence appear. First, studies of anxiety have shown correlations with exercise dependence (Grandi et al., 2011; Spano 2001) and that exercise can have anxiety-reducing effects (Da Silva et al., 2012; Petruzzello et al., 1991). A potential explanation to why high levels of anxiety may be considered a mechanism behind exercise dependence may therefore be that the individual becomes dependent on exercise for its anxiety reducing effects (Bamber et al., 2000). Results about the effects of regular exercise on anxiety are however, inconclusive. Benefits of exercise in reducing symptoms of anxiety have mainly been shown in trials that used placebo or waitlist controls. Thus it seems that exercise does not have any special anxiety alleviating properties, rather it suggests that engaging in purposeful delay activities may lead to some reductions in symptoms of anxiety (Bartley et al., 2013). This brings additional clarity to the relationship between exercise dependence and anxiety. Rather than becoming dependent on exercise for it's anxiety-reducing effects the exercise dependent may engage in exercise as a way of coping with their anxiety. Although it

may not have any long-term alleviating effects, engaging in exercise may work as a purposeful delay activity and give some reductions in anxiety symptoms.

Second, the participants in the "high risk exercisers" did not only experience higher levels of anxiety but also of obsessive passion. Previous research shows that obsessive passion is correlated to all symptoms of exercise dependence (i.e. tolerance, withdrawal, intention effects, lack of control, time, reduction in other activities and continuance) (Paradis et al., 2013), and that obsessively passionate individuals experience negative emotions on days when they do not exercise (Guerin et al., 2013). Obsessive passion may work as a mechanism by which exercise dependence appear by motivating individuals to exercise to avoid the negative emotions experienced when they don't exercise. This idea is supported by Parastatidou et al. (2014) who argue that exercise dependence can originate from the negative emotions about exercise that is generated by obsessive passion. Third, higher scores of appearance orientation indicated that "high risk exercisers" placed greater importance in their appearance compared to "low risk exercisers". Body image disturbance is a predictive factor for health problems such as depression and eating disorders (Hausenblas & Fallon, 2006). Results from this study indicate that a body image with too much focus on appearance may be a component and predictive factor of exercise dependence.

Overall, the current study extends previous knowledge of mechanisms behind exercise dependence by applying a person centred approach. Moreover the findings of this study may strengthen the notion that certain personality characteristics may be considered important mechanisms behind exercise dependence.

Methodological reflections

Most of the previous studies of exercise dependence have used variable-centred analyses and there have been an interest to conduct studies with person-centred analyses in order to bring increased theoretical and practical understanding of exercise dependence (Magee et al., 2015). As previously discussed, exercise dependence is a complex phenomenon that includes and is influenced by many different psychological, situational and personal factors (Egorov & Szabo, 2013). Because of the complex nature of exercise dependence it is plausible that a person-centred approach where meaningful relationships are clustered into qualitatively and quantitatively distinct patterns or profiles (Morin et al., 2011) will provide more useful insights compared to looking at variables separately. Another important methodological aspect was that a time delay between measures was introduced. This reduces method bias by reducing the participants' motivation and ability to use previous answers to fill in gaps in what is recalled, draw conclusions about missing details or answer subsequent questions (Podsakoff, MacKenzie, & Podsakoff, 2012). Important strengths of this study therefore lie in its design, with repeated measures and a person-centred approach. However, the study also has its limitations. One of them was the fact that 39 participants (19 %) dropped out and did not complete the second data collection. If there is systematicity to the missing data (for example if those not answering the second measure all were individuals with high levels of exercise dependence at the first measure) it can be hard to make accurate conclusions about the results from the study (Enders, 2010). In the current study independent *t* test showed that there were no significant differences on the dependent variable (exercise dependence), between participants who completed both measures (T1 and T2) and those who did not. Therefore data was considered MCAR, which is regarded as purely haphazard missingness and the observed data can be viewed as a random sample of the data that would have been analysed if complete (Enders, 2010). Another limitation is the relatively short period of time that passed between T1 and T2, and it may be discussed to what extent changes can occur between measurements. The results of this study indicated that 50 (25%) of the study's participants could be categorized into the "high risk exercisers" profile. It could be discussed

if this is a representative figure, but it is in line with previous research which has found that between 3% and 52% of regular exercisers can be considered at risk for exercise dependence, depending on the population (e.g. Berczik et al., 2012; Lejoyeux et al., 2012; McNamara & McCabe, 2012). Many of the participants in this study came from groups were previous research have shown high prevalence of exercise dependence (e.g. running, triathlon and gym training) which supports the number of participants identified as "high risk exercisers".

An important reflection to make is regarding effect size. Just looking at the p value for the differences between the two profiles on exercise dependence at T2 does not tell us how big the difference between the groups are (Ivarsson, Andersen, Stenling, Johnson & Lindwall, 2015). In the current study a Cohen's d effect size = 0.47 showed that differences between groups could be considered medium to large (Cohen, 1992), which essentially means the results outlined above were supported.

Implications

Findings from the current study can be of importance to professionals in, for example, sport clubs, health care, gyms, sport and exercise psychology etcetera. Although exercise plays an important role in health maintenance and disease prevention, it is important for those working to promote health to understand that for individuals with certain personality characteristics healthy exercise behaviours can become uncontrollable and unhealthy instead. It could also be argued that different inclusion criteria may be needed for exercise interventions. Individuals with personality characteristics putting them at risk for developing exercise would probably not, in the long run, benefit from an intervention aimed at encouraging exercise.

Because of exercise dependence's detrimental consequences to both physical and mental health it is important to prevent, detect and treat the condition. This study not only brings knowledge of factors that render individuals vulnerable to developing exercise dependence. It also gives important clues to factors that could be crucial to identifying such individuals. Furthermore it gives indications of aspects to focus on in interventions aimed at preventing and treating exercise dependence.

Future research

The majority of research on exercise dependence is cross-sectional. To advance research longitudinal studies are required (Costa, Coppolino, & Oliva, 2015). By looking at previously studied variables with a longitudinal design researchers could gain knowledge of how different factors contribute to the development of exercise dependence over time. This could, for instance, be of use for the design of effective interventions. Since exercise dependence, as previously mentioned, is a complex phenomenon it would also be of interest to collect not only quantitative but also qualitative data. A mixed-method design could potentially be beneficial in providing a more holistic perspective where experiences of exercise dependent individuals could be studied more comprehensively. Moreover, the instruments in the form of questionnaires that commonly are used to measure exercise dependence, does not work as diagnostic tools (Szabo, Griffiths, de la Vega Marcos, Mervo, & Demetrovics, 2015). If the researcher follows questionnaires up with in-depth interviews, identification of individuals that could be considered exercise dependent could be more conclusive. Furthermore, previous studies have often looked at exercise dependence focusing on samples practising a specific form of exercise (e.g. Magee et al., 2015). Since there exists many forms of exercise that are inherently different, exercise dependence might manifest differently between exercise forms. It would therefore be of interest to investigate whether different types of exercise dependence may exist in different exercise forms.

Conclusions

Personality characteristics can be considered important mechanisms behind exercise dependence and certain personality related factors may predict development of exercise dependence. The results from this study indicate that high levels of anxiety, obsessive passion and appearance-oriented body image specifically, render individuals vulnerable to developing exercise dependence.

Practically, the results of this study could be of use for health professionals (e.g. personal trainers, coaches in sport clubs, sport and exercise psychologists). This study and its results can help to increase the knowledge of exercise dependence and information that for some individuals (with certain personality traits) healthy exercise behaviours may become uncontrollable and unhealthy. Furthermore, it may be suggested that inclusion criteria might be needed for exercise interventions since individuals with personality characteristics putting them at risk for developing exercise probably would not benefit from an intervention aimed at encouraging exercise. Finally, the study also gives clues to factors that could help identifying individuals prone to developing exercise dependence and indications of aspects to focus on in interventions aimed at preventing and treating exercise dependence.

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Appendix 1

Questionnaire

Träningsvanor

Bakgrundsfrågor:

Ålder:

Kön:

Huvudsaklig träningsform:

Under en vanlig 7-dagars period (en vecka), hur många gånger på din fritid utför du följande typ av träning under mer än 15 minuter? Vänligen ange antal gånger nedan.

1. Ansträngande träning (hög hjärtfrekvens/hög intensitet)
Exempelvis löpning, jogging, hockey, fotboll, squash, basket, judo, ansträngande simning

……………ggr

2. Måttlig träning (inte uttröttande/måttlig intensitet)
Exempelvis rask promenad, lättare cykling, simning och dans

……………ggr

3. Mild träning (minimal ansträngning(låg intensitet)
Exempelvis yoga, fiske, bowling, golf, lätta promenader

……………ggr

4. Hur många gånger på din fritid deltar du i någon regelbunden fysisk aktivitet länge nog för att börja svettas och få snabb hjärtfrekvens? Vänligen ringa in ett alternativ nedan

Aldrig/Sällan   Ibland   Ofta

5. I genomsnitt, hur många gånger per vecka tränar du?

…………..ggr

6. I genomsnitt, hur långa brukar dina träningspass vara?

…………..minuter

7. I genomsnitt, vilken ansträngning/intensitet i % brukar dina träningspass vara? (Maxintensitet är 100%)

………………%

Mina känslor gentemot min idrott

Nedan följer ett antal påståenden som beskriver känslor som idrottare kan ha i relation till sin idrott. Det finns inga rätta eller felaktiga svar. Fundera inte för mycket inför varje påstående utan ange spontant det som bäst beskriver dina känslor. Besvara samtliga påståenden genom att ringa in den siffra som bäst motsvarar din känsla.

I vilken utsträckning håller du med om nedanstående påståenden	Håller inte alls med	Håller inte med	Håller delvis inte med	Varken eller	Håller delvis med	Håller med
1. Jag tränar för att undvika att känna mig irriterad.	1	2	3	4	5	6
2. Jag tränar trots att fysiska problem återkommer.	1	2	3	4	5	6
3. Jag ökar ständigt min träningsbelastning för att uppnå önskad effekt/vinst med träning	1	2	3	4	5	6
4. Jag kan inte minska den tid jag lägger ner på träning.	1	2	3	4	5	6
5. Jag tränar hellre än att umgås med min familj/vänner.	1	2	3	4	5	6
6. Jag lägger ner mycket tid på träning	1	2	3	4	5	6
7. Jag tränar tidsmässigt mer än vad jag har för avsikt att göra.	1	2	3	4	5	6
8. Jag tränar för att undvika att känna oro	1	2	3	4	5	6
9. Jag tränar även fast jag är skadad	1	2	3	4	5	6
10. Jag ökar ständigt antalet träningstillfällen för att uppnå önskad effekt/vinst med träningen	1	2	3	4	5	6
11. Jag kan inte minska antalet gånger jag tränar	1	2	3	4	5	6
12. Jag tänker på träning när jag borde vara fokuserad på skolan/jobbet	1	2	3	4	5	6
13. Jag lägger den mesta delen av min fritid på träning	1	2	3	4	5	6
14. Jag tränar tidsmässigt mer än vad jag förväntar mig	1	2	3	4	5	6
15. Jag tränar för att undvika att känna mig spänd	1	2	3	4	5	6
16. Jag tränar även fast jag har ihållande fysiska problem	1	2	3	4	5	6
17. Jag ökar ständigt den tid jag lägger ner på träning för att uppnå önskad effekt/vinst med träningen	1	2	3	4	5	6

18.	Jag kan inte minska belastningen i min träning	1	2	3	4	5	6
19.	Jag väljer att träna för att undvika umgänge med min familj/vänner	1	2	3	4	5	6
20.	En stor del av min tid ägnar jag till träning	1	2	3	4	5	6
21.	Jag tränar tidsmässigt längre än vad jag planerar	1	2	3	4	5	6

Mina känslor gentemot min idrott

I vilken utsträckning håller du med om nedanstående påståenden	Håller inte alls med	Håller inte med	Håller delvis inte med	Varken eller	Håller delvis med	Håller med	Håller absolut med
22. Jag har svårt att kontrollera mitt behov för att idrotta	1	2	3	4	5	6	7
23. Jag är nästan besatt av mitt idrottande	1	2	3	4	5	6	7
24. Idrott är det enda som jag riktigt brinner för	1	2	3	4	5	6	7
25. Om jag kunde skulle jag bara hålla på med idrott	1	2	3	4	5	6	7
26. Idrotten är så spännande och rolig att jag ibland tappar kontrollen över den	1	2	3	4	5	6	7
27. Jag har en känsla av att idrotten kontrollerar mig	1	2	3	4	5	6	7

Mina känslor gentemot mig själv

Följande påståenden innehåller en rad uttalanden om hur människor kan tänka, känna eller bete sig. Ange i vilken utsträckning varje påstående avser dig personligen. Sitt inte och fundera för länge. Det första svar som dyker upp för dig på varje påstående är antagligen riktigare än ett svar du tänkt på länge

1. Jag känner mig spänd eller "uppskruvad"

☐ För det mesta
☐ Ofta
☐ Då och då
☐ Inte alls

2. Jag får en slags känsla av rädsla som om någonting förfärligt håller på att hända

☐ Alldeles bestämt och rätt illa

☐ Ja, men inte så illa

☐ Lite, men det oroar mig inte

☐ Inte alls

3. Oroande tankar kommer för mig

☐ Mycket ofta

☐ Ofta

☐ Då och då men inte så ofta

☐ Bara någon enstaka gång

4. Jag kan sitta i lugn och ro och känna mig avspänd

☐ Absolut

☐ Oftast

☐ Inte ofta

☐ Inte alls

5. Jag får en slags känsla av rädsla som om jag hade "fjärilar i magen"

☐ Inte alls

☐ Någon gång

☐ Rätt ofta

☐ Mycket ofta

6. Jag känner mig rastlös som om jag måste vara på språng

☐ Verkligen mycket

☐ En hel del

☐ Inte så mycket

☐ Inte alls

7. Jag får plötsliga panikkänslor

☐ Verkligen ofta

☐ Rätt ofta

☐ Inte så ofta

☐ Inte alls

Mina känslor gentemot mig själv

I vilken utsträckning håller du med om nedanstående påståenden	Håller inte alls med	Håller mestadels inte med	Varken eller	Håller mestadels med	Håller absolut med
8. Innan jag går ut bland människor, kollar jag alltid hur jag ser ut	1	2	3	4	5
9. Jag är noga med att köpa kläder som får mig att se så bra ut som möjligt	1	2	3	4	5
10. Jag kollar mitt utseende i en spegel så fort jag får tillfälle	1	2	3	4	5
11. Innan jag går ut bland folk spenderar jag vanligtvis mycket tid med att göra mig iordning	1	2	3	4	5
12. Det är viktigt att jag alltid ser bra ut	1	2	3	4	5
13. Jag använder väldigt få skönhetsprodukter	1	2	3	4	5
14. Jag känner mig osäker om min styling inte är rätt	1	2	3	4	5
15. Jag har oftast på mig det som är praktiskt utan att bry mig om hur det ser ut	1	2	3	4	5
16. Jag bryr mig inte om vad folk tycker om mitt utseende	1	2	3	4	5
17. Jag ägnar mig särskilt mycket åt att fixa min frisyr	1	2	3	4	5
18. Jag tänker aldrig på mitt utseende	1	2	3	4	5
19. Jag försöker alltid förbättra mitt fysiska utseende	1	2	3	4	5

Appendix 2

Information letter

Enkät om träningsvanor och hälsa

Högskolan i Halmstad
Akademin för Hälsa och Välfärd
Psykologi inriktning idrott 91-120hp
D-uppsats
Jenny Back

Handledare:
Torbjörn Josefsson
Doktor i Psykologi
Torbjorn.Josefsson@hh.se

Syfte med studien
Syftet med studien är att undersöka kopplingar mellan träningsvanor och hälsa

Vad betyder deltagande i projektet?
Deltagande innebär att du vid två tillfällen kommer att få besvara en enkät med påståenden/frågor angående dina träningsvanor och känslor gentemot dig själv och din idrott. Enkäterna tar cirka 10 minuter vardera att fylla i.

Det är helt frivilligt att delta i studien och du kan när som helst dra dig ur utan att ange orsak.

Vad händer med informationen?
För att data från de olika mättillfällena ska kunna kopplas samman kommer dina enkäter få ett personligt löpnummer. Detta nummer är till för att data från mättillfälle ett och två ska kunna kopplas samman. Insamlad data kommer att analyseras i statistikprogrammet SPSS. Inga analyser sker på individnivå och inga obehöriga kommer att kunna ta del av enkäter eller data inmatad i SPSS under projektets gång samt tills data är färdiganalyserad. Kodlista med löpnummer kommer att förvaras till dess att all data är inmatad i SPSS. Därefter kommer denna lista att förstöras.

Kontaktuppgifter:
jenbac13@student.hh.se
0709-492711

Tack på förhand!

Med vänlig hälsning,
Jenny Back

Informed consent

Informerat samtycke för deltagande i studie

Jag har fått ta del av information om studien "Enkät om träningsvanor och hälsa". Genom att signera detta dokument ger jag mitt samtycke till att delta i studien. Jag är medveten om att deltagande är frivilligt och att jag när som helst kan välja att avsluta min medverkan utan att ange orsak.

Namn:

Datum:

Plats:

Signatur:

Appendix 3

Tables

Table 2.
Correlations of the study variables

Variable	1	2	3	4	5	6	7	8
1. GLTEQ								
2. Workout frequency	0,29**							
3. Average number of workout/week	0,54**	0,34**						
4. Average lenght of workout (minutes)	-0,01	0,12	0,11					
5. Average intensity of workout (%)	0,00	0,13	-0,01	0,34**				
6. Exercise dependence	0,31**	0,21**	0,24**	0,25**	0,07			
7. Anxiety	0,07	-0,04	-0,08	0,06	0,09	0,31**		
8. Obsessive passion	0,23**	0,17*	0,19**	0,21**	0,14*	0,47**	0,35**	
9. Appearance orientation	-0,08	0,07	0,03	0,05	0,05	0,13	0,34**	0,19**

*Note: *$p<0.05$; **$p<0.1$

GLTEQ, Godin Leisure-Time Exercise Questionnaire; Workout frequency; Frequency of exercise "long enough to work up a sweat" (1-never/rarely, 2-sometimes, 3-often)

Table 3.
Fit indicies of the different latent profile soulutions (n = 206)

	2 profiles	3 profiles	4 profiles
BIC	3028.32	3034.41	3042.26
Sample Adjusted BIC	2996.63	2990.06	2985.26
Lo-Mendell Rubin LRT Test	0.00	0.18	0.63
Bootstrapped Likelihood Ratio Test	0.01	0.20	0.03
Entropy	0.74	0.70	0.70

Jenny Back