Anxiety as a mediating factor of perfectionism and needs thwarting in relation to exercise dependence in team sports

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Abstract

The main aim of this study was to investigate the relationship between exercise dependence, basic psychological needs, perfectionism and anxiety. Specifically, the purpose was to examine if the relationship between psychological needs thwarting and exercise dependence as well as socially prescribed perfectionism and exercise dependence was mediated by anxiety. Participants were 59 team sport athletes with the mean age 20.36 years from twelve different team sport clubs in Sweden. Data were analysed using PROCESS tool in the program Statistical Package for the Social Science (SPSS). The PROCESS analysis indicated that anxiety did not mediate the relationship between psychological needs thwarting and exercise dependence or socially prescribed perfectionism and exercise dependence. Further, the results showed that needs thwarting and perfectionism had a direct effect on exercise dependence. This indicates that needs thwarting and socially prescribed perfectionism should be considered risk factors for exercise dependence in team sports. Anxiety did not predict exercise dependence. Based on the findings, exercise dependence is a complex process where different personal and social factors interact. Further research is recommended to increase the understanding about potential risk factors and mediating mechanisms that can explain how exercise dependence develop in team sports.

Keywords: anxiety, basic psychological needs, exercise dependence, mediation, needs thwarting, perfectionism, self-determination theory, socially prescribed perfectionism

Sammanfattning


Nyckelord: behovsfustration, grundläggande psykologiska behov, mediering, perfektionism, självbestämmandeteorin, socialt orienterad perfektionism, träningsberoende, ångest
The positive health benefits of physical activity are well known, and regular exercise is recommended for obtaining a healthy lifestyle (Statens folkhälsoinstitut 2017; Warburton, Nicol, & Bredin, 2006). However, excessive exercise can have adverse consequences, such as increased risk for injury, anxiety when unable to exercise and inferences with other life domains (Schreiber & Hausenblas, 2015).

At first, I seemed able to balance the time I spent training with the time I spent with my friends. But my regimens engulfed me at an astonishing pace. No sooner had I latched on to an obsession with burning at least four hundred calories on a specific elliptical machine than I had to add at least a half hour of weight lifting to my routine. I didn’t see anything wrong with turning down invitations to social events to stay at the gym. I wasn’t even concerned when I couldn’t focus in class because all I’d be thinking about was how I’d work one muscle group one day and another the next. Exercise quickly became the primary source of my happiness, self-esteem, and sense of stability. I didn’t realize until many years later, when I had an emotional meltdown upon learning couldn’t exercise due to an injury, how pathological my behavior had gotten. (Schreiber & Hausenblas, 2015, p. 33)

This compulsive exercise behaviour shares some of the same features of other addictions and has therefore been labelled “exercise dependence” or “exercise addiction” (Berczik et al., 2012). Although scholars have investigated the exercise dependence phenomenon during the last thirty years, it is still an understudied subject (Egorov & Szabo, 2013; Marques et al., 2019). Previous research have found associations between exercise dependence and different personality characteristics such as perfectionism (Hall, Hill, Appleton, & Kozub, 2009), anxiety and negative mood states (Back, Josefsson, Ivarsson, & Gustafsson, 2019; Grandi, Clementi, Guidi, Benassi, & Tossan, 2011). The basic psychological needs are another factor that has been linked to exercise dependence (Costa, Coppolino, & Oliva, 2016; Edmunds, Ntoumanis, & Duda, 2006). However, the relationship between exercise dependence and these factors is not completely understood. An attempt to better understand these relationships is to identify potential mediating processes that account for these relations.

The main focus in previous studies has been on individual athletes and regular exercisers, and until today few studies have investigated exercise dependence within team sports only (Marques et al., 2019). Considering the negative impact exercise dependence can have on physical and mental health, it is of interest to explore how different psychological factors relate to each other and what the underlying mechanisms are that determine the development of exercise dependence (Grandi et al., 2011). A better understanding of the antecedents and mediating processes for exercise dependence would help to improve prevention and treatment strategies (MacKinnon & Fairchild, 2009).

**Exercise dependence**

Researchers have over the years used various terms to name the phenomenon of exercise dependence, such as compulsive, excessive or obligatory exercise or running addiction (Kerr, Lindner, & Blaydon, 2007). In the present study the term exercise dependence will be used. Hausenblas and Symons Downs (2002a) define exercise dependence as “a craving for leisure-time physical activity, resulting in uncontrollable excessive exercise behavior, that manifests in physiological (e.g. tolerance/withdrawal) and/or psychological symptoms (e.g. anxiety, depression when unable to exercise)” (p. 90). Exercise dependence is characterised by several symptoms. These were enumerated by Hausenblas and Symons Downs (2002b) as: (1) tolerance, increased amount of tolerance for exercise or diminished effect by continuing the same amount of exercise, (2) withdrawal symptoms, for example anxiety when not able to exercise, (3) intention effect,
longer and bigger amount of exercise sessions than initially intended, (4) absence of control, unsuccessful effort to have control over exercise habits, (5) time, time spent active to acquire exercise (e.g. exercise vacations), (6) conflict, occupational, recreational or important social activities are unprioritized or neglected in advantage of exercise, and (7) continuance, exercise routine continues despite knowledge of recurrent physical or psychological problems that likely have been caused by the exercise habit. Hausenblas and Symons Downs (2002b) considered that at least three or more of the enumerated seven criteria are indicative of exercise dependence. Furthermore, based on the criteria of exercise dependence, Hausenblas and Symons Downs (2002b) also mean that the subjects can be classified into the following categories: individuals at risk for exercise dependence (individuals showing strong symptoms on several criteria), nondependent-symptomatic (individuals showing some symptoms but do not meet the criteria for exercise dependence) and nondependent-asymptomatic (individuals showing no symptoms of exercise dependence). Previous research has distinguished between primary and secondary exercise dependence. Primary is when the exercise is an end in itself and secondary is excessive exercise in combination with an eating disorder (Veale, 1995). Exercise behaviour seems to exhibit corporated clinical features to substance dependence. Although a clinical definition of such behaviour is yet to be distinctly specified and it is not recognized in a diagnostic terminology (Hausenblas & Symons Downs, 2002a). A study by Costa, Hausenblas, Olivia, Cuzzocrea and Larcan, (2013) shows that all ages are plagued by exercise dependence but it is considered more common among people younger than 35 years. Previous research have reported prevalence rates ranging from 0.3 to 42%, but the suggested estimation for regular exercisers is 3-7% and for professional athletes 6-9% (Marques et al., 2019). Studies that have compared individual and team sport athletes have reported no or only small differences between groups regarding the prevalence rate (Kovacsik, Soós, de la Vega, Ruíz-Barquín, & Szabo, 2018; Lichtenstein, Larsen, Christiansen, Støving, & Bredahl, 2014; Szabo, de la Vega, Ruíz-Barquín, & Rivera, 2013). The risk rate for exercise dependence in these studies varied between 7 and 19 % for the team sport athletes. Based on previous findings, exercise dependence seems to exist in various types of sports. However, it is not clear whether it is more or less prevalent in team sports than individual sports since team sport athletes have been an understudied population in exercise dependence research. Further studies are needed to get a better overview and understanding about this issue among team sports (Lichtenstein et al., 2014; Marques et al., 2019). Several factors have been linked to exercise dependence, and one that has been highlighted in previous studies is anxiety (e.g. Back et al., 2019).

Anxiety

Anxiety is a psychological established term that is characterized by feelings of worry, tailspin or dread and is one of the most widely experienced psychiatric symptoms (Stonerock, Hoffman, Smith, & Blumenthal, 2015). Regular physical activity is in general believed to have a positive impact on mood and anxiety (Ströhle, 2009). According to the Cognitive Appraisal Hypothesis (Szabo, 1995), an individual may use exercise as a way of coping with life-stress and worries. With time, the individual becomes dependent of the exercise routine in order to handle the stress and anxiety, and when forced to reduce the amount of exercise, withdrawal symptoms emerge (e.g. increased anxiety and negative mood) (Szabo, 1995).

Previous research on exercise dependence have found that non-dependent symptomatic individuals displayed significantly higher scores of anxiety and hostility than non-symptomatic (Grandi et al., 2011). Consistently, anxiety was found to be a main predictor for exercise dependence in regular exercisers (Back et al., 2019), and Costa et al. (2013) also found a positive correlation between negative mood states and exercise
dependence. In a sample of the general population, obsessive-compulsiveness and trait-anxiety were linked to higher levels of commitment to exercise (Spano, 2001). Based on these findings, anxiety may be a significant risk factor in the development of exercise dependence. Another factor that has been investigated in previous exercise dependence research is the concept of basic psychological needs (Costa et al., 2016; Edmunds et al., 2006).

**Basic psychological needs theory**

Self-determination theory (SDT) is often used to describe people's motivation and why they engage in a certain behaviour (Deci & Ryan, 2000). SDT consists of several sub-theories and one of them is Basic psychological needs theory. According to this theory, humans have three innate psychological needs: autonomy, competence and relatedness. Autonomy refers to the degree to which the individual experiences a feeling of control over the behaviour and can make independent choices. The need for competence refers to the feeling of being able to accomplish challenging tasks, while relatedness means the individual’s feeling of belongingness to other people. In order to achieve optimal functioning and well-being all three needs have to be satisfied. Deci and Ryan (2000) see humans as active organisms who seek environments and activities where growth and satisfaction of the needs can be fulfilled. However, if the environment does not provide opportunities for the individual to satisfy the needs, it can have negative consequences for the psychological health. This phenomenon is called needs thwarting (Deci & Ryan, 2000) and can be described as a process between the social context and the person, where thwarting occurs when the environment is controlling or actively demeans the person’s ability (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011a). For example, in a team sport setting the athlete could experience competence thwarting if the coach and/or other team members do not provide opportunities to fulfil the athlete’s potential. Similarly, the athlete could experience relatedness thwarting if the athlete feels excluded from the team. These factors could possibly be a driving force that make the athlete train more in order to feel adequate. Just because a person feels incompetent it does not necessarily indicate that the need for competence is thwarted. It could be due to lack of skills, and this would lead to a feeling of dissatisfaction (Bartholomew et al., 2011a).

According to Basic psychological needs theory (Deci & Ryan, 2000), thwarting of the psychological needs can make the individual develop compensatory behaviour or need substitutes like extrinsic motivational regulations, which eventually leads to ill-being. Compensatory behaviour is characterised by releasing self-control, rigid behavioural patterns (compulsively holding on to a certain behaviour because it provides a sense of structure and security) and oppositional defiance (a resistance to engage in socially requested activities) (Vansteenkiste & Ryan, 2013). These are similar to some of the symptoms of exercise dependence, for example absence of control, conflict with social relationships and exercising to avoid withdrawal symptoms and longer than intended. Therefore, exercise dependence might also be considered as a compensatory behaviour caused by needs thwarting. Rigid behavioural patterns is a way to protect the individual from negative emotions that results from needs thwarting, but it also prevents the individual from dealing with inner thoughts and emotions (Deci & Ryan, 2000). As suggested by Szabo (1995) some individuals may turn to exercise to decrease feelings of anxiety and life-stress. Theoretically, the training regimen could turn into a rigid behaviour when the individual increases the amount of exercise as a strategy to gain a sense of control and to decrease the negative emotions.

Previous research has confirmed the assumption that needs thwarting would have a negative impact on health and well-being, while satisfaction of the needs would lead to positive health outcomes. Studies have shown that high needs satisfaction could predict
positive affect and well-being (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011b; Deci & Ryan, 2000). In sport contexts, psychological needs thwarting predicted exhaustion and psychological ill-being (Bartholomew et al., 2011a; Gunnell, Crocker, Wilson, Mack, & Zumbo, 2013) and other negative outcomes, such as depression, negative affect, disordered eating and burnout (Bartholomew et al, 2011b). There is a lack of studies that have investigated how psychological needs thwarting influences the development of exercise dependence, but a study by Costa et al. (2016) shows a positive relationship between needs thwarting and exercise dependence. However, these studies only describe correlations and do not say anything about other factors that might contribute to the negative outcomes associated with needs thwarting. Bartholomew et al. (2011a) recommend that future studies should continue to examine how needs thwarting is connected to maladaptive outcomes in sport settings. Considering its connection to exercise dependence and psychological ill-being, there might be mechanisms like anxiety that mediate the relationship between needs thwarting and exercise dependence. Costa et al. (2016) found that basic psychological needs thwarting had a mediating effect on the relationship between maladaptive perfectionism and exercise dependence. These findings indicate that needs thwarting as well as perfectionism are relevant factors that could increase the risk for exercise dependence.

Perfectionism

Perfectionism is considered as a multidimensional concept. Hewitt and Flett (1991) divide perfectionism into three dimensions: self-oriented (setting high standards on oneself), other-oriented (demanding perfection from other people) and socially prescribed perfectionism (a perception that other demand perfection from oneself). In sport psychology literature, perfectionism is a debated concept. Some authors claim that some of the dimensions are linked to positive outcomes and that it therefore should be distinguished between adaptive and maladaptive perfectionism (Flett & Hewitt, 2005). Flett and Hewitt (2005) perceive perfectionism mainly as a maladaptive characteristic.

Previous research that have investigated potential factors linked to exercise dependence show that some personality characteristics might have an impact on the development of exercise dependence, and perfectionism has been highlighted in several studies (e.g. Costa et al., 2016; Hausenblas & Symons Downs, 2002b). Both self-oriented and socially prescribed perfectionism has been found to be positively related to exercise dependence (Hall et al., 2009; Miller & Mesagno, 2014). Results from another study showed that self-oriented perfectionism was the only unique predictor of all exercise dependence symptoms and socially prescribed perfectionism predicted two of the symptoms (Hill, Robson, & Stamp, 2015). Further, Hagan and Hausenblas (2003) found that individuals “at risk” for exercise dependence were more perfectionistic than non-dependent individuals. To date there are not many studies that have investigated potential underlying factors that can explain why some perfectionistic individuals are at higher risk for exercise dependence. Unconditional self-acceptance is one factor that has been found to mediate the relationship between perfectionism and exercise dependence (Hall et al., 2009). The authors of that study recommend further investigation of different psychological mechanisms behind the perfectionism-exercise dependence relationship. For the present study, anxiety was chosen as a mediating variable for investigation.

Maladaptive perfectionism, like perfectionistic concerns (i.e. fear of making mistakes and of negative social evaluation), socially prescribed perfectionism and pressure from team members or coach, could possibly lead to more negative affect, anxiety and perception of external pressure (Limburg, Watson, Hagger, & Egan, 2017; Mallinson & Hill, 2011). This is confirmed by previous research which have found a positive correlation between the dimension of perfectionistic concerns and anxiety in non-clinical populations (Gnilka, Ashby, & Noble, 2012). A meta-analysis shows that
both perfectionistic concerns and strivings were significantly related to different psychopathological outcomes, with perfectionistic concerns having larger effect than perfectionistic strivings on for example anxiety, depressive symptoms and obsessive-compulsive disorder symptoms (Limburg et al., 2017). Another meta-analysis by Hill, Mallinson-Howard and Jowett (2018) examined the relationship between perfectionism and different psychological variables in sports. The study found a difference between samples of team sport athletes and individual athletes regarding the relationship between perfectionistic concerns and cognitive anxiety, with team sport athletes showing a stronger correlation. It might be argued that socially prescribed perfectionism (similar to perfectionistic concerns) would play a bigger role in team sports compared to individual sports because of the unique psychological processes that exist in team sports. The greater social interactions in team sports can, on one hand, provide support and a feeling of relatedness, but it can also increase fears of failure and perceived perfectionistic demands (Hill et al., 2018). For this reason, the dimension of socially prescribed perfectionism will be in focus of the present study.

Perfectionistic concerns and socially prescribed perfectionism can be unique factors that force the athlete to increase the training so that the athlete can live up to the high standards set by others. However, an underlying factor could be anxiety since these dimensions of perfectionism are associated with negative affect and anxiety (Limburg et al., 2017). In that case, the athlete could also use the increased training as a way to cope with anxiety and pressure, as suggested by Szabo (1995). By including anxiety into the equation, that could possibly explain the relationship between perfectionism and exercise dependence better.

Previous findings indicate that both individual and team sport athletes are plagued by exercise dependence, but the reported difference in prevalence rate between these two groups is small (Lichtenstein et al., 2014). The majority of previous studies have mainly included athletes from individual sports (Marques et al., 2019). Therefore further studies are needed to get a better understanding if team sport athletes are plagued by exercise dependence to the same extent as individual athletes, and what factors that could explain why some individuals become dependent and some not (Hausenblas & Symons Downs, 2002b). Results from previous studies show that anxiety, needs thwarting and perfectionism are associated with exercise dependence. A limitation of these studies is that they are mainly cross-sectional and do not say anything about other intervening factors. In order to understand the whole process of how one variable (e.g. needs thwarting) affects another (e.g. exercise behaviour), it is important to explore mediating variables. In this type of process, the mediator transfers the effect of one variable on another variable (MacKinnon, Fairchild, & Fritz, 2007). By identifying mediating processes, it is also easier to develop efficient interventions that can focus on the significant variables (MacKinnon & Fairchild, 2009). According to the Interactional model for exercise dependence (Egorov & Szabo, 2013), it is an interaction of various personal, social, environmental factors and motive for exercise, combined with sudden life-stress, that determine if the training is used as a coping strategy for stress. All individuals that experience needs thwarting or perfectionistic demands from others do not necessarily develop exercise dependence, and it is therefore important to investigate potential mediators that could explain the interaction between different factors and how these increase the risk for exercise dependence. Considering the negative impact exercise dependence can have on physical and mental health, it is important to get a better understanding about potential risk factors in order to develop prevention strategies.
Aim and hypotheses

Based on previous research and the theoretical frameworks discussed above, the aim of this study was to investigate if anxiety mediates the relationship between needs thwarting and exercise dependence, as well as the relationship between socially prescribed perfectionism and exercise dependence in team sports. For this purpose, two mediation models were tested (see Figure 1 and 2). The hypotheses of this study were that anxiety mediates the relationship between needs thwarting and exercise dependence (H1) and that anxiety mediates the relationship between socially prescribed perfectionism and exercise dependence (H2).

Figure 1
Mediation model of the relationship between needs thwarting (predictor) and exercise dependence (outcome), mediated by anxiety (mediator)
Figure 2
Mediation model of the relationship between socially prescribed perfectionism (predictor) and exercise dependence (outcome), mediated by anxiety (mediator)

Method

Participants
59 participants (40 women, 18 men, 1 other) from twelve different team sport associations in Sweden participated in the study. The participants were between 15 and 37 years old ($M = 20.36$, $SD = 4.77$). The sports represented were volleyball ($n = 31$), football ($n = 10$), floorball ($n = 17$) and ice hockey ($n = 1$). The participants competed at division two ($n = 15$), division one ($n = 24$) or in the highest national league ($n = 20$).

Measures
The questionnaires begun with demographic questions regarding gender, age, level of competition and type of sport. The questionnaires were based on the measurements chosen for this study and they are described in more detail below.

Exercise Dependence Scale Revised (EDS-R)
A Swedish version (Lindwall & Palmeira, 2009) of The Exercise Dependence Scale-Revised (EDS-R) (Symons Downs, Hausenblas, & Nigg, 2004) was used to measure the risk of exercise dependence. The Swedish scale has been proved to be reliable and valid for measuring exercise dependence (Lindwall & Palmeira, 2009). This self-rating scale consists of 21 items that measures seven symptoms: withdrawal, continuance, tolerance, lack of control, reduction, time and intention effects. The participant rates the statements on a six-point Likert scale (1 = never, 6 = always). Examples of statements are “I continually decrease my exercise duration to achieve the desired effects/benefits”, “I exercise to avoid feeling anxious”, “I spend a lot of time exercising” and “I exercise despite recurring physical problems”. Higher points on the scale indicates higher risk of exercise dependence. Based on the scores, the participants are classified as either at risk for exercise dependence (scoring 5 or 6 on at least three of the criteria), nondependent-symptomatic (scoring 3 or 4 on at least three of the criteria) or nondependent-asymptomatic (scoring 1 or 2 on three or more of the criteria) (Symons Downs et al., 2004). In the current study Cronbach's alpha was 0.86.

Psychological Need Thwarting Scale (PNTS)
PNTS (Bartholomew et al., 2011a) is a self-rating scale for measuring perceived psychological needs thwarting in sport contexts. The questionnaire consists of 12 statements divided into the sub-categories autonomy, competence and relatedness, e.g. “I feel prevented from making choices with regard to the way I train”, “There are situations in my sport where I am made to feel inadequate” and “In my sport, I feel I am rejected by those around me”. The respondents answer the statements at a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). Cronbach's alpha for the total scale was 0.87 in the current study.

**Hospital Anxiety and Depression (HAD)**

HAD, a measurement for general anxiety by Zigmond and Snaith (1983) is a 14-item instrument composed for examination of anxiety and depression among non-clinical populations. It has been found to show good validity and sensitivity (Bjelland, Dahl, Tangen Haug, & Neckelmann, 2002). HAD includes two different subscales, anxiety (HAD-A) (e.g., I get a sort of frightened feeling like 'butterflies' in the stomach) and depression (HAD-D) (e.g., I feel as if I am slowed down). The scales are a four-point scale with range 0 (never) to 3 (always). Each subscale varies from 0-21 as a total score. In this study, the 7-item subscale for anxiety (HAD-A) was used. 6 points or lower on HAD-A indicate no symptoms of anxiety, 7-10 points mild to moderate anxiety and 11 points or more indicate a potential anxiety disorder. In this study, Cronbach's alpha was 0.80.

**Multidimensional Perfectionism Scale**

To measure the participants’ level of socially prescribed perfectionism the Multidimensional Perfectionism Scale (Hewitt & Flett, 1991) was used. This measurement includes 45 statements, of which 15 measure socially prescribed perfectionism on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). Examples of questions are “I find it difficult to meet others’ expectations of me” and “People around me think I am still competent even if I make a mistake”. In the present study a Swedish version of the scale was used (Saboonchi & Lundh, 1997). Cronbach's alpha was 0.84 in the current study.

**Design and procedure**

The study used a two-time point measurement design. The predictors perfectionism and basic psychological needs and the mediator anxiety were measured at the first time. Two weeks later the outcome variable exercise dependence was measured. The aim with using a design with several measurements was to increase the efficiency. Rather than using a cross-sectional design with only one measurement, a design with two or more measurements can increase the understanding of how psychological phenomena develop over time (Stenling, Ivarsson, & Lindwall, 2016). A temporal separation of the measurement of the predictor and outcome variable is also beneficial for reducing risk of method biases, since it makes the participants’ prior responses less salient and thus reduces the participants’ ability to use previous answers in later stages (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Various team sport associations in Sweden were contacted by email, telephone and personal contact. They received an invitation to participate and an information letter with a description of the study, ethical issues and contact information. Twelve teams with approximately 195 players in total confirmed their interest to participate in the study. The questionnaires were distributed online. The purpose with having the questionnaires online was to reach participants from different areas of the country and give the participants the opportunity to answer the questions when it suited them best, but within a time limit. A leader of the teams that had confirmed their interest to participate in the study received a link to the survey. That person was then asked to share the link with the team players. A reminder about each questionnaire was also sent out to the teams that participated.
An information part with ethics like “the data will be treated confidentially, they have the right to withdraw from the study at any time” was presented in the beginning of the survey, which was in line with the ethical standards of APA (American Psychological Association, 2017). This was followed by an informed consent that the participants had to agree to in order to proceed and complete the questionnaires. The participants always had the ability to reach one of the writers of the study if there were any questions. In order to create a personal code, the participants had to answer two short questions. This was done in order to ensure the participants confidentiality and so that the data from the two measurements could be combined. No unauthorized person had access to the list of codes or the measurement data. When the analyse was done the list of codes was destroyed.

Data analysis

Data was analysed using the Statistical Package for the Social Science (SPSS). Descriptive statistics were computed for all the variables. Based on the total score on the EDS-R, the participants were classified as “at risk”, “nondependent-symptomatic” or “nondependent-asymptomatic” using the scoring procedure for EDS-R (Symons Downs et al., 2004). In order to test the study’s hypotheses, two separate mediation analyses were performed using the PROCESS tool (Hayes, 2013). Mediation analysis can give a better understanding of the relationships between variables and it is a frequently used method in psychological research. Mediation is a process of when a mediating variable transfers the effect of an independent variable to a dependent variable. In the case of significant mediation, the independent variable (X) has an indirect effect on the dependent variable (Y) through the mediator (M) (MacKinnon & Fairchild, 2009). In the present study the aim was to test if needs thwarting (X) had an indirect effect on exercise dependence (Y) through anxiety (M) (Figure 1), and if socially prescribed perfectionism (X) had an indirect effect on exercise dependence (Y) through anxiety (M) (Figure 2). The mediation analyses also describe the direct effect of the two independent variables on the mediator (path a), and the mediator’s direct effect on the dependent variable (path b). Additionally, the mediation analyses test the direct effect of the independent variables on the dependent variable (path c’). In the mediation analyses bootstrapping with 95% confidence interval was used. The indirect effect is significant if zero is not included in the 95% confidence interval (Preacher & Hayes, 2004). For all the statistics a significance level of $p < .05$ was used.

Results

Descriptive statistics for the variables psychological needs thwarting, socially prescribed perfectionism, anxiety and exercise dependence is presented in Table 1. Based on the total score on EDS-R, 15 participants (25%) were classified as at risk for exercise dependence, 42 participants (71%) were classified as nondependent-symptomatic and one participant was classified as nondependent-asymptomatic. One participant was excluded from the classification due to missing values. Based on the sum score on HAD-A, 20 participants (34%) reported no anxiety problems, 19 participants (32%) mild to moderate anxiety and 20 participants (34%) were classified as having a potential anxiety disorder.
Table 1
Descriptive statistics (mean and standard deviation) for the variables exercise dependence, anxiety, needs thwarting and socially prescribed perfectionism

<table>
<thead>
<tr>
<th>Descriptive Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>59</td>
<td>3.75</td>
<td>0.76</td>
</tr>
<tr>
<td>HAD-A</td>
<td>59</td>
<td>8.15</td>
<td>3.86</td>
</tr>
<tr>
<td>PNT</td>
<td>59</td>
<td>3.23</td>
<td>1.08</td>
</tr>
<tr>
<td>SPP</td>
<td>59</td>
<td>3.30</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Note. ED = Exercise dependence, HAD-A = Anxiety, BPN = Psychological needs thwarting, SPP = Socially prescribed perfectionism.

Mediation analyses
The results from the first mediation analysis indicated a significant model, $F(2,56) = 7.06, p < .00$. Psychological needs thwarting had a significant direct effect on exercise dependence, $\beta = .43, p < .00$. The results also showed that needs thwarting significantly predicted anxiety, $\beta = .62, p < .00$. Anxiety did not predict exercise dependence, $\beta = .18, p = .25$. Furthermore, the results showed that psychological needs thwarting did not have an indirect effect on exercise dependence via anxiety, $ab = .11, 95\% CI [-.05, .33]$. A more detailed overview of the analysis is presented in Table 2.

Table 2
Regression results from mediation analysis of the effect of psychological needs thwarting on exercise dependence via anxiety

<table>
<thead>
<tr>
<th>Model</th>
<th>Value</th>
<th>SE</th>
<th>p</th>
<th>CI(lower)</th>
<th>CI(upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model without mediator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNT ED</td>
<td>.43</td>
<td>.08</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2_x-y$</td>
<td>.18</td>
<td>.06</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model with mediator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNT HAD-A (a)</td>
<td>.62</td>
<td>.05</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAD-A ED (b)</td>
<td>.18</td>
<td>.21</td>
<td>.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNT ED (c')</td>
<td>.32</td>
<td>.11</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect effect</td>
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<td>.10</td>
<td>-.05</td>
<td>.33</td>
<td></td>
</tr>
<tr>
<td>$R^2_m$</td>
<td>.39</td>
<td>.00</td>
<td>.00</td>
<td></td>
<td></td>
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<tr>
<td>$R^2_y$</td>
<td>.20</td>
<td>.00</td>
<td>.00</td>
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</table>

Note. PNT = Psychological needs thwarting (x), ED = Exercise dependence (y), HAD-A = anxiety (m).

The second mediation analysis indicated a significant model, $F(2,56) = 9.20, p < .00$. Socially prescribed perfectionism had a significant direct effect on exercise dependence, $\beta = .49, p < .00$. The results also showed that perfectionism significantly predicted anxiety, $\beta = .63, p < .00$. Anxiety did not predict exercise dependence, $\beta = .11, p = .48$. Furthermore, the results showed that socially prescribed perfectionism did not have an indirect effect on exercise dependence through anxiety, $ab = .07, 95\% CI [.12, .27]$. A more detailed overview of the analysis is presented in Table 3.
Table 3  
Regression results from mediation analysis of the effect of socially prescribed perfectionism on exercise dependence via anxiety

<table>
<thead>
<tr>
<th>Model</th>
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*Note*. SPP = Socially prescribed perfectionism (x), ED = Exercise dependence (y), HAD-A = anxiety (m).

Discussion

The aim of this study was to investigate if anxiety mediated the relationship between psychological needs thwarting and exercise dependence as well as socially prescribed perfectionism and exercise dependence in a team sport population. The results showed that anxiety did not have a significant mediating effect on these relationships. Further, both needs thwarting and socially prescribed perfectionism had a significant direct effect on exercise dependence. The results also showed that needs thwarting and perfectionism predicted anxiety, while anxiety did not predict exercise dependence.

The results from this study indicate that team sport athletes are at risk for exercise dependence, which other studies also have shown (Kovacsik et al., 2018; Lichtenstein et al., 2014). Furthermore, 34% of the participants showed symptoms of a potential anxiety disorder, which is about the same percent (25-43%) reported by professional football players across Europe (Gouttebarge, Backx, Aoki, & Kerkhoffs, 2015). In comparison to the 14.8% prevalence rate of anxiety disorder found in Back et al. (2019) study on exercise dependence, this could be considered high. However, the results in the present study did not show a significant association between anxiety and exercise dependence. This contradicts the findings from previous studies where anxiety was found to be a significant predictor for exercise dependence (Back et al., 2019; Grandi et al., 2011). A possible explanation why anxiety did not have a direct or a mediating effect on exercise dependence could be due to the characteristics of the sample. While previous studies have mainly used regular exercisers, university students or members of fitness centres, this study focused on team sport athletes. According to the Cognitive Appraisal Hypothesis (Szabo, 1995) some individuals might use training as a coping mechanism to reduce stress and anxiety. Although the participants in the present study showed high symptoms of anxiety, they might not use the training as a coping mechanism for anxiety to the same extent as exercisers or individual athletes. Some of the participants in the present study were active in sport associations that competed at the highest national level. Athletes in those teams might have better access to a sport consultant or have coping skills for emotional regulation (Gould, Dieffenbach, & Moffett, 2002; Katsikas, Argeitaki, & Smirniotou, 2009) which they can use as a more efficient coping strategy for stress and general anxiety instead of excessive exercise. For exercisers or athletes who do not have
the same available resources regarding their training, the risk for using exercise as a method to cope with anxiety could potentially be higher. Further, Egorov and Szabo (2013) suggest that athletes might have more mastery-oriented motives for exercise, like performance enhancement, compared to recreational exercisers who use more therapeutic motives for exercise, like improving mental and physical health or coping with stress. According to DiLodovico, Dubertret and Ameller (2018), runners who exercise for losing weight (i.e. secondary exercise dependence) might also be more prone to use exercise as a way to change their mood. Exercise dependent individuals for whom the exercise is the primary goal in itself, might not use exercise for mood regulation to the same extent. The motive for exercise could therefore be of importance when investigating how anxiety is related to exercise dependence. Although this is not an argument for that team sport athletes would not be at risk for exercise dependence, it rather emphasizes that the risk factors may differ depending on the sample of investigation. In team sports, certain mechanisms, like perfectionism or needs thwarting, may be more important in the development of exercise dependence than anxiety.

A drawback with the Cognitive Appraisal Hypothesis is that it does not account for other factors that determine if an individual uses training as a coping strategy. According to the Interactional model, it is a combination of different personal and social factors and motives for exercise together with life-stress that determine if an individual develop exercise dependence (Egorov & Szabo, 2013). Considering the results of the present study and the Interactional model, it seems like the process of who and how exercise dependence develops is complex since there might be many different factors that interact and increase the risk for exercise dependence. The factors that were investigated in the current study might not completely explain the development of exercise dependence for this population. Instead of anxiety, there might be other psychological or environmental factors in combination with needs thwarting and perfectionism that increase the risk for exercise dependence among athletes in team sports.

The results from the mediation analysis did not confirm the first hypothesis that needs thwarting would have an indirect effect on exercise dependence through anxiety. However, there was a direct effect of needs thwarting on exercise dependence, which is in line with previous research (Costa et al., 2016) and indicates that needs thwarting could be a risk factor for exercise dependence. The results suggest that when the training environment demeans the athlete’s ability or actively thwarts the need for relatedness, it can trigger the athlete to increase the amount of training, which eventually might lead to an addiction for exercise. According to Basic psychological needs theory, individuals who experience needs thwarting can develop compensatory behaviour (Deci & Ryan, 2000). Compensatory behaviour is manifested by rigid behavioural patterns, releasing self-control and oppositional defiance, which are similar to some of the criteria for exercise dependence (e.g. continuance, conflict and absence of control) (Hausenblas & Symons Downs, 2002a; Vansteenkiste & Ryan, 2013). The direct effect of needs thwarting on exercise dependence that was found in the present study indicates that exercise dependence could be a type of compensatory behaviour.

Previous research have found associations between needs thwarting and psychological ill-being (Bartholomew et al., 2011a; Gunnell et al., 2013), and the results in the present study confirm these findings since needs thwarting predicted anxiety. It also strengthens the theory that psychological needs thwarting would have a negative impact on the psychological health (Deci & Ryan, 2000). Even if previous studies have found that needs thwarting had a significant direct effect on exercise dependence (Costa et al. 2016) this relationship could not be explained in this study by anxiety as a mediator. In addition to the possible explanations discussed above, this might indicate that thwarting of the psychological needs can cause other types of psychological ill-being, for example frustration or low self-esteem (Vansteenkiste & Ryan, 2013), rather than...
anxiety, and that these psychological factors could play a mediating role in the relationship between needs thwarting and exercise dependence.

In addition to the basic psychological needs, Self-determination theory (SDT) also consists of goal contents and regulatory processes through which the goals are achieved. According to SDT, all three parts have to be considered to get a complete understanding of an individual’s psychological development and well-being (Deci & Ryan, 2000). Few studies have investigated the role of goal contents on exercise dependence, but previous findings indicate that certain motives, especially extrinsic goals for exercise are associated with exercise dependence (Sicilia, Alcaraz-Ibáñez, Lirola & Burgueño, 2017). As mentioned, the motives for exercise can differ depending on the athletic level and affect the development of exercise dependence (Egorov & Szabo, 2013). Therefore it could be important to consider the goal contents in combination with the basic psychological needs when exploring factors that can mediate the relationship between needs thwarting and exercise dependence.

Perfectionism is a factor that has been associated with exercise dependence in several studies (e.g. Hall et al., 2009; Miller & Mesagno, 2014) and the results from the current study confirm this relationship. This indicates that individuals who perceive that others demand perfection from oneself might have an increased risk for engaging in excessive amounts of exercise in an attempt to live up to these standards. The results in the present study showed that socially prescribed perfectionism predicted anxiety. This contributes to previous research that has found that this dimension of perfectionism could have a negative impact on the psychological health (Limburg et al., 2017). It also indicates that socially prescribed perfectionism is rather a maladaptive than adaptive characteristic, which confirms other researchers’ conception of perfectionism (Flett & Hewitt, 2005).

The second hypothesis of this study was not confirmed, since anxiety did not mediate the relationship between socially prescribed perfectionism and exercise dependence. Although anxiety could not transfer the effect from socially prescribed perfectionism on exercise dependence, it does not rule out that other factors could have a mediating role in the relationship between perfectionism and exercise dependence. Apart from anxiety, maladaptive perfectionism can lead to other psychopathological outcomes, such as depressive symptoms, eating pathology or OCD (Limburg et al., 2017). These factors could have a stronger mediating effect than general anxiety on the perfectionism-exercise dependence relationship. About one third of the participants in the present study reported mild to moderate levels of general anxiety and one third high levels. For some athletes, concern over mistakes and other maladaptive dimensions of perfectionism are likely to increase the anxiety levels, and specifically competitive anxiety (Flett & Hewitt, 2005). The perceived competitive anxiety and pressure could then lead to behavioural consequences, for example the athlete trains more in order to avoid failure, and could therefore be a stronger predictor and mediator of exercise dependence than general anxiety for the sample of the present study. Although it is difficult to say anything about the participants’ level of competitive anxiety, the results from the mediation analysis might have been different if another type of anxiety had been used as a mediator.

Another explanation why anxiety did not mediate the relationship between socially prescribed perfectionism and exercise dependence might be due to the fact that there are several dimensions of perfectionism. Previous studies have for example used the dimensions self-oriented perfectionism and perfectionistic self-presentational styles, which were also associated with anxiety and negative emotions, as well as with exercise dependence (Hall et al., 2009; Hill et al., 2015). Hill et al. (2015) conclude that self-imposed perfectionism can predict exercise dependence to a larger degree than perfection demanded by others. By using a different dimension with anxiety as a mediator the outcome of the analysis might have been different.
25% of the athletes in the present study were classified as at risk for exercise dependence, which is lower than risk rates found in professional triathletes (41%) (Blaydon & Lindner, 2002) and Australian elite athletes (34%) (McNamara & McCabe, 2012), but considerably higher than risk rates of 7-19% for team sport athletes found in previous studies (Kovacsik et al., 2018; Lichtenstein et al., 2014). These varying results and high risk rates could be attributed to methodological differences and the athletes’ high commitment (Szabo, Griffiths, de la Vega Marcos, Mervó, & Demetrovics, 2015). Symptoms of exercise dependence are for example loss of control over the behaviour and increased amount of training. A dependent team sport athlete who has scheduled training sessions many times a week, would have to do excessive training before or after the scheduled training. That would be considered challenging, if not physically impossible. The relatively high risk rates of exercise dependence reported by the athletes in this and previous studies could therefore be explained by the interpretation of the items of the scale (e.g. “I continually increase my exercise frequency to achieve the desired effects”, “I spend a lot of time exercising”) (Szabo et al., 2015). A majority of team sport athletes also have a trainer who plans the training and keeps an eye on the athlete. This is seldom the case for an exerciser, for whom it could be more difficult to know when the training becomes “too much”. Apart from EDS-R, previous studies have used different measures to examine the prevalence of exercise dependence, such as Exercise Addiction Inventory (Terry, Szabo & Griffiths, 2004), Obligatory Exercise Questionnaire (Pasman & Thompson, 1988) and Commitment to Exercise Scale (Davis, Brewer & Ratusny, 1993). The problem with this is that some of the measures fail to capture both the psychological and physiological aspects of exercise dependence, and that they are not based on the clinical criteria for substance dependence (Symons Downs et al., 2004).

**Method discussion**

The current study used a two-time point measurement design in order to enhance the understanding of the psychological mechanisms and how they interact (Stenling et al., 2016). A temporal separation of the measurements is a way to control for method biases and could be considered a strength of this study. Another procedure that was conducted to reduce biases was to keep the participants’ answers anonymous (Podsakoff et al., 2003). Cronbach’s alpha for all the measurements used in the present study were high, which indicates high reliability and internal consistency (Mitchell & Jolley, 2013). The different measurements have been used frequently in previous studies where they have displayed good validity. To collect the data, self-reported questionnaires were used. This entails possible risks for bias, such as social desirability and participants answering the questions without reflecting on them (Mitchell & Jolley, 2013; Podsakoff, et al., 2003). However, the authors kept the questionnaires relatively short in order to increase the response rate. Of 195 players, only 59 participants completed both questionnaires. The low response rate could be explained by the fact that each team leader confirmed the participation on behalf of the whole team and was the distributor of the questionnaires, which increased the distance between the researchers and the participants. If the researchers had attended a training session and distributed the questionnaires directly to the participants, this might have increased the response rate. However, by having the questionnaires online it was possible to reach athletes from different areas of the country and it also gave the participants the opportunity to answer whenever it suited them best.

A limitation of self-reported questionnaires for measuring exercise dependence is that it only gives an estimate about the risk rate for exercise dependence rather than a clinical diagnosis (Szabo et al., 2015). Another problem is the interpretation of the items on the scale, which may differ depending on the culture, gender or level of competition. Further, some of the previous studies have also used other types of measures than EDS-R. All these factors can make it difficult to compare and draw valid conclusions about the
results. Other factors to consider are that the sample in the present study only represented four different sports and the majority were women. The generalizability of the results to other team sports is therefore limited.

**Implications**

The findings of this study contribute to the research on exercise dependence by identifying needs thwarting and socially prescribed perfectionism as risk factors. The results and the theory of Basic psychological needs could be useful when planning prevention strategies for exercise dependence in team sports. Based on the findings, it is important for athletes and people working in sport settings to not put pressure and high perfectionistic standards on other team members. To prevent thwarting of the psychological needs, it is important to create a training environment where all athletes can have an influence on the training routine and where they can fulfil their potential and experience relatedness to other team members. From a research perspective, it would be relevant to conduct new studies and interventions to get a better understanding of how and why needs thwarting and perfectionism increase the risk for exercise dependence in team sports. The results also contribute to previous research that have investigated the relationship between anxiety and exercise dependence, by showing that anxiety is not necessarily a significant predictor for exercise dependence in all populations or sport contexts.

The results from the present study indicate that exercise dependence is prevalent in team sports. It is therefore of importance to increase awareness about this issue since exercise dependence can have negative consequences for physical and mental health. It could not only affect the individual athlete but also the rest of the team. If an athlete becomes exercise dependent there is a risk for injuries which can force the athlete to step aside. This could negatively affect team cohesion and the team’s performance level.

**Future research**

The results in the present study showed that anxiety was not a significant mediator, but there might be other psychological and/or environmental factors that act as underlying mechanisms and increase the risk for exercise dependence. Future research should continue to explore underlying mechanisms that could explain different risk factors’ relationship with exercise dependence. The finding of anxiety’s non-significant correlation to exercise dependence contradicts the results of previous works. Future studies should continue to investigate in what type of contexts and populations anxiety can increase the risk for exercise dependence. In the current study the different dimensions of needs thwarting were analysed as a whole unit. In future studies it could therefore be of interest to analyse the different needs separately in order to see if one need has a bigger impact than the others on exercise dependence. Team sport athletes are an underrepresented group in the research field of exercise dependence, and more studies are needed to get a better understanding about this issue and the consequences that exercise dependence can have on the individual athlete as well as the team. Previous studies in the field of exercise dependence have primarily used self-reported questionnaires and cross-sectional designs. To get a better understanding for the exercise dependence phenomenon it is recommended for future studies to use qualitative research methods like in-depth interviews with persons showing symptoms of exercise dependence. This can bring clarity in the high risk rates reported by some groups of athletes and if it is only an indication of the athlete’s high commitment to training or if there are other underlying psychological causes (Szabo et al., 2015). Longitudinal research designs with several measurements could also be applied to better understand how the phenomenon of exercise dependence develops over time (Stenling et al., 2016), for example by following youth sport teams over several years that are striving for an elite career.
Conclusions

The findings in this study confirm that also team sport athletes are plagued by exercise dependence. The prevalence rate of 25% highlight the importance of recognizing team sport athletes showing symptoms of exercise dependence, since this can have negative consequences for a person’s health. The findings of this study support the earlier notion that psychological needs thwarting and socially prescribed perfectionism are related to exercise dependence and should therefore be considered important risk factors. Further, the study showed that anxiety was not a predictor nor a mediator for exercise dependence in team sports. More research in this area is recommended to get a better understanding of different risk factors and mediating mechanisms that can increase the risk for exercise dependence in team sports.
References


