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Prevalence and characteristics of exercise dependence among Norwegian men

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Forord

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Abstract

The first aim of this study was to explore the prevalence of Exercise Dependence (ED) in the Norwegian male population. The second aim was to examine what characterize men with high scores on Exercise Dependence Scale–Revised (EDS-R), when it comes to mode of exercise, exercise frequency, exercise intensity, exercise at a competitive level and hours exercising at the gym. To achieve these aims 5000 questionnaires were sent to randomly selected men between 18 and 65 years in Norway, and 1824 returned completed forms. Cases were excluded when data were missing and the final sample consisted of 1546 men. The questionnaire consisted of the Norwegian translated version of the Exercise Dependence Scale- Revised (EDS-R), demographic items and items that inquired about exercise-related characteristics. Results showed prevalence of exercise dependence in the male Norwegian population of 0.4%, and a higher occurrence of exercise dependence symptoms (21.4%). Higher total EDS-R score were found among these sub-groups of men: men engaging in power and weight class sports, exercising frequently, that often exercise with high intensity, exercising at a competitive level, and exercising more than 5 hours a week at the gym. The results offer insight into ED in the Norwegian male population, but more research is needed to further elucidate the phenomenon.

Keywords: Exercise dependence, prevalence

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Prevalence and characteristics of exercise dependence among Norwegian men

Exercise dependence (ED) was described as a “positive addiction” by Glasser (1976), and research to date indicates that physical activity has positive effects, both physical and psychological (Helsedirektoratet, 2009; United States Department of Health and Human Services, 1998). To promote and maintain health, the health authorities in Norway suggest a minimum of 30 minutes of moderate intensity physical activity, and further health benefits can be achieved with increasing the amount or intensity (Helsedirektoratet, 2009). A study indicated an increase in physical activity in the Norwegian population from 1985 to 2011, with 78 % engaging in regular exercise in 2011 compared to 57.9 % in 1985. In 2011, 13.9% were classified as highly active, which means that they exercise 5-6 times a week (Breikvik & Rafoss, 2012).

Even though there are known positive effects, it is agreed upon in the literature that exercise can have negative effects (Anthony, 1991; Diekhoff, 1984; Morgan, 1979; Little, 1979). For example Little (1987) shed light on this phenomenon when he described cases of men who carried on running despite injuries and other complications, and Diekhoff (1984) found that runners classified as dependent to running were more likely to be injured. In addition many studies have been done on unhealthy exercise (see Hausenblas & Symons Downs, 2002a, for a review). Allegre, Souville, Therme & Griffiths (2006) argue that exercise should be viewed as a continuum, from healthy to unhealthy exercise (i.e., ED) that is pathological and includes withdrawal symptoms, tolerance, and exercising despite medical advice not to. Morgan (1979) mentions additional negative effects, such as disadvantageous social consequences and negative interference with relationships and work. Despite knowledge of its possible negative effect some scientists argue that problematic exercise behaviour is always linked with an eating disorder, and that primary exercise (i.e., without an eating disorder) is not pathological (Bamber, Cockerill & Carrol, 2000). Other researchers challenge this view, and studies suggest incidents of exercise dependence where no eating disorder is present (Blaydon & Lindner, 2002; Cook et al., 2013). Even though there are cases of primary ED, there is not enough research to affirm that it's pathological.

Definitions and measures

At present, ED is not acknowledged as a medical or psychiatric diagnosis, and researchers have yet to agree on a concrete definition of the phenomenon (Berczik et al. 2012). Studies on the subject have used different definitions, methods and assessments,

which makes it difficult to compare studies and increase our understanding of the subject (Hausenblas & Symons Downs, 2002a).

The classification of ED has often been based on one dimension of symptoms, such as exercise level or biological factors, but multidimensional measures and definitions have also been developed in later years (Hausenblas & Synmons Downs, 2002a). An example of the latter is the Exercise Dependence Questionnaire (EDQ; Ogden, Veale & Summers, 1997), which includes both biological (e.g., withdrawal) and psychological (e.g., negative influence of social functioning) dimensions. In addition, two widely used and validated instruments to date are the Exercise Addiction Inventory (EIA; Terry, Szabo & Griffiths, 2004) and Exercise Dependence Scale-Revised (EDS-R; Hausenblas & Symons Downs, 2002b; Downs, Hausenblas & Nigg, 2004) which are multidimensional constructs including physiological, behavioural and psychological dimensions.

Hausenblas & Symons Downs (2002a) defined exercise dependence as a “craving for leisure-time physical activity, resulting in uncontrollable excessive exercise behaviour, that manifests in physiological and/or psychological symptoms” (p. 90), and other researchers have suggested definitions that closely resemble this (Bamber, Cockerill, Rodgers & Carroll, 2003; De Coverley Veale, 1987). Based on this definition Hausenblas and Symons Downs (2002b) developed the EDS-R. The scale is based on the Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) criteria for substance dependence (American Psychiatric Association, 2000), and individuals are differentiated as at risk for ED (i.e., showing many ED symptoms) nondependent symptomatic (i.e., showing some ED symptoms) and nondependent asymptomatic (i.e., showing no ED symptoms), based on amount of diagnostic criteria present. The seven criteria are: (a) Tolerance: defined as a need for an increased amount of exercise to achieve the desired effect, or decreased effect with continued use of the same amount of exercise; (b) Withdrawal: manifested by characteristic withdrawal symptoms such as anxiety and fatigue, and/or needing the same (or closely related) amount of exercise to ease or avoid withdrawal symptoms; (c) Intention effect: exercise is often executed at a higher level, or over a longer period than the person had intended; (d) Lack of control: a continued desire or unsuccessful effort to reduce or control exercise; (e) Time: a lot of time is spent in activities involving exercise; (f) Reduction of other activities: occupational and recreational activities are cut down or dropped entirely because of exercise; (g) Continuance: exercise is continued despite knowledge of having a lasting or present problem (physical or psychological) that presumably was caused or intensified by the exercise (e.g., continued running despite injury).

The prevalence and characteristics of exercise dependence

Our review of the literature shows a prevalence ranging from 3- 45.9 % in different studies, primarily done with college youths in USA (Downs et al., 2004; Garman, Hayduk, Crider, & Hodel, 2004; McLaren & Best, 2010; Terry et al., 2004; Zimijewski & Howard, 2003). Ambiguous prevalence estimates can, as mentioned above, be related to the use of different target populations and assessment methods to estimate the phenomenon (Hausenblas & Downs, 2002a). To illustrate, Zimijewski & Howard (2003) used a 14 item self-report questionnaire called Exercise Dependence Criteria (EDC; Zimijewski & Howard, 2003) and estimated ED prevalence to 45.9%, while Terry et al., (2004) found an ED prevalence of 3% using the Exercise Addiction Inventory (EIA; Terry et al., 2004). It's unknown how Zimijewski & Howard (2003) found such a high ED prevalence, as the psychometric properties of the scale were not presented. Another limitation of most of the studies is that they have used convenience sampling, and not an evident definition of that particular population (Mónok et al. 2012).

Most studies using EDS-R are validation studies done on physical active populations. Two studies carried out among physical active university students in the US found that 3.6-5% (Downs, Hausenblas & Nigg, 2004) were at risk for ED. In an Italian sample of regular users of the gym 6.6% were at risk (Costa et al, 2003) and in Swedish and Portuguese samples of physical active college students 9.2% of the Swedish sample and 5.2% of the Portuguese sample were at risk (Lindwall & Palmeira, 2011).

There are few population-based studies on ED using the EDS-R, and no studies including only men. Population based studies in Germany and Hungary found a prevalence of 0.09% and 0.3% at risk for ED in the general population (Mónok et al, 2012; Müller et al. 2013). The lower prevalence is probably because these samples were from the general population opposed to physical active college students in the aforementioned studies. This research suggests that ED is rare in the general population, something that fits well with the literature (Szabo, 2000; Veale, 1995).

A review of the literature by Hausenblas & Symons Downs (2002a) shows that when it comes to exercise mode, running is the most studied, succeeded by general exercise and weight lifting. Because the majority of studies reviewed only concerned one type of exercise (mainly running) it's unknown whether individuals engaging in various modes of exercise differ in ED.

Some studies indicate that the prevalence of ED could be higher among those who engage in exercise at a professional level or exercise at a gym. Blaydon and Lindner (2002)

estimated that 64.3% of the professional triathletes could be classified as ED, using the EDQ. When it comes to exercising at the gym, a study of 300 clients of a Parisian fitness studio reported that 42% had ED (Lejoyeux, Avril, Richoux, Embouazza, & Nivoli, 2008). The latter study used a questionnaire designed by the authors, based on the DSM-IV criteria proposed by Hausenblas & Symons Downs (2002b). One cannot rule out that the assessment methods in these two studies had a lower threshold to classify individuals as ED than the standardised cut-off in EDS-R.

Investigators suggest a positive correlation between exercise frequency and ED (Furst & Gerome, 199; Pierce, McGowan & Lynn, 1993), assessed with the Negative addiction scale (Hailey & Bailey, 1982). This is a one-dimensional measure that focuses on the psychological component of ED, which is problematic, as ED is recognized as a multidimensional construct (Hausenblas & Symons Downs, 2002b). Nevertheless, the association between exercise frequency and ED is further supported by a validation study of EDS-R in Spain, where users of sport centres who exercised often scored higher on EDS-R (Sicilia & González-Cutre, 2011). Some investigators have shown that individuals at risk for ED report more high and moderate intensity exercise than the participants classified as non-dependent, but no group difference was evident for mild intensity exercise (Downs et al., 2004; Hausenblas & Symons Downs, 2002b). This may indicate that the association between exercise frequency and ED is more complex than first suggested.

The literature reviewed included both male and female participants, and some studies suggest that males may be at greater risk for ED (Hausenblas & Symons Downs, 2002c; Müller et al. 2013).

Aims of the study

The main aim of the study is to broaden the knowledge of ED in the Norwegian male population by investigating ED prevalence and exercise-related characteristics of men with high scores on EDS-R.

As to our knowledge, no population-based studies to date have investigated the prevalence of ED among men, and no study has estimated the prevalence of ED in the Norwegian population. Therefore, the first purpose of this study was to estimate the prevalence of ED in the Norwegian male population using the EDS-R. Considering the population studies reviewed above, the hypothesis was that the prevalence of people at risk for ED would be below 1%.

The second aim of the study was to examine the exercise-related characteristics of men with high scores on EDS-R, such as mode of exercise, exercise frequency, exercise

intensity, exercise at a competitive level, and hours exercising at the gym. Because no study to date has specifically investigated whether there are differences in EDS-R score when it comes to exercise mode, no predictions were made according to this.

Based on the fact that studies have estimated a high prevalence of ED among individuals exercising at the gym and at a competitive level, we predicted that the men engaging in exercise at a competitive level and exercise at the gym would show higher EDS-R scores. On the basis of earlier studies, it was predicted that groups of men exercising more frequently and with higher intensity would show higher EDS-R scores.

Information about the frequency of problematic exercise and the exercise-related characteristics among men with high EDS-R scores in the Norwegian population will hopefully increase the amount of attention given to the subject, and fuel the development of psychological interventions to deal with the issue.

Method

Participants and procedure

The target population of the survey was the total population of men in Norway between 18 and 65 years of age (1 635 813 persons). In December 2005 questionnaires were sent to 5000 randomly selected men between the ages of 18 and 65 in Norway, with valid addresses through the central office for national register. In addition, the sampling procedure was executed according to geographic location representative of the target population. Of the surveys distributed, 4500 reached the correct address, and after one reminder, 1824 forms were completed and returned, giving a response rate of 41%. Cases were excluded when data were missing ($N=278$), and the final sample consisted of 1546 men. The Regional Committee for Research Ethics approved this study. Demographic characteristics of the sample are summarized in table 1.

Measures

The questionnaire included demographic items (i.e., age, civil status, residence, education and work) and items about exercise (such as number of hours exercising each week, number of hours at the gym each week, if they engaged in sports at a competition level, frequency of high intensity exercise, and mode of exercise). The survey included eight different modes: (a) Technical (i.e., bowling, curling, golf, riding, sailing, shooting, snowboard, fencing, motorcycle trials, water-ski and parachute jumping); (b) Endurance

(i.e., biathlon, cross-country skiing, cycling, dog racing, long distance skating, long and middle distance running, orienteering, rowing, paddling, race-walking, swimming, triathlon and ski-orienteering); (c) Aesthetic (i.e., figure skating, gymnastics, sport gymnastics and sport dance); (d) weight class (i.e., judo, jujutsu, karate, kickboxing, weight lifting, taekwondo and wrestling) ; (e) Ball playing (i.e., badminton, basketball, ice hockey, land hockey, football, softball, baseball, table tennis, squash, handball, tennis, under water rugby and volleyball) ; (f) Power (i.e., alpine, bob, discos, sledgehammer, hurdles, javelin throw, shot put, skate sprint, sprint and telemark skiing); (g) Anti-gravitation (i.e., indoor climbing, high jump, long jump, pole vault and triple jump) and (h) other sports.

Exercise Dependence Scale – Revised

The Exercise Dependence Scale - Revised (EDS-R) (Hausenblas & Symons Downs, 2002; Downs et al. 2004) was used in the study. The scale was translated into Norwegian using the backward translation strategy by two researchers and a professional proof reader (Gaarder et al., manuscript). The scale has seven subscales: (a) withdrawal (e.g., “ I exercise to avoid feeling tense”); (b) Continuance (e.g., “ I exercise when injured); (c) Tolerance (e.g., I continually increase my exercise intensity to achieve the desired effects/ benefits”); (d) Lack of control (e.g., “I am unable to reduce how often I exercise”); (e) Reduction in other activities (e.g., I think about exercise when I rather should be concentrating on school/work”); (f) Time (e.g., “ I spend a lot of time exercising”); and (g) Intention effects (e.g., “ I exercise longer than I plan”). Three items represent each subscale, and participants indicate how often (1=never; 6= always) they experience different feelings or behaviours associated with exercise. Dependence is calculated based on the subscale scores, and participants are categorized as “at risk for exercise dependence”, “nondependent symptomatic”, and “nondependent asymptomatic”, using a scoring manual with flowchart decision rules. The participants also get a total score, which is the summarized score of all the subscales. Research have demonstrated that EDS-R has good internal consistency with a Cronbach’s alpha ranging from 0.75 to 0.90, good test-retest reliability, and support for convergent validity with individuals at risk for ED reporting higher frequency exercise and perfectionistic tendencies (Downs et al., 2004). Cronbach’s Alpha on EDS-R in this study was 0.83, which indicates good reliability.

Statistical Analyses

A frequency analysis was conducted to differentiate between the men at risk for ED, the nondependent symptomatic and the nondependent asymptomatic, using SPSS Syntax for

EDS-R. One-way ANOVA was used to investigate the relationship between modes of exercise on the EDS-R total score, and Tukey post hoc tests were applied to examine group differences. Correlation coefficients were applied to investigate the relationship between the frequency of exercise and EDS-R total score. Three independent samples t-tests were used to investigate the relationship between men exercising at the gym, exercising at a competitive level, and exercising frequently with high intensity according to EDS-R total. In addition, effect sizes were calculated using Cohen's d with pooled standard deviation. To reduce the risk of mass significance due to large sample size, a 1% significance level was chosen.

Results

Demographic characteristics of the sample

The sample consisted of 1546 men with a mean age of 43 years ($SD=12.9$). To investigate the representativeness of this sample an effect size was calculated for age in the sample and age in the general Norwegian male population. The low effect size ($d= .01$) indicates that the sample is similar to the Norwegian male population when it comes to distribution of age. Demographic characteristics of the sample are presented in Table 1.

Table 1.
Demographic Characteristics of the sample (N=1546)

		N (%)
Age, years	< 24	156 (10.2)
	25-34	269 (17.4)
	35-44	365 (23.4)
	45-54	376 (24.4)
	55-64	332 (21.4)
	65+	29 (1.9)
Civil status	Married	814 (52.7)
	Separated/divorced	80 (5.2)
	Cohabitant	330 (21.3)
	Single	314 (20.3)
Residence (number of inhabitants)	< 200	58 (3.8)
	200- 19 999	614 (39.7)
	20 000- 99 999	467 (30.2)
	100 000 or more	375 (24.3)
Education	Not finished primary school	11 (0.7)
	Finished primary school	170 (11.0)
	Finished vocational education	512 (33.1)
	Finished college or university education	570 (36.9)
Employment	Employed	1228 (79.4)
	Students	113 (7.3)
	Unemployed	34 (2.2)
	Sick and unable to work	99 (6.4)

Note. The sum does not add up to 100 per cent because of unprovided data.

Prevalence of exercise dependence

In the general male population, and based on the aforementioned criteria, six participants (0.4%) was classified as at risk, 331 (21.4%) as nondependent symptomatic, and 1209 (78.2%) as nondependent asymptomatic.

Men with a subscale score above 7 on a given criteria were defined as showing symptoms of that specific criterion. The men in the sample showed most symptoms of “tolerance” (32.7%), followed by “lack of control” (22.2%), and they showed the least symptoms of “reduction in other activities” (6.7%). Mean, standard deviations, and Cronbach’s alpha of the EDS-R scale, as well as percent of Norwegian men showing ED symptoms is presented in table 2.

Table 2.

Mean, standard deviations, and Cronbach’s Alpha for the subscales of the EDS-R in the Norwegian-population sample, and per cent of men showing ED symptoms

	Mean	SD	Cronbach’s alpha	EDS Symptoms %
EDS Total	33.58	12.10	0.85	
Tolerance	4.65	12.18	0.81	32.7
Withdrawal	4.76	2.49	0.83	18.9
Continuance	5.51	2.76	0.79	18.5
Lack of control	4.87	3.02	0.83	22.2
Reduction in activities	3.98	1.54	0.81	6.7
Time	4.98	2.59	0.79	20.0
Intention effect	4.81	2.17	0.79	19.3

Note. Valid $n = 1546$, range for the subscales are from 3 to 18, and range for EDS total are from 21 to 126.

Exercise factors

A significant overall between-groups main effect appeared between the seven modes of exercise, $F(8,1537) = 33.51, p = .01$. Men engaging in weight sports ($M = 45.90, SD = 14.42$) and power sports ($M = 42.75, SD = 13.57$) scored significantly higher on EDS-R total than men engaging in ball playing sports ($M = 35.63, SD = 11.91$), technical sports ($M = 35.0, SD = 11.52$), other sports ($M = 33.59, SD = 12.22$) and endurance sports ($M = 36.95, SD = 10.60$). The effect sizes for men engaging in weight sports compared to other sports, technical, ball playing and endurance sports were moderate to strong ($d = .95, d = .83, d = .77, d = .70$), and the effect sizes for men engaging in power sports compared to other sports, technical, ball playing and endurance sports were moderate ($d = .70, d = .61, d = .55, d = .47$). A summary of the scores is presented in table 3.

Table 3.

Overview of men engaging in different modes of exercise and their mean EDS-R total score and Standard deviations

<i>Modes</i>	N	Mean	SD
Technical	62	35.00	11.52
Endurance	402	36.95	10.60
Esthetic	8	38.75	14.22
Weight class	41	45.90	14.42
Ball playing	259	35.63	11.90
Power	63	42.74	13.57
Antigravitation	14	36.00	11.60
Other sports	89	33.59	12.21

Note. Valid $n = 936$ (610 men did not provide data on this variable)

Correlational analysis showed that hours of exercise per week was significantly and positively associated with total EDS-R score, $r = 0.48$, $p < .01$. The correlation was moderate. All of the seven subscales in EDS-R correlated positively and significantly with hours of exercise per week. The two subscales correlating the most with hours of exercise per week were “time” and “tolerance”, $r = .86$ and $r = .59$, $p < .01$. Further, the two subscales correlating the least with hours of exercise per week was “continuance” and “lack of control”, $r = .22$ and $r = .24$, $p < .01$.

Men who often exercise with high intensity ($N = 326$) were differentiated from men that seldom exercise with high intensity ($N = 1128$). Analysis revealed that men in the first group scored significantly higher on EDS-R total than the latter ($M = 40.98$, $SD = 13.78$ versus $M = 32.27$, $SD = 10.87$), $t(1452) = 11.94$, $p < .01$, and the effect size was moderate to strong ($d = .70$). The effect sizes for the subscales ranged from $d = .27$ to $d = .86$. The highest effect size was found for “tolerance” and the lowest effect size was found for “lack of control”.

Men exercising at a competition level ($M = 41.20$, $SD = 12.28$) scored significantly higher on EDS-R total than men not exercising at a competition level ($M = 32.15$, $SD = 11.53$), $t(1529) = 11.26$, $p < .01$, and the effect size was moderate to strong ($d = .75$). The effect sizes for the subscales ranged from $d = .27$ to $d = .84$. The highest effect size was found for “time” and the lowest effect size was found for “withdrawal”.

Men exercising more than 5 hours at the gym a week ($N = 41$) were differentiated from men exercising less than 5 hours at the gym ($N = 921$). Analyses showed that men exercising more than 5 hours a week at the gym ($M = 49.0$, $SD = 13.87$) scored significantly higher on EDS-R total than men exercising less than 5 hours a week at the gym ($M = 36.36$,

$SD= 11.96$), $t(960) = -6.571$, $p < .001$. The effect size was strong ($d = .97$). The effect sizes for the subscales ranged from $d = .23$ to $d = 1.42$. The highest effect size was found for “time” and the lowest effect size was found for “continuance”.

Discussion

The aim of the present study was to determine the prevalence of exercise dependence (ED) in the Norwegian male population, and to examine the exercise-related characteristics of men with high scores on EDS-R.

Prevalence of ED

The hypothesis of the study was that the prevalence of men at risk for ED would be below 1%. This was confirmed, with 0.4% of men in the Norwegian population being at risk for ED. These results are congruent with previous population-based studies in Hungary and Germany, with 0.3% and 0.09% of the population being at risk for dependence. Study results also confirmed arguments from other scientist that ED is not a common phenomenon in the population (Szabo, 2000; Veale, 1995).

A significantly higher number of men showed symptoms of exercise dependence (21.4%), than those classified as at risk for ED. The fact that symptoms of ED are common among men in the Norwegian population is somewhat surprising, and it cannot be ruled out for certain that these symptomatic men could be at risk for ED. One reason that these men do not classify as at risk could be as Veale (1995) postulated, that they “deny having a problem or are “somatising” their emotional distress” (p.2), or as argued by Berczik et al. (2012) that the underlying problems are often more serious than the noticeable symptoms. It could also be that they simply don't have pathological symptoms. However, previous studies have used lower cut-offs. In the German population study mentioned, they made a cut-off that included symptomatic individuals in order not to under-diagnose, in addition to the criteria for estimating ED prevalence used in this study (Müller et al., 2013). Further investigation as to where the cut-off should be is needed to capture true ED individuals.

The highest percent of men showed tolerance symptoms, defined as a need for increased amounts of exercise to achieve the desired effect or decreased effect with continued use of the same amount of exercise. This result may, to some degree, explain the higher scores on EDS-R among men exercising more frequently with high intensity, and suggest that needing an increased amount of exercise to achieve the desired effect is a

common symptom in the Norwegian population. The symptom of tolerance may be explained by physiological mechanisms that possibly affect most exercisers. For example Thompson & Blanton (1987) argued that ED could be explained by decreased sympathetic activity, which requires the individual to engage in higher levels (i.e., intensity, duration) of exercise to achieve the same physiological state, due to exercise adaption. As suggested by Paradis, Cooke, Martin & Hall (2013) a tolerance effect could also be understood as a needed increase in exercise in order to achieve the same or better results than before. This can be when a weightlifter lifts heavier to increase strength, or when a runner increases his running intensity to improve endurance. The finding that very few of the men showed symptoms of reducing other activities, could be explained by the fact that they adjust their everyday routine to fit in with exercising. Veale (1995) argues this to be true for ED individuals, who often “adapt to the their environment, by remaining single or adopting partners who put up with their preoccupation” (p.2). It could be speculated that Norwegian men in general also adapt to the environment in a similar manner, or that they just don't let exercise come in the way for other activities that they value. The extent to which these symptoms contribute to ED and its pathology needs further elaboration.

Exercise factors

No other study has investigated whether individuals engaging in specific types of sports differ on scores of ED. The current study showed that the highest total scores on EDS-R were found among men engaging in weight class and power sports, and the lowest scores were found among men engaging in other sports, followed by technical and ball playing sports.

Technical and ball playing sports are often described as aerobic exercise (i.e., oxygen dependent exercise that can be performed for more than 2 minutes), and power and weight class sports are often classified as anaerobic exercise (i.e., oxygen independent exercise that cannot be performed above 2 minutes) (Helsedirektoratet, 2009). These findings indicate that men engaging in anaerobic sports may be more vulnerable for ED than men engaging in aerobic sports. In accordance with these findings, a study by Hale, Roth, DeLong & Briggs (2010) assessing EDS-R found that 15.1% of adult weightlifters are at risk for dependence, a number that is higher than for other physical active populations (Costa et al, 2003; 6.6%, Downs et al., 2004; 3.6-5%, Lindwall & Palmeira, 2011; 9.2 % and 5.2 %). Findings from Hale et al., (2010) further suggest that total score on the Drive for Muscularity Scale (McCreary & Sasse, 2000) measuring individuals motivation to increase their muscularity,

can predict total EDS scores. In accordance to this finding it's possible that the motivation to get the ideal muscular body could to some degree explain the association between high EDS-R scores and weight and power sports.

According to the prediction there was a significant positive association between exercise frequency and EDS-R total scores, with a moderate correlation. This is in line with previous studies showing a positive correlation between exercise frequency and ED (Furst & Gerome, 1993; Pierce et al., 1993), and a study showing higher scores on EDS-R among people who exercise frequently (more than three days a week) (Sicilia & González-Cutre, 2011). Seeing that "time" is one of the risk criteria for ED in EDS-R, the findings of this study are somewhat expected. In addition, it's important to keep in mind that exercise dependence is acknowledged as a multidimensional construct defined by 7 criteria. In accordance to this, exercise frequency showed a low correlation with some of the subscales in EDS-R. This finding indicates that exercise frequency is not enough to establish an ED diagnosis, and it says little about the underlying problems. As an example, a man that exercises compulsively 3 hours a week and cannot stop thinking about exercise, feels anxious when one of these hours is missed, and this results in him reducing other important activities. This man might be more at risk for ED than a man exercising 15 hours a week without these additional factors present. A study by Adkins & Keel (2005) on exercise in bulimia supports that time exercising might say little about the underlying problems associated with exercise. In this study compulsion to exercise was a positive predictor for disordered eating, and exercise time was a negative predictor. Even though the aforementioned study concerned bulimia and not ED, the argument that frequency of exercise says little about the psychological mechanisms underlying problematic exercise might still well be applied.

As anticipated, men who exercise with high intensity scored significantly higher on EDS-R total than men exercising rarely. This fits well with two studies of university students, showing that high and moderate intensity exercise were associated with ED (Downs et al., 2004; Hausenblas & Symons Downs, 2002b). However, the subscale "tolerance effect" used in the EDS-R consisting of the item "I continually increase my exercise intensity to achieve the desired effect", can to some degree explain the association between intensity and EDS- R total. This is in line with finding a strong effect size for intensity and the subscale "tolerance" in the study.

As predicted, individuals exercising at a competitive level scored significantly higher on EDS-R total than individuals who don't, with a large effect size. This is in line with

Blaydon & Lindner's (2002) finding that the prevalence of ED among professional triathletes was high. The fact that individuals exercising at a competitive level scored higher on EDS-R might to a large extent be explained by the fact that many of the EDS-R criteria coincide with characteristics of this group. As an example, professional athletes score high on the subscale "time" because spending a lot of time on exercise is essential at the competitive level. Similarly, the high scores on the subscale "tolerance effect" might relate to an increase in exercise to achieve the wanted results associated with a particular activity (Paradis et al., 2013), which is usually the goal for competitive exercisers.

The association between hours exercising at the gym and EDS-R scores was also tested in the study, and it was found that men exercising at the gym for more than 5 hours a week had significantly higher EDS-R total scores. This is in accordance with a study showing high ED prevalence among clients of a Parisian fitness studio (Lejoyeux et al., 2008). Moreover, men exercising at the gym for more than 5 hours a week had a higher total score on EDS-R than men exercising at a competition level, which may indicate that the group of men exercising at the gym are at particular high risk for ED. Accordingly, future research should focus on the group of men who exercise a lot at the gym, and power and weight class sports seems to be important factors for the understanding of ED. This knowledge could influence the growth of psychological interventions concerning ED, and one possible ED intervention could be to increase ED competence among professionals working at gyms.

Strengths and Limitations

To our knowledge, this is the first population based prevalence study of exercise dependence among men, and the first conducted in Norway, thus significantly advancing our knowledge of ED. The strength of the present study is the use of a large randomized sample of men in the general Norwegian population, and the examination of numerous exercise variables. On the other side, a 41% response rate is low, making it problematic to generalize the results to the general male population in Norway. However, a randomized procedure was used, and that the sampling procedure was executed according to geographic location representative of the target population, strengthening the study. In addition, there seems to be similar distribution of age in the sample and the Norwegian male population, further supporting the representativeness of the sample.

Other limitations of this study must also be further examined in order to interpret the results. As acknowledged by Hausenblas & Symons Downs (2002b) and Downs et al.

(2004), EDS-R is merely a screening instrument to detect people who may be vulnerable for ED. If a diagnosis is to be made, individuals at risk for dependence must go through a clinical examination. Accordingly, the present results are limited because it is not certain that the men classified at risk for dependence are clinically ED. Clinical validation of the EDS-R is needed. This would significantly contribute to capturing the individuals with true ED, broaden our knowledge of the occurrence of the phenomenon and characteristics of this group. Also, this information is essential for the public awareness on the subject and development of specific ED interventions. Using clinical examinations of individuals at risk for dependence, the question about the pathological status of ED could further be answered. With this in mind, the lack of clinical examination of subjects weakens the findings of Bamber et al. (2000), that primary exercise is not pathological.

When it comes to the second purpose of the study, EDS-R total was assessed, and it's important to stress that a high average EDS-R score does not necessarily mean that the men are at risk for ED, it just shows that they scored higher in average on the scale than other groups of men.

Another limitation of the present study is the use of self-reported data, vulnerable to factors such as selective memory and social desirability. Also, the men choosing to answer the survey (1824 out of 4500) could be more interested in exercise and mental health than the men choosing not to answer, and some men at risk of ED might even avoid such questionnaires, which may bias the results. In addition, the study only gives information about categories (i.e., modes) of exercise, and lacks information about the specific type of exercise engaged in. At last, the study does not control for the combination of anaerobe and aerobic exercise, with only reporting the main mode of exercise.

Because this study investigated ED among men in the Norwegian population, the results cannot be generalized to women in the Norwegian population or other countries. However, population-based studies comparable to the present study suggest a similar prevalence in other European countries (Mónok et al, 2012; Müller et al. 2013). Future research should explore the prevalence of ED in other countries, using EDS-R in a representative national sample. It would also be interesting to investigate the prevalence of ED in the Norwegian female population. In order to get a better understanding of the causal factors and the factors maintaining ED, future research should address the issue with longitudinal studies and qualitative studies. Another important avenue for further research is the physiological aspect of ED, with focus on the influence of opioids, hormones, catecholamines and sympathetic activity on ED.

Berczik et al. (2012) argue that the interventions concerning exercise should find an adequate balance between promotion of healthy exercise and prevention of unhealthy exercise (i.e., exercise dependence). The fact that almost 20% of the Norwegian male population show symptoms of ED suggests the need for such a focus when developing ED interventions in Norway.

Conclusion

The main findings of the present study is that there is a prevalence of ED in the male Norwegian population of 0.4 %, and a relatively higher occurrence of symptoms, with one out of five men showing ED symptoms. Higher EDS-R scores were found among these sub-groups of men: exercising frequently, often exercising with high intensity, exercising at a competitive level, exercising more than 5 hours a week at the gym, and engaging in power and weight class sports. These results broaden our knowledge of ED, and suggest a need for more research on the subject with longitudinal and qualitative studies. Men exercising at the gym for more than 5 hours a week seem to have a particularly high EDS-R score, suggesting a need to increase the knowledge of ED among this group, so that specific and potent interventions can be developed. This can in part be accomplished by further increasing the competence among professionals working at gyms when it comes to ED.

References

- Adkins, E.C. and Keel, P.K. (2005), Does “excessive” or “compulsive” best describe exercise as a symptom of bulimia nervosa? *International Journal of Eating Disorders*, 38, 24–29.
- Allegre, B., Souville, M., Therme, P., & Griffiths, M.D. (2006). Definitions and measures of exercise dependence. *Addiction research and Theory*, 14, 631-646.
- American Psychiatric Association (2000). *Diagnostic and statistical manual for mental disorders* (4th ed., rev. ed.). Washington, DC: American Psychiatric Publishing.
- Anthony, J (1991). Psychologic aspects of exercise. *Clinical Sports Medicine*, 10,171-180.
- Bamber, D.J., Cockrill, I.M., & Carroll, D. (2000). The pathological status of exercise dependence. *British Journal of Sports Medicine*, 34, 125-132.
- Bamber, D.J., Cockrill, I.M., Rodgers, S., Caroll, D. (2003). Diagnostic criteria for exercise dependence in women. *British Journal of Sports Medicine*, 37, 393-400.
- Berczik, K., Szabó, A., Griffiths, M.D., Kurimay, T., Kun, B., Urbán, R., & Demetrovics, Z. (2012). Exercise addiction: symptoms, diagnosis, epidemiology, and etiology. *Substance Use and Misuse*, 47, 403-417.
- Blaydon, M.J., & Lindner, K.J. (2002). Eating disorders and exercise dependence in triathletes. *Eating disorders*, 10, 49-60.
- Breikvik, G., & Rafoss, K. (2012). *Fysisk aktivitet; omfang, tilrettelegging og sosial ulikheten oppdatering og revisjon*. Retrieved from <http://www.helsedirektoratet.no/publikasjoner/fysisk-aktivitet-omfang-tilrettelegging-og-sosial-ulikhet-revisjon/Publikasjoner/Fysisk%20aktivitet;%20omfang,%20tilrettelegging%20og%20sosial%20ulikhet%20-%20revisjon.pdf>
- Cook, B., Karr, T.M., Zunker, C., Mitchell, J.E., Thompson, R., Sherman, R., . . . Wonderlich, S.A. (2013). Primary and Secondary Exercise Dependence in a Community Based Sample of Road Race Runners. *Journal of Sport & Exercise Psychology*, 35, 464-469.
- De Coverly Veale, D.M.W. (1987). Exercise Dependence. *British Journal of addiction*, 82, 735-740.
- Diekhoff, G.M. (1984). Running amok: Injuries in compulsive runners. *Journal of Sport Behaviour*, 7, 120-129.

- Downs, D.S., Hausenblas, H.A., & Nigg, C.R. (2004). Factorial validity and psychometric examination of the exercise dependence scale-revised. *Measurement in Physical Education and Exercise Science*, 8, 183-201.
- Edmunds, J., Ntoumanis, N., & Duda, J.L. (2006). Examining exercise dependence symptomology from a self-determination perspective. *Journal of Health Psychology*, 11, 887-903.
- Furst, D.M., & Gerome, K. (1993) Negative addiction in male and female runners and exercisers. *Perceptual and motor skills*, 77, 192-194.
- Gaarder, M., Ramsdal, I.A.T., Vedul-Kjelsås, E., Prevalence and co-morbidity of disturbed eating behavior, exercise dependence and muscle dysmorphia in training centers (Manuscript)
- Garman, J.F., Hayduk, D.M., Crider, D.A., & Hodel, M.M. (2004). Occurrence of exercise dependence in a college-aged population. *Journal of American College Health*, 52, 221-228.
- Glasser W. (1976). *Positive addiction*. New York: Harper and Row.
- Hailey, B.J., & Bailey, L.A. (1982). Negative addiction in runners: A quantitative approach. *Journal of Sport Behaviour*, 5, 150-154.
- Hale, B.D., Roth, A.D., DeLong, R.E., Briggs, M.S. (2010). Exercise dependence and the drive for muscularity in male bodybuilders, power lifters, and fitness lifters. *Body Image*, 7, 234-239.
- Hausenblas, H.A., & Symons Downs, D. (2002a). Exercise Dependence: A systematic review. *Psychology of Sport and Exercise*, 3, 89-123.
- Hausenblas, H.A., & Symons Downs, D. (2002b). How much is too much? The development and validation of the Exercise Dependence Scale. *Psychology and Health: An International Journal*, 17, 387-404.
- Hausenblas, H. A., Symons Downs, D. (2002c). Relationship Among Sex, Imagery, and Exercise Dependence Symptoms. *Psychology of Addictive Behaviours*, 16, 169-172.
- Helsedirektoratet (2009). *Aktivitetshåndboken - Fysisk aktivitet i forebygging og behandling*. Retrieved from <http://www.helsedirektoratet.no/publikasjoner/aktivitetshandboken-fysisk-aktivitet-i-forebygging-og-behandling/Publikasjoner/aktivitetshaandboka.pdf>
- Lejoyeux, M., Avril, M., Richoux, C., Embouazza, H., & Nivoli, F. (2008). Prevalence of exercise dependence and other behavioral addictions among clients of a Parisian fitness room. *Comprehensive Psychiatry*, 49, 353-358.
- Little, J.C. (1979). Neurotic illness in fitness fanatics. *Psychiatric Annals*, 9, 49-56.

- Lindwall, M. & Palmeira, A. (2011). Factorial validity and invariance testing of the Exercise Dependence Scale-Revised in Swedish and Portuguese exercisers. *Measurement in Physical Education and Exercise Science*, 13, 166–179.
- MacLaren, V.V., & Best, L.A. (2010). Multiple addictive behaviours in young adults: Student norms for the Shorter PROMIS Questionnaire. *Addictive behaviours*, 35, 252-255.
- McCreary, D.R., & Sasse, D. K. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health*, 48, 297-304.
- Mónok, K., Berczik, K., Urbán, R., Szabo, A., Griffiths, M.D., Farkas, J., . . . Demetrovics, Z. (2012). Psychometric properties and concurrent validity of two exercise addiction measures: A population wide study. *Psychology of Sport and Exercise*, 13, 739–746.
- Morgan, W.P. (1979). Negative addiction in runners. *Physician Sports Medicine*, 7, 57-70.
- Müller, A., Claes, L., Smits, D., Gefeller, O., Hilbert, A., Herberg, A., . . . de Zwaan, (2013). Validation of the German Version of the Exercise Dependence Scale. *European journal of psychological assessment*, 29,213-219.
- Ogden, J., Veale, D.M., & Summers, Z. (1997). The development and validation of the Exercise Dependence Questionnaire. *Addiction Research*, 5, 343-355.
- Paradis, K.F., Cooke, L.M., Martin, L.J., Hall, C.R. (2013). Too much of a good thing? Examining the relationship between passion for exercise and exercise dependence. *Psychology of Sport and Exercise*, 14, 493-500.
- Pierce, E.F., McGowan, R.W., & Lynn, T.D. (1993). Exercise dependence in relation to competitive orientation runners. *Journal of Sports Medicine and Physical Fitness*, 33, 189-193.
- Sicilia, Álvaro., & González-Cutre. (2011). Dependence and Physical Exercise: Spanish Validation of the Exercise Dependence Scale-Revised (EDS-R). *The Spanish Journal of Psychology*, 14, 421-431.
- Szabo, A. (2000). Physical activity as a source of psychological dysfunction. In Biddle, S., Fox, K. and Boutcher, S. (Eds.), *Physical Activity and Psychological Well-Being*, Chapter 7, (pp. 130–153). London: Routledge.
- Terry, A., Szabo, A., & Griffiths, M. (2004). The Exercise Addiction Inventory: A new brief screening tool. *Addiction Research and Theory*, 12, 489–499.
- Thompson, J.K., & Blanton, P. (1987). Energy conservation and exercise dependence. A sympathetic arousal hypothesis. *Medicine and Science in Sport and Exercise*, 19, 91-99.

United States Department of Health and Human Services (1998). *Physical activity and health: A report of the Surgeon General*. Toronto: Jones and Bartlett Publishers.

Veale, D. (1995). Does primary exercise dependence really exist? In J. Annett, B. Cripps, & H. Steinberg, *Exercise addiction: Motivation for participation in sport and exercise* (pp. 1–5). Leicester, UK: British Psychological Society.

Zmijewski, D.F., & Howard, M.O. (2003). Exercise dependence and attitudes toward eating among young adults. *Eating Behaviors*, 4, 181-195.