

Primary and Secondary Exercise Dependence in a Community-Based Sample of Road Race Runners

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The purpose of our study was to examine exercise dependence (EXD) in a large community-based sample of runners. The secondary purpose of this study was to examine differences in EXD symptoms between primary and secondary EXD. Our sample included 2660 runners recruited from a local road race (M age = 38.78 years, SD = 10.80; 66.39% women; 91.62% Caucasian) who completed all study measures online within 3 weeks of the race. In this study, EXD prevalence was lower than most previously reported rates ($\gamma = .248$, $p < .001$) and individuals in the at-risk for EXD category participated in longer distance races, $F(8,1) = 14.13$, $p = .01$, partial eta squared = .05. Group differences were found for gender, $F(1,1921) = 8.08$, $p = .01$, partial eta squared = .004, and primary or secondary group status, $F(1,1921) = 159.53$, $p = .01$, partial eta squared = .077. Implications of primary and secondary EXD differences and future research are discussed.

Keywords: exercise dependence, running, eating disorders

Exercise dependence (EXD) is defined as habitually engaging in high amounts of exercise behavior while simultaneously experiencing a compulsion to continue despite physical, psychological, and/or social detriments resulting from the behavior itself (Hausenblas & Symons Downs, 2002). Research examining the prevalence of EXD has focused on either EXD as the primary concern or when EXD is present but

secondary to a more serious pathology. Specifically, primary EXD is defined as meeting criteria for EXD and continually exercising solely for the psychological gratification resulting from the exercise behavior itself (Bamber, Cockerill, & Carroll, 2000, 2003). Secondary EXD is defined as meeting criteria for EXD, but using excessive exercise to accomplish some other end (e.g., weight loss or body composition changes) that is related to another disorder such as the development of an eating disorder (Bamber et al., 2000, 2003). Simply stated, EXD is then secondary to the more severe psychopathology and presents more severe consequences such as earlier eating disorder onset, lower BMI, higher perfectionism, more eating disorder symptoms, higher obsessions and compulsions, higher persistence, and higher anxiety (Dalle Grave, Calugi, & Marchesini, 2008; Shroff et al., 2006).

To date, most researchers that have examined EXD status have reported sum scores of symptom severity (Sussman, Lisha, & Griffiths, 2011) rather than prevalence rates that may capture the scope of EXD. Current prevalence estimates seem to be heavily influenced by sample characteristics (i.e., potentially including inactive college students, samples of eating disordered individuals, etc.) and the sensitivity of various measurement instruments that have attempted to quantify EXD. Table 1 provides a comprehensive list of the various measurement instruments, samples, and

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prevalence rates that have been reported. Simply stated, the varying sample characteristics and assessment tools may be limiting our understanding of EXD (Mónok, Berczik, Urbán, Szabó, Griffiths, et al., 2012). Moreover, the relationship among running distance, comparison of primary and secondary EXD, and gender as a moderator is not clear. Therefore, it would seem prudent to examine the prevalence of EXD in understudied cohorts that may represent large segments of physically active populations. A community-based sample of road race runners represents such a cohort. The purpose of this study was to examine primary and secondary EXD in a large community-based sample of road race runners. First, we hypothesized that EXD symptoms would be positively associated with longer race distances (Hausenblas & Symons Downs, 2002). Second, we hypothesized that EXD prevalence rates would be lower than those reported in previous studies (Allegre, Therme, & Griffiths, 2007; Mónok et al., 2012; Sussman et al., 2011). The secondary purpose of this study was to examine differences in EXD symptoms between primary and secondary EXD. Our third hypothesis was that individuals who are at risk for secondary EXD would report greater scores of EXD symptoms than individuals at risk for primary EXD (Bamber et al., 2000, 2003), and that gender (i.e., women would report higher EXD symptoms) would moderate this relationship (Cook et al., 2013).

Method

Participants

Participants were recruited through flyers, an advertisement as part of a packet distributed to all runners in the variety of Fargo Marathon weekend road race events (i.e., 5k, 10k, half marathon, full marathon, two- or four-person relay events in the full marathon, 5k plus the half marathon, and 5k plus the full marathon), and through an e-mail list managed by the race director. Anyone who took part in the race was eligible to take the survey, which was available online for 3 weeks following the event. A total of 3117 runners accessed the online survey. Our final sample excluded individuals who did not provide informed consent ($n = 161$), who did not participate in a race event ($n = 227$), and individuals under age 18 ($n = 69$). Thus, our final sample included 2660 runners ($M_{\text{age}} = 38.78$ years, $SD = 10.80$; 66.39% women; 91.62% Caucasian). Participants self-reported height and weight, ethnicity, marital status, education, employment, race event, race history, and a brief medical history.

Exercise Dependence Scale

The 21-item Exercise Dependence Scale (EDS; Hausenblas & Symons Downs, 2002) was used to assess EXD. The EDS includes three items on each of the following seven subscales: Tolerance, Withdrawal, Continuance,

Lack of Control, Reductions in Other Activities, Time, and Intention. Items are measured on a 6-point Likert scale ranging from 1 (*never*) to 6 (*always*), with lower scores revealing less exercise dependence symptoms. Scoring was based on the EDS manual (see Hausenblas & Symons Downs, 2002). Higher scores on each item indicate increased severity for that item. Specifically, individuals endorsing scores of 5 to 6 on items for at least three subscales are categorized as “at risk for EXD,” scores of 3 to 4 on at least three subscales are categorized as “nondependent symptomatic,” and scores of 1 to 2 are categorized as “nondependent asymptomatic” (Hausenblas & Symons Downs, 2002). Internal consistency was measured by Cronbach’s alpha ($\alpha = .93$).

Goldfarb Fear of Fat Scale

The Goldfarb Fear of Fat Scale (Goldfarb, Dykens, & Gerrard, 1985) was used to group primary EXD and secondary EXD. It is a 10-item scale that assesses an individual’s fear of gaining weight. Because fear of fat is a key feature of eating disorders (APA, 2000), examining fear of fat allows clarification of whether the EXD is secondary to the presence of potential development of an eating disorder. Responses are indicated on a 4-point Likert scale ranging from *very untrue* to *very true*. Individuals diagnosed with anorexia nervosa report a mean score of 35 and those with bulimia nervosa report a mean score of 30 on this scale (Goldfarb et al., 1985). Therefore, a cutoff of 30 was used to indicate the distinction between possible primary EXD (i.e., scored below 30) and secondary EXD (i.e., scored 30 or above). Consequentially, 80.5% of men and 68.6% of women scored below 30 on the Goldfarb and 19.5% of men and 31.4% of women scored above 30. The Fear of Fat Scale has demonstrated validity and reliability (Goldfarb et al., 1985). Internal consistency was measured by Cronbach’s alpha ($\alpha = .90$).

Procedures

All study measures and procedures were reviewed and approved by the IRB. Questionnaire data were obtained from participants in the Fargo Marathon events. We performed a cross tabulation between EXD category and race distance to calculate the ordinal association. ANOVAs were conducted to examine continuous scale scores from the EDS in relationship with nominal race event. Prevalence rates of EXD were computed based on EDS syntax for at-risk, symptomatic, and asymptomatic categories (see Hausenblas & Symons Downs, 2002; Symons Downs, Hausenblas, & Nigg, 2004) and were compared with the extant literature using a nonparametric one-sample binomial test with Clopper–Pearson 95% confidence intervals. Finally, primary and secondary group exercise dependence total score comparisons were examined using 2 (gender) $\times$ 2 (primary or secondary group) ANOVAs.

Table 1 Exercise Dependence Prevalence Rates—Grouped by Measure

Authors	Year	Exercise Dependence Measure	Prevalence	Sample	N
Lejoyeux et al.	2008	Author-developed questionnaire	42.0%	French gym users	300
Lejoyeux et al.	2012	Author-developed questionnaire	30.0%	French gym users	500
Garman et al.	2004	Commitment to Exercise Scale	21.8%	College students	268
Mond, Hay, Rodgers, & Owen	2006	Commitment to Exercise Scale	16.5%	Australian sample of female exercisers	3472
Mond et al.	2008	Commitment to Exercise Scale	22.6%	Adult women from primary care facilities	257
Guidi et al.	2009	Consumptive Habits Questionnaire	18.1%	College students	589
Griffiths, Szabo, & Terry	2005	Exercise Addiction Inventory	3.0%	College students	279
Mónok et al.	2012	Exercise Addiction Inventory	3.2%	Hungarian nationwide—regular exercisers	474
Mónok et al.	2012	Exercise Addiction Inventory	0.5%	Hungarian nationwide—point prevalence	2710
Szabo & Griffiths	2007	Exercise Addiction Inventory	6.9%	College students	355
Villella et al.	2011	Exercise Addiction Inventory	8.5%	Italian High School students	2853
Bamber, Cockerill, & Carroll	2000	Exercise Dependence Questionnaire	22.8%	Women from colleges, fitness classes, running clubs, and eating disorder treatment	291
Blaydon & Lindner	2002	Exercise Dependence Questionnaire	52.0%	Triathletes	171
Grandi et al.	2011	Exercise Dependence Questionnaire	36.4%	Fitness club users, regular exercisers	79
Weik & Hale	2009	Exercise Dependence Questionnaire	24.9%	Adult exercisers	204
Zmijewski & Howard	2003	Exercise Dependence Questionnaire	45.9%	College students	237
Allegre, Therme, & Griffiths	2007	Exercise Dependence Scale	3.2%	Ultra marathoners	95
Cook et al.	2011	Exercise Dependence Scale	2.7%	College students	539
Cook & Hausenblas	2011	Exercise Dependence Scale	1.9%	College students—female only	387
Hausenblas & Symons	2002	Exercise Dependence Scale	3.4%	College students	266
Downs	(Study 1)				
	(Study 2)	Exercise Dependence Scale	13.4%	College students	553
	(Study 3)	Exercise Dependence Scale	3.1%	College students	862
	(Study 4)	Exercise Dependence Scale	9.6%	College students	366
	(Study 5)	Exercise Dependence Scale	9.8%	College students	419
Mónok et al.	2012	Exercise Dependence Scale	1.9%	Hungarian nationwide—regular exercisers	474
Mónok et al.	2012	Exercise Dependence Scale	0.3%	Hungarian nationwide—point prevalence	2710
Symons Downs et al.	2004	Exercise Dependence Scale	5.0%	College students	1263
Weik & Hale	2009	Exercise Dependence Scale	11.9%	Adult exercisers	204
Modolo et al.	2011	Negative Addictions Scale	33.2%	Amateur athletes	300
Ackard, Brehm, & Steffen	2002	Obligatory Exercise Questionnaire	8.9%	College students—female only	586
Slay et al.	1998	Obligatory Exercise Questionnaire	25.9%	Runners in a 4-mile recreational road race	324
Dalle Grave et al.	2008	Questioned from the Eating Disorder Examination	45.5%	Eating disorder patients	165
Schroff et al.	2006	Questions from the Structured Interview for Anorexic and Bulimic Disorders	38.8%	Eating disorder patients	1857

Results

Preliminary Analyses

The half marathon had the highest number of participants who volunteered for this study ($n = 1032$; 38.8%), followed by the marathon ($n = 539$; 20.3%), 10k ($n = 356$; 13.4%), 5k ($n = 288$; 10.8%), 5k plus half marathon ($n = 118$; 4.4%), four-person relay ($n = 111$; 4.2%), 5k plus marathon ($n = 63$; 2.4%), and two-person relay ($n = 2$; 0.1%). Individuals who reported a history of at least one stress fracture within the past 12 months reported significantly higher EDS scores, $t(2243) = -6.65, p = .001$.

Continuous Measure of EXD Symptoms and Relationship With Race Distance

Exercise Dependence Scale scores were compared by race distance (e.g., full marathon, half marathon, 10k, 5k, four-person relay, 5k plus marathon, and two-person relay). Significant differences were found for EDS scores, $F(8,1) = 14.13, p = .01, \eta^2_p = .05$. The partial eta squared value represents a medium effect size. Tukey post hoc comparison revealed individuals who ran longer distance races (i.e., marathon and 5k, marathon, half marathon) reported higher EDS scores than those who ran shorter races (i.e., 10k and 5k distances) ($ps = .01$).

EXD Prevalence

Overall prevalence rates for EXD were 1.44% at risk for EXD, 72.24% nondependent symptomatic, and 26.33% nondependent asymptomatic. Accordingly, prevalence rates were low for both men (1.26%) and women (1.40%). Individuals in the at-risk for EXD category participated in longer distance races ($\gamma = .248, p < .001$). Prevalence

in our community-based sample of road race runners was compared with the average of all previously reported rates obtained from the EDS (5.52%; see Table 1). Our observed prevalence rate was lower than previously reported EXD prevalence rates obtained using the EDS ($p = .01$, Clopper-Pearson 95% CI = 0.01–0.02), thus suggesting that sample characteristics may influence EXD status.

Differences in EXD Symptoms Between Primary and Secondary EXD

To classify EXD status, participants EDS scores were categorized into primary and secondary EXD based on their Goldfarb Fear of Fat Scale scores. Potential group differences on the Exercise Dependence Scale were examined using 2 (gender) $\times$ 2 (primary, secondary) ANOVA using a p value of .01. Group differences were found for gender, $F(1,1921) 8.08, p = .01, \eta^2_p = .004$, and primary or secondary group status, $F(1,1921) 159.53, p = .01, \eta^2_p = .077$. The partial eta squared value for gender represents a small effect size and the value for primary or secondary group status represents a medium effect. Specifically, men reported higher EDS scores than women and the secondary EXD group reported higher EDS scores than the primary EXD group. However, no moderation effect of gender and EXD was found, $F(1,1921) 0.87, p = .35, \eta^2_p < .001$ (see Table 2).

Discussion

Our first hypothesis of a positive association of EXD symptoms and longer race distances (Hausenblas & Symons Downs, 2002) was supported. Similarly, our second hypothesis that EXD prevalence rates in this

Table 2 Scale and Subscale Score Mean (SD) by Gender and Group

	Primary EXD Group		Secondary EXD Group		Gender Differences		Primary/Secondary Group Differences	
	Male	Female	Male	Female	p	η^2	p	η^2
EDS—Total	50.66 (12.30)	49.13 (12.29)	61.46 (14.58)	58.45 (15.86)	.01	.004	.01	.077
Withdrawal	7.98 (3.26)	9.24 (3.22)	9.66 (3.39)	10.36 (3.44)	.01	.013	.01	.026
Continuance	7.17 (2.87)	6.49 (2.82)	8.57 (3.07)	7.89 (3.41)	.01	.007	.01	.031
Tolerance	10.17 (3.24)	9.60 (3.00)	11.01 (3.19)	10.81 (3.11)	.04	.002	.01	.016
Lack of Control	5.44 (2.28)	5.26 (2.28)	7.36 (2.86)	7.02 (3.31)	.10	.001	.01	.069
Reduction in Other Activities	5.65 (1.95)	5.32 (1.94)	7.53 (2.33)	6.61 (2.51)	.01	.013	.01	.076
Time	7.80 (2.66)	7.25 (2.66)	9.50 (2.88)	8.50 (2.97)	.01	.011	.01	.041
Intention	6.58 (2.25)	6.11 (2.20)	8.01 (2.47)	7.32 (2.58)	.01	.009	.01	.045

sample would be relatively low (Sussman et al., 2011) was supported. Finally, our third hypothesis that individuals in the secondary EXD group would report higher EXD symptom scores (Bamber et al., 2000; 2003) was supported, although gender was not found to moderate this relationship.

Our finding of relatively low prevalence of EXD in a physically active community-based sample support that sample characteristics must be considered when interpreting EXD prevalence, and that EXD rates in this sample are likely low (Sussman et al., 2011). Moreover, our study extends the literature by examining gender, primary, and secondary EXD. Interestingly, we observed higher scores for men than women in the secondary EXD group. This result may be explained by the EDS used to assess EXD. Specifically, Weik and Hale (2009) report that men report higher EXD scores on the EDS, but women report higher scores on the Exercise Dependence Questionnaire and Drive for Thinness Scale. Finally, the differences we observed between primary and secondary EXD suggests future research should continue to inform the clinical assessment and diagnostic criteria for EXD. Specifically, closer examination of the effect sizes (see Table 2) for the seven EDS subscales supports that the nonphysiological dependence dimensions are generally higher than the physiological dependence type (Hausenblas & Symons Downs, 2002). Thus, the physiological effects of increased exercise amount may not sufficiently account for increases in EXD symptoms. This finding suggests that psychological factors may contribute to the rise in EXD symptom scores. Therefore, future research is encouraged to examine the psychological aspects of EXD and their potential role in the development of other related disorders. Identifying common psychological factors in EXD and related disorders may support previously proposed independent diagnostic criteria for primary EXD and secondary EXD (Bamber et al., 2003). Simply stated, exercise amount alone does not account for increase in EXD symptom severity.

Several limitations were present in our study. First, clinical assessments were not used to measure the extent that exercise behavior may be impacting health. Therefore no inference of potential health differences can be directly observed. Moreover, our use of the Goldfarb Fear of Fat Scale only assessed an eating disorder symptom, but not diagnosis. Thus, clinical assessments of eating disorder status may provide a more accurate distinction between primary and secondary EXD status. Second, our large sample size precluded the use of objective methods of assessing physical activity. Finally, our cross sectional design precludes any causal inferences in to the development of EXD.

Conclusion

The results of our study extend the literature by examining EXD with both continuous symptom scores and categorical distinction of EXD prevalence in a large community-based sample from an understudied population. Our

results support conclusions that EXD prevalence rates are likely low (Sussman et al., 2011). However, a large number of participants were classified as symptomatic of EXD. Thus, future longitudinal research is needed to examine the health impact of these findings. Furthermore, we observed a difference in secondary EXD and primary EXD symptoms, thus suggesting many people may be participating in road races for other reasons such as fear of becoming fat. Future research is encouraged to further examine potential gender differences among primary and secondary EXD.

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