Contrasting gender differences on two measures of exercise dependence

M Weik and B D Hale

*Br. J. Sports Med.* 2009;43;204-207; originally published online 28 Feb 2008; doi:10.1136/bjsm.2007.045138

Updated information and services can be found at:
http://bjsm.bmj.com/cgi/content/full/43/3/204

These include:

**Rapid responses**
You can respond to this article at:
http://bjsm.bmj.com/cgi/eletter-submit/43/3/204

**Email alerting service**
Receive free email alerts when new articles cite this article - sign up in the box at the top right corner of the article

Notes

To order reprints of this article go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to *British Journal of Sports Medicine* go to:
http://journals.bmj.com/subscriptions/
Contrasting gender differences on two measures of exercise dependence

M Weik, B D Hale

ABSTRACT

Objective: Recent studies using multidimensional measures have shown that men (Exercise Dependence Scale; EDS-R) are more exercise-dependent than women, whereas others have found that women (Exercise Dependence Questionnaire; EDQ) are more exercise-dependent than men. This study investigated whether there may be sex differences in exercise dependence or whether the questionnaires may be measuring different dimensions of exercise dependence.

Design: Regular exercisers voluntarily completed the EDS-R, EDQ and Drive for Thinness (DFT) subscale before or after a workout.

Setting: A local health club in the eastern USA.

Participants: Male (n = 102) and female (n = 102) exercisers completed the three questionnaires, but 11 participants (1 man, 10 women) were excluded from further analysis because scores indicated possible secondary exercise dependence (eating disorder).

Primary outcome measures: Eight subscales of the EDQ, seven subscales of the EDS, the DFT subscale, and several demographic variables served as dependent measures.

Results: A multivariate analysis of variance (MANOVA) on the EDS-R showed that men were significantly higher than women on the Withdrawal, Continuance, Tolerance, Lack of Control, Time, and Intention Effect subscales. Another MANOVA on the EDQ indicated that women scored significantly higher than did men on the Interference, Positive Rewards, Withdrawal, and Social Reasons subscales. Statistical analysis using t tests revealed that men had significantly higher total EDS-R scores than women, but women had significantly higher EDQ and DFT scores.

Conclusion: These results suggest that both questionnaires measure different aspects of exercise dependence that favour either gender. It remains for further research to determine whether these instruments are equally viable for measurement of ED in both men and women.

Exercise dependence has been defined as “a craving for leisure time physical activity that results in uncontrollable excessive exercise behaviour and that manifests in physiological symptoms (eg, tolerance, withdrawal) and/or psychological symptoms (eg, anxiety, depression)” (page 90).

In the past decade, attempts to measure this elusive concept have involved multidimensional self-report inventories based on multiple theoretical and clinical constructs. Ogden et al created the Exercise Dependence Questionnaire (EDQ), based on four criteria for primary exercise dependence. This is a 29-item self-report questionnaire with eight subscales, giving a total overall score. It does not classify respondents into “at risk” or “non-symptomatic” categories, even though subsequent studies have tried to categorise participants as “high scorers” with a total of score of $\geq 116$ or “possibly exercise dependent” with a score of $\geq 130$. After several researchers psychometrically reviewed the questionnaire, Hausenblas et al concluded that one scale is psychometrically unsound and five scales appear to measure exercise attitudes, benefits and social aspects, rather than exercise dependence. More recently, Hausenblas et al have attempted to produce a more psychometrically valid instrument to measure multidimensional exercise dependence, based on all seven criteria (Tolerance, Withdrawal Effects, Intention Effect, Lack Of Control, Time, Reductions in Other Activities, and Continuance) for substance dependence as identified in DSM-IV. In the revised version, the Exercise Dependence Scale (EDS-R) has 21 items with 7 subscales and a total score. It is also able to classify respondents into “at-risk”, “nondependent symptomatic”, and “non-dependent asymptomatic” categories. Initial research has suggested that the EDS-R is a valid and reliable means to measure exercise dependence.

Older results using unidimensional exercise dependence questionnaires that attempted to identify possible gender differences either found no gender differences or women scoring higher in exercise dependence. Reviewers summarising the research concluded that the evidence for gender differences was equivocal. Clearer trends in possible gender differences appear when studies using the multidimensional questionnaires are scrutinised. For the EDQ, Kjelsas And Augestad reported that women scored significantly higher on the exercise for weight control and withdrawal symptoms subscales, while men scored higher on the insight into problems subscale. Similarly Zmijewski and Howard found that women exercisers scored significantly higher than men on the exercise for weight control and exercise for health reasons scales.

The opposite trend appears for gender differences in studies using the EDS-R. Hausenblas and Fallon reported that undergraduate men showed higher means on six of the seven subscales of the EDS-R. In a subsequent statistical comparison of sex differences, Hausenblas and Symons Downs computed significant differences for men over women on the same six scales (tolerance, continuance, lack of control, reduction in other activities, time, and intention). In another study of the EDS-R with a gender-balanced sample, it was reported that almost three times as many undergraduate men were categorised as being “at risk” for exercise dependence as women. More
recently, it was reported that men scored significantly higher on total EDS-R scores than women on a sample ranging in age from 16–64 years. Unfortunately, in three of these EDS studies no effort was made to identify whether “at risk” participants could be categorised as primary or secondary exercise-dependent, which could have clouded the results.

Although gender difference trends on each scale seem apparent, it has been reported that the EDS and EDQ total scores still showed a strong correlation ($r = 0.69$) in the only published comparison to date. Thus, after examining the gender differences literature, there seems to be no simple, concise conclusion about possible gender differences in the samples tested.

As most of the earlier research on gender differences used undergraduate samples without first removing subjects with possible secondary exercise dependency, the primary purpose of our study was to see if gender differences exist in a sample of adult exercisers in which we controlled for eating disorder symptoms. Based on equivocal historical findings, a null hypothesis was selected. In addition, the secondary purpose was to see if there are questionnaire-based trends in gender differences of exercise dependence in a design incorporating both of the popular measures. Based on the recently published evidence from EDQ and EDS-R studies, it was hypothesised that women would score higher than men on the EDQ total and subscales and that men would score higher on the EDS-R total and subscales.

METHODS
The institutional review board at Penn State University approved the study. Participants completed a university-approved implied informed consent form.

Participants and procedures
In total, 204 adult exercisers (102 men, 102 women; mean age 39.16 and 41.74 years, respectively), predominantly middle-class Caucasians, volunteered to complete the questionnaire packet at a local health club in southeastern Pennsylvania. The participants exercised regularly (mean 3.95 and 4.08 bouts, respectively, per week), had a long exercise history (11.07 and 36.36 years), typically exercised at moderate intensity (75.64 and 77.21 minutes), and engaged in both aerobic and anaerobic workouts. The subjects completed the questionnaires before or after their exercise workout.

Instrumentation
Exercise Dependence Questionnaire
This EDQ consists of 29 items divided into 8 subscales (Social–Occupational Interference, Positive Reward, Withdrawal Symptoms, Exercise for Weight Control, Insight into Problems, Exercise for Social Reasons, Exercise for Health Reasons, Stereotyped Behavior) and answered on a seven-point Likert scale. The authors reported a high degree of internal consistency ($r = 0.84$) for the total score, and the scores for the eight subscales ranged from 0.52–0.81. Kjelsas and Augestad reported a similar statistic ($r = 0.82$). Although the EDQ authors did not create a criterion score for the classification, this study also adopted the cut-off score of ≥116 used by Bamber et al. to classify participants as “high” in exercise dependence for comparison.

Exercise Dependence Scale - Revised
The EDS-R is a 21-item multidimensional questionnaire with items based on DSM-IV criteria for substance dependence. The seven subscales (Tolerance, Withdrawal Effects, Continuance, Lack of Control, Reductions in Other Activities, Time, Intention) have all shown acceptable Cronbach α internal consistencies ($r = 0.67–0.93$) and were supported by results of a confirmatory factor analysis. Participants are categorised based on total score as “exercise-dependent”, “non-dependent symptomatic” or “non-dependent asymptomatic”. Hausenblas et al. presented evidence of concurrent validity.

Drive For Thinness scale
The DFT is a subscale of the Eating Disorder Inventory-2. The subscale contains seven questions, which attempt to assess weight preoccupation. If a participant scores ≥14, they are considered to be at risk for an eating disorder. Several researchers have recommended that because these eating-disordered participants do not show primary exercise dependence, they should be excluded from further data analysis focusing on exercise dependence.

Statistical analysis
All participants who scored ≥14 on the DFT were excluded from further analysis. In total, 11 participants (10 women, 1 man) were excluded (mean EDQ total score 118.64, mean EDS-R total score 56.27), leaving 193 (92 women, 101 men) participants to undergo further analysis.

We used the criteria of Bamber et al. for classifying exercisers as having high exercise dependence if they score ≥116 on the EDQ total. In total, 48 (24.9%) participants fell into this category (22 (11.4%) men and 26 (13.5%) women). Using the Hausenblas and Symons Downs criterion computation for exercise dependence classification on total EDS-R scores, 23 participants (11.9%) (22 men (11.4%) and 1 woman (0.5%)) were classified as at risk for exercise dependence. In addition, 125 (64.8%) participants were further classified as non-dependent symptomatic and 45 (23.3%) participants as non-dependent asymptomatic.

Pearson product–moment correlations were calculated between the total scores on the three questionnaires and all the scale scores to further ensure that exercise dependence was not strongly associated with any eating disorder behaviours and to investigate if the two dependence scales were measuring the same constructs. Another set of correlations was calculated for the separate gender samples to investigate if gender-specific relationships existed on any the total scores on either questionnaire.

Independent $t$ tests were calculated for gender differences in exercise history variables and total scores on the EDQ, EDS-R and DFT. Because Levene’s test for equality of variances was significant for EDQ and DFT scores, corrected $t$ values where equal variances were not assumed were used for these results. Two separate multivariate analyses of variance using the eight EDQ scale scores and the seven EDS scales scores were calculated for gender differences following the statistical procedures used by Hausenblas and Symons Downs.

To further compare the internal consistency of each exercise dependence scale and explore the possible gender differences in each individual scale item, Cronbach’s α statistic and separate independent $t$ tests on significant scale items were computed. Because the overall scale scores were already significant using multivariate statistics, the risk of increased type I error using multiple $t$ tests was less of a concern, according to statistical advice.
RESULTS

A series of independent t tests were computed to see if there were gender differences in age, years of exercising, length of typical exercise bout and typical number of weekly exercise bouts. No significant differences were found.

All correlations were nonsignificant for the total scores for the EDQ and EDS-R relationship (r = 0.02), EDQ and DFT relationship (r = 0.09) and EDS-R and DFT relationship (r = 0.06). A series of further correlational analyses was computed for all the subscales of the EDQ and EDS. All resulting r values were low to moderate and ranged from 0.00 to 0.44.

For the male sample, all the correlations between the total scores of EDQ and EDS-R were nonsignificant (r values ranged from −0.095 to −0.14). For women, the correlation was significant for the EDQ and EDS-R (r = 0.53, p < 0.01), but nonsignificant for the EDQ and DFT (r = 0.20) and the EDS-R and DFT (r = 0.19).

Women had significantly higher total EDQ scores than men (t190.08 = −4.11, p < 0.001). In contrast, men scored significantly higher than did women on the total EDS-R score, t193.71 = 6.76, p < 0.001. Finally, on the DFT scale, women scored significantly higher than did men, t173.21 = −3.04, p < 0.01 (table 1).

On the EDQ scales an overall significant effect for gender was found (Wilks λ = 0.88, χ2,194 = 3.08, p < 0.05). Women had significantly higher scores than men on the Interference with Family (F1,191 = 5.43, p < 0.05), Positive Rewards (F1,191 = 22.59, p < 0.001), Withdrawal (F1,191 = 3.80, p < 0.05) and Social Reasons (F1,191 = 5.78, p < 0.05) scales. They also had marginally significantly higher scores than men on the Weight Control scale (F1,191 = 5.36, p = 0.068) (table 1).

A significant overall effect for gender was computed on the EDS-R scales (Wilks λ = 0.73, F2,185 = 10.00, p < 0.001). Men had significantly higher scores than women on the Withdrawal, (F1,191 = 4.07, p < 0.05) Continuance (F1,191 = 46.47, p < 0.001), Tolerance(F1,191 = 34.92, p < 0.001), Lack of Control (F1,191 = 29.61, p < 0.001), Time (F1,191 = 13.63, p < 0.001) and Intention Effect (F1,191 = 9.17, p < 0.01) scales (table 1).

DISCUSSION

These results seem to create more research questions about the conceptual dimensions of more recent multidimensional exercise dependence questionnaires. First, the null hypothesis was rejected because the data suggests that there may be gender-specific differences in both the EDQ and EDS-R results. Our findings support this historical trend2 9 11 in the existing literature, with women scoring significantly higher on five of eight scales (and total score) of the EDQ and men scoring significantly higher on six of seven scales (and the total score) of the EDS-R. Furthermore, the results of the in-depth gender analysis of individual items by multiple t tests also support the notion that the items on both questionnaires could be imbalanced towards one gender or another. Questionnaires that attempt to measure a behavioural syndrome that affects both sexes should be thoroughly validated so that users know if one questionnaire favours one gender or is gender-neutral.

These potential gender differences lead to a more fundamental question about each questionnaire: Are they accurately measuring the exercise dependence concept? According to the analysis of Hausenblas and Symons Downs1 five scales of the EDQ (Positive Reward, Exercise for Weight Control, Insight into Problems, Exercise for Social Reasons and Exercise for Health Reasons) actually measure attitudes, benefits and social aspects toward exercise, rather than exercise dependence. Because in our study the gender differences that were found on five scales of the EDQ (Interference with Family, Positive Rewards, Withdrawal, Social Reasons, Weight Reasons) also seem to emphasise both social and body image consequences and attitudes that typically dominate women’s motivations for exercise, it suggests that the EDQ may inadvertently measure dimensions of exercise motivation that typically occur more often in women than men.

On the other hand, males were found to score significantly higher on Withdrawal, Continuance, Tolerance, Lack of Control, Time and Intention Effect scales of the EDS-R. These scales seem to be less concerned with social and health motives and more closely follow the DSM-IV diagnostic criteria for substance dependence, which may more accurately predict a clinically maladaptive pattern of exercise. In support, the overall calculated prevalence of “at risk” exercise dependence classification was significantly higher for men based on the total EDS-R score. Men’s symptoms for dependent behaviour may be based more on regimented, behavioural routines and consequences for exercise than women’s social and health-based dependence characteristics.

Both scales attempt to measure withdrawal symptoms3 8 in both sexes, but the items must be tapping different behaviours because women scored significantly higher on the EDQ Withdrawal Scale whereas men were higher on the EDS-R Withdrawal Scale. This point is further reinforced by the low but significant correlation (r = 0.21) found between the scales. Further analysis of the Withdrawal item content of both scales is necessary to see if they are measuring different aspects of withdrawal behaviours.

Table 1 Means and standard deviations of gender differences

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 101)</th>
<th>Women (n = 92)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Interference with Family</td>
<td>9.27</td>
<td>4.49</td>
</tr>
<tr>
<td>Positive Reward</td>
<td>19.79</td>
<td>4.94</td>
</tr>
<tr>
<td>Withdrawal Symptoms</td>
<td>14.38</td>
<td>4.77</td>
</tr>
<tr>
<td>Exercise for Weight Control</td>
<td>15.87</td>
<td>3.40</td>
</tr>
<tr>
<td>Insight into Problems</td>
<td>5.96</td>
<td>2.97</td>
</tr>
<tr>
<td>Exercise for Social Reasons</td>
<td>6.06</td>
<td>3.75</td>
</tr>
<tr>
<td>Exercise for Health Reasons</td>
<td>18.26</td>
<td>2.06</td>
</tr>
<tr>
<td>Stereotyped Behavior</td>
<td>9.55</td>
<td>2.54</td>
</tr>
<tr>
<td>EDS-R</td>
<td>65.30</td>
<td>15.96</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>11.13</td>
<td>4.20</td>
</tr>
<tr>
<td>Continuance</td>
<td>11.00</td>
<td>5.05</td>
</tr>
<tr>
<td>Tolerance</td>
<td>13.94</td>
<td>4.16</td>
</tr>
<tr>
<td>Lack of Control</td>
<td>7.84</td>
<td>3.32</td>
</tr>
<tr>
<td>Reductions in Other Activities</td>
<td>4.46</td>
<td>1.94</td>
</tr>
<tr>
<td>Time</td>
<td>9.50</td>
<td>3.57</td>
</tr>
<tr>
<td>Intention Effect</td>
<td>7.44</td>
<td>3.20</td>
</tr>
<tr>
<td>DFT</td>
<td>3.30</td>
<td>2.69</td>
</tr>
</tbody>
</table>

DFT, Drive For Thinness; EDQ, Exercise Dependence Questionnaire; EDS, Exercise Dependence Scale; SD, standard deviation.

* p < 0.05.
† p < 0.01.
Hausenblas and Symons Downs have presented substantial evidence in support of the fundamental construct validity of the EDS-R by basing it on all seven symptoms of dependent behaviour from DSM-IV criteria. In the study of Veale et al., tracing the creation and initial validity of EDOQ items, only a weak attempt at clinical symptom criterion was provided. Other dependence researchers have suggested that the exercise dependence construct must include dimensions of withdrawal symptoms, tolerance, adverse consequences and lack of control. An examination of the EDOQ items and scales suggests that the scale may not be measuring tolerance and lack of control adequately enough. In addition, the EDOQ offers no numerical cut-off point for categorising individuals as exercise dependent or not. The EDS-R accomplishes this identification cleanly and accurately. Furthermore, recent confirmatory factory analysis findings strongly support the construct validity of the EDS-R, whereas the EDOQ has not undergone any further sophisticated construct validity testing.

Our gender-based findings also point to a deeper question: are both questionnaires measuring different constructs of this multidimensional syndrome? In the current study, no significant correlations occurred between the total scores of the two scales, and even the correlations between subscales were low to moderate. In contrast, Hausenblas and Symons Downs reported a significant correlation of 0.69 between the EDS and EDOQ. Because this initial finding was based on the original 27-item version of the EDS and our subsequent finding used the 21-item EDS-R, this difference in correlation may be accounted for by the different versions, but it is still unclear whether or not the EDOQ and EDS-R are measuring the same dimensions of the exercise dependence construct.

The results of this study also mirror the prevalence trends previously reported in the literature. The EDOQ, with its nontheoretical cutoff score for exercise dependence identification, identified 25% of this sample as “at risk” for exercise dependence. The EDS-R, with its clinical criteria, labelled only 12% of the sample “at risk” for dependence. The latter figure seems more realistic and trustworthy compared with the high prevalence reported on the EDQ here and elsewhere. This evidence also points to further potential construct flaws of the EDQ.

Perhaps the results of our study are sample-specific. Most studies in the past have used undergraduate college-age samples with men and women about 18–23 years old, whereas our sample had an average age of <40 years, perhaps, as some have suggested, the salience of the items on the scales of the EDQ and EDS-R lessens with age. However, our sample of “40-somethings” still showed a fairly high prevalence of “at risk” exercise behaviours. Perhaps our sample is not representative of the general population. It was comprised of middle-class, Caucasian adult volunteer exercisers at one large suburban health club in the eastern USA. However, our findings do match the gender-based trends that have occurred in past EDOQ and EDS-R studies with college-age samples. More studies with larger representative samples are needed.

In conclusion, this study found strong gender-based results on two commonly used multidimensional questionnaires for exercise dependence research. It raises concerns about the construct validity of the EDOQ and suggests that more in-depth validity studies using both questionnaires should be undertaken.

Competing interests: None.

REFERENCES