

# THE DEVELOPMENT AND VALIDATION OF THE EXERCISE DEPENDENCE QUESTIONNAIRE

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The aim of the present study was to develop and validate the Exercise Dependence Questionnaire (EDQ). 86 statements, derived from semi structured questionnaires, were used to develop a self report rating scale which was completed by 449 subjects who exercised for more than 4 hours a week. Factor analysis was used and items not loading onto any factors (<0.6), that loaded onto more than one factor or intercorrelated greater than 0.6 were rejected from the analysis. The final EDQ consisted of 29 items and eight factors; interference with social / family / work life, positive reward, withdrawal symptoms, exercise for weight control, insight into problem, exercise for social reasons, exercise for health reasons and stereotyped behaviour. These factors were shown to have good internal reliability. The questionnaire was then partially validated against the Eating Attitudes Test, the Profile of Mood States factors; depression, anxiety, fatigue and vigour, perceptions of control over behaviour and characteristics of exercise behaviour.

Keywords: Exercise dependency; questionnaire development; validity

Regular exercise may result in physiological and psychological benefits and is recommended in both the prevention and treatment of physical disorders such as coronary heart disease, hypertension and obesity and psychological problems such as depression and anxiety (eg. Orwin, 1973; Berger, 1984; Simons, McGowan, Epstein & Krupfer, 1985; Veale, leFevre, Pantelis, de Souza & Mann, 1992).

However, recent literature suggests that exercise may have harmful effects on the individual, particularly in terms of exacerbating physical injuries and having negative effects on interpersonal relationships and mood (Morgan, 1979; Yates, Leehey & Shisslak, 1983; Morgan, Costill, Flynn *et al.*, 1988; Yates, 1991). Early articles examined the concept of 'exercise addiction' and discussed positive vs negative exercise addiction (Glasser, 1976; Morgan, 1979; Sachs, 1981; Hailey & Bailey, 1982) and deliberated over whether excessive exercise was harmful. The term addiction was later replaced by others such as 'obligatory running' (Blumenthal, O'Toole & Chang, 1984; Coen & Ogles, 1993), 'compulsive running' (Nash, 1987) and 'morbid exercising' (Chalmers, Catalan, Day & Fairburn, 1985). Veale (1987) suggested the term 'exercise dependence' and proposed a set of criteria for

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diagnosing exercise dependence which included both traditional biomedical criteria for addiction (eg. tolerance and withdrawal symptoms) and psychosocial perspectives (eg. interference with other areas of life).

Over recent years there has been an increased interest in exercise dependence and several measures have been developed to attempt to assess this behaviour. Carmack & Martens (1979) developed the 'Feelings about running' scale to measure commitment to running. However, this measure only assessed running behaviour and was not relevant to other forms of exercise dependence. In addition it was found to be unrelated to the individual's self report of running addiction. Chapman & Castro (1990) developed the 'running addiction scale' which correlated with the subject's self report of addiction but was only validated on 47 subjects and was again specific to running behaviour. Furthermore, the Obligatory Exercise Questionnaire was developed (Pasman and Thompson, 1988) to cover a range of exercise behaviours and has been shown to discriminate between exercisers and controls and to be sensitive to socially desirable responding. However, although the OEQ aims to assess a variety of types of obligatory exercise its focus is still mainly exercise specific with questions specifying particular forms of exercise. Further, all these measures were validated on an American sample, which may be distinct from a UK European population.

Accordingly, the aim of the present study was to develop a measure of exercise dependence which was relevant to all forms of exercise, conceptualised dependency as a combination of both traditional models of addiction in terms of factors such as withdrawal, tolerance, repetitive behaviour and excess and psychosocial perspectives in terms of factors such as psychological consequences and effects on interpersonal relationships and was relevant to a UK / European population. In addition, the study aimed to provide some partial validation for the new measure. Recent literature has proposed that exercise dependence may either be secondary to an eating disorder (secondary dependence), or an independent problem (primary dependence), (Veale, 1987) or alternatively that both conditions may be conceptualised as a unitary phenomenon (Yates *et al.*, 1983; Veale, 1987; Yates, 1991). It therefore seemed appropriate to validate a measure of exercise dependence against a measure of eating disorders. Furthermore, due to the predicted association between exercise and mood (eg. Morgan *et al.*, 1988) measures of mood were also included. In addition, the study aimed to examine the relationship between exercise dependence and characteristics of exercise behaviour and perceptions of control.

## METHOD

The method involved two sets of subjects. The first set ( $n = 131$ ) were involved in the development of the original 86 item question, the second set ( $n = 449$ ) were involved in completing this questionnaire and its subsequent validation.

### *Development of the Original 86 Item Questionnaire*

131 subjects who considered themselves to be addicted to exercise, and responded to articles in magazines about exercise dependence, completed unstructured self report questionnaires concerning their feelings and cognitions about their exercise behaviour. They

were encouraged to answer the broad questions as freely as possible and these questionnaires were examined for recurring themes by the authors. On the basis of the statements provided by these subjects and the common themes apparent in their responses 86 items were developed and used to generate the original questionnaire. The original questionnaire consisted of these 86 items which were rated on a 7 point likert scale ranging from 'Strongly Disagree' (1) to 'Strongly Agree' (7). Subjects were also given the option of rating an item 'not applicable' (0). Each item was rated as 'not applicable' by an average of 3% of the subjects (ranging from 0.02% to 6%) and subsequently items scored as '0' were not included in the analysis. In addition, because of the low use of this option, 'not applicable' was not included in the final questionnaire.

### *Subjects*

Subjects were recruited through sports clubs, leisure centres and by advertising in magazines. Subjects were asked to participate if they exercised for more than 4 hours per week on average. It was deemed necessary to have a baseline cut off point, as the items on the questionnaire were not relevant to individuals exercising less than this. 700 questionnaires were distributed and 449 (men = 161, and women = 288) returned a completed self report questionnaire. They also completed profile questions concerning their age, weight, years of regular exercise and hours of weekly exercise. They were also asked about their perceptions of control over their exercise behaviour. They were asked to select either i) I exercise **less than I** would like to or ii) I exercise **as much as I** would like to or iii) I exercise **more than I** would like to. In addition, they were asked to list the kinds of exercise they did in on average. This was included as a memory aide for the subjects and also to provide a description of the types of exercise being done.

### *Additional Questionnaires*

Subjects also completed the 26 item Eating Attitudes Test (EAT, Garner, Olmsted, Bohr & Garfinkel, 1982) which evaluates attitudes such as 'am terrified about being overweight' and 'feel that food controls my life'. The characteristics assessed by the EAT are conceptualised as continuous traits. Its validity has been assessed on both adult and adolescent populations and cut off scores have been used to identify cases of anorexia nervosa. The EAT was included to evaluate the relationship between exercise dependence and eating disorders. Subjects also completed the depression, anxiety, fatigue and vigour items from the Profile of Mood States (POMS, McNair, Lorr and Droppleman, 1971). This consists of a checklist of items such as 'worthless', 'shaky', 'weary' and 'vigorous' and was included to evaluate the relationship between both positive and negative affect and exercise dependence. The EAT and the POMS were included to provide some preliminary external validation of the Exercise Dependence Questionnaire (EDQ).

### *Data Analysis Overview*

The data was analysed using SPSS for Windows in the following ways:

1. The subjects' profile characteristics were examined using descriptive statistics.
2. The original 86 item questionnaire was reduced to produce the 29 item EDQ.

3. The factor structure of the EDQ was analysed using factor analysis (rotated Varimax).
4. The internal reliability of the factors was evaluated by computing Cronbach's alpha scores for each factor.
5. The external validity of the EDQ was assessed using one way ANOVAs and post hoc tests (Newman Keuls) and correlations analyses to compare the EDQ with the EAT, the POMS, characteristics of exercise behaviour and perceptions of control.

## RESULTS

### 1. Profile Characteristics

Subjects described a wide variety of exercise behaviours including individual behaviours such as running, weight training, and aerobics at home, and group activities such as team games (e.g. squash, badminton, tennis) and rowing and group aerobics. The means for the subjects' age, weight, years of regular exercise and hours of weekly exercise are shown in Table 1.

### 2. Item Elimination—From 86 to 29 Items

*i) The Original Factor Analysis* The 86 item questionnaire was analysed using Factor Analysis (SPSS for Windows). The method used was a Rotated Varimax. The initial analysis produced a solution consisting of 18 factors with eigen values greater than 1.0 (the default extraction criteria used by SPSS for Windows). However, on the basis of the location of the elbow of the Eigen plot it was deemed justified to extract a 9 factor solution, with each factor accounting for more than 2% of the total variance. Items were selected if they loaded onto a factor with a factor loading greater than 0.4. On the basis of this procedure 13 items were dropped. The factors produced were as follows: i) Withdrawal symptoms (21.7%, 16 items): eg. If I cannot exercise I feel irritable; ii) Interference with social / family life (8.8%, 12 items) eg. I sometimes miss time at work to exercise; iii) Insight into problem (4.4%, 10 items): eg. I feel guilty about the amount I exercise; iv) Positive reward (3.6%; 11 items): eg. After an exercise session I feel that I am a better person; v) Weight control (2.8%, 7 items): eg. I exercise to control my weight; vi) Exercise and control (2.7%, 8 items): eg. I cannot reduce the amount I exercise; vii) Exercise and physical health (2.5%, 8 items): eg. I exercise to feel fit; viii) Social reasons (2.1%, 4 items): eg. I exercise to meet other people; ix) Stereotyped behaviour (2.0%, 4 items): eg. I exercise for the same amount of time each week. The factor analysis produced a 73 item questionnaire with 9 factors.

**Table 1** Subject Characteristics

	<i>Men (n = 161)</i>	<i>Women (n = 288)</i>
Age (yrs)	32.25 ± 10.59	31.26 ± 10.32
Height (cm)	182.91 ± 8.52	169.03 ± 8.07
Weight (kg)	78.24 ± 11.04	61.51 ± 8.54
Regular exercise (years)	13.19 ± 9.13	8.37 ± 8.13
Weekly exercise (hours)	12.01 ± 6.73	10.88 ± 6.4

ii) *Producing the 29 item questionnaire* The following steps were taken to produce the final 29 item questionnaire:

- a. 7 items which loaded onto more than one factor with a loading greater than 0.4 were eliminated reducing the questionnaire to 66 items.
- b. 36 items were selected if they loaded onto factors with a factor loading of greater than 0.6. This stricter criteria was chosen to shorten the length of the questionnaire.
- c. Items within each factor were intercorrelated in order to delete those items which were too similar. 7 items correlating greater than  $r = 0.6$  with other items were eliminated. It is acknowledged that such a stringent criteria may reduce the homogeneity of the factors, however this did not appear to be the case (see the internal reliability analysis).

This produced the 29 item questionnaire.

### 3. *The Factor Structure of the 29 Item EDQ*

The final 29 item questionnaire was then factor analysed again to evaluate the final factor loadings and the variance accounted for by the different factors. The method was Rotation Varimax and the extraction criteria was set at eigen values greater than 1.0. The results from the final factor analysis are shown in Table 2.

The analysis produced an 8 factor solution with items loading onto the factors with values greater than 0.6. The 8 factors were given the following labels: 1/ Interference with social / family / work life; 2/ Positive reward; 3/ Withdrawal Symptoms; 4/ Exercise for weight control; 5/ Insight into problem; 6/ Exercise for social reasons; 7/ Exercise for health reasons; 8/ Stereotyped behaviour. The final Exercise Dependence Questionnaire is shown in the Appendix.

### 4. *Internal Reliability of the 29 Item EDQ*

The final questionnaire consisted of 29 items and 8 factors. To evaluate the internal reliability of the factors and the total questionnaire a Cronbach's Alpha score was computed for the items on each factor. These were as follows: 1/ Interference with social / family / work life: Cronbach's Alpha = 0.814; 2/ Positive reward: Cronbach's Alpha = 0.795; 3/ Withdrawal symptoms: Cronbach's Alpha = 0.799; 4/ Exercise for weight control: Cronbach's Alpha = 0.781; 5/ Insight into problem: Cronbach's Alpha = 0.759; 6/ Exercise for social reasons: Cronbach's Alpha = 0.755; 7/ Exercise for health reasons: Cronbach's Alpha = 0.701; 8/ Stereotyped behaviour: Cronbach's Alpha = 0.516; Total Exercise Dependence Questionnaire Score: Cronbach's Alpha = 0.843 (composed of all 29 items).

### 5. *Preliminary External Validation of 29 Item EDQ*

i) *Validating against the EAT* The EDQ was validated against the EAT. Subjects were divided into high EAT or low EAT scorers using a score of 20 as the cut off point. This cut off score has been used in previous research to detect possible cases of anorexia nervosa. Group differences between the high EAT ( $n = 103$ ) and low EAT ( $n = 322$ ) scorers were

**Table 2** Factor Analysis of 29 item questionnaire

	<i>F1</i> 20.9%	<i>F2</i> 13.0%	<i>F3</i> 7.1%	<i>F4</i> 5.3%	<i>F5</i> 4.8%	<i>F6</i> 4.8%	<i>F7</i> 4.6%	<i>F8</i> 3.8%
1/ My pattern of exercise interferes with my social life	.7033*	.0678	.0504	.1451	.2346	.1411	-.1233	-.0255
2/ My level of exercising makes me tired at work	.8032*	.0299	.0352	-.0545	.1129	.0753	-.1239	.0167
3/ I sometimes miss time at work to exercise	.7407*	-.0594	.0062	-.0565	-.0044	.0399	-.1053	-.0419
4/ I have little energy for my partner, family and friends	.7161*	.0632	.0679	.0562	.2945	.0450	-.0271	.1252
5/ The rest of my life has to fit in around my exercise	.6181*	.0440	.3796	.1127	.1760	.0946	-.0088	.0406
6/ After an exercise session I feel more positive about myself	-.0322	.7455*	.0539	.1802	-.0631	.0587	.2632	.0879
7/ After an exercise session I feel less anxious	-.0003	.7575*	.1112	.0839	.1596	.0148	.0647	.0049
8/ After an exercise session I feel happier about life	.0323	.7188*	.2773	.1948	-.0110	-.0461	.2259	.0027
9/ After an exercise session I feel that I am a better person	.0921	.7197*	.1934	.1201	.1084	.1565	.0761	.0284
10/ If I cannot exercise I feel agitated	.0798	.0919	.7689*	.0405	.0909	.0831	.1049	.1275
11/ If I cannot exercise I feel I cannot cope with life	.1126	.3668	.6100*	.1894	.2247	.0185	-.1546	-.0525
12/ If I cannot exercise I feel irritable	.0890	.1897	.7689*	.2422	.1195	.0826	.0749	.0656
13/ I hate not being able to exercise	.0665	.1474	.7644*	.1532	.0899	-.1094	.1224	-.0296
14/ I exercise to control my weight	-.0416	.0855	.1858	.7378*	.0613	-.0179	.1860	.0795
15/ Being thin is the most important thing in my life	.0491	.0304	.2030	.7383*	.1449	.0694	-.0232	.0455
16/ I exercise to look attractive	-.0050	.1664	.0743	.7047*	.0863	.1231	.1070	-.0205
17/ After an exercise session I feel thinner	.1227	.2940	.0533	.7504*	.0869	-.0092	.0456	.0295
18/ I feel guilty about the amount I exercise	.0659	.0468	.0452	.0291	.7777*	-.0004	-.0522	.0162

Table 2 (Continued)

	<i>F1</i> 20.9%	<i>F2</i> 13.0%	<i>F3</i> 7.1%	<i>F4</i> 5.3%	<i>F5</i> 4.8%	<i>F6</i> 4.8%	<i>F7</i> 4.6%	<i>F8</i> 3.8%
19/ My level of exercise has become a problem	.2202	.0745	.1661	.0707	.7508*	-.0371	-.1059	.0523
20/ I make a decision to exercise less but cannot stick to it	.1039	.0165	.1458	.1017	.6837*	.0915	.0787	-.0161
21/ My exercising is ruining my life	.2760	.0862	.0597	.1850	.6607*	.0047	.0078	.0203
22/ I exercise to meet other people	.0126	.0156	-.0463	-.0079	-.0481	.8625*	.1505	-.0144
23/ If I cannot exercise I miss the social life	.1437	.0246	.0672	.0283	-.0125	.8364*	-.0277	-.0882
24/ I exercise to keep me occupied	.1614	.1291	.0455	.1516	.1439	.6973*	-.0843	.1248
25/ I exercise to feel fit	-.0421	.2148	.0654	.1588	-.1054	.0854	.7016*	.1317
26/ I exercise to be healthy	-.0845	.1984	.0747	.1087	-.0575	.0024	.8061*	.0755
27/ I exercise to prevent heart disease and other illnesses	-.2927	.0964	.0705	.0272	.1045	-.0368	.7626*	-.0931
28/ I exercise for the same amount of time each week	-.1016	.0246	.0709	-.0205	-.0268	.0307	.0815	.8339*
29/ My weekly pattern of exercise is repetitive	.1691	.0547	.0345	.1206	.0826	-.0302	.0148	.7633*

## Key:

F1 = Interference with Social / Family life., F2 = Positive reward., F3 = Withdrawal Symptoms., F4 = Exercise for weight control., F5 = Insight into problem., F6 = Exercise for social reasons., F7 = Exercise for health reasons., F8 = Stereotyped behaviour.

\*factor loading > 0.6

then evaluated on the individual factors of the EDQ and the total EDQ score (24 subjects did not complete the EAT) using one way ANOVAs with group (high EAT vs low EAT) as the between subject factor. The results showed a significant main effect of group on 'withdrawal symptoms' (low EAT  $20.68 \pm 6.09.$ , high EAT  $26.01 \pm 5.92$ ), ( $F[1,424] = 60.1$ ,  $p < 0.0001$ ), 'interference with social / family life' (low EAT  $16.56 \pm 9.08.$ , high EAT  $20.3 \pm 9.36$ ), ( $F[1,423] = 13.05$ ,  $p < 0.0003$ ), 'insight into problem' (low EAT  $6.69 \pm 4.39.$ , high EAT  $10.38 \pm 6.94$ ), ( $F[1,419] = 39.8$ ,  $p < 0.0001$ ), 'positive reward' (low EAT  $22.97 \pm 5.79.$ , high EAT  $26.51 \pm 5.36$ ), ( $F[1,423] = 29.67$ ,  $p < 0.0001$ ), 'exercise for weight control' (low EAT  $15.45 \pm 6.43.$ , high EAT  $24.17 \pm 5.58$ ), ( $F[1,424] = 152.22$ ,  $p < 0.0001$ ), 'stereotyped behaviour' (low EAT  $11.66 \pm 3.21.$ , high EAT  $12.46 \pm 3.22$ ), ( $F[1,425] = 4.83$ ,  $p < 0.02$ ) and the total exercise dependence score (low EAT  $124.00 \pm 22.62.$ , high EAT

150.10  $\pm$  25.92), (F[1,406] = 111.81,  $p < 0.0001$ ). There were no significant group differences for the factors 'exercise for health reasons' (low EAT 19.47  $\pm$  3.98., high EAT 19.77  $\pm$  4.43), (F[1,425] = 0.425,  $p = 0.515$ ) and 'exercise for social reasons' (low EAT 10.49  $\pm$  5.41., high EAT 11.02  $\pm$  5.76), (F[1,425] = 0.71,  $p = 0.4$ ).

*ii) Validating against the POMS* Correlations analysis was then used to assess the relationship between the factors of the EDQ, the total EDQ score and the POMS items depression, anxiety, fatigue and vigour. The correlation coefficients are shown in Table 3.

The results suggest that 'interference with social / family life', 'withdrawal symptoms', 'insight into problem', 'positive reward', 'exercise for weight control', 'exercise for social reasons' and the total EDQ score were significantly **positively** correlated with all four POMS items (depression, anxiety, fatigue and vigour). 'Exercise for health reasons' was significantly **negatively** correlated with depression and fatigue, and significantly **positively** correlated with vigour. 'Stereotyped behaviour' was significantly **positively** correlated with vigour.

*iii) Validating with characteristics of exercise behaviour* The analysis next examined the relationship between reports of years of regular exercise, weekly hours of exercise and the individual factors and the total EDQ score. The correlation coefficients are shown in Table 4.

The results suggest that the number of years of regular exercise was significantly negatively correlated with interference with social life, positive reward, exercise for weight control, insight into problem, and the total EDQ score. This suggests that recent onset of regular exercising behaviour is related to greater exercise dependence. The average number of hours of exercise in a week was significantly positively correlated with interference with social life, insight into problem, exercise for social reasons, stereotyped behaviour and the total EDQ score. This suggests that more excessive exercising is related to greater exercise dependence. However, the number of weekly hours was significantly negatively correlated with exercising for health reasons. This suggests that exercise motivated by health may not be reflected in excessive behaviour.

*iv) Validating against perceptions of control* The final analysis examined the relationship between exercise dependence and perceptions of control over exercise behaviour.

**Table 3** Validating with the POMS (correlation coefficients and significance levels)

	<i>Depression</i>	<i>Anxiety</i>	<i>Vigour</i>	<i>Fatigue</i>
Interference	0.2509**	0.2387**	0.4873**	0.4178**
Positive reward	0.2223**	0.2042**	0.5512**	0.0953*
Withdrawal	0.2837**	0.2312**	0.5135**	0.1854**
Weight	0.2340**	0.0980*	0.5020**	0.1428*
Insight	0.3256**	0.2640**	0.3460**	0.3476**
Social	0.1113*	0.1263*	0.5146**	0.1257*
Health	-0.1424*	-0.0926	0.1692**	-0.171**
Stereotyped	-0.0091	-0.0116	0.1555*	0.0031
Total score	0.3396**	0.2784**	0.7858**	0.7858**

Key:

\* $p < 0.05$ ,

\*\* $p < 0.001$ .



**Table 4** Validating with characteristics of exercise behaviour (correlation coefficients and significance levels)

	<i>Regular (yrs)</i>	<i>Weekly (hrs)</i>
Interference	-0.1152*	0.4640**
Positive Reward	-0.144**	-0.0597
Withdrawal	-0.1029*	0.0741
Weight	-0.2547**	-0.0559
Insight	-0.0954*	0.1283**
Social	-0.0920	0.1520**
Health	-0.0846	-0.2464**
Stereotyped	-0.0588	0.1072*
Total	-0.2345**	0.1918**

Key:

\* $p < 0.05$ ,\*\* $p < 0.01$ 

Subjects were asked whether i) I exercise **less than I** would like to; ii) I exercise **as much as I** would like to; iii) I exercise **more than I** would like to. The results were then analysed using one way ANOVAs and post hoc tests (Newman Keuls) with group (more than / as much as / less than) as the between subjects variable for the different questionnaire factors and the total EDQ score (9 subjects did not complete the control question). The means for the three groups are shown in Table 5.

The results suggest that the groups (exercise less than / as much as / more than I would like to) showed significantly different scores on 'interference with social / family life' ( $F[2,424] = 12.92$ ,  $p < 0.0001$ ); 'positive reward' ( $F[2,424] = 4.316$ ,  $p < 0.01$ ); 'withdrawal symptoms' ( $F[2,424] = 12.89$ ,  $p < 0.0001$ ); 'exercise for weight control' ( $F[2,424] = 5.88$ ,  $p < 0.005$ ); 'insight into problem' ( $F[2,424] = 25.29$ ,  $p < 0.0001$ ); 'exercise for health reasons' ( $F[2,424] = 5.61$ ,  $p < 0.005$ ); 'stereotyped behaviour' ( $F[2,424] = 3.67$ ,  $p < 0.05$ ); total exercise dependence score ( $F[2,424] = 15.77$ ,  $p < 0.0001$ ). Post hoc tests showed that subjects who felt that they exercised 'more than they would like to', suggesting poor control, consistently showed higher scores on the different factors (except the

**Table 5** Validating with perceptions of control (means and standard deviations)

	<i>less than I would like to (n = 214)</i>	<i>as much as I would like to (n = 203)</i>	<i>more than I would like to (n = 23)</i>
Interference	16.83 ± 8.9	17.47 ± 8.9	27.10 ± 7.13**
Positive Reward	24.70 ± 5.75	23.11 ± 5.77	25.00 ± 6.47**
Withdrawal	23.12 ± 5.91	20.89 ± 5.65	26.90 ± 6.35**
Weight	18.36 ± 7.54	16.57 ± 6.88	21.29 ± 6.71**
Insight	7.51 ± 5.14	7.05 ± 4.32	15.19 ± 9.09**
Social	10.15 ± 5.35	10.93 ± 5.61	12.17 ± 4.66
Health	19.64 ± 4.01	19.62 ± 3.83	16.74 ± 5.54**
Stereotyped	11.45 ± 3.25	12.23 ± 2.97	12.52 ± 3.55*
Total EDQ	132.00 ± 24.47	127.09 ± 24.16	158.09 ± 22.79**

Key:

\*significant effect of group ( $p < 0.05$ )\*\*significant effect of group ( $p < 0.001$ )

health reasons factor) and the total EDQ score than the other subject groups ( $ps < 0.05$ ). Subjects who stated that they exercised 'less than they would like to' scored higher on the health reasons factor than the other two subject groups ( $p < 0.05$ ). No significant differences were found for scores of exercise for social reasons.

## DISCUSSION

The Exercise Dependence Questionnaire (EDQ) is a self report measure which consists of 29 items and is simple and quick to complete. It reflects motivations to continue exercising based on fear of withdrawal symptoms, experiences of positive reward following exercise, a desire to control weight and body shape, a need for social contact and a drive for physical health. It reflects some recognition of problem behaviour in terms of insight into the problem, an acknowledgement that the exercising behaviour is interfering with the individual's social and family life and perceptions of low control. It also reflects the degree to which the behaviour is rigid, stereotyped and excessive. In addition, exercise dependence appeared to be related to more recent uptake of the behaviour. These characteristics are similar to those found in discussions of other addictive behaviours and represent a combination of traditional biomedical approaches to addictions (eg. withdrawal symptoms, stereotyped behaviour) and more recent psychosocial models (eg. interference with social / family life, positive reward), (eg. Orford, 1984; Marlatt & Gordon, 1985). Furthermore, the EDQ enables exercise dependence to be conceptualised within a continuum model of behaviour, although future research could develop possible criteria for case-ness (ie. whether someone is exercise dependent or not).

The preliminary validation with the EAT indicates that the EDQ measures a behaviour which is similar to that found in eating disordered individuals as significant differences were found between high and low EAT scorers on the EDQ. This provides some support for the concept of secondary dependence. However, several differences were also found in the populations selected by the factors of the EDQ and the EAT suggesting that exercise dependence as measured by the EDQ is a separate problem to eating disorders. This is consistent with the concept of primary dependence. The validation with the items on the POMS showed a similar profile of results. The factors and total EDQ score were significantly correlated with items from the POMS suggesting a relationship between exercise dependence and depression, anxiety, fatigue and vigour. This provides some support for the predicted relationship between exercise dependency and mood disorder, and also for the reported negative and positive effects of exercise on mood. However, many of the significant correlations were low and additionally not all factors were correlated with all POMS items. This suggests that the EDQ is not simply replicating the POMS in terms of a measurement of mood.

Further research is needed to evaluate the relationship between exercise dependence and eating disorders. In addition the aetiology and consequences of exercise dependence also need to be examined. The Exercise Dependence Questionnaire conceptualises exercise dependence within both traditional biomedical and psychosocial perspectives and provides a means to examine these issues. In addition the EDQ could provide a useful tool for profiling athletes and determining factors relating to successful performance. Future

validation of this measure could include examining the relationship between the EDQ and other existing measures of problem behaviour, a clinical classification of exercise dependence and evaluating responses to the EDQ on an additional sample.

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APPENDIX  
EXERCISE DEPENDENCE QUESTIONNAIRE

Age \_\_\_\_ Sex \_\_\_\_ Weight \_\_\_\_ Height

We would like to know how much you exercise. Please consider exercise as being any structured activity which increases your heart rate eg. running, cycling, aerobics, weight training and complete the following sentence:

I exercise for \_\_\_\_ hours per week.

Below are a series of statements that people have used to describe their attitudes to exercise. Please rate each of the statements by circling the appropriate number for how much it describes your attitude to your own exercise over the past month. Please use the following scale:

	Strongly Disagree							Strongly Agree			
	1	2	3	4	5	6	7				
1/ My level of exercising makes me tired at work					1	2	3	4	5	6	7
2/ After an exercise session I feel happier about life					1	2	3	4	5	6	7
3/ If I cannot exercise I feel irritable					1	2	3	4	5	6	7
4/ The rest of my life has to fit in around my exercise					1	2	3	4	5	6	7
5/ After an exercise session I feel less anxious					1	2	3	4	5	6	7
6/ I exercise to look attractive					1	2	3	4	5	6	7
7/ I sometimes miss time at work to exercise					1	2	3	4	5	6	7
8/ After an exercise session I feel that I am a better person					1	2	3	4	5	6	7
9/ If I cannot exercise I feel agitated					1	2	3	4	5	6	7
10/ I exercise to meet other people					1	2	3	4	5	6	7
11/ I hate not being able to exercise					1	2	3	4	5	6	7
12/ I exercise to keep me occupied					1	2	3	4	5	6	7
13/ If I cannot exercise I feel I cannot cope with life					1	2	3	4	5	6	7

14/ I exercise to control my weight	1	2	3	4	5	6	7
15/ I have little energy for my partner, family and friends	1	2	3	4	5	6	7
16/ Being thin is the most important thing in my life	1	2	3	4	5	6	7
17/ I feel guilty about the amount I exercise	1	2	3	4	5	6	7
18/ I exercise to be healthy	1	2	3	4	5	6	7
19/ After an exercise session I feel thinner	1	2	3	4	5	6	7
20/ My level of exercise has become a problem	1	2	3	4	5	6	7
21/ I make a decision to exercise less but cannot stick to it	1	2	3	4	5	6	7
22/ I exercise for the same amount of time each week	1	2	3	4	5	6	7
23/ After an exercise session I feel more positive about myself	1	2	3	4	5	6	7
24/ My weekly pattern of exercise is repetitive	1	2	3	4	5	6	7
25/ My pattern of exercise interferes with my social life	1	2	3	4	5	6	7
26/ I exercise to feel fit	1	2	3	4	5	6	7
27/ My exercising is ruining my life	1	2	3	4	5	6	7
28/ I exercise to prevent heart disease and other illnesses	1	2	3	4	5	6	7
29/ If I cannot exercise I miss the social life	1	2	3	4	5	6	7