Validity of the Compulsive Exercise Test in Regular Exercisers

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Abstract

Measurement of compulsive exercise is important for the study of eating pathology in individuals who regularly participate in sport and exercise. The current study examined the factor structure, internal consistency and validity of the compulsive exercise test (CET) in regular exercisers. Participants were recruited via the internet and from sport clubs (n = 313 adults; M = 32 years; 57% female). A three-factor model for the CET was supported which included the weight control exercise, avoidance and rule-driven behaviour, and mood improvement subscales (fit statistics for the three-factor model: χ^2_{SB} = 4.39; CFI = .95; NNFI = .94, RMSEA = .100, 95% CI: .093 - .110, AIC = 656.92). The subscales lack of exercise enjoyment and exercise rigidity were not retained. All factors demonstrated acceptable internal consistency with Cronbach's α = .77 to .91. The weight control exercise and avoidance and rule-driven behaviour subscales were significantly related to eating disorder symptoms. Given the association between CET subscales and eating disorder symptoms, the CET three-factor model may be informative when assessing eating pathology in individuals who regularly exercise.

Keywords: Compulsive exercise test; compulsive exercise; eating disorders; factor analysis; reliability; validity

Introduction

The construct of compulsive exercise involves a rigid and extreme urge to exercise, with difficulty in stopping despite the possibility of negative consequences (Taranis, Touyz, & Meyer, 2011). As such, it is of relevance to clinical eating disorders as well as subclinical eating pathology (Egan et al., 2017; Formby, Watson, Hilyard, Martin, & Egan, 2014; Meyer et al., 2016; Shroff et al., 2006). There is evidence that exercise that is undertaken primarily for the purpose of reducing weight or changing shape differentiates between individuals with and without eating pathology (Mond & Calogero, 2009). Despite this, early measures of compulsive exercise focused on measuring compulsive exercise through quantity of exercise (Davis, Brewer, & Ratusny, 1993; Ogden, Veale, & Summers, 1997; Thompson & Pasman, 1991), an approach which may not capture the core aspects of compulsive exercise.

In response to the limitations of previous measures of compulsive exercise, Taranis et al. (2011) developed the compulsive exercise test (CET). The creation of the CET represented a shift in the focus of measures of compulsive exercise, as it was designed to capture the complexity of compulsive exercise and the psychological dependence on exercise, rather than solely focusing on the absolute quantity of exercise. The CET is based on four key factors proposed to characterise compulsive exercise based on Meyer et al.'s (2011) cognitive-behavioural model: eating psychopathology, obsessive compulsiveness, affect regulation, and perfectionism. After this model, compulsive exercise differs from healthy exercise in that compulsively exercising individuals present with weight and shape concerns, persistently continue exercising with the aim to avoid guilt or negative affect, and have very rigid, ritualistic and inflexible attitudes towards their exercising behaviour (Meyer et al., 2011). As such, the construct has been directly related to eating disorders and has been associated with higher relapse, suicidal behaviour and treatment drop-out in eating disorders (Formby et al., 2014; Meyer et al., 2011). The CET was originally tested in a sample of

young female exercisers (Taranis et al., 2011) and comprises five subscales: Avoidance and rule-driven behaviour (e.g., “I feel guilty if I miss an exercise session”); weight control exercise (e.g., “I exercise to burn calories and lose weight”); mood improvement (e.g., “I feel less anxious after I exercise”); lack of exercise enjoyment (e.g., “I find exercise a chore”); and exercise rigidity (e.g., “I follow a set routine for my exercise”).

While there is evidence supporting the five factor structure of the CET (Goodwin, Haycraft, Taranis, & Meyer, 2011; Meyer et al., 2016; Taranis et al., 2011), there has also been research that raises questions over its proposed structure. For example, a study in a clinical sample of adolescents with eating disorders did not support a five factor structure of the CET, despite finding evidence for its multidimensionality (Formby et al., 2014). Similarly, Plateau et al. (2014) investigated the CET in competitive athletes, and a confirmatory factor analysis (CFA) did not provide confirmation of the five factor structure. Subsequently, Plateau et al. (2014) developed an adapted version of the scale based on exploratory factor analysis (EFA). The 15-item scale comprised three factors: avoidance and rule driven behaviour, weight control exercise, and mood improvement. Correlation analyses revealed that each factor was significantly correlated with the EDE-Q. Given the rather disparate evidence for the structure of the CET to date, further research is required to investigate the factor structure of the CET to improve the understanding of the validity of the scale. Further, considering the heterogeneous samples the factor structure of the CET has been evaluated in before, it would be worthwhile to gain more evidence from relevant samples. This could lead to a factor structure that is applicable across samples.

With regard to the association of the CET scales with eating pathology, research has indicated that CET scores of patients with clinician-verified eating disorders were significantly higher than controls (Meyer et al., 2016). Moreover, the CET total score was positively associated with measures of eating pathology in the original sample of young

female exercisers (Taranis et al., 2011), a non-clinical adolescent sample (Goodwin et al., 2011), adolescents with clinical eating disorders (Formby et al., 2014), and athletes (Plateau et al., 2014; Turton, Goodwin, & Meyer, 2017). Furthermore, the CET has been shown to be an effective means to discriminate between female athletes with an eating disorder and non-eating disordered athletes. Whilst the avoidance and rule-driven behaviour and weight control exercise subscales of the CET correlated strongly and positively with a measure of eating pathology, the CET subscales mood improvement and lack of exercise enjoyment were unrelated to, or only weakly associated with, eating pathology (Goodwin et al., 2011; Plateau et al., 2014; Taranis & Meyer, 2011; Taranis et al., 2011). It appears useful to further examine the association of the proposed factors of Taranis et al. (2011) with eating pathology in order to gain a more complete understanding of these relationships.

Considering the inconsistencies in the evidence for the factor structure of the CET, the first aim of the current study was to examine the factor structure and internal consistency of the CET in a mixed sample of recreational sport participants and exercisers. A reason for this type of sample is that regular exercisers may represent a group that may have elevated risk for developing a compulsive style of exercising (Hausenblas & Downs, 2002). Since previous findings diverged from the original factor structure of the CET, our aim was to test the five-factor structure of the CET using confirmatory factor analysis (CFA) and, if necessary, to propose an alternative factor structure based on the results. We hypothesised that the CET subscales would demonstrate acceptable internal consistency. Our second aim was to test associations between the CET dimensions confirmed in the preceding CFA and dimensions of eating pathology. The relevant dimensions were chosen based on the transdiagnostic cognitive behavioural theory that proposes an overevaluation of eating, weight, shape, and their control as the core psychopathology of eating disorders (Fairburn, Cooper, & Shafran, 2003). Consistent with previous research, we predicted that the CET subscales avoidance and

rule driven behaviour and weight control exercise would be associated with eating pathology dimensions. Our third aim was to compare participants presenting with elevated levels of eating pathology to those without eating pathology regarding their CET subscale scores. We hypothesised that those with elevated levels of eating pathology would score higher on the CET compared to those without eating pathology.

Materials and Methods

Participants

Participants were 313 regular sport participants and exercisers (18-65 years; *M* = 31.60, *SD* = 10.50; 57% females, 43% males). Recruitment was done via the internet with postings on social media (public Facebook profiles of the authors) and e-mails to distribution lists of local gyms and sports clubs in Western Australia and via postings and flyers in local gyms and sports clubs. Hence, participants were not approached in person, but were provided with a link to the online questionnaire. Exercisers were eligible to participate in the study if they had participated in sport or exercise twice or more per week, over the past three months. To check this criterion, participants were asked to indicate whether they fulfilled this criterion before being transferred to the survey. If they did not confirm, they were not transferred. The criterion of exercising twice or more per week was chosen in order to include people who exercised on at least a weekly basis, but to make the volume of exercise criterion relatively low, given it is not the amount of exercise that has found to be important in defining compulsive exercise (Adkins & Keel, 2005). The criterion for regular exercise is the same as utilised in research demonstrating that compulsive exercise mediated the relationship between perfectionism and eating disorder symptoms (Egan et al., 2017). In the original validation study of the CET (Taranis et al., 2011), the criterion for regular exercise was some form of regular exercise or sport over the past four weeks. Our criterion of exercise twice or more per

week as the definition for regular exercise is more stringent than that suggested by Taranis et al. (2011), but low enough to capture a sample of largely recreational sport participants and exercisers rather than competitive athletes alone (Plateau et al., 2014). Since we did not systematically assess all members of one or more gyms or sports club but instead invited people to access the survey if interested, we were unable to assess the number of eligible people fulfilling the exercise frequency criterion and chose not to participate.

Measures

Compulsive Exercise Test (CET; Taranis et al., 2011). The 24-item self-report CET is designed to measure compulsive exercise and comprises five subscales: avoidance and rule-driven behaviour; weight control exercise; mood improvement; lack of exercise enjoyment; and exercise rigidity. Responses are provided on six-point scales (0 = *never true* and 5 = *always true*). Items 8 and 12 are reverse coded. Subscale scores are calculated by summing the items from the subscale and dividing this number by the total number of items (mean score). Overall, the CET has good internal consistency ($\alpha = .85$) while the subscales have acceptable to high internal consistencies (Avoidance and rule-driven behaviour: $\alpha = .88$, Weight control exercise: $\alpha = .86$, Mood improvement: $\alpha = .75$, Lack of exercise enjoyment: $\alpha = .84$, Exercise rigidity: $\alpha = .73$, Taranis et al., 2011).

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994).

The self-report EDE-Q assesses eating disorder symptoms over the past 28 days. The EDE-Q consists of four subscales: restraint; eating concern; weight concern; and shape concern. Therefore, these subscales assess the dimensions of the core psychopathology of eating disorders as proposed by Fairburn and colleagues (2003), namely the overevaluation of eating, weight, shape, and their control. The scale also allows assessing behavioural aspects such as binge eating, this was however not covered in the present study. Responses are provided on seven-point scales. Subscale scores are calculated by summing the subscale

items and dividing by the number of items, higher scores represent greater extents of eating disorder pathology. A global score can be calculated by averaging the subscale scores. The EDE-Q has excellent test-retest reliability (r = .81 to .94; Luce & Crowther, 1999), and internal consistency (Luce & Crowther, 1999). Of note, the scale is unable to make a categorical decision on whether an eating disorder is present or not but allows to assess symptoms on a dimensional level. However, in a validation study of the EDE-Q it was suggested that a total score of 2.3 on the global EDE-Q scale differentiates best between individuals with and without an eating disorder (Mond, Hay, Rodgers, Owen, & Beumont, 2004).

Procedure

The Curtin University Human Research Ethics committee provided approval for the study. Individuals meeting the inclusion criteria of participation in sport or exercise twice or more per week were invited to read the information sheet and complete a questionnaire on the internet hosted by Qualtrics™ software, which included items assessing demographic variables (age, nationality, first language), items referring to training frequency, and type of sport or exercise in which they typically participated, followed by the CET (Taranis et al., 2011) and EDE-Q (Fairburn & Beglin, 1994). Type of sport was assessed with a text field and categorised into different sport participation categories by the authors. On completion of the questionnaires, participants were directed to a debrief page and provided with details for eating disorder services. Participants were given the opportunity to enter a draw for a $50 shopping voucher by providing their email address.

In order to prevent the occurrence of missing data, the online questionnaire could only be completed if all items were answered.

Statistical Analysis

For our first aim, a CFA using LISREL 8.8 (Jöreskog, 2000) was estimated on data for the 24-item CET to compare the five-factor structure (Meyer et al., 2011; Taranis et al., 2011) to a one-factor structure. These models were also compared to a reduced 21-item four-factor structure in which the lack of exercise enjoyment subscale was deleted, and a 21-item single-factor structure. The rationale for the elimination of the lack of exercise enjoyment subscale was based on previous research indicating a weak correlation between this subscale and the CET total (r = .13), and a non-significant association of this subscale with eating psychopathology (Taranis et al., 2011). Further, research conducted by Plateau et al. (2014) proposed a revised 3-factor model of compulsive exercise in regular exercisers, eliminating both the lack of exercise enjoyment and exercise rigidity subscales from the original 24-item CET. Therefore, a reduced 18-item, three-factor structure, eliminating these subscales, and an 18-item one-factor structure were also examined. The five-factor model, the most complex model, consisted of 63 free parameters. The sample size of 313 participants satisfied the necessary condition of five participants per parameter for estimating CFA models (Kline, 2011).

We used multiple criteria to assess the fit of the proposed models with the data: (a) the relative or normed Satorra-Bentler chi-square (χ^2_{SB}) value, computed as χ^2 divided by its degrees of freedom, with values no higher than 5 and ideally less than 3 indicating adequate fit (Hooper, Coughlan, & Mullen, 2008; Tabachnik & Fidell, 2013); (b) the comparative fit index (CFI) and the he non-normed fit index (NNFI), with values greater than or equal to .90 indicates good fit (Hu & Bentler, 1999); (c) The standardised root mean square residual (SRMSR), with values less than .1 indicating acceptable fit; and (d) the root mean square error of approximation (RMSEA), with values closer to 0 indicating better fit (Chen, Curran, Bollen, Kirby, & Paxton, 2008). In addition, the Akaike Information Criterion (AIC; Burnham & Anderson, 2004) was used to compare the fit of the non-nested five-, four-, and

three-factor models. Further, Cronbach's alpha was computed for all factors and the total score as a measure of internal consistency.

Regarding our second aim, we used latent factor correlations to examine associations between CET dimensions and dimensions of the EDE-Q. To test our third aim, we divided the sample into those with a global score on the EDE-Q below 2.30 and those with a global score equal to or higher than 2.30, as suggested by Mond et al. (2004). The groups with scores above and below the cut-off then presented individuals with elevated levels of eating pathology vs. individuals without eating pathology. We then compared those groups regarding their scores on the CET with independent samples *t*-tests and also estimated effect sizes, i.e., Cohen's *d*. The latter were interpreted according to the rules of thumb provided by Cohen (1988), with *d* values of 0.30, 0.50, and 0.80 indicating small, medium, and large differences between groups, respectively.

Results

Sample Characteristics

Descriptive statistics characterising the sample are presented in Table 1. The sample predominately resided in Australia (88%), with the remainder from a range of countries (UK, USA, Canada, Germany, Italy, France, Croatia, Holland, Sweden, Brazil, South Africa, China, Malaysia, and Indonesia). The majority of participants were involved in endurance activities (running, cycling), ball sports, and visiting the gym, with a diverse range of other sports and exercise activities represented.

Insert Table 1 here

Confirmatory Factor Analysis

Fit statistics for the six models tested are reported in Table 2. According to our multiple criteria for goodness-of-fit, the one-factor models had adequate fit with the data. In contrast, the five-, four-, and three-factor models each had reasonable fit with the data based

on three criteria (χ^2_{SB} < 5; CFI > .94; NNFI > .94). The multi-factorial models failed to reach threshold on the SRMSR (all values > .10) and the RMSEA (all values > .08). Based on these criteria, the five-, four-, and three- models were considered the most tenable of the models tested in describing the data. The three-factor model had the smallest AIC value, which suggests its fit with the data is superior to the four- or five-factor models. In addition, the factor loadings from the three-factor model were all greater than .50 thereby supporting the construct validity of each factor (Hair, Black, Babin, & Anderson, 2010).

Insert Table 2 here

Descriptive statistics including subscale means, standard deviations, and Cronbach's alpha for the CET three-factor model subscales with factor correlations are presented in Table 3. The correlations between latent factors for the final three-factor model were small to medium in size. The relatively small sized correlation between the weight control exercise and mood improvement subscales is inconsistent with the notion that these factors are driven by a common higher-order factor (Brown, 2014). All factors had acceptable to good internal consistency as represented by Cronbach's alpha. The average inter-item correlation for all items of the three subscales was 0.31 which can be interpreted as adequate (Piedmont, 2014).

Insert Table 3 here

Correlations between CET and EDE-Q Subscales

Correlations among CET and EDE-Q subscales are presented in Table 4. Correlations between CET avoidance and rule-driven behaviour and all EDE-Q subscales were small in size and significant while correlations between CET weight control exercise and all EDE-Q subscales were medium in size and significant. The relationship between CET mood improvement and EDE-Q subscales was non-significant.

Insert Table 4 here

Group Comparisons for Eating Pathology

We tested differences on the CET subscales in groups of participants above (n = 135, 43%) and below (n = 178, 57%) the 2.30 cutoff on the EDE-Q global score. Results are presented in Table 5. Participants with elevated levels of eating pathology according to EDE-Q scores had significantly higher scores on the avoidance and rule-driven behaviour and weight control exercise subscales with medium-to-large effect sizes. Differences on CET mood improvement were not statistically significant.

Insert Table 5 here

Discussion

The aim of this study was to examine the factor structure of the CET (Taranis et al., 2011) and its associations with eating pathology in a sample of regular sport participants and exercisers. We also tested for differences on CET factors in regular sport and exercise participants with and without subclinical eating pathology. A three-factor model comprising weight control exercise, avoidance and rule-driven behaviour, and mood improvement subscales and omitting the lack of exercise enjoyment and exercise rigidity had optimal fit and parsimony according to multiple criteria. Our finding is in line with those of Plateau et al. (2014) who found the same three factor solution in a sample of competitive athletes. However, other studies in samples of clinically verified eating disorder patients (Meyer et al., 2016) and young women (Taranis et al., 2011) supported the original five-factor solution. Hence, our sample of mixed-gender regular exercisers may have similarities with the sample of competitive athletes. Plateau and colleagues (2014) interpreted their findings in a way that athletes usually have repetitive, habitual and performance oriented exercising schedules that often are externally regulated. The scale exercise rigidity assesses self-imposed rigid exercising behaviours that may not be applicable to athletes but instead more relevant for eating pathology. Also, the aspect of the lack of exercise enjoyment may be less relevant since athletes are exercising for different reasons than enjoyment. Although our sample was

not comprised of professional athletes but amateur athletes, there may be similarities to professionals. For example, a substantial amount of our sample participated in team sports which are often done in clubs and as such may be organised similarly to professional sports, with certain exercise schedules and supervision by coaches. The fact that Taranis and colleagues (2011) found a five-factor-structure in their original study in female exercisers but we did not replicate this in mixed-gender athletes may point at gender differences regarding compulsive exercise. Exercise rigidity and lack of exercise enjoyment may be more relevant for females than for males and may therefore not apply to a sample including both genders. The current study did not evaluate the gender-specific aspects of the scale due to power reasons. Future research could compare the factor structure in male vs. female participants. In sum, although our analysis found support for a three-factor solution, our findings are consistent with the widely-held assumption that compulsive exercise is a multidimensional concept.

Regarding our second aim, correlations between eating pathology and the subscales from our three-factor solution for the CET were largest for the avoidance and rule-driven behaviour, and weight control exercise subscales while the association between eating pathology and the mood improvement subscale was small and non-significant. This corresponds to previous studies that found consistent and medium-to-large relationships between eating pathology and the weight control exercise and avoidance and rule-driven behaviour CET subscales (Goodwin et al., 2011; Plateau et al., 2014; Taranis et al., 2011). Taken together, these correlations suggest that the respective CET dimensions may serve as indicators for the presence of subclinical eating pathology in regular exercisers. Since the mood improvement subscale was not associated with eating pathology, it may be that it is correlated with different types of psychopathology, such as depression or anxiety. Future research should aim to explore relations between these subscales and anxiety and depression

in order to confirm current findings in other indices of psychopathology. This should also be confirmed in samples of competitive athletes and regular exercisers as well as in clinical populations, particularly since there is proof for the relationship between compulsive exercise and depression and anxiety (Coen & Ogles, 1993; Peñas-Lledó, Vaz Leal, & Waller, 2002; Weinstein, Maayan, & Weinstein, 2015). Alternatively, one has to consider the vast body of evidence suggesting that physical activity is associated with health benefits such as better general and health-related quality of life, better functioning and improved mood (Penedo & Dahn, 2005). Therefore, high scores on mood improvement may even be a protective factor against the dysfunctional aspects of compulsive exercise in our study population of regular exercisers.

Our results confirm that participants with elevated levels of eating pathology, as indicated by their EDE-Q score above a 2.3 cut-off, scored significantly higher on the weight control exercise and avoidance and rule-driven behaviour subscales, with medium-to-large effect sizes. Thus, these CET scales may be able to distinguish between individuals with elevated levels of eating pathology vs. individuals without eating pathology. This aligns with findings from the clinical sample investigated by Meyer et al. (2016). In this study, lack of exercise enjoyment, a scale which was not included in the current study due to poor correlations and factor loadings, also had discriminatory value. Hence, it is possible that lack of exercise enjoyment may be a subscale of the CET that is only relevant to pathology in clinical eating disorder populations. This would also align with the findings regarding factor structure suggesting that lack of exercise enjoyment (and exercise rigidity) may be more applicable to people with eating disorders. In terms of clinical implications, our findings suggest that the three-factor version of the CET may be useful to assess aspects of compulsive exercise in clients that regularly exercise. Elevated scores on avoidance and rule-driven behaviour and weight control exercise may serve to point out compulsive exercise as a

treatment target. Reducing those aspects early in treatment may help to prevent the development of eating disorder symptoms or improve treatment outcome. This may be especially important considering findings that compulsive exercise can lead to a chronic course in eating disorders (Meyer et al., 2011; Strober, Freeman, & Morrell, 1997). Depending on which population the particular client belongs to (i.e., regular exerciser, professional athlete, patient with eating disorder, young female, etc.), the corresponding version of the CET could be used (i.e., three-factor or five-factor model) in order to best represent the specific population.

Limitations of the present study and implications for future research

This study had several limitations. A convenience sampling approach to participant recruitment was used, so the sample should not be considered representative of the general population. Due to this approach, we do not have any information on how many people would have been eligible based on the frequency of their sports participation but chose not to participate. Generalisability is also limited since participants were mostly Australian, so the findings may apply primarily to Australian populations. Also, because data on ethnicity was not collected we are unable to draw conclusions on possible differences that may occur due to cultural or ethnic reasons. Cultural factors have however been associated with participation in sports and recreational exercise (Duda & Allison, 1990) as well as the level of body dissatisfaction (Yates, Edman, & Aruguete, 2004). Therefore, it would be worthwhile to also look at cultural differences in the CET by evaluating its factor structure in different cultures. Similarly, although gender was nearly equally distributed in our sample we were unable to investigate gender-specific differences in the CET due to power reasons. A thorough analysis and comparison would have required testing the factor structure, validity, and internal consistency in both a male and a female sample separately and compare the results. This may however be an important step for future research since males have been shown to present

with higher scores on the CET total as well as avoidance and rule-driven behaviour, mood improvement, and rigidity (Murray, Griffiths, Rieger, & Touyz, 2014). Further, although participants engaged in multiple sport and exercise disciplines (Plateau et al., 2014), it would be useful for future research to compare the psychometric properties of the revised 18-item CET among groups of participants in specific sports. This would allow for a more detailed analysis regarding the use of the CET in relation to individuals from different sport backgrounds, including those who may be more focused on gaining weight and muscle, as opposed sports in which weight loss is commonplace (e.g., combat sports) or a thin, lean physique is valued (e.g., gymnastic, diving). In terms of associations between CET subscales and eating disorder pathology, we considered only the cognitive aspects measured by the EDE-Q while we did not evaluate associations with behavioural symptoms such as binge eating or use of substance such as laxatives, steroids, or similar. This may however be related with exercising behaviour, particularly in people with eating disorders or symptoms of eating disorders (Murray, Griffiths, & Mond, 2016). Another limitation is that we did not assess whether participants had a current or previous diagnosis of an eating disorder. Therefore, the group of participants with EDE-Q scores > 2.3 may include people with clinically relevant and potentially severe eating disorders. Finally, we conducted a cross-sectional study with no follow-up assessment that would allow investigating test-retest reliability. Additional research is needed to examine the CET on a longitudinal base.

Conclusion

In summary, there is support for the multidimensional structure of compulsive exercise on the CET in people who engage in regular exercise. In line with previous research, we conclude that the CET may be useful in detecting patterns of exercise behaviour that are related to eating pathology. It would be useful for future research to determine the utility of the CET in assessing compulsive exercise across different types of psychopathology. Further,

the CET should be evaluated as an outcome measure in interventions for compulsive exercise.

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Table 1

Sample Characteristics

	M (*SD*) or *n* (%)	Range
Age, *M* (*SD*)	31.6 (10.5)	17 – 65
Female gender, *n* (%)	181 (57.8)	
Scores on CET subscales (range 0-5)		
Avoidance and rule-driven behaviour, *M* (*SD*)	2.2 (1.3)	0.0 – 5.0
Weight control exercise, *M* (*SD*)	2.5 (1.2)	0.0 – 5.0
Mood improvement, *M* (*SD*)	3.8 (1.0)	0.0 – 5.0
Lack of exercise enjoyment, *M* (*SD*)	0.7 (0.8)	0.0 – 5.0
Exercise rigidity, *M* (*SD*)	2.8 (1.2)	0.0 – 5.0
Scores on EDE-Q subscales		
Restraint, *M* (*SD*)	2.8 (1.4)	1 – 7
Eating concern, *M* (*SD*)	1.7 (1.2)	0.8 – 6.5
Weight concern, *M* (*SD*)	2.1 (1.4)	0.4 – 6.1
Shape concern, *M* (*SD*)	2.6 (1.5)	0.5 – 6.25
Global score, *M* (*SD*)	2.3 (1.2)	0.7 – 6.5
Sport participation		
Endurance (running, triathlon), *n* (%)	197 (46.4)	
Ball sports (volleyball, football, baseball, basketball, golf, rugby, squash, netball, cricket, hockey, tennis, badminton), *n* (%)	73 (17.2)	
Gym, *n* (%)	56 (13.1)	
Cycling, *n* (%)	36 (8.5)	
Swimming, *n* (%)	18 (4.2)	
Athletics, short distance running, *n* (%)	10 (2.4)	
Aesthetic sports (dance, figure skating, gymnastics), *n* (%)	10 (2.4)	
Rowing, *n* (%)	10 (2.4)	
Yoga, pilates, *n* (%)	5 (1.2)	
Water sports (water polo, sailing, surf lifesaving), *n* (%)	4 (1.0)	
Equestrian, *n* (%)	2 (0.5)	
Other (skateboarding, hula hooping, parkour), *n* (%)	3 (0.7)	

Note. *N* = 313; CET = Compulsive Exercise Test; EDE-Q = Eating Disorder Examination Questionnaire. Multiple answers were allowed for sport participation. Participants were asked to provide the type of sport in a text field, answers were then grouped into categories provided in the table.

Table 2

Fit Statistics for the Factor Models of the Compulsive Exercise Test

Model	χ^2	df	χ^2_{SB}/df	CFI	NNFI	SRMSR	RMSEA [95% CI]	AIC
5 Factors[1]	834.48	242	3.45	.94	.94	.12	.089 [.082-.095]	950.48
1 Factor[2]	2409.30	252	9.56	.79	.77	.16	.170 [.160-.170]	2505.30
4 Factors[3]	696.30	183	3.80	.94	.94	.11	.095 [.087-.100]	792.30
1 Factor[4]	1689.93	189	8.94	.84	.82	.14	.160 [.150-.170]	1773.93
3 Factors[5]	578.92	132	4.39	.95	.94	.11	.100 [.093-.110]	656.92
1 Factor[6]	1495.01	135	11.07	.84	.81	.15	.170 [.170-.180]	1567.01

Note. [1] = 24 items, [2] = 24 items, [3] = 21 items, excluding Factor 4, [4] = 21 items excluding Factor 4, [5] = 18 items, excluding Factors 4 and 5, [6] = 18 items, excluding Factors 4 and 5. χ^2_{SB} = Satorra-Bentler chi square, df = degrees of freedom, CFI = comparative fit index, NNFI = non-normed fit index, SRMSR = standardised root mean square residual, RMSEA = root mean square error of approximation, AIC = Akaike Information Criterion.

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Table 3

Descriptive Statistics, Intercorrelations, and Reliability Coefficients for Three-Factor Solution for the Compulsive Exercise Test

Subscale	Descriptive statistics			Correlations		
	M	*SD*	α	1	2	3
1. Avoidance and rule driven behaviour	2.22	1.30	.91	-		
2. Weight control exercise	2.52	1.24	.81	.45*	-	
3. Mood improvement	3.78	0.97	.77	.49*	.22	-
Total score	2.84	0.91	.90	.86**	.75**	.69**

Note. α = Cronbach's alpha, *$p < .05$, **$p < .01$.

Table 4

Correlation Coefficients Depicting the Association Between the Subscales of Three-Factor Compulsive Exercise Test and the Eating Disorder Examination Questionnaire.

	CET avoidance and rule-driven behaviour	CET weight control exercise	CET mood improvement
EDE-Q global	0.42**	0.75**	0.10
EDE-Q restraint	0.41**	0.54**	0.13*
EDE-Q eating concern	0.34**	0.56**	0.08
EDE-Q weight concern	0.34**	0.72**	0.05
EDE-Q shape concern	0.37**	0.74**	0.09

Note. CET = Compulsive Exercise Test, EDE-Q = Eating Disorder Examination Questionnaire. *p < .05, **p < .01

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Table 5

Group Comparison Between Participants with EDE-Q Global Scores Above and Below the Cut-Off Value of 2.30

	EDE-Q global < 2.3 (n = 178), M (SD)	EDE-Q global ≥ 2.3 (n = 135), M (SD)	t	df	p	Effect size (Cohen's d)
CET weight control exercise	1.83 (0.92)	3.44 (0.98)	14.98	311	< .001	1.69
CET avoidance and rule-driven behaviour	1.84 (1.16)	2.72 (1.32)	6.20	311	< .001	0.71
CET mood improvement	3.74 (0.94)	3.85 (1.00)	0.98	311	.33	0.11

Note. CET = Compulsive Exercise Test, EDE-Q = Eating Disorder Examination Questionnaire.

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