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Predictors of excessive exercise in anorexia nervosa

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Abstract

Objective: The aim of the present study was to replicate and amalgamate findings from previous research into a comprehensive regression model predicting excessive exercise in individuals with anorexia nervosa (AN).
Method: Participants were 153 patients admitted to an inpatient treatment program for AN. Excessive exercise status was defined as a minimum of 1 hour of obligatory exercise aimed at controlling shape and weight, 6 days per week in the month before admission.
Results: Thirty-four percent (n = 52) of participants met criteria for excessive exercise. A logistic regression was conducted with excessive exercise status as the dependent variable and a number of variables previously found to be predictors of excessive exercise entered as independent variables on the same step. The overall regression model was statistically significant ($P < .0005$) and explained 31% of the variance in exercise status. Higher levels of dietary restraint ($P = .03$), depression ($P = .04$), and self-esteem ($P = .02$); lower levels of obsessive-compulsive symptomatology ($P = .04$); and the restricting subtype of AN ($P = .03$) were significantly associated with excessive exercise.
Conclusions: Excessive exercise is associated with a number of independent psychologic and behavioral variables, some that suggest a negative impact and others that suggest positive effects.

1. Introduction

Anorexia nervosa (AN) is an eating disorder characterized by severe food restriction, maintenance of an abnormally low body weight, intense fear of weight gain, and body image disturbance [1]. In about half of cases, there is recurrent binge eating and purging through self-induced vomiting or laxative misuse (ie, binge-purge subtype). The disorder tends to run a chronic course and is associated with significant psychiatric comorbidity, serious medical complications, and considerable impairment in psychosocial functioning.

Exercise has long been recognized as a prominent feature of AN. Indeed, early accounts made note of the presence of driven physical activity that seemed to be agreeable to the patient, despite their emaciated state [2,3]. Hyperactivity is among the first signs of AN to appear, and some researchers have suggested that it should be considered a primary feature of the illness [4]. In one study, 85% of clinical specialists perceived physical activity to be an important component in the pathogenesis and maintenance of eating disorders [5]. Individuals with AN have been shown to have been more physically active than controls, not only during the course of the disorder, but also before its onset [6]; and premorbid activity levels have been shown to be predictive of later excessive exercise activity [7]. Furthermore, higher total exercise activity has been associated with higher drive for thinness and body dissatisfaction scores [8]. However, some studies have found no differences in activity levels between individuals with AN and those without [9,10]. In particular, one study found that a group of individuals with eating disorders did not differ from a non–eating-disordered group in terms of the amount of exercise they engaged in, but rather were distinguished by the feelings associated with the exercise: the group with eating disorders had higher scores on items such as "being annoyed if exercise was interrupted," "others feeling you exercise a lot," "feeling bad if unable to exercise a certain amount," and "feeling that you have/have had problems with exercise" than the group without eating

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disorders [9]. Similarly, several studies have found that exercising to improve appearance and feelings of guilt after exercise postponement were more strongly associated with elevated eating disorder psychopathology than the total amount of exercise activity [11-13]. Thus, some researchers have suggested that what makes exercise *excessive* in eating disorders is not the amount, but rather the obligatory nature of the activity [9,14,15]. Thus, *excessive exercise* as a construct is characterized by a significant amount of physical activity combined with a compulsive need to do the activity. Estimates of proportions of individuals with AN who have exercised excessively at some point during the course of their illness range from 40% [16] to 81% [7].

Despite the prominence of excessive exercise behavior in individuals with AN, there is relatively little clinical research on the role that this type of exercise plays in the course and treatment of this disorder. There is some evidence that the presence of excessive exercise is associated with more physical problems [17], increased energy needs for weight gain [18], poor clinical outcome [19,20], longer periods of hospitalization [8], higher rates of relapse after recovery [20,21], and increased psychopathology [16, 22-27].

Given the negative prognostic sequelae associated with excessive exercise in AN, researchers have attempted to identify diagnostic, personality, and psychologic variables associated with excessive physical activity. Research to date has found that individuals with AN who exercise excessively report higher levels of anxiety, depression, and perfectionism [16,27,28]; increased obsessive-compulsive symptomatology and obsessive-compulsive personality characteristics [16,22-25,29]; more severe eating disorder psychopathology [16,30]; higher levels of anhedonia [31]; higher self-esteem but lower body esteem [25]; lower reward dependence and novelty seeking [30]; younger ages [16]; and lower lifetime minimum body mass indexes (BMIs) [16]. Evidence is mixed in terms of the relationship between AN subtype and exercise status. Some studies have found that excessive exercisers are more likely to be of the purging subtype of AN than individuals with eating disorders who do not exercise excessively [11,16], whereas Dalle Grave and colleagues [30] found that excessive exercise was associated with the restricting subtype of AN, and Brewerton and colleagues [32] found that excessively exercising patients with eating disorders had a lower frequency of binge eating, vomiting, and laxative use than those who did not exercise.

Although the available research has begun to provide us with some sense of the various factors associated with overexercise in AN, most studies have failed to include variables that have been previously identified as predictors of exercise in their regression models. Although these kinds of analyses are useful in an exploratory context, an important next step is to consolidate the results of past research and formulate a more comprehensive regression model of predictors of excessive exercise in AN. The aim of the current study was to develop a comprehensive model predicting extant levels of excessive exercise in individuals with current diagnoses of AN using variables that have been shown to be predictors of exercise in previous literature. In this way, we hoped not only to replicate, but to also extend the findings of previous research by identifying which predictors remained important even after shared variance in the model had been taken into account.

2. Method

2.1. Participants

The participants were 153 (148 women and 5 men) consecutive first-admission patients with AN admitted to the Toronto General Hospital Inpatient Eating Disorders Program between 2000 and 2007 who agreed to participate in the study and who had no missing data on any of the interview or self-report measures. This treatment program has been described in detail elsewhere [33]. It is an intensive group therapy program that is primarily directed at symptom control, normalized eating, and the restoration of body weight to a BMI (in kilograms per square meter) of 20.

2.2. Procedure

A complete description of the study was provided to participants upon admission to the program; and written, informed, and voluntary consent was obtained. Eating disorder diagnosis was established using the diagnostic items of the Eating Disorder Examination (EDE) [34]. As part of the EDE assessment, participants' exercise behavior over the previous 3 months was assessed. The assessor was trained to inquire about exercise that was "obligatory," "obsessive," or "driven" and engaged in for the purpose of burning calories or controlling weight, as opposed to exercise that is a part of daily life (eg, walking 5 minutes to the bus stop). Only exercise that participants endorsed as obligatory or driven was included in the tally of excessive exercise. Participants were then classified into 1 of 2 exercise categories: excessive exercisers and nonexcessive/nonexercisers. *Excessive exercise* was defined as a minimum of 1 hour of "obligatory" exercise a day, at least 6 days a week, for a period of not less than 1 month. This definition of excessive exercise has been used in a number of other studies [7,22,29,32]. As Davis and Kaptein [22] have suggested, although 6 hours of exercise a week may not seem excessive for a healthy adult, for individuals with AN, who are emaciated and medically unstable, any exercise could be construed as excessive.

In addition, during the initial interview, participants' current age and lowest ever BMI were determined. Participants also completed a number of self-report measures described below upon admission to the treatment program.

This study was approved by the Research Ethics Board of the Toronto General Hospital.