

Exercise and Eating Disorders in College-Aged Women: Profiling Excessive Exercisers

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This study examined associations among excessive exercise, eating disorders, and selected psychological characteristics in college women (N = 586). Participants were recruited from university classes and administered the Obligatory Exercise Questionnaire, Eating Disorders Inventory—2, Bulimia Test-Revised, and other psychosocial measures. Results indicated that obligatory exercise is best viewed as multidimensional. These dimensions were used, through cluster analysis, to generate a typology of exercisers. One identified group clearly manifested eating disorder traits and behaviors, as well as signs of psychological disturbance. Another group who exercised with equal intensity but less emotional fixation showed the fewest signs of eating disorders and psychological distress.

Although much is known about the positive effects of exercise on physical and psychological well-being, there is considerable interest in the negative effects of excessive exercise and its associated disorders (Cockerill & Riddington, 1996; Scully, Kremer, Meade, Graham, & Dudgeon, 1998). Other terms have been used to describe excessive exercise such as obligatory exercise (Pasman & Thompson, 1988), exercise dependence (Cockerill & Riddington, 1996; Ogden, Veale, & Summers, 1997), compulsive exercise (Brewerton, Stelfox, Hibbs, Hodges, & Cochrane, 1995), exercise addiction (Hailey & Bailey, 1982), overexercising (Long, Smith, Midgley, & Cassidy, 1993), and overcommitment to exercise (Yates, Shisslak, Crago, & Allender, 1994). Excessive exercise has been identified as a compensatory behavior for the diagnosis of bulimia (DSM-IV; American Psychiatric Association, 1994)

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and as a correlate of anorexia nervosa (Brewerton et al., 1995; Caspar, Schoeller, Kushner, Hnilicka, & Gold, 1991; Davis et al., 1997; Epling, Pierce, & Stefan, 1983).

In past research, there has been some controversy about the links between excessive exercise and eating disorders. A central part of the controversy surrounds the commonalities between those who exercise excessively and those who have restrictive eating disorders (i.e., restricting subtypes of anorexia nervosa or bulimia nervosa). While some studies have suggested a relation between excessive exercise and eating disordered attitudes and behaviors (Brehm & Steffen, 1998; Epling & Pierce, 1988; Imm & Pruitt, 1991; Katz, 1986; Nudel et al., 1989; Pasmán & Thompson, 1988; Selby, Weinstein, & Bird, 1990; Yates, Leehey, & Shisslak, 1983; Yates et al., 1994), others have demonstrated no such association (Iannos & Tiggeman, 1997; Nudelman, Rosen, & Leitenberg, 1988; Owens & Slade, 1987; Weight & Noakes, 1987). The conflicting results of these studies may have been related to the subject populations studied or the method of identifying excessive exercisers. Earlier studies that did not find similarities have often compared the behavioral and psychological characteristics of small, homogenous, but highly selective groups (i.e., marathoners and eating disordered patient populations). Whereas, more recent studies that used comparison groups drawn from similar populations were more likely to discover commonalities between excessive exercisers and eating disordered individuals.

Disparate results may also be attributed to the problem of identifying excessive exercisers using a valid measure of the construct. A variety of methods have been used to identify the excessive exerciser, including direct questions or unidimensional scales that assess only the frequency and intensity of the exercise. Researchers have begun to recognize excessive exercise as a multidimensional activity. Thus, multi-item scales have been developed that incorporate additional behavioral and psychological characteristics (Hailey & Bailey, 1982; Loumidis & Wells, 1998; Ogden et al., 1997).

In a recent study, Steffen and Brehm (1999) used factor analysis to show that there were several dimensions to the Obligatory Exercise Questionnaire (Thompson & Pasmán, 1991; OEQ). Initial item and factor analyses allowed reduction of the 20-item OEQ to a 10-item measure with three factors: (1) Emotional Element of Exercise, with items that refer to some degree of emotional distress resulting from a missed exercise session; (2) Exercise Frequency and Intensity, with items relating to the amount and intensity of exercise; and (3) Exercise Preoccupation, with items relating to thoughts and anticipation of exercise. The most compelling finding was that the newly derived OEQ subscales consistently surpassed the OEQ total in a comparison of their correlations with the Eating Disorder Inventory (EDI) and its subscales. Moderate and significant correlations were obtained between one or more OEQ subscales and all of the EDI subscales. Most notable of these was the substantial contribution of the Emotional Element of Exercise factor to predictions of all EDI subscale scores. Those who display a high degree of

emotionality about their exercising, and who become distressed with missed exercise sessions, seem to view it as an obligatory activity.

The major finding of the Steffen and Brehm (1999) study was that it is not the *amount* of exercise but rather the negative emotionality associated with the exercise activity that may link exercise and eating disorders. In other words, excessive exercisers can be subdivided into at least two groups: those for whom exercise has a highly charged psychological meaning and those for whom it does not. Thus, the disposition of the exerciser toward the exercise may well be the key to linking problematic exercise and eating disorders.

The present study aims to investigate further the association between excessive exercise and eating disordered behaviors and characteristics that the overlooked multidimensionality of exercise measures might have obscured in past research. In this regard, our previous analysis of excessive exercise in high school students (Steffen & Brehm, 1999) is replicated with college women through an analysis of preexisting data (Ackard, 1998). If there is, in fact, an emotional element to exercise as has been previously found, then a similar dimension with the current sample is expected, demonstrating a key link between exercise and eating disorders. Further, based upon their obligatory exercise subscale scores, participants will be classified into discrete groups with different exercise activity and motivation patterns; these resulting subgroups will be described using eating disorder and other psychosocial measures.

METHOD

Participants

Participants were 586 women between the ages of 17 and 55. All were students at a large Midwestern university, were recruited from psychology, women's studies, and continuing education classes, and volunteered to participate in exchange for extra credit points or to fulfill a class requirement.

Instruments

EXERCISE

The Obligatory Exercise Questionnaire (OEQ; Thompson & Pasman, 1991) is a 20-item questionnaire with documented reliability and validity that measures attitudes and activities related to exercise. Individuals report on a 4-point Likert scale how often they experience each exercise-related situation. Higher scores indicate a stronger sense of obligation to exercise.

EATING DISORDER CHARACTERISTICS AND BEHAVIORS

The Eating Disorders Inventory-2 (EDI-2; Garner, 1991) is a 91-item multidimensional self-report instrument that assesses psychological and behavioral

characteristics of anorexia and bulimia nervosa. Reliability and validity estimates have been documented elsewhere (Crowther, Lilly, Crawford, Shepherd, & Oliver, 1990; Garner & Olmsted, 1984; Garner, Olmsted, & Polivy, 1983; Wear & Pratz, 1987). Responses are scored by assigning the three least pathological responses a score of 0 and the other responses 1, 2, or 3 in order of lowest to highest pathology (Garner, 1991). The EDI-2 has 11 subscales that tap into specific eating disordered characteristics. Higher scores indicate greater degrees of the measured characteristic.

The Bulimia Test-Revised (BULIT-R; Thelen, Farmer, Wonderlich, & Smith, 1991) is a 28-item, self-report, Likert-type scale that assesses symptoms of DSM-III-R bulimia and that has been validated for DSM-IV (Thelen, Mintz, & Vander Wal, 1996). Reliability and validity estimates have been reported in other publications (Welch, Thompson, & Hall, 1993). Higher scores indicate a stronger tendency toward bulimic symptomatology.

DEPRESSION

The Center for Epidemiological Studies-Depression scale (CES-D; Radloff, 1977) is a psychometrically sound 20-item self-report scale designed to measure symptoms of depression in the general population. Individuals indicate on a 4-point Likert scale (from 0–3) how often they experience different symptoms of depression. Higher scores indicate more severe symptomatology.

AFFECT IDENTIFICATION AND REGULATION

The Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) is a 30-item self-report scale that has been found to have strong reliability and validity estimates. It has three subscales designed to assess relatively stable individual differences in people's tendency to attend to their moods and emotions (Attention), discriminate clearly among them (Clarity), and regulate them (Repair).

FAMILY ENVIRONMENT

The Family Environment Scale-Real form (FES-R; Moos, 1974; Moos & Moos, 1981) is a self-report questionnaire with 10 subscales designed to measure family social environment as perceived by individual family members. Each has been found to have established reliability and validity (Moos & Moos, 1981). Higher scores on each subscale indicate more of the family attribute being measured.

SELF-ESTEEM

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965, 1979) is a 10-item self-report questionnaire with excellent validity and reliability that was developed for use with high school students. Higher scores indicate higher levels of self-esteem.

BODY IMAGE

The Body Image Assessment instrument (BIA; Williamson, Kelley, Davis, Ruggiero, & Blouin, 1985) is a method for measuring body image disturbance. Participants are instructed to select one female body silhouette perceived to represent their current body size, and one silhouette for their ideal body size. Each figure corresponds to a number from 1 (thinnest) to 9. Reliability and validity have been established (Williamson, Davis, Bennett, Goreczny, & Gleaves, 1989).

Procedure

After a brief overview of the study, informed consent was obtained from each participant. All questionnaires were completed in small groups. Sixteen different orders of the eight instruments were used to counterbalance order effects. These sixteen orders were randomly selected from the 64 possible ones.

RESULTS

Five hundred eighty-six women provided data for these current analyses that augment the findings of the earlier study (Ackard, 1998). The participants averaged 20.61 ($SD = 3.09$) years of age; 78.3% were Caucasian and 14.3% were African-American; their height averaged 65.26 ($SD = 2.67$) inches; they weighed 137.4 ($SD = 26.73$) pounds; their ideal weight was 122.58 ($SD = 13.94$) pounds; and their actual and ideal BMIs were 22.79 ($SD = 4.51$) and 20.31 ($SD = 2.17$) respectively.

A principal components factor analysis with varimax rotation was used to reduce the number of OEQ items. After four such analyses, 9 items were eliminated with the remaining 11 items loading on three factors that explained 64.4% of the variance in the item set. Table 1 contains the 11 items, subdivided by their designated factors, and their factor loadings.

Factor 1, Exercise Fixation, contains five items describing a preoccupation with exercise, negative affect associated with missed exercise, and the use of exercise to compensate for perceived overeating. Factor 2, Exercise Frequency, has three items that address the frequency and type of exercise episodes. Factor 3, Exercise Commitment, has three items indicative of an individual's sense that routine exercise episodes cannot be missed. Factors 1, 2, and 3 have coefficient alphas of .775, .829, and .661, respectively.

The present factor solution differs only slightly from those we previously found in our study of high school students (Steffen & Brehm, 1999). Our original factors of Emotional Element of Exercise and Exercise Preoccupation combined in the present analysis to form the Exercise Fixation factor. The previously identified Exercise Frequency and Intensity factor is essentially the same as the present Exercise Frequency factor. Finally, the Exercise Commitment factor found here did not emerge in the previous analysis.

TABLE 1. Factor Loadings of 11 Remaining OEQ Items

| Factor | OEQ item ^a | Factor loading | Cronbach's α |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|
| Factor 1: Exercise Fixation | 14. Sometimes I find that my mind wanders to thoughts about exercising. | .758 | .775 |
| | 13. When I miss a scheduled exercise session, I may feel tense, irritable, or depressed. | .715 | |
| | 12. If I feel I have overeaten I will try to make up for it by increasing the amount I exercise. | .699 | |
| | 15. I have had daydreams about exercising. | .697 | |
| | 4. When I don't exercise, I feel guilty. | .663 | |
| Factor 2: Exercise Frequency | 3. I exercise more than three days per week. | .872 | .829 |
| | 2. I engage in one or more of the following forms of exercise: walking, jogging, running, or weightlifting. | .838 | |
| | 1. I engage in physical exercise on a daily basis. | .813 | |
| Factor 3: Exercise Commitment | ^b 8. If I have planned to exercise at a particular time and something unexpected comes up (like an old friend comes to visit or I have some work that needs immediate attention), I will usually skip my exercise for that day. | .835 | .661 |
| | ^b 10. I may miss a day of exercise for no good reason. | .765 | |
| | 7. When I miss an exercise session, I feel concerned about my body possibly getting out of shape. | .622 | |

^a Original OEQ item numbers

^b Reverse scored

These dissimilarities are likely due to the age difference between study participants (high school versus college) and the gender composition of the current sample. Table 2 contains comparative correlations of the full OEQ and its three subscales with the EDI subscales.

Participants were then clustered using their three OEQ subscale scores as the clustering variables. Table 3 contains descriptive statistics for the six cluster analysis-derived groups on the OEQ subscales. The members of Group 1 ($n = 52$) are characterized by high scores on all three subscales and will be subsequently identified as the "Pathological Obligatory Exercisers." Those in Group 2 ($n = 180$) have scores close to the whole sample average on all three subscales and will be called the "Well-Adjusted Exercisers." Members of Group 3 ($n = 80$) scored below average on exercise fixation and frequency but quite high on commitment and will be called the "Obligatory NonExercisers." Participants in Group 4 ($n = 86$) scored at the average for exercise fixation and commitment but well above average for exercise frequency and will be called "Well-Adjusted Avid Exercisers." Group 5 ($n = 76$) is composed of individuals who scored low on all three subscales and are called the "Well-Adjusted Nonexercisers." Finally, those in Group 6 ($n = 112$)

TABLE 2. Correlations Among OEQ and EDI-2 and their Subscales

| | OEQ total | Exercise fixation | Exercise frequency | Exercise commitment |
|-------------------------|-----------|-------------------|--------------------|---------------------|
| EDI-2 subscales | | | | |
| Drive for Thinness | .482** | .602** | .146** | .311 |
| Bulimia | .232** | .285** | -.017 | .194** |
| Body Dissatisfaction | .242** | .462** | -.023 | .098* |
| Ineffectiveness | .184** | .194** | -.045 | .291 |
| Perfectionism | .159** | .217** | .087* | -.042 |
| Interpersonal Distrust | .081 | .082* | -.104* | .205** |
| Interoceptive Awareness | .295** | .320** | .050 | .244** |
| Maturity Fears | .142** | .178** | -.038 | .145** |
| Asceticism | .265** | .232** | .001 | .377** |
| Impulse Regulation | .201 ** | .250** | -.011 | .187** |
| Social Insecurity | .136** | .111 | -.094* | .344** |

* $p < .05$ ** $p < .01$

scored high on exercise fixation but average on commitment and low on frequency and are called “Exercise-Obsessed Nonexercisers.”

A multivariate analysis of variance was performed on weight-, body image- and exercise-related measures. The overall multivariate effect for cluster membership was highly significant [$F(35, 2345.52) = 7.76, p < .001$]. Subsequent univariate analyses indicated significant differences on all but one measure (i.e., height). Table 4 contains the means and standard deviations of the basic weight-related variables grouped by cluster membership. The six clusters differed among themselves on self-reported weight, with the Exer-

TABLE 3. Means, Standard Deviations, and Group Size (N) of Six Cluster Analysis-Derived Groups on OEQ Subscales

| Group (N) | OEQ Subscales | | |
|----------------------------------------|-------------------|--------------------|---------------------|
| | Exercise fixation | Exercise frequency | Exercise commitment |
| Pathological obligatory exerciser (52) | 14.21 (1.76) | 10.60 (1.56) | 9.48 (1.51) |
| Well-adjusted exerciser (180) | 8.38 (1.77) | 7.95 (1.07) | 6.59 (1.29) |
| Obligatory nonexerciser (80) | 6.53 (1.04) | 5.63 (1.44) | 9.30 (1.85) |
| Well-adjusted avid exerciser (86) | 8.92 (1.97) | 10.92 (0.88) | 7.57 (1.51) |
| Well-adjusted nonexerciser (76) | 6.26 (1.37) | 4.80 (1.22) | 4.09 (0.95) |
| Exercise-obsessed nonexerciser (112) | 11.55 (1.96) | 6.04 (1.18) | 7.16 (1.63) |

TABLE 4. Descriptive Statistics (Means and Standard Deviations) of Six Cluster Analysis-Derived Groups on Selected Weight-related Measures

| Group | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
|---------------|-----------------------------------------|--|----------------------------|--|----------------------------|--|---------------------------------|--|-------------------------------|--|---------------------------------------|--|
| | Pathological obligatory exerciser | | Well-adjusted exerciser | | Obligatory nonexerciser | | Well-adjusted avid exerciser | | Well-adjusted nonexerciser | | Exercise- obsessed nonexerciser | |
| Weight | 130.69 (17.77) | | 140.14 (27.19) | | 140.61 (32.76) | | 129.92 (15.40) | | 132.39 (30.87) | | 143.04 (26.67) | |
| Ideal Wt. | 117.87 (13.15) | | 123.72 (14.83) | | 124.15 (13.67) | | 120.23 (12.35) | | 120.97 (14.31) | | 124.70 (13.33) | |
| BMI | 21.21 (2.68) | | 23.19 (4.68) | | 23.17 (4.80) | | 21.48 (2.23) | | 22.07 (4.68) | | 24.13 (5.35) | |
| Ideal BMI | 19.11 (1.67) | | 20.45 (2.38) | | 20.51 (2.03) | | 19.87 (1.52) | | 20.21 (2.04) | | 20.93 (2.38) | |
| Body Image | 3.75 (1.03) | | 3.76 (1.27) | | 3.46 (1.20) | | 3.37 (0.95) | | 3.38 (1.28) | | 4.50 (1.19) | |
| Pref. Image | 2.29 (0.78) | | 2.67 (0.84) | | 2.41 (0.97) | | 2.69 (0.66) | | 2.80 (0.73) | | 2.66 (0.94) | |
| Hrs. Exercise | 1.85 (1.33) | | 1.11 (0.51) | | 0.84 (0.86) | | 1.63 (0.77) | | 0.55 (0.81) | | 0.87 (0.58) | |

cise-Obsessed Nonexercisers (Group 6) being the heaviest and the Pathological Obligatory Exercisers (Group 1) and Well-Adjusted Avid Exercisers (Group 4) weighing the least. The clusters differed as well on their ideal weight with the Pathological Obligatory Exercisers having the lowest ideal weight and the Exercise-Obsessed Nonexercisers the highest. Differences also were found among groups on their body mass indices and ideal body mass indices with Group 1 being lowest and Group 6 highest on both. The groups also differed on the body image assessment scale for current and preferred figures with the Exercise-Obsessed Nonexercisers reporting heavier current body images and the Well-Adjusted Avid Exercisers and Well-Adjusted Nonexercisers reporting the least. On Body Image Assessment Preferred Figure, the Well-Adjusted Nonexercisers preferred the heavier image while the Pathological Obligatory Exercisers preferred the thinner figure. The groups differed substantially on the number of hours reported exercising each day, with the Pathological Obligatory Exercisers (Group 1) exercising the most and the Well-Adjusted Nonexercisers (Group 5) exercising the least.

Three separate multivariate analyses of variance (MANOVA) were conducted on the psychosocial measures with the EDI subscales and BULIT in the first, the FES subscales in the second, and the remaining psychological variables in the third analysis. The MANOVA with cluster membership as the grouping factor conducted on the EDI subscales and the BULIT was significant [$F(60,2579.21) = 5.89, p < .001$]. All univariate ANOVAs were significant at $p < .001$. As shown in Table 5, Group 1 scored the highest on the Drive for Thinness, Body Dissatisfaction, Ineffectiveness, Perfectionism, Interpersonal Distrust, Interoceptive Awareness, Maturity Fears, Asceticism, and Impulse Regulation subscales, indicating a group with several signs pathomonomic of serious eating disorder. Group 6, another group showing signs of eating disturbances, was highest on the Bulimia subscale and second or third highest on all the others. Group 3 scored highest or near highest on Ineffectiveness, Interpersonal Distrust, Asceticism, and Social Insecurity. It appears that this group's members, while not displaying typical eating disorder traits, demonstrate a degree of psychological pathology that might lead to eating disorders. Finally, Groups 2, 4, and 5 were consistently among the lowest scoring on all subscales and seem to be relatively benign with regard to eating disorders.

The MANOVA on the ten FES subscales was also significant [$F(50,2525.43) = 1.54, p < .009$]. Univariate differences ($p < .05$) were obtained on the Cohesion, Conflict, and Active-Recreational Orientation subscales. No clear patterns emerge from these findings. Groups 4, 2, and 1, respectively, are highest on Cohesion; Groups 3, 4, and 2 are lowest on Conflict; and, Groups 4, 2, and 1 are highest on Active-Recreational Orientation. These groups appear to come from families that are considered to be relatively stable.

Finally, the MANOVA for the self-esteem, depression, and trait meta-

TABLE 5. Descriptive Statistics (Means and Standard Deviations) of Six Cluster Analysis-Derived Groups on Selected Psychosocial Measures

| Group | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
|----------------------|-----------------------------------------|---------|----------------------------|---------|----------------------------|---------|---------------------------------|---------|-------------------------------|---------|---------------------------------------|---------|
| | Pathological obligatory exerciser | | Well-adjusted exerciser | | Obligatory nonexerciser | | Well-adjusted avid exerciser | | Well-adjusted nonexerciser | | Exercise- obsessed nonexerciser | |
| BULIT | 72.94 | (20.08) | 51.71 | (19.19) | 51.93 | (19.53) | 54.10 | (20.36) | 45.71 | (14.67) | 65.47 | (24.95) |
| Depression scale | 24.12 | (12.59) | 15.87 | (11.95) | 17.81 | (9.83) | 14.80 | (11.62) | 14.48 | (10.27) | 22.24 | (11.72) |
| Self-esteem scale | 26.96 | (5.75) | 30.38 | (5.38) | 27.30 | (5.24) | 30.89 | (5.45) | 30.66 | (5.15) | 28.23 | (5.02) |
| Trait MM scale | 77.04 | (18.72) | 67.39 | (16.12) | 71.89 | (14.94) | 66.07 | (16.58) | 68.56 | (14.31) | 75.10 | (15.71) |
| Attention | 43.35 | (7.63) | 44.63 | (7.24) | 42.87 | (6.34) | 44.92 | (6.73) | 44.51 | (6.56) | 43.04 | (7.34) |
| Clarity | 33.13 | (9.59) | 39.34 | (8.16) | 38.72 | (6.87) | 40.20 | (8.60) | 38.83 | (7.52) | 35.92 | (8.02) |
| Repair | 20.48 | (5.23) | 22.61 | (4.71) | 20.18 | (5.57) | 22.84 | (5.54) | 21.92 | (4.85) | 19.81 | (4.84) |
| EDI Subscales | | | | | | | | | | | | |
| Drive for Thinness | 13.52 | (5.55) | 4.66 | (4.85) | 4.23 | (4.06) | 5.40 | (5.85) | 2.72 | (4.21) | 8.64 | (5.93) |
| Bulimia | 2.69 | (3.58) | 1.31 | (2.18) | 2.10 | (2.35) | 1.62 | (2.73) | 1.07 | (2.24) | 3.28 | (3.99) |
| Body Dissatisfaction | 17.88 | (7.45) | 10.67 | (8.43) | 8.59 | (6.95) | 8.53 | (7.53) | 8.83 | (8.56) | 15.37 | (7.56) |
| Ineffectiveness | 6.52 | (6.07) | 3.42 | (5.45) | 6.40 | (5.17) | 2.62 | (4.37) | 2.22 | (3.77) | 5.32 | (5.48) |
| Perfectionism | 8.35 | (4.98) | 5.61 | (3.68) | 4.48 | (2.90) | 6.17 | (3.73) | 6.49 | (3.72) | 6.69 | (4.18) |
| Interpersonal Dist. | 4.12 | (4.35) | 2.68 | (3.18) | 4.64 | (3.54) | 2.19 | (2.57) | 2.72 | (3.16) | 3.67 | (3.97) |
| Interceptive Aware. | 8.38 | (5.46) | 5.01 | (3.30) | 5.91 | (3.19) | 5.52 | (3.77) | 4.27 | (3.12) | 7.14 | (4.38) |
| Maturity Fears | 5.15 | (4.52) | 3.27 | (3.49) | 4.33 | (3.95) | 2.90 | (2.93) | 3.20 | (3.46) | 4.38 | (4.76) |
| Asceticism | 6.47 | (3.40) | 4.02 | (2.63) | 6.29 | (2.75) | 4.27 | (2.86) | 3.44 | (2.11) | 5.30 | (3.48) |
| Impulse Regulation | 6.00 | (6.28) | 2.79 | (3.82) | 4.44 | (3.52) | 2.91 | (3.88) | 2.82 | (3.80) | 5.21 | (5.07) |
| Social Insecurity | 5.90 | (4.62) | 3.83 | (3.92) | 7.90 | (4.81) | 3.65 | (3.80) | 3.50 | (3.69) | 5.44 | (4.17) |

FES Subscales

| | | | | | | | | | | | | |
|---------------------|------|--------|------|--------|------|--------|------|--------|------|--------|------|--------|
| Cohesion | 6.19 | (2.81) | 6.45 | (2.40) | 5.83 | (2.44) | 6.62 | (2.52) | 5.66 | (2.60) | 5.70 | (2.49) |
| Expressiveness | 5.13 | (2.63) | 5.26 | (2.09) | 5.01 | (1.95) | 5.28 | (2.11) | 5.18 | (2.08) | 4.88 | (2.25) |
| Conflict | 4.02 | (2.32) | 3.54 | (2.33) | 3.11 | (2.12) | 3.51 | (2.05) | 4.05 | (2.46) | 4.23 | (2.47) |
| Independence | 6.25 | (1.97) | 6.54 | (1.67) | 5.79 | (1.85) | 6.77 | (1.70) | 6.72 | (1.66) | 3.35 | (1.77) |
| Achievement | 6.33 | (1.76) | 5.90 | (1.76) | 5.50 | (1.63) | 6.19 | (1.78) | 6.08 | (1.74) | 5.93 | (1.92) |
| Intellectual | 4.60 | (2.40) | 5.02 | (2.36) | 4.43 | (2.27) | 4.97 | (2.41) | 4.49 | (2.50) | 4.89 | (2.38) |
| Active-Recreational | 5.62 | (2.37) | 5.66 | (2.21) | 5.21 | (1.88) | 6.14 | (2.00) | 5.09 | (2.22) | 5.24 | (2.09) |
| Moral-Religious | 5.02 | (2.18) | 4.90 | (2.32) | 5.28 | (2.02) | 5.74 | (2.17) | 5.00 | (2.52) | 5.22 | (2.21) |
| Organization | 5.10 | (2.14) | 5.00 | (2.17) | 5.04 | (2.22) | 5.27 | (2.20) | 5.04 | (2.29) | 4.67 | (2.30) |
| Control | 4.08 | (2.62) | 4.18 | (2.56) | 4.37 | (2.33) | 4.80 | (2.28) | 4.11 | (2.32) | 4.44 | (2.23) |

mood measures was significant [$F(15,1554.6) = 4.96, p < .001$]. All three univariate analyses were significant with $p < .001$. The Well-Adjusted Avid Exercisers (Group 4) reported the highest level of self-esteem and the Pathological Obligatory Exercisers (Group 1) the lowest. Group 1 was the highest on the Trait-Meta Mood Scale indicating a tendency to attend to their internal experience and Group 4 was the lowest on this measure. Finally, the Pathological Obligatory Exercisers scored highest on depression while the Well-Adjusted Nonexercisers and Well-Adjusted Avid Exercisers were the lowest.

A clear pattern emerges here striking a sharp distinction between the two groups, Groups 1 and 4, who demonstrate the highest levels of exercise activity. Group 1 consistently scores in the least adjusted range for almost all measures and Group 4 is consistently among the best adjusted. These findings underscore the fact that it is not the frequency of exercise per se that is related to pathological eating and other psychosocial maladjustment but rather the negative emotionality associated with the exercise.

DISCUSSION

The multidimensionality of excessive exercise was established in this sample of college women. As found by Steffen and Brehm (1999), the Obligatory Exercise Questionnaire can be reduced in length and has subscales that highlight the multifaceted nature of excessive exercise. While the dimensions of Exercise Fixation, Exercise Frequency, and Exercise Commitment obtained with this sample of college women did not exactly replicate those found by Steffen and Brehm (1999) with high school students, some degree of factor overlap occurred. The Exercise Fixation factor is equivalent to the Exercise Emotionality factor combined with the Exercise Preoccupation factor from Steffen and Brehm. Inspection of the items loading on Exercise Fixation shows that persons who score high are immersed in and preoccupied with their exercise routine. There is a certain degree of negative emotionality associated with missing an exercise session, and exercise is used to compensate for overeating. This factor, among the three extracted, showed the highest correlations with most EDI subscales, suggesting a link between it and eating disordered traits and behaviors. In this regard, our current findings with college women and past ones with high school male and female students appear to be highly comparable. Common to both samples is a strong emotional attachment to exercise. This seems to be the operative factor linking eating disorders and excessive exercise.

Our findings and others' (Cockerill & Riddington, 1996; Loumidis & Wells, 1998; Ogden et al., 1997) suggest that it is overly simplistic to view exercise in a unidimensional fashion. It is our contention that the past work on the link between eating disorders and exercise has been seriously mistaken when excessive exercise is defined solely by the number of hours of daily exercise or by engagement in particular types of intense exercise, such

as long distance running. Granted, people who engage in inordinate amounts of exercise activity are different from the norm. However, our findings and others (Davis et al., 1997) indicate that it is not only the amount of exercise that is important, but also the rationale and meaning of the exercise. The Exercise Frequency factor obtained in this study seems to reflect a dimension of exercise that is not always related to eating disorders. Inspection of its items shows that those who score high on this factor exercise often and engage in intense activities. Yet, they do not necessarily score high on eating disorder subscales.

Recognition of the complex and multifaceted nature of excessive exercise led to the clustering of participants using their scores on the three extracted obligatory exercise factors. Based on this cluster analysis, six meaningful subgroups were identified that had profiles suggestive of differing exercise attitudes and behaviors. Noteworthy was the fact that those who scored high on the Exercise Frequency factor were further subdivided on the basis of their Exercise Fixation factor score to produce a high fixation group (Group 1: Pathological Obligatory Exerciser) who scored high on almost all EDI subscales and a lower fixation group (Group 4: Well-Adjusted Avid Exerciser) who scored low on those same subscales. The identification of distinct exerciser profiles using the OEQ subscales is perhaps the most substantive contribution of this research.

Treating frequent exercise as *prima facie* evidence of a disorder is a disservice to those who exercise for health and enjoyment reasons. However, there are some for whom frequent exercise becomes pathological. The results of the cluster analysis reported here support this distinction between healthy and unhealthy frequent exercisers. These findings provide evidence for an association between particular profiles of exercise attitudes and behaviors and eating disordered characteristics without implying cause and effect. Those who exercise frequently, who are strongly and emotionally fixated on their exercise activity, and who have a strong commitment to it are among those whose scores on eating disorder and psychosocial measures indicate substantial psychopathology. On the other hand, those who exercise frequently, who have some commitment to their activities, but who do not manifest a psychological fixation upon them are the best adjusted. The Fixation factor is most strongly related to measures of psychosocial maladjustment, independent of exercise frequency.

Several implications can be drawn from the present study. First, in light of the current findings and those of Davis et al. (1997), researchers investigating the exercise–eating disorder link should use some multidimensional measure of exercise such as the one provided here. It has been demonstrated that the amount and intensity of exercise alone is not associated with eating disordered traits. Second, the importance of the Exercise Fixation factor in distinguishing maladjustment among frequent exercisers suggests that the cognitions associated with excessive exercise could be a key to understanding how it contributes to the pathology of eating disorders. The

items on the Exercise Fixation factor depict a particular frame of mind about exercise and its purpose. The attitudes and beliefs that contribute to a person's fixation on her exercise routine may have some commonality with those associated with her disordered cognitions about eating and body image.

Clinically, the identification of exercise enthusiasts and athletes who score high on the Exercise Fixation factor may enhance primary and secondary prevention of eating disorders through early symptom detection. If the findings of this current study can be considered normative for college women, then scores on the Exercise Fixation factor can be used as a rough index of a woman's risk for being eating disordered. In the current revision of the OEQ, five items constitute this fixation subscale and are rated from 1–4 with 1 being "never" and 4 "always." Resulting scores can range from 5–20. Using the norms presented here, it would be safe to assume that a college woman scoring 12 or above on the fixation subscale may well be at risk. This is not to suggest that exercise fixation necessarily precedes an eating disorder but rather that exercise may be a less obvious form of compensatory behavior when compared to other eating disordered behaviors, such as self-induced vomiting or extreme calorie restriction.

Third, the identification of a highly maladjusted group (Group 1: Pathological Obligatory Exercisers) by using the three OEQ subscale scores is quite meaningful, clearly demonstrating an association among exercise beliefs and activities, eating-disordered traits, and psychopathology (i.e., depression, self esteem, and mood sensitivity). The exerciser profiles identified here need to be cross-validated. While the present findings are robust, they are only as useful to the degree to which they can be generalized. Additional evidence for the existence of the pathological obligatory exerciser is needed in the continuing effort to clarify the eating disorder-exercise linkage. Finally, the importance of cognitive factors within this framework needs elucidation. Several authors have proposed cognitive models of bulimia, anorexia nervosa, and excessive exercise (Cooper, 1997; Leung, Waller, & Thomas, 2000; Long et al., 1993; Loumidis & Roxborough, 1995). Our findings suggest that the negative cognitions among those who have eating disorders may be extended to their exercise activities.

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