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Behavioral and Psychological Aspects of Exercise across Stages of Eating Disorder Recovery

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Abstract

This study examined the relationship between behavioral and psychological aspects of exercise and eating disorder recovery. Participants were categorized as having an eating disorder ($n = 53$), partially recovered ($n = 15$), fully recovered ($n = 20$), or non-eating disorder controls ($n = 67$). Groups did not differ significantly in time spent exercising, but did differ in exercise intensity, guilt related exercise, obsessive exercise cognitions, and appearance/weight management and stress/mood management motivations for exercise. Results support the importance of measuring psychological aspects of exercise in particular across the course of an eating disorder.

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Unlike other behaviors associated with eating disorders, such as restrictive eating and purging, exercise is a behavior that, outside of an eating disorder context, is healthy and encouraged. In fact, exercise is a key factor in the prevention and treatment of obesity, helping to produce necessary weight loss and contributing to weight maintenance (Blair & Holder, 2002; Carels, Konrad, Young, Darby, Coit, Clayton, & Oemig, 2008). However, the exercise activities of those struggling with an eating disorder are often unhealthy in terms of excessive behavioral components and obsessive psychological qualities. Indeed, exercise as a means to control weight is common among those with eating disorders, especially those with anorexia nervosa (Meyer, Taranis, & Touyz, 2008), and "excessive exercise" as an inappropriate compensatory behavior is included as a diagnostic criterion for bulimia nervosa (American Psychiatric Association, 2013). It is estimated that approximately 80% of patients with anorexia nervosa and 55% of patients with bulimia nervosa engage in unhealthy exercise patterns (Davis et al., 1997). Ideally, those recovering from an eating disorder would return to not only healthy eating, such as intuitive eating, but also healthy exercise, such as more mindful physical activity free of obsessive qualities. The current study examines behavioral and psychological aspects of current exercise among individuals at different stages of an eating disorder and non-eating disorder controls.

Adkins and Keel (2005) note that all definitions of unhealthy exercise appear to converge on two related dimensions of this phenomenon: a quantitative dimension (often referred to as "excessive") and a qualitative or psychological dimension ("compulsive"). The "excessive" dimension of exercise refers to quantifiable and more behavioral aspects of exercise such as duration, frequency, and intensity, while the "compulsive" dimension of exercise refers to qualitative and psychological aspects of exercise such as the experience of guilt and anxiety when exercise sessions are missed, as well as one's motivations for exercise.

A limitation of past research on exercise has been the overemphasis on the behavioral dimension to identify those with unhealthy exercise patterns (Meyer et al., 2008; Steffen & Brehm, 1999), with the operationalization of "excessive exercise" varying greatly from study to study (e.g., Shroff et al., 2006 – more than three hours/day; Holland, Brown, & Keel, 2014 – more than 60 minutes/day). Another approach to examining behavioral aspects of exercise in relation to eating pathology involves considering exercise intensity. Bratland-Sanda, Martinsen, Rosenvinge, Ro, Hoffart, and Sundgot-Borgen (2011) found that accelerometer-assessed vigorous, but not moderate, intensity physical activity was associated with greater eating pathology in a sample of patients diagnosed with an eating disorder.

Very limited work exists on the nature of behavioral aspects of exercise in relation to eating disorder recovery. When excessive exercise was defined as engaging in some form of exercise more than 21 days in a given month, researchers found that 23% of current patients with an eating disorder met this criterion, in contrast to only 5% of "recovering" patients (i.e., had been inpatients approximately 12 months previously) (Abraham, Boyd, Luscombe, Hart, & Russell, 2007). In terms of exercise and prediction of recovery from anorexia nervosa, Casper and Jabine (1996) found that within a group with a good outcome (i.e., weight within ±15% of expected with regular menstruation), significantly fewer individuals (68%) reported overexercising at admission, as opposed to 98% of the poor outcome group.

Behavioral dimensions undoubtedly warrant consideration in determining whether exercise is maladaptive or unhealthy; however, it has been argued that feelings and attitudes toward exercise are what more uniquely differentiate those with and without eating pathology (Boyd, Abraham, & Luscombe, 2007). It is therefore essential for researchers to also examine psychological aspects of exercise when assessing exercise that may be unhealthy and concerning. Considering both behavioral and psychological constructs provides a more comprehensive, multi-faceted, and accurate understanding of exercise in relation to eating disorder recovery status. This dimensional approach also offers the possibility of multiple points of intervention in terms of which facets of exercise are potentially most related to recovery and should be targeted.

The degree of guilt experienced after missing exercise is one psychological indicator that appears to distinguish between eating disorder and non-eating disorder groups. Boyd et al. (2007) found that more strongly endorsing that one felt like a bad person for not exercising a certain amount significantly discriminated between eating disorder and non-eating disorder groups. Mond and Calogero (2009) found that women with eating disorders who were excessive exercisers reported more intense guilt associated with missing exercise compared to controls.

Exercise preoccupation or obsessive cognitions about exercise is also a meaningful focus of exercise and eating disorder research. A factor analysis of the Obligatory Exercise Questionnaire (OEQ; Pasman & Thompson, 1988) revealed a factor reflecting obsessive thoughts about exercise (Steffen & Brehm, 1999). Ackard, Brehm, and Steffen (2002) reported that “exercise fixation” is highly correlated with measures of psychological maladjustment, regardless of exercise frequency, and suggested that cognitions related to excessive exercise could be critical to understanding how it contributes to eating disorder psychopathology.

Lastly, research suggests that motivation for exercise may be related in important ways to eating pathology. Findings from Thome and Espelage (2007) suggest that individuals who feel compelled to exercise and exercise for weight-related reasons may be at greater risk of developing an eating disorder than those who exercise often but not for weight-related reasons. Relatedly, exercising for weight control, tone, and to improve appearance has been linked to higher levels of eating pathology and lower quality of life (Mond & Calogero, 2009). Interestingly, some research has found that as patients with an eating disorder who excessively exercise progress through treatment, decreased eating pathology is associated with decreased importance of exercise for regulating negative affect (Bratland-Sanda, Sundgot-Borgen, Ro, Rosenvinge, Hoffart, & Martinsen, 2010). Other work suggests that women in recovery from anorexia nervosa (defined as not meeting diagnostic criteria in the past three years) do not differ from non-eating disorder controls on reasons for exercise, endorsing similar levels of exercising for reasons of weight control, fitness, mood, health, attractiveness, enjoyment, and tone (Dellava, Hamer, Kanodia, Reyes-Rodriguez, & Bulik, 2011).

The current study explored both behavioral aspects of exercise (e.g., amount of time spent exercising, intensity level) and aspects which capture psychological dimensions of exercise

(e.g., guilt, obsessive cognitions, motivations) in a sample of women at different stages of an eating disorder. Recovery was conceptualized as full recovery (recovery in physical, behavioral, and psychological domains) and partial recovery (physical and behavioral, but not psychological, recovery), with the latter group appearing to outsiders as "recovered" by virtue of weight and the absence of eating disorder behaviors but still maintaining eating disordered thoughts and attitudes (Bardone-Cone, Harney, Maldonado, Lawson, Robinson, Smith, & Tosh, 2010). To date, no study has examined how individuals fully recovered from an eating disorder compare with individuals with an eating disorder, a partially recovered group, and non-eating disorder controls in terms of these exercise dimensions. Considering exercise dimensions in relation to stages of eating disorder recovery helps further flesh out what full recovery may "look" like. Further, given that excessive exercise has been found to be predictive of a poor outcome, including longer inpatient treatment (Solenberger, 2001) and shorter time to relapse (Strober, Freeman, & Morrell, 1997), knowing how problematic features of exercise relate to different stages of recovery could clarify appropriate targets for intervention.

It was hypothesized that individuals in some stage of recovery (full or partial) and non-eating disorder controls would look similar on the behavioral measures of exercise, all with significantly lower levels than the eating disorder group. It was also hypothesized that the fully recovered and control groups would look similar and report lower levels of psychological aspects of unhealthy exercise engagement (i.e., less guilt, lower levels of obsessive cognitions, less motivation for weight control) than the partially recovered and eating disorder groups, which would not significantly differ from each other.

Method

Participants and Procedure

Participants were recruited from current and former female eating disorder patients (ages 16 and older) seen from 1996–2007 at a primary care and referral clinic specializing in children and adolescents. Of 273 potential eating disorder patients, 96 (35.2%) were contacted and recruited. Fifty-five (20.1%) of the 273 were contacted but chose not to participate, four (1.5%) were deceased, and 118 (43.2%) could not be contacted. These rates are comparable to those of other first follow-ups of eating disorder patients over long time periods (Yackobovitch-Gavan et al., 2009). Thus, of the 151 eating disorder patients contacted, 63.6% participated. Controls were recruited from the same primary care clinic ($n = 17$) and a university campus, including introductory psychology courses ($n = 50$). Eligible controls were females ages 16 and older who were screened via a phone diagnostic interview for no current or past eating disorders or severe eating pathology. This same dataset has produced other research findings related to eating disorder recovery, but this is the first work from this dataset to examine exercise in relation to recovery.

All participants (current/former patients and controls) provided written consent and completed the same study measures (survey, interview), receiving financial compensation (for introductory psychology students: course credit) for participating. This study was approved by the university's institutional review board.

Measures

Measures used to define eating disorder status—To determine whether criteria for a current eating disorder were met, the Structured Clinical Interview for DSM-IV, Patient Edition (SCID; First, Spitzer, Gibbon, & Williams, 1995) was used to assess diagnoses of anorexia nervosa (AN) – excluding the amenhorrea requirement, bulimia nervosa (BN), and Eating Disorder Not Otherwise Specified (EDNOS). A random subset (approximately 5%) of the audiotaped interviews was examined for inter-rater reliability, yielding absolute agreement between the first author and the two other interviewers for current AN, BN, and EDNOS.

To determine physical recovery, measurements of weight and height were taken after the interview to compute BMI; for the minority who did not complete the interview in person, self-reported weight and height were used for BMI. To determine behavioral recovery (i.e., no binge eating, purging, or fasting in the past three months), portions of the Eating Disorders Longitudinal Interval Follow-up Evaluation (LIFE EAT II; Herzog, Sacks, Keller, Lavori, von Ranson, & Gray, 1993) were used. To determine psychological recovery, the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994), composed of restraint, eating concern, weight concern, and shape concern subscales, was used, with participants' scores within 1 SD of age-matched community norms on all four subscales representing psychological recovery. The SCID, LIFE EAT II, and EDE-Q are all well-established measures with good psychometric properties (Anderson & Williamson, 2002; Fairburn & Beglin, 1994; Herzog et al., 1993; Luce & Crowther, 1999; Segal, Hersen, & Van Hasselt, 1994).

Behavioral aspects of exercise—Participants were asked to list all forms of exercise they engaged in during a typical week. For each type of exercise listed, participants then indicated the number of days per week they typically engaged in the exercise, the typical number of minutes per exercise episode, and the typical level of intensity (1 = *not at all intensely* to 5 = *extremely intensely*), permitting computation of the typical number of weekly minutes of exercise overall, as well as the typical exercise intensity overall. Exercises were also categorized as cardiovascular/aerobic exercise (sustained elevations in heart rate – e.g., running) and strength/resistance exercise (e.g., weight lifting, yoga), so that information about number of weekly minutes and intensity could also be reported separately for these two categories.

Psychological aspects of exercise

Guilt related to missing exercise—Guilt was assessed using a single item that has been used in prior work on exercise (e.g., Mond, Hay, Rodgers, & Owen, 2006). Participants responded to the question, "Do you feel 'guilty' that you have somehow 'let yourself down' when you miss an exercise session?" using a 5-point scale from 1 = *I don't feel at all guilty* to 5 =*I feel extremely guilty*.

Obsessive cognitions related to exercise—Cognitive aspects of exercise were assessed via two questions created for this study. Participants reported on: (1) the amount of waking hours they spent thinking about exercise (e.g., "planning when you will exercise next

or which exercises you'll do, thinking about exercise you did, thinking about opportunities to exercise that you missed"), rated from 1 = *no time or almost no time* to 5 = *almost all the time or all the time*, and (2) how easy or difficult it is for them to stop thinking about exercise when they find themselves thinking about it (1 = *extremely easy* to 5 = *extremely difficult*).

Motivations for exercise—Motivations for exercise were assessed using the Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988). The REI is composed of 24 items that are rated on a 7-point scale ranging from 1 = *not at all important* to 7 = *extremely important*. Instructions stress that respondents report on their actual reasons for exercising rather than the reasons they believe they should have for exercising; participants were instructed not to answer these questions if they never exercised ($n = 7$). Based on prior factor analytic work (Cash, Novy, & Grant, 1994), four factors of motivations were examined: appearance/weight management (eight items; e.g., to improve my appearance), fitness/health management (eight items; e.g., to improve my cardiovascular fitness), stress/mood management (four items; e.g., to cope with stress, anxiety), and socializing (two items; e.g., to socialize with friends). The socializing factor reported by Cash et al. (1994) included an additional item that was not included in the original REI; we retained the socializing subscale for examination, but note that it includes two of the three items used by Cash and colleagues. These factors yielded adequate reliabilities for these subscales in a sample of undergraduate females (coefficient alphas from .73 to .91; Cash et al., 1994). In the current study, coefficient alphas were as follows: appearance/weight management (.89), fitness/health management (.89), stress/mood management (.81), and socializing (.88).

Results

Descriptive Statistics

Based on data from the SCID, the LIFE EAT II, the EDE-Q, and BMI, participants were categorized into one of four eating disorder status groups: (1) non-eating disordered controls ($n = 67$) had no history of an eating disorder; (2) fully recovered individuals ($n = 20$) did not currently have an eating disorder, had a BMI of at least 18.5 kg/m^2 (a BMI of 18.5–24.9 is considered normal by the World Health Organization; Bjorntorp, 2002), reported no binge eating, purging, or fasting in the prior three months, and scored within 1 *SD* of age-matched community norms on each of the EDE-Q subscales; (3) partially recovered individuals ($n = 15$) met all the criteria for full recovery except for psychological recovery; and (4) active eating disorder individuals ($n = 53$) had a current eating disorder diagnosis (AN, BN or EDNOS). This approach to delineating different stages of recovery was guided by prior work (Bardone-Cone et al., 2010; Couturier & Lock, 2006). (Of note, while the operationalization of full recovery involves improved eating disorder cognitions, such as weight concern, as measured by the EDE-Q, these cognitions do not include exercise-related cognitions.) Eight of the 96 patients with a current or former eating disorder did not meet criteria for a current eating disorder or either definition of recovery (i.e., partial or full recovery), and thus were not included in these analyses. These eight were primarily

individuals who had reported some (though minimal) binge eating or purging, typically once or twice in the past three months.

The fully recovered, partially recovered, and active eating disorder groups did not differ in their pattern of lifetime eating disorder diagnoses (e.g., no significant differences in the percentage with a lifetime diagnosis of AN), number of years since the emergence of the eating disorder symptoms, or age or BMI at start of treatment. Of the active eating disorder group, 17% currently had AN, 6% had BN, and 77% had EDNOS (most with bulimic-type presentations). The four groups did not differ in terms of race/ethnicity (percentiles reporting as Caucasian: 90% of controls, 95% of the fully recovered, 93% of the partially recovered, and 93% of the active eating disorder group) or socio-economic status (with highest parental education attained used as a proxy: 16.52 years for controls, 16.60 years for the fully recovered, 16.63 years for the partially recovered, and 16.68 years for the active eating disorder group). The groups did differ in age ($F(3, 151) = 15.44$, $p < 0.001$), with controls significantly younger ($M = 19.46$ years, $SD = 1.88$) than any of the eating disorder groups (fully recovered - $M = 24.55$, years, $SD = 4.89$; partially recovered - $M = 23.53$ years, $SD = 5.80$; active eating disorder - $M = 23.18$, years, $SD = 4.39$). Due to this age difference, analyses were run both with and without age as a covariate. For parsimony, findings with age as a covariate are reported only in cases where controlling for age changed the pattern of significance.

Behavioral Aspects

Table 1 displays how the groups compared on behavioral aspects of exercise based on analyses of variance (ANOVAs). Of note, outliers were identified for number of minutes of weekly exercise – in particular, an outlier of 3070 minutes/week (about 7 hours/day) of total exercise, reported by a participant in the active eating disorder group; an outlier of 2525 minutes/week (about 6 hours/day) of cardiovascular exercises, reported by the same participant; and an outlier of 1260 minutes/week (3 hours/day) of strength exercises, reported by a participant in the control group. When converted to z-scores, each of these three extreme outlier values reflected z-scores of 6.21–6.65, were all clear departures from the next highest values (1–3 z-scores different), and reflected breaks in the distribution of minutes of exercise reported. Analyses run with and without these outliers did not change the pattern of results and thus all data on amount of time spent exercising were retained. Groups did not differ significantly in amount of time devoted to exercise, whether assessed in terms of total exercise, cardiovascular exercise, or strength exercise. The only group difference on a behavioral dimension of exercise was for the average intensity across all exercise. Pairwise group comparisons using Tukey's tests found that the partially recovered group reported exercising more intensely, on average, than the fully recovered group and the active eating disorder group.

Psychological Aspects

Table 2 displays how the groups compared on psychological aspects of exercise. An ANOVA revealed that groups differed significantly in how guilty they felt after missing an exercise session. The fully recovered group and controls reported significantly less guilt than

the active eating disorder group; the partially recovered group did not differ significantly from the active eating disorder group in terms of level of guilt.

There were also group differences in obsessive cognitions related to exercise based on ANOVA. In particular, the fully recovered group reported thinking about exercise less and having fewer difficulties stopping thoughts about exercise than the active eating disorder group, and controls reported fewer difficulties with exercise thought stoppage than the partially recovered or active eating disorder groups. The partially recovered group did not differ significantly from the active eating disorder group on these cognitions.

Analyses involving motivations for exercise were the only ones where some patterns of significance changed depending on whether or not age was controlled for and, thus, findings are presented with age as a covariate. The multivariate analysis of covariance (MANCOVA) examining motivations for exercise was significant, $F(12, 371) = 5.55$, $p < .001$, Wilks' Lambda = .65, partial $\eta^2 = .14$, meaning scores on the set of motivational factors differed across eating disorder status groups. Follow-up analyses of covariance (ANCOVAs) indicated that groups did not differ in terms of how important fitness/health management or socializing was as a motivation for exercising. Groups did differ in how much appearance/weight management was a motivation for exercise; both the fully recovered group and the controls endorsed lower levels of exercising for appearance/weight management than the group with eating disorder diagnoses. Groups also differed on the stress/mood management motivation, with the eating disorder group reporting exercising for stress/mood reasons more so than controls.

Discussion

Overall, psychological aspects of exercise, rather than behavioral aspects, more consistently distinguished individuals in full recovery from those with an eating disorder. In regard to behavioral aspects of exercise, the active eating disorder, fully recovered, partially recovered, and non-eating disorder control groups did not differ in the typical amount of self-reported time spent exercising per week across total exercise, cardiovascular exercise, or strength exercise. This finding is contrary to some work (e.g., Long, Smith, Midgley, & Cassidy, 1993 – patients with anorexia nervosa were more likely than controls to exercise daily) but is consistent with other research using mixed samples of eating disorders, similar to the current study (e.g., Boyd et al., 2007 – no differences in amounts or days of exercise between patients with an eating disorder and controls). The one behavioral difference found involved partially recovered individuals exercising more intensely than those who were fully recovered or had active eating disorders. It could be that partially recovered individuals who, by the current operationalization, do not meet criteria for an eating disorder but may still be psychologically entrenched in eating disorder thinking, rely on more socially sanctioned behaviors in response to their eating disordered thoughts (e.g., in response to strong negative body image, they may exercise with greater intensity).

Regarding the psychological aspects of exercise, findings demonstrate that, as hypothesized, both fully recovered individuals and controls experienced lower levels of guilt associated with missing an exercise session than the active eating disorder group. Similarly, the fully

recovered and control groups reported lower levels of difficulty in being able to stop thoughts about exercise, and the fully recovered group also reported significantly lower amounts of time spent thinking about exercise compared to the active eating disorder group. In sum, the fully recovered group differed markedly from the eating disorder group on degree of guilt and obsessive cognitions related to exercise, providing optimism that a recovered state from an eating disorder can exist that is free from these potentially debilitating experiences. These findings are consistent with past research looking both at exercise-related guilt and obsessive cognitions and eating pathology (e.g., Boyd et al., 2007; Davis & Kaptein, 2006; Mond & Calogero, 2009; Mond et al., 2006).

In terms of motivations for exercising, there was no difference between groups in fitness/health management or socializing motivations, but there were differences in appearance/weight management and stress/mood management motivations. The fully recovered and non-eating disorder control groups had lower appearance/weight management motivations for exercise than the active eating disorder group, as hypothesized. This finding is in line with most research finding that the extent to which appearance (e.g., weight, shape, tone) is a motivating factor for exercise is associated with eating pathology (Keyes et al., 2015; Mond et al., 2006). Regarding stress/mood management motivations, controls had lower levels of this motivation for exercise than the active eating disorder group. This finding is consistent with past research citing exercise as a key component of affect regulation for those suffering from an eating disorder (Bratland-Sanda et al., 2011). While exercise as a mood regulator is not inherently negative, what may be important for maximal health is to have multiple ways to regulate affect instead of relying on a limited repertoire of behaviors (e.g., exercise).

The current study has several strengths, including its novel research questions centered on eating disorder recovery and exercise, the examination of both behavioral and psychological aspects of exercise, and the use of a comprehensive validated approach to defining stages of eating disorder recovery. One limitation of the present study is its cross-sectional nature; a longitudinal framework is needed to understand the temporal ordering of the stages of recovery and exercise behaviors and attitudes. Additionally, this sample was composed of only females, limiting its generalizability. Given that exercise may be a more central part of eating disorder pathology in males than females (Strother, Lemberg, Stanford, & Turberville, 2012) and that different exercise motivations may be prominent for males (e.g., competition; Long et al., 1993), it is important to understand if there are behavioral or psychological factors of exercise that may impede recovery in males differently. The use of a mixed eating disorder sample primarily represented by those with Eating Disorder Not Otherwise Specified with binge/purge features is also a limitation. Although excessive exercise is a transdiagnostic phenomenon, the relationship between anorexia nervosa and excessive exercise is especially strong (Keyes et al, 2015; Meyer, et al., 2008). Considering different stages of eating disorder recovery and exercise in a larger sample that would permit examination within different eating disorder diagnoses might yield more nuanced findings. Lastly, the small sample size is a limitation. Observed power for the non-significant findings ranged from .21 (for a small effect size of η_p^2 = .02, for number of minutes of strength exercises) to .62 (for a medium effect size of η_p^2 = .05, for socializing motivation). Thus, this study appeared underpowered to detect small effects (i.e., minutes of exercise, fitness/

health management motivation) as well as some medium effects (i.e., average intensity for cardiovascular and strength exercises separately, socializing motivation). Replication efforts with larger samples (overall and, in particular, in terms of fully and partially recovered groups) is warranted.

Future studies may want to use accelerometers to assess exercise behaviors more rigorously and ecological momentary assessment to capture exercise experiences, motivations, and affect and cognitions related to exercise with minimal retrospective recall. Another line of research should consider types of physical activity that may be protective. Martin, Prichard, Hutchinson, and Wilson (2013) found that practicing yoga was associated with fewer disordered eating tendencies, suggesting the need to examine mind/body activities as possible promoters of recovery. Lastly, future work may want to consider how different motivations for exercise may work in moderator or mediation models to identify level of eating pathology.

The current findings have several clinical implications. For one, knowing whether individuals in some stage of recovery from eating disorders exhibit psychological characteristics of exercise similar to those with eating disorders is important since this may put them at higher risk for relapse; as one example, Strober and colleagues (1997) found that, among patients treated for anorexia nervosa, having a higher compulsive drive to exercise at discharge predicted relapse at a 15-year follow-up. The current findings also argue for the need to better address exercise in the treatment of eating disorders (Meyer et al., 2008; Zunker, Mitchell, & Wonderlich, 2011). Given that exercise has clear physical and mental health benefits (e.g., Cook, Hausenblas, Tuccitto, & Giacobbi, 2011), it is important to consider how healthy levels of and attitudes toward exercise can be fostered as part of recovery from an eating disorder. Limited research suggests that the inclusion of therapeutic exercise groups within a broader eating disorder treatment protocol leads to significant improvements in weight (among underweight patients) and unhealthy exercise attitudes (Calogero & Pedrotty, 2004). Acceptance and commitment therapy (ACT) may also be helpful by guiding clients to take a more mindful approach to exercise that would organize moderate amounts of exercise around their life, rather than organizing their life around exercise, and subsequently, missing out on other things that they may value (Calogero & Pedrotty-Stump, 2010). Additionally, given that individuals with eating disorders may rely on exercise as a key coping strategy in the face of negative affect, clinicians may be well-served to assess the degree to which exercise is used for mood management and teach their clients a wider repertoire of strategies for managing their negative affect.

In sum, results of the current study suggest that the psychological component of exercise may be more closely tied to eating disorder recovery than the behavioral component. This pattern of results was also found in community-based samples where distress related to missing exercise and exercise motivated by weight management were better predictors of eating disorder diagnoses than excessive exercise based on quantity (Holland et al., 2014). Thus, there is burgeoning support for assessing the psychological aspects of exercise (e.g., guilt, obsessive thoughts, motivations) across the course of an eating disorder and considering their role in recovery and maintenance. Relatedly, treatment protocols would be well served to more consistently focus on aiding patients in developing healthy exercise

practices and attitudes (Calogero & Pedrotty, 2004), moving away from unhealthy, obsessive, appearance-motivated exercise to moderate, flexible, health-oriented exercise.

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Table 1

Means and (Standard Deviations) and Comparisons of Behavioral Aspects of Exercise across Eating Disorder Status Groups

	Controls	Fully Recovered	Partially Recovered	Active Eating Disorder	Significance and Pairwise Comparisons
Number of minutes/week of (total) exercise	424.38 (423.42)	239.11 (169.32)	356.15 (390.54)	445.45 (502.73)	$F(3, 144) = 1.15$; $p = .330$; partial $\eta^2 = .02$
Number of minutes/week of cardiovascular exercise	318.14 (383.55)	183.03 (146.30)	219.92 (182.39)	319.17 (412.48)	$F(3, 148) = 1.00$; $p = .395$; partial $\eta^2 = .02$
Number of minutes/week of strength exercise	103.65 (198.86)	54.03 (48.02)	136.23 (271.00)	113.83 (129.60)	$F(3, 146) = .75$; $p = .527$; partial $\eta^2 = .02$
Average intensity across all exercise episodes	3.30 (.51)	3.04 (.85)	3.70 (.69)	3.12 (.78)	$F(3, 141) = 3.23$; $p = .024$; partial $\eta^2 = .06$ PR > FR, AED
Average intensity for cardiovascular exercise episodes	3.28 (.60)	3.06 (.72)	3.69 (.82)	3.21 (.81)	$F(3, 138) = 2.16$; $p = .095$; partial $\eta^2 = .05$
Average intensity for strength exercise episodes	3.46 (.65)	3.01 (.98)	3.59 (.58)	3.15 (.83)	$F(3, 104) = 2.34$, $p = .078$; partial $\eta^2 = .06$

Note. FR = fully recovered from an eating disorder; PR = partially recovered from an eating disorder; AED = active eating disorder. Pairwise comparisons listed were significant at least at $p < .05$. Degrees of freedom are noticeably lower for the intensity analyses involving strength exercises since more individuals reported zero minutes of strength exercises than cardiovascular exercises, and individuals who did not engage in strength exercises could not provide an intensity rating for that category.

Table 2

Means and (Standard Deviations) and Comparisons of Psychological Aspects of Exercise across Eating Disorder Status Groups

	Controls	Fully Recovered	Partially Recovered	Active Eating Disorder	Significance and Pairwise Comparisons
Guilt	2.68 (1.26)	2.84 (1.17)	3.57 (1.45)	4.02 (1.16)	$F(3, 143) = 11.96$; $p < .001$; partial $\eta^2 = .20$ C < AED; FR < AED
Amount of time thinking about exercise	2.10 (.87)	1.75 (.72)	2.57 (1.09)	2.57 (1.31)	$F(3, 150) = 4.00$; $p = .009$; partial $\eta^2 = .07$ FR < AED
Difficulty stopping thoughts about exercise	1.67 (.87)	1.84 (1.17)	2.57 (.85)	2.98 (1.28)	$F(3, 147) = 16.20$; $p < .001$; partial $\eta^2 = .25$ C < PR, AED; FR < AED
Appearance/weight management (REI)	4.37 (1.38)	4.72 (1.20)	5.35 (1.37)	5.58 (1.19)	$F(3, 143) = 5.73$; $p = .001$; partial $\eta^2 = .11$ C < AED; FR < AED
Fitness/health management (REI)	5.60 (1.00)	5.54 (1.15)	5.39 (1.23)	5.06 (1.18)	$F(3, 143) = 1.48$; $p = .222$; partial $\eta^2 = .03$
Stress/mood management (REI)	4.50 (1.33)	4.98 (1.48)	4.77 (1.21)	5.12 (1.36)	$F(3, 143) = 4.13$; $p = .008$; partial $\eta^2 = .08$ C < AED
Socializing (REI)	3.91 (1.97)	2.85 (1.64)	2.86 (1.94)	2.48 (1.53)	$F(3, 143) = 2.54$; $p = .059$; partial $\eta^2 = .05$

Note. REI = Reasons for Exercise Inventory. C = non-eating disorder controls; FR = fully recovered from an eating disorder; PR = partially recovered from an eating disorder; AED = active eating disorder. Pairwise comparisons listed were significant at least at $p < .05$. Analyses involving REI factors controlled for age; however, the means and standard deviations presented are unadjusted for the age covariate to allow for comparisons with means reported by other work in the literature.