Prevalence and Correlates of Exercise Motivated by Negative Affect

Kyle P. De Young, MA*
Drew A. Anderson, PhD

ABSTRACT
Objective: The purpose of this study was to determine the prevalence and correlates of exercising in response to negative affect.

Method: Participants (N = 177) completed questionnaires assessing affect before and after exercise, exercise quality and quantity, eating behaviors and attitudes, body image, and self-esteem.

Results: Fifty-eight percent of participants endorsed ever exercising in response to negative affect. As a group, these individuals were more likely to report self-induced vomiting, binge eating, and fasting over the previous 4 weeks. They also showed poorer body image and self-esteem, and their exercise was more obligatory and impairing. Groups did not differ on body mass index or quantity of exercise.

Discussion: Negative affect motivated exercise appears to be a common phenomenon that is associated with eating disordered behavior.

Keywords: exercise; negative affect; motivation; exercise function; eating disorders

Accepted 18 December 2008
*Correspondence to: Kyle De Young, Department of Psychology, University at Albany, State University of New York, SS369, Albany, New York 12222. E-mail: kdeyoung@albany.edu

Introduction

Over the years, many researchers have been interested in the function of disordered eating and related behaviors.1–3 Little work, however, has investigated the function of exercise within the context of eating pathology. The purpose of the present study was to determine if exercise behavior undertaken to alleviate adverse emotional states is associated with eating disordered behaviors.

The focus on the role of adverse emotional states as a motivator for exercise in this study stems from research on the function of binge eating, which has indicated that this type of eating episode is more likely to occur in the presence of heightened negative affect.3 This relationship has been found in both naturalistic and experimental studies.5 Binge eating episodes have also been found to be more likely to occur after negative social interactions,7 providing further evidence that affective states may drive binge eating behavior.

Consistent with these findings is Heatherton and Baumeister’s escape theory of binge eating, which states that binge eating episodes function to narrow cognitive focus on food and the process of eating, thus decreasing self-awareness. Individuals are therefore more likely to binge eat when they experience an aversive state of self-awareness, such as heightened negative affect, from which they would like to escape. In support of this theory, studies have found that individuals who endorse the expectancy that eating reduces negative affect report increased eating disorder symptoms.9,10 But interestingly, some researchers have found that heightened negative affect proceeds rather than precedes binge eating episodes in both naturalistic11 and retrospective studies.12

Schupak-Neuberg and Nemeroff13 extended escape theory to account for this finding and also proposed that the propensity to escape from self-awareness via binge eating would be more prevalent in individuals who view the self as body because it would be more effective for them. Binge eating episodes serve only to temporarily distract individuals from the negative affect which preceded them. Upon completion of the binge, negative affect returns, perhaps even more intensely because of the ingestion of large amounts of food in the interim, and is then decreased via the purge. Whereas escape theory accounts for the function of binge eating in both individuals who purge and those who never purge, self as body theory is specific to individuals suffering from a binge-purge syndrome such as the purging type of bulimia nervosa.
Support for the role of purging behavior in the alleviation of negative affect has been found both retrospectively\textsuperscript{14} and naturalistically,\textsuperscript{15} with the period prior to the purging episode being characterized by high negative affect and the period after by relative calm. Limited research has investigated the effect of affective states on other inappropriate compensatory behaviors, such as excessive exercising. However, a great deal of work has aimed to uncover the influence of exercise on affective states.

In a naturalistic study of individuals with physical disabilities, researchers found that exercise was associated with increased positive and decreased negative affect.\textsuperscript{16} However, this effect was not found in a naturalistic study of college students during the 2 weeks prior to final exams.\textsuperscript{17} Bodin and Martinsen\textsuperscript{18} found similar changes in positive and negative affect following exercise in a group of depressed individuals experiencing increased self-efficacy but not in those who did not experience increased self-efficacy. McGowan, Talton and Thompson\textsuperscript{19} found similar changes after a weight lifting class in college students. Raedeke\textsuperscript{20} also found these changes in affect after an exercise session and further found that exercise enjoyment moderated changes in positive affect but was unrelated to changes in negative affect. In another study, smoking-specific weight concerns were found to moderate the association between exercise and negative affect among women who were quitting smoking.\textsuperscript{21} Regarding the frequency of exercise, Watson\textsuperscript{22} had 80 participants complete a measure of positive and negative affect daily for 6–8 weeks and record the occurrence of exercise. He found that frequency of exercise was related to positive but not negative affect.

Among the few studies that have investigated the relationship between pre-exercise affect and exercise, Lynch et al.\textsuperscript{12} retrospectively examined negative affect before and after engaging in exercise as a method of compensating for binge eating. Unfortunately, in their analyses, exercise was grouped with other inappropriate compensatory behaviors, leaving the role of exercise alone unclear. The only naturalistic study to date that investigated the role of negative affect on exercise behavior found that increases in the urge to exercise were associated with increased negative affect.\textsuperscript{23} Because their sample was composed of women diagnosed with anorexia nervosa in an inpatient eating disorder unit, they could only examine associations with the urge to exercise and not actual physical activity. It therefore remains unknown what role negative affect plays in the initiation and maintenance of exercise behavior and whether this role is similar for individuals both with and without eating disorders.

Negative affect may motivate individuals to exercise in ways that are not to their benefit, or conversely, it may be an adaptive coping strategy that substitutes health-promoting activity for potentially unhealthy alternatives like binge eating, purging, or the use of drugs or alcohol. In fact, a recent paper reviewing the evidence for exercise as a treatment for eating disorders concluded that although more research is needed, it appears to be a promising intervention.\textsuperscript{24} However, this idea is not new. For example, in 1984, Sachs and Buffone\textsuperscript{25} published a book entitled \textit{Running as Therapy}, in which they detail the potential physical and psychological benefits of adopting a regimen of physical activity for individuals with psychological disorders, including eating disorders.

The first aim of this study was to investigate the prevalence of exercise motivated by negative affect in a college population. The second aim was to evaluate the associations between this type of exercise behavior and eating and body-related psychopathology and other qualities of exercise in order to determine its associated benefits and detriments.

\section*{Method}

\subsection*{Participants}

Participants ($N = 177$) were undergraduate students at a Northeastern university participating for credit toward a course requirement. The mean (SD) age of participants was 19.5 (2.8) years. Women composed 52.5\% of the sample. A total of 66.7\% of participants identified themselves as Caucasian, 11.9\% as Asian American, 10.2\% as African American, 9.6\% as Hispanic, 1.1\% as other, and one participant did not provide race/ethnicity information. The only inclusion criterion was that participants engage in physical exercise at least occasionally. The Institutional Review Board at the University at Albany approved this study.

\subsection*{Materials}

\textbf{Affect.} The Positive and Negative Affect Schedule (PANAS\textsuperscript{26}) assesses affect along two dimensions by asking participants to rate the degree to which 20 affect-laden words describe how they have felt using a five-point scale from “Very slightly or not at all” to “Extremely.” In the present study, participants completed the PANAS twice, once for how they feel immediately before exercising and once for how they feel immediately after exercising. The PANAS before exercise version had Cronbach’s alphas of 0.93 for the negative affect scale and 0.90 for the positive affect scale in the present study. The after exercise version had Cronbach’s alpha values of 0.93 for the negative affect scale and 0.90 for the positive affect scale in the present study.
0.90 for the negative affect scale and 0.91 for the positive affect scale in the present study.

**Coping Style.** The Coping Inventory for Stressful Situations (CISS) is a self-report questionnaire that assesses multiple methods of coping with stress, including undertaking physical activity, using 51 items. Participants rate various methods they use to cope with stressful situations on a five-point scale from “Not at all” to “Very much.” Cronbach’s alpha for the CISS was 0.91 in the present study.

**Exercise Quality.** The Obligatory Exercise Questionnaire (OEQ) is a 20-item self-report questionnaire that assesses exercise one feels compelled to undertake. Participants rate each item on a four-point scale from “Never” to “Always.” Cronbach’s alpha was 0.89 for the OEQ in the present study.

The Commitment to Exercise Scale (CES) is an eight-item self-report questionnaire that assesses compulsive, distressful, and impairing exercise using a 100 mm visual analog scale. Cronbach’s alpha for the CES in this study was 0.89.

The Reasons for Exercise Inventory (REI) is a 24-item self-report questionnaire that assesses several domains of motivations for exercise. Participants rate various reasons that play a role in their decisions to exercise on a seven-point scale from “Not at all important” to “Extremely important.” In the present study, the Cronbach’s alpha was 0.90 for the REI.

**Exercise Quantity.** An estimate of each participant’s quantity of physical activity was gathered through the use of a portion of the Lifestyle Questionnaire, which asks participants to rate the number of weeks over the past year, the number of days during each week, the number of minutes during each day, and the intensity at which they biked, swam, jogged, went to exercise classes, and lifted weights during the past year. To arrive at the estimate of the frequency of each activity, days per week is multiplied by weeks per year. An index of the intensity of these activities is calculated by multiplying the frequency of the activity (days × weeks) by the minutes spent engaged in the activity (1–15 min = 1; 15–30 min = 2; 30–60 min = 4; 60 or more minutes = 6) and the rating of how intensely the individual did the activity (light = 1; medium = 2; heavy = 3).

**Disordered Eating and Exercise Behavior.** The Eating Disorder Examination Questionnaire (EDE-Q) is a 28-item self-report questionnaire that assesses the frequency of binge eating, purging, fasting, and compulsive or driven exercise for weight or shape reasons over the past 4 weeks. The EDE-Q has four subscales: Restraint, Eating Concern, Shape Concern, and Weight Concern. Cronbach’s alpha for the EDE-Q was 0.96 in the present study.

**Body Image.** The Multidimensional Body-Self Relations Questionnaire (MBSRQ) is a 57-item self-report questionnaire that assesses body image disturbance as a multidimensional construct using a five-point scale. Participants are asked to rate how much they agree with various statements about their appearance from “Definitely disagree” to “Definitely agree.” Included with this measure is the nine-item Body Area Satisfaction Scale (BASS) that assesses the satisfaction with specific body areas on a five-point scale ranging from “Very dissatisfied” to “Very satisfied.” Cronbach’s alphas for the MBSRQ and the BASS were found to be 0.87 and 0.80, respectively, in the present study.

Women completed the Eating Disorder Inventory-2 Drive for Thinness subscale (EDI-2-DT), a seven-item self-report questionnaire that assesses dieting and the desire to be thin using a six-point scale from “Always” to “Never.” In the present study, Cronbach’s alpha for the EDI-2-DT was 0.90.

Men completed the Drive for Muscularity Scale (DMS), a 15-item self-report questionnaire that assesses body image as it relates to muscularity, the desire to become more muscular, and the presence of muscle-gain behaviors using a six-point scale from “Always” to “Never.” The DMS had a Cronbach’s alpha of 0.90 in the present study.

**Self-Esteem.** The Rosenberg Self Esteem Scale (RSE) is a 10-item self-report questionnaire that assesses self-esteem using a four-point scale from “Strongly agree” to “Strongly disagree.” In the present study, the Cronbach’s alpha for the RSE was 0.86.

**Design and Procedure.**

After receiving informed consent and agreeing to participate in the study, participants were asked to complete both versions of the PANAS, the CISS, OEQ, CES, REI, part of the Lifestyle Questionnaire, the EDEQ, MBSRQ and BASS, RSE, and either the EDI-2-DT or the DMS depending on what sex they indicated on a demographics questionnaire.

**Data Analyses.**

Participants were split into one of two groups based upon their answer to the question, “Do you ever exercise BECAUSE you are feeling bad?” which they responded to immediately following the before and after exercise versions of the PANAS. Those who answered “Yes” (n = 103; 58.2%) compose the Negative Affect Exercisers (NAE) group. Those who answered “No” (n = 74; 41.8%) compose the Comparison Exercisers (CE) group. Independent samples two-tailed t-tests were conducted to compare groups on continuous measures using a Bonferonni-corrected significance threshold of p < .001 to maintain the family-wise error rate at p < .05. Logistic regression anal-
Analyses were conducted to examine whether group (NAE versus CE) was significantly associated with endorsing categorical measures of the presence versus absence of eating disorder behaviors. Odds ratios (OR) greater than 1.0 indicate that membership in the NAE group predicts endorsing the presence of eating disorder behaviors, whereas ratios <1.0 indicate they predict endorsing their absence.

**Results**

Women were more likely than men to indicate having ever exercised in response to negative affect (Wald $\chi^2 = 12.78$, $p < .05$; OR = 3.11). Seventy-one percent of women and 44% of men endorsed exercise motivated by negative affect. All analyses were conducted separately for men and women. Because the pattern of results was identical, men and women were combined in order to increase the statistical power with the exception of the EDI-2-DT and DMS which only women and men completed, respectively. There were no statistically significant differences between groups for race/ethnicity ($\chi^2 = 8.48$, df = 4, $p = .075$). Mean (SD) body mass index (kg/m²) was 23.7 (4.0) for NAE group and 24.3 (5.0) for the CE group ($t(165) = -0.78$, $p = .434$). Mean (SD) age was 19.6 (3.3) for the NAE group and 19.4 (1.9) for the CE group ($t(175) = 0.68$, $p = .498$).

As displayed in Table 1, the NAE group reported significantly higher negative affect prior to exercise than the CE group ($t(174.95) = 3.41$, $p < .001$). They did not differ on level of positive affect prior to ($t(175) = 0.48$, $p = .629$) or following exercise ($t(136.01) = 0.78$, $p = .434$) or negative affect following exercise ($t(169.85) = 2.66$, $p = .009$).

Table 2

As shown in Table 2, the NAE group scored significantly higher than the CE group on both measures of obligatory exercise: the OEQ ($t(173.23) = 5.86$, $p < .001$) and the CES Obligatory Exercise subscale ($t(175) = 5.14$, $p < .001$). The NAE group also scored significantly higher than the CE group on the Pathological Exercise subscale of the CES ($t(170.83) = 5.90$, $p < .001$). In regards to the reasons for undertaking exercise as measured by the REI, the NAE group rated exercising for weight control and for mood significantly higher than the CE group ($t(172) = 3.81$, $p < .001$ and $t(172) = 5.27$, $p < .001$, respectively).

As shown in Table 3, no significant differences were found between the NAE and CE groups for the frequency or intensity index of biking, swimming, jogging, weight lifting, or exercise classes (all $p$ values $>.001$).
Disordered Eating and Exercise Behavior

As displayed in Table 4, the EDE-Q revealed significant differences between the NAE and the CE groups on all four subscales: Restraint ($t(172.27) = 7.07, p < .001$), Eating Concern ($t(138.77) = 7.23, p < .001$), Shape Concern ($t(173.68) = 6.29, p < .001$), and Weight Concern ($t(173.76) = 6.26, p < .001$). In addition, the NAE group reported fasting on a significantly greater number of days over the past 4 weeks when compared with the CE group ($t(144.55) = 5.25, p < .001$). Groups did not significantly differ on the number of days they experienced a binge eating episode or the number of times they induced vomiting, took laxatives, or exercised in a “driven” way over the past 4 weeks (all $p$ values > .001).

Logistic regression analyses revealed that, with eating disorder behaviors coded as either present or absent over the previous 4 weeks, individuals in the NAE group were significantly more likely to have experienced a binge eating episode, induced vomiting, and fasted (Table 5). Fifty-eight (57.4%) individuals in the NAE group reported experiencing a binge eating episode over the past 4 weeks compared with 27 (36.5%) in the CE group ($Wald \chi^2 = 7.37, p < .05; OR = 2.35$). Thirteen (12.7%) individuals in the NAE group reported self-induced vomiting compared with two (2.7%) in the CE group ($Wald \chi^2 = 4.58, p < .05; OR = 5.26$). Forty-seven (45.6%) individuals in the NAE group reported fasting compared with nine (12.3%) in the CE group ($Wald \chi^2 = 19.24, p < .05; OR = 5.97$). There was no significant difference in laxative use between groups over the past 4 weeks ($Wald \chi^2 = 2.45, p = .117; OR = 3.48$).

### Table 3. Comparisons of NAE and CE groups on exercise quantity

<table>
<thead>
<tr>
<th>Exercise Quantity</th>
<th>NAE ($n = 98–103$)</th>
<th>CE ($n = 74$)</th>
<th>$t$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biking Days</td>
<td>19.8 (32.9)</td>
<td>21.6 (31.7)</td>
<td>-0.37</td>
<td>-0.06</td>
</tr>
<tr>
<td>Intensity</td>
<td>128.9 (253.8)</td>
<td>122.9 (191.6)</td>
<td>0.17</td>
<td>0.03</td>
</tr>
<tr>
<td>Swimming Days</td>
<td>25.1 (34.1)</td>
<td>21.5 (33.8)</td>
<td>0.69</td>
<td>0.11</td>
</tr>
<tr>
<td>Intensity</td>
<td>184.7 (431.6)</td>
<td>147.4 (285.2)</td>
<td>0.65</td>
<td>0.10</td>
</tr>
<tr>
<td>Jogging Days</td>
<td>113.0 (79.9)</td>
<td>86.7 (83.9)</td>
<td>2.11</td>
<td>0.32</td>
</tr>
<tr>
<td>Intensity</td>
<td>1017.3 (1143.0)</td>
<td>601.9 (862.4)</td>
<td>2.72</td>
<td>0.41</td>
</tr>
<tr>
<td>Weight lifting</td>
<td>83.1 (79.3)</td>
<td>67.4 (62.6)</td>
<td>1.42</td>
<td>0.22</td>
</tr>
<tr>
<td>Intensity</td>
<td>771.9 (1184.4)</td>
<td>659.7 (884.9)</td>
<td>0.69</td>
<td>0.11</td>
</tr>
<tr>
<td>Exercise class</td>
<td>10.2 (29.8)</td>
<td>7.6 (27.6)</td>
<td>0.59</td>
<td>0.09</td>
</tr>
<tr>
<td>Intensity</td>
<td>118.5 (382.9)</td>
<td>85.2 (330.6)</td>
<td>0.60</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Notes: NAE, negative affect exercisers; CE, comparison exercisers.

### Table 4. Means of NAE and CE groups on measures of eating pathology, body image, and self-esteem

<table>
<thead>
<tr>
<th></th>
<th>NAE ($n = 101–103$)</th>
<th>CE ($n = 73–74$)</th>
<th>$t$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDE-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting days</td>
<td>1.1 (1.5)</td>
<td>0.2 (0.6)</td>
<td>5.25*</td>
<td>0.75</td>
</tr>
<tr>
<td>Objective binge episode days</td>
<td>3.9 (5.6)</td>
<td>2.2 (4.7)</td>
<td>2.22</td>
<td>0.34</td>
</tr>
<tr>
<td>Vomit times</td>
<td>1.0 (3.8)</td>
<td>0.1 (0.8)</td>
<td>2.22</td>
<td>0.31</td>
</tr>
<tr>
<td>Laxative times</td>
<td>0.3 (1.3)</td>
<td>0.1 (0.8)</td>
<td>1.25</td>
<td>0.18</td>
</tr>
<tr>
<td>“Driven” exercise times</td>
<td>5.9 (7.4)</td>
<td>2.9 (6.1)</td>
<td>2.96</td>
<td>0.44</td>
</tr>
<tr>
<td>Restraint</td>
<td>2.3 (1.5)</td>
<td>1.0 (1.0)</td>
<td>7.07*</td>
<td>1.04</td>
</tr>
<tr>
<td>Eating concern</td>
<td>1.5 (1.5)</td>
<td>0.3 (0.6)</td>
<td>7.23*</td>
<td>1.03</td>
</tr>
<tr>
<td>Shape concern</td>
<td>3.0 (1.7)</td>
<td>1.6 (1.3)</td>
<td>6.29*</td>
<td>0.94</td>
</tr>
<tr>
<td>Weight concern</td>
<td>2.6 (1.7)</td>
<td>1.2 (1.2)</td>
<td>6.26*</td>
<td>0.93</td>
</tr>
<tr>
<td>MBSRQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appearance evaluation</td>
<td>3.1 (0.8)</td>
<td>3.5 (0.7)</td>
<td>-3.50*</td>
<td>-0.54</td>
</tr>
<tr>
<td>Appearance orientation</td>
<td>3.6 (0.6)</td>
<td>3.3 (0.6)</td>
<td>3.67*</td>
<td>0.56</td>
</tr>
<tr>
<td>Fitness evaluation</td>
<td>3.8 (0.8)</td>
<td>3.9 (0.7)</td>
<td>-1.58</td>
<td>-0.24</td>
</tr>
<tr>
<td>Fitness orientation</td>
<td>3.6 (0.7)</td>
<td>3.7 (0.7)</td>
<td>-1.00</td>
<td>-0.15</td>
</tr>
<tr>
<td>Health evaluation</td>
<td>3.4 (0.7)</td>
<td>3.8 (0.5)</td>
<td>-4.32*</td>
<td>-0.64</td>
</tr>
<tr>
<td>Health orientation</td>
<td>3.3 (0.6)</td>
<td>3.4 (0.6)</td>
<td>-0.13</td>
<td>-0.02</td>
</tr>
<tr>
<td>Illness orientation</td>
<td>3.1 (0.7)</td>
<td>3.1 (0.7)</td>
<td>-0.13</td>
<td>-0.02</td>
</tr>
<tr>
<td>Overweight preoccupation</td>
<td>3.0 (1.0)</td>
<td>2.0 (0.8)</td>
<td>7.13*</td>
<td>1.07</td>
</tr>
<tr>
<td>BASS total score</td>
<td>3.1 (0.6)</td>
<td>3.4 (0.7)</td>
<td>-3.04</td>
<td>-0.46</td>
</tr>
<tr>
<td>RSE total score</td>
<td>19.7 (5.1)</td>
<td>22.5 (5.6)</td>
<td>-3.62*</td>
<td>-0.55</td>
</tr>
<tr>
<td>EDI-2-DT total scorea</td>
<td>10.7 (6.7)</td>
<td>4.1 (3.9)</td>
<td>5.94*</td>
<td>1.21</td>
</tr>
<tr>
<td>DMS total scoreb</td>
<td>3.5 (1.1)</td>
<td>2.8 (0.8)</td>
<td>3.25</td>
<td>0.70</td>
</tr>
<tr>
<td>Muscle development behaviorb</td>
<td>3.2 (1.3)</td>
<td>2.3 (0.9)</td>
<td>3.79*</td>
<td>0.85</td>
</tr>
<tr>
<td>Muscularity oriented body image attitudesb</td>
<td>4.0 (1.2)</td>
<td>3.6 (1.2)</td>
<td>1.48</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Notes: NAE, negative affect exercisers; CE, comparison exercisers; EDE-Q, Eating Disorder Examination-Questionnaire; MBSRQ, Multidimensional Body-Self Relations Questionnaire; BASS, Body Areas Satisfaction Scale; RSE, Rosenberg Self-Esteem Scale; EDI-2-DT, Eating Disorders Inventory-2 Drive For Thinness Subscale; DMS, Drive for Muscularity Scale.

*a* Women only: NAE ($n = 66$), CE ($n = 27$).

*b* Men only: NAE ($n = 37$), CE ($n = 27$).

*p* < .001. 

International Journal of Eating Disorders 43:1 50–58 2010
Based upon the frequencies of binge eating and purging (self-induced vomiting and laxative use) reported on the EDE-Q, four participants, all in the NAE group, appeared to meet diagnostic criteria for bulimia nervosa purging type (at least eight binge eating and purging episodes over the past 4 weeks). An additional 12 individuals reported both binge eating and purging but either one or both of the behaviors occurred less than eight times over the past 4 weeks; 10 of these 12 individuals (83%) were in the NEA group. A total of 69 individuals reported only binge eating, and 44 (64%) of them were in the NEA group. Two individuals each in the NEA and CE groups reported only purging. Five individuals had a body mass index below 17.5 kg/m², three of whom (60%) were in the NEA group.

**Body Image**

As measured by the MBSRQ, the NAE group evaluated their appearance significantly more negatively ($t(175) = -3.50, p < .001$) and was significantly more oriented toward their appearance ($t(175) = 3.67, p < .001$) than the CE group (Table 4). The NAE group also evaluated their health more poorly ($t(174.70) = -4.32, p < .001$) and was more preoccupied with thoughts of being overweight ($t(173.17) = 7.13, p < .001$) than the CE group. Women in the NAE group scored significantly higher on the Drive for Thinness subscale of the EDI-2 than women in the CE group ($t(79.58) = 5.94, p < .001$), and men in the NEA group scored significantly higher on the Muscle Development Behaviors subscale of the DMS than men in the CE group ($t(60.80) = 3.79, p < .001$).

**Self-Esteem**

The NAE group scored significantly lower than the CE group on the RSE, indicating lower self-esteem (Table 4; $t(174) = -3.62, p < .001$).

**Evidence of Incremental Validity**

To determine whether negative affect motivated exercise as a construct demonstrated incremental validity above and beyond other exercise-related variables, a series of four hierarchical multiple linear regression and four hierarchical multiple logistic regression analyses were conducted. The four...
EDE-Q subscales were entered as the dependent variables for the linear regression analyses and the presence/absence of fasting, binge eating, self-induced vomiting, and laxative use over the previous 28 days, as assessed by the EDE-Q, were the dependent variables for the logistic regression analyses. Six independent variables were entered into the first step of these analyses; OEQ total score, CES Obligatory Exercise and Pathological Exercise subscales, EDE-Q “driven” exercise days, and REI Weight Control and Mood subscales. In the second step, the grouping variable for negative-affect-motivated exercise was entered (i.e., NAE vs. CE).

The NAE/CE grouping variable demonstrated incremental validity by accounting for statistically significant unique variance in all four EDE-Q subscales above and beyond that accounted for by the other exercise variables (Table 6). In addition, the NAE/CE grouping variable significantly improved the prediction of the presence of binge eating and fasting over the previous 28 days; however, it did not significantly improve the models for laxative use and self-induced vomiting (Table 6).

Discussion

The results of this study suggest that negative affect motivated exercise is a common phenomenon, having been reported by over half of the participants in this study. Furthermore, this type of exercise is associated with eating disordered behaviors. The NAE group showed significantly elevated scores on all of the subscales of eating-related psychopathology measured in this study, showing more restraint, concerns over eating, and concerns about their body shape and weight. All of these differences were large effects. In addition, they were at greater risk of having experienced a binge eating episode, having self-induced vomiting, and having fasted over the 4 weeks prior to participation. Further evidence of body image related psychopathology comes from the findings that members of the NAE group were more oriented to their appearance and evaluated their appearance more negatively than the CE group. Importantly, groups did not differ from one another in mean body mass index, and both means were within the healthy range.

Adaptive Coping Strategy, Eating Disorder Behavior, or Eating Disorder?

The results of this study strongly suggest that exercising in response to negative affect is associated with various eating disordered behaviors and attitudes; however, the consequences of this type of exercise behavior may be beneficial, detrimental, or neutral. For example, if this type of exercise is used as a substitute for other more harmful behaviors, it may indeed be advantageous. Incorporating exercise into psychological interventions as suggested by Hausenblas et al.24 and Sachs and Bufone25 may be an effective treatment component. From a harm-reduction perspective, even if this type of exercise behavior has its own set of harmful consequences, it may still be a preferred alternative to other more harmful behaviors. Importantly, although it may be more preferable, it may still represent a source of impairment, especially for individuals who rely heavily or solely on this method of affect regulation.

Binge eating, purging, or both behaviors were reported by roughly 60% of individuals who endorsed exercising in response to negative affect. Thus, if exercise is an effective method of coping with negative affect, most individuals are not using it as a complete replacement for other disordered eating behaviors. This type of exercise may instead be one of many behaviors exhibited by individuals with eating disorders. Exercising in response to negative affect may function in ways similar to purging insofar as these behaviors provide individuals with temporary relief from negative affect through their connection to body shape and weight. In this scenario, negative affect motivated exercise represents an eating disordered behavior, though it is potentially less severe than other eating disordered behaviors. Exercise motivated by negative affect may serve as a useful marker for other eating disordered behaviors, especially because it is less stigmatized and less socially undesirable than other eating disordered behaviors. However, if it is the only eating disordered behavior in which an individual engages, as was the case for nearly 40% of the NAE group in this study, there may be limited reason for concern. Nevertheless, it is possible that some exercise behavior alone is as impairing as other eating disorder behaviors.

In this study, the NAE group did not exercise in greater quantity than the CE group; but the quality of exercise in NAE participants was more obligatory and more impairing than exercise in CE participants. That exercise quality rather than quantity is associated with eating disordered attitudes and behaviors parallels previous findings of associations with the obligatory quality of exercise.38 Furthermore, this finding suggests that any impairment from exercise in the NAE group was unlikely to be due to spending a greater amount of time.
exercising in response to negative affect may make individuals more likely to exercise in ways or at times that are impairing. This may particularly be the case for individuals whose repertoire of affect regulation skills is restricted to undertaking exercise. This scenario resembles excessive exercise as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR). The DSM-IV-TR states that exercise is excessive “when it significantly interferes with important activities, when it occurs at inappropriate times or in inappropriate settings, or when the individual continues to exercise despite injury or other medical complications” (pp. 590–591). Indeed, the NEA group endorsed items from the CES that measure these behaviors (i.e., exercising when feeling tired or unwell, continuing to exercise even when an exercise-related injury has been sustained, and turning down invitations to social events in order to exercise) at significantly higher rates than the CE group. These findings suggest that negative affect motivated exercise may put individuals at risk for exercise behavior that may be a psychological disorder even in the absence of other eating disordered behaviors (e.g., binge eating and purging), so long as it is impairing to a clinically significant degree.

Limitations of the present study include the retrospective, cross-sectional nature of the study design, which precludes any causal conclusions of the impact of pre-exercise negative affect on exercise behavior. Also, it is unknown how reliably participants could recall their pre- and post-exercise affective states. However, in both groups negative affect after exercise was significantly lower than negative affect before exercise and positive affect before and after exercise were not significantly different in either group (results not shown). This pattern of affect before and after exercise is consistent with but not identical to previous research on the effects of exercise on affective state (e.g., 16,17). In addition, a measure of general negative affect was not included in the present investigation, leaving open the possibility that the NAE group experienced heightened negative affect in general and not specifically heightened pre-exercise negative affect. Support for this possibility may be gleaned from the small effect (d = 0.39) of post-exercise negative affect found between groups, which may be evidence of overall higher negative affect in the NAE group. This difference was not statistically significant using the conservative Bonferroni correction. However, higher trait-negative affect is unlikely to have accounted for the association between exercising in response to negative affect and psychopathology found in this study, because individuals could experience any level of trait-negative affect but still respond to state-negative affect by undertaking exercise.

Whether exercising in response to negative affect functions to narrow attention to bodily sensations and actions, thereby decreasing self-awareness and the experience of the aversive state, as in the role posited for binge eating, is a question for future research. The significant reduction in negative affect from pre- to post-exercise found in this study suggests that exercise may be an effective coping strategy that is less harmful than possible alternatives such as binge eating and purging. Nevertheless, individuals who exercise for the purpose of lessening negative affect (or lessening the experience of it) appear to be at risk for experiencing impairment from exercise due to exercising at times that are inappropriate. In addition, because of associations with other eating disorder behaviors, exercising in response to negative affect may be a useful marker for eating pathology. Future research should examine negative affect and exercise prospectively. Although physical activity has numerous physical and mental health benefits, it may also be used by some in ways that are neither physically nor mentally beneficial and may, in fact, be detrimental.

Clinical Implications

So is negative affect motivated exercise an effective coping strategy, an eating disordered behavior, or an eating disorder? It is likely all three. For some individuals, undertaking exercise may be one of a number of ways they effectively and adaptively deal with negative affect. Because of this possibility, it is important that researchers and clinicians alike avoid pathologizing healthy exercise behavior. In fact, encouraging individuals to develop a flexible exercise regimen may prove to be beneficial for many individuals. However, for others, this type of exercise may be an ineffective and potentially harmful way of dealing with negative affect that accompanies other behaviors like binge eating and vomiting. Still for others, it may be their sole method of dealing with negative affect to the exclusion of other activities and social relationships. Understanding that exercise behavior may not always be health-promoting behavior may improve the identification of unhealthy exercise and eating behavior and the treatment of eating disorders. Thus, uncovering the various dimensions of negative affect motivated exercise may be a fruitful area for future research. This study represents the first step in identifying and describing exercise moti-
vated by negative affect as a behavior of interest in the eating disorders field.

References


