Physical Activity and Psychological Adjustment in Adolescents

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Objective: To examine the association between volume and intensity of physical activity (PA) and depressive symptoms, anxiety, and body image in a large sample of adolescents in Ottawa and surrounding region.

Methods: A total of 1259 (n = 746 girls and n = 513 boys) students responded to surveys on leisure time PA, depressive symptoms, anxiety, and body image. Results: A dose response effect of intensity of PA and psychological distress was observed whereby those who performed greater bouts of vigorous PA exhibited better psychological adjustment than adolescents engaging in mild to moderate intensity activity. Gender impacted the results as vigorous PA was associated with reduced depression but not anxiety in boys, and reduced anxiety but not depression in girls. The positive association between total volume of PA and psychological functioning in the overall sample was no longer significant when gender was considered, except for reduced anxiety in girls.

Conclusions: Vigorous PA was associated with reductions in depressive symptoms, anxiety and improvements in body esteem in adolescents, but these associations were differentially influenced by gender. Future research is needed to elucidate the efficacy of vigorous PA as a treatment for mental health problems in male and female adolescents.

Keywords: mental health, physical activity, adolescents, exercise psychology

Depressive disorders occur earlier in life than in the past, and the prevalence of depression in teens is almost twice as high as adults aged 25 to 44 years. Several large scale population surveys indicate widespread presence of mental health problems among adolescents. It has been estimated that more than 30% of American teens have a diagnosable mental health disorder that cause some or substantial functional impairment. The World Health Organization has projected that by the year 2020 depression will be second to only cardiovascular disease as the world’s leading cause of death and disability.

The psychological benefits of physical activity (PA) are well documented in the adult population. Clinical and epidemiological studies have shown that PA is inversely related to not only depression, but also anxiety, panic attacks, phobias, and stress disorders. A dose-response relationship between PA and reduced anxiety and depression has also been reported in adults.

Much less is known about the relationship between PA and mental health outcomes in adolescents. Consistent with the adult literature, large cross-sectional studies suggest an inverse relationship between PA and emotional and behavioral problems in adolescents. Longitudinal research has shown that naturally occurring changes in PA across time during adolescence is inversely related to a change in depressive symptoms. Moreover, there is a consistent relationship between PA in adolescence and psychological well-being in adulthood. However, there is evidence that moderate-to-vigorous PA and improved depressive symptoms is not a universal finding as epidemiological studies failed to support this relationship. Moreover, a recent study found that low to moderate intensity of PA was a protective factor of depression, whereas high intensity PA was a risk factor for suicidal ideation and general psychological disorders. This suggests that intensity of PA is important and may be differentially associated with psychopathological symptoms.

The research on PA and body image in adolescents is mixed. Physical activity is known to lead to energy expenditure, a reduction of body fat and increases in lean body mass, all of which may result in improved body image. Goldfield et al, 2007 found that increases in PA were associated with increases in perceived physical conditioning and body satisfaction, independent of BMI in obese preadolescent children. In a 5-year longitudinal study of adolescents, higher body image predicted higher levels of PA in girls and boys independent of body mass index.
and other confounders.\textsuperscript{18} However, some cross-sectional studies failed to establish a relationship between body image and PA.\textsuperscript{19} Moreover, 2 intervention studies that included PA and healthy nutrition failed to improve body image in adolescents.\textsuperscript{20,21} Thus, the relationship between PA and body image in adolescents remains unclear.

Relative to the adult literature, research on the relationship between PA and mental health in youth is scarce. Moreover, there has been too great a focus on depression and anxiety as mental health indicators, to the exclusion of other variables of emotional well-being such as body image and self-esteem. Furthermore, many previous studies have measured emotional and behavioral problems using methods that were developed for adults without establishing the validity among adolescents.\textsuperscript{12} Very few aforementioned studies examined the type, frequency, or intensity of PA and how it relates to psychological adjustment.

More research is needed to examine the relationship between PA and psychological adjustment in adolescents as this information may elucidate how PA may be used to improve psychological functioning. As such, the purpose of this study was to examine the relationship between PA, including that performed at different levels of intensities, and psychological factors in a large sample of adolescents. We hypothesized that higher levels of PA performed at greater intensity would be associated with lower levels of anxiety and depression, and higher body esteem.

**Methods**

**Participants**

Questionnaires were administered to 1590 youth, and of those 1259 were returned fully completed, making the response rate a respectable 79%. This study is part of a larger longitudinal study examining eating behavior and adolescent lifestyles. The sample for this study was drawn from 24 middle schools and high schools in the surrounding Metropolitan Ottawa regions. Students who participated in the study were English-speaking males and females from grade 7 (age 12 years) to grade 12 (17–18 years of age), and the data were collected between November 2004 to May 2006. The research team established firm liaisons with 3 school boards and several private schools in the region. To achieve an accurate representative sample of students from the region, schools were geographically dispersed with some participating schools being drawn from urban, suburban and rural districts. This study was approved by the Research Ethics Boards of the Children’s Hospital of Eastern Ontario, the Royal Ottawa Mental Health Centre, and of the respective school boards. Table 1 displays the demographic and anthropometric characteristics of the sample.

**Procedures**

Students completed surveys anonymously in classrooms, with the average completion time ranging between 50 to 75 minutes. At the end of the survey, students were asked to proceed to a private and confidential area where their weight and height were taken and marked directly on the questionnaire itself. Research personnel were on hand to answer any questions or deal with any critical incidents. All completed questionnaires were sealed in an envelope by students and deposited in a box in the front of the classrooms to ensure confidentiality of responses. Participants were told that the purpose of the study was to explore eating attitudes and lifestyle in youth.

**Measures**

Demographic data were collected from each participant, and entailed details on grade, age, gender, and parental education level.

**Weight Measurements.** Weight measurements were collected using a standardized digital scale, and recorded in kilograms to the nearest 0.1kg. Height measurements were taken using a stadiometer, and were recorded in centimeters to the nearest 0.1cm. Students were asked to remove their shoes before measurements were taken. Body Mass Index (BMI) was calculated by dividing the participants’ weight in kilograms by their height in meters squared (kg/m^2).

The Body Esteem Scale for Adolescents and Adults (BESAA) is a 23-item scale, rated on a 5-point Likert scale from 0 (never) to 4 (always). Mendelson et al\textsuperscript{22} factor analyzed the scale which yielded 3 factors of body esteem in adolescents and adults: Appearance Esteem (10 statements) that deal with general feeling around one’s looks (eg, I like what I look like in pictures), Weight Esteem (8 statements) concerns the extent to which the person is happy about their weight and how much they would like to change (eg, I am satisfied with my weight), and External Attribution (5 statements) concerns of how others perceive their looks (eg, others people consider me good looking). Negative items are reversed so that a high score always reflects a positive value judgment on the body. Cronbach alphas for male and female samples ranged from .75 to .96, indicating acceptable to excellent internal consistency for the 3 subscales for both sexes.\textsuperscript{22,23} In addition, the BESSA has been shown to have good test-retest reliability 3 months after the first test, with correlations of .83 for the attribution factor, .89 for the appearance factor, and .92 for the weight factor (\(P < .001\)).\textsuperscript{22} Regarding convergent validity, as one would expect, significant gender differences have been shown in respect of Weight and Appearance scales, in that girls have scored lower than boys.\textsuperscript{22} Also, body mass index (BMI) has been shown to be strongly associated with the BESSA subscale Weight, in that girls with high BMI have been associated with low scores.\textsuperscript{22} Global self-esteem, as measured by Neeman and Harter,\textsuperscript{24} is highly correlated to unidimensional self-evaluations of physical appearance across the lifespan.\textsuperscript{25} Thus, the finding that global self-esteem would be more highly related to general feelings about Appearance than to weight satisfaction or to evaluations attributed to others about one’s body and appearance provides evidence of concurrent validity. There is
also good evidence of discriminant validity of the 3 BE subscales. The factor analysis differentiated them, and the BE-Appearance and BE-Weight subscales were more closely related to Neeman and Harter’s Appearance subscale than was the BE-Attribution subscale, whereas the BE-Attribution subscale correlated more highly with Neeman and Harter’s social subscales. Thus, the BE-Attribution subscale is distinct from self-evaluations of weight and appearance.

The Child Depression Inventory (CDI) is a 27-item questionnaire asking 6- to 17-year-old respondents to endorse statements about themselves reflecting cognitive, behavioral and somatic symptoms of depression. The items are rated on a 3-point scale indicating symptom severity (ie, 0 = no presence of symptom and 2 = highest severity possible). Total scores on the CDI range from 0 to 52, with higher scores indicative of greater reports of depressive symptoms. The measure has been shown to have acceptable internal consistency (alphas = .71 to .89) and good discriminant validity when classifying children and youth with no significant psychopathology versus those who were depressed.

The Godin Leisure-Time Exercise Questionnaire (Godin & Shepard) is a 4-item questionnaire asking about intensity and frequency of leisure-time exercise. It asks, how many times per week, on average, do you do the following types of exercise: a) strenuous exercise (9 METS) where the heart beats rapidly and causes heavy sweating (running, jogging, hockey, football, soccer, etc.); b) moderate exercise (5 METS) are activities that are not exhausting but cause light sweating (fast walking, baseball, tennis, easy cycling, etc.); and c) mild exercise (3 METS) is defined as activities that involve minimal effort and no sweating (ie, yoga, easy walking, archery, fishing, etc.). The fourth question asks respondents how many times per week in their leisure time do they engage in any activity long enough to work up a sweat (heart beats rapidly); never, sometimes, or often. Due to the similarity of this question with the question asking vigorous/strenuous activity, this item was not used in the analysis. Instead total volume of PA was calculated based on the following equation; frequency of strenuous activity × 9 (METS) + frequency of moderate activity × 5 (METS) + frequency of strenuous activity × 9 (METS). Correlations between subjective and objective data were significant at r = .38 for strenuous exercise, .24 for total exercise, and .26 for self-rating of sweat-inducing exercise in adults. Two-week test-retest reliability coefficients varied between .46 and .94. However, in a sample of 72 children and adolescents, test-retest reliability coefficient was 0.84. In another sample of 36 5th graders, 36 8th graders, and 30 11th graders, the 2-week test-retest reliability ranged from .69 to .96. As a measure of concurrent validity, the Godin questionnaire correlated significantly r = .32, P < .001 with other self-report questionnaires in 102 adolescents. Moreover, this measure has reported adequate validity (r = .39) when compared with kilocalories expended per day by telemetry in 5th, 8th, and 11th graders.

Multidimensional Anxiety Scale for Children (MASC-10). This is a brief 10-item scale adapted from the original 39-item MASC that assesses overall levels of anxiety symptoms. Respondents are asked to rate each symptom using a 4-point Likert scale ranging from 0 (never true about me) to 3 (often true about me). Test-retest reliability for the adolescent sample (13–18 years old) falls in the satisfactory to excellent range with Interclass correlation coefficients (ICC) ranging from .75 to .92. Total ICC for this sample was .88. As for convergent validity, the MASC total score showed significant correlations with the Revised Children’s Manifest Anxiety Scale (RCMAS) with r = .633.

Analytic Plan

We provided means and standard deviations as well as prevalence rates and percentages to describe the characteristics of the sample. Differences in parental education by gender were determined by Chi-Square analyses. Partial Pearson correlations with body mass index (BMI) partialled out were conducted to examine the correlations between PA and psychological factors in the overall sample, as well as by gender. We statistically controlled for BMI given its inverse relationship to PA and association to mental health factors.

Results

Characteristics of the sample are presented in Table 1. On average, the mean age of the sample was approximately 15 years old with a normal BMI and coming from well educated and likely middle to upper-middle class families, which is representative of the Ottawa region. As expected, boys were more physically active than girls.

As shown in Table 2, moderate and vigorous PA was inversely related to depressive and anxiety symptoms and positively associated with body esteem. A dose-response effect between intensity of PA and symptom reduction was observed in the overall sample. Total volume of PA was also inversely related to psychological symptoms in the overall sample, most notably, significant associations with reduced anxiety and increased feelings about appearance and weigh satisfaction, but the magnitude of these correlations were milder than for vigorous PA. In addition, volume of PA was not significantly related to depression in the overall sample.

As shown in Table 3 (males) and Table 4 (females), gender had a large impact on the association between PA and psychological adjustment. Vigorous PA was still the strongest correlate of psychological factors, whereas mild and moderate intensity PA did not yield any significant associations, except for moderate intensity activity and depression in males (r = −.11, P < .05). In males, vigorous PA was significantly correlated with reduced depression (r = −.15, P < .001) but not anxiety (r = −.06, P > .06), whereas for girls, vigorous PA was inversely correlated with anxiety (r = −.15, P < .001) but showed no significant correlation with depression (r = −.03, P > .05). In addition, vigorous PA was significantly correlated with body
Table 1 Characteristics of the Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall sample (N = 1259)</th>
<th>Males (N = 513)</th>
<th>Females (N = 746)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>Age</td>
<td>14.8 ± 1.8</td>
<td>14.8 ± 1.9</td>
<td>14.6 ± 1.7</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>21.6 ± 3.8</td>
<td>21.8 ± 3.8</td>
<td>21.5 ± 3.5</td>
</tr>
<tr>
<td>Times/week in mild PA*</td>
<td>3.9 ± 1.4</td>
<td>4.4 ± 2.8</td>
<td>3.6 ± 3.7</td>
</tr>
<tr>
<td>Times/Week in Mod. PA*</td>
<td>3.6 ± 2.8</td>
<td>3.9 ± 3.1</td>
<td>3.4 ± 2.6</td>
</tr>
<tr>
<td>Times/Week in Vig. PA*</td>
<td>3.6 ± 2.9</td>
<td>4.3 ± 3.2</td>
<td>3.2 ± 2.7</td>
</tr>
<tr>
<td>Total Volume of PA*</td>
<td>62.1 ± 55.6</td>
<td>71.4 ± 75.0</td>
<td>55.7 ± 34.4</td>
</tr>
<tr>
<td>Mother education n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No HS diploma</td>
<td>74 (6%)</td>
<td>28 (6%)</td>
<td>46 (6%)</td>
</tr>
<tr>
<td>HS diploma</td>
<td>232 (18%)</td>
<td>98 (19%)</td>
<td>134 (18%)</td>
</tr>
<tr>
<td>College degree or higher</td>
<td>953 (76%)</td>
<td>414 (80%)</td>
<td>539 (72%)</td>
</tr>
<tr>
<td>Father’s education n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No HS diploma</td>
<td>86 (7%)</td>
<td>24 (5%)</td>
<td>62 (8%)</td>
</tr>
<tr>
<td>HS diploma</td>
<td>197 (16%)</td>
<td>86 (17%)</td>
<td>111 (15%)</td>
</tr>
<tr>
<td>College degree or higher</td>
<td>976 (78%)</td>
<td>403 (79%)</td>
<td>573 (77%)</td>
</tr>
</tbody>
</table>

Abbreviations: PA, physical activity; Mod., moderate intensity physical activity; Vig., vigorous physical activity; HS, high school.

* Males greater than females at P < .001. No differences were detected by gender in parental education as determined by Chi-Square tests.

Table 2 Pearson Correlations Between Self-Reported Physical Activity and Mental Health Indicators With BMI Partialled Out (N = 1259)

<table>
<thead>
<tr>
<th>Mental health outcomes</th>
<th>Mild</th>
<th>Mod.</th>
<th>Vig.</th>
<th>Total PA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>.02</td>
<td>-.07*</td>
<td>-.10**</td>
<td>-.05</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-.01</td>
<td>-.08*</td>
<td>-.16***</td>
<td>-.10***</td>
</tr>
<tr>
<td>Feelings about appearance</td>
<td>-.02</td>
<td>.09**</td>
<td>.14***</td>
<td>.07**</td>
</tr>
<tr>
<td>Weight satisfaction</td>
<td>-.04</td>
<td>.08**</td>
<td>.14***</td>
<td>.06*</td>
</tr>
<tr>
<td>External attribution</td>
<td>-.00</td>
<td>.02</td>
<td>.09**</td>
<td>.04</td>
</tr>
</tbody>
</table>

Abbreviations: Mild, mild intensity physical activity; Mod., moderate intensity physical activity; Vig., vigorous intensity physical activity.

* P < .05.

**P < .01.

***P < .001.

esteen subscales in the overall sample, but the magnitude of correlations with body esteem subscales were higher in males compared with females. For example, vigorous PA was significantly correlated with the external attribution subscale of the Body Esteem Scale for Adolescents in males (r = .20, P < .001) but not in females (r = .00, P > .05). Volume of PA was only associated with reduced anxiety in females (r = −.10, P < .01) and improved External Attribution body esteem subscale in males.

Discussion

This study examined the relationship between volume and intensity of PA and indicators of mental health in an overall sample of adolescents, as well as in adolescent boys and girls. As shown in Table 2, a clear dose-response effect was observed whereby higher intensities of PA was associated with significantly reduced measures of psychological distress, such as anxiety and depression.
and improved body esteem in the overall sample. When the data were analyzed by gender (see Tables 3 and 4), vigorous PA became even more strongly associated with mental health indicators, especially in males, compared with volume of PA, which was generally significantly correlated with psychological adjustment in the overall sample but most of these effects were lost when gender was taken into account. Mild intensity of PA, such as yoga, fishing, bowling etc., showed virtually no relationship at all to mental health indicators in the overall sample or by gender, which is in contrast to findings of Tao et al.\textsuperscript{15} Although several studies have examined overall volume of leisure-time PA in association with psychological adjustment in youth, with mixed results,\textsuperscript{10,12,16} very few have examined the relationship between PA intensity and psychological distress. Our findings indicating that vigorous PA was associated with reduced psychological distress in youth are consistent with a previous study\textsuperscript{34} but stand in contrast to other studies showing either no relationship\textsuperscript{14} or an increased risk of depression with vigorous PA.\textsuperscript{15} Nevertheless, our findings have important clinical implications given the high prevalence of anxiety and depressive disorders in youth.

It is interesting to note that our findings suggest that vigorous PA may be more closely associated to reduced psychological distress than total volume of PA, especially when gender is taken into account. This suggests that brief periods (15 minutes) of high intensity activity may provide greater psychological benefits than less intense activity performed over longer durations. As noted by Paluska and Schwenk,\textsuperscript{7} there may be several psychological and biological mechanisms that link vigorous PA with reduced psychological distress in adults. Psychological theories include the distraction from stress hypothesis, self-efficacy theory, the mastery hypothesis, and the social interaction hypothesis. The biological mechanisms include the monoamine hypothesis, the endorphin hypothesis, and the thermogenic model. There is reason to believe that similar mechanisms, either acting individually or in combination with each other, may underlie these associations between vigorous PA and reduced psychological distress in adolescents, and need to be addressed in future research.

Interestingly, we found marked gender differences in the relationship between vigorous PA and psychological variables of interest. For example, the significant relationship found between vigorous PA and reduced anxiety and depression in the overall sample was differentially influenced by gender. Specifically, vigorous PA was significantly correlated with reduced depression in males but not females, whereas vigorous PA was significantly inversely associated with anxiety in females but not males. Males also showed that moderate intensity activity was associated with reduced depression, but this effect was not found in females. Our findings are unlikely due to a statistical power issue since the sample of boys and girls in the current study was quite large. Our findings suggest that vigorous PA was needed in both boys and girls to produce reductions in psychological distress, with the one exception noted that moderate intensity of PA was associated with reduced depression in males only. Interestingly, while the volume of activity was significantly related to anxiety in the overall sample, it remained significant only in females but not in males.

The findings with respect to body image paralleled those of psychological distress. Vigorous PA was the strongest correlate of positive body image findings in the overall sample. Again, it appeared that intensity of PA was more strongly associated with perceptions of improved body image than volume of PA. As was the case for anxiety and depression, gender impacted the relationship between body image and vigorous PA. For boys, the magnitude of correlations were twice as high than for girls, suggesting that boys may derive greater benefits in body image than girls when doing vigorous PA. This effect was especially pronounced when considering the relationship between external attribution (believing that others think you are good looking) and vigorous PA, as shown in Table 3 and Table 4. Since baseline data showed

<table>
<thead>
<tr>
<th>Mental health outcomes</th>
<th>Mild</th>
<th>Mod.</th>
<th>Vig.</th>
<th>Total PA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>.03</td>
<td>-.11*</td>
<td>-.15***</td>
<td>-.05</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-.02</td>
<td>-.06</td>
<td>-.06</td>
<td>-.05</td>
</tr>
<tr>
<td>Feelings about appearance</td>
<td>-.03</td>
<td>.07</td>
<td>.14**</td>
<td>.04</td>
</tr>
<tr>
<td>Weight satisfaction</td>
<td>-.08</td>
<td>.06</td>
<td>.15***</td>
<td>.01</td>
</tr>
<tr>
<td>External attribution</td>
<td>-.01</td>
<td>.06</td>
<td>.20***</td>
<td>.09*</td>
</tr>
</tbody>
</table>

Abbreviations: Mild, mild intensity physical activity; Mod., moderate intensity physical activity; Vig., vigorous intensity physical activity.

* $P < .05$.
** $P < .01$.
*** $P < .001$. 

that boys were more active than girls, which is a well known finding, it is possible that vigorous activity may be most closely associated with improved body image ratings in boys because the greater amount of vigorous activity exhibited by boys may have produced more positive changes in body habitus. Alternatively, it is well known that adolescent males are more satisfied with their bodies than adolescent females. Thus, it is also possible that people who are more satisfied with their bodies (ie, males) may be more likely to exercise more and at higher levels of intensity. Future research is needed to clarify the relationships between PA intensity and body image perceptions in adolescents, and ascertain why the relationship between vigorous activity and body image appears stronger in males than females.

There are many strengths and weaknesses to our study. One of the main strengths of the study was the use of direct or objective measures of height and weight for BMI rather than relying on self-report, as well as our use of well validated measures of psychological functioning. Given the high response rate and broad sampling of schools that included private and public schools in urban and rural settings, we believe the sample is representative of adolescents living in the metropolitan Ottawa region. However, since Ottawa is more affluent than many other cities in Ontario and Canada and only 10.8% of youth come from low-income families, results may not generalize to all adolescents in Canada. It is important to note that our data are cross-sectional, thus directionality or causality cannot be determined. Our study is also limited by the self-report nature of PA, and it is possible that associations to mental health would have been stronger or weaker had more direct measures of PA been used. In addition, we did not adjust findings based on school clustering effects, so the effects of school clustering on findings remains unknown and should be addressed in future investigation.

In summary, our data indicate that several bouts per week of vigorous PA lasting as little as 15 minutes per bout was the strongest correlate of reduced psychological distress and improved body image in the overall sample, and when gender was taken into account. To the best of our knowledge, we are the first to show that vigorous PA was associated with reduced depression but not anxiety in boys, and reduced anxiety but not depression in girls. Although both anxiety and depression are internalizing mental health problems, our findings have implications for possible differential psychological benefits of PA based on gender. In addition, although vigorous PA was associated with improved body esteem in both boys and girls, the relationship appears to be stronger in boys. Longitudinal research is needed to determine whether vigorous PA reduces psychological distress in adolescent boys and girls, or whether those who are less psychologically distressed are more likely to engage in vigorous PA. Moreover, future prospective research with direct measures of PA are needed to better elucidate the psychological benefits of the volume and intensity of PA in adolescents. The importance of focusing on increasing PA to help attenuate psychological distress and improve emotional well-being in adolescents is underscored by its low-cost and low-risk of harm, as well as in which it can be included as an adjunctive form of treatment. Relatively few randomized controlled trials assessing the psychological benefits of PA in adolescents have been conducted, and even fewer have examined gender differences in response to intervention, and this arena remains a fruitful target of future research.

**Table 4** Pearson Correlations Between Self-Reported Physical Activity and Mental Health Indicators With BMI Partialled Out in Females (N = 746)

<table>
<thead>
<tr>
<th>Mental health outcomes</th>
<th>Mild</th>
<th>Mod.</th>
<th>Vig.</th>
<th>Total PA score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>.03</td>
<td>-.04</td>
<td>-.03</td>
<td>-.03</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.05</td>
<td>-.03</td>
<td>-.15***</td>
<td>-.10***</td>
</tr>
<tr>
<td>Feeling about appearance</td>
<td>-.05</td>
<td>.05</td>
<td>.08*</td>
<td>.05</td>
</tr>
<tr>
<td>Weight satisfaction</td>
<td>-.02</td>
<td>.06</td>
<td>.08*</td>
<td>.07</td>
</tr>
<tr>
<td>External attribution</td>
<td>-.03</td>
<td>.00</td>
<td>.00</td>
<td>-.01</td>
</tr>
</tbody>
</table>

Abbreviations: Mild, mild intensity physical activity; Mod., moderate intensity physical activity; Vig., vigorous intensity physical activity.

*P < .05.

**P < .01.

***P < .001.

**Acknowledgments**

Data for this study have been collected as part of the Research on Eating and Adolescent Lifestyles (REAL study), funded by the University of Ottawa Medical Research Fund, and the Ontario Provincial Centre of Excellence for Child and Youth Mental Health.
References