Physical Activity Intensity Among Adolescents and Association With Parent–Adolescent Relationship and Well-Being

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Abstract
Participation in physical activity (PA) provides young people significant health benefits, including improved well-being. However, large percentages of children and adolescents do not meet the recommendations for PA. Given that PA patterns are established during childhood and adolescence, and evolve within the context of the family, the current study explores the relationship between perceived parent–adolescent relationships and adolescents’ PA levels, body mass index (BMI), and subjective well-being. The study was conducted in Israel, and the sample included 233 participants (126 girls, 107 boys) aged 13 to 18 years.

Participants self-reported the following measures: demographic information, BMI, the Godin-Shephard Leisure-Time Physical Activity Questionnaire, the Personal Well-Being Index, and parent–adolescent relationship. The data were analyzed using Pearson analyses, t tests, and regressions. A clear difference emerged in strenuous PA activity by sex [t(223) = 2.1, p < .01]: the average strenuous PA was greater for boys (M = 3.9, SD = 2.4) than for girls (M = 1.8, SD = 2.4). Furthermore, different predictors of strenuous PA by sex were found: for boys, parent–adolescent relationship was a significant predictor; for girls, subjective well-being was a predictor. The findings can shed light on the need for different intervention programs for adolescent boys and girls to increase their involvement in PA.

Keywords
physical activity intensity, adolescent, subjective well-being, parent–adolescent relationship

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Participation in physical activity (PA) provides young people significant health benefits, including obesity prevention, improved well-being, cardiovascular (CV) fitness, and bone health (Bailey, Wellard, & Dismore, 2004; Janssen & LeBlanc, 2010). Furthermore, PA behaviors adopted during adolescence are likely to persist into adulthood, underscoring the relevance of adequate participation during this stage of life (Gordon-Larsen, Nelson, & Popkin, 2004; Kjønniksen, Torsheim, & Wold, 2008; Telama, 2009). In addition to promoting health, PA promotes enhanced memory and cognitive performance (Hillman, Erickson, & Kramer, 2008), higher energy levels (Graham, Bauer, Friend, Barr-Anderson, & Nuemark-Sztainer, 2014), improved mood (Fox, 1999), and higher sleep quality (Youngstedt, 2005), especially important during adolescence.

However, large percentages of adolescents do not meet the recommended and optimal levels of regular PA (Graham et al., 2014; Troiano et al., 2008). The Youth Risk Behavior Surveillance System—United States estimated that 45.6% of boys and only 27.7% of girls were meeting these guidelines (U.S. Centers for Disease Control and Prevention, 2010). Worldwide, 80% of 13- to 15-year-olds do not achieve the recommended amount of activity each day (Hallal et al., 2012), and there is evidence of a decline in PA at the population level, especially during adolescence (Dumith, Gigante, Domingues, & Kohl, 2011; Nader, Bradley, Houts, McRitchie, & O’Brien, 2008). Thus, only about 20% of adolescents worldwide meet the PA guidelines (Hallal et al., 2012; Raustorp & Ekroth, 2013; Telama et al., 2014).

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PA patterns are established during childhood and adolescence and evolve within the context of the family (Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2010). Although parents are just one possible area of influence (e.g., peers, school), socialization of many behaviors occurs within the family, and parents’ beliefs, attitudes, and behaviors substantially affect children’s mental, emotional, and physical health (Pugliese & Tinsley, 2007).

The mechanism by which parents influence adolescent PA remains unclear. Therefore, given that PA patterns are established during childhood and adolescence and evolve within the context of the family, the current study explores the relationship between perceived parent–adolescent relationships and adolescents’ PA levels, subjective well-being (SWB), and body mass index (BMI), an objective measure of height and body weight.

Physical Activity

The ability of PA to “energize” and to produce a more positive mood is reported widely. At least 20 reviews of studies in the area of affect have been published (Biddle & Asare, 2011). There is also epidemiological evidence of a clear association between PA and several indices of SWB (Malebo, van Eeden, & Wissing, 2007). Further, the degree of intensity in sports activities may increase one’s locus of internal control, level of aspirations, and SWB (Archer & Garcia, 2014; Fox, 1999). To attain these benefits, recommended guidelines state that adolescents need to accumulate at least 60 min of moderate-to-vigorous PA (MVPA) most days of the week (Physical Activity Guidelines Advisory Committee, 2008; World Health Organization, 2010).

Examination of sex differences revealed another concern (Butcher, Sallis, Mayer, & Woodruff, 2008; Currie et al., 2008; Riddoch et al., 2004): internationally as well as in Israel, girls are less active than boys (Garcia, Pender, Antonakos, & Ronis, 1998; Telford, Telford, Olive, Cochrane, & Davey, 2016), and there is a more pronounced decline in PA during adolescence in both sexes and in girls more than in boys (Kahn et al., 2008; Kimm et al., 2000), with age a significant correlate of PA prevalence in adolescent girls (Butcher et al., 2008; Currie et al., 2012; Pate et al., 2009). Possible explanations for these sex disparities include that competitive activities may appeal more to boys whereas girls may focus more on health and fitness (Vilhjalmsson & Kristjansdottir, 2003).

Additionally, bodily appearance was a stronger predictor of MVPA in boys than in girls (Walter & Shennar-Golan, 2017). Moreover, findings suggest that BMI is important for undertaking PA in adolescents and should be considered when preparing programs aimed at improving PA (Kantanista, Osiński, Borowiec, Tomczak, & Król-Zielińska, 2015).

Due to the pronounced sex differences in PA during adolescence and the decrease in activity levels with increased age in adolescence, there is a call for researchers to better understand the terms and reasons for PA decline during adolescence, particularly the problem of physical inactivity of girls during this developmental period and how to best address it (Bailey, Wellard, & Dismore, 2004; Camacho-Miñano, LaVoi, & Barr-Anderson, 2011).

Furthermore, although previous studies in the field of adolescent PA suggested that personal, behavioral, and socioenvironmental factors are all related to PA (Davison, Schmalz, & Downs, 2010; Taylor, Ntoumanis, Standage, & Spray, 2010), there is considerable inconsistency in the literature regarding the magnitude and even directions of the relationships between many of these variables and PA (Sallis, Prochaska, & Taylor, 2000). Given the importance of identifying correlates of PA to guide interventions as well as the lack of consistency in the literature regarding personal, behavioral, and socioenvironmental factors that contribute to PA among adolescents and especially adolescent girls, and because parents exert considerable influence over the health-related behaviors of children (Beets, Cardinal, & Alderman, 2010), the current study focuses on the role of the family environment and, within it, perceptions of parent–adolescent relationships and their influence on adolescent boys’ and girls’ PA and SWB.

Parental Influence on Adolescents’ Physical Activity

Parents are a primary influence on the activity-related behavioral patterns of their children (e.g., sports, outdoor play, and exercise; Beets et al., 2010; Kohl & Hobbs, 1998; Sallis, Prochaska, & Taylor, 2000; Trost & Loprinzi, 2011). Parental influence over children’s PA is viewed in the literature from several perspectives, revealing indeterminate findings (Gustafson & Rhodes, 2006; Sallis et al., 2000). A review by van der Horst et al. (2007) found that several factors were positively associated with child’s PA, including sex (male), self-efficacy, parental PA (for boys), and parental support. Of these, the presence of social support, which consists of indirect verbal and nonverbal support, positively influences children’s and adolescents’ activity levels (Sallis et al., 2000). Parental practices that involve emotional support have been shown to be positively associated with higher children’s PA levels (Gustafson & Rhodes, 2006; Hennessy et al., 2010; Trost et al., 2003).

In a meta-analytic review, Pugliese and Tinsley (2007) also found a moderate positive relationship between parental support and modeling behavior and child’s PA levels. In a study of 800 Latino parents and their
children, Arredondo et al. (2006) found that parental reinforcement and monitoring were both positively associated with children’s PA.

In a more recent study of parental influences on adolescent PA, Trost and Loprinzi (2011) evaluated 103 studies, revealing that factors such as family cohesion, “emotional bonding that family members have toward one another” (Olson & Gorall, 2003), parent–child communication, and parental engagement positively predicted strenuous PA for boys and girls. In accordance with previous findings, the authors pointed to mixed findings for family cohesion; they noted, however, that fostering a communicative, connected, and well-functioning family environment is arguably a sensible strategy for influencing all health-promoting behaviors in children and adolescents, including PA.

Regarding the sex differences and decline of PA among girls in this developmental stage, studies indicated that parental encouragement has an influence, as boys appear to receive more encouragement to be active from their parents than do girls (Fredricks & Eccles, 2005).

Physical Activity and Well-Being

SWB plays an important role in positive development and overall adaptation during adolescence, has important implications for adulthood, and appears to buffer against a variety of negative outcomes (Proctor, Linley, & Maltby, 2009; Tomyn & Cummins, 2011). This developmental stage, with its changes and potential stresses and crises, can jeopardize the ability of adolescents to experience high levels of SWB (Keyes, 2006; Orkibi, Ronen, & Assoulin, 2014) or can even bring a decline in well-being (Casas, González, Figuer, & Malo, 2009). At the same time, adolescence is an opportune stage to establish a strong foundation for positive well-being, which in turn leads to a satisfying life in adulthood (McCabe, Bray, Kehle, Theodore, & Gelbar, 2011).

PA is one of the suggested foundations for enhanced well-being, especially SWB (Archer & Garcia, 2014; Wang et al., 2012). Frequency of activity was positively correlated with well-being up to a threshold of moderate frequency of activity (McMahon et al., 2017). Furthermore, increasing moderate activity in adolescents seems to result in a meaningful improvement in well-being (Ware, 1995). It positively influences different mental health outcomes (Ahn & Fedewa, 2011) and reduces both clinical depression (Biddle & Asare, 2011) and depressive symptoms (Brown, Pearson, Braithwaite, Brown, & Biddle, 2013; Johnson & Taliaferro, 2011) among adolescents.

In this study, the authors examined PA and its associations with SWB and perceptions of parent–child interactions from the point of view of adolescents. The study objectives were to describe the intensity and frequency of PA and participation in sports among girls and boys and to examine associations between PA and sports participation and well-being. The authors hypothesized that most adolescents were insufficiently active according to current public health guidelines, girls were more inactive than boys, and higher frequency of PA would be associated with greater well-being. Moreover, they hypothesized that the parent–adolescent relationship would be associated positively with adolescent participation in PA and would affect adolescents’ well-being.

Method

Participants

The sample included 233 adolescents, in grades 8 to 12, 126 (54.1%) girls and 107 (45.9%) boys, aged 13 to 18 years (girls: M = 15.26, SD = 1.43; boys: M = 15.44, SD = 1.31), who were students at a regional high school in northern Israel and who had attended that school on the day the data were collected. The chosen school serves a large region that includes a variety of settlement types (kibbutz, town, village, city) and whose residents come from different socioeconomic and sociocultural categories. The study was conducted in this school only because it resembles the general population in Israel and was part of a larger study conducted in 2016.

Procedure

The research questionnaires (described below) were distributed with the permission of the school principal and with approval by the authors’ ethics committee. Students were approached in class and asked to complete the questionnaires anonymously. All participants received a description of the study’s importance, objectives, and procedures and signed an informed consent form. They were assured that their responses would be anonymous and that the data collected would be used only for this research. The data were cleaned, coded, and analyzed using SPSS version 18 (SPSS Inc., Chicago, IL). Descriptive statistics were used to describe the sample and the main variables.

Measures

Five questionnaires were used in the research study.

A demographic questionnaire collected background information about participants’ age, sex, weight, and height.

The Godin-Shephard Leisure-Time Physical Activity Questionnaire (Godin, 2011), a four-item self-administered questionnaire, gathers information on the
number of times one engages in light (minimal effort), moderate (not exhausting), and strenuous (heart beats rapidly) leisure-time PA (LTPA) of at least 15-min duration during a typical 7-day period. Then, each frequency score is multiplied by a corresponding metabolic equivalent of task value (i.e., 3, 5, and 9 for light, moderate, and strenuous intensity, respectively) and summed to obtain a leisure score index expressed in arbitrary units. The Cronbach’s α for the scale in adolescents is .84 (Godin & Shephard, 1984); in the current study it was .59.

**SWB** was measured using the Personal Well-Being Index (PWI-A: International Wellbeing Group, 2006). The PWI-A includes one overall question about satisfaction with life as a whole and eight items measuring satisfaction in specific life domains: standard of living, personal health, achieving in life, personal relationships, personal safety, community-connectedness, future security, and religion. All items are rated on a scale from 0 (completely dissatisfied) to 10 (completely satisfied). The Cronbach’s α for the scale in adolescents is .84 (Godin & Shephard, 1984); in the current study it was .59.

**BMI** (Kg/M²) is used to measure adiposity (Pietrobelli et al., 1998). Height was measured to the nearest millimeter using stadiometers, and weight was measured barefoot with digital scales in kg. A BMI of less than 18.5 is considered underweight, of 18.5 to 24.9 is considered normal and optimal, and of 25 or more is considered overweight (Swanton & Davies, 2008).

### Statistical Analysis

Data were analyzed—using Pearson correlations, *t* tests, and regressions—to assess the effects of BMI, SWB, and parent–adolescent relationship on intensity of PA across sexes. A multiple regression was run to determine the contributions of these independent variables to explaining the variance in the intensity of PA participation. All predictors were standardized.

Pearson correlations were computed to analyze the relationships between intensity of PA, the dependent variable; the independent variables SWB, sex, and parent–adolescent relationship; and BMI as an objective measure. Parent–adolescent relationship was analyzed in relation to BMI, SWB, and PA intensity. A *t* test assessed the mean differences in the variables by sex. A partial Pearson correlation assessed the connection between PA level, SWB, parent–adolescent relationship, and BMI. Finally, a multiple regression was run to determine the contribution of the independent variables to explaining the variance in PA intensity.

### Results

Age, height, weight, BMI, and parental support are described in Table 1. Most girls (76.2% *M* = 20.48, *SD* = 2.8) and boys (76.6%; *M* = 20.97, *SD* = 3.39) were of normal weight; 6.3% of the girls and 10.3% of the boys were overweight; and 4% of the girls and 5.6% of the boys were underweight. The reported quality of the parent–adolescent relationship for girls ranged from 8 to 24 (*M* = 19.35, *SD* = 3.27) and for boys ranged from 9 to 24 (*M* = 18.98, *SD* = 3.27; see Table 1).

Pearson correlations were conducted to examine relationships between the independent (PA intensity) and dependent variables (parent–adolescent relationship, SWB, and BMI). A moderate correlation was found between SWB and parent–adolescent relationship, *r*(223) = .342, *p* < .01; a weak correlation was found between parent–adolescent relationship and strenuous PA, *r*(223) = .150, *p* < .01; and

### Table 1. Demographic Characteristics, by Sex.

| Variable                  | n  | %    | M    | SD   |
|---------------------------|----|------|------|------|
| Age range in years       |    |      |      |      |
| Boys                      | 15.44 | 1.31 |      |      |
| 13–14                     | 27  | 5.6  |      |      |
| 15–16                     | 55  | 76.6 | 20.97| 3.39 |
| 17–18                     | 20  | 10.3 |      |      |
| Girls                     | 15.26 | 1.43 |      |      |
| 13–14                     | 44  | 5.6  |      |      |
| 15–16                     | 45  | 34.9 | 20.48| 2.8  |
| 17–18                     | 25  | 35.7 |      |      |
| Body mass index           |    |      |      |      |
| Boys                      |    |      |      |      |
| Underweight               | 6   | 5.6  |      |      |
| Normal weight             | 82  | 76.6 | 20.97| 3.39 |
| Overweight                | 11  | 10.3 |      |      |
| Girls                     |    |      |      |      |
| Underweight               | 5   | 4    |      |      |
| Normal weight             | 96  | 76.2 | 20.48| 2.8  |
| Overweight                | 8   | 6.3  |      |      |
| Parental support          |    |      |      |      |
| Boys (9–24 points)        | 107 | 18.98| 3.27 |      |
| Girls (8–24 points)       | 119 | 19.35| 3.27 |      |
SWB was found to positively correlate with strenuous PA, $r(223) = .234$, $p < .01$ (see Table 2).

Pearson correlations were also conducted to examine relationships between the independent (PA intensity) and the dependent variables (parent–adolescent relationship, SWB, and BMI) for boys and girls separately (see Table 3). For boys, a moderate and positive correlation was found between SWB and parent–adolescent relationship, $r(107) = .258$, $p < .001$, and a weak correlation was found between strenuous PA and parent–adolescent relationship, $r(107) = .220$, $p < .01$. For girls, a strong positive correlation was found between SWB and parent–adolescent relationship, $r(116) = .443$, $p < .01$, and a moderate positive correlation was found between SWB and parent–adolescent relationship, $r(116) = .443$, $p < .01$, and a moderate positive correlation was found between SWB and parent–adolescent relationship, $r(116) = .443$, $p < .01$, and a moderate positive correlation was found between SWB and parent–adolescent relationship, $r(116) = .443$, $p < .01$, and a moderate positive correlation was found between SWB and strenuous PA, $r(116) = .284$, $p < .01$. Furthermore, when dividing the BMI measure into three categories (underweight less than or equal to 20%, normal weight between 20% and 24%, overweight greater than 24%), an interesting finding emerged only for the overweight categories: for boys, well-being was associated with light activity, $r(107) = .698$, $p < .01$; for girls, parent–adolescent relationship and strenuous activity was associated with light activity, $r(116) = .732$, $p < .01$.

Because the data indicate differences between boys and girls, a $t$ test of the independent variable (sex) was conducted to analyze the mean differences in the dependent variables (SWB, BMI, and level of PA). The hypothesis related to examining the mean differences in sex for the research variables was tested using unpaired $t$ tests. A clear difference was found in strenuous PA [$t(223) = 2.1$, $p < .01$]; the average strenuous PA was greater for boys ($M = 3.9$, $SD = 2.4$) than for girls ($M = 1.8$, $SD = 2.4$). The remaining analyses did not show any significant differences between boys and girls (see Table 4).

Multiple regression was performed using SWB for girls and parent–adolescent relationship for boys to predict their respective engagement in strenuous PA. The results are presented in Table 5. For girls, SWB was significantly associated with engagement in strenuous PA, $r(.057)$, $p < .001$, whereas for boys, parent–adolescent relationship was significantly associated with engagement in strenuous PA, $r(.055)$, $p < .001$. The model was

Table 2. Means, Standard Deviations, and Intercorrelations of Study Variables (N = 233).

| Variable                      | Mean | SD | 1   | 2    | 3    | 4    | 5    | 6    |
|-------------------------------|------|----|-----|------|------|------|------|------|
| 1. Subjective well-being      | 7.7  | 1.37 | 1   | .342 | −.054 | .031 | −.016 | .234 |
| 2. Parent–adolescent relationship | 19.1 | 3.27 | .342 | 1    | −.089 | −.046 | .013 | .150 |
| 3. Body mass index             | 20.1 | 3.1  | −.054 | 1    | −.002 | −.130 | −.073 | 1    |
| 4. Light activity              | 2.3  | 2.5  | .031 | −.046 | 1    | .438b | .028 | 1    |
| 5. Moderate activity           | 2.2  | 2.1  | −.016 | .013 | 1    | .438b | .149a | 1    |
| 6. Strenuous activity          | 2.7  | 2.3  | .234b | .150a | −.073 | .028 | .149a | 1    |

Note. $^a p < .05$. $^b p < .01$.

Table 3. Means, Standard Deviations, and Intercorrelations for Study Variables, by Sex.

| Variable                  | Subjective well-being | Parent–adolescent relationship | Body mass index | Mild activity | Moderate activity | Strenuous activity |
|---------------------------|------------------------|--------------------------------|-----------------|---------------|-------------------|--------------------|
| Boys (n = 107)            |                        |                                |                 |               |                   |                    |
| Subjective well-being     | 1                      | .258b                          | −.164           | .039          | .014              | .147               |
| Parent–adolescent relation| .258b                  | 1                              | −.182           | −.001         | .062              | .220a              |
| Body mass index            | −.164                  | −.182                          | 1               | −.006         | −.055             | −.122              |
| Light activity             | .039                   | −.001                          | −.006           | 1             | .474b             | −.054              |
| Moderate activity          | .014                   | .062                           | −.055           | .474b         | 1                 | .271               |
| Strenuous activity         | .147                   | .220a                          | −.122           | −.054         | .271b             | 1                  |
| Girls (n = 126)            |                        |                                |                 |               |                   |                    |
| Subjective well-being      | 1                      | .443b                          | .062            | .009          | −.060             | .284d              |
| Parent–adolescent relation | .443b                  | 1                              | .025            | −.082         | −.029             | .185a              |
| Body mass index            | .062                   | .025                           | 1               | −.013         | −.240             | −.135              |
| Light activity             | .009                   | −.082                          | −.013           | 1             | .399b             | .060               |
| Moderate activity          | −.060                  | −.029                          | −.240           | .399          | 1                 | −.037              |
| Strenuous activity         | .284b                  | .185a                          | −.135           | .060          | −.037             | 1                  |

Note. $^a p < .05$. $^b p < .01$. $^d p < .01$.
statistically significant for boys, $F(3, 95) = 2.434$, $p < .001$, and accounted for approximately 5.5% of the variance in strenuous PA, and for girls, $F(3, 100) = 3.258$, $p < .001$, and accounted for approximately 5.7% of the variance in strenuous PA.

A multiple regression was used to test whether SWB, parent–adolescent relationship, BMI, and sex as covariants significantly predicted whole participant rating of strenuous PA (see Table 6). The regression results indicated that the four predictors explained 30% of the variance ($R^2 = .300$, $F(4, 198) = 21.25$, $p < .001$). Parent–adolescent relationship significantly predicted PA ($\beta = .142$, $p < .01$), SWB ($\beta = .107$, $p < .01$), BMI ($\beta = -.093$, $p < .01$), as did sex ($\beta = -.502$, $p < .01$).

### Discussion

This study assessed and evaluated the effect of adolescents’ PA intensity level—light, moderate, and strenuous (independent variable)—and adolescents’ perceived relationship with their parents, SWB, and one objective measure, BMI (dependent variables). Based on World Health Organization (2010) recommendations, children and youths aged 5 to 17 should accumulate at least 60 min of moderate- to vigorous-intensity PA daily. In line with previous studies, there is concern worldwide about the actual level activity of adolescents.

The current research assessed a model that considers the variables concerned with mental health and body composition and the influence of family environment, the three main domains that previous studies identified as important during adolescence. We hypothesized that perceived parent–adolescent relationship, a sense of SWB, and BMI would predict the level of PA intensity. Moreover, we expected different levels of PA intensity for boys and girl (Fredricks & Eccles, 2005; Timperio et al., 2008); therefore, we assessed the model as a whole and then split it for boys and girls.

According to the results, about three-quarters (73.8%) of the adolescents in our study reported participating at least in light PA, less than 15.5% reported participating in mild PA, and the rest reported participating in strenuous PA. In Israel, the board of education requires that structured PA be offered twice a week in school and recommends

### Table 4. Differences in Selected Variables Between Boys and Girls ($N = 233$).

| Variable                      | Boys $n = 107$ | Girls $n = 126$ | $M$ (SD) | $M$ (SD) | $M$ difference | $t$ |
|-------------------------------|----------------|----------------|----------|----------|----------------|-----|
| Parent–adolescent relationship| 18.98 (3.36)   | 19.4038 (3.4)  | -.05     | -.891    |                |     |
| Light activity                | 2.5 (2.5)      | 2.1 (2.5)      | .34      | 1.03     |                |     |
| Moderate activity             | 2.3 (2.2)      | 2.1 (2.2)      | .25      | .919     |                |     |
| Strenuous activity            | 3.9 (2.4)      | 1.8 (2.4)      | 2.1      | 2.1*c    |                |     |
| Body mass index               | 20.97 (3.39)   | 20.4 (2.84)    | .48      | 1.2      |                |     |
| Subjective well-being         | 7.85 (1.44)    | 7.58 (1.31)    | .31      | -1.31    |                |     |

Note. df = 201. *p < .05. **p < .01. ***p < .001.

### Table 5. Multiple Regression Analysis Summary for Variables Predicting Strenuous Physical Activity, by Sex.

| Variables                     | $B$ | $SE B$ | $t$ | $B$ | $SE B$ | $t$ |
|-------------------------------|-----|--------|-----|-----|--------|-----|
| Boys                          |     |        |     | Girls|        |     |
| Parent–adolescent relationship| .144| .055   | 1.921b | .112| .112   | 1.043|
| Body mass index               | -.050| -.092  | -.692 | -.155| -.155  | -1.62|
| Subjective well-being         | .160| .247   | -.692 | .916 | .916   | 1.8b |

Note. *p < .05. **p < .01. ***p < .001.
our findings of significant associations between PA intensity and well-being are consistent with previous findings (Biddle & Asare, 2011). In terms of well-being, McMahon et al. (2017) suggested that moderately increasing activity in inactive adolescents could result in a meaningful improvement in their well-being. These findings are in keeping with longitudinal research on the association between PA and changes in well-being (Wang et al., 2012). Different patterns of relationships between the groups also emerged. Among male adolescents, we found a positive correlation between parent–adolescent relationship and SWB. Among female adolescents, SWB was positively associated with strenuous PA, and BMI was associated with moderate PA. These results may be discussed in the context of our second hypothesis, which predicted significant differences between male and female adolescents. These findings are similar to those of previous studies that boys are consistently more active (Hinkley et al., 2008) and engage in more vigorous activity than girls (Zecevic et al., 2010). As hypothesized, girls were significantly more likely to be inactive than boys. This finding is in accordance with those of international studies researching activity levels in European adolescents (Currie et al., 2012; McMahon et al., 2017) and suggesting that opportunities to participate in sports and other PAs may favor boys (Currie et al., 2012).

The different relationship patterns for boys and girls led us to conduct separate regression analyses for each group. We found that different sets of factors predicted boys’ and girls’ PA levels (for strenuous PA). For boys, parent–adolescent relationship was the only significant predictor of strenuous PA; for girls, SWB was the only significant predictor. Although the result of the regression was significant, results indicated that the predictors explained low percentages of the variance; therefore, we constructed a new multiple regression including sex as a covariance. All the independent variables, including sex, predicted the strenuous PA level, suggesting that sex plays a different role for boys and girls, involving the PAS, SWB, and BMI. The relation of strenuous PA to lower BMI was found to be consistent with the results of other previous studies (Gutin, Yin, Humphries, & Barbeau, 2005). Other possible explanations for these sex disparities are that competitive activities may appeal more to boys whereas girls may focus more on health and fitness and appearance (McMahon et al., 2017; Vilhalmsson & Kristjansdottir, 2003). Exploring why boys and girls engage differently in PA is a future research venue that could explain some of these discrepancies.

Based on previous studies in the field of body image (e.g., Walter & Shenaar-Golan, 2017), these results might indicate that boys and girls in this developmental stage

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**Table 6. Multiple Regression Analysis Summary for Variables Predicting Strenuous Physical Activity, (N = 233).**

| Variable                      | B    | SE B | t     |
|-------------------------------|------|------|-------|
| Parent–adolescent relationship| .100 | .142 | 2.2⁵  |
| Subjective well-being         | .185 | .107 | 1.67⁴ |
| Body mass index               | -.071| -.093| -1.5⁴ |
| Sex                           | -2.402| -.502| -8.3⁵ |
| R²                            | 0.300|
| F                             | 21.247²|

Note. *p < .05. *p < .01. *p < .001.

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adding another hour per week. In school, boys and girls are separated during the PA lesson and taught by a teacher of the same sex. The lesson length is 45 min. Moreover, school principals are directed to motivate students’ involvement in afterschool PA.¹ The findings demonstrate a pattern similar to that previously reported for non-compliance with the PA guidelines (Physical Activity Guidelines Advisory Committee, 2008). For example, in Spain 50% of adolescents (Roman, Serra-Majem, Ribas-Barba, Pérez-Rodrigo, & Aranceta, 2008), in Germany 15.3% of adolescents (Jekauc, Reimers, Wagner, & Woll, 2012), and in the United States 8% to 9% of 12- to 19-year-olds do not meet the PA guidelines (Whitt-Glover, 2012), and in the United States 8% to 9% of 12- to 19-year-olds do not meet the PA guidelines (Whitt-Glover, 2012).
may engage in PA for different reasons: whereas boys are more occupied with social comparison with their peer group, girls are busy with their appearance and media influences; these might reflect on girls choosing light and moderate PA levels. This study helps expand knowledge of the association between PA level and SWB among adolescent boys and girls. Where previous studies indicated a decrease in PA in this developmental stage with increased depressive symptoms (Hennessy et al., 2010), the current study indicates that greater SWB, which is a positive representation of mental health (McMahon et al., 2017), in girls contributed to choosing involvement in strenuous PA. This finding can shed light on the need for different intervention programs for adolescent boys and girls to increase their involvement in moderate-higher-intensity PA, and it responds to the call by researchers, educators, and policy makers for action to underscore the problem of physical inactivity among adolescent boys and girls (Camacho-Miñano et al., 2011; Trost & Loprinzi, 2011).

Conclusion

Recent studies explored the relationship between adolescent PA level, BMI, SWB, and parent–adolescent relationship. Because previous studies indicated a decrease in PA level in adolescents, and given the differences in PA levels between boys and girls, PA provides important health benefits, increasing physical and mental health and reducing symptoms of depression and anxiety. The current study predicted the main differences between boys and girls, expanded the understanding of the above variables, and may influence the direction for intervention programs in increasing PA activity. The findings emphasize the importance of the parent–adolescent relationship in fostering engagement in higher PA levels, particularly for boys. Intervention programs for girls should focus on positive elements of mental health such as SWB.

The results of this study should be considered in light of certain limitations. First, because this was a cross-sectional study, the direction of influence could not be determined, and it was not possible to investigate any potential causal or temporal relationships between PA and SWB. Furthermore, the girls need to be supported by family and coaches to explore their competitive natures at an early age, and this support may impact their participation in physical activity. Further research could include in-depth cross-national comparisons and longitudinally examine the impact of PA on SWB. Another limitation of the study was the use of self-report methods to assess adolescent PA rather than objective measures such as direct observation or use of an accelerometer. The costs of such methods were prohibitive for the current study; however, to strengthen the validity of the findings, BMI was used as an objective measure. Furthermore, the current study used adolescents’ perceptions of the parent–adolescent relationship without accounting for parents’ perceptions; future studies should differentiate participants’ perceptions of the relationship with mother and father separately from their reasons for engaging or not in PA. Future studies should also employ a multiple-informant approach that includes parents’ attitudes toward and perceptions of relationships with children.

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Note

1. http://cms.education.gov.il/EducationCMS/Applications/Mankal/EtsMedorim/2/2-2/HoraotKeva/K-2011-1-2-2-72.htm

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