American Journal of Men's Health
2018, Vol. 12(5) 1530–1540

DOI: 10.1177/1557988318768600
journals.sagepub.com/home/jmh
SAGE

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

Vered Shennar-Golan[1] and Ofra Walter[1]

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

Received October 10, 2017; revised February 10, 2018; accepted February 23, 2018

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).

[1]Tel-Hai Academic Coolege, Upper Galilee, Israel

Corresponding Author:
Ofra Walter, Tel-Hai Academic Coolege, Upper Galilee, 12210, Israel.
Email: ofraw60@gmail.com

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 & Shenaar-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

Table 1. Demographic Characteristics, by Sex.

Variable	*n*	%	*M*	*SD*
Age range in years				
Boys			15.44	1.31
13–14	27	25.2		
15–16	55	51.4		
17–18	20	18.7		
Girls			15.26	1.43
13–14	44	34.9		
15–16	45	35.7		
17–18	25	19.8		
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	20.48	2.8
Normal weight	96	76.2		
Overweight	8	6.3		
Parental support				
Boys (9–24 points)	107		18.98	3.27
Girls (8–24 points)	119		19.35	3.27

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 ranges from .70 to .85 (International Wellbeing Group, 2006) and in the current study was high (α = .81).

Parent–adolescent relationship was assessed using the Parental Attachment Scale (PAS) developed by Chapple (2006). The scale is based on the social control theory of Hirschi, which postulates that attachment to parents is primary in life and is the affective dimension of the social bond. Parental attachment in this study was measured by six items assessing the affective component of the parent–child bond in terms of affection, caring, and mutual respect. The sum of the items is totaled for an overall score ranging from 0 to 24. Higher mean total scores indicate greater attachment to parents. The PAS has fair internal consistency, with a Cronbach's α of .74; in the current study it was .69.

BMI (Kg/M^2) 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 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[b]	−.054	.031	−.016	.234[b]
2. Parent–adolescent relationship	19.1	3.27	.342[b]	1	−.089	−.046	.013	.150[a]
3. Body mass index	20.1	3.1	−.054	−.089	1	−.002	−.130	−.073
4. Light activity	2.3	2.5	.031	−.046	−.002	1	.438[b]	.028
5. Moderate activity	2.2	2.1	−.016	.013	−.130	.438[b]	1	.149[a]
6. Strenuous activity	2.7	2.3	.234[b]	.150[a]	−.073	.028	.149[a]	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	.258[b]	−.164	.039	.014	.147
Parent–adolescent relationship	.258[b]	1	−.182	−.001	.062	.220[a]
Body mass index	−.164	−.182	1	−.006	−.055	−.122
Light activity	.039	−.001	−.006	1	.474[b]	−.054
Moderate activity	.014	.062	−.055	.474[b]	1	.271
Strenuous activity	.147	.220[a]	−.122	−.054	.271[b]	1
Girls (n = 126)						
Subjective well-being	1	.443[b]	.062	.009	−.060	.284[b]
Parent–adolescent relationship	.443[b]	1	.025	−.082	−.029	.185[a]
Body mass index	.062	.025	1	−.013	−.240	−.135
Light activity	.009	−.082	−.013	1	.399[b]	.060
Moderate activity	−.060	−.029	−.240	.399	1	−.037
Strenuous activity	.284[b]	.185[a]	−.135	.060	−.037	1

Note. [a]$p < .05$. [b]$p < .01$.

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 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 4. Differences in Selected Variables Between Boys and Girls (*N* = 233).

Variable	Boys *n* = 107 *M* (*SD*)	Girls *n* = 126 *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.
[a]*p* < .05. [b]*p* < .01. [c]*p* < .001.

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

Variables	*B*		*SE B*		*t*	
	Boys	Girls	Boys	Girls	Boys	Girls
Parent–adolescent relationship	.144	.055	.200	.112	1.921[b]	1.043
Body mass index	−.050	−.092	−.070	−.155	−.692	−1.62
Subjective well-being	.160	.247	.095	.194	.916	1.8[b]
R^2						
Boys				.055		
Girls				.057		
F						
Boys				2.434[b]		
Girls				3.258[b]		

Note. [a]*p* < .05. [b]*p* < .01. [c]*p* < .001.

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

Variable	*B*	*SE B*	*t*
Parent–adolescent relationship	.100	.142	2.2[b]
Subjective well-being	.185	.107	1.67[b]
Body mass index	−.071	−.093	−1.5[b]
Sex	−2.402	−.502	−8.3[c]
R^2	.300		
F	21.247[c]		

Note. [a]$p < .05$. [b]$p < .01$. [c]$p < .001$.

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 noncompliance 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 et al., 2009).

Based on the first hypothesis, we assumed that the variables component model would be significantly correlated with PA intensity. Examining all relationships between the model variables revealed that only strenuous PA was correlated with SWB and parent–adolescent relationship. Our findings suggest that how adolescents perceive their relationship with their parents is significantly associated with their engagement in strenuous PA. As indicated by Trost and Loprinzi (2011), 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. This is consistent with the limited research in this area, which highlights the importance of activity-related support from family and friends as a way to promote PA among adolescents (Davison, 2004), and extends this work by documenting other aspects of parental influence that have not been previously investigated with respect to adolescents' PA (Hennessy et al., 2010). Parental support and encouragement of healthy behaviors, which are likely to be important to adolescents' adoption of healthy behaviors, such as PA (Hennessy et al., 2010), could be one mechanism to explain the relationship found between parent–adolescent relationship and PA activity in the study sample, although more research is needed in this area.

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; Vilhjalmsson & 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

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.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Note

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

ORCID iD

Ofra Walter https://orcid.org/0000-0002-6796-9081

References

Ahn, S., & Fedewa, A. L. (2011). A meta-analysis of the relationship between children's physical activity and mental health. *Journal of Pediatric Psychology*, *36*(4), 385–397. Retrieved from https://doi.org/10.1093/jpepsy/jsq107

Archer, T., & Garcia, D. (2014). Physical exercise influences academic performance and well-being in children and adolescents. *International Journal of School and Cognitive Psychology*, *1*(1). Retrieved from https://doi.org/10.4172/2469-9837.1000e102

Arredondo, E. M., Elder, J. P., Ayala, G. X., Campbell, N., Baquero, B., & Duerksen, S. (2006). Is parenting style related to children's healthy eating and physical activity in Latino families? *Health Education Research*, *21*(6), 862–871. Retrieved from https://doi.org/10.1093/her/cyl110

Bailey, R., Wellard, I., & Dismore, H. (2004). *Girls' participation in physical activities and sports: Benefits, patterns, influences and ways forward*. Canterbury: Centre for Physical Education and Sport Research, Canterbury Christ Church University. Retrieved August 27, 2017, from http://create.canterbury.ac.uk/4661/

Beets, M. W., Cardinal, B. J., & Alderman, B. L. (2010). Parental social support and the physical activity-related behaviors of youth: A review. *Health Education & Behavior*, *37*(5), 621–644. Retrieved from https://doi.org/10.1177/1090198110363884

Biddle, S. J. H., & Asare, M. (2011). Physical activity and mental health in children and adolescents: A review of reviews. *British*

Journal of Sports Medicine, *45*(11), 886–895. Retrieved from https://doi.org/10.1136/bjsports-2011-090185

Brown, H. E., Pearson, N., Braithwaite, R. E., Brown, W. J., & Biddle, S. J. H. (2013). Physical activity interventions and depression in children and adolescents: A systematic review and meta-analysis. *Sports Medicine (Auckland, N.Z.)*, *43*(3), 195–206. Retrieved from https://doi.org/10.1007/s40279-012-0015-8

Butcher, K., Sallis, J. F., Mayer, J. A., & Woodruff, S. (2008). Correlates of physical activity guideline compliance for adolescents in 100 U.S. Cities. *The Journal of Adolescent Health*, *42*(4), 360–368. Retrieved from https://doi.org/10.1016/j.jadohealth.2007.09.025

Camacho-Miñano, M. J., LaVoi, N. M., & Barr-Anderson, D. J. (2011). Interventions to promote physical activity among young and adolescent girls: A systematic review. *Health Education Research*, *26*(6), 1025–1049. Retrieved from https://doi.org/10.1093/her/cyr040

Casas, F., González, M., Figuer, C., & Malo, S. (2009). Satisfaction with spirituality, satisfaction with religion and personal well-being among Spanish adolescents and young university students. *Applied Research in Quality of Life*, *4*(1), 23–45. Retrieved from https://doi.org/10.1007/s11482-009-9066-x

Chapple, C. L. (2006). Parental Attachment Scale (PAS). In J. Fischer & K. Corcoran (Eds.), *Measures for clinical practice and research: A sourcebook: Vol. 1. Couples, families, and children* (pp. 388−389). Oxford: Oxford University Press.

Currie, C., Gabhainn, S. N., Godeau, E., Roberts, C., Smith, R., Currie, D., ... Barnekow, V. (2008). *Inequalities in young people's health: Health behaviour in school-aged children: International report from the 2005/2006 survey*. Copenhagen: WHO Regional Office for Europe.

Currie, C., Zanotti, C., Morgan, A., Currie, D., de Looze, M., Roberts, C., ... Barnekow, V. (2012). *Social determinants of health and well-being among young people: Health Behaviour in School-Aged Children (HBSC) study: International report from the 2009/2010 survey*. Copenhagen: WHO Regional Office for Europe.

Davison, K. K. (2004). Activity-related support from parents, peers and siblings and adolescents' physical activity: Are there gender differences? *Journal of Physical Activity & Health*, *1*(4), 363–376. Retrieved from https://doi.org/10.1123/jpah.1.4.363

Davison, K. K., Schmalz, D. L., & Downs, D. S. (2010). Hop, skip… no! Explaining adolescent girls' disinclination for physical activity. *Annals of Behavioral Medicine*, *39*(3), 290–302. Retrieved from https://doi.org/10.1007/s12160-010-9180-x

Dumith, S. C., Gigante, D. P., Domingues, M. R., & Kohl, H. W. (2011). Physical activity change during adolescence: A systematic review and a pooled analysis. *International Journal of Epidemiology*, *40*(3), 685–698. Retrieved from https://doi.org/10.1093/ije/dyq272

Fox, K. R. (1999). The influence of physical activity on mental well-being. *Public Health Nutrition*, *2*(3a), 411–418. Retrieved from https://doi.org/10.1017/S1368980099000567

Fredricks, J. A., & Eccles, J. S. (2005). Family socialization, gender, and sport motivation and involvement. *Journal of Sport & Exercise Psychology*, *27*(1), 3–31. Retrieved from https://doi.org/10.1123/jsep.27.1.3

Garcia, A. W., Pender, N. J., Antonakos, C. L., & Ronis, D. L. (1998). Changes in physical activity beliefs and behaviors of boys and girls across the transition to junior high school. *The Journal of Adolescent Health*, *22*(5), 394–402. Retrieved from https://doi.org/10.1016/S1054-139X(97)00259-0

Godin, G. (2011). The Godin-Shephard leisure-time physical activity questionnaire. *Health & Fitness Journal of Canada*, *4*(1), 18–22.

Godin, G., & Shephard, R. J. (1984). Normative beliefs of school children concerning regular exercise. *Journal of School Health*, *54*(11), 443–445.

Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends: Adolescence to adulthood. *American Journal of Preventive Medicine*, *27*(4), 277–283. Retrieved from https://doi.org/10.1016/j.amepre.2004.07.006

Graham, D. J., Bauer, K. W., Friend, S., Barr-Anderson, D. J., & Nuemark-Sztainer, D. (2014). Personal, behavioral, and socio-environmental correlates of physical activity among adolescent girls: Cross-sectional and longitudinal associations. *Journal of Physical Activity & Health*, *11*(1), 51–61. Retrieved from https://doi.org/10.1123/jpah.2011-0239

Gustafson, S. L., & Rhodes, R. E. (2006). Parental correlates of physical activity in children and early adolescents. *Sports Medicine (Auckland, N.Z.)*, *36*(1), 79–97. Retrieved from https://doi.org/10.2165/00007256-200636010-00006

Gutin, B., Yin, Z., Humphries, M. C., & Barbeau, P. (2005). Relations of moderate and vigorous physical activity to fitness and fatness in adolescents. *The American Journal of Clinical Nutrition*, *81*(4), 746–750.

Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., Ekelund, U., & The Lancet Physical Activity Series Working Group. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *Lancet*, *380*(9838), 247–257. Retrieved from https://doi.org/10.1016/S0140-6736(12)60646-1

Hennessy, E., Hughes, S. O., Goldberg, J. P., Hyatt, R. R., & Economos, C. D. (2010). Parent–child interactions and objectively measured child physical activity: A cross-sectional study. *The International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 71. Retrieved from https://doi.org/10.1186/1479-5868-7-71

Hillman, C. H., Erickson, K. I., & Kramer, A. F. (2008). Be smart, exercise your heart: Exercise effects on brain and cognition. *Nature Reviews: Neuroscience*, *9*(1), 58–65. Retrieved from https://doi.org/10.1038/nrn2298

Hinkley, T., Crawford, D., Salmon, J., Okely, A. D., & Hesketh, K. (2008). Preschool children and physical activity: A review of correlates. *American Journal of Preventive Medicine*, *34*(5), 435–441. Retrieved from https://doi.org/10.1016/j.amepre.2008.02.001

International Wellbeing Group. (2006). *Personal wellbeing index* (5th ed.). Melbourne: Australian Centre on Quality of Life, Deakin University.

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged

children and youth. *The International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 40. Retrieved from https://doi.org/10.1186/1479-5868-7-40

Jekauc, D., Reimers, A. K., Wagner, M. O., & Woll, A. (2012). Prevalence and socio-demographic correlates of the compliance with the physical activity guidelines in children and adolescents in Germany. *BMC Public Health*, *12*(1), 714. Retrieved from http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-714

Johnson, K. E., & Taliaferro, L. A. (2011). Relationships between physical activity and depressive symptoms among middle and older adolescents: A review of the research literature. *Journal for Specialists in Pediatric Nursing*, *16*(4), 235–251. https://doi.org/10.1111/j.1744-6155.2011.00301.x

Kahn, J. A., Huang, B., Gillman, M. W., Field, A. E., Austin, S. B., Colditz, G. A., & Frazier, A. L. (2008). Patterns and determinants of physical activity in U.S. adolescents. *The Journal of Adolescent Health*, *42*(4), 369–377. https://doi.org/10.1016/j.jadohealth.2007.11.143

Kantanista, A., Osiński, W., Borowiec, J., Tomczak, M., & Król-Zielińska, M. (2015). Body image, BMI, and physical activity in girls and boys aged 14–16 years. *Body Image*, *15*, 40–43. https://doi.org/10.1016/j.bodyim.2015.05.001

Keyes, C. L. M. (2006). Mental health in adolescence: Is America's youth flourishing? *The American Journal of Orthopsychiatry*, *76*(3), 395–402. Retrieved from https://doi.org/10.1037/0002-9432.76.3.395

Kimm, S. Y. S., Glynn, N. W., Kriska, A. M., Fitzgerald, S. L., Aaron, D. J., Similo, S. L., ... Barton, B. A. (2000). Longitudinal changes in physical activity in a biracial cohort during adolescence. *Medicine and Science in Sports and Exercise*, *32*(8), 1445–1454. Retrieved from https://doi.org/10.1097/00005768-200008000-00013

Kjønniksen, L., Torsheim, T., & Wold, B. (2008). Tracking of leisure-time physical activity during adolescence and young adulthood: A 10-year longitudinal study. *The International Journal of Behavioral Nutrition and Physical Activity*, *5*(1), 69. Retrieved from https://doi.org/10.1186/1479-5868-5-69

Kohl, H. W., & Hobbs, K. E. (1998). Development of physical activity behaviors among children and adolescents. *Pediatrics*, *101*(3 Pt 2), 549–554.

Malebo, A., van Eeden, C., & Wissing, M. P. (2007). Sport participation, psychological well-being, and psychosocial development in a group of young Black adults. *South African Journal of Psychology*, *37*(1), 188–206. Retrieved from https://doi.org/10.1177/008124630703700113

McCabe, K., Bray, M. A., Kehle, T. J., Theodore, L. A., & Gelbar, N. W. (2011). Promoting happiness and life satisfaction in school children. *Canadian Journal of School Psychology*, *26*(3), 177–192. Retrieved from https://doi.org/10.1177/0829573511419089

McMahon, E. M., Corcoran, P., O'Regan, G., Keeley, H., Cannon, M., Carli, V., ... Wasserman, D. (2017). Physical activity in European adolescents and associations with anxiety, depression and well-being. *European Child & Adolescent Psychiatry*, *26*(1), 111–122. Retrieved from https://doi.org/10.1007/s00787-016-0875-9

Nader, P. R., Bradley, R. H., Houts, R. M., McRitchie, S. L., & O'Brien, M. (2008). Moderate-to-vigorous physical activity from ages 9 to 15 years. *Journal of the American Medical Association*, *300*(3), 295–305. Retrieved from https://doi.org/10.1001/jama.300.3.295

Olson, D. H., & Gorall, D. M. (2003). Circumplex model of marital and family systems. In F. Walsh (Ed.), *Normal family processes* (3rd ed., pp. 459–486). New York, NY: Guilford. Retrieved from https://doi.org/10.4324/9780203428436_chapter_19

Orkibi, H., Ronen, T., & Assoulin, N. (2014). The subjective well-being of Israeli adolescents attending specialized school classes. *Journal of Educational Psychology*, *106*(2), 515–526. Retrieved from https://doi.org/10.1037/a0035428

Pate, R. R., Stevens, J., Webber, L. S., Dowda, M., Murray, D. M., Young, D. R., & Going, S. (2009). Age-related change in physical activity in adolescent girls. *The Journal of Adolescent Health*, *44*(3), 275–282. Retrieved from https://doi.org/10.1016/j.jadohealth.2008.07.003

Physical Activity Guidelines Advisory Committee. (2008). *Physical activity guidelines advisory committee report, 2008* [Internet]. Washington, DC: U.S. Department of Health and Human Services. Retrieved from http://www.health.gov/paguidelines/Report/pdf/CommitteeReport.pdf

Pietrobelli, A., Faith, M. S., Allison, D. B., Gallagher, D., Chiumello, G., & Heymsfield, S. B. (1998). Body mass index as a measure of adiposity among children and adolescents: A validation study. *The Journal of Pediatrics*, *132*(2), 204−210. Retrieved from https://doi.org/10.1016/S0022-3476(98)70433-0

Proctor, C. L., Linley, P. A., & Maltby, J. (2009). Youth life satisfaction: A review of the literature. *Journal of Happiness Studies*, *10*(5), 583–630. Retrieved from https://doi.org/10.1007/s10902-008-9110-9

Pugliese, J., & Tinsley, B. (2007). Parental socialization of child and adolescent physical activity: A meta-analysis. *Journal of Family Psychology*, *21*(3), 331–343. Retrieved from https://doi.org/10.1037/0893-3200.21.3.331

Raustorp, A., & Ekroth, Y. (2013). Tracking of pedometer-determined physical activity: A 10-year follow-up study from adolescence to adulthood in Sweden. *Journal of Physical Activity & Health*, *10*(8), 1186–1192. Retrieved from https://doi.org/10.1123/jpah.10.8.1186

Riddoch, C. J., Andersen, L. B., Wedderkopp, N., Harro, M., Klasson-Heggebø, L., Sardinha, L. B., ... Ekelund, U. (2004). Physical activity levels and patterns of 9- and 15-yr-old European children. *Medicine and Science in Sports and Exercise*, *36*(1), 86–92. Retrieved from https://doi.org/10.1249/01.MSS.0000106174.43932.92

Roman, B., Serra-Majem, L., Ribas-Barba, L., Pérez-Rodrigo, C., & Aranceta, J. (2008). How many children and adolescents in Spain comply with the recommendations on physical activity? *The Journal of Sports Medicine and Physical Fitness*, *48*(3), 380–387.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise*, *32*(5), 963–975. Retrieved from https://doi.org/10.1097/00005768-200005000-00014

Swanton, K., & Davies, A. M. (2008). *Healthy weight, healthy lives: A toolkit for developing local strategies*. London: National Heart Foundation in Association with the Faculty of Public Health and Department of Health. Retrieved from http://www.fph.org.uk/uploads/full_obesity_toolkit-1.pdf

Taylor, I. M., Ntoumanis, N., Standage, M., & Spray, C. M. (2010). Motivational predictors of physical education students' effort, exercise intentions, and leisure-time physical activity: A multilevel linear growth analysis. *Journal of Sport & Exercise Psychology*, *32*(1), 99–120. Retrieved from https://doi.org/10.1123/jsep.32.1.99

Telama, R. (2009). Tracking of physical activity from childhood to adulthood: A review. *Obesity Facts*, *2*(3), 187–195. Retrieved from https://doi.org/10.1159/000222244

Telama, R., Yang, X., Leskinen, E., Kankaanpää, A., Hirvensalo, M., Tammelin, T., ... Raitakari, O. T. (2014). Tracking of physical activity from early childhood through youth into adulthood. *Medicine and Science in Sports and Exercise*, *46*(5), 955–962. Retrieved from https://doi.org/10.1249/MSS.0000000000000181

Telford, R. M., Telford, R. D., Olive, L. S., Cochrane, T., & Davey, R. (2016). Why are girls less physically active than boys? Findings from the LOOK longitudinal study. *PloS One*, *11*(3), e0150041.

Tomyn, A. J., & Cummins, R. A. (2011). Subjective wellbeing and homeostatically protected mood: Theory validation with adolescents. *Journal of Happiness Studies*, *12*(5), 897−914. Retrieved from https://doi.org/10.1007/s10902-010-9235-5

Troiano, R. P., Berrigan, D., Dodd, K. W., Mâsse, L. C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise*, *40*(1), 181–188. Retrieved from https://doi.org/10.1249/mss.0b013e31815a51b3

Trost, S. G., & Loprinzi, P. D. (2011). Parental influences on physical activity behavior in children and adolescents: A brief review. *American Journal of Lifestyle Medicine*, *5*(2), 171–181. Retrieved from https://doi.org/10.1177/1559827610387236

Trost, S. G., Sallis, J. F., Pate, R. R., Freedson, P. S., Taylor, W. C., & Dowda, M. (2003). Evaluating a model of parental influence on youth physical activity. *American Journal of Preventive Medicine*, *25*(4), 277–282.

U.S. Centers for Disease Control and Prevention. (2010). *Youth risk behavior surveillance—United States, 2009*. Atlanta, GA: Author.

van der Horst, K., Kremers, S., Ferreira, I., Singh, A., Oenema, A., & Brug, J. (2007). Perceived parenting style and practices and the consumption of sugar-sweetened beverages by adolescents. *Health Education Research*, *22*(2), 295–304. Retrieved from https://doi.org/10.1093/her/cyl080

Vilhjalmsson, R., & Kristjansdottir, G. (2003). Gender differences in physical activity in older children and adolescents: The central role of organized sport. *Social Science & Medicine*, *56*(2), 363–374. Retrieved from https://doi.org/10.1016/S0277-9536(02)00042-4

Walter, O., & Shenaar-Golan, V. (2017). Effect of the parent–adolescent relationship on adolescent boys' body image and subjective well-being. *American Journal of Men's Health*, *11*(4), 920–929. Retrieved from https://doi.org/10.1177/1557988317696428

Wang, F., Orpana, H. M., Morrison, H., de Groh, M., Dai, S., & Luo, W. (2012). Long-term association between leisure-time physical activity and changes in happiness: Analysis of the prospective national population health survey. *American Journal of Epidemiology*, *176*(12), 1095–1100. Retrieved from https://doi.org/10.1093/aje/kws199

Ware, J. E. (1995). The status of health assessment 1994. *Annual Review of Public Health*, *16*(1), 327–354. Retrieved from https://doi.org/10.1146/annurev.pu.16.050195.001551

Whitt-Glover, M. C., Taylor, W. C., Floyd, M. F., Yore, M. M., Yancey, A. K., & Matthews, C. E. (2009). Disparities in physical activity and sedentary behaviors among US children and adolescents: Prevalence, correlates, and intervention implications. *Journal of Public Health Policy*, *30*(Supp1 1), S309–S334. Retrieved from https://doi.org/10.1057/jphp.2008.46

World Health Organization. (2010). *Global recommendations on physical activity for health*. Geneva: Author.

Youngstedt, S. D. (2005). Effects of exercise on sleep. *Clinics in Sports Medicine*, *24*(2), 355–365. Retrieved from https://doi.org/10.1016/j.csm.2004.12.003

Zecevic, C. A., Tremblay, L., Lovsin, T., & Michel, L. (2010). Parental influence on young children's physical activity. *International Journal of Pediatrics*, *2010*, 1–9. Retrieved from https://doi.org/10.1155/2010/468526