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PHYSICAL FITNESS

The Relationship of Sport Involvement and Gender to Physical Fitness, Self-Efficacy, and Self-Concept in Middle School Students

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Abstract

Sport involvement may offer physical and psychological benefits to early adolescents beyond those accrued through physical activity (PA). Those benefits, though, may be moderated by gender. The purpose of this study was to examine these potential benefits in a middle school population. The sample consisted of 629 sixth graders enrolled in a physical education (PE) course. Students completed self-report measures on sport involvement, PA self-efficacy, and physical self-concept. During PE, students completed FitnessGram testing, which provided measurements of cardiorespiratory fitness (CRF), muscular strength and flexibility, and body composition. MANCOVA analyses were used to examine the interaction between sport involvement and gender in relation to the psychological and physical outcomes. Multivariate analyses demonstrated no Sport × Gender interactions for any outcome; sport involvement, however, was related significantly to improvements in CRF, muscular strength, PA self-efficacy, and physical self-concept (aerobic endurance and muscular strength). The findings suggest that

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sport involvement, above what may be attained through standardized, school-based PE experiences, uniquely provides physical and psychological benefits for early adolescents.

For many children and adolescents, physical activity (PA) often occurs during their school physical education (PE) classes (Jago et al., 2009; Sallis et al., 2012). Despite that many U.S. students aged 6 to 14 years are required to participate in PE, fewer than half meet current guidelines of at least 60 min of moderate to vigorous PA (MVPA) daily (Fakhouri et al., 2014; Troiano et al., 2008). Further, a recent meta-analysis reported that students are spending just 43% of their PE class time in MVPA (Lonsdale et al., 2013). Thus, to achieve recommended daily PA levels and accrue associated health and fitness benefits, students must be active through other venues, such as sport participation. The extent to which sport participation provides to students health and fitness benefits that are independent of those resulting from involvement in mandatory PE experiences, however, remains unclear (Barr-Anderson et al., 2007; Renfrow, Caputo, Otto, Farley, & Eveland-Sayers, 2011).

The importance of PA in children's and adolescents' health and well-being is clear, often leading to improvements in cardiorespiratory fitness (CRF), body composition, and muscular strength (Aires et al., 2010; Faigenbaum et al., 2002; Nader, Bradley, Houts, McRitchie, & O'Brien, 2008), and to increases in PA self-efficacy and physical self-concept (Dunton, Schneider, Graham, & Cooper, 2006; Strauss, Rodzilsky, Burack, & Colin, 2001). Self-concept, in particular, also has been associated with beneficial outcomes, including improved fitness and overall self-esteem (Dunton et al., 2006; Greenleaf, Petrie, & Martin, 2014). Both PA self-efficacy and physical self-concept appear to have a bidirectional relationship with PA (McAuley & Blissmer, 2000; Weiss, 2000), which may help children maintain, and even increase, their PA levels. Further, many health risk factors originate in childhood and adolescence, and improved fitness during this time is associated with continued PA, development of protective factors against the risk of health concerns (e.g., improved metabolic profile to protect against cardiovascular disease), and improved physical health in adulthood (Landry & Driscoll, 2012; Ortega, Ruiz, Castillo, & Sjostrom, 2008).

Sport is another modality through which children can be physically active and may accrue physical and psychological health benefits. Sport participation has been found to result in up to an additional 20 min of MVPA each day and a fifteenfold increase in the odds of children reaching recommended daily activity levels (Hebert, Moller, Andersen, & Wedderkopp, 2015), as well as students being able to meet an increasing number of physical fitness health standards (Renfrow et al., 2011). Relatedly, middle school students' participation in any sport (compared to no sports) was associated with a reduction in BMI and a significant decrease in the likelihood of being classified as overweight or obese (Romani, 2011). These studies do not address the extent to which such improvements in fitness extend beyond what is accrued through involvement in PE classes. Further, children and adolescents who participate in sport are more likely to be involved in PA as adults (Perkins, Jacobs, Barber, & Eccles, 2004), yet there is a minimal relationship between childhood total PA or leisure activity and adult fitness activities (Cleland, Dwyer, & Venn, 2012). Thus, youth sport participation may be the primary factor determining engagement in future PA and predicting health benefits in adulthood.

Sport participation also appears to have positive effects on PA self-efficacy and physical self-concept (Barr-Anderson et al., 2007; Klomsten, Skaalvik, & Espnes, 2004). Researchers have found that structured forms of PA (e.g., sport and PE) are related to higher scores on PA self-efficacy and several domains of physical self-concept (Barr-Anderson et al., 2007; Dishman et al., 2006; Klomsten et al., 2004); these studies, however, often have not examined the effects of sport involvement separate from other forms of PA or how increased sport involvement may provide additional benefits. Thus, more research is needed to delineate the relationship between sport and self-perception variables independent of school-based PE requirements.

In a study of sport participation and the associated fitness outcomes, potential gender effects should be considered. Although current recommendations are that boys and girls engage in similar levels of PA (U.S. Department of Health and Human Services, 2008), girls participate in less daily PA than boys (Belcher et al., 2010; Nader et al., 2008). Further, boys are more likely than girls to reach recommended PA levels and meet an increased number of health standards when they engage in sport (Marques, Ekelund, & Sardinha, 2016; Renfrow et al., 2011). Gender differences also have been found with self-concept, and such differences typically follow gender stereotypes (Klomsten et al., 2004; Marsh, 1989). For example, boys scored significantly higher on all concept dimensions related to physical ability with the exception of flexibility, which is typically characterized as feminine (Klomsten et al., 2004; Marsh, 1989). In terms of PA self-efficacy, boys tend to score significantly higher than girls, which may explain higher overall PA levels; however, PA self-efficacy is a stronger correlate of PA in girls (Trost et al., 1996; Spence et al., 2010). Thus, PA self-efficacy may be particularly important for girls, though no studies have examined the interaction of gender and sport involvement in relation to these outcomes.

Expanding from previous research (e.g., Klomsten et al., 2004; Renfrow et al., 2011), we examined the interaction of sport participation and gender in relation to objective measures of physical fitness (CRF, muscular strength, flexibility, and body composition), and self-reported PA self-efficacy and physical self-concept (strength, aerobic endurance, flexibility). We controlled for the students' level of school-based PA by including only students who were enrolled in standardized PE classes. We hypothesized that (a) more involvement in organized sport would be related to better fitness levels, higher PA self-efficacy, and stronger physical self-concept and (b) boys would score better on all fitness measures except flexibility and higher on all dimensions of physical self-concept (except flexibility) and PA self-efficacy. Our tests of interaction effects were exploratory; thus, no specific hypotheses were made regarding the extent to which gender might moderate the aforementioned relationships between sport participation and our outcomes.

Method

Participants

Male (n = 261) and female (n = 368) sixth graders from a school district located in a large suburban area in the South Central United States participated. The school district provided data on participants' gender, age, race/ethnicity, and meal status. Mean age was 11.39 years (SD = .51). The majority were White/non-Hispanic (58.5%,

n = 368), followed by Hispanic/Latino (21.8%, n = 137), Black (8.7%, n = 55), Asian American (3.8%, n = 24), American Indian/Alaska Native (0.8%, n = 5), and biracial (0.8%, n = 5); 5.6% (n = 35) were not classified. One hundred seventy (27.0%) received either free or reduced-price lunch through the school district. Regarding participation on organized sport teams, students answered the question, "During the last year (12 months), on how many different sports or sport teams did you play (Include any teams run by your community or private clubs/academies);" 27.0% (n = 170) played on 0, 44.5% (n = 280) on 1 or 2, and 28.5% (n = 179) on 3 or more. Within this school district, sixth-grade students were required to participate in PE classes that had a standardized curriculum; they were not, however, allowed to play any in-school sports. Thus, all students were exposed to the same school-based PA through their PE classes; sport participation occurred outside of school.

Instruments

Cardiorespiratory fitness. CRF was measured by the Progressive Aerobic Cardiovascular Endurance Run (PACER; Plowman & Meredith, 2013), which is part of the FitnessGram protocol. The PACER involves completion of a 20-m shuttle run within specified time intervals that become progressively shorter each minute, requiring participants to increase their pace to complete each lap within the allotted time span. The total score is the number of 20-m laps completed in compliance with FitnessGram testing guidelines. Intraclass reliability coefficients have ranged from .64 to .93, and concurrent validity was established through correlations with VO_2 max (Plowman & Meredith, 2013).

Physical strength. Physical strength was represented by three tests from the FitnessGram protocol: curl-ups (abdominal strength and endurance), push-ups (strength and endurance of the upper arms and shoulder girdle), and trunk lift (trunk extensor strength and flexibility). Total scores for the curl-up and push-up tests were represented by the total number completed based on FitnessGram testing guidelines. For the trunk lift test, the total score was the highest of the three measurements, which could not exceed 12 in. The reliabilities and validities of these tests are well-established (Meredith & Welk, 2013; Plowman & Meredith, 2013).

Flexibility. Hamstring flexibility in each leg was assessed via the FitnessGram back-saver sit and reach (Meredith & Welk, 2013). Total score for each leg can range from 0 to 12 in. Interrater reliabilities have ranged from .93 to .99 across a broad range of ages (6 to 41 years). Criterion tests of hamstring flexibility utilizing flexometer, goniometer, and inclinometer measurements in comparison with the sit and reach and other flexibility measurements show moderate to high correlations, ranging from .39 to .89 (Plowman & Meredith, 2013).

Body composition. Body mass index (BMI) percentile was used to represent body composition, which is an acceptable approach in large-scale field testing (Plowman & Meredith, 2013). Height was recorded to the nearest half inch and weight was obtained using a Seca digital scale and recorded to the nearest 0.1 lb. BMI was calculated via the FitnessGram computer program (Meredith & Welk, 2013) and then converted to a percentile based on sex and age (Centers for Disease Control and Prevention, 2015). Laurson, Eisenmann, and Welk (2011) found that approximately 90% of children aged 5 to 18 years were correctly classified into their percentage body fat group via BMI.

Physical activity self-efficacy. The eight-item Physical Activity Self-Efficacy Scale (PASES; Motl et al., 2000) measures the extent to which children believe they are able to be physically active across a range of situations. On items such as "on most days, I can be physically active even if it is very hot or cold outside," students responded from 1 (*disagree a lot*) to 5 (*agree a lot*). Total score is the mean and can range from 1 (*low efficacy*) to 5 (*high efficacy*). In a sample of fourth and fifth graders, Bartholomew, Loukas, Jowers, and Allua (2006) reported Cronbach's alphas that ranged from .74 to .88; the alpha for our study was .85. Through confirmatory factor analyses, the PASES has demonstrated factorial validity and factorial invariance (Motl et al., 2000).

Physical self-concept. We used three items from the Physical Self-Description Questionnaire (PSDQ; Marsh, Richards, Johnson, Roche, & Tremayne, 1994) to measure students' beliefs about their strength ("I am a physically strong person"), flexibility ("My body is flexible"), and aerobic endurance ("I can run a long way without stopping"). Each item was rated on a 6-point scale from 1 (*false*) to

6 (*true*). Among high school students, Marsh (1996) reported internal consistency reliabilities of above .90 for the scales that included these items. Specific to the items chosen for our study, all had factor loadings that exceeded .79 on their original scales (Marsh et al., 1994). We selected these three items because of their high factor loadings, their face validity, their significant relationships with the physical fitness outcomes assessed in this study (Greenleaf et al., 2014), and the need to work within class time limits.

Pubertal development. The five-item Pubertal Development Scale (PDS; Peterson, Crockett, Richards, & Boxer, 1988) measures physical development in children and adolescents. For each question, such as "Would you say your growth in height . . .," participants responded by indicating the extent to which this change was complete, ranging from 1 (*not yet started*) to 4 (*seems complete*). Although total scores for each gender are based on five items, boys and girls share only three (i.e., changes in body hair, skin, and growth spurt); each have two that are unique (boys—voice, facial hair; girls—breasts, menarche). Total scores are the mean of each gender's items and can range from 1 (*no development*) to 4 (*development already past*). Cronbach's alphas have ranged from .68 to .83 for adolescents (Peterson et al., 1988); alphas from this study were .75 (boys) and .73 (girls). Bond et al. (2006) recommended that the PDS be used in research studies with adolescents because it provides the most valid measure.

Procedure

We obtained approval for the study through the university's institutional review board, school district administrators, and the middle school principals. Students were provided parental consent and child assent forms through their PE classes; only students who returned the completed consents (and assents) participated. As part of state-mandated fitness testing, we administered the FitnessGram tests during regularly scheduled PE classes. Students also completed questionnaires during the FitnessGram testing period; questionnaires were coded with the students' district identification number so data could be matched from different sources. At each school, participants were entered into a random drawing to win $10.00 cash prizes.

Data Analysis

First, we examined all PDS, PASES, and physical self-concept items; values were missing completely at random and ranged from 0.70% to 6.00% (M = 2.04%). We used expectation maximization to impute values. We then examined the distribution of each measure; skewness and kurtosis were within acceptable limits and no significant outliers existed. To examine the primary research question, which was the relationship of sport participation (i.e., none, 1–2, or 3+) and gender (boys vs. girls) to cardiorespiratory and physical fitness, body composition, physical self-concept, and PA self-efficacy, we used a series of multivariate analyses of covariance (MANCOVA). The dependent variables were grouped into physical fitness measures (i.e., BMI, PACER, curl-up, push-up, trunk lift, and sit and reach) and self-perception measures (i.e., PASES and the aerobic endurance, flexibility, and strength scores from the PSDQ). PDS was used as a covariate in the analyses to control for any effects pubertal development might have had on the outcomes in the study (Greenleaf et al., 2014).

Results

Physical Fitness Measures

The Gender × Sport Involvement interaction was not significant, Pillai's trace = .023, $F(14, 1234) = 1.033$, $p = .417$, partial $\eta^2 = .012$. However, both sport involvement, Pillai's trace = .094, $F(14, 1234) = 4.335$, $p < .0001$, partial $\eta^2 = .047$, and gender, Pillai's trace = .264, $F(7, 616) = 31.581$, $p < .0001$, partial $\eta^2 = .264$, as well as the covariate PDS, Pillai's trace = .061, $F(7, 616) = 5.693$, $p < .0001$, partial $\eta^2 = .061$, were significant.

Sport involvement. Students, regardless of gender, who participated in sports at any frequency (i.e., 1–2 or 3+ sports) scored significantly higher than those who did not on the number of push-ups completed (1–2 sports: Cohen's d =.19; 3+ sports: Cohen's d =.34) and on their trunk lift (1–2 sports: Cohen's d = .30; 3+ sports: Cohen's d = .35). Additionally, students who participated in 3+ sports scored significantly higher on the number of curl-ups completed (Cohen's d = .38) and had significantly higher BMI levels (Cohen's d = .25) than the sixth graders who did not participate in any sports; students who participated in 1–2 sports were not significantly different from either group on these two outcomes. For the PACER, the students who participated in 3+ sports ran more laps than those who took part in 1–2 sports (Cohen's $d = .24$) and those who were not involved in sport (Cohen's $d = .64$); students in 1–2 sports scored significantly higher than those in no sports (Cohen's $d = .39$). There were no significant differences across the three sport groups for hamstring flexibility on either leg. See Table 1.

Table 1

Adjusted Means, Standard Error, and F Values for Outcome Variables by Sport Level

	0 sport teams (*n* = 170)		**1–2 sport teams (*n* = 282)**		**3+ sport teams (*n* = 179)**		
Test	***M***	***SD***	***M***	***SD***	***M***	***SD***	***F***
PACER	25.65_{a}	1.14	30.95_{b}	.91	34.34_{c}	1.10	15.24***
Curl-Up	40.71_{a}	1.72	$44.92_{a,b}$	1.37	48.09_{b}	1.65	4.80**
Push-Up	14.79_{a}	.69	16.71_{b}	.55	17.27_{b}	.67	3.69*
Trunk Lift	8.86_{a}	.15	9.41_{b}	.12	9.65_{b}	.15	7.18***
Back Saver S & R - Left	9.95	.14	10.28	.11	10.17	.13	1.72
Back Saver S & R - Right	10.00	.15	10.30	.12	10.24	.14	1.32
BMI Percentile	55.83_{a}	2.34	$60.53_{a,b}$	1.87	64.84_{b}	2.25	3.85*
PA Self-Efficacy	3.17_{a}	.06	3.46_{b}	.05	3.74_{c}	.06	20.45***
Strength Self-Concept	4.26_{a}	.10	4.81_{b}	.08	5.00_{b}	.09	16.15***
Flexibility Self-Concept	4.19	.11	4.22	.09	4.19	.11	.03
Aerobic Endurance Self-Concept	3.63_{a}	.11	4.05_{b}	.09	4.31_{b}	.11	9.34***

Note. Means that do not share common subscripts are significantly different at $p < .05$. PACER (Progressive Aerobic Cardiovascular Endurance Run; 0, *low,* to 85, *high*); Curl-Up (0, *low,* to 75, *high*); Push-Up (0, *low*, to unlimited high score); Trunk Lift (0 in., *low,* to 12 in., *high*); Right and Left Back-Saver Sit and Reach (0 in., *low*, to 12 in., *high*); BMI (kg/m2); PA Self-Efficacy (Physical Activity Self-Efficacy Scale; 1, *low efficacy*, to 5, *high efficacy*); Strength, Flexibility, and Aerobic Endurance Self-Concept (Physical Self-Description Questionnaire; 1, *low self-concept,* to 6, *high self-concept*).

$^{*}p < .05$. $^{**}p < .01$. $^{***}p \leq .001$.

Gender. Girls were significantly more flexible in terms of their hamstrings (left: Cohen's d = .93; right: Cohen's d = .86) and performed better on the trunk lift (Cohen's d = .46) than the boys. Boys, on the other hand, did more PACER laps (Cohen's d = .38), push-ups (Cohen's d = .51), and curl-ups (Cohen's d = .32) than the girls. There were no significant differences on BMI. See Table 2.

Table 2

Adjusted Means, Standard Error, and F Values for Outcome Variables by Gender

	Male (n = 261)		Female (n = 370)		
Test	M	SD	M	SD	F
PACER	32.90_a	.94	27.75_b	.81	16.68***
Curl-Up	47.81_a	1.41	41.32_b	1.22	11.79***
Push-Up	18.42_a	.57	14.09_b	.49	32.31***
Trunk Lift	8.83_a	.13	9.78_b	.11	31.81***
Back Saver S & R - Left	9.25_a	.12	11.01_b	.10	131.57***
Back Saver S & R - Right	9.33_a	.12	11.04_b	.11	108.46***
BMI Percentile	61.05	1.92	59.75	1.66	.25
PA Self-Efficacy	3.40	.05	3.51	.05	2.23
Strength Self-Concept	4.68	.08	4.69	.07	.005
Flexibility Self-Concept	4.04_a	.09	4.37_b	.08	7.12**
Aerobic Endurance Self-Concept	4.15_a	.09	3.84_b	.08	6.23*

Note. Means that do not share a common subscript are significantly different at $p < .05$. PACER (Progressive Aerobic Cardiovascular Endurance Run; 0, *low,* to 85, *high*); Curl-Up (0, *low,* to 75, *high*); Push-Up (0, *low*, to unlimited high score); Trunk Lift (0 in., *low,* to 12 in., *high*); Right and Left Back-Saver Sit and Reach (0 in., *low*, to 12 in., *high*); BMI (kg/m2); PA Self-Efficacy (Physical Activity Self-Efficacy Scale; 1, *low efficacy*, to 5, *high efficacy*); Strength, Flexibility, and Aerobic Endurance Self-Concept (Physical Self-Description Questionnaire; 1, *low self-concept,* to 6, *high self-concept*).

*$p < .05$. **$p < .01$. ***$p \leq .001$.

Self-Perception Measures

Neither the PDS covariate, Wilks' Lambda = .991, $F(4, 619) = 1.479$, $p = .207$, partial $\eta^2 = .009$, nor the Gender × Sport Involvement interaction, Wilks' Lambda = .986, $F(8, 1238) = 1.110$, $p = .353$, partial $\eta^2 = .007$, were significant. The main effects for sport involvement, Wilks' Lambda = .899, $F(8, 1238) = 8.503$, $p < .0001$, partial $\eta^2 = .052$, and gender, Wilks' Lambda = .960, $F(4, 619) = 6.490$, $p < .0001$, partial $\eta^2 = .040$, were significant.

Sport involvement. Students, regardless of gender, who participated in sport at any frequency (i.e., 1–2 or 3+ sports) scored significantly higher than those who did not participate on strength (1–2 sports: Cohen's $d = .39$; 3+ sports: Cohen's $d = .55$) and aerobic endurance (1–2 sports: Cohen's $d = .29$; 3+ sports: Cohen's $d = .47$) self-concepts; there were no differences on their flexibility self-ratings. PA self-efficacy was highest among students who participated in 3+ sports compared to 1–2 sports (Cohen's $d = .35$) or no sports (Cohen's $d = .67$); students who played 1–2 sports (Cohen's $d = .33$) scored significantly higher than the no sport participants. See Table 1.

Gender. Girls scored significantly higher on their flexibility (Cohen's $d = .19$) and boys significantly higher on their aerobic endurance (Cohen's $d = .22$) self-concept. There were no significant differences for strength self-concept and PA self-efficacy. See Table 2.

Discussion

Our findings, which are consistent with findings in previous research (e.g., Barr-Anderson et al., 2007; Hebert et al., 2015; U.S. Department of Health and Human Services, 2008; Marsh, Gerlach, Trautwein, Lüdtke, & Brettschneider, 2007; Marques et al., 2016; Renfrow et al., 2011), indicate that being more involved in sport is associated with higher levels of fitness (i.e., cardiorespiratory, strength, and endurance) and of PA self-efficacy and aerobic endurance and strength self-concepts. These findings existed even after controlling for school-based PA opportunities and pubertal development. Playing sports appears to provide students with additional opportunities to engage in PA and, as a result, improve their physical fitness across multiple domains. Sport participation also may contribute to increases in PA self-efficacy beliefs when children and adolescents learn that sport affords them some control over their ability to be physically active. Further, as the students improved their fitness levels, they likely experienced development in their self-concept across parallel domains (Marsh et al., 2007). Thus, it follows that because no significant differences were found in the students' flexibility levels, this self-concept would not be significantly different based on sport involvement either.

Although BMI is an appropriate and acceptable proxy for body composition, particularly in large, field-based studies (Centers for Disease Control and Prevention, n.d.), it does not differentiate well between fat and fat-free mass. Though our findings were inconsistent with previous research that has shown sport involvement to be associated with a reduction in BMI (Romani, 2011), this lack of differentiation may explain why the sixth graders who participated in 3+ sports had the highest BMI percentile. Given these students were stronger and had higher levels of CRF than those engaged in fewer sports, their larger BMI level may have represented the presence of more fat-free mass (muscle) as opposed to body fat. Future research could use more sensitive measures of body composition (e.g., skinfold measurements; Meredith & Welk, 2013) to examine this possibility more directly.

Consistent with past research (Marques et al., 2016; Renfrow et al., 2011), the girls had lower levels of CRF and muscular strength than the boys but demonstrated better flexibility; the boys' and girls' physical self-concept closely mirrored their physical fitness. One possible explanation is that, even if not consciously aware of the influences of gender socialization (Plaza, Boiche, Brunel, & Ruchaud, 2017), the boys and girls in our study may have chosen to engage in gender-stereotypical physical activities (e.g., strength-based sports such as football for boys) outside of school. If so, they likely would have been more advanced in comparable areas of physical fitness, such as muscular strength for boys and flexibility for girls, which is what we found in our study. No significant differences emerged for strength self-concept despite boys performing better on physical strength tests. Strength self-concept, however, may trail gender differences in actual tests of muscular strength and be more strongly related to pubertal development and increases in muscularity (Klomsten et al., 2004). In our study, the boys rated their pubertal development as just beginning, indicating that they had not experienced large increases in muscle mass yet, which thus potentially tempered their perceptions of themselves as strong.

There were no gender differences on PA self-efficacy and given boys and girls had similar rates of PA and sport involvement, this finding is not surprising. In our study, 73% of the boys and 73% of the girls engaged in sport, which provided relatively equal, and additional, opportunities to be physically active. This equal level of participation may partially explain why gender did not moderate the relationship between sport participation and any of the outcomes in our study despite evidence that girls have tended to engage in less daily PA than boys (Belcher et al., 2010; Nader et al., 2008). It is heartening that equal percentages of girls and boys participated in sport, given that sport experiences afford opportunities for increased PA, which may lead to increases in physical fitness and improvements in future physical and psychological health (e.g., Aires et al., 2010; Faigenbaum et al., 2002; Hebert et al., 2015; Nader et al., 2008; Dunton et al., 2006; Strauss et al., 2001).

There are limitations that deserve discussion. First, although this approach has been taken in past research (e.g., Barr-Anderson et al., 2007; Dunton et al., 2006; Klomsten et al., 2004; Renfrow et al., 2011; Strauss et al., 2001), we only used self-report measures to determine students' sport involvement and self-perceptions, which may introduce social desirability bias. However, the significant associations with the objective measures of physical fitness (e.g., higher levels of CRF were associated with stronger aerobic endurance self-concept) suggest that the self-perception questions were valid. Second, the study was cross-sectional and thus determinations of the temporal relationships among the variables cannot be made. For example, it is possible that because of their higher levels of CRF and strength, fit students choose to participate in more sports, which in turn, can lead to even more improvements in fitness levels. Longitudinal studies are needed to determine if sport participation, over time, does indeed lead to expected improvements in fitness and self-perceptions. Finally, we did not assess for each student's level of PA, but rather controlled for PA by only including students enrolled in standardized school-based PE. Given our large-scale field testing, such individualized measurement of students' PA levels was not feasible. However, our findings now provide support for future studies where researchers take a more controlled approach to assessing individual levels of PA and sport involvement in smaller samples of students. Such an approach would allow researchers to determine the extent to which sport predicts higher levels of PA and the subsequent development of physical fitness.

Overall, our findings suggest that sport participation during early adolescence may play an important role in the development of physical fitness and positive physical self-perceptions, even beyond the benefits accrued through required, school-based PE classes. Sport provides a unique avenue through which early adolescents can develop their physical fitness during a time when many are not otherwise meeting recommended PA guidelines (Fakhouri et al., 2014; Troiano et al., 2008). Future research utilizing longitudinal data could provide more specific information about how sport contributes to early adolescents' overall health and fitness.

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