Assessing Levels of Physical Fitness in Elementary School Students

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Abstract: *This study aimed to examine the extent to which fourth-grade students achieved a healthy fitness zone in relation to the NASPE standard 4, as a result of participating in a three-year Carol White Physical Education Program (PEP) project intervention. Participants in this study were nine physical education teachers and their students in grade 4 who were enrolled in nine different elementary schools within the same school district. The students' cardiovascular endurance, muscular strength and endurance were assessed with four FITNESSGRAM test items during regular physical education classes in the PEP year 2 and PEP year 3. Descriptive statistics results indicated that the percentages of the students' reaching the Healthy Fitness Zone (HFZ) on each test in PEP year 2 and year 3 ranged from high to very high (68.1% to 89.2%). The results of the t-tests indicated that the boys had statistically significant higher mean scores than the girls on PACER and push-up tests. In contrast, the girls' mean scores were statistically significant higher than the boy's on the trunk lift test. No significant differences were found on the curl-up test between boys and girls in the two years. It was concluded that at least two-thirds of the students met HFZ for the four fitness tests in PEP year 2 and year 3.*
Key words*: Physical Fitness, Healthy fitness zone, Content standards, FITNESSGRAM test, Quality PE*

1. Introduction

To effectively combat the alarming prevalence of obesity in children and adolescents, key health organizations unanimously recommend one critical strategy is to engage children and adolescents in regular physical activity (e.g. Centers for Disease Control and Prevention [CDC], 2010; Institute of Medicine of National Academy [IMNA], 2012; National Association for Sport and Physical Education [NASPE], 2010; U.S. Department of Health and Human Services [USDHHS], 2010). USDHHS (2008) noted that regular physical activity is directly associated with health-enhancing physical fitness among children and adolescents.

Stodden et al. (18) proposed a critical mediating role of health-related physical fitness played in a dynamic relationship between motor skill competency and physical activity. As an enabling factor, health-related physical fitness provides physical foundations necessary for enjoyable and successful physical activity engagement in children and adolescents. Also, there is empirical evidence for a positive relationship between physical fitness and physical activity in children (Gutin, Yin, Humphries, & Barbeau, 2005; Ruiz, Rizzo, Hurtig-Wennlöf, Ortega, Wärnberg, & Sjöström, 2006). Children with higher physical fitness levels were more likely to participate in physical activity (Barnett, Beurden, Morgan, Brooks, & Beard, 2008; Castelli & Valley, 2007; Erwin & Castelli, 2008). For elementary school students, physical fitness performance was an only significant contributor to for elementary school students to participate in physical activity, but not other factors (Erwin & Castelli, 2008).

Physically active children and adolescents have healthy hearts and lungs, strong muscles and bones, and appropriate body fat and lean mass ratios (NASPE, 2010). A healthy level of cardiorespiratory endurance is positively related to a healthier cardiovascular profile in children and adolescents, but it is negatively related to obesity, cardiovascular disease factors, and clustering of metabolic risk factors. Improvement muscular strength/endurance, and flexibility have a positive effect on skeletal health (Ortega, Ruiz, Castillo, & Sjöström, 2008). Healthy physical fitness in children and adolescents tend to track healthy fitness in adulthood (USDHHS, 2008).

Regular physical activity and health-related physical fitness are key indicators of health outcomes (Gutin et al., 2005; NASPE, 2010; Ortega et al., 2008). Maintaining and improving health-enhanced physical fitness is one desired learning outcome described in the NASPE (2014) national physical education content standards. To promote a healthy physical fitness level, USDHHS's Physical Activity Guidelines for Americans (2008) recommend children and adolescents should engage in 60 minutes or more of physical activity daily. As a part of their 60 or more minutes of daily physical activity, children and adolescents should include (a) aerobic endurance-enhancing vigorous-intensity physical activity at least 3 days a week; (b) muscle-strengthening physical activity at least 3 days of the week; (c) bone-strengthening physical activity at least 3 days of the week.

Given the fact that students spend approximately 6 hours each day in schools for up to 13 critical years of growth (US Department of Education, Institute of Education Science, 2011), schools play a vital role in promoting health-related physical fitness by providing adequate opportunities for students to learn and practice fitness-related physical activities (National Association for Sport and Physical Education [NASPE], 2010). In lieu of supporting the USDHHS's guidelines

(2008), NASPE (2004) recommends 150-minutes of physical education for grades K-5 per week. NASPE (2004) and CDC (2011) advocate that daily quality physical education and comprehensive school-based physical activity programs are crucial vehicles for promoting physical fitness for each student during a school day.

Quality physical education is essential to promoting health-related physical fitness. To help students achieve the NASPE content standard 4 that states: achieves and maintains a health-enhancing level of physical fitness (NASPE, 2004), a quality physical education program incorporates fitness activities into a regular physical education class and provides a variety of physical activities that are fitness-enhancing and developmentally appropriate for students. Quality physical education provides students with appropriate instructional practices, so that students have adequate opportunities to engage in moderate to vigorous activities for enhancing their physical fitness levels in a regular physical education lesson (NASPE, 2004; Rovegno & Bandhauer, 2013).

Given the essential role of physical fitness in establishing a physically active lifestyle throughout childhood, adolescence, and into adulthood, CDC (2011) recommends schools should conduct fitness testing to determine how well students achieve the NASPE physical education standard 4 that focuses on maintaining a healthy fitness level. Conducting fitness testing allows teachers to monitor and reinforce students' engagement in fitness-enhancing physical activities. Since research on examining elementary school students' health-related fitness levels is very sparse, we merely found two cross-sectional studies. Erwin and Castelli (2008) examined elementary school students' achievement of the NASPE content standard 4. In their study, 178 students in grades 4-5 completed five FitnessGram test items. They found that 40% of the participants reached the Healthy Fitness Zone for all five tests including PACER, curl-ups, push-ups, sit/reach, and BMI. In another study by Castelli and Valley (2007), they examined 230 children's levels of physical fitness in relation to achievement of the NASPE standard 4 in a summer program using five FitnessGram tests. They reported that 34% achieved the Healthy Fitness Zone for only four tests and a majority of students fell short of meeting the Healthy Fitness Zone for the five tests.

To date, research examining how a quality physical education helps students achieve a healthy level of physical fitness is scarce. Therefore, the purpose of this study was to examine the extent to which fourth-grade students achieved a healthy fitness zone in relation to the NASPE standard 4 as a result of participating in a three-year Carol White Physical Education Program (PEP) grant project intervention. Specific objectives of this study were to investigate (a) levels of the 4th grade students' physical fitness during the PEP grant project year 2 and year 3; (b) differences of physical fitness levels between the year 2 cohort and the year 3 cohort; and (d) gender differences of physical fitness in PEP grant project year 2 and year 3. The significance of this study lies in providing longitudinal empirical evidence for how the PEP grant project can impact elementary school students' achieving desired learning outcomes in relation to the NASPE content standard 4.

2. Methods

2.1 Participants and research settings

Participants in this study were fourth-grade students who were enrolled in nine different elementary schools within the same school district in the United States during the second and third PEP project year. The PEP grant project was designed to help elementary school students become physically active, mentally healthy, and socially cooperative children through implementing the Coordinated Approach to Child Health (CATCH) physical education curriculum and Mileage Club Recess Program**.** The CATCH PE is a proven standards-based and age-appropriate curriculum. The CATCH PE 3-5 offers 500 learning activities on 20 modules which expand the range of skill themes and physical fitness activities. The Mileage Club Recess Program is a lunch hour program whereby students walk or run on a designated ¼ mile pathway. After five miles, students were awarded a "toe token" to place on their shoelaces to motivate students to engage in a structured physically active recess program. The recess coordinators monitor students' progress, distribute awards, and keep track of both students and classroom achievements.

The school district housed nine elementary schools and served 4,000+ students in K-5. The student population was pre-dominantly White (> 90%). K-2 students had a 30-minute physical education class and a 30-minute wellness class per week, while students in grades 3-5 had a 60-minute physical education class per week. The class size ranged from 18-28 students.

The university institutional review board and the school district granted the permission for conducting this study. The students who returned the informed consent form signed by their parent(s)/guardian(s) to their physical education teachers indicated their voluntary participation in this study.

2.2 Context of trainings

Nine elementary physical education teachers (5 females and 4 males) taught physical education to K-5 students at nine different elementary schools within the same school district. The physical education teachers' experience of teaching elementary physical education varied from 6 years to over 20 years. Each physical education teacher had a spacious gymnasium with a climbing wall. Each teacher was provided with CATCH PE curriculum packages and adequate equipment through PEP grant money allocated to the curriculum implementation.

To help the teachers implement the CATCH PE curriculum, prior to the PEP year 2 (data collection), we held three days of CATCH PE curriculum workshops during which all physical education teachers participated in all training activities. Again, prior to the PEP year 3, the physical education teachers participated in one full-day summer workshop to review and study the curriculums. The teachers were provided with a complete CATCH PE K-5 curriculum package and the needed equipment.

To help a recess coordinator effectively run the Mileage Club (MC) Recess Program, prior to each school year, we held a three-hour Mileage Club Orientation meeting with all recess coordinators and all physical education teachers. The PEP project coordinator presented the strategic plan for organizing and running the Mileage Club Recess Program for each school building. The physical education teacher worked with their schools' MC recess coordinator to run and promote Mileage Club Recess Program in each of the nine schools. We purchased and provided MC materials and related equipment for each school building using specified PEP grant money.

To help physical education teachers objectively conduct FitnessGram tests with their students, a half-day workshop was devoted to training how to administer the FitnessGram PACER test. Another half-day workshop was held to train the teachers how to administer the FitenssGram curl-ups, push-ups, trunk-lift, and shoulder stretch tests. During the two separate workshops, the teachers learned the testing directions, protocols, recording sheet, class organizations, and criteria for healthy and un-healthy fitness zone corresponding to a specific age and gender for each fitness test.

2.3 FitnessGram tests

To determine the extent to which the fourth-grade students achieved the NASPE content 4 (achieves and maintains a health-enhancing level of physical fitness), the FitnessGram test was used to measure levels of students' health-related physical fitness. The FitnessGram test, which is developed by the Cooper Institute, is a nationally recognized, valid, and reliable fitness assessment toolkit for assessing five components of health-related fitness, including cardiovascular endurance, muscular strength and endurance, flexibility, and body composition through a variety of test items (Meredith & Welk, 2007). It uses "criterion referenced" standards to compare the testing scores to the Healthy Fitness Zone (HFZ) based on specific age and gender guidelines to evaluate boys' and girls' physical fitness levels on each test and suggest areas for improvement.

During the first two weeks of May in PEP years 2 and 3, the fourth-grade students were administered to four fitness tests by trained physical education teachers during regular physical education classes. They were (a) 15-meter version of the Progressive Aerobic Cardiovascular Endurance Run (PACER) for cardiovascular endurance, (b) curl-up test for abdominal muscular strength and endurance, (c) push-up test for upper body strength and endurance, and (d) trunk lift for trunk extensor strength and flexibility.

The "FitnessGram Standards for Healthy Fitness Zone for Boys" (Meredith & Welk, 2007, p. 61) and the "FitnessGram Standards for Healthy Fitness Zone for Girls" (Meredith & Welk, 2007, p. 62) were used to determine whether a student's score on each test was placed into the Healthy Fitness Zone (HFZ). The HFZ is defined specifically for each test type, age, and gender (Meredith & Welk, 2007). The 8.4 version of the FitnessGram test software was used to record the testing results.

2.4 Data Analysis

Descriptive statistics were conducted to describe levels and proportions of 4^{th} grade students' physical fitness in PEP years 2 and 3. To examine if there was a significant difference of mean scores on each test between the PEP year 2 cohort and the PEP year 3 cohort, an independent *t*-test was conducted for all tests one at a time. Descriptive statistics were also conducted to describe the percentages of boys and girls that met the healthy fitness zone on each test based on age and gender guidelines. To examine if there was a significant difference of percentage for meeting the healthy zone between boys and girls, Fisher exact chi-square method was conducted for each test in PEP years 2 and 3. Further, to examine if there was a means score difference of each test between boys and girls, an independent t-test was performed for PEP years 2 and 3. The standardized-difference effect size (Cohen's *d*) (Trusty, Thompson, & Petrocelli, 2004) was

used to report the mean differences of the dependent variables between the PEE year 2 cohort and the PEP year 3 cohort, between boys and girls in PEP year 2, and between boys and girls in PEP year 3.

3. Results

3.1 PACER tests in PEP year 2 and year 3.

3.1.1 Percentages for meeting the healthy fitness zone. Based on the "FitnessGram Standards for Healthy Fitness Zone for Boys" (Meredith & Welk, 2007, p. 61)**,** 30 laps is the cut off number for a 10-year old boy who meets the HFZ for the PACER test, while for a 10-year old girl, the cut off number for the HFZ is only 9 laps (Meredith & Welk, 2007, p. 62). Figure 1 presents the PACER test results of the participating students in PEP years 2 and 3.

In PEP year 2, among 573 students who completed the PACER test, 406 students (70.8%) reached the HFZ. The year 2 cohort ran on average 29 laps (*SD* = 16.1). In PEP year 3, of 623 students who completed the PACER test, 424 students (68.1%) met the HFZ. The year 3 cohort ran on average 27 laps on (*SD*=15.6). No significant mean laps difference on the PACER tests between the two cohorts was found.

3.1.2 Gender differences. Figure 2 shows the fitness testing results of the boys and girls in year 2. As seen in Figure 2, 165 out of 325 boys ran 30 laps or more, indicating 50.7% of the boys' cardiovascular endurance was in the HFZ. In contrast, 241 out of 248 girls ran 9 laps or more, indicating 97.2% of the girls were in the HFZ. Chi-square test revealed a significant difference of percentages for meeting the HFZ between the boys and the girls ($X^2 = 146.702$, $df = 1$, $p < .01$). The results indicated that the number of girls who met the HFZ was significantly higher than that of the boys who met the HFZ based on the gender-specific guidelines. However, regardless of the age and gender guidelines for the healthy zone, the results of the *t*-test indicated that boys statistically outperformed girls on the PACER test in year 2 ($\text{Mean}_{\text{boys}} = 32$ vs. $\text{Mean}_{\text{girls}} = 25$, $t = 5.93$, $df = 570$, $p < .01$, Cohen's $d = .50$).

Figure 3 illustrates the fitness testing results of the boys and girls in year 3. As presented in Figure 3, 156 out of 348 boys ran 30 laps or more, indicating 44.8% of the boys' cardiovascular endurance was in the HFZ. In contrast, 268 out of 275 girls ran 9 laps or more, indicating 97.2% of the girls were in the HFZ. The results of the chi-square test yielded a significant difference of percentages for meeting the HFZ between the boys and the girls ($X^2 = 195.703$, $df = 1$, $p < .01$). However, when we merely focused on examining the mean laps difference of the PACER test between the boys and the girls, the results of the *t*-test yielded that boys ran significantly more laps than girls on the PACER test in year 3 ($\text{Mean}_{\text{boys}} = 29$ vs. $\text{Mean}_{\text{girls}} = 24$, $t = 4.175$, $df = 621$, $p < .01$, Cohen's $d = .34$).

3.2 Curl-up tests in PEP year 2 and year 3

3.2.1 Percentages for meeting the healthy fitness zone. Based on the Fitnessgram standards for healthy fitness zone for boys and girls (Meredith & Welk, 2007), 12 curl-ups represent the cut off number in the healthy fitness zone for both boys and girls at age of 10. In PEP year 2, of 573 fourth-graders who took the curl-ups test, 450 (78.5%) students reached the HFZ. The year 2 cohort performed on average 28 curl-ups (*SD*=20.62). In PEP year 3, among 623 students who participated in the curl-ups test, 479 (76.9%) students reached the HFZ. The year 3 cohort averaged 26 curl-ups (*SD*=19.6). No significant mean scores difference on the curl-up tests between the two cohorts was found.

3.2.2 Gender differences. As seen in Figure 2, in year 2, 245 out of 325 boys did 12 or more curl-ups, indicating 75.4% of the boys met the HFZ for abdominal muscular strength/endurance. On the contrary, 205 out of 248 girls performed 12 or more curl-ups, indicating 82.7% of the girls reached the HFZ. A chi-square test yielded a significant difference of percentages for meeting the HFZ between the boys and the girls ($X^2 = 4.418$, $df = 1$, $p < .05$). The results indicated that the percentage of the girls meeting the HFZ was statistically and significantly higher than the boys. However, the results of the *t*-test indicated no significant differences between the boys and the girls on this test in year 2 ($\text{Mean}_{\text{boys}} = 28$ vs. $\text{Mean}_{\text{girls}} = 28$, $t = 0.38$, $df = 546$, $p > .05$, Cohen's $d = .03$).

As seen in Figure 3, in year 3, 259 out of 325 boys performed 12 or more curl-ups, indicating 74.4% of the boys met the HFZ for abdominal muscular strength/endurance. 220 out of 275 girls performed 12 or more curl-ups, indicating 80% of the girls reached the HFZ. A chi-square test indicated no significant difference of percentages for meeting the healthy zone between the boys and the girls ($X^2 = 2.686$, $df = 1$, $p > .05$). The results indicated that the percentage for girls meeting the healthy fitness zone was not significantly different from the percentage for boys reaching the healthy fitness

zone. Similarly, the results of the *t*-test showed no significant differences between the boys and girls on this test in year 3 (Mean $_{boys}$ = 27 vs. Mean $_{girls}$ = 26, t = .873, df = 616, p > .05, Cohen's d = .07)

3.3 Push-up test results in PEP year 2 and year 3

3.3.1 Percentages for meeting the healthy fitness zone. Based on the Fitnessgram standards for healthy fitness zone, 7 push-ups is the cut off number for both boys and girls at age of 10 to reach the HFZ. In PEP year 2, among 573 students who took the push-ups test, 431 (75.2%) students met the HFZ. The year 2 cohort performed on average 13 push-ups (*SD* = 9.76). In PEP year 3, of 623 participants who took the push-up test, 457 (73.3%) students reached the HFZ. The year 3 cohort again completed on average 13 push-ups (*SD* = 8.67). The *t*-test revealed no significant mean scores difference on the push-up tests between the two cohorts.

3.3.2 Gender differences. As presented in Figure 2, in year 2, 255 out of 325 boys did 7 or more push-ups, indicating 78.5% of the boys met the HFZ for upper body muscular strength/endurance. 176 out of 248 girls did 7 or more push-ups, indicating 71% of the girls reached the HFZ. A chi-square test yielded a significant difference of percentages for meeting the HFZ between the boys and the girls (X^2 = 4.238, df = 1, p < .05). The results indicated that the percentage of the boys who met the HFZ was statistically and significantly higher than the girls. Likewise, an independent *t*-test indicated a significant difference of the mean scores on the push-up tests between the boys and the girls in year 2 (Mean $_{boys}$ = 13.6 vs. Mean $_{girls}$ = 11.9, t = 2.084, df = 554.97, p < .05, Cohen's d = .18).

As presented in Figure 3, 259 out of 348 boys did 7 or more push-ups, indicating 74.4% of the boys met the HFZ. 198 out of 275 girls did 7 or more push-ups, indicating 72% of the girls reached the HFZ. A chi-square test yielded no significant difference of percentages for meeting the HFZ between the boys and the girls (X^2 = .462, df = 1, p > .05). However, the *t*-test yielded a significant difference of the mean scores on the push-up tests between the boys and girls in year 3 (Mean $_{boys}$ = 13.31 vs. Mean $_{girls}$ = 11.60, t = 2.5, df = 619.73, p < .05, Cohen's d = .20).

3.4 Trunk Lift test results in PEP year 2 and year 3

3.4.1 Percentages for meeting the healthy fitness zone. Based on the Fitnessgram standards for healthy fitness zone, lifting the upper body 9 inches off the floor using the muscles of the back from the prone position is the HFZ for both boys and girls at the age of 10. In year PEP 2, among 573 students who took the trunk lift test, 498 (87%) met the HFZ. The year 2 cohort averaged 11 inches (*SD* =1.69). In year 3, of 623 students who took the trunk lift test, 556 (89.2%) met the HFZ. The mean score of the participants in the year 3 cohort was 11 inches also (*SD* = .81). No significant mean scores difference on the trunk lift tests between the two cohorts was found.

3.4.2 Gender differences. From Figure 2, 281 out of 325 boys lifted their upper body 9 or more inches off the mat, indicating 86.5% of the boys met the HFZ for their trunk extensor muscular strength/endurance (Seen in Figure 2). 217 out of 248 girls lifted their upper body 9 or more inches off the mat, indicating 87.5% of the girls reached the HFZ. A chi-square test yielded no significant difference of percentages for meeting the HFZ between the boys and the girls (X^2 = .133, df = 1, p > .05). Similarly, the results of the *t*-test indicated no significant differences between the boys and girls on this test (Mean $_{boys}$ = 11.09 vs. Mean $_{girls}$ = 10.89, t = .780 , df = 549, p > .05, Cohen's d = .07) in year 2.

In year 3, 301 out of 348 boys lifted their upper body 9 or more inches off the mat, indicating 86.5% of the boys met the HFZ (See Figure 3). 255 out of 275 girls lifted their upper body 9 or more inches off the mat, indicating 92.7% of the girls reached the HFZ. A chi-square test yielded a significant difference of percentages for meeting the HFZ between the boys and the girls (X^2 = 6.218, df = 1, p < .05). Similarly, the results of *t*-test also yielded a significant difference of the mean scores between the boys and the girls on this test (Mean $_{boys}$ = 10.9 vs. Mean $_{girls}$ = 11.4, t = - 4.01, df = 619, p <.01, Cohen's d = .32) in year 3.

4. Discussion

One purpose of this study was to examine physical fitness levels of the fourth-grade students during PEP years 2 and 3. One promising result is that, on average, 77.89% of the year 2 cohort and 78.65% of the year 3 cohort were in the HFZ for cardiovascular endurance, abdominal and upper body muscular strength and endurance, trunk extension strength and flexibility, and upper body flexibility. Compared to 40% of the fourth- and fifth-graders who met the healthy zone for

five Fitnessgram test items (Erwin, & Castelli, 2008), this study indicated a relatively high percentage of the students meeting the HFZ for four FitnessGram test items. One possible explanation for the results might be related to the students' participating in a quality physical education and physically active recess program during the PEP years. As described in the methods, the physical education teachers taught CATCH PE curriculums to their students and implemented a Feelin' Good MC recess program during a daily lunch recess throughout three years of PEP project. The results provide empirical support for implementation of a comprehensive school-based physical activity program that includes quality physical education and structured physically active recess during a school day (NASPE, 2004; USDHHS, 2008).

Given the fact that different physical fitness components contribute to different health outcomes, a comprehensive school-based physical activity program plays a key role in improving the levels of cardiovascular endurance, muscular strength and endurance as well as flexibility. Healthy cardiovascular endurance is an indicator of having a strong heart, healthy lungs, and efficient blood vessels. Having healthy cardiovascular endurance helps reduce the risk of life-threatening diseases, improve mental state, and enhance the body's efficiency (CDC, 2011; Ortega et al., 2007; USDHHS, 2008). In this study, the results of the PACER tests in PEP years 2 and 3 were promising, compared to previous studies (Castelli & Valley, 2007; Erwin & Castelli, 2008). 70.8% of the year 2 cohort and 68.1% of the year 3 cohort met the HFZ for cardiovascular endurance. In Erwin and Castelli's study (2008), 63% of the participants met the healthy fitness zone for the PACER test. In the study by Castelli and Valley (2007), 64% of the participants were in healthy fitness zone for the PACER test.

Strong muscular strength and endurance are positively associated with skeletal growth and health. Having a strong muscular strength and endurance helps improve body posture, maintain daily functional capability and energy, and limit injuries. In combination with cardiovascular endurance, strong muscular strength and endurance also increase metabolism (CDC, 2011; Ortega et al., 2007; USDHHS, 2008). In this study, the results of curl-up, push-up, and trunk lift for the two year cohorts were encouraging. 78.5% of the year 2 cohort and 76.9% of the year 3 cohort met the HFZ for curl-up test. Nearly four-fifths of the participants had strong muscular strength and endurance in their core. The results are slightly higher than the curl-up test in a study by Erwin and Catellie (2008) who reported 76% of the participants met the healthy fitness zone. More encouraging results showed that the mean scores of curl-ups tests for the year 2 cohort and the year 3 cohort were 28 and 26, which were higher than the high end of the HFZ (12-24). For push-up tests, 75.2% of the year 2 cohort and 73.3% of the year 3 cohort were in the HFZ. About three-fourths of the participants had strong upper body muscular strength and endurance. The number of participants in this study that met the HFZ was also higher than 69% of the participants who met the healthy fitness zone in Erwin and Castelli's study (2008). In addition, the participants in the year 2 and 3 cohorts averaged 13 push-ups, which fell in the midrange of the healthy fitness zone (7-20 for boys, 7-15 for girls).

The benefits of flexibility are to reduce muscle soreness, limit risk of injuries, and improve muscles and joints coordination. Flexibility is one of the major components of health-enhancing physical fitness, so improving flexibility in children and youth is one of the primary goals in maintaining and enhancing physical fitness for quality physical education (CDC, 2011; NASPE, 2004; USDHHS, 2008). The greatest number of participants who were in the HFZ was for the trunk lift test (87% in year 2 cohort and 89.2 % in year 3 cohort). This might be related to the trunk lift test itself, which is designed to assess a combination of muscular strength and flexibility. Due to their developmental stage in physical and physiological aspects, children in this age are more flexible, which might be one of the reasons for having such a high percentage result.

Across the fitness tests, the highest number of participants in this study that met the HFZ is the trunk lift, followed by shoulder stretch, curl-ups, and push-ups. Similar to the results of flexibility tests in previous studies (Erwin and Castalli, 2008; Reeves, Broeder, Hennedy-Honeycutt & East, 1999), most of the participants in the two year cohorts demonstrated a healthy level of flexibility in the lower back. In addition, the result of the tests indicated that a majority of the participants demonstrated strong muscles in the core, shoulders, and back. Given the widely recognized benefits of muscular fitness, individuals' having strong muscles in the core, shoulders, and back are critical to developing their good body postures. Improvement in these major muscles groups is also very beneficial to their healthy lean body mass and bone mass. In short, three-fourths or more of the participants showed adequate progress toward meeting the NASPE content standard 4 in terms of muscular strength, muscular endurance, and flexibility.

Consistent with the results reported by Erwin and Castelli (2008), this study showed that the lowest number of participants who met the HFZ is the PACER test. This study indicated that although 71% of the year 2 cohort and 68% of the year 3 cohort gained healthy cardiovascular endurance, roughly one-thirds of the participants in this study failed to reach the HFZ. Given a significant relationship between vigorous physical activity and cardiovascular endurance (Gutin et al., 2005; Ruiz et al., 2006), this study suggests that to help more students gain healthy cardiovascular endurance, physical education teachers are challenged to hone the quality of their teaching and to increase the time spent in moderate to

vigorous physical activity engagement during a physical education lesson. Researchers found that children with healthy levels of cardiovascular endurance were more likely to participate in both competitive and noncompetitive sports and physical activities (Castelli & Valley, 2007; Erwin and Castelli, 2008). To help children become physically active kids, it is physical education teachers' responsibility to improve students' cardiovascular endurance by providing students with adequate physical activities in a regular physical education lesson and to engage students in physically active recess programs during a school day.

The second purpose of this study was to examine gender differences on these fitness tests in PEP years 2 and 3. It was noted that based on the gender-specific standards for the HFZ, the proportions of the girls meeting the HFZ on three fitness tests in the two years were higher, compared with the boys. In contrast, the boys had higher percentages than the girls on the push-up tests in the two years. Regardless of gender specific guidelines, examination of the mean score differences indicated that the boys performed significantly better than the girls on the PACER tests and the push-up tests during PEP years 2 and 3. Erwin and Castelli (2008) also reported that the boys statistically outperformed the girls on the PACER tests, but not for the push-up test. Similarly, Barnett, Beurden, Morgan, Brooks, and Beard (2008) found that boys ran more laps than girls on the cardiovascular endurance test. In contrast, the girls in this study performed statistically better than the boys on the trunk lift test during PEP year 3. The results were consistent with the finding by Erwin and Castelli (2008) who reported that the girls had better flexibility than the boys. No gender differences were found on the curl-up tests in PEP year 2 and year 3. Similarly, Erwin and Castelli (2008) also reported no statistically significant difference by gender on the curl-ups.

Given the gender differences on different physical fitness components, this study suggests that while incorporating life-time sports and health-related fitness activities into a regular physical education lesson and recess program, physical education teachers need to provide tailored activities and instructions to specifically target the areas in which students need improvement, in particular, upper body muscular strength/endurance for girls and flexibility of specific major muscle groups for boys. Improving upper body strength and endurance for girls would help promote their participation in organized and non-organized sports and physical activities. Upper body muscular strength and endurance are considered the bedrock for conditioning to successfully perform object control skills used in team sports, individual sports, and lifetime sports. For example, during a regular physical education lesson, a physical education teacher may allocate a small amount of lesson time toward having students work at needs-based stations. Physical education teachers may use age-appropriate upper body building activities as routinized warm-up to improve muscular strength and endurance, particularly in girl students. To improve flexibility in boys, physical education teachers may use different types of stretching exercises and kids-yoga as routinized warm-up activities and cool-down activities to help children improve their flexibility.

Throughout the school year, physical education teachers may use a balanced approach to teach a variety of object control skills, small-sided and modified games, team building activities, physical activities, and fitness-enhancing games to help improve students' health-related physical fitness during a physical education lesson. Physical education teachers should also focus on working with school staff to create physically active, season appropriate indoor and outdoor recess programs, and closely monitor program implementation. A comprehensive school-based physical education and physical activity program collectively provides students with an effective forum to improve their physical fitness and maintain the healthy level of their fitness.

In conclusion, the proportions of the students' reaching the HFZ for each fitness test in PEP year 2 and 3 were high to very high, ranging from 68.1% to 89.2%. Across the test items in the two years, the lowest number of the students reaching the HFZ was the PACER test while the highest number was the trunk lift test. Based on the gender-specific standards for the HFZ, the percentages of the girls meeting the HFZ on three fitness tests in the two years were higher, compared with the boys, except for the push-up tests with the boys' having higher percentages in the two years. However, regardless of the gender-specific standards, the results of the *t*-tests indicated that for the PACER and push-up tests, the boys had statistically significant higher mean scores than the girls. In contrast, the girls' mean scores were statistically significant higher than the boy's on the trunk lift test. No significant differences of the mean scores between the boys and the girls on the curl-up test in the two years were found. This study suggests physical education teachers should provide a balanced curriculum approach to meet the needs of students and used tailored instructions to meet the needs of gender.

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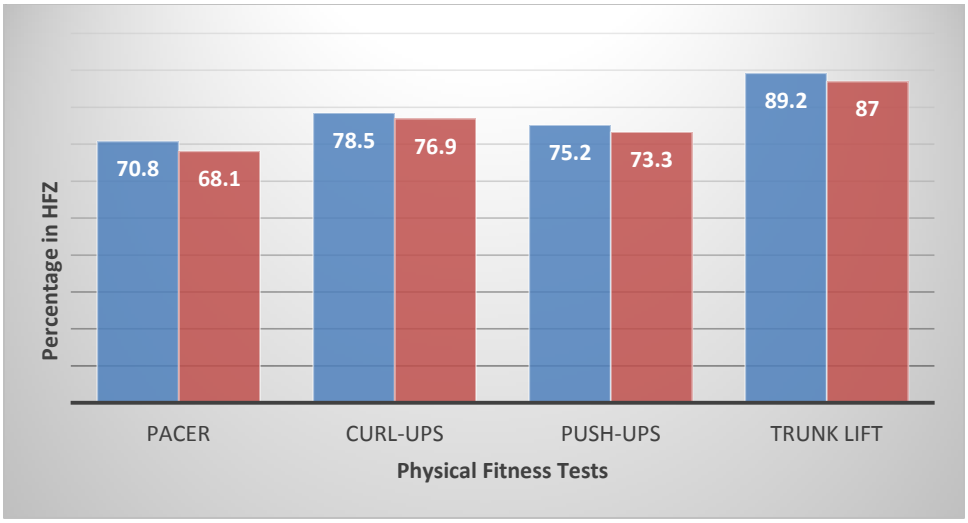

Figure 1. Percentage in HFZ on each test between the year 2 and year 3 cohorts

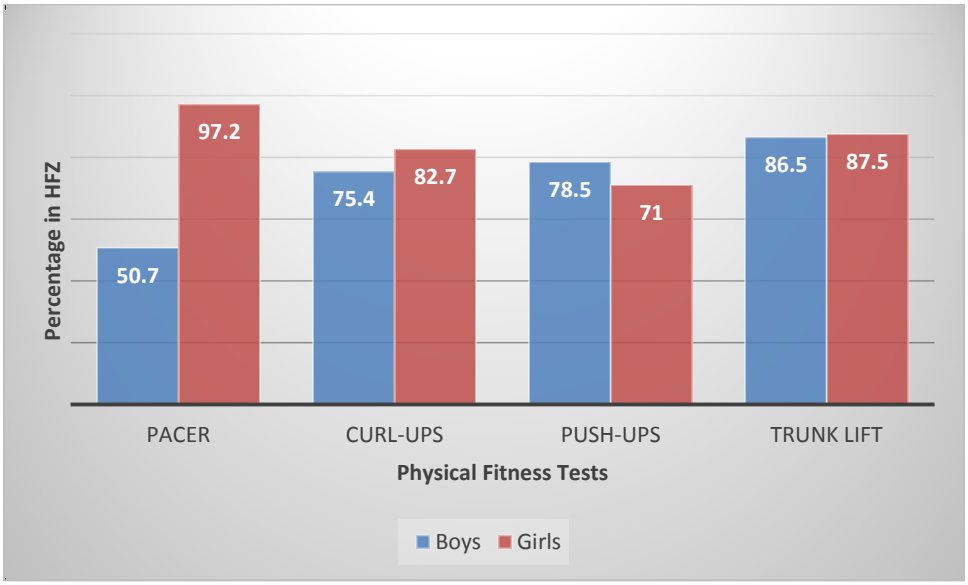

Figure 2. Percentage in HFZ on each fitness test by gender in PEP year 2

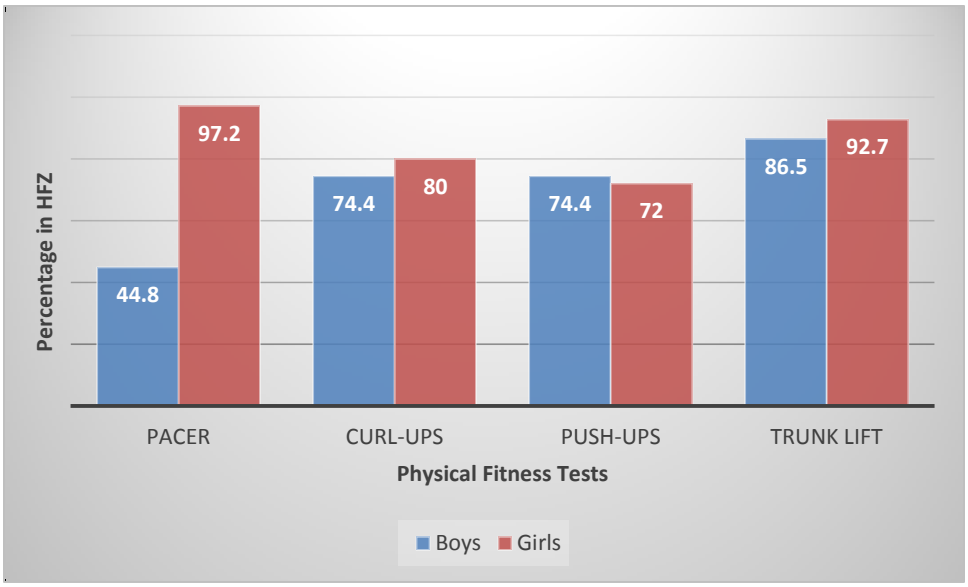

Figure 3. Percentage in HFZ on each fitness test by gender in PEP year 3