Project Fit America's Impact on Youth Fitness Levels: Second Year Curriculum

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Abstract

Background: Project Fit America (PFA) curriculum was initiated in 1990 with a mission to provide opportunities for all American children to be fit with unique lessons and outdoor fitness equipment. PURPOSE: In this study, the physical education (PE) fitness testing scores of elementary school students were examined to determine the effect of PFA curriculum inclusion. **Methods:** A total of 72 (M= 31, F=41) 4th and 5th grade students participated. Students were divided into one of four groups: males experiencing (EM) or not experiencing (NEM) the PFA curriculum and females experiencing (EF) and not experiencing (NEF) the PFA curriculum. At this school, fitness testing was completed twice a year as part of regular PE assessment and included the following activities: cadence push-ups, cadence curl-ups, sit and reach, and the Progressive Aerobic Cardiovascular Endurance Run (PACER) test. **Findings:** The EM group showed significant increases in their post-test scores for both curl-ups ($t(20) = -2.348$, $p = 0.029$) and PACER ($t(19) = -2.806$, $p = 0.011$) while the EF group showed significant increases for average sit and reach ($t(25) = -2.518$, $p = 0.019$) only. The NEM group showed significantly greater post-test scores for curl-ups ($t(9) = -2.427$, $p = 0.038$). The NEF group showed no significant increases for any of the four tests. **Conclusion:** The results of this study indicate that PFA inclusion serves to improve student's physical fitness measures.

Keywords: Fitness education, curriculum, technology

High levels of physical activity can indicate favorable health status for children, and United States guidelines suggest children should partake in 60 minutes of moderate-to-vigorous- physical activity per day (Physical Activity Guidelines Advisory Committee, 2018). Therefore, those who are responsible for the education of today's youth should emphasize the importance of daily activity within their teaching or parenting strategy. During childhood, accrued health behaviors can have significant impacts on future health; especially with regards to cardiovascular fitness (Herman, Craig, Gauvin, & Katzmarzyk, 2009). Young people who value physical activity (PA) may be more likely to achieve and maintain favorable health status than their less-active counterparts (Franka, Flynn, Farnell, & Barkley, 2018). Overall, evidence exists in favor of physical activity promotion from a young age (Tarp et al., 2018).

Reports have indicated US levels of adolescent obesity are rising for both sexes (Skinner, Perrin, & Skelton, 2016). Physical Activity may be the best way for preventing the current obesity epidemic. Levels of obesity for American youth (aged 2-19) were 18.5% in 2015-2016, which is a significant increase when compared to the 13.9% prevalence reported in 1999-2000 (Hales, Carroll, Fryar, & Ogden, 2017). Thus, current children in America are more obese than the previous generations. Research suggests that children who are physically inactive and obese are more likely to carry those traits into adulthood (Craigiea, Lakeb, Kelly, Adamsond, & Mathers, 2011). In a meta-analysis by Simmonds, Llewellyn, Owen, & Woolacott (2015), several (N=200,777) obesity follow-up studies were analyzed to see if subjects who were obese in childhood continued that characteristic into adulthood. The authors reported that throughout participant follow-ups, 55% of obese children were still obese in adolescence and 80% of those adolescence were still obese in adulthood. Ultimately, obesity levels reported for young people have increased over the past couple decades and most of these children remain obese throughout adolescence and adulthood.

The school system provides an avenue for youth physical participation and education for obesity prevention. Many schools mandate physical education (PE) class, where the curriculum often incorporates movement activities and lessons that promote an active lifestyle. The school environment can be essential for promoting PA and teachers should attempt to create a PA culture, where each school day is engrained with a PA component (Erwin, Brusseau, Carson, Hodge, & Kang, 2018). Project Fit America (PFA) is a national non-profit organization that creates curricula for PE classes in school's grade K-8. PFA incorporates non-traditional outdoor equipment and motivating lessons, to foster student activity. The PFA curriculum uses intrinsic and extrinsic motivation to promote the five components of fitness: muscular strength, muscular endurance, cardiovascular endurance, flexibility and body composition (Project Fit America, 2018a).

Existing research regarding PFA's effect on children's activity levels is limited. In preliminary data collected by the authors, a grant for PFA equipment and curriculum was received and adopted by a local Midwestern elementary school. They evaluated PFA's effect and fitness test scores for 4th and 5th grade students. Significant

improvements were reported between pre- and post-testing for measures of muscular strength and endurance for boys and girls participating in PFA during year one. The control group of 4th and 5th grade students who did not experience the PFA curriculum or equipment displayed significant increases in cardiovascular endurance for the boys only. The current study analyzed similar fitness test score data from the same elementary school to present second year data for PFA inclusion. The goal of this study was to assess the data from the second year curriculum implantation and look at the longitudinal impact of PFA's curriculum and fitness equipment on fitness test scores of school-aged students. Although, the students are not necessarily the same.

Methods

Participants

A total of 72 (M= 31, F=41) students participated, who were attending 4th and 5th grade (9-11 years old) from an upper-Midwest elementary school. The school was chosen for their availability and willingness to participate in the application and installation of PFA equipment and curriculum. Participating students were required to submit parental approval and consent before being included in the study. Of the 41 females who participated, 27 experienced the PFA curriculum (EF) and 14 did not (NEF). Of the 31 males who participated, 21 experienced the PFA curriculum (EM) and 10 did not (NEM). Class sessions for each group were held every other day (three days one week, two the other) for 40 minutes.

Instrumentation

Researchers applied for and received a PFA grant for a specific elementary school, which included the fitness curriculum and outdoor fitness equipment utilized as a part of the two year curriculum. The grant also included medicine balls, as well as both weighted jump ropes and hula hoops, $250 in play money and 1,000 fitness cups were also included, along with several certificates, providing extrinsic motivators for activities within the curriculum.

Procedure

At this school, fitness testing was completed twice a year as part of regular PE assessment (Deutsch & Hetland, 2012). The goal of this study was to see if student participation in the PFA curriculum and outdoor fitness equipment had any impact on their fitness levels from the beginning of the year to the end, during the second year of the curriculum implementation. For the fitness testing, students outcomes were recorded for cadence push-ups (upper body strength), cadence curl-ups (abdominal strength), sit-and-reach (flexibility), Progressive Aerobic Capacity Endurance Run (PACER) test (cardiovascular endurance), and calculated BMI (body composition) (**Table 1**.). The results were recorded by the PE teacher and obtained by researchers upon completion of regular fall and spring fitness testing collection.

Table 1. *Student Fitness Assessment Pre- and Post-test Procedures*

Fitness Test	PFA Fitness Component (5)	Procedure
Cadence Push-ups	Muscular Strength & Endurance (Upper-body)	Maximal receptions for Push-ups, 1 every three seconds, performed to a metronome recording, 75 maximum
Cadence Curl-ups	Muscular Strength & Endurance (Lower-body)	Maximal receptions for Curl-ups, 1 every three seconds, performed to a metronome recording, 75 maximum
Sit-And-Reach	Flexibility & Body Composition	Individual measurements (inches) of right and left legs, then averaged for both legs
PACER	Cardiovascular Endurance	Running from one line to another (20m apart) while keeping pace with a metronome recording that increases slightly with each round, maximum 241 lines completed

Note: Testing was completed during regularly scheduled physical education class as a part of bi-annual fitness assessments. Results were collected and recorded immediately after the tests completion. Fall testing was completed in October and spring testing in May.

Statistical Analysis

All analyses were performed using SPSS version 24.0 (IBM, Armonk, NY, 2006). In the event of missing data, the sequence of data in correlation with the missing piece was not included in the statistics. Anthropometric measurements of participants are presented using descriptive statistics. Paired sample t-tests were used to determine significant changes from pre- and post-test scores between groups. Statistical significance was determined by $P < 0.05$.

Results

The EM group showed significant increases in their post-test scores for both curl-ups ($t(20) = -2.348$, $p = 0.029$; d = 0.167) and the PACER ($t(19) = -2.806$, $p = 0.011$; d = 0.257), but no significant increases were seen in post-test scores for push-ups ($t(20) = -1.221$, $p = 0.24$; d = 0.331) and average sit and reach ($t(20) = -0.74$, $p = 0.468$; d = 0.137). The NEM group showed significantly greater post-test scores for curl-ups ($t(9) = -2.427$, $p = 0.038$; d = 0.342), but no significant increases were seen for push-ups ($t(9) = 1.177$, $p = 0.269$; d = 0.347), average sit and reach ($t(9) = 0.375$, $p = 0.716$; d = 0.073), and the PACER ($t(9) = 1.244$, $p = 0.245$; d = 0.141).

The EF group showed significant increases in their post-test scores for average sit and reach ($t(25) = -2.518$, $p = 0.019$; d = 0.218), but no significant increases were found in post-test scores

for push-ups ($t(25) = -0.359$, $p = 0.723$; d = 0.054), curl-ups ($t(26) = -1.726$, $p = 0.096$; d = 0.106), and the PACER ($t(23) = -1.707$, $p = 0.101$; d = 0.113). Additionally, no significant increase was found for the NEF group in any of the four tests: push-ups ($t(13) = -0.838$, $p = 0.417$; d = 0.265), curl-ups ($t(13) = -1.076$, $p = 0.301$; d = 0.388), average sit and reach ($t(13) = -0.168$, $p = 0.869$; d = 0.031), and the PACER ($t(13) = -0.812$, p = 0.431; d = 0.127).

Cadence Push-Ups

The EM and EF groups showed no significant increases from their pre- to post-testing for push up scores (~ 37.3%, (p = 0.24) and ~ 3.1% (p = 0.723), respectively). Additionally, the NEM and NEF showed no significant differences from their pre- to post-testing for push-ups (~ -20.1% (p = 0.753) and ~ 9.5% (p = 0.417), respectively) (see **Table 2**).

Table 2. *Pre- and post-test scores for student cadence push-ups (maximum 86)*

	NEM	NEF	EM	EF
Number in group	10	14	21	24
Pre-test Score	44.30 ± 22.21	23.07 ± 10.69	23.33 ± 19.40	30.56 ± 18.74
Post-test Score	36.90 ± 21.10	25.50 ± 7.35	37.24 ± 56.15	31.54 ± 17.63
% Change	-20.05%	9.52%	37.34%	3.12%

Note: NEM: no experience males, NEF: no experience females, EM: experience male, EF: experience females; Data are mean ± standard deviation.

Cadence Curl-Ups

Both the EM and NEM groups showed significant increases from their pre- to post-testing for curl up scores (~ 10.1%, ($p = 0.029$) and ~ 14.3% (p =0.038), respectively) (see **Table 3**). Additionally, the EF and NEF groups showed no significant increases from their pre- to post-testing for curl-ups (~ 5.0% ($p = 0.096$) and ~ 15.9% ($p = 0.301$), respectively).

Table 3. *Pre- and post-test scores for student curl-ups (maximum 80)*

	NEM	NEF	EM	EF
Number in group	10	14	21	25
Pre-test Score	53.90 ± 23.93	35.14 ± 17.16	41.00 ± 29.04	52.00 ± 26.63
Post-test Score	61.60 ± 20.06	41.79 ± 17.05	45.62 ± 26.28	54.74 ± 25.11
% Change	14.28%	15.9%	10.13%	5.01%

Note: NEM: no experience males, NEF: no experience females, EM: experience male, EF: experience females; Data are mean ± standard deviation.

Sit and Reach

Sit and reach testing was performed for both the right and left leg. Individual leg scores were averaged together and presented in Table 4. The EM, NEM, and NEF groups showed no significant differences from their pre- to post-testing scores for the sit and reach (~ 5.2% ($p = 0.468$), ~ -1.0% ($p = 0.716$), and ~ 0.3% ($p = 0.869$), respectively) (**Table 4**). The EF group showed significant increases from their pre- to post-testing scores for the sit and reach (~ 2.6% ($p = 0.019$)) (see **Table 4**).

Table 4. *Pre- and post-test scores for student averaged sit and reach (inches)*

	NEM	NEF	EM	EF
Number in group	10	14	21	24
Pre-test Score	9.90 ± 1.47	11.11 ± 1.18	7.33 ± 2.33	10.15 ± 1.91
Post-test Score	9.80 ± 1.25	11.14 ± 1.10	7.74 ± 2.37	10.42 ± 1.68
% Change	-1.02%	0.32%	5.23%	2.58%

Note: NEM: no experience males, NEF: no experience females, EM: experience male, EF: experience females; Data are mean ± standard deviation.

PACER (Progressive Aerobic Cardiovascular Endurance Run)

The EM group showed a significant increase from their pre- to post-testing scores for the PACER (~ 11.5% ($p = 0.011$)). The EF, NEM, and NEF groups showed no significant differences in their pre- to post-testing scores (~ 3.8%, ($p = 0.101$), ~ -6.4% ($p = 0.245$), and ~ 3.7% ($p = 0.431$), respectively) (see **Table 5**).

Table 5. *Pre- and post-test scores (lines with maximum 241) for student PACER*

	NEM	NEF	EM	EF
Number in group	10	14	20	22
Pre-test Score	51.70 ± 21.19	37.50 ± 10.92	47.71 ± 22.78	43.22 ± 15.33
Post-test Score	48.60 ± 22.80	38.93 ± 11.54	53.90 ± 25.34	44.92 ± 14.71
% Change	-6.38%	3.67%	11.48%	3.77%

Note: NEM: no experience males, NEF: no experience females, EM: experience male, EF: experience females; Data are mean ± standard deviation.

Discussion

Strong evidence exists supporting fitness testing in schools to develop standards of physical fitness and identify children at risk of cardiovascular disease (Ruiz et al., 2016). Teachers and parents can use fitness test scores of the children to identify if intervention is necessary. Early identification and intervention may be important, recall that that children who are physically inactive and obese are more likely to carry those traits into adulthood (Craigiea et al., 2011). In a study of 265 fifth grade students (Mean age = 11 years old.) by Chen, Hammond-Bennett, Hypnar, and Mason (2018), overall performance on FitnessGram testing was significantly associated with PA levels in PE and recess. Therefore, promotion and testing of cardiovascular fitness should start at childhood.

In the current study, children's motivation to participate in PA may have affected the outcome of their fitness tests. In a meta-analysis by Barte and Wendel-Vos (2017), all studies that provided children with an incentive (inexpensive gift or cash) for reaching daily PA levels (time spent in motion, steps, or aerobic minutes) had a positive effect on activity levels as measured by a pedometer. PFA includes an incentive program where each student is given an index card to complete by performing and documenting a certain amount of repetitions. In a PFA sponsored school, "the ultimate incentive that students work for from grade 2 through 6 is to earn the special 6th grade goal of 100 miles and 8 stations. "This not only earns the student the coveted PFA hooded sweat shirt but a special plaque that lists their name and all their activity accomplishments (Project Fit America, 2018b, p. 1)." Perhaps the incentives of PFA in the current study motivated the experimental group to be more active each class period, therefore improving fitness levels and improving their fitness post-test scores.

Children who are physically inactive tend to perceive themselves negatively in terms of physical ability and health (Gu, Chang, & Solmon, 2016). PFA offers students activities and equipment alternative to the one traditionally offered by their school. Some students may prefer traditional forms of activity in which they are competent and accustomed to. However, students who view themselves as less competent in the context of traditional PA forms may become more active as a result of new opportunities for activity at their disposal (Prichard & Deutsch, 2013). Students who feel a perception of self-competence in relation to their peers will be more likely to find in-school PA enjoyable (Shen et al., 2018). Consequently, PFA presents the opportunity to increase levels of activity and perceived competence for students who need it most.

The school grounds can be the most impactful environment for PA promotion; so teachers should try to create a culture for PA by incorporating it into daily lessons (Duffine Gilman. & Volpe, 2018). PFA embraces this concept with a goal to create opportunities for everyday activity, fitness, and health as part of the school experience (Project Fit America, 2018c). In the current study, the experimental group may have developed a new found daily awareness for PA through the PFA curriculum; leading to improvements in fitness levels and post-test scores. Overall, the equipment and education provided by PFA gives staff members of the participating school an opportunity to emphasize PA each school day.

The current study provides the second year data to assess the effect of a two year PFA grant for this elementary school. It is not a true longitudinal study, as the same sample of students was not used in both studies. However, some 4th grade students from the first year study could have been in the current study as a 5th grader. Also, a large percentage of students in the current study likely attended the same school last year. This presented them small exposure to PFA concepts and opportunity to experience the equipment on their school grounds for a whole year. The results of the current study suggest that PFA inclusion may have significant positive effect on student outcomes for cadence curl-ups and the PACER tests for boys; and the average sit and reach test for girls. Whereas, analysis of first year data indicated significant improvements in cadence push-ups and curl-ups for both boys and girls experiencing PFA.

Given the two year nature of this study, one could assume there is some participant carryover and an increased familiarity of PFA equipment by all students at the school for the current sample. Therefore, it is not shocking to see differences in improvements between first and second year data. Students with a large magnitude of improvement in the first year for one test would be more likely to improve on a different test the next year. The exact mechanisms for the improvements in this study cannot be identified, but the significance of fitness test improvements within the two studies present a strong case for PFA's positive effect on school-aged fitness levels. Thus, PFA inclusion has led to significant improvements for measurements of flexibility and body composition, muscular strength and endurance, as well as cardiovascular endurance in elementary aged boys and girls.

Conclusion

Increasing physical activity and fitness levels of children is an effective way to reduce their risk of lifelong obesity (Grossman, 2017). Which is important as US levels of adolescent obesity are rising for both sexes (Skiner et al., 2016). The results of this study indicate that PFA inclusion serves to improve student's physical fitness measures. These results are a product of the motivating nature of PFA; utilizing fitness goals, incentives, and creative activities to promote student achievement. To conclude, PFA serves as a useful curriculum for schools to utilize in the effort to reverse trends of obesity in the youth of America.

This study was limited in its ability to determine the exact mechanism of the PFA experience responsible for increases in student's test scores. The significant increases seen by the experimental groups could be a product of the motivating nature of the PFA curriculum. Additionally, while some groups showed large increases between their pre- and post-testing scores, the high variance among these groups likely prevented the presentation of a statistical significance. Future researchers should attempt to identify the influence and level of motivation for children participating in PFA by using a questionnaire. Activities chosen from the PFA curriculum to be used during PE classes should be well documented to standardize the curriculum's influence on student fitness testing scores.

Suggestions for Teachers

To promote the best results, PE teachers need to understand certain aspects of PFA curriculum inclusion. The activity chosen by the PE teacher may affect student PA levels and fitness

outcomes. Perhaps students who prefer traditional PE lessons without a fitness component are less likely to benefit from PFA. The PFA curriculum includes activities that intrinsically motivate students to participate. The incentive system provides an extra factor of extrinsic motivation to keep students engaged through the activities that they find less enjoyable. One way to foster activity levels in children is to teach and promote physical self-assessment, the knowledge of their own fitness outcomes may motivate them to achieve improvements (Petrie & Clarkin-Phillips, 2018). Finally, it is important to provide the students an opportunity to learn and practice fitness tests a few weeks prior to the test date (Mahar & Rowe, 2008). This familiarity with the testing protocol may increase test results and efficiency on test day.

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