

LEGACY CHARTER SCHOOL



Examining the Impact of 45 Minutes of Daily Physical Education on Cognition, Body Composition and Fitness Performance of Elementary and Middle School Youth



Courtesy of Legacy Charter School

Year 7 and Longitudinal Findings (2010-2016)

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EXECUTIVE SUMMARY

National adult obesity rates exceed 35% in four states, 30% in 25 states and are above 20% in all states according to *The State of Obesity: Better Policies for a Healthier America* released September, 2016. Louisiana has the highest adult obesity rate at 36.2% and Colorado has the lowest at 20.2%¹.

US adult obesity rates, fortunately have decreased in four states (Minnesota, Montana, New York and Ohio), increased in two (Kansas and Kentucky) and remained stable in the rest, between 2014 and 2015. These decreases mark the first time in the past decade that any states have experienced decreases — aside from a decline in Washington, D.C. in 2010¹.

Unfortunately, South Carolina is not on the decline and has the 13th highest adult obesity rate in the US, currently 31.7%, up from 21.1% in 2000 and from 12.0% in 1990.

The Centers for Disease Control and Prevention (CDC) has identified health-risk behaviors such as **physical inactivity** consistently linked to poor grades and test scores and lower educational attainment. It is widely accepted, however, that participating in regular physical activity reduces the risks of developing chronic diseases associated with obesity along with providing a variety of health benefits.

According to the South Carolina Obesity Action Plan² released in the fall of 2014:

- **More than 30% of South Carolina high school students are overweight or obese.**
- **1 in 3 low-income children ages 2 – 5 years old are overweight or obese.**

The immediate health effects of obesity according to the CDC reveals that obese youth are more likely to have risk factors for cardiovascular disease, such as high cholesterol or high blood pressure³. In a population-based sample of 5- to 17-year-olds, 70% of obese youth had at least one risk factor for cardiovascular disease⁴.

Obese adolescents are also more likely to have prediabetes, a condition in which blood glucose levels indicate a high risk for development of diabetes⁴⁻⁶. Additionally, children and adolescents who are obese are at greater risk for bone and joint problems, sleep apnea, social and psychological problems such as stigmatization and poor self-esteem⁴⁻⁶.

The 2015 South Carolina Children's Health Assessment Survey revealed that 27% of middle school aged children did not meet the World Health Organization recommendation of 1 hour or more of physical activity per day for children ages 5-17 and 29% of high school aged youth did not meet this recommendation as well.

Equally alarming, the **2015 Youth Risk Behavior Survey** found that 69% of female and 46% of male high school students in South Carolina, respectively, did not participate in at least 60 minutes of physical activity 5 or more days, and 51% of high school students did not play at least on sports team administered by their school or community group in the prior year⁷. Yet federal mandates continue to emphasize academic achievement, leading many school districts to provide

only curricula to improve test scores, resulting in instruction time reductions for physical education⁸.

The rise in childhood obesity according to the US Surgeon General is attributed to declines in physical activity opportunities in schools, primarily in physical education and recommends all US school systems mandate daily physical education (150 minutes per week) for elementary age youth⁴. Considering the significant number of total waking hours youth spend at school and in school-related activities, the Institute of Medicine (IOM)⁹ highlights how schools are excellent environments to promote healthy behaviors such as participation in regular physical activity. Schools throughout history been integral to support the well-being and health of youth by providing health screenings, immunizations, and nutrition programs, and also by training them for lifelong learning, thus schools should and can play a positive role providing daily opportunities for youth to be active⁹.

Only about half of youth are reported to meet the current Physical Activity Guidelines for Americans' recommendation of at least 60 minutes of daily vigorous or moderate-intensity physical activity⁹. The research agenda investigating the impacts of regular physical activity on cognition, academic performance and academic achievement continues to be understudied, however promising findings from the IOM document positive associations between participation in regular physical activity and brain health⁹.

Physical activity can have both immediate and long-term benefits on academic performance and academic achievement. Youth are often better able to concentrate on classroom tasks, which can enhance learning immediately after a bout of physical activity. Physical activity can have both immediate and long-term benefits on academic performance⁹⁻¹⁰.

Research disseminated by Active Living Research supported by the Robert Wood Johnson Foundation in 2015 revealed that almost immediately after participating in physical activity, children are better able to concentrate on classroom tasks, which can enhance their learning¹⁰. As youth continue to participate in developmentally appropriate physical activity, their improved physical fitness can possibly have positive effects on academic outcomes¹⁰. Furthermore, there is little to no evidence that increased physical education time negatively impacts academic achievement¹¹.

Less than 4% and 8% of US public elementary and middle schools, respectively, provide daily physical education¹². These low percentages limit the availability of data to identify all of the potential associations between physical activity, and a variety of cognitive measures. Nonetheless, available data from recent studies highlighted by the IOM⁹, Active Living Research¹⁰ and the CDC¹³ substantiate that physically active and physically fit children have greater academic performance, academic achievement and enhanced cognition compared to their less active peers.

Furthermore, 11 of the 14 studies described in the CDC's report had at least one positive association between physical education and academic outcomes including tests scores and grades. Similarly to these findings was increased time devoted to physical education did not

adversely affect academic outcomes regardless of less time spent on core classroom curriculum¹³.

The Year 7 and longitudinal (2010-2016) findings highlighted in this report are consistent with this body of evidence.

The purpose of evaluating the Legacy Charter Physical Activity Program is to examine the impact of 45 minutes of daily physical education on cognition, body composition, and fitness performance of elementary and middle school youth in Greenville, South Carolina.

Participants

In Year 7, eight hundred and ninety-four (N=894) students at Legacy Charter School participated in the present study. Students attending two Title I schools were identified as controls (N=703). In previous study years, oversampling techniques were utilized to identify a comparison sample of students for both controls similar to Legacy Charter School's demography. In the present study year (i.e., Year 7) the diversity of Legacy Charter School increased, thus all participants in grades 2-8 from Legacy and controls participated in the study for Year 7.

Cognitive Findings

- Legacy Charter School students had a significant improvement in Fluid Intelligence at the post-test assessments in Year 7.
- Legacy elementary and middle school males and females without adjusting for grade significantly improved on 3 of 6 Fluid Intelligence sections (50%), including the Total section compared to 0 of 6 (0.00%) for controls in Year 7.
- Legacy middle school males and females significantly improved on 2 of 6 Fluid Intelligence sections (33%), including the Total section, compared to 0 of 6 (0.00%) for controls in Year 7.
- Stratified by gender, Legacy elementary school females significantly improved on the Fluid Intelligence Total section in Year 7.
- Control students did not significantly improve on any of the Fluid Intelligence sections at the post-test assessments in Year 7.
- Control school students observed decreases in many of the Fluid Intelligence sections in Year 7 at the post-test assessments.
- Legacy Charter elementary school females improved significantly on 3 of 4 (75%) Perceptual Speed sections including the Total section following the post-test assessments in Year 7.
- Legacy Charter middle school students improved significantly on the Perceptual Speed Total section at the post-test assessments in Year 7.
- Legacy Charter middle school students observed significant gain increases on 3 of 6 (50%) including the Total section of the Fluid Intelligence sections compared to 0 of 6 (0.00%) for controls from 2013-2016.
- Legacy Charter middle school females observed significant gain increases on 2 of 6 (33%) Fluid Intelligence sections compared to 0 of 6 (0.00%) for controls from 2014 to 2016.

- Legacy Charter male and female middle school students observed significant gain increases on 2 of 6 (33%) Fluid Intelligence Sections compared to 0 of 6 (0.00%) for controls from 2014 to 2016.
- Legacy Charter elementary school students observed significant gain increases on: 2 of 4 (50%) Perceptual Speed sections, including the Total section compared to 0 of 4 (0.00%) for controls from 2013-2016.

Fitness and Physical Activity Findings

- Legacy Charter School students observed significant improvements in fitness performance by grade and gender [i.e., in PACER, muscular strength and muscular endurance] in Year 7.
- Control school students observed no significant fitness improvements (0 of 12; 0.00%) by grade level and gender; additionally *decreases* (8 of 12; 66%) in fitness performance by grade and gender was also observed at the post-test assessments among control school students in Year 7.
- Legacy elementary school female students significantly improved on 3 of 3 (100%) fitness measures [i.e., in PACER, muscular strength and muscular endurance] compared to 0 of 3 (0.00%) for controls in Year 7.
- Legacy elementary school male students significantly improved on 3 of 3 (100%) fitness measures [i.e., in PACER, muscular strength and muscular endurance] compared to 0 of 3 (0.00%) for controls in Year 7.
- Legacy middle school female students significantly improved on 3 of 3 (100%) fitness measures [i.e., in PACER, muscular strength and muscular endurance] compared to 0 of 3 (0.00%) for controls in Year 7.
- Legacy middle school males significantly improved on 3 of 3 (100%) fitness measures [i.e., in PACER, muscular strength and muscular endurance] compared to 0 of 3 (0.00%) for controls in Year 7.
- The aerobic capacity values of Legacy Charter School male students compared to control school male students differed significantly in Year 7.
- Legacy Charter female and male elementary and middle school students observed significant gain increases in aerobic capacity compared to a *decrease* in aerobic capacity for control school students in Year 7.
- The percentage of Legacy Charter elementary school females meeting the HFZ standard for curl-ups significantly increased at the post-test assessments in Year 7.
- The percentage of Legacy Charter middle school males and females meeting the HFZ standard for curl-ups significantly increased at the post-test assessments in Year 7.
- The percentage of Legacy Charter elementary school females and males meeting the HFZ standard for push-ups significantly increased at the post-test assessments in Year 7.
- Legacy Charter elementary school students accumulated 8,460 steps in a typical week during physical education, while Legacy Charter middle school students accumulated 10,145 steps in a typical week during physical education in Year 7.

- Control elementary school students accumulated 1,154 steps in a typical week during physical education, since control elementary school students received physical education only once per week in Year 7.
- Control middle school students accumulated 9,925 steps in a typical week, but only received physical education for the fall term during Year 7.
- The longitudinal findings for Legacy Charter elementary school students revealed significant gain increases from 2013-2016 (3 of 3; 100%) in PACER, muscular strength and muscular endurance.
- Legacy Charter middle school students observed significant gain increases in PACER, muscular strength and muscular endurance compared to control elementary school students.
- Control elementary students observed decreases in two fitness areas, respectively, from 2013-2016.
- Longitudinal findings for Legacy Charter middle school students revealed significant gain increases from 2013-2016 (3 of 3; 100%) in PACER, muscular strength and muscular endurance.
- Control middle school students observed decreases in one fitness area, from 2013-2016.
- Legacy Charter elementary and middle school females observed significant gain increases in (5 of 6; 83%) fitness compared to decreases (4 of 6; 66%) for control elementary and middle school males and females from 2012-2016.
- Legacy Charter elementary school female and male students observed significant gain increases (5 of 6; 83%) in fitness. Control elementary school females and males however observed decreases in (4 of 6; 66%) fitness tests from 2012-2016.
- Legacy Charter middle school males and females observed significant gain increases (4 of 6; 66%) in fitness, while control middle school males and females observed decreases (4 of 6; 66%) in fitness from 2012-2016.

Body Composition Findings

- The BMI percentile changes for Legacy elementary/middle school females and males significantly decreased in Year 7.
- Legacy elementary school students had a significant decrease of -1.82 in BMI percentile vs. controls of -0.51 in Year 7.
- Legacy middle school students had a significant decrease of -0.94 in BMI percentile vs. an increase among controls of 0.52 in Year 7.
- Legacy middle school males and females observed significant decreases in %BF from pre-test 34.68 to 31.60 at the post-test assessments in Year 7.
- For control school elementary students the BMI percentile increases was significantly greater compared to Legacy Charter school elementary students from 2014-2016 (3.15 vs. -0.51).
- Control elementary school students observed a significant increase in BMI (3.33 vs. 1.52) compared to Legacy Charter elementary school students from 2015-2016.

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