



Contents lists available at ScienceDirect

Annals of Epidemiology

journal homepage: www.annalsofepidemiology.org

Original article

Sex differences in fitness outcomes among minority youth after participation in a park-based after-school program

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ARTICLE INFO

Article history:

Received 30 November 2017

Accepted 30 March 2018

Available online xxx

Keywords:

Children

Adolescents

Fitness

Sex differences

Ethnic minority

Community-based

ABSTRACT

Purpose: This study aimed to describe sex differences in fitness outcomes after participation in Fit2Play, a park-based after-school health and wellness program.

Methods: Youth who participated in Fit2Play for either 1, 2, or 3 school years between 2010 and 2016 ($n = 2129$, mean age 9.1 years, 52% Hispanic, 48% non-Hispanic black, 54% male) were tested via a comprehensive fitness battery at the beginning/end of the school year(s). Effects of length of Fit2Play participation on fitness outcomes were assessed via three-level repeated measures analysis stratified by sex and adjusted for child sociodemographics, weight category, area poverty, and year.

Results: Significant improvements for boys and girls were found in the Progressive Aerobic Cardiovascular Endurance Run ($P < .01$ for girls, $P < .001$ for boys), 400 meter run tests ($P < .001$ for girls, $P < .01$ for boys), and push-ups ($P < .01$ for both), with dose-response trends for girls after up to 3 years of Fit2Play participation. From baseline to 1, 2, and 3 years of participation, girls demonstrated 8%, 14%, and 23% mean improvement in 400 meter run times versus 9%, 9%, and 17% for boys, respectively ($P < .001$ for all). Dose-response improvements were also found in girls for PACER scores and sit-ups.

Conclusions: After-school physical activity programs can improve fitness in all youth, and particularly girls with increased years of participation. Further research should examine sex differences in the effects of park/community-based programs to reduce sex disparities in fitness, particularly in light of the current youth obesity epidemic.

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Introduction

Only 18% of high school girls compared with 37% of boys are reported to meet national physical activity benchmarks [1], but much less is known about sex differences in fitness levels during the elementary and middle school years [2]. Sex-related differences in physical activity and fitness have been documented throughout the pediatric years and track strongly into adulthood, despite general declines in activity and fitness for both sexes across the lifespan [3,4].

In general, males are reported to be more physically active and more likely to engage in exercise than females [1,2]. Evidence of sex

differences in physical activity may be explained by biological factors such as the presence of a larger muscle mass and hormonal contributions in males [5–7]. Research on prepubescent sex differences in physical fitness demonstrated higher aerobic fitness, speed, and strength in boys compared with girls [8–10]. However, explanations for sex-related differences in physical activity and exercise behaviors per se (vs. biophysiology) in school-age youth have primarily focused on a number of social, psychological, and demographic factors such as earlier development of fundamental motor skills [9] and greater opportunities, and encouragement [1,8]. Moreover, these sex differences in physical activity contribute directly to lower aerobic fitness in girls, higher rates of unhealthy weight, and obesity-related health cardiometabolic health consequences throughout the pediatric years [5].

Increased levels of physical activity and quality dietary intake have both been contributing factors in obesity prevention, regardless of age and sex [6]. Short-term cross-sectional observational and experimental intervention studies on obesity prevention

No conflicts of interest to report for any authors. No sources of funding to report.

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<https://doi.org/10.1016/j.annepidem.2018.03.020>

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Please cite this article in press as: Messiah SE, et al., Sex differences in fitness outcomes among minority youth after participation in a park-based after-school program, Annals of Epidemiology (2018), <https://doi.org/10.1016/j.annepidem.2018.03.020>

programs show a significant effect of exercise training on fitness levels in children and adolescents, with greater fitness performance in boys compared with girls [7–10]. However, multiyear observational studies are needed to support these findings, and especially among pediatric populations at the highest risk for obesity and its health-related consequences such as type II diabetes and cardiovascular disease. Furthermore, it may not be feasible or in some cases ethical (e.g. withholding an evidence-based obesity prevention programs during critical development years when unhealthy weight is so prevalent in high-risk groups [11]) to randomize children/adolescents to treatment arms in community-based settings, especially among low resource, high-risk populations. An understanding of the longer-term determinants of fitness in children and adolescents will lead to future opportunities for healthy weight maintenance, and conversely for the promotion of physical activity and the prevention of overweight and obesity [10]. As such, here we explored the sex differences in fitness outcomes after 1 year, and up to 3 years of participation in Fit2Play, a park-based after-school physical activity promotion program targeting high-risk elementary and middle school youth aged 6–14 years. Based on previous studies in different settings [1,2], it was hypothesized that over time, boys would have more improvement in (1) cardio-respiratory fitness via the Progressive Aerobic Cardiovascular Endurance Run (PACER) and 400 meter run tests; (2) strength via 1-minute-timed push-ups and sit-ups; and (3) flexibility via the sit-and-reach test, versus girls.

Methods

Study design

A prospective, multilevel repeated measures design (observations nested in participants, nested in parks) was used to report sex differences in fitness outcomes among Fit2Play participants over up to 3 years.

Study participants

Children aged 6–15 years who participated in the Miami-Dade County Parks, Recreation and Open Spaces (MDPROS) Fit2Play after-school program for at least 1 school year and up to 3 consecutive school years were included in this analysis. The final number of subjects included were as follows: 2115 with a completed baseline (regardless of number of years in the study); 1859 who completed 1 year of Fit2Play (two measurement time points); 337 who completed 2 years of Fit2Play (four measurement time points); and 132 who completed 3 years of Fit2Play (six measurement time points, Fig. 1). Although there were Fit2Play participants for 4, 5, and 6 years consecutively, the overall number in each group was significantly less than those who participated in up to 3 years making the data less reliable to draw valid scientific conclusions. Thus, they were not included in this analysis. The study was approved by the University of Miami (UM) Institutional

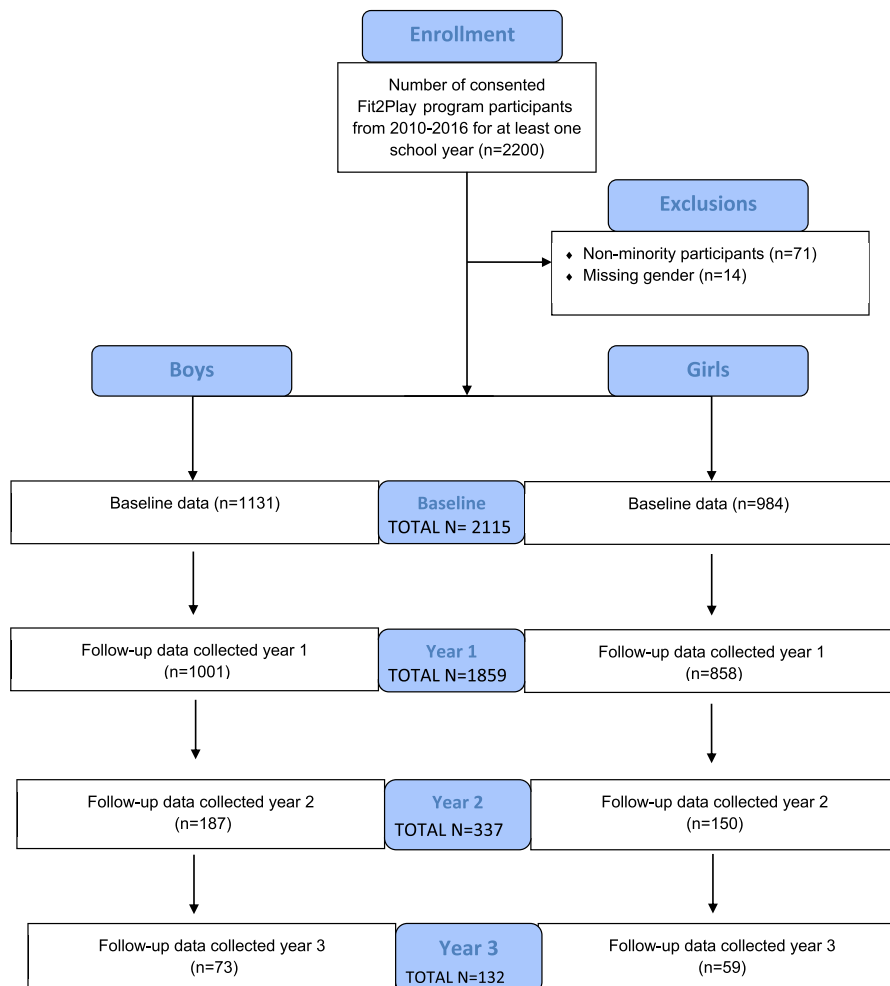


Fig. 1. Analytic sample flow diagram of participants in the Fit2Play after-school program for 3 years, Miami-Dade County, Florida, 2010–2016. Response rate from 2010 to 2016, or those parents who agreed to have their child's pre-post measures collected each year were as follows: 63% in year 1, 68% in year 2, 71% in year 3, 82% in year 4, and 84% in years 5 and 6.

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