

Effects of Before-School Physical Activity on Obesity Prevention and Wellness

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Introduction: The effects of Build Our Kids Success—a 12-week, 1-hour before-school physical activity program—on BMI and social-emotional wellness among kindergarten to eighth grade students was examined.

Study Design: This was a nonrandomized trial.

Setting/participants: Participants were from 24 schools in Massachusetts; there were 707 children from kindergarten to eighth grade.

Intervention: Children registered for Build Our Kids Success in 2015–2016 participated in a 2 days/week or 3 days/week program. Nonparticipating children served as controls.

Main outcome measures: At baseline and 12 weeks, study staff measured children's heights/weights; children aged ≥ 8 years completed surveys. Main outcomes were 12-week change in BMI z-score, odds of a lower BMI category at follow-up, and child report of social-emotional wellness. Analyses were completed in March–June 2017.

Results: Follow-up BMI was obtained from 67% of children and self-reported surveys from 72% of age-eligible children. Children in the 3 days/week group had improvements in BMI z-score (-0.22 , 95% CI = -0.31 , -0.14) and this mean change was significantly different than the comparison group (-0.17 difference, 95% CI = -0.27 , -0.07). Children in the 3 days/week group also had higher odds of being in a lower BMI category at follow-up (OR = 1.35 , 95% CI = 1.12 , 1.62); significantly different than the comparison group ($p < 0.01$). Children in the 2 days/week program had no significant changes in BMI outcomes. Children in the 3 days/week group demonstrated improvement in their student engagement scores (0.79 units, $p = 0.05$) and had nonsignificant improvements in reported peer relationships, affect, and life satisfaction versus comparison. The 2 days/week group had significant improvements in positive affect and vitality/energy versus comparison.

Conclusions: A 3 days/week before-school physical activity program resulted in improved BMI and prevented increases in child obesity. Both Build Our Kids Success groups had improved social-emotional wellness versus controls.

Trial registration: This study is registered at www.clinicaltrials.gov NCT03190135.

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INTRODUCTION

Obesity affects 12.7 million (17%) children and adolescents throughout the U.S.¹ Substantial work is being directed at efforts towards childhood obesity prevention. As a modifiable lifestyle habit, physical activity is a potential target for these efforts.

Evidence supports the health benefits of physical activity. Children who are more physically active have

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lower body fat percentage² as well as lower BMI.³ Higher levels of physical activity early in life are associated with future physical activity levels as well as lower risks of cardiovascular disease and diabetes later in life.⁴⁻⁸ There is also growing evidence that physical activity has a positive impact on psychosocial wellbeing, cognitive outcomes, and academic performance, as well as mental health.^{9,10}

Despite these benefits, most children do not receive the recommended amount of physical activity.¹¹ Parents cite time pressures, safety concerns, cost, and competition with screen time as challenges to supporting their children's physical activity.¹² As children spend the majority of their time in school, most of their physical activity occurs in this setting,¹³ however, schools overall do not promote physical activity.^{14,15} Barriers exist to school-based physical activity, including lack of available resources, concerns regarding burden on academic time, and perceived lack of knowledge to lead physical activity sessions.¹⁶ Interventions to increase physical activity in schools have shown mixed results, largely because of the overall heterogeneity in intervention design.¹⁷⁻¹⁹

Build Our Kids Success (BOKS) is a before-school physical activity program present in more than 2,500 elementary and middle schools throughout the U.S. and internationally. The 60-minute, 12-week program includes a core curriculum delivered by trained volunteers. In a recent report in a single school, BOKS effectively decreased percentage of body fat, and increased aerobic performance in participants versus control students.²⁰ The BOKS program is consistent with Huang and Glass's systems-level framework to prevent obesity,²¹ and is rooted in the social contextual theory of behavior change.²² Previous research has found that before-school physical activity programs increase overall physical activity^{23,24} and improve lean body mass.²⁰

This study examines the effects of participation in a 2 days/week and 3 days/week BOKS program on anthropometric and social-emotional wellness outcomes among children and adolescents, aged 5-14 years, in Massachusetts. BOKS addresses current barriers to school-based physical activity programming by utilizing a before-school program that does not conflict with academic time and by providing a core curriculum to empower volunteers in leading physical activity opportunities.

METHODS

This nonrandomized controlled trial was conducted in 24 elementary and middle schools in three Massachusetts communities during the 2015-2016 school year (Appendix Figure 1, available online). Study design, eligibility, and recruitment have been

published previously.²⁵ In each school, children whose parents registered them for BOKS participated in a 1-hour, before-school program. Nonparticipating children served as controls. Primary outcomes included students' BMI z-score collected by study staff at baseline and at 12 weeks, and odds of being in a lower BMI category at follow-up. Students aged ≥ 8 years also completed surveys assessing social-emotional wellness. The study was approved by the IRBs of Spaulding Rehabilitation Hospital and Partners HealthCare, Boston, MA. The trial has been recorded with clinicaltrials.gov (NCT03190135).

Study Population

All students in kindergarten to eighth grade (aged 5-14 years) within participating schools were eligible for participation. In partnership with the schools, all students had equal opportunity to participate in the BOKS program and randomization was not feasible. Recruitment occurred in September 2015 and January 2016, with follow-up measures collected in December 2015 and April 2016, respectively.

Parents were notified of the study through a flyer within a packet including BOKS registration and parental consent forms. Parents who registered their children in the BOKS program had the option to voluntarily enroll their child in the study. For students who chose not to participate, parents could consent for participation in the control group. If students consented to study participation and participated in both sessions, only the fall term was included in the analysis. Students were not blinded to study arm because of the nature of participation in the program (i.e., students knew if they were participating in BOKS and how many days per week). Outcomes assessors were also not blinded because of the nature of study data collection sessions (e.g., conducted during a BOKS session or outside of the program).

Students participated in BOKS for 12 weeks. A total of 16 schools administered the program 2 days/week and eight schools administered the program 3 days/week. Program frequency was determined by each district based on feasibility, staffing, and preference. BOKS sessions lasted approximately 60 minutes and started with a warm-up game, transitioned into running, relay races, or obstacle courses, and included a skill of the week (e.g., plank, running, jumping). Volunteers, trained by the BOKS organization in program content and teaching methods, led each of the sessions. The BOKS curriculum has been developed by the BOKS educational leadership team and was not altered for the study. Assessments for fidelity to the BOKS curriculum were implemented to ensure consistency across schools.

Measures

Main outcomes included BMI parameters in all participants and social-emotional wellness and student engagement measures in students aged ≥ 8 years. The authors measured 12-week changes in BMI z-score and the odds of being in a lower BMI category at follow-up. At baseline and at 12 weeks, trained research assistants measured child height and weight without shoes and in light clothing using a Seca scale and a stadiometer. From these measurements, child BMI, and age- and sex-specific BMI z-score and percentile categories were calculated, using the Centers for Disease Control and Prevention guidelines.²⁶ Percentile categories were defined as normal (≥ 5 th to < 85 th percentile), overweight (≥ 85 th to < 95 th percentile), obesity (≥ 95 th percentile)

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