


## **Before the School Bell Rings** **How BOKS Improves Executive Functions**

Researchers and educators continue to raise concern about how schools can balance physical activity with academic instruction. Findings from a three-year study of Build Our Kids' Success (BOKS) by the National Institute on Out-of-School Time (NIOST) strengthen the argument that physical activity can position children to be more ready and alert for learning experiences.




Significant results or promising patterns in effects of BOKS participation on executive functions related to **working memory** and **shift**, which enable children to hold information, complete tasks, carry out instructions, and transition from one task to another.

- Kindergartners who participated in BOKS have significantly improved working memory as compared those who did not participate.
- Kindergartners and second graders who participated in at least one session of BOKS show significant improvement in shift skill; those who did not participate showed decline compared to their peers.
- Research on BOKS suggests that participation is associated with enhanced readiness to learn.
- Consistent participation in before-school physical activity programming not only fosters children's wellness but also can make an important contribution to their school success.



**from BOKS  
to books...  
and more** !

The findings from a three-year study strengthen the argument that **physical activity** can position children to be more ready and **alert for learning** experiences.



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## Study Methods

NIOST studied BOKS from September 2011 through June 2014 in five Natick elementary schools. At the beginning and end of each of the three school years, the researchers collected surveys from teachers and parents of children who did and did not participate in BOKS. Teachers and parents completed surveys in November and April of each of the three years of the study. The survey return rate for teachers during the three study years was more than 96 percent. Parent return rates ranged from 66 percent during the first year to 51 percent during the third year.

Of the 570 students enrolled in the study in Year 1, 136 had registered to participate in BOKS. Most enrolled in BOKS for both the fall and spring sessions. The remaining 434 students comprised the comparison group. In Year 2, the 2012–2013 school year, most students—104 BOKS students and 254 comparison students—remained in the study. NIOST recruited 141 new kindergarten students in fall 2012. No new participants were recruited after the fall of Year 2. For Year 3, the study had 467 participants in grades 1–3. Of these, 167 were enrolled in BOKS. Girls slightly outnumbered boys in both BOKS and comparison groups across all three years, except in Year 2, when 47 percent of the comparison group was girls. Because 92 percent of the school population was white, race was not included in the analysis.

## Findings

In the area of working memory, NIOST found statistically significant correlations between BOKS participation and improvements in working memory for some analysis subgroups. In Year 1, teachers rated kindergarteners ( $N = 134$ ) who participated in BOKS for a full year as significantly improved ( $M = 1.29$ ) in working memory; they did not perceive significant improvement in the non-BOKS kindergarteners ( $M = -0.22$ ). Although teachers did not rate this group of BOKS children, now in first grade, as showing significant improvement in working memory at the end of the year, parents did see significant improvement (BOKS  $M = 0.90$ , non-BOKS  $M = 0.29$ ). In Year 3, first graders who were full-year BOKS participants showed significant improvement ( $M = 0.69$ ) in parents' ratings of their working memory skills, while their non-participating peers ( $M = -0.54$ ) did not. For other years and subgroups, pre- to post-participation change in working memory was not significant.

Year 1 data showed no significant differences in either teachers' or parents' ratings of Behavior Rating Inventory of Executive Function shift skills between pre- and post-test. However, in Year 2, teachers rated second graders who participated in at least one semester of BOKS as showing significant improvement in shift skills ( $M = 0.25$ ) at the end of the year. They rated non-BOKS second graders as having declined ( $M = -0.95$ ) between pre- and post-assessment. Parents also rated BOKS second graders as showing less of a decline in this domain than their non-BOKS peers, though these effects were not significant. In Year 3, parents rated first graders who participated in at least one semester of BOKS as showing significant improvement in shift skills ( $M = 0.94$ ), while their non-BOKS peers declined ( $M = -0.20$ ). Changes in shift skills for other years and subgroups were not significant.

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