

RESEARCH-TO-PRACTICE SUMMARY

Improving Preschool Literacy Skills using Physical Activity.

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Poor early literacy skills and obesity in preschool children have been associated with poor academic achievement later in life. There is limited evidence to suggest a relationship between physical and improved literacy, and decreased obesity in older children (Carlson et al., 2008). However, little is known about the effects of increasing physical activity on literacy skills in preschool children. This article summarizes the effects of academic lessons taught using physical activity on literacy skills of preschool students enrolled in Head Start. The results showed that by increasing physical activity in the preschool classroom, children were more physically active during free play, and showed improvement in literacy skills compared to non-exercising classrooms. Therefore, physical activity academic lessons are cost effective, require minimal teacher preparation, and result in improved academic scores and lower body weight.

There is currently considerable interest in increasing physical activity and improving academic achievement in preschool children. However, concern over meeting academic achievement goals has resulted in the reduction or elimination of physical activity in preschools. Therefore, less than 54% of preschoolers meeting the recommended 60 minutes per day of physical activity (Tucker, 2008). Evidence is available which suggests an association of low physical activity with low academic achievement. Therefore, strategies to increase physical activity and improve academic achievement in preschoolers would be important for long-term health and academic success.

Despite the associations between physical activity-based academic lessons and improved academic achievement, the majority of published research that looked at this relationship (Keays & Allison, 1995) has been conducted primarily with school-age (K-12) children (Castelli, Hillman, Buck, & Erwin, 2007; Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001). There has been very little research focused on physical activities and their association with achievement in preschoolers. The preschool classroom setting such as Head Start provides an ideal opportunity to consistently promote increased physical activity and academic development. Given the large number of children enrolled in preschool programs (over 60% of three to five year olds were served in center-based preschool settings in the United States in 2008 (*America's children in brief: Key national indicators of well-being* 2008) and the importance of improving academic achievement and physical activity, community settings such as Head Start may be the critical environment in which programs came be implemented. Head Start serves millions of children; many of whom include minority families

and other families who live at or below the federal poverty level. These preschoolers are at high risk for poor or delayed academic development. For example, children who read below grade level at the end of elementary school are most often those who failed to develop early literacy skills during preschool (Torgesen, 1998). Furthermore, children growing up in poverty are at risk for lower-than-average levels of academic achievement through primary and secondary grades and are overrepresented in special education classrooms for students with learning disabilities (Gottlieb, Alter, Gottlieb, & Wishner, 1994; Kozol, 1991; Schorr, 1988). Weaknesses in early literacy skills and later reading failure are most common among low-income, non-white children and among children with limited proficiency in English (Hart & Risley, 1995; Snow, Burns, & Griffin, 1998). Therefore, Head Start classrooms are an ideal environment to have an impact on improving academic achievement and to increase physical activity. The association between physical activity and academic achievement provides a unique opportunity to intervene and provide programs that both improve health and academic performance. Integrating physical activity into Head Start preschool classrooms' academic lessons offers an innovative approach to increasing physical activity during the school day without decreasing the time devoted to academics.

The current study examined the effects of a low cost, teacher-directed program that delivered existing lesson plans taught through physical activity in Head Start preschools serving African American children, a group at high risk of poor academic achievement and low physical activity levels.

STUDY INFORMATION

There were a total of fifty-four African American preschool children with the average age of three years, nine months from an urban Head Start program that participated in the six-month study. Within the Head Start program, two Head Start centers totaling four classrooms (two classrooms per center) participated in the study. The Head Start centers were in the same urban city (just 1 mile apart) and managed through a partnership with a local university. One preschool center participated in the physical activity based academic lessons and a second center participated at the control center with no physical activity-based academic lessons. Students were assigned to condition based on the site they attended. Each classroom was staffed with two teachers (one lead teacher, one assistant). There were a total of eight teachers (four lead and four assistants), all of them female. All teachers followed the local Head Start curriculum. Teacher implementation and time spent on curriculum were identical in both preschools as measured by direct observation and teacher report. All available resources such as technology, classroom materials, and teacher training were identical across classrooms. Both centers followed the same curriculum and were expected to monitor child progress toward outcomes as monitored by the Head Start Child Development and Early Learning Framework (2010).

During the first three months, a member of the research team performed daily observations, feedback and support to ensure the physical activity based academic lessons were being administered correctly and to monitor compliance. During months four through six there was no contact between the investigators and the teachers. The limited contact was done to evaluate if there was a continuation effect in which the physical activity-based academic lessons continued to be used by teachers without ongoing support and feedback by the research team.

Early literacy and language were measured using the Early Literacy Individual Growth and Development Indicators (IGDI - Research and development of individual growth and development indicators for children between birth and age eight; Tech. Rep. No. 4, 1998). Three IGDI are commonly used as indicators of children's language and literacy development in preschool programs. These three measures, *Picture Naming* assessment of expressive language development, *Rhyming* assessment of phonological awareness, and *Alliteration* assessment of phonological awareness (specifically letter sound identification), were each developed by researchers at the University of Minnesota under the support of the Early Childhood Research Institute on Measuring Growth and Development.

Physical activity levels during free play were measured using the System for Observing Fitness Instruction Time (SOFIT) to determine if increasing physical activity in the classroom increased physical activity throughout the day. Physical activity levels of students were recorded using a Likert-type scale (e.g. 1 = lying down, 2 = sitting, 3 = standing, 4 = walking, 5 = jogging/running). During the first three months observers conducted SOFIT observations in all of the intervention and control classrooms five days per week to determine student activity intensity levels. In months four through six staff conducted SOFIT observations one day per month in both the intervention and control classrooms and all teachers in each Head Start center.

RESULTS

The results indicated that adherence to the program was greater than 95%, meaning that students were obtaining half (30 minutes) of the daily 60 minutes/day of recommended structured physical activity during SOFIT observations, staff also indicated the level of participation by teachers during an active lesson. Overall teacher participation was related to SOFIT scores for students in the intervention schools but not the control schools.

Rhyming significantly improved in the physical activity group from the beginning of the study (less than one correct response in two minutes) to six months (three correct responses in two minutes) compared to the non-activity group (less than one correct response up to two correct responses in two minutes). Higher scores for alliteration and rhyming indicate greater early literacy skills and phonological awareness. Alliteration (letter sound identification) significantly improved in the physical activity group from the beginning of the study (less than one correct response in two minutes) to six months (two correct responses in two minutes) compared to non-activity group (less than one correct response at both the beginning of the study as well as at six months).

Students at the intervention site performed significantly greater levels of physical activity in the classroom than students at the control site at three and six months. Preschoolers at the control site were primarily sitting during lesson plan activities, whereas students in intervention site were primarily moving during lesson plan activities.

At the end of the study we gathered information from the teachers regarding the perception of the program and the likelihood that the program could be adopted into a preschool classroom. In general, teachers reported that the program was easy to implement, children enjoyed the program, had a positive influence on the children learning and helped them focus better. Most encouraging, the teachers indicated that they would have their class participate in the physical activity program again.

DISCUSSION AND IMPLICATIONS FOR PRACTICE

To our knowledge this is the first study to indicate that a teacher-directed physical activity program in a Head Start center serving African American preschoolers is effective at increasing physical activity and improving measures of early literacy. It appears that physical activity can be maintained for at least three months without direct supervision with the potential for improving early literacy development. The teachers indicated that they felt the program was easy to administer, enjoyable, and made an impact on children's learning in the classroom. Results from this study suggested that a physical activity program that was incorporated within the preschool classroom improved early literacy and was maintained even after there was no contact between the investigators and teachers. The physical activity lessons may provide an important strategy to improve early literacy in at-risk preschoolers.

For those currently practicing in the field, the implications from this study are that teachers play a critical role in promoting physical activity throughout the day for children in their classroom. By combining physical activity with lesson plans, teachers can work on both cognitive skills and physical activity, engaging children in ways that keep them active during the learning process. Also, the program described is low-cost, with the primary materials being the lesson plans that teachers already had completed, and CD player to allow for increased music and movement activities during circle and other times of the day.

Specific suggestions for teachers include incorporating games such as Simon Says that target children's abilities to follow directions, while including commands such as "Simon Says hop 5 times like a rabbit (numbers and movement combined in one command). Another activity includes "Moving with Numbers" which has children choose a number and then an activity to go with it. For example, Jackie chooses the number 4 and the children touch their toes 4 times, moving up and down each down, which also helps children learn directions (up, down). Other popular activities were "Animal Action Fun" and "Follow the Leader Marching Game". With these activities, children would move like animals (animal name and animal sound recognition) and following the chosen physical movement of the leader (for example, three jumping jacks) which targets listening and following directions. Teachers are encouraged to expand on activities they already use while incorporating physical movements at the same time.

One of the major advantages of the physical activity program is it is a minimal intervention that can be easily implemented, requiring minimal change to the current curriculum, few additional supplies (if any), and minimal cost to schools.

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