

# Increasing Physical Activity in Preschool: A Pilot Study to Evaluate Animal Trackers

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## ABSTRACT

**Objective:** This report describes a pilot study to evaluate Animal Trackers (AT), a preschool program designed to (1) increase structured physical activity (PA) during the preschool day; (2) increase practice of gross motor skills; (3) provide teachers with an easy-to-use PA program regardless of teacher experience; and (4) implement a teacher walking intervention.

**Design:** Pilot observational study in volunteer preschools.

**Setting:** Nine preschools in New Mexico.

**Participants:** Two-hundred seventy 3- to 5-year-old children and 32 teachers.

**Intervention:** Daily 10-minute classroom activities for children.

**Main Outcome Measure:** Implementation and duration of AT activities, teacher preparation time, and added weekly time spent in structured PA.

**Analysis:** Process evaluation to track program implementation, and pre-post measures to assess outcomes.

**Results:** AT activities were implemented 4.1 times per week (11.4 minutes/activity), with 7 minutes teacher preparation time. Overall, AT added 47 minutes of structured PA per week for children.

**Conclusions and Implications:** The AT program increased structured PA time in preschools. Teachers felt that AT was developmentally appropriate; that children enjoyed the activities; and that the children's motor skills improved. Results of the pilot study are encouraging, since research suggests that even small increases in PA could help prevent obesity.

**Key Words:** children, physical activity, preschool, curriculum, school health (*J Nutr Educ Behav.* 2009;41:47-52.)

## INTRODUCTION

Studies suggest that participation in enjoyable physical activity (PA) behaviors and mastery of basic gross motor skills in early childhood can provide a foundation for lifelong enjoyment of daily PA and fitness activities.<sup>1-4</sup> Further, Piaget's theory suggests that children from 2 to 7 years old, in the pre-operational stage of cognitive development, learn to use language, represent objects by images and words, and classify objects.<sup>5-7</sup> At this stage, a child is not yet able to

conceptualize abstractly and needs concrete physical situations to understand concepts. The Animal Trackers (AT) preschool intervention considers a child's developmental stage by linking structured physical movement with various preschool learning constructs to form an integrated curriculum, as suggested by Beane.<sup>8</sup> This concept, first tested in early childhood settings in the mid-1970s, focused on the impact of integration on learning.<sup>9</sup>

Guidelines for preschool movement programs have been published

by the National Association for Sport and Physical Education (NASPE) and the National Association for the Education of Young Children (NAEYC).<sup>10-12</sup> These recommendations are based on 6 core principles: (1) quality daily movement programs should be available to all preschool children; (2) preschool children are different from elementary school-aged children; (3) young children learn through interaction with their environment; (4) teachers of young children are guides or facilitators; (5) young children learn and develop in an integrated fashion; and (6) a combination of play, along with planned or structured movement experiences designed to develop gross motor skills, is most beneficial in assisting young children in their development. National Association for Sport and Physical Education guidelines recommend 30 minutes of structured and 60 minutes or more of unstructured PA each day, as well as activities aimed at competence in motor skills that are basic to developing more complex movement

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tasks.<sup>10</sup> The structured activities contained in the AT intervention are designed to help children accomplish the national recommendations and assist them in mastering basic gross motor skills.

The need to increase physical activity among children in the United States has also gained urgency over the past decade as rates of childhood obesity have increased. The increase is evident in preschool children as well as older children and adolescents. Data from the NHANES 2003-2004 survey show that 13.9% of children from 2 to 5 years old are now overweight (body mass index [BMI]  $\geq$  95<sup>th</sup> percentile) compared with only 5% in the NHANES I survey (1971-1974).<sup>13,14</sup> The adverse health effects of obesity, evident even among preschool children, include elevated blood pressure, low levels of HDL cholesterol, and higher levels of triglycerides, insulin, and C-reactive protein.<sup>15-20</sup>

Treatment of childhood obesity, even in young children, is often unsuccessful; therefore, prevention beginning early in life is an important public health goal. Most excess weight gain results from an imbalance between energy intake (diet) and energy expenditure (primarily physical activity), thus prevention strategies have focused on these modifiable variables. The Centers for Disease Control and Prevention (CDC) issued guidelines (1997) for school and community programs to promote PA among youth,<sup>21</sup> and in 2002, the NASPE issued PA guidelines for preschoolers, aged 0 to 5 years.<sup>10</sup>

The literature supporting these guidelines is derived from studies linking low levels of PA and a sedentary lifestyle in young children to increasing adiposity and subsequent obesity. Berkowitz et al found that adiposity in 4- to 8-year-old children was inversely correlated with high daytime PA as measured by motion sensors.<sup>22</sup> Mo-suwan et al found that compared with children with high exercise rates, preschool children with low exercise rates were 2.6 times more likely to be obese.<sup>23</sup> Metallinos-Katsaras et al examined the association between PA, measured by accelerometer for 7 days, and BMI in 56 preschool children.<sup>24</sup> Results showed that overweight children (BMI  $\geq$  85<sup>th</sup> percentile) spent significantly less

time in *very vigorous* PA compared with normal weight children (2.6 vs 4.6 minutes). Similar findings have been reported in longitudinal studies. Klesges et al followed preschool children for 3 years and found that a higher levels of baseline PA and increasing leisure time PA were both associated with less subsequent weight gain.<sup>25</sup> Also, modifiable variables (eg, PA and dietary intake) accounted for more of the variance in BMI change than nonmodifiable variables (eg, number of obese parents). Moore et al followed 3-5 year olds to age 5-6 years and found that when age, television viewing, energy intake, baseline triceps thickness, and parental BMI were controlled for, inactive preschool children with low levels of PA (measured by accelerometer) were 3.8 times more likely to have increasing body fatness, compared with more active children.<sup>26</sup> Jago et al found that PA and television viewing were the only significant predictors of BMI among 3- to 4-year-old children followed for 3 years.<sup>27</sup> Both PA (negatively associated) and television viewing (positively associated) became stronger predictors as the children aged.

A few intervention studies have attempted to increase PA and decrease inactivity in preschool children with the goal of preventing obesity. Mo-suwan et al reported on a 29-week intervention (a 15-minute morning walk and 20-minute afternoon dance), which resulted in a greater decrease in triceps skinfold thickness for intervention children versus controls.<sup>28</sup> Dennison et al conducted a 7-session intervention of weekly PA, healthful snacks, and education.<sup>29</sup> Intervention children reported 3 fewer hours of television/video per week but did not differ from controls in adiposity. Finally, Reilly et al conducted a 12-month PA intervention among 545 children in 36 preschools, which resulted in significant increases in motor skills but no reduction of BMI among intervention children.<sup>30</sup> In each study, however, duration and intensity of PA interventions varied greatly.

The present 10-week intervention evaluated the feasibility adding 10 minutes of structured PA and motor skills training into the usual preschool day in a population of low-income preschool children.

## DESCRIPTION OF THE INTERVENTION

### Development of the Animal Trackers Curriculum

The Animal Trackers (AT) curriculum is a developmentally appropriate preschool PA program designed to integrate structured movement and motor skills practice with preschool learning concepts. A basic premise of the program is that mastery of motor skills and early adoption of healthful lifestyles by preschool children may result in good health maintenance and prevent the development of obesity and risk factors for chronic disease later in adult life.

Funded by a seed grant from the International Life Sciences Institute, AT was developed over several years by an interdisciplinary team, including several of the authors (CW, BJC), in consultation with childhood movement specialists and educators. During development of the AT curriculum, individual units were tested in preschool centers of varying size and ethnic/economic status in New Hampshire, New York City, and Georgia. Feedback from teachers and administrators was instrumental in making revisions and enhancements.

The goal of the AT curriculum is to incorporate 10-minute periods of structured PA in the preschool classroom, promote gross motor skill development, and enhance comprehension of preschool learning concepts. The activities build on mechanisms by which young children learn, integrating auditory, visual, and kinesthetic learning methods. Animal Trackers was designed to be developmentally appropriate for 3- to 5-year-old children, and compatible with PA and gross motor skills acquired during this age range. The primary focus is on mastery of gross motor skills (eg, jumping, throwing, kicking, and balancing) that preschool children gradually acquire with guidance. Animal Trackers activities also build on young children's natural urge to imitate the behavior of others.

Animal Trackers consists of 10 units, each with six 10-minute classroom PAs developed around a gross motor skill or set of motor skills. Each unit features a different animal, for example, Unit 1 is Creeping and

Crawling with Lenny the Lizard. Preschool learning concepts (eg, colors, shapes, letters, and numbers) and linked nutrition education ideas are also integrated into each activity. Program materials include a compact disc (CD) that features songs used in the various activities. Table 1 summarizes the AT units and activities.

### Program Implementation in New Mexico

A pilot study of the AT curriculum was conducted in the spring of 2003 to evaluate implementation of the AT curriculum in preschool centers serving low-income, minority children. Primary objectives were to (1) increase the amount of time spent in structured PA during preschool; (2) encourage practice and improvement of gross motor skills (eg, jumping, throwing, hopping); and (3) provide teachers with an easy-to-use PA promotion program regardless of teacher experience. A secondary objective was to implement a teacher walking intervention to complement the children's PA program.

**Population.** The AT program was implemented in 9 Head Start centers in New Mexico, which were all of the centers in the United States Department of Health and Human Services, Region 6. All 9 centers were invited and agreed to participate in the pilot study. Overall, 270 students and 32 classroom teachers in 4 New Mexico

counties participated: 3 centers each in Otero and Luna, 2 in Hidalgo, and one in Sierra. The average classroom size was 16.7 students with 2 teachers. Teachers averaged 6 years of teaching experience, with a range of < 1 to 17 years. Mean age of the children was 4.6 years at the beginning of the intervention (range 3-5 years), half male and half female. Ethnicity of the students was 74% Hispanic or Latino, 15% white, 8% bi- or multiracial, and 2% African American. This study was approved by the Institutional Review Board of the International Life Sciences Institute.

**Teacher training.** A 1.5-hour teacher training was held a week before beginning the AT intervention. Teacher training was conducted by an author (DLK) and a health education specialist, both of whom are experienced in the area of PA integration. Teacher training included curriculum overview and role playing of activities, preschool motor skill competence and importance of structured PA, and evaluation requirements.

**Teacher walking intervention.** A secondary program objective was to increase daily walking steps by teachers to increase awareness of personal PA patterns and healthful goals. Omron HJ 105 (Omron Healthcare, Kyoto, Japan) pedometers were distributed at the teacher training, with explanation of setup, use, and record keeping. Teachers were encouraged to gradually

increase daily step counts, but specific goals were not specified. A pretest survey had teachers estimate the days per week they participated in 4 types of PA: sports, stretching, toning, and walking or riding a bicycle. Posttest surveys were administered the last week of the intervention.

### DESCRIPTION OF THE EVALUATION AND OUTCOMES

The primary goal of the 10-week pilot project was for teachers to implement 1 AT activity per day in each classroom, thus increasing the amount of time preschool children spent in structured PA by 50 minutes per week. Implementation of the AT classroom activities was assessed by review of the AT unit evaluation forms completed and submitted by teachers on a weekly basis. Small incentives were provided to teachers for submitting the completed weekly evaluation forms. All 16 classrooms provided evaluations that were analyzed to determine the frequency and duration of the activities along with the preparation time. Teachers' perception of the activities as it related to willingness and enjoyment of implementation and efficiency of curriculum integration was also assessed. Since not every classroom completed all 10 AT unit evaluations, the 12 classrooms with 100% reporting were used in the analysis to determine the frequency of implementation and best capture the

**Table 1.** Animal Trackers (AT): Curriculum Units, Sample Activities, and Learning Strategies

Unit	Title	Sample Activity and Learning Strategies <sup>a</sup>
1	Creeping and Crawling with Lenny the Lizard	A Creep, Creep Here and a Creep, Creep There – <i>rhythm and music to learn creeping skill</i>
2	Walking and Marching with Dara the Duck	Follow That Duck – <i>cooperative learning and understanding directions</i>
3	Running with Chuck the Cheetah	Run Across America – <i>visualization, guided imagery to explore concept of geography</i>
4	Jumping and Hopping with Kate the Kangaroo	Rabbits and Roos – <i>reciprocal teaching and directed movement</i>
5	Galloping with Harry the Horse	A Horse Story – <i>storytelling and role playing</i>
6	Throwing and Catching with Maria the Monkey	Bounce and Catch – <i>peer cooperation and mnemonic language skills</i>
7	Kicking with Marty the Mule	An Obstacle Course, of Course! – <i>directed movement</i>
8	Rolling with Danny the Dog	Puppy Dog Rolls – <i>rhythm and music to learn rolling skill</i>
9	Balancing with Buddy the Bear	Counting Buddy's Body Parts – <i>anatomy and brainstorming</i>
10	Animals on Parade	Animal Associations – <i>cooperative learning and categorizing</i>

<sup>a</sup>The complete Animal Trackers curriculum is available at <http://www.Healthy-Start.com>.

**Table 2.** Animal Trackers (AT) Classroom Activities Implemented, by Chapter and Activity

	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5	Activity 6	Chapter Totals (mean, SD)
Chapter 1	13	9	7	12	9	8	58 (9.7, 2.3)
Chapter 2	12	12	9	11	9	5	58 (9.7, 2.7)
Chapter 3	12	10	10	8	4	3	47 (7.8, 3.6)
Chapter 4	13	8	11	9	11	7	59 (9.8, 2.2)
Chapter 5	12	9	9	8	6	3	47 (7.8, 3.1)
Chapter 6	12	6	12	7	7	6	50 (8.3, 2.9)
Chapter 7	12	9	10	8	3	5	47 (7.8, 3.3)
Chapter 8	13	9	12	6	3	3	46 (7.7, 4.4)
Chapter 9	10	7	9	6	8	3	44 (7.3, 2.2)
Chapter 10	10	6	9	3	7	4	39 (6.5, 2.7)

SD indicates standard deviation.

Total number of activities implemented in all 10 chapters = 495 over the 10-week intervention.

Note: N = 12 classrooms with complete reporting.

Each of the 10 chapters in Animal Trackers includes 6 activities targeting a specific gross motor skill or combination of skills.

Overall, 495 AT activities were implemented during the 10-week program.

Some activities could be repeated more than once if requested by the children.

overall program implementation at the classrooms level. A chi-square analysis found no significant demographic or implementation pattern differences among the 12 classrooms with complete reporting versus the other 4 with incomplete reporting.

Each of the 10 AT units includes 6 individual activities relating to the targeted PA and motor skill objectives integrated with learning constructs. In the 12 classrooms with complete reporting, the total number of activities implemented during the 10 weeks was 495. The average classroom implemented the program an average of 4.12 times per week with each classroom having implemented 41.25 activities during the 10 weeks. A chi-square analysis was performed (SPSS, version 12.0, SPSS Inc., Chicago, IL,

2004) to determine if any demographic or implementation differences existed between the classrooms reporting on each of the chapter evaluations and those who did not, and no significant differences were observed. The activity implementation by chapter and activity is summarized in Table 2.

Teachers were asked to implement at least 1 AT activity each school day with the understanding that each activity should last for a minimum of 10 minutes to allow for adequate demonstration and practice of the targeted gross motor skill, or combination of skills. The average duration for the 495 activities implemented was 11.4 minutes (SD 1.7), as summarized in Table 3.

The mean value for implementation of the program was 4.12 times per class-

room per week; the mean total for the 10 weeks was 41.25 activities per classroom. Overall, the average amount of time spent per week engaged in structured physical activity was 47 minutes (program goal was 50 minutes). The 50-minute goal was based on a 5-day school week; however, 4 of the 9 preschool centers were operating on a 4-day school week. Thus, taking the 4-day school week into consideration, the majority of classrooms did implement one AT activity per day.

Teachers reported that preparation time for AT classroom activities ranged from 5.3 to 10.8 minutes (mean 7.23; SD 1.2). A chi-square test revealed that there was no significant difference in preparation time for teachers with more versus fewer years of teaching experience.

**Table 3.** Average Duration of Activities in Each Chapter of the Animal Trackers Program (minutes per activity)

	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8	Ch 9	Ch 10	AllMean (SD)
Activity 1	9.8	9.6	9.6	9.8	11.2	10.7	11.3	8.9	11.0	13.0	10.5 (1.2)
Activity 2	11.0	9.8	11.0	10.6	12.2	9.7	10.6	10.0	9.0	9.0	10.3 (1.0)
Activity 3	13.3	11.8	15.0	10.4	10.3	10.8	11.7	10.1	10.4	11.4	11.5 (1.6)
Activity 4	10.7	10.5	11.4	12.2	13.7	10.4	11.3	12.1	9.8	16.3	11.8 (1.9)
Activity 5	10.6	10.6	10.0	10.9	11.1	14.7	10.0	15.0	12.7	12.1	11.8 (1.8)
Activity 6	10.3	12.0	10.0	10.0	13.3	11.3	15.0	13.3	11.8	16.0	12.3 (2.1)
Mean-All (SD)	11.0 (1.2)	10.7 (1.0)	11.2 (2.0)	10.7 (0.9)	12.0 (1.3)	11.3 (1.8)	11.3 (1.7)	11.6 (2.3)	10.8 (1.3)	13.0 (2.8)	11.4 (1.7)

Ch indicates Chapter in the Animal Trackers curriculum; SD, standard deviation.

Teachers were also asked to comment on recommending the program to other teachers, effectiveness of curriculum integration, ease of following instructions, and if the music tape complemented the activities. Each of the 4 questions was presented in a 5-point Likert scale format from 5 = strongly agree to 1 = strongly disagree. Mean scores for 3 of the 4 questions were 4.2, suggesting that teachers: (1) would recommend the program to other teachers; (2) felt that the program effectively integrated PA and academics; (3) thought the instructions were easy to follow; and (4) to a slightly lesser degree (mean score 3.9), felt that the music complemented the activities.

### OUTCOME OF TEACHER WALKING INTERVENTION AND PA SURVEYS

All 32 teachers participated in the teacher walking intervention and tracked their daily step counts for 11 weeks with a pedometer. Baseline mean step counts during week 1 (baseline) were compared to subsequent 10-week mean step counts (intervention). Only 19 (59%) teachers returned their step tracking sheets at the end of the study, however. For these teachers, the mean step count for the first week (baseline) was compared with the subsequent 10 weeks in a 1-sample *t* test. The baseline mean step count of 6165 (SD 1029) was not significantly different from the subsequent mean count of 6549 (SD 983) ( $P =$  non-significant; at .05 significance level, 11 df).

All 32 teachers completed the baseline teacher PA survey, and 17 (53%) returned the postintervention survey on which they estimated the number of days per week they participated in 4 types of PA: sports, stretching, toning, and walking or riding a bicycle. For the 4 activities combined, the mean days per week at pretest was 2.2 and at postintervention was 3.3, a significant difference between pre- and posttest scores ( $P = .003$ ; 1-sample *t* test). Each individual type of activity increased in frequency by about once a week, suggesting that teachers were more active during implementation of the AT curriculum.

### DISCUSSION

This report describes a pilot study to evaluate the feasibility of implementing a new preschool physical activity and motor skills curriculum, Animal Trackers, in 9 Head Start centers. The goals were to increase the amount of time children spent in structured PA during the school day; include practice and improvement of gross motor skills; provide staff with a user friendly PA program requiring minimal preparation time or equipment; link the PA activities with related preschool educational content; and positively impact teacher physical activity time.

Results showed that on average, children participated in almost an hour a week of additional structured physical activity. Many of the activities in the AT curriculum were designed for moderate-to-vigorous or vigorous PA, although for individual children, outcomes could vary significantly depending on teaching style, child characteristics, and physical environment. It is reasonable to question whether an hour of additional physical activity per week for preschool children could help prevent obesity. Some evidence suggests that it could. In Metallinos-Katsaras's study, overweight children on average spent only 9.2 minutes *less* per day of vigorous and very vigorous PA compared with normal weight children.<sup>24</sup> More research would be helpful, however, to better define the optimal dose of PA for preschool general health, as well as for obesity prevention. School policies and practices have been shown to have an important influence on the activity levels of preschool children. Pate et al used accelerometers to measure PA for 6 or 7 days in 281 children and found that the preschool the child attended was a significant predictor of vigorous and moderate-to-vigorous PA (MVPA).<sup>31</sup> Among the 9 schools studied, time spent in MVPA varied from 4.4 to 10.2 minutes per hour. Finn et al reported similar findings after measuring PA by accelerometer for 2 days in 214 children aged 3 to 5 years attending 10 preschools.<sup>32</sup> Again, the child care center attended by the child was the highest individual predictor of activity level. Thus, efforts to influence preschool policies and daily practice routines may be a critical

component of efforts to ensure permanent increases in preschool PA.

In the present study the intervention aimed to change the daily practice routine of preschool teachers to add an additional 10 minutes of structured PA and gross motor skills practice to the classroom schedule. Since the preschools were in session 4.5 days a week, the added 47 minutes per week of structured PA achieved the desired goal. Physical activity levels were not measured directly, and changes in motor skills were not assessed in this pilot study owing to funding restraints and the relatively brief 10-week intervention. In their evaluations, however, preschool teachers reported that classroom activities were age- and developmentally appropriate, that children enjoyed the activities, and that the children's motor skills seemed to improve with practice.

### IMPLICATIONS FOR RESEARCH AND PRACTICE

Programs that include regularly scheduled indoor and outdoor play activities with ample opportunity to learn and practice movement and motor skills are most likely to be beneficial in helping children develop better gross motor skills and enhance enjoyment of PA. In addition, a growing body of literature suggests that increasing young children's PA and active play may be effective in helping prevent the early onset and progression of obesity. Future research is needed to evaluate the effects of the AT curriculum after a full school year with direct measurement of PA and assessment of targeted gross motor skills at pre- and posttest.

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