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Journal of Early Intervention 2009 31: 126
DOI: 10.1177/1053815109331858

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>> Version of Record - Mar 19, 2009
What is This?
Effects of Teacher-Encouraged Physical Activity on Preschool Playgrounds

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Increased numbers of young children who are overweight have become a significant health problem in the United States. Public health investigators have hypothesized that increased caloric intake and low levels of physical activity may be associated with the troubling trend of weight problems among children. To enhance preschool children’s moderate to vigorous physical activity on playgrounds the authors develop, implement, and evaluate two practical teacher-implemented activities. Direct observations of five children in two preschool programs during teacher-implemented activities indicate increased moderate to vigorous physical activity on intervention days relative to nonintervention days (i.e., business-as-usual conditions). The results and implications for preschool practitioners are discussed.

Keywords: preschool children; physical activity; sedentary activity; direct observation; physical activity intervention; outdoor play

During the past several decades in the United States, childhood obesity rates have increased significantly, and many children are becoming overweight at younger ages. Ogden and colleagues (2006) reported that the prevalence rate of at-risk for overweight (i.e., ≥85th percentile) among 2- to 5-year-old children in the United States was more than one in four children, and during the past half decade the rate increased by more
than 4%. Moreover, early weight problems may restrict young children’s physical activity, further affecting their future weight status (e.g., Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003), and children’s weight problems predict adult obesity (e.g., Baker, Olsen, & Sorensen, 2007; Guo, Wu, Chumlea, & Roche, 2002). Finally, African American, Hispanic, and low-income children have even higher prevalence rates for childhood obesity than the general population (e.g., Haas et al., 2003; Sherry, Mei, Scanlon, Mokdad, & Grummer-Strawn, 2004).

Obesity has been associated with multiple health-related difficulties, including coronary heart disease, hypertension, type II diabetes, and some types of cancer (e.g., Blair & Brodney, 1999; Lopez & Murray, 1998; Must et al., 1999). Public health researchers have theorized that the increased frequency of obesity has been related to both increased caloric intake in contemporary diets (e.g., fats, sugars) and physical inactivity (e.g., Biglan, 2004; Popkin, 2007; Troiano & Flegal, 1998). Given these troubling health trends, the United States Department of Health and Human Services (2000), the Council on Sports Medicine and Fitness and Council on School Health (2006), and former Surgeon General Richard H. Carmona (2005) have declared that prevention of childhood obesity is a major health concern in the United States. In addition, recently, early childhood professionals such as Story, Kaphingst, and French (2006) and Krishnamoorthy, Hart, and Jelalian (2006) have recommended policy and practice research to focus on issues related to the children’s overweight problems.

Along with the troubling weight trends in children, the number of young children served in community-based programs has increased steadily across the past several decades (Fuligni, Brooks-Gunn, & Berlin, 2003; Kagan & Newman, 2000). National estimates have indicated that more than 4.5 million preschoolers (i.e., 3-, 4-, and 5-year-old children not enrolled in kindergarten) have been served in preschools in the United States (Federal Interagency Forum on Child and Family Statistics, 2007). The significant numbers of children enrolled in community-based programs and young children’s emerging weight trends make those out-of-home settings especially important preventive contexts for efforts related to enhancing their health in general and their physical activity in particular (cf. Brown et al., 2009; Pate, McIver, Dowda, Brown, & Addy, 2008). Indeed, Barnett, O’Loughlin, Gauvin, Paradis, and Hanley (2006) recently argued that schools may be excellent settings for improving children’s physical activity, and they asserted that children’s positive physical activity experiences in schools may promote future favorable health behaviors and attitudes about physical fitness (cf. Bandura, 2004).

Currently, we have general information about demographic variables (e.g., gender, ethnicity, and age) and global setting factors (e.g., indoor vs. outdoor) associated with young children’s physical activity in preschools (cf. Fulton et al., 2001; Oliver, Schofield, & Kolt, 2007; Pate, 2001). Nevertheless, well-specified contextual information about moment-to-moment factors such as indoor and outdoor activity contexts and teacher-arranged activities to promote physical activity has been noticeably lacking (Bower et al., 2008; Brown et al., 2006; Brown et al., 2009).

Investigators using several descriptive methods (i.e., accelerometry, direct observation, energy expenditure measures) have shown that typically preschool children’s physical activity in community-based programs is characterized as primarily sedentary
(e.g., Baranowski, Thompson, DuRant, Baranowski, & Puhl, 1992; McKenzie et al., 1997; Noland, Danner, DeWalt, McFadden, & Kotchen, 1990; Pate et al., 2008; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004; Reilly et al., 2004; Sallis, Patterson, McKenzie, & Nader, 1988). Indeed, descriptive findings of frequent sedentary behavior have become a commonly replicated finding for preschool children in many programs (see Oliver et al., 2007, for review of 49 preschool studies). For example, recently, in two different samples, Pate and colleagues (2004, 2008) found that preschool children participated in less than the recommended physical activity during the preschool day. Moreover, with direct observation and a sample of 372 young children from 24 preschool programs (i.e., Church-affiliated preschools, child care centers, Head Start Programs) who were observed in two waves of data collection for an average of 34 min per child during their outdoor play periods, Brown and colleagues (2009) determined that the children spent the majority of their recess in sedentary activity ($M = 56\%$ of the intervals) and only $17\%$ of their time in moderate to vigorous physical activity. Dowda, Pate, Trost, Almeida, and Sirard (2004), Dowda et al. (2008), and Bower et al. (2008) have also shown that children’s physical activity levels varied, depending on both general and specific qualitative dimensions of the preschools. Pate and colleagues (2004, 2008) have concluded that yet to be determined day-to-day policies and practices might be influential in affecting children’s rates and levels of physical activity in preschools. In addition, Brown and colleagues (2006, 2009) have reported that preschool teachers rarely encouraged or used teacher-arranged physical activities to promote children’s physical activity, even during outdoor playtime.

Systematic observations have indicated that many young children do not participate extensively in moderate to vigorous physical activity in preschool settings (e.g., McKenzie et al., 1997; Pate et al., 2004), even during outdoor play periods (e.g., Brown et al., 2009; Sallis et al., 1988). To date, however, empirically validated interventions that focus on how to enhance children’s physical activity in preschools have been scarce (cf. Brown et al., 2009; Fulton et al., 2001; Pate, 2001; Reilly et al., 2006). If children’s health and physical well-being constitute an important developmental dimension, then enhanced rates of moderate to vigorous physical activity may be especially important to promote preschoolers’ physical fitness and general health. The purpose of our research was to develop, implement, and begin to empirically validate acceptable and feasible teacher-implemented interventions to enhance young children’s moderate to vigorous physical activity on playgrounds (cf. West, Brown, Grego, & Johnson, 2007).

**Method**

We used similar intervention procedures in two studies during 3 school years with five preschool children in two preschools in Columbia, South Carolina. Specifically, Study 1 was performed with two children in the spring of 2006 and another child in the fall of 2006. Study 2 was conducted with two children in the fall of 2007. Basic study procedures will be delineated in the subsection for Study 1, and similarities and differences in methods will be presented in a General Procedures subsection in Study 2.
Method for Study 1

Intervention development. Prior to the formal study, the first author consulted with an interested preschool teacher to develop two teacher-implemented physical activity interventions that she believed may be motivating and fun for young children and that might increase and maintain their physical activity at moderate to vigorous levels for sustained albeit relatively brief periods during outdoor play. The two activities were “Track Team,” which consisted of jogging around the playground with teachers and peers, and “Dance Party,” which entailed dancing to high-energy preschool music with teachers and peers in a specified area of the playground.

The teacher-implemented interventions developed included a modified “Plan, Do, and Review” process similar to the High Scope curriculum but altered to focus on children’s moderate to vigorous physical activity (cf. Hohmann, Banet, & Weikart, 1979). Specifically, teachers and children planned the physical activity (“Plan Dance Party”), performed it (“Do Dance Party”), and then briefly discussed the activity afterwards (“Review Dance Party”). The teacher-implemented procedures were also similar to friendship activities with two primary implementation components: (a) teacher-led large group guided discussion about the importance of moderate to vigorous physical activity for health and well-being (e.g., “To build a strong and healthy heart!” “To make us strong!”) as well as the rules for activities (e.g., “Keep your hands to yourself while running,” “Don’t push friends while dancing”) and (b) teacher participation in the physical activity with frequent encouragement and acknowledgement of children’s active engagement in moderate to vigorous physical activity (cf. Brown, Ragland, & Fox, 1988). The physical activity intervention was a classwide activity with all children encouraged but
not required to participate during playground implementation (see Table 1 for intervention components).

**Participants and settings.** Participants in Study 1 were three preschool children enrolled in a university-affiliated childcare center. Specifically, 16 preschoolers 4 years old and their lead and assistant teachers in two classrooms participated in the study. The children appeared to have age-appropriate skills in all major developmental domains, including motor and physical development. No further developmental information was collected or available for participants in Study 1. The lead teachers in the two classrooms had 4-year college degrees, and the assistant teachers had 2-year college degrees in early childhood education or a related area. The outdoor play space was a modern and well-equipped playground with fixed children’s equipment (e.g., slides, sandbox, monkey bars, swings), portable equipment and materials (e.g., tricycles, balls, small trucks), and significant open space (i.e., total area of 193 feet by 149 feet). Two 30-min outdoor play periods were scheduled daily, one in the morning and one in the afternoon.

Teachers in the two classrooms selected three focal children for direct observation of the preschoolers’ levels of physical activity during nonintervention and intervention play periods on the playground. Although the teacher-implemented intervention was a classwide intervention, only the physical activity of the three focal children was observed systematically during nonintervention or intervention play periods. Hence, the three participants represent a sample of convenience without any additional exclusionary or inclusionary criteria. Two children’s playground observations (i.e., Amy and Claire) were conducted during the spring of 2006, and the other child’s observations (i.e., Bill) were performed during the fall of 2006. Because McKenzie et al. (1997) and some of our previous descriptive work has shown that children are generally most active earlier during outside play periods, throughout the study, both nonintervention and intervention sessions were held after 5 min of children transitioning onto the playground.

**Nonintervention procedures.** During baseline play periods, children participated in their normal morning or afternoon recess (i.e., “business as usual conditions”), which included free access to playground equipment, materials, and child-initiated play activities on the playground with occasional social interactions with teachers and peers. Teachers were asked to perform their routine playground duties, which included monitoring and supervising children’s activities and occasional interactions with others. Throughout the study, all the nonintervention and intervention playground observations for Amy and Claire, who were enrolled in one classroom, were conducted in either the morning (i.e., between 9:30 a.m. and 10:30 a.m.) or the afternoon (i.e., between 3:00 p.m. and 4:00 p.m.) play periods 3 or 4 days a week. All playground observations for Bill, who was enrolled in another classroom, were performed during his afternoon play periods (i.e., between 3:00 p.m. and 4:00 p.m.) 3 or 4 days a week. Typical teacher behavior on the playground before intervention and during nonintervention play periods was to assist some children in obtaining materials from a shed (e.g., bikes, scooters) at the beginning of recess and then monitoring children’s outdoor behavior to ensure safety while intervening to prevent any negative child interactions. Teachers rarely initiated interactions with children and often talked among themselves during play periods. No discernible and formalized staffing pattern was implemented during recess (e.g., zone vs. man to man).
Intervention procedures. On intervention days, except for the initial intervention day for Amy and Claire, intervention procedures included several components that were packaged and labeled enhanced intervention on Amy and Claire’s graphs (see Figure 1). Specifically, following an indoor guided discussion about the importance of physical activity, the children transitioned onto the playground. The group-guided discussions were 3 to 5 min in duration, with children being reminded of the importance of physical activity followed by brief discussions. After being outside for at least 5 min, children were assembled by the teachers for a brief pep talk and encouraged to participate in the teacher-planned physical activity (e.g., “Who’s on my track team?” “Who’s coming to dance at my party?”). Following the pep talk, either “Track Team” or “Dance Party” was performed for 5 min with two focal children, Amy and Claire, and their classmates or for 7 min with focal child Bill and his peers. Often, children from another preschool class who were on the playground chose to participate in the teacher-implemented physical activities. Teacher-implemented activity to promote children’s physical activity was accompanied by adult participation and frequent adult encouragement of and acknowledgement for children’s engagement in moderate to vigorous physical activity. Following the teacher-implemented physical activities during the review process, participating children were descriptively praised both as a group (e.g., “You guys are track stars!”) and as individuals (“Claire you are a cool dancer!”) and allowed to choose a small sticker as further acknowledgment of their running or dancing efforts. Children who did not engage in moderate to vigorous physical activity were encouraged to participate “next time to build a healthy heart!” The “review” part of the Plan, Do, and Review component along with praise and stickers was approximately 3 to 5 min in duration.

Direct observation procedures. Observers were systematically trained to record children’s physical activity on playgrounds with a previously developed system, the “Observational System for Recording Physical Activity in Preschoolers” (OSRAP; see Brown et al., 2006, and Brown et al., 2009, for details and Table 2 for brief physical activity definitions). Observers were trained with a modified version of Hartmann and Wood’s (1990) recommended observational training (i.e., informal playground observations, learning observation codes from a manual, and extensive, in situ observing and recording practice). The OSRAC-P is a focal child, momentary-time-sampling direct observation system (i.e., 5 s to observe and 25 s to record, yielding two observations per minute) and was used with an accompanying direct observation software system for hand-held Dell Axim computers (i.e., INTMAN; Tapp & Wehby, 2000). Following informal playground observations and manual training, observers were trained in situ for several weeks to a predetermined criterion (i.e., 80% agreement for 3 consecutive observation days) on the measures of interest, the intensity of children’s physical activity levels during outdoor activities, and whether teachers arranged and encouraged physical activity to promote children’s nonsedentary behavior. Hence, the primary dependent measure for the investigation was whether participants exhibited moderate to vigorous physical activity on an interval-by-interval basis. The aggregation of activity levels 4 and 5 has been a common procedure in many physical activity studies for assessing and reporting children’s nonsedentary activity (e.g., McKenzie et al., 1997; Pate et al., 2008). A second behavioral measure of interest was whether the teachers arranged and encouraged children’s physical activity during observations. Our previous descriptive efforts have demonstrated that teachers’ involvement and encouragement of children’s physical activity is an extremely rare behavioral event,
Figure 1
Percentage of Intervals of Moderate to Vigorous Physical Activity for Amy, Claire, and Bill

Amy

Claire

Bill
Interobserver agreement. Interobserver agreement sessions were performed on 28 of 50 playground observations (i.e., 56% of sessions) spread across the three focal children and the nonintervention and intervention playground sessions. During each observational interval, observers simultaneously but independently recorded children’s physical activity level and whether teachers arranged activities and encouraged children’s moderate to vigorous physical activity. Separate interval-by-interval interobserver agreement formulas for the occurrence only and nonoccurrence only of children’s moderate to vigorous physical activity were used to yield a proportion of estimated reliability (e.g., agreements on occurrences divided by agreements on occurrences only plus nonagreements on occurrences multiplied by 100 or \[\frac{A}{A+D} \times 100\]). Interobserver agreement for occurrence only of moderate to vigorous physical activity ranged from 60% to 100%, with a mean of 94%. The overwhelming majority of session agreement scores were 100%. Agreement scores for nonoccurrence only ranged from 80% to 100%, with a mean of 97%. Again, the overwhelming majority of session agreement scores were 100%. The interobserver agreement scores for teacher-arranged physical activity were 100% for both occurrence only and nonoccurrence only of the activity context across intervention and nonintervention days throughout the study for all three participants.
Research design. A single-case withdrawal of intervention research design, which allowed for comparison of children’s physical activity during nonintervention and intervention outdoor play periods across days, was used to assess the percentage of intervals in which focal children participated in moderate to vigorous physical activity during recess (Kennedy, 2005). The primary behavior of interest, the focal children’s moderate (Level 4 physical activity) and vigorous (Level 5 physical activity) were combined and graphed for visual inspection and analysis. In addition, the OSRaC-P afforded observers the opportunity to document any teacher-arranged activities that related to physical activity (i.e., measure of intervention implementation).

Results of Study 1

The three focal children’s percentage of intervals in which they exhibited moderate to vigorous physical activity serves as evaluation information on the efficacy of teacher-implemented activities for enhancing preschoolers’ physical activity. Whereas during nonintervention play periods, teachers did not exhibit teacher-arranged activities to promote children’s physical activity, they did systematically implement teacher-arranged physical activities (e.g., planning activity, pep talk, frequent encouragement, and acknowledgement of moderate to vigorous activity) on the intervention days for all intervals during the teacher-led play activities. Teacher-implemented physical activity interventions were effective in increasing children’s moderate to vigorous physical activity on intervention days relative to nonintervention days (see Figure 1).

For Amy and Claire we intervened on Day 5 with the teacher-implemented physical activity intervention. On the initial intervention day, we observed that the teachers appeared to be very reluctant to enthusiastically encourage children’s moderate to vigorous physical activity and the datum for Claire reflected less than robust differences in her moderate to vigorous physical activity over her baseline sessions. Given this development, we returned to baseline and in consultation with her teachers discussed with them how best to enhance children’s motivation and participation during the intervention. Specifically, we decided to increase encouragement of children’s participation with (a) a brief pep talk, (b) much more frequent teacher encouragement of and acknowledgement for participation, and (c) a small sticker for participating preschoolers.

Amy’s physical activity. With respect to Amy, her moderate to vigorous physical activity for 5 days of teacher-implemented physical activities exceeded all but 1 of 14 nonintervention playground observations. Amy was particularly active on Day 3 of her initial baseline condition and climbed vigorously on the monkey bars most of the recess, as reflected in the datum for that play period. The frequency of her physical activity on this nonintervention day was atypical for the remainder of the nonintervention days throughout the study. Her physical activity on intervention days, except for the 1st intervention day, was characterized by frequent jogging during Track Team or dancing during Dance Party. Hence, her single-case research design was procedurally an A-B-A-B′-A design although the initial intervention was used for 1 day only with fewer components and the intervention procedures were enhanced during the second B’ phase. Amy’s initial baseline ranged from 0% to 80%, with a mean of 23% of the observed intervals. The initial 1-day intervention was 60% of the
observed intervals. Her second baseline ranged from 0% to 40% with a mean of 27% of the observed intervals. During the enhanced physical activity condition with teacher-implemented activities, her physical activity ranged from 60% to 90%, with a mean of 75% of the observed intervals. In contrast, the final baseline on nonintervention days, her moderate to vigorous physical activity ranged from 30% to 50%, with a mean of 40% of the observed intervals under business-as-usual conditions.

**Claire’s physical activity.** With respect to Claire, she had 2 days during her initial baseline phase that were equal to or higher than her initial intervention day, Day 5. Her physical activity on intervention days, except for the 1st intervention day, was characterized by frequent jogging during Track Team or dancing during Dance Party. Unfortunately, she was terminated from the preschool when she traveled with her mother to China for an extended vacation. Hence, her research design also constituted a procedural A-B-A-B’ design albeit with only 1 day in the first intervention with fewer components. Hence, functionally, Claire’s research design for the enhanced intervention constitutes only an AB’ design. The slight overlap in her moderate to vigorous physical activity in the first 11 days and her early termination from the study make Claire’s results less clear than Amy’s.

Nevertheless, the second intervention phase with enhanced intervention procedures for Days 12 through 15 demonstrated the positive effects of teacher-implemented interventions for increasing her moderate to vigorous physical activity. Specifically, Claire’s initial baseline ranged from 0% to 50%, with a mean of 23% of the observed intervals. Her initial 1-day intervention was only 40% of the observed intervals. Claire’s second baseline ranged from 0% to 30%, with a mean of 7% of the observed intervals. During the enhanced physical activity condition with teacher-implemented activities, her physical activity ranged from 60% to 100%, with a mean of 80% of the observed intervals.

**Bill’s physical activity.** With respect to Bill, who was observed during the following fall, we lengthened the playground observations from 5 to 7 min and used an A-B-A single-case design. Because Bill expressed reluctance in participating in Dance Party, we implemented Track Team on Days 7, 8, and 9. When Track Team was implemented, he had more moderate to vigorous physical activity on the playground than on nonintervention days. Similar to Amy and Claire’s physical activity on intervention days, Bill’s moderate to physical activity was also characterized by frequent jogging during Track Team. Specifically, Bill’s initial baseline ranged from 7% to 35%, with a mean of 26% of the observed intervals. During the physical activity condition with teacher-implemented activities, his physical activity was 70% of the observed intervals for 3 intervention days. Bill’s withdrawal of intervention in the second baseline ranged from 14% to 42%, with a mean of 30% of the observed intervals.

**Study 1 summary.** The research design used with Amy and Claire was procedurally an A-B-A-B’ albeit with only a single day initial intervention on Day 5. One of the primary strengths of single-case designs and a reason why the repeated measures methods are particularly applicable to formative types of research is that the procedures allow researchers to determine quickly any potential difficulties related to manipulations in an independent variable. Following the 1st day of intervention on Day 5 for Amy and
Claire, it became obvious to us that we needed to enhance teachers’ encouragement of and acknowledgement for children’s efforts during the teacher-implemented physical activities. Following changes in teachers’ encouraging and acknowledging strategies with a brief pep talk, more frequent use of prompting and praising of children’s efforts, and inclusion of a sticker for participation, children’s levels of moderate to vigorous physical activity improved markedly during the second intervention phases. As expected, the participating teachers exhibited teacher-arranged activities for all observation intervals on intervention days whereas they did not exhibit teacher-arranged activities for physical activity during nonintervention business-as-usual play periods. These positive results were replicated with Bill during intervention days in the second preschool class.

Method for Study 2

Participants and setting. Participants in Study 2 were two girls enrolled in a Title I preschool program for 4-year-old prekindergarten children at risk of school failure (e.g., living in poverty, single parent with limited maternal educational attainment). The girls, Alexis and Keisha, were nominated by their preschool teachers because they were viewed as having frequent sedentary behavior and infrequent moderate to vigorous physical activity on the playground. Three days of informal investigator observations confirmed the teachers’ perceptions of infrequent moderate to vigorous physical activity on the playground. No exclusionary and inclusionary criteria, beyond teacher nomination and investigator confirmation of infrequent moderate to vigorous physical activity on their playgrounds, were used.

The two participants were enrolled in classrooms each composed of 15 preschoolers who were 4-year-old children at risk for school failure, a teacher, an assistant teacher, and a practicum teacher. Specifically, the two girls were receiving Title I preschool services because of very limited family income. The DIAL-3 standard scores and percentile rankings for the two girls were as follows: (a) Alexis (age at study was 4 years and 6 months)—Motor, 9 or 52nd percentile; Concepts, 14 or 59th percentile; Language, 17 or 87th percentile; and Total Score, 40 or 71st percentile; and (b) Keisha (age at study was 4 years and 6 months)—Motor, 6 or 24th percentile; Concepts, 13 or 51st percentile; Language, 16 or 81st percentile; and Total Score, 35 or 55th percentile.

Similar to Study 1, each class had a 30-min morning and afternoon outdoor play period but the focal children’s classes were scheduled on the playground at different times of the day. Similar to the playground in Study 1, Alexis and Keisha’s playground had children’s fixed equipment (e.g., slides, sandbox, climbing areas), portable equipment (e.g., tricycles, balls, small trucks), and significant open space (i.e., total area of 185 feet by 113 feet). During Study 2, all nonintervention and intervention playground observations were performed during the morning play periods.

General procedures. Similar teacher-implemented intervention procedures were used during Study 2. Specifically, a plan–do–review process, guided discussions about physical activity, initial pep talks on the playground, teacher participation and frequent adult encouragement
of and acknowledgement for children’s physical activity efforts, brief review and acknowledgement after the activity, and stickers for child participation were used. Trained observers used the OSRAC-P to systematically record children’s moderate to vigorous physical activity and teacher-arranged activities to promote physical activity. In Study 2, only Track Team was used during intervention play periods.

**Interobserver agreement.** Interobserver agreement sessions, which included the same agreement procedures as Study 1, were conducted on 12 of 27 play periods (i.e., 44% of observations) for the two focal children and spread across intervention and nonintervention play periods. Interobserver agreement scores for the occurrence only of participants’ moderate to vigorous physical activity ranged from 60% to 100%, with a mean of 91%. Again, the majority of session agreement scores were 100%. Agreement scores for nonoccurrence only ranged from 90% to 100%, with a mean of 97%. Again, the majority of session agreement scores were 100%. Similar to Study 1, for both participating teachers, the interobserver agreement scores for teacher-arranged physical activity were 100% for both occurrence only and nonoccurrence only across intervention and nonintervention days throughout the study.

**Research design.** During Study 2, we used a single-case alternating-treatment research design to assess differences in children’s physical activity levels on intervention and nonintervention days (Kennedy, 2005).

**Results of Study 2**

The two focal children’s percentages of intervals in which they exhibited moderate to vigorous physical activity again serve as an evaluation of the effectiveness of teacher-implemented activities for promoting children’s outdoor physical activity. As expected and similar to the teachers in Study 1, during nonintervention play periods (business-as-usual conditions), teachers did not exhibit teacher-arranged activities to promote children’s physical activity. During intervention play periods, however, when they did implement teacher-arranged physical activities, both focal children’s physical activity levels changed markedly (see Figure 2).

**Alexis’s physical activity.** During the initial baseline conditions, Alexis engaged in very limited moderate to vigorous physical activity that ranged from 0% to 20%, with a mean of 10% of the observed intervals. Following her baseline phase, during the contrasting intervention and nonintervention circumstances, she exhibited more moderate to vigorous physical activity on intervention days than nonintervention days. Alexis’s moderate to vigorous physical activity during teacher-encouraged physical activity ranged from 80% to 100%, with a mean of 92%, of the observed intervals. In comparison on nonintervention days, her moderate to vigorous physical activity ranged from 0% to 20%, with a mean of 5%, of the observed intervals during business-as-usual circumstances.

**Keisha’s physical activity.** During the initial baseline conditions, Keisha displayed limited moderate to vigorous physical activity that ranged from 0% to 30%, with a mean of
10%, of the observed intervals. Following her baseline phase, during the contrasting intervention and nonintervention play periods, Keisha engaged in moderate to vigorous physical activity more often during intervention days than on nonintervention days. Her enhanced physical activity during teacher-implemented activities ranged from 50% to 90%, with a
mean of 72%, of the observed intervals. In contrast, on nonintervention days, her moderate to vigorous physical activity ranged from 0% to 30%, with a mean of 13%, of the observed intervals under business-as-usual conditions.

**Study 2 summary.** During Study 2, we replicated the findings from Study 1 with two additional children who had limited moderate to vigorous physical activity during recess in their Title I community-based preschool. In addition, we used the teacher-implemented physical activity intervention with children who were at risk for school failure because they were living in poverty. The use of the alternating treatment design applied in Study 2, which integrates relatively rapid changes in intervention across days, indicates to us that physical activities arranged and implemented by teachers may be an especially effective intervention to enhance young children’s physical activity in contrast to typical conditions on many preschool playgrounds. Again as anticipated, the participating teachers exhibited teacher-arranged activities for all observation intervals on intervention days whereas they did not exhibit teacher-arranged activities for physical activity during nonintervention business-as-usual play periods.

**Discussion**

The “conventional wisdom” (cf. Galbraith, 1958) of many early childhood professionals and parents has been that young children are very active. Nevertheless, to date, convergent evidence has shown clearly that many young children are often not very active in preschool settings (e.g., Brown et al., 2009; Oliver et al., 2007). In the accountability zeitgeist, early childhood educators have become especially focused on children’s cognitive, language, and social emotional development, especially with their efforts to enhance children’s preacademic abilities (e.g., National Education Goals Panel, 1997; No Child Left Behind of 2002). Nevertheless, we believe that a significant and urgent need exists for many early childhood educators to become better informed about and interested in preschool children’s general physical well-being. The troubling national trend of increased numbers of young children becoming overweight at earlier ages warrants the careful consideration of both policy makers and practitioners. Given the existing data concerning preschoolers’ physical inactivity, particularly the dearth of information on effective physical activity interventions (cf. Brown et al., 2009; Pate, 2001; Pate et al., 2004; Reilly et al., 2006), it appears that many young children enrolled in center-based programs may not be as active as they ought to be, even during appropriate periods of the preschool day such as outdoor play (e.g., Brown et al., 2009; McKenzie et al., 1997). Our investigative efforts indicate to us that brief bouts of teacher-implemented physical activities might be a feasible and practical procedure for enhancing children’s moderate to vigorous physical activity on playgrounds.

With respect to contemporary professional standards for young children, both the National Association for the Education of Young Children (1998), which recommends at least 60 min of outdoor activity per day, and the National Association for Sport and Physical Education (2002), which advises 120 min per day of total physical activity (60 min of structured and 60 min of unstructured activity) for young children, have propagated guidelines for young children’s physical activity. Because children’s health and physical well-being constitute an important developmental dimension, we believe that enhanced rates of
moderate to vigorous physical activity in preschools are needed to promote young children’s healthy lifestyles. Furthermore, many public health (e.g., Biglan, 2004; Pate et al., 2004) and early childhood education (e.g., Brown et al., 2007; Scott-Little & Kagan, 2006) professionals have argued that physical activity programming ought to be better integrated into day-to-day preschool policies and practices, particularly for young children who are growing up in low-income families and communities and who are at greater risk for becoming overweight and for poor health outcomes (cf. Goodway & Smith, 2005).

During our two studies with preschool children and their teachers, we developed relatively brief and straightforward teacher-implemented activities to enhance children’s moderate to vigorous physical activity on playgrounds. We believe that our interventions are an innovative and promising practice. Moreover, interested practitioners might easily modify or perhaps develop other high-interest, teacher-implemented physical activities and strategically embed them into at least part of children’s scheduled outdoor play periods. Moreover, if space permits, Dance Party and similar high-energy group activities can be performed indoors. We believe that using teacher-planned classwide activities to provide children with many additional brief albeit sustained opportunities to be physically active during the preschool day is a practical approach and may constitute one component of a continuum of interventions for personnel who are interested in encouraging children’s physical activity and general health (cf. Brown, Odom, & Conroy, 2001).

Study Limitations and Future Research

The limitations of our two studies should be apparent with a restricted sample of preschoolers (n = 5 focal children), classes (n = 4 classes), activities (n = 2), and teachers (n = 6 teachers) as well as relatively brief albeit intense and explicit intervention procedures. Any generalizability of similar teacher-implemented physical activity procedures to other settings, activities, and circumstances as well as additional populations of children and teachers awaits further and much-needed single-case (cf. Kennedy, 2005) and between-group (cf. Weisz, Jensen, & McLeod, 2004) replications by future investigators (cf. Owen, Glanz, Sallis, & Kelder, 2006). In particular, replications of the intervention package or similar procedures with children with identified developmental delays, particularly in their motor and physical development, are sorely needed.

The immediate decreases in children’s moderate to vigorous physical activity during nonintervention play periods, especially in Study 2 with the alternating treatments research design, indicate to us that teachers’ ongoing support may be an especially important factor in early attempts at promoting preschoolers’ nonsedentary physical activity. On nonintervention days, the children’s moderate to vigorous physical activity approximated extant estimates of children’s nonsedentary activity on playgrounds (e.g., Brown et al., 2009). Specifically, for nonintervention days in Studies 1 and 2, moderate to vigorous physical activity for the five participants averaged 19% of the total intervals as contrasted with the 17% of the total intervals reported by Brown and colleagues (2009) for a much larger sample of 372 young children from 24 preschools. Moreover, with Alexis and Keisha, who were identified by teachers as children with infrequent physical activity, their average nonintervention intervals of moderate to vigorous physical activity was even lower, with a mean of only 9% per observation across 15 baseline days.
Unfortunately, with the multicomponent intervention package we used and in the procedural manner it was applied, we cannot logically disentangle the specific contributions of individual intervention components that were related to improvements in children’s nonsedentary activity. At best, we can only assert that the intervention package was related to enhanced moderate to vigorous physical activity. Moreover, although generalization and maintenance of intervention effects have been a long sought after and much less frequently achieved goal for many interventions with young children, in our two studies we did not examine those important dimensions of behavioral change. At this time, we do not anticipate generalization and maintenance of preschool children’s effortful and sustained physical activity without ongoing adult encouragement and support across much longer periods of time and perhaps with additional dispositional components included (e.g., inculcate positive attitudes toward physical activity). Of course, generalization and maintenance of children’s physical activity and favorable dispositions related to increased moderate to vigorous physical activity await future research; particularly investigations with much larger and diverse samples of children and with longitudinal measures of both physical activity and children’s attitudes toward nonsedentary activity (cf. Weisz et al., 2004). To date and to our knowledge, very few of those types of studies have been conducted. Nevertheless, in a well-controlled randomized motor skill and physical activity intervention with 545 preschoolers, Reilly and colleagues (2006) demonstrated improvements in 4-year-old children’s motor performance. The investigators’ physical activity component of the intervention did not yield reliable and robust physical activity results for the participants.

Lessons Learned

We learned or perhaps were reminded of several important lessons during our playground studies with the teacher-implemented intervention package for children’s physical activity. First, teacher enthusiasm for and participation in activities appears to be especially critical in attempts to enhance children’s effortful physical activity, particularly initial efforts. Hence, unless teachers view the physical activities as acceptable and feasible and are willing to explicitly model healthy behaviors through their participation or at least active encouragement of the children, they probably will not implement the playground activities regularly, even for brief periods (cf. Park, Solomon, & Lee, 2007; West et al., 2007).

Second, similar to Bill, some children expressed definite preferences for which activities they wanted to participate in during outdoor play. Therefore, an array of high-interest activities to encourage moderate to vigorous physical activity should be developed and choices in those activities provided (and perhaps periodically rotated) to maximize children’s motivation for and active engagement in effortful physical activities.

Third, some may question the relatively brief bouts of teacher-encouraged moderate to vigorous physical activity. Nevertheless, when we lengthened the teacher-implemented interventions by 2 min, we noticed that Bill and many of his peers had difficulty maintaining moderate to vigorous physical activity for 7 consecutive minutes. Indeed, a “ceiling effect” may have been evident for Bill, whose moderate to vigorous physical activity appeared to plateau at about 70% of the intervals during his 7-min intervention play periods. Hence, shorter albeit relatively intense and sustained physical activity periods embedded strategically
throughout the morning and afternoon recesses may be better suited to the emerging fitness levels of many young children. With older school-age children, bouts of about 10 min of embedded moderate to vigorous physical activity have been recommended (e.g., Yancey, Ory, & Davis, 2006). Nevertheless, longer bouts of intense physical activity beyond about 5 min may be less appropriate for preschoolers.

Fourth, given the active and potentially chaotic nature of the teacher-implemented physical activity interventions, practitioners should plan for proactive behavioral guidance procedures to ensure that children learn self-control, such as acquiring basic courtesy and safety rules so that the activities do not become potentially disruptive rough-and-tumble play. We view preschoolers’ participation in the physical activities as an excellent opportunity and behavioral context for them to practice and, when indicated, receive teacher appraisal (e.g., “Wow, you’re being a good team player!” “Cool, you know the rules!”) of their social behavior and “self-regulation” related to active and suitable participation during age-appropriate group activities.

Finally, although the teacher-implemented interventions were developed with children without identified disabilities, we believe that they are applicable to the vast majority of preschool children who have, or are at risk for, developmental delays. The exceptions might be the relatively small number of children for whom moderate to vigorous physical activity is contraindicated by their disabilities or medical needs (e.g., conditions that prohibit physical activity, significant motor impairment, medical apparatus that constrains movement). Nevertheless, given appropriate adaptive equipment (e.g., wheel chairs, walkers), circumstances (e.g., walkways, patio areas), and adult supports (e.g., monitoring equipment use, encouraging needed adult or peer assistance), children with physical limitations might participate in and enjoy inclusion into the classwide physical activities, such as Dance Party (e.g., wheel chair dancing).

Conclusions

Educators across the nation have delineated early learning standards for preschoolers, and in a recent review, Scott-Little and Kagan (2006) noted that 46 states have early learning standards in cognition, language, social, physical and motor, and approaches to learning. The authors also reported that the existing early learning standards have concentrated primarily on cognitive and language skills that are closely related to school readiness and to only a limited extent on physical well-being and motor development. Moreover, they indicated that when state standards for physical well-being and motor development were developed, those standards focused mostly on motor development or performance rather than children’s physical activity and general physical fitness.

Although we do not want to throw the baby out with the bathwater and are certainly not advocating that early childhood educators reduce their efforts to better address and promote children’s language and literacy, preacademic, and social-emotional needs, we along with many public health professionals (e.g., Council on Sports Medicine and Fitness and Council on School Health, 2006; United States Department of Health and Human Services, 2000) believe that an especially urgent need exists to plan for and embed brief bouts of age-appropriate moderate to vigorous physical activity for children throughout their preschool day. As
Brown (2006) asserted, “If we truly believe in working with the ‘whole child,’ then we ought to be proactive about how we implement preschool policies and practices related to children’s physical activity, particularly higher rates of moderate to vigorous physical activity and lower rates sedentary behavior.” The essential challenge for early childhood educators is how best to develop and implement day-to-day preschool policies and practices across all critical developmental dimensions, including motor development and physical activity, while better promoting high-quality programs for young children and their families.

References


