Active Play Opportunities at Child Care

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abstract

BACKGROUND AND OBJECTIVES: Physical activity (PA) is important for children's health and development, yet preschoolers are not meeting PA recommendations. The objective of this study was to examine different PA opportunities at child care and how variation in indoor versus outdoor and free versus teacher-led opportunities relate to children's PA.

METHODS: An observational study of 98 children (mean age 4.5 years, 49% girls) from 10 child care centers. Classrooms were observed for at least 4 full days per center (total 50 days) to categorize time into (1) not an active play opportunity (APO); (2) naptime; (3) APO, outdoor free play; (4) APO, outdoor teacher-led; (5) APO, indoor free play; and (6) APO, indoor teacher-led. Children wore accelerometers during observations. Linear regression models examined the influence of APO categories on moderate-vigorous physical activity (MVPA) and sedentary time.

RESULTS: Children's activity was 73% sedentary, 13% light, and 14% MVPA. For 88% of time children did not have APOs, including 26% time as naptime. On average, 48 minutes per day were APOs (41% sedentary, 18% light, and 41% MVPA), 33 minutes per day were outdoors. The most frequent APO was outdoor free play (8% of time); outdoor teacher-led time was <1%. Children were more active and less sedentary outdoors versus indoors and during the child-initiated APOs (indoors and outdoors) versus teacher-led APOs.

CONCLUSIONS: Preschoolers were presented with significantly fewer than recommended opportunities for PA at child care. More APOs are needed for children to meet recommendations, particularly those that encourage more outdoor time, more teacher-led and child-initiated active play, and flexibility in naptime for preschoolers.

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WHAT'S KNOWN ON THIS SUBJECT: Physical activity (PA) of preschoolers has been found to be highly correlated with their child care environment. Preschool-aged children are sedentary for most of their time at child care and most are not meeting PA recommendations.

WHAT THIS STUDY ADDS: Preschoolers were presented with significantly fewer than recommended PA opportunities at child care. More active play opportunities are needed to increase PA, including more outdoor time, more teacher-led and child-initiated active play, and flexibility in naptime for preschoolers.

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Physical activity (PA) is important for children's health and development[1–3] and excessive sedentary behaviors are associated with poor health outcomes.[4] Physical and sedentary activity have been found to track through childhood[5,6] and there is a strong protective effect of PA on body fat accumulation from preschool age to adolescence.[7] Whereas 3- to 5-year-olds tend to be more active than older children,[8] they are not sufficiently active, as nearly half are not meeting minimal recommendations for daily PA.[9–11]

Increasing children's PA in child care settings is critical given that approximately 5 million US children attend preschools or structured child care programs, with the average child spending more than 30 hours per week in this care.[12] Best practice guidelines encourage 60 minutes per day of teacher-led structured PA time, 60 minutes per day or more of unstructured free play time, and daily outdoor time, although how much each contributes to desirable levels of PA is not known.[13] Pediatric health care providers have an important role in addressing and promoting active play opportunities (APOs), including those at child care.[14,15]

The PA of preschoolers has been found to be highly correlated with their child care environment, thus providing policy and environment opportunities for intervention.[16–18] In one study, the preschool attended explained 27% of the variance in activity levels, and accounted for more variance than did factors such as age, gender, and race/ethnicity.[19] Certain child care characteristics have been positively associated with more PA, such as open space, portable play equipment, outdoor time, structured physical activities, and staff supportive of PA.[17,20–23] A review of existing interventions to increase PA at child care found studies of varying quality, with 4 of 8 studies that assessed PA outcomes having had significant intervention effect, typically through structured PA programs.[24] Although the child care setting provides multiple targets for intervention, the research on how to best organize child care time to optimize PA and decrease sedentary behavior is in its nascence.

The overall aim of this project was to examine different types of PA opportunities at child care and how variation in indoor versus outdoor and free versus teacher-led opportunities relate to children's PA. Such evidence could inform the targeting of policy and practices to increase PA in early childhood education environments.

METHODS

We conducted an observational study of 3- to 5-year-olds from a convenience sample of 10 licensed child care centers between 2012 and 2014. This study was approved by the Seattle Children's Hospital Institutional Review Board. All participating centers were in the Seattle area, where state licensing standards require a 10:1 child: teacher ratio for preschool classrooms. None were Head Start programs or funded by the city or state. Each center provided full day programming (at least 10 hours per day) and served infants through school-aged children. In 8 of the 10 programs, the directors had more than 10 years of child care experience. All of the centers had posted daily schedules that had at least 60 minutes per day scheduled for outdoor play time, divided into 2 sessions per day, but that time was not specified as "unstructured" or "teacher-led" active play time. All centers had outdoor play areas with fixed play structures and variable amounts of portable play equipment. They each had a dedicated indoor space (separate room from classroom) available for PA, including running and jumping, and assorted indoor play equipment. No center had any specific mention of weather-related outdoor play policies in either their staff or parent handbooks, but teachers did have the option of using the indoor play area if the weather was not considered favorable for outdoor time. We recruited 8 to 10 children (ages 3–5) from each center to participate.

Measures

Location and Type of Activity

Data collection occurred in nonsummer months, as many preschools change their schedules to offer summer camp programming. A trained research assistant observed 1 classroom from each participating center for a minimum of 4 full days, but sometimes more frequently if we did not get 4 days of data on many children. The observer was present between 8 AM and 5 PM, which is when most children are in care and most of the structured curriculum occurs. Observation days were the same as the days when children wore accelerometers. The observer noted precise times when children were in various locations (eg, classroom, playroom, playground) and specifically noted whether they were indoors or outdoors. Before beginning data collection, all 3 research assistants simultaneously observed a nonparticipating preschool classroom for 2 days to establish consistency in coding.

Based on classroom activities and location, during the observation, the observers coded time into 6 mutually exclusive categories: (1) not an APO (eg, circle time, crafts, seated learning activities, meals); (2) naptime (children are required to sleep or lay on a mat for "quiet" activities; (3) APO, outdoor free play (children outdoors and could choose activities); (4) APO, outdoor teacher-led (teacher-initiated activities, such as running laps or active games, in which all children were expected to participate); (5) APO, indoor free play (active play encouraged indoors with children initiating activities; for example, climbing equipment, balls, in an indoor playroom); and (6) APO,

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indoor teacher-initiated (teacher-led exercises [eg, yoga] in which all children were expected to participate). Any uncertainty about categorization was discussed soon after the visit with the research team to reach consensus. A category 7 was created for the few activities/times that still could not be clearly classified. This category comprised 1% of observed time.

Interrater reliability was assessed for 20% of the study observation days (1–2 days per center). This was done by having all 3 research assistants and the principal investigator independently recode the same days of original observation notes into the 7 categories mentioned previously. When the few category 7 times were removed, 100% concordance was seen among the observers.

Activity Levels

After obtaining parental consent and child assent, children wore Actigraph GT3×+ accelerometers (Actigraph. Pensacola, FL) on their right hip by using an adjustable belt during child care time on observation days. The research assistant placed the belt on the children soon after they arrived at the center and removed it at pick up, and this information was used to determine accelerometer wear time. The Actigraph has been validated and calibrated for use among children.[25] Data were collected in 15-second epochs, which is the current standard for preschool-aged children. Time-stamped accelerometer data were scored as sedentary, light, and moderate-to-vigorous (MVPA) by using Pate criteria.[26] Accelerometer data were then matched to observed categories of classroom activities. Although observation times and accelerometer wear time were similar, they were not equal (for example, if a child took the accelerometer off for naptime). Therefore, the sedentary, light, and MVPA percentages reflect a percentage of accelerometer wear time among children who were observed to have any time in that category. Of note, the observed type of activity (APO or not) reflects the expectation of the preschoolers, and the activity level is quantified based on the children's actual movements. It is possible, for example, to have some sedentary activity during an APO and some MVPA during a non-APO or even naptime.

Demographics

At the time of consent, the date of birth and gender of children were collected. Parents also were given a short survey on their child's race/ethnicity, the highest educational attainment of adults at home, and household income.

Analysis

We summarized continuous measures by using means and SDs, and categorical variables by using frequencies and proportions. By using average time per day in each category for each child as the unit of analysis, we created separate mixed-effects linear regression models for the 2 primary outcomes (MVPA and sedentary time) to evaluate the influence of the 4 APO categories (outdoor free play, outdoor teacher-led, indoor free play, indoor teacher-led). We controlled for age, gender, and accelerometer wear time and accounted for clustering of children within child care centers and among observations from a single child as random effects. We also created separate mixed-effects linear regression models to test the effect of total outdoor versus indoor time and total outdoor APOs (free play plus teacher-led) versus indoor APOs on the outcomes of sedentary and MVPA, including the same covariates and random effects.

RESULTS

We conducted 50 total days of observations from 10 centers (with a minimum of 4 days per center) for an average of 7.2 hours per day. Our sample consisted of 98 children who wore accelerometers with a mean age of 4.5 (range 3.1–5.8) years and 49% were girls. Additional demographic information was available for 82 participants and is presented in Table 1.

Sixty-two percent of the child care day (268.6 ± 44.8 minutes) could be categorized as not providing APOs for children, excluding naptime (see Table 2). Naptime constituted an additional 26% of the child care day (112.3 ± 32.2 minutes). On average, 48.5 ± 14.4 minutes of the day (12% of child care time) were considered APOs. Of the APOs, outdoor child-initiated free play was most common, followed by indoor teacher-led, indoor child-initiated, and then outdoor teacher-led. Children spent an average of 32.7 ± 13.8 minutes outdoors daily, with most of that time (99%) in child-initiated, free play activities. Children's mean MVPA was 55.2 ± 20.3 minutes per day with 34% attaining ≥60 minutes per day.

Regression analyses revealed that during the teacher-led indoor active time, children were more sedentary than during indoor or outdoor child-initiated free play times ($P < .001$). Children attained less MVPA during teacher-led indoor active time

TABLE 1 Demographic Characteristics of Participating Children (n = 82)

Characteristic	%
Race	
White	70
African American/black	6
>1 race	15
Asian/Pacific Islander/ Native American	6
Hispanic	13
Highest educational attainment in household	
Less than high school	2
Completed high school	24
Completed college	51
Graduate/professional degree	20
Household income, $	
<29 000	29
30 000–49 000	16
50 000–69 000	5
70 000–89 000	12
≥90 000	32

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TABLE 2 Characterization of Children's Opportunities for Active Play at Child Care

Category	By Observation		By Accelerometer[a]		
	Min/d, Mean (SD)	Mean Percentage of Day	Sedentary Min/d (%)	Light Min/d (%)	MVPA Min/d (%)
Total[b]	431.5 (57.4)		279.3 (73)	49.7 (13)	55.2 (14)
No opportunity for PA, total	381.0 (53.4)	88	258.0 (77)	40.7 (12)	35.1 (11)
Nonactive time	268.6 (44.8)	62	200.8 (75)	35.3 (13)	30.7 (12)
Naptime	112.3 (29.0)	26	57.2 (85)	5.4 (8)	4.5 (7)
APOs, total	48.5 (14.4)	12	19.8 (41)	8.7 (18)	19.8 (41)
Outdoor child-initiated	32.3 (13.6)	8	12.3 (38)	6.1 (19)	14.2 (44)
Indoor teacher-led	8.4 (8.9)	2	4.9 (49)	1.6 (17)	3.3 (34)
Indoor child-initiated	7.4 (8.4)	2	4.9 (39)	1.8 (17)	4.3 (44)
Outdoor teacher-led	0.4 (1.0)	0.1	1.1 (42)	0.3 (16)	0.5 (42)

[a] Observation time and accelerometer wear time were similar but not equal. The sedentary, light, and moderate-vigorous PA are percentages of accelerometer wear time, among children who were observed to have any time in that category.

[b] Total minutes include 2 minutes of a "category 7," which were activities that were not able to be classified into the other categories.

compared with the other active opportunities ($P < .001$). When comparing indoor and outdoor APOs (including both child-initiated and teacher-led), children spent less time sedentary (38% vs 44%, $P = .006$) and more time in MVPA (44% vs 39%, $P = .056$) outdoors. For indoor versus outdoor time in total (including APOs and non-APOs), children were less sedentary (38% vs 76%, $P < .001$) and spent more time in MVPA (44% vs 12%, $P < .001$) outdoors. Boys were more active and less sedentary than girls in all of the models (data not shown), but age and accelerometer wear time were not statistically significantly related to the outcomes.

DISCUSSION

This study found that for 88% of child care time, children were not presented opportunities for active play, so the finding that more than 70% of children's time was sedentary is not surprising. Compared with the recommended 120 minutes per day of PA time,[13] our average of 48 minutes per day of APOs is considerably suboptimal. APOs did result in higher proportion of time in MVPA and less sedentary time, but constituted a small proportion of the day. Teacher-led PA opportunities were rare, and when present, children achieved lower percentages of time in MVPA compared with free play. Outdoor time was also low, but children were more active and less sedentary when they were outdoors compared with indoors. These findings highlight the continued disconnection between PA recommendations and actual practices in early learning environments, which results in undesirable levels of sedentary behavior and PA.

Our findings suggest that child-initiated activity, indoors or outdoors, may result in less sedentary and more active play compared with teacher-led PA. Encouraging child-initiated free play of course has a myriad of additional benefits for young children's social, emotional, cognitive, and physical well-being.[27] Our results, however, seem inconsistent with previous studies, which found that structured, adult-led activities were associated with greater PA in children at child care.[24] Many of these programs used trained professionals, however (ie, not the classroom teacher), and implemented the intervention in a way that the structured activity was delivered with consistent frequency.[28,29] Studies that use existing classroom staff to deliver interventions have been less successful and have reported challenges with intervention fidelity.[30,31] Using professional physical education teachers at child care is not widely feasible and our results highlight what a limited role structured PA currently plays in many child care settings. On average, daily teacher-led active play time amounted to 8.4 minutes indoors and 24 seconds outdoors, highlighting a significant gap from the recommended 60 minutes of teacher-led active time. Given that teacher-led activities also could have other potential benefits (eg, greater inclusion of all children, role modeling, integrating educational content), increasing child care providers' skills and comfort level in leading PA would be important to increasing APOs. In addition, it would be important to consider indoor and outdoor environments and equipment, which may better support teachers in encouraging movement both as part of the curriculum and during recess. How to best schedule and support APOs in terms of teacher-led or unstructured, frequency and duration, to maximize MVPA, needs to be better understood.

Our study also suggests that increasing outdoor time at child care is another route for promoting healthier activity levels. The National Association for the Education of Young Children recommends "daily" outdoor time[32] as an accreditation criteria, but most states do not mandate this.[33] In our study, children had an average of 33 minutes of outdoor time per day (8% of their child care day), which was considerably less than the 60 minutes per day scheduled in all of the participating centers. A previous study found that preschoolers in 2 preschools in Sweden spent 46% of

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their attendance time outdoors compared with 18% for children in 2 US preschools.[34] PA counts per minute was significantly higher outdoors versus indoors in both settings and the time spent in MVPA at preschool was very limited and predominantly outdoors. The investigators pointed out that there were more expectations for preschoolers in the United States to be sedentary (line up, sit down for circle time, nap, or engage in quiet activities during naptime). Those expectations plus the large difference in time indoors versus outdoors are likely reasons for higher MVPA in the Swedish children. A previous study using nationally representative data found that most preschool-aged children are not being taken outdoors daily by their parent(s).[35] Because many preschoolers spend considerable time in child care, usually during the daytime when outdoor play is most feasible, increasing outdoor time there is a strategy for increasing their overall PA. Children's outdoor time is a modifiable, environmental correlate of PA, although increasing outdoor time would likely require strategies to overcome perceived barriers around weather. Present findings suggest that both child-initiated and teacher-led outdoor time is conducive to children's PA.

We also found that children were less sedentary outdoors overall, and also during outdoor APOs compared with indoor APOs. The study that compared preschools in the United States and Sweden also found that children spent significantly less time engaged in sedentary behavior when they were outdoors compared with indoors. However, 2 previous studies did not find significant association between outdoor time and sedentary behavior.[36,37] There is growing interest in targeting reductions in sedentary time as a distinct approach in health promotion,[38] as sedentary behavior is independently associated with adiposity in children and adults.[39–42] There are several postulated mechanisms for the independent relationship between sedentary behavior and poor health outcomes, including physiologic changes that occur from loss of skeletal muscle contraction that lead to elevated glucose, triglycerides and free fatty acids and create a biochemical milieu conducive to cardiovascular risk factors.[43] Shifting some of this excessive sedentary behavior even to light PA, could be beneficial.

Naptime constituted a notable 26% of child care time in our study and is worthy of discussion with regard to age-appropriate expectations for napping. Daily rest time is often a licensing regulation in the United States, whereas other countries do not have a such a strict mandate, especially for older preschoolers.[34] Although there are certainly benefits to daytime sleep for young children[44] and many children may not been getting adequate nighttime sleep, some older preschoolers may no longer need daily scheduled long naps. Perhaps a shorter duration of rest time or the option to engage in different activities for some children would allow some of that large proportion of sedentary time to be redirected to APOs.

Excessive sedentary time and suboptimal active play may be having negative consequences on numerous aspects of children's development, health, and well-being. The paucity of APOs in child care is likely driven by multiple factors, including parent and teacher priorities. Parental preferences for academics and concerns about safety have been reported by child care providers as barriers they face in promoting PA in child care.[45] Teacher training and self-efficacy in implementing APOs is another possible barrier. Although the relationship between PA and learning is gaining considerable support through research in school-aged children,[46] it is not yet as well established in preschoolers. Increased focus on the idea that active play and learning are not mutually exclusive may help reframe the importance of daily APOs to promote more supportive early learning practices and policies.

There are some limitations to our study. First, different levels of outdoor time and/or PA may occur on days when an observer is present compared with nonobserved days. However, relying on teacher report of indoor/outdoor time and PA opportunities also could include bias.[47] Second, this study was conducted at a limited number of licensed child care centers within 1 geographic area and therefore has limited generalizability to other child care settings and geographic regions. For our geographic area, we did capture a range of seasons and weather conditions over a 2-year period. Future studies could more precisely examine the relationship of seasonality and weather to outdoor play and PA.

CONCLUSIONS

Preschoolers were presented with significantly fewer than recommended opportunities for PA at child care. More APOs and fewer sedentary expectations at child care are needed for children to meet PA recommendations. Strategies to increase preschoolers' PA should be informed by research on which modifications would have the greatest benefit, including possibly encouraging more outdoor time, more teacher-led and child-initiated active play, and even some flexibility in mandated naptime for older preschoolers. In an environment in which sedentary behavior is increasingly common, pediatric health care providers can and should address PA opportunities of children within the context of all settings where children spend time.

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