

Physical Activity Behaviors During the Preschool Years

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Abstract

This is the first Canadian study to measure physical activity participation and opportunities for outdoor playtime among preschoolers. Preschoolers in the London, Ontario study spent significantly more time engaging in high-intensity indoor activity versus outdoor activity. Daycare providers reported the children in their care had access to approximately 2 hours of daily outdoor playtime. Nearly half the study's parents reported their preschoolers did not engage in physical activity at the level needed for health gains. Insufficient activity among such a large segment of preschoolers has potentially serious physical and psychological health implications. Daycare settings afford ample opportunity for physical activity programming among this population. Further research using more objective measures on a larger sample is needed.

Keywords: health behavior, paediatrics, health promotion, physical activity, preschoolers

Physical activity provides many health benefits, including combating obesity, diabetes, cardiovascular disease, hypertension, and cancer, and promoting decreased depression (Dunn, Trivedi, & O'Neal, 2001; Warburton, Nicol, & Bredin, 2006). Despite the overwhelming benefits, 73 to 91% of Canadian children and youth remain insufficiently active (Canadian Fitness and Lifestyle Research Institute, 2005a). Although all children over 2 years of age can benefit from participating in physical activity (Canadian Fitness and Lifestyle Research Institute, 2005a; Marcus et al., 2000), less than half of Canadian children are “expending the energy required to maintain a healthy weight and to develop healthy hearts, lungs, muscles and bones” (Active Healthy Kids Canada, 2005, p. 2).

Establishing moderate levels of physical activity early in life is a strong public health initiative in the 2- to 17-year age group, specifically given the rise in childhood overweight and obesity, a disease that now affects one third of Canadian children

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(Deckelbaum & Williams, 2001; Tremblay, Katzmarzyk, & Willms, 2002; World Health Organization, 2003); 8% of Canadian children aged 2–17 were identified as obese in 2006 (Canada, Statistics Canada, Health Statistics Division, 2006), and a recent Canadian study reported that 1 in 4 preschoolers was overweight or obese (Canning, Courage, & Frizzell, 2004). This rise in excess bodyweight among young children is also reported in the United States, where children less than 2 years of age are progressing towards a higher weight-to-height ratio (Ogden et al., 1997). Given the numerous health consequences associated with obesity (Dietz, 1998; Figueroa-Colon, Franklin, Lee, Aldridge, & Alexander, 1997; Figueroa-Munoz, Chinn, & Rona, 2001; Pinhas-Hamiel & Zeitler, 2005; Reilly et al., 2003; Williams, 2001), and in light of the Canadian Paediatric Society's assertion that 70% of obese children will grow up to become obese adults, it is essential to focus attention on preventing this disease (Canadian Paediatric Society, 2002).

The preschool years are a critical intervention time to prevent the onset of overweight and obesity and to support children's health-related behaviors, including physical activity (Troiano & Fliegel, 1998). Developing healthy active lifestyles as the norm in young children's lives can help to foster long-term physical activity behaviors that can be carried throughout the lifespan (Borra, Schwartz, Spain, & Natchipolsky, 1995; Schmitz & Jeffery, 2000; Steinbeck, 2001; Stolley et al., 2003). In fact, establishing these behaviors is essential to prevent the onset of obesity (Borra et al., 1995; Schmitz & Jeffery, 2000; Steinbeck, 2001; Stolley et al., 2003).

Physical activity in preschoolers has been acknowledged to occur during free play rather than through structured activities (Bailey et al., 1995). However, children's physical activity lacks the continuous episodes of sustained movement that exemplifies adult physical activity and is, therefore, a challenge to measure (Burdette & Whitaker, 2005). Consequently, outdoor playtime, having been recognized as a strong determinant of children's physical activity behaviors (Baranowski, Thompson, DuRant, Baranowski, & Puhl, 1993; Benham-Deal, 2005; Burdette, Whitaker, & Daniels, 2004; Oja & Jürimäe, 2002), has been deemed an acceptable proxy for measuring physical activity in preschool-aged children (Oja & Jürimäe, 2002).

Current physical activity guidelines for preschoolers recommend at least one to several hours of unstructured activity per day, and no more than one hour of sedentary activity at a time (National Association for Sport and Physical Education, 2007). Although this guideline offers a starting point for assessing physical activity levels in preschoolers, it does not define the duration or intensity of physical activity necessary among this age group to attain health benefits. In a recent qualitative investigation of preschoolers' physical activity behaviors, parents anecdotally reported that their children spent between 1 and 10 hours being active each day (Irwin, He, Sangster Bouck, Tucker, & Pollett, 2005). Irwin and colleagues concluded that a more objective assessment of preschoolers' activity was needed. With respect to sedentary behavior, TV viewing has been blamed as playing a vital role in the increase in obesity (Canadian Paediatric Society, 1999; Robinson, 2001). Although the Canadian Paediatric Society recommends decreasing screen viewing by 1 hour per day, preschoolers' screen time has been reported at between 1 and 4 hours per day (Burdette & Whitaker, 2005; Canadian Paediatric Society, 1999; He, Irwin, Sangster Bouck, Tucker, & Pollett, 2005; Robinson, 2001).

Research pertaining to preschoolers' physical activity behaviors is limited (Irwin et al., 2005; Kohl & Hobbs, 1998; Lindquist, Reynolds, & Goran, 1999). Although recent progress has been made (McKenzie, Sallis, Nader, Broyes, & Nelson, 1992; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004; Trost, Sirard, Dowda, Pfeiffer, & Pate, 2003), to our knowledge, there is no other Canadian study that has quantified the physical activity levels of preschool-aged children. Therefore, the main purpose of this study was to assess the level of physical activity among preschoolers in London, Ontario, Canada. The secondary purpose was to assess the opportunities children had for outdoor playtime during the day.

Method

Participants

A heterogeneous sample, based on neighborhood socio-economic status, of 71 public and 57 private daycares, and 55 family physicians throughout London, Ontario were targeted for this study. Fifty-eight daycares caring for a total of 2,372 preschoolers (2.5–5 years of age), and 7 family physicians caring for an unknown number of preschoolers agreed to distribute the questionnaire and encourage parental participation in this study. A total of 140 parents participated in this study, providing an estimated response rate of less than 10 percent. The mean age of participating parents was 34.7 years ($SD = 4.7$), 83% were female, and 89% resided in a double-parent home. The mean age of parents' preschoolers was 3.42 years ($SD = 0.8$). Table 1 provides complete demographic information of the participating parents. Although parents were recruited through both daycare facilities and family physicians in an attempt to secure a representative sample, this was not achieved.

Table 1
Descriptive Characteristics of Parents of Preschoolers

Demographic characteristics	Sample size	Percentage
Gender		
Male	23	16.7
Female	115	83.3
Age (years)		
29 and under	20	15.3
30–34	39	29.7
35–39	49	37.4
40 and over	23	17.6
No. of children		
1	40	29.0
2	81	58.7
3	13	9.4
4 +	4	2.8
Childcare arrangements		
Private	42	30.7
Public	63	46.0
Other ^a	30	21.9

Family situation		
Single-parent household	15	10.8
Double-parent household	124	89.2
Highest level of education		
High school	15	12.4
College/University	86	62.8
Graduate school	33	24.1
Currently employed		
Yes	112	80.6
Part-time	30	26.8
Full-time	81	72.3
No	27	19.4
Household income		
49,000 and less	25	20.5
50,000–74,999	22	18.0
75,000–99,999	17	17.2
100,000 and more	54	44.3

Note. N = 140; subsample totals may be less than N because of non-reporting.

^aAnecdotal reports identified preschoolers as attending formalized preschool or relative babysitting.

With all children in this study attending a daycare or preschool facility, the amount of outdoor playtime offered in these settings was also of interest to provide an understanding of the opportunities children had to be active during the day. Fifty-eight of 75 daycare leaders agreed to participate (providing a response rate of 77.3%). Eighteen of the participating daycares were privately operated and 40 were publicly licensed. Ethical approval was obtained through The University of Western Ontario (UWO).

Measures

Because direct observation and accelerometers were cost-prohibitive for this population-based study despite the superior validity of the measurement tool, (Sirard & Pate, 2001), an adapted version of Harro's (1997) Physical Activity Questionnaire for parents of young children was utilized. This 3-day tool, which was validated previously against Caltrac accelerometers and Polar Sport Tester heart rate monitors, required parents to identify the amount of time, in minutes, that their preschooler spent in indoor and outdoor low-intensity (e.g., sitting, walking, and other activities with no heavy breathing) and high-intensity activities (e.g., running, jumping, and other activities resulting in heavy breathing) on Tuesday, Thursday, and Saturday of the week following questionnaire distribution (Harro, 1997). The last question asked parents to identify the amount of time their child spent in outdoor playtime on a "typical" weekday, and on a "typical" weekend day. A demographic form, asking about parents' age, income, sex, and other descriptive information was attached to the activity questionnaire.

Because outdoor playtime has been confirmed as an accurate proxy for children's physical activity, daycare leaders were asked to identify the outdoor playtime provided by completing the previously validated Outdoor Playtime Checklist (modified from Burdette et al., 2004). The daycare providers could not logistically report on the

individual activity level of each child attending their facility; therefore, this simple checklist was deemed more appropriate for them to complete than the individualized Modified Physical Activity Questionnaire given to parents.

Procedures

Initial contact was made with each daycare provider director, and the purpose of the study was outlined. Both the daycare and parent questionnaires were hand-delivered to each daycare director who agreed to complete the daycare provider questionnaire and assist with parental recruitment. For those daycare providers who agreed to be involved in only the daycare portion of the study, the questionnaire was delivered and returned via fax machine.

The daycare providers determined the method of parent questionnaire distribution: One director allowed a member of the research team to be on site to hand out questionnaires during child pick-up time; one director handed the questionnaires directly to each parent, and all other directors either placed the questionnaire in each preschooler's cubby/mailbox or backpack, or posted notices at their facilities inviting interested parents to pick up a questionnaire. Three follow-up telephone calls were made to each director requesting assistance in retrieving parent questionnaires that remained outstanding. Due to a disappointing return rate of questionnaires, the recruitment strategy was revised (expanded) and upon ethical approval for the updated protocol, recruitment efforts continued.

In the fall of 2006, letters were mailed out to family physicians to request their involvement in the recruitment and distribution of questionnaires. A follow-up phone call to each physician occurred approximately two weeks after the letters were mailed. If the physician agreed to participate, the nurses or office staff at the family practice distributed the questionnaires to parents with preschool-aged patients who visited the office. The parents were instructed to mail the completed questionnaires back to the researchers in the preaddressed, stamped envelopes. As per ethics protocol, completion of the questionnaire served as informed consent.

Analysis

Using SPSS, version 13, descriptive statistics were run to assess the physical activity levels of preschool-aged children at home. Data from the survey were analyzed using paired sample *t*-tests to assess whether there were significant differences between weekday and weekend day physical activity behaviors, indoor versus outdoor activity, and low- versus high-intensity activity.

Results

Physical Activity as Reported by Parents

Overall, parents reported an average of 40.9 minutes of high-intensity indoor activity per day (*SD* = 32.2), and their preschoolers' high-intensity outdoor activity averaged 31.7 minutes per day (*SD* = 28.2), for a total of 72.5 minutes of daily high-intensity activity (*SD* = 48.0; see Table 2). Children spent significantly more time engaging in high-

intensity indoor activity versus outdoor activity ($p < 0.001$) and significantly more time in high-intensity physical activity on weekend days than on weekdays, with 54.3 minutes ($SD = 41.1$) versus 29.2 minutes ($SD = 24.5$) respectively ($p < 0.001$). Parents reported an average of 108.3 minutes of low-intensity indoor activity ($SD = 98.0$) and 37.1 minutes of low-intensity outdoor activity each day ($SD = 28.2$), which was significantly more than their preschoolers' high-intensity activity ($p < 0.001$).

For those children who did meet the guidelines suggested by the National Association for Sport and Physical Education by engaging in physical activity from 60 to 190 minutes, their daily activity averaged 105.7 minutes of high-intensity activity ($SD = 38.8$). For those who were physically active from 0 to 56.7 minutes a day and did not meet the guidelines, their daily high-intensity activity averaged 31.7 minutes ($SD = 16.4$).

Table 2

Means (Standard Deviations) for Indoor vs. Outdoor Physical Activity

Intensity level (minutes)	Physical Activity		
	Indoor	Outdoor	Total
Low (<i>SD</i>)	108.30** (97.96)	37.10 (28.24)	142.70 (101.39)
High (<i>SD</i>)	40.89** (32.19)	31.73 (28.17)	72.47** (48.04)

** indicates a significant difference at $p < .05$.

Outdoor Playtime as Reported by Daycare Leaders

Outdoor playtime opportunities among preschoolers attending private and public daycare facilities averaged 129.0 ($SD = 51.0$) and 120.5 ($SD = 56.4$) minutes per day respectively.

Discussion

According to parental reports, 55% of preschoolers in this study met the minimum requirement of 60 minutes of physical activity recommended in *Active Start: Physical Activity Guidelines for Children Birth to Five Years*, whereas 45% of preschoolers engaged in less than 60 minutes of high-intensity physical activity daily (National Association for Sport and Physical Education, 2007). Children who did not meet the guideline need to double, on average, their current cumulative total of high-intensity activity to reach the lowest acceptable requirement of 60 minutes. Given the relative homogeneity of the sample's socioeconomic status (SES), no significant differences were present for preschoolers' high-intensity activity among children from varying SES groups or based on daycare arrangements (i.e., public or private).

Being outdoors has been documented as a correlate and accurate barometer of children's physical activity levels (Burdette et al., 2004; Sallis et al., 1993). Therefore, it is important to support and promote outdoor playtime among children of all ages. Interestingly, preschoolers in the current study spent significantly more time engaging in indoor rather than outdoor activity. One possible reason for this finding may be the colder weather during the fall in southwest Ontario.

Daycares in this study included licensed and unlicensed facilities. Both types of providers indicated that children attending their facilities had approximately two hours of outdoor playtime, which afforded ample opportunity during the day to meet the minimum physical activity guidelines. It is not possible to know if this time was, in fact, used for physical activity because daycare leaders did not have the resources to provide individualized information (i.e., identify what each child did during this outdoor playtime). Based on the activity time available, we concur with Sellers and colleagues (2005) that daycare facilities are important venues to provide preschoolers with physical activity programming, exposure to different types of activities, and to ingrain activity as part of normal daily life from this young age. In a recent investigation, Bower and colleagues (2008) identified those children at facilities with high physical activity environment scores (as assessed using the Environment and Policy Assessment and Observation instrument) as receiving approximately 80 more minutes of moderate physical activity per week. Similarly, Dowda and associates identified that those preschoolers attending facilities that offered more resources and better educated teachers experienced significantly higher levels of physical activity (Dowda et al., 2004). Previous research has revealed that 50% of the variation in physical activity during preschool hours has been attributed to the childcare centre (Finn, Johannsen, & Specker, 2002; Pate et al., 2004). Given the large number of Canadian preschoolers attending daycare (Canadian Fitness and Lifestyle Research Institute, 2005b), and the possible variation in resources, quality, and outdoor time, policies and procedures that support play and activity are important and necessary to incorporate into the programming of childcare settings (Bower et al., 2008).

Limitations of the Study

This is the first Canadian study to assess the physical activity levels of preschool-aged children, and the findings provide a preliminary understanding of this population's current activity level, a level we deem to be disconcerting. Although researchers have found that all children over the age of 2 years benefit from regular physical activity (Marcus et al., 2000), almost half of the current study's population was not sufficiently active. However, the likely accuracy of our findings must be discussed. Although the Harro Physical Activity Questionnaire has been previously validated and deemed a simple and inexpensive tool for large-scale implementation, it does not differentiate activity intensity levels sufficiently. Therefore, this tool may have led to an underestimation of physical activity at the level needed to gain health benefits because only high-intensity activity was used as a proxy for sufficient intensity of physical activity. At the same time, because preschoolers are a difficult age group to assess, the self-response surveys relied on parental reports, which may have resulted in an over-reporting of the children's physical activity. As noted by Sallis, Patterson, McKenzie, & Nader (1988), whose activity findings were somewhat lower than in the current study, although parents tended to describe their young children as constantly active, their children's heart rate recordings suggested that two-thirds were actually not adequately active.

Although recruitment efforts continued for a year and a half, we were unable to acquire a representative sample of the city's parents of preschoolers. Parents who chose to participate in the current study had a high SES (average household income of

\$100,000). Previous researchers have found that participation in physical activity is positively correlated to SES (Ford et al., 1991). Therefore, we suspect that if our findings are not completely accurate, they likely reflect an over-representation of preschoolers' actual activity levels and, thus, even fewer than 55% of preschoolers may be meeting the guideline. While disturbing, this finding should not, perhaps, be a surprise considering that for three consecutive years, Canadian children have received a failing grade (D) on the Canadian Report Card on Physical Activity for Children and Youth (Active Healthy Kids, 2007). It is clear that physical inactivity among children is problematic, and interventions to encourage and support appropriate physical activity behaviors among children are imperative.

Although important findings and insights have been identified through the current study, there were a number of challenges and limitations inherent within the investigation that need to be noted. First, the poor response rate on the part of the parents of preschoolers is a concern. A possible reason for the low response is that another physical activity questionnaire was sent home through daycares around the same time by the City of London (which was unknown to the researchers until after initial recruitment). It is also possible that parental worry and guilt about providing the "right" experiences for the optimal development of children became a barrier to completing the survey. Previous research has identified that parents of preschoolers feel guilty because they worry about providing their child with all that they deserve, and this guilt may have influenced their willingness to participate (Irwin et al., 2005).

A further limitation was that the sex of the child was not requested as researchers would have been able to identify participants at the small childcare facilities, and this would have resulted in a breach of participant confidentiality. As a result, activity levels of boys and girls in this study cannot be compared. This is a limitation of the study as this information would have been valuable to see at what age girls' activity levels drop below that of boys.

Implications of the Findings

Despite the above-mentioned limitations, this study offers a starting point for measuring physical activity levels in preschoolers and identifying the outdoor playtime opportunities daycare facilities provide. The potential implications of preschoolers' insufficient activity for the current obesity epidemic are staggering; if nearly half of our preschoolers are not 'catching on' to the joy and habit of engaging in regular physical activity now, it is startling to think about what will happen to their body compositions as they enter and advance through the more sedentary homework years (Ritchie et al., 2001). The preschool years are a critical time to intervene from both a physical and behavioral standpoint (Borra et al., 1995; Schmitz & Jeffery, 2000; Steinbeck, 2001; Stolley et al., 2003). Moreover, daycare facilities represent an ideal and appropriate venue to target the physical activity levels of preschoolers. Further research using more objective measures on a larger sample is needed to better understand the physical activity behaviors of preschool-aged children.

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