

Physical Activity Levels Among Children Attending Family Day Care

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ABSTRACT

Objective: To objectively measure the physical activity (PA) levels of children attending family day care programs.

Methods: A total of 114 children from 47 family day care centers wore an accelerometer for the duration of their time in care. Time in moderate-to-vigorous PA (MVPA) and total PA was calculated using previously validated cut points.

Results: Children accumulated 5.8 ± 3.2 minutes of MVPA and 10.4 ± 4.4 minutes of total PA per hour of attendance. Boys exhibited significantly higher levels of PA than girls. Among healthy weight children, 4- and 5-year-olds exhibited significantly higher levels of PA than 2- and 3-year-olds. Overweight and obese 4- and 5-year-olds exhibited significantly lower levels of PA than their healthy weight counterparts.

Conclusions and Implications: Children attending family day care participate in low levels of PA during the child care day. The results highlight the need for effective programs to promote PA in family day care.

Key Words: preschool, accelerometry, sedentary behavior, active play (*J Nutr Educ Behav.* 2014;46:197-202.)

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INTRODUCTION

The prevalence of obesity among children aged 2–5 years has increased dramatically over the past 3 decades. Data from the 2007–2008 National Health and Nutrition Examination Survey indicated that just over 21.4% of US children between the ages of 2 and 5 years are overweight or obese.^{1,2} The dramatic rise in childhood overweight has been deemed one of the most serious public health issues facing society today. Obese children are at increased risk for adult obesity and, relative to non-obese children, are at increased risk for significant health problems such as insulin resistance, hypertension, pulmonary disorders, gastroenterological problems, and psychological problems.^{3,4}

Low levels of physical activity are an important contributing factor in the development and maintenance of childhood obesity.⁵ Janz and

colleagues⁶ studied the effects of physical activity participation at age 5 on body fatness, measured at ages 8 and 11. For boys and girls, daily moderate-to-vigorous physical activity (MVPA) was significantly and inversely related to fat mass at ages 8 and 11. Boys and girls in the highest quartile for MVPA at age 5 had significantly lower fat mass at ages 8 and 11 than did children in the lowest MVPA quartile at age 5.

In 2011, 61% of US children aged ≤ 5 years attended some form of child care on a regular basis.^{7,8} Whereas the majority of these children were cared for by a relative or attended center-based care just over 12% were cared for exclusively by a family day care provider, defined as a non-relative who cares for 1 or more children in her or his home.^{7,8} Children attending family day care spend considerable amounts of time in this setting. On average, children with

employed mothers spend 32 hours per week in family day care, whereas children with mothers not employed spend an average of 18 hours per week in family child care.⁸

Although it is an important setting to promote physical activity and prevent obesity in young children, little is known about the physical activity behaviors of children attending family day care. To date, only 1 published study examined the physical activity characteristics of children in this child care setting. Temple and colleagues⁹ objectively measured the physical activity levels of 64 children attending family day care in British Columbia, Canada. On average, children accumulated < 2 minutes of MVPA per hour of child care attendance and accumulated virtually no vigorous intensity physical activity across the child care day. Although the results of that study suggest that children attending family day care are insufficiently active, the extent to which the findings are generalizable to children attending family day care in the US is unknown. Furthermore, the small sample size did not allow the investigators to explore potentially important age group, gender, and weight-related differences in physical activity behavior. Therefore, the aims of this study were twofold: (1) to objectively measure the physical

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activity characteristics of a large and age diverse sample of children attending family day care in the northwestern US; and (2) to examine the influence of age, gender, and weight status on physical activity participation.

METHODS

Participants and Settings

Participants in the study were 2- to 5-year-old children attending family day care centers enrolled in the Healthy Home Child Care Project, an obesity prevention study for preschool-aged children and their families. Family day care centers were recruited from 5 regional child care Resource and Referral hubs serving 7 economically diverse counties in Oregon. Before selection, the sample was stratified by Resource and Referral hub and providers within each stratum were randomly sampled with a probability proportional to the total number of registered family day care centers operating in the hub.

Initially, 63 family day care centers were enrolled in the study. Of those, 5 had too few children under their care when data collection began (< 4 children) and 2 others closed their business before data collection, which left a sample of 56 family day care centers. All children between the ages of 2 and 5 years attending these family day care centers were invited to take part in the activity monitoring portion of the study. The number of eligible children within each family day care center ranged from 1 to 6, with a median of 4 child participants per family day care center. The study was approved by the University of Queensland's institutional review board, and before participating, family day care providers and the children's parents provided written informed consent.

Physical Activity Assessment

Physical activity was measured using the ActiGraph GT1M accelerometer (Pensacola, FL). Activity assessments were conducted during a randomly selected week. At the beginning of each monitoring day, the provider attached the accelerometer to the child's right hip via an adjustable

elastic belt, noting the time of attachment, the identification number of the child, and the identification number of the accelerometer on the activity monitoring log. When the child departed, the child care provider removed the accelerometer and noted the time of departure on the log. The ActiGraph accelerometer has been shown to be a valid instrument for assessing physical activity in preschool aged children.¹⁰

Data Reduction

Stored activity counts were uploaded to a customized data reduction macro for the determination of daily time spent in MVPA and total PA (TPA) (sum of light, moderate, and vigorous physical activity). Counts were classified into these intensity categories using the previously validated cut points developed by Van Cauwenberghe and colleagues.¹¹ Non-wear time was estimated by summing the number of consecutive 0 counts accumulated in strings of ≥ 60 minutes.¹² Children were included in the analyses if they had ≥ 2 days in which wear time was $\geq 75\%$ of the attendance time. The 2-day inclusion criterion provided a reliability of > 0.70 for MVPA and TPA (intraclass correlation coefficient, 0.73–0.84). All variables were standardized for the duration of child care attendance by dividing each activity outcome by wear time.

Height and Weight Assessment

Height was measured to the nearest 1 mm using a portable stadiometer (Seca 214; Seca, Chino, CA). Weight was measured to the nearest 0.1 kg using a portable digital scale (Seca 874). Body mass index was calculated as body weight in kilograms divided by height in meters squared. Children were classified as overweight or obese using the age- and sex-specific 85th and 95th percentiles from the Centers for Disease Control and Prevention growth charts.¹³

Statistical Analyses

Group differences in the physical activity variables were evaluated for significance using a 3-way (gender \times age group \times weight status) factorial ANOVA. A binary age group variable

was created by combining 2- and 3-year-olds and 4- and 5-year-olds.

RESULTS

Of the 56 family day care centers enrolled in the study, 47 completed the accelerometry protocol. The initial and monitoring samples were comparable with respect to median years of operation, number of children between the ages of 2 and 5 years, provider age, provider education, race/ethnicity, and participation in the Child and Adult Care Food Program (Table 1).¹⁴ Within the 47 family day care homes, a total of 191 children (mean age, 3.4 ± 1.1 years; 49.5% male) were eligible for the activity monitoring study. Of this number, 124 children wore the accelerometer on at least 1 day and completed the height and weight assessments (mean age, 3.6 ± 1.0 years; 53.2% male; 29% overweight or obese). After excluding participants with < 2 valid monitoring days ($n = 10$), the final sample consisted of 114 children (60 boys and 54 girls). Exclusion of these participants had negligible impact on the demographics of the sample. Table 2 provides descriptive characteristics of the final monitoring sample.

On average, children wore the accelerometer for 5.5 ± 1.6 h/d. Across the entire sample, the average participation in MVPA and total PA was 5.8 ± 3.2 and 10.4 ± 4.4 min/h, respectively. Figure 1 displays gender differences in the physical activity variables. Relative to girls, boys exhibited significantly higher levels of MVPA and TPA during the child care day.

Relative to age and weight status, both MVPA and TPA exhibited evidence of a significant age group by weight status interaction. The results are displayed in Figures 2 and 3, respectively. Among healthy weight children, 4- and 5-year-olds exhibited significantly higher levels of MVPA and TPA than 2- and 3-year-olds. No age-related differences were observed among overweight or obese children. Among 4- and 5-year-olds, overweight and obese children exhibited significantly lower levels of MVPA and TPA than their healthy weight counterparts. However, among 2- and 3-year-olds, MVPA and

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