Preventive Medicine 97 (2017) 33–39

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

"Monkey see, monkey do": Peers' behaviors predict preschoolers' physical activity and dietary intake in childcare centers

Stéphanie Ward [a,*], Mathieu Bélanger [b], Denise Donovan [c], Jonathan Boudreau [d], Hassan Vatanparast [e], Nazeem Muhajarine [f], Anne Leis [g], M Louise Humbert [h], Natalie Carrier [i]

[a] Centre de formation médicale du Nouveau-Brunswick, Pavillon J.-Raymond-Frenette, 100 rue des Aboiteaux, Université de Sherbrooke, Moncton, New Brunswick E1A 3E9, Canada
[b] Department of Family Medicine, Centre de formation médicale du Nouveau-Brunswick, Pavillon J.-Raymond-Frenette, 100 rue des Aboiteaux, Université de Sherbrooke, Moncton, New Brunswick E1A 3E9, Canada
[c] Department of Community Health Sciences, Centre de formation médicale du Nouveau-Brunswick, Pavillon J.-Raymond-Frenette, 100 rue des Aboiteaux, Université de Sherbrooke, Moncton, New Brunswick E1A 3E9, Canada
[d] New Brunswick Institute for Research, Data and Training, PO Box 4000, 304F Keirstead Hall, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada
[e] School of Public Health, 104 Clinic Place, University of Saskatchewan, Saskatoon, Saskatchewan S7N 2Z4, Canada
[f] Department of Community Health and Epidemiology, 107 Wiggins Road, University of Saskatchewan, Saskatoon, Saskatchewan S7N 2Z4, Canada
[g] Department of Community Health and Epidemiology, 107 Wiggins Road, University of Saskatchewan, Saskatoon, Saskatchewan S7N 2Z4, Canada
[h] College of Kinesiology, 97 Campus Drive, University of Saskatchewan, Saskatoon, Saskatchewan S7N 2Z4, Canada
[i] École des sciences des aliments, de nutrition et d'études familiales, Pavillon Jacqueline-Bouchard, 51 Antonine-Maillet Avenue, Université de Moncton, Moncton, New Brunswick E1A 3E9, Canada

ARTICLE INFO

Article history:
Received 25 August 2016
Received in revised form 15 December 2016
Accepted 8 January 2017
Available online 10 January 2017

Keywords:
Peer influence
Motor activity
Diet, food, and nutrition
Child, preschool
Child day care centers

ABSTRACT

Preschoolers observe and imitate the behaviors of those who are similar to them. Therefore, peers may be role models for preschoolers' dietary intake and physical activity in childcare centers. This study examined whether peers' behaviors predict change in preschoolers' dietary intake and physical activity in childcare centers over 9 months.

A total of 238 preschoolers (3 to 5 years old) from 23 childcare centers in two Canadian provinces provided data at the beginning (October 2013 and 2014) and the end (June 2014 and 2015) of a 9-month period for this longitudinal study. Dietary intake was collected at lunch using weighed plate waste and digital photography on two consecutive weekdays. Physical activity was assessed using accelerometers over five days. Multilevel linear regressions were used to estimate the influence of peers' behaviors on preschoolers' change in dietary intake and physical activity over 9 months.

Results showed that preschoolers whose dietary intake or physical activity level deviated the most from those of their peers at the beginning of the year demonstrated greater change in their intakes and activity levels over 9 months, which enabled them to become more similar to their peers (all β 95% CI ranged from −0.835 to −0.074).

This study suggests that preschoolers' dietary intake and physical activity may be influenced by the behaviors of their peers in childcare centers. Since peers could play an important role in promoting healthy eating behaviors and physical activity in childcare centers, future studies should test interventions based on positive role modeling by children.

1. Introduction

Establishing healthy eating and physical activity behaviors in childhood is important as these can persist into adulthood (Bélanger et al., 2015; Mikkilä et al., 2005) and could lead to better health outcomes later in life. Childcare centers have been identified as potential key locations for the promotion of healthy eating behaviors and physical activity as approximately 80% of preschoolers (2 to 5 years old) living in developed countries receive out-of-home care (Organisation for Economic Co-operation and Development, 2013), and spend a considerable amount of their waking hours in childcare centers. For example, 70%

* Corresponding author at: Centre de formation médicale du Nouveau-Brunswick, Pavillon J.-Raymond-Frenette, Université de Sherbrooke, 100 rue des Aboiteaux, Moncton, New Brunswick E1A 3E9, Canada.
E-mail addresses: stephanie.ann.ward@usherbrooke.ca (S. Ward), mathieu.f.belanger@usherbrooke.ca (M. Bélanger), denise.donovan@usherbrooke.ca (D. Donovan), jonathan.boudreau@unb.ca (J. Boudreau), vatan.h@usask.ca (H. Vatanparast), nazeem.muhajarine@usask.ca (N. Muhajarine), anne.leis@usask.ca (A. Leis), louise.humbert@usask.ca (M.L. Humbert), natalie.carrier@umoncton.ca (N. Carrier).

http://dx.doi.org/10.1016/j.ypmed.2017.01.001
0091-7435/

of Canadian parents who use childcare services for their children under the age of 4 report using them for at least 30 h a week (Sinha and Bleakney, 2014).

Childcare centers offer many opportunities for children to develop both healthy eating behaviors and physical activity. Children who attend childcare centers on a full-time basis are generally offered lunch and snacks, which can contribute to their daily nutritional requirements (Benjamin Neelon et al., 2011). United States benchmarks for nutrition have suggested that half to two-thirds of children's nutritional needs should be met while in childcare (Benjamin Neelon et al., 2011). However, many preschoolers consume low amounts of vegetables and fruit, and excessive amounts of saturated fat and added sugars while in childcare centers (Copeland et al., 2013; Erinosho et al., 2013; Gubbels et al., 2014). Furthermore, despite opportunities for children to be active inside and outside, studies have consistently shown that sedentary time within childcare centers is typically high, while physical activity levels are typically very low, accumulating <20 min per day of moderate-to-vigorous physical activity (MVPA) during an 8-hour day (Kuzik et al., 2015).

Bandura's theory of observational learning suggests that children can learn new behaviors, or increase or decrease the frequency of a previous behavior by observing, remembering and replicating the behaviors of those around them (Bandura, 1977). Furthermore, it is suggested that children will be more likely to replicate the behavior of someone who they like, respect or who they perceive as similar to themselves (Bandura, 1977). Therefore, preschoolers' eating and physical activity behaviors may be shaped by imitating those of their peers while in childcare centers. However, a recent systematic review concluded that current evidence of a potential relationship between preschoolers' food intake or physical activity, and that of their peers is based on small controlled experimental research, cross sectional observations, and small pre-post studies (Ward et al., 2016). This review also highlighted the need for longitudinal population-based studies to examine how peers influence these behaviors over time, as recent data suggest that it can take up to 8 months for a health-related behavior to be adopted (Lally et al., 2010). Therefore, this study aimed to assess how peers' behaviors predict preschoolers' dietary intake and physical activity in childcare centers, over the course of 9 months.

2. Methods

2.1. Subjects

Participants in the Healthy Start – Départ Santé (HSDS) intervention, a clustered randomized controlled trial conducted over a 9-month period in New Brunswick and Saskatchewan, provided data for this longitudinal study (Bélanger et al., 2016). All preschoolers (3 to 5 years) attending the childcare center on a full-time basis were eligible to participate in the study. Of the 61 childcare centers that were recruited for the HSDS intervention, dietary data from children who attended 17 childcare centers randomized to the control group in the first two years of the study were available at the time of analysis. Valid physical activity data from children attending 22 of the 23 centers randomized to the control group in the first two years of study and were used for the analysis on physical activity. Procedures used to obtain these data are described below. The HSDS study received approval from the Centre Hospitalier de l'Université de Sherbrooke, the University of Saskatchewan, and Health Canada ethics review boards. All parents or guardians of participating children provided signed informed consent.

3. Outcome assessments

3.1. Dietary intake

Children's intake in calories, fiber, sugar, fat, sodium, and fruit and vegetables was assessed at lunch on two consecutive weekdays, at baseline (October 2013 and 2014) and endpoint (9 months later, i.e., June 2014 and 2015, respectively) of the same school year, using weighed plate waste and digital photography. These nutrients were chosen based on reports that Canadian children frequently consume foods and beverages that are high in calories, sugar, fat and sodium, and consume insufficient amounts of fiber-rich fruit and vegetables (Garriget, 2007). The decision to collect dietary data on only two days was based on feasibility and on reports from previous studies which have assessed children's dietary data in schools and childcare centers over the same number of days (Ball et al., 2007; Kirks and Wolff, 1985). The weighed plate waste method has shown to be a reliable measurement of dietary intake and has been used in studies among school-aged children (Lee et al., 2001). First, each food item that was offered at lunch on days of data collection was weighed and photographed before and after each serving. This included the main course, sides, beverages and desserts. Second, the difference in weight between the initial serving and the leftovers was calculated to obtain each child's specific dietary intake. Third, the recipes of the lunches were entered into a nutritional analysis software, Food Processor (version 10.10.00), to analyze the child's intake in calories, fiber, sugar, fat, sodium, and fruit and vegetables. Pictures were used to validate all data collected and to qualitatively identify the proportion of food items that were served and consumed. The average intake over the course of the two days was then computed for each child. The difference between a child's dietary intake at endpoint and baseline was calculated to reflect the change in dietary intake of the child over the course of 9 months, and was used as the outcome variable for this study.

3.2. Physical activity and sedentary activity

Physical activity was assessed using the Actical accelerometer. The Actical has shown to be a valid tool for measuring physical activity levels of preschoolers (Pfeiffer et al., 2006). Children wore the accelerometer on the right hip with an elastic belt during childcare hours for five consecutive weekdays. Educators were required to place the accelerometer on the children when they first arrived at the childcare center, and remove it before they went home. Children were asked to wear the accelerometer during the entire day, including nap time. After the measurement period, the accelerometers were collected and sent to the research staff.

Accelerometer data were recorded in 15 second epochs, and were used to measure time spent in physical activity and sedentary behavior based on predetermined thresholds validated in preschoolers (Pfeiffer et al., 2006). Accelerometer counts of <25 counts per 15 s defined sedentary behavior (which would include nap time), while counts between 25 and 714 per 15 s defined light intensity physical activity time (LPA). Moderate-to-vigorous physical activity (MVPA) was defined as 715 counts or more per 15 s. Non-wear time was defined as at least 60 consecutive minutes of zero counts. Valid days and hours were determined using the study's baseline data, following a statistical method described by Rich et al. (2013). Specifically, the Spearman-Brown prophecy formula and the intraclass correlation coefficient were used to calculate the reliability coefficients (r) of the mean daily counts/minute and analyses were repeated on data from children who met wear times between one to ten hours (based on typical childcare hours of 7:30 am to 5:30 pm), and wear days between one to five (Monday to Friday). Results demonstrated that using a minimum of two hours and four days as valid minimum wear time provided acceptable reliability coefficients ($r = 78.6\%$) while maximizing the number of data collection days and sample size (Fig. 1). All children's physical activity data were then standardized to an 8-hour period to control for within and between participant wear time variation (Katapally and Muhajarine, 2014). Raw accelerometer data were cleaned and managed using SAS codes adapted for this study (Bélanger and Boudreau, 2015).