



Individual and environmental correlates of school-based recess engagement

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ABSTRACT

The purpose of this study was to examine individual variables associated with children's levels of recess physical activity (PA), as well as environmental influences that influence children's engagement during recess. Participants ($n = 146$) were 4–6th grade students across seven schools. PA data were collected using the Fitbit Flex. Psychological need satisfaction at recess data were collected with a basic psychological need satisfaction for recess PA survey. Observations of recess activity engagement and the quality of the recess environment were also collected at 134 recess periods ($n = 8340$ children) across nine schools. Results of multi-level regression analyses indicated that gender and recess time were significant predictors of physical activity during recess. In examination of the environmental level factors, multi-level regression analyses revealed that 'adult engagement and supervision' was the only significant predictor for recess engagement in boys and girls. These findings suggest the amount of time allocated, and the quality of the recess environment must be included in evaluation of the critical factors relevant to engagement of students in physically active recesses.

1. Introduction

Physical activity (PA) is important to help curb high obesity rates amongst today's children (Hills et al., 2011). In considering environmental contexts, the school day takes up a large quantity of waking hours for children, and is a prime opportunity to promote PA. Despite research that shows time spent engaging in PA may positively contribute to academic outcomes (Centers for Disease Control and Prevention, 2010; Jarrett et al., 1998; Wittberg et al., 2010; Zygmunt-Fillwalk and Bilello, 2005), and evidence which indicates that class time afforded to PA does not hinder academic performance (Centers for Disease Control and Prevention, 2010; Ahamed et al., 2007), time dedicated to PA opportunities such as school recess have decreased over the last two decades in the United States (U.S.) (Zygmunt-Fillwalk and Bilello, 2005). This trend disproportionately affects children who go to large, urban schools; schools with a high minority population; and schools with low-income levels (Robert Wood Johnson Foundation, 2007). These schools also report the fewest number of recess minutes allotted per day (Robert Wood Johnson Foundation, 2007). Children in urban communities also have less access to out of school opportunities to become physically active (Echeverria et al., 2014; Kottyan et al., 2014). Thus, opportunities during the school-day have become a more

important, yet ever decreasing, mechanism for children to engage in PA that may help temper the current obesity epidemic.

In the U.S., recess has been shown to be a primary contributor to school-based PA (Robert Wood Johnson Foundation, 2007; Erwin et al., 2012). Despite this, 60% of U.S. school districts have no formal policy regarding daily recess, and only 22% of school districts require daily recess for children, with less than half of these requiring at least 20 min of recess per day (Centers for Disease Control and Prevention, 2014). While recess is an opportune time for PA during the school day, critical factors that allow schools to leverage this time period to promote PA are needed. In considering factors that might influence recess activity and engagement, data has consistently shown that boys are more active than girls during recess periods. For example, controlling for socioeconomic status (SES), Baquet et al. (2014) reported that boys participated significantly more in moderate-to-vigorous physical activity (MVPA), and that girls were significantly more likely to engage in sedentary behaviors during recess. Similar findings have been reported throughout the literature (Ishii et al., 2014; Martin et al., 2012; Saint-Maurice et al., 2011; Viciano et al., 2016). Aside from gender, weight status and perceived competence in sports are likely contributors to PA during discretionary periods such as recess (Martin et al., 2012). This finding is consistent with previous work that suggested satisfaction of

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basic psychological needs (e.g., perceived competence) is predictive of PA behavior (Kotlyan et al., 2014; Haapala et al., 2014; Murillo Pardo et al., 2016; Stellino and Sinclair, 2013). Finally, in a systematic review of recess interventions, Erwin and colleagues (Erwin et al., 2012) reported that adding more playground equipment and providing a structured recess yielded the largest effect on PA during recess. Results showed the highest level of PA in younger children. Type of activity might also matter, as researchers have reported girls engage in similar levels of MVPA as boys when playing team sports (Saint-Maurice et al., 2011), and that providing an activity of the week intervention can yield gains in MVPA (Stellino et al., 2010).

As reported above, gender, age, SES, psychological needs and the playground environment can influence levels of PA during recess. Given that older elementary school children are less likely to be active than younger children, and that children in low SES schools are least likely to have opportunities for PA during school, we aimed to explore both individual, and environmental, correlates of PA in this specific population. The primary purpose of the current study was, therefore, to examine individual variables (i.e., gender, competence, autonomy, relatedness) that affect children's level of PA at recess; and to examine environmental factors (i.e., safety and structure, adult supervision and engagement, student behaviors, and transitions) that affect children's PA engagement at recess, in a sample of older elementary school students in an urban, low-income school district. Secondary purposes included an examination of how long students participated in PA during recess each day, the contribution of recess to school-based PA, and a description of what types of activities children choose to do at recess.

2. Materials and methods

2.1. Participants

Participants included 146 students ($M_{age} = 9.85$ years) in 4th, 5th and 6th grades across seven public schools in a large urban school district in the Midwestern portion of the U.S. Participants were 57.1% female, 43.5% African American, 34.8% Hispanic or Latino, and 12.9% Caucasian. Observational data of 8370 children, at 134 separate recess sessions were also collected across these nine schools. School district data reports showed that 85.07% of children in these nine schools were classified as economically disadvantaged and 12% were classified as English language learners.

2.2. Measures

2.2.1. Demographic data

Demographic data for each individual participant was collected by a trained data assessor. This information included participant age, grade, sex, and race (Table 1). Additionally, the percent of children classified as economically disadvantaged at each school was obtained from the department of public instructions' accountability report cards and used as an indicator of school level socio-economic status (SES).

2.2.2. Physical activity

The Fitbit Flex™ is a wrist worn triaxial accelerometer that uses proprietary algorithms to estimate steps counts and time spent in various activity levels. An anonymous account was created for each device accessible only by the research team. Data was housed by a third-party vendor (Fitabase LLC, San Diego, California). In child-based studies, both waist-worn (Hamari et al., 2017) and wrist worn (Voss et al., 2016) Fitbit devices (Fitbit One and Fitbit Charge, respectively) have been shown to have consistent levels of step counts with Actigraph accelerometers, yet may over-estimate absolute number of steps, as well as time spent in MVPA. Additional research in young adult populations has shown moderate validity between the wrist-worn Fitbit Flex and the wrist-worn Actigraph GT3X+ in free-living conditions (Sushames et al., 2016), yet the Fitbit flex showed higher levels of variability, and was

more likely to under-estimated activity levels.

2.2.3. Activities for Daily Living–Playground Play (ADL-PP)

The different types of activities children engaged in during recess were measured using an observational form of the Activities for Daily Living–Playground Play (ADL-PP; Stellino and Sinclair, 2014). The ADL-PP is a single-page document that includes 38 squares with labeled illustrations (i.e., the words “bounce a ball” with a drawn picture of a child bouncing a ball) of playground-based activities (e.g., kickball, hopscotch, watch other kids) that children typically engage in during recess. An additional open square (Box 39) with no illustration and the phrase “play a different game” was included so observers could report any activities that were not included elsewhere on the instrument, but played during recess. Trained observers conducted observations at 5-minute intervals during a recess period, with frequency counts collected for all activities including the different games, activities, or sedentary behaviors. Counts were separated by gender, and a percent of children engaged in active play (as opposed to not-engaged) was calculated. Previous studies have suggested high levels of agreement between children self-report and observer reports (Watkinson et al., 2001) as well as between multiple raters (Stellino et al., 2018).

2.2.4. Great Recess Framework–Observational Tool (GRF-OT)

The GRF-OT is an observational measure that is used during live data collection periods. Previous research has shown support for the factorial validity of a four-factor model for the GRF-OT (Authors, blinded reference). Specifically, adult supervision and engagement, safety and structure of the playground, student behaviors, and transitions have all emerged as unique constructs within the tool. These constructs are measured through a series of questions pertaining to the context of recess and placed on a 4-point scale in which lower scores reflect a lower quality scores for each item. In the current study, the range of possible scores on the GRF-OT was 16 (i.e., “1” for each item) to 64 (i.e., “4” for each item). Previous data has also supported the inter-rater reliability, and the test-retest stability of the GRF-OT (Authors, blinded reference).

2.2.5. Basic Psychological Needs Satisfaction – Recess (BPNS)

Individual students completed a modified version (Sushames et al., 2016) of the basic psychological need satisfaction scale (BPNS; Deci et al., 2001), which measures autonomy (7-items), competence (6-items), and relatedness (8-items) for PA at recess. All responses corresponded to a 5-point Likert scale (5 = high need satisfaction) on items such as “I feel like I can say my ideas about what I want to do at recess” (autonomy), “Kids tell me I am good at things I do at recess” (competence) and “I really like the kids I play with at recess” (relatedness). Previous research consistently reported adequate reliability for each of the three areas of need satisfaction, including use of the measure adapted to physical education (Sushames et al., 2016; Stellino and Sinclair, 2014).

2.3. Procedures

All procedures were approved by the institutional review board of the first author's institution and the participating school district's research and evaluation office prior to school and participant recruitment. Schools were provided a \$70 gift certificate to purchase recess equipment after data collection was completed. Parental consent forms were sent home in the weekly folders of fourth and fifth grade students at each school (note: one school had a combined classroom with 4–6th grade students, and thus these 6th grade students were included in the study). Signed parental consent and student assent was obtained to collect individual level data for 146 students. Prior to the start of the school day each participant was fitted with a Fitbit Flex on their non-dominant hand and was instructed to keep the device on throughout the day. Members from the research team were present at the beginning

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