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Physical activity during the segmented school day in adolescents with and without autism spectrum disorders

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ABSTRACT

The purpose of this study was to assess the intensity of physical activity (PA) that secondary school-aged students with autism spectrum disorders (ASD) and typically developing (TD) students exert during a school day, and to compare the percentages of students achieving the recommended guidelines between groups. The PA of 60 male students (ASD, $n = 30$; TD, $n = 30$) was recorded every 10 s for up to 5 school days by performing uniaxial accelerometry. The main results are listed as follows: (a) daily PA was significantly lower among the students with ASD than among the TD students; (b) students with ASD spent significantly lower proportion of their time in moderate PA than TD students did during physical education (PE), recess, and lunchtime; and (c) fewer students with ASD than TD students achieved the PA guidelines during the school day and PE time. Schools should increase PA opportunities across the school day.

1. Introduction

The prevalence of overweight and obesity among youths has become a major health concern worldwide, and youths with autism spectrum disorders (ASD) are particularly vulnerable to development of obesity (Curtin, Anderson, Must, & Bandini, 2010; Memari et al., 2012; Rutkowski & Brimer, 2014) due to the complex behavioral, physical, and psychosocial difficulties (Srinivasan, Pescatello, & Bhat, 2014). Youths with ASD may have motor impairments (Fournier, Hass, Naik, Lodha, & Cauraugh, 2010; Memari et al., 2013; Pan, 2014; Staples & Reid, 2010) and exhibit low levels of physical activity (PA) (Borremans, Rintala, & McCubbin, 2010) that are closely associated with the development of obesity. Since physical inactivity is a major modifiable factor contributing to the international epidemic of childhood obesity, understanding the availability of PA opportunities for youths with ASD is crucial to developing, implementing, and evaluating interventions targeting PA.

Schools are in a position to address the need for increasing PA among their students with and without disabilities because many students do not have access to PA programs outside of school (Lee, 2005). Therefore, examining the PA opportunities available to students during a school day is essential to identifying the time periods in which PA can be increased. Schools are

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recommended to provide PA opportunities to students that enable them to meet the guideline recommending 60 min of moderate-to-vigorous PA (MVPA) on most days of the week (Centers for Disease Control & Prevention, 2011; U. S. Department of Health and Human Services [USDHHS] and Department of Agriculture, 2005). Some students, such as those at risk for overweight or obesity, may need more than 60 min per day to maintain or regain adequate health status. Schools are also recommended to provide students with MVPA opportunities such as physical education (PE) and recess. The guidelines for school-day PA recommend that 50% of the class time during PE (USDHHS, 2010) and 40% of the recess time and lunch breaks be spent in MVPA (Ridgers, Stratton, & Fairclough, 2005). In addition, schools should maximize students' MVPA not only during PE classes and recess time but also during after-school hours (extracurricular activities) to promote lifelong PA participation. The implementation of multiple PA practices doubled the PA of students during the school day (Carlson et al., 2013); however, the formal and informal PA opportunities that schools provide to students with ASD require investigation to address issues related to obesity risk and prevention.

Evidence supports the effectiveness of school practices such as PE (Pan, 2008b) and recess (Rosser-Sandt & Frey, 2005) in increasing the PA of students with ASD, although the influence of the type of practice on the PA of these students is controversial. Rosser-Sandt and Frey (2005) compared PE, recess, and after-school MVPA between students with ($n = 15$) ASD and typically developing (TD) peers ($n = 13$) aged 5–12. No significant differences in the PA levels of the two groups were observed. Students with ASD engaged in relatively similar MVPA during recess (58%), during PE (41%), and after school (29%) compared with the TD students. When time periods were compared, both groups spent more time in MVPA during recess and PE than during the after-school period, indicating that recess is a valuable source of MVPA for students with and without ASD. Pan (2008b) compared MVPA in students with ($n = 24$) ASD and TD students ($n = 24$) (aged 7–12) during inclusive PE and recess and observed no differences in the MVPA levels of the two groups; however, both students with ASD and TD students spent more time in MVPA during PE (46% and 47%, respectively) than during recess (28% and 36%, respectively); these results emphasized the importance of structured PE in increasing MVPA among these participants.

The definition of recess time and availability of support for PA (e.g., if children with ASD had aides) in the aforementioned studies (Pan, 2008b; Rosser-Sandt & Frey, 2005) may be factors contributing to the differences observed in the results. Rosser-Sandt and Frey (2005) did not include lunchtime in the recess period, whereas Pan (2008b) addressed a combined lunch and recess period (30–60 min/day); an increase in the overall recess time available was associated with a lower percentage of MVPA during recess. However, studies in which only a specific recess time period was examined indicated that students with ASD spent less time in MVPA during the lunch break than TD students did (Pan, 2008a). Furthermore, PE and the recess environment were not controlled and many variables existed; for example, the PE placements for students with ASD included regular PE with or without an aide, reverse mainstream PE, and segregated PE in the Rosser-Sandt and Frey (2005) study, whereas, in Pan (2008b), all students with ASD were placed in regular PE classes without an aide. Moreover, students with ASD engaged in recess in both segregated and inclusive settings and received varying levels of support in the Rosser-Sandt and Frey (2005) study; whereas, students with ASD were placed in an inclusive setting without any support in Pan (2008b). Further research is required to control these variables and determine their influence on the PA levels of students with ASD.

PE, recess, lunchtime, and after-school time are the critical times that enable students to be active during school days through formal and informal play, sport, active walking, and running. Very few ASD studies have distinguished between moderate PA (MPA) and vigorous PA (VPA), or examined only recess, lunch, or PE. Given that the magnitude of the association between PA and some health risk and health promotion behaviors of students is intensity driven (Delisle, Werch, Wong, Bian, & Weiler, 2010), it is of paramount importance to gain an insight into which segments of the day may benefit from strategies for increasing engagement in MPA and VPA. Therefore, the primary purpose of this study was to describe and compare objectively measured levels of the PA of secondary school-aged students with ASD and TD students during a typical school day (including PE, recess, lunchtime, and after-school time). The secondary purpose of this study was to explore the compliance of each group of students with recommendations for MVPA during these periods, and compare whether guideline compliance differed between students with and without ASD during the school day, PE, recess, and lunchtime. The recommendations applied were engagement in MVPA for at least 60 min MVPA during the school day, 50% of PE class in MVPA (USDHHS, 2010), and 40% of recess and lunch time in MVPA (Ridgers et al., 2005). We hypothesized that (a) students with ASD would be less active than TD students during the school day and each time interval of the day, and (b) a lower proportion of students with ASD than TD students would meet PA guidelines during the school day and in each segment of the day.

2. Method

2.1. Participants and settings

Participants were recruited from local secondary schools and autism support organizations and networks, and through available media (direct contact, e-mail announcement, and autism list serves) in Taiwan. The inclusion criteria required that the participants be in good health and free from diseases or disorders that could affect their physical movement (e.g., cerebral palsy, orthopedic dysfunction).

Thirty male students with ASD from 22 secondary schools and 30 male TD students from 23 secondary schools aged 12–17 years volunteered to participate. A child psychiatrist or a physician diagnosed the ASD at a hospital (Taiwan Ministry