



Original article

Ethnicity differences in pedometer-based physical activity levels among adolescent girls

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Abstract

The purpose of this study was to determine adolescent girls' objective daily physical activity levels and how these levels varied as a function of ethnicity. The participants were 104 middle-school girls (mean age = 12 ± 0.96 years). All subjects wore the Walk4Life Neo II pedometer for three consecutive weekdays to obtain their steps and physical activity time. More than 60% of the girls exceeded 60 minutes physical activity per day. Fewer than 10% of the girls exceeded 12,000 steps per day, and > 90% reached 100 steps per minute. Hispanic girls accumulated significantly more activity time per day ($F(2, 79) = 5.17, p = 0.008, \eta^2 = 0.11$) and steps per day ($F(2, 79) = 4.90, p = 0.01, \eta^2 = 0.11$) than Caucasian girls. No significant differences were found between Hispanic girls and girls of other ethnicities, and between Caucasian girls and girls of other ethnicities. In conclusion, middle-school girls' physical activity levels measured by steps per day, minutes per day and steps per minute reflected differently when using the existing physical activity recommendations of children as the assessment standard. Hispanic middle-school girls were more physically active than Caucasian girls.

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Keywords: Pedometer; Physical activity measurement; Steps per minute

Introduction

In a long range of lifespans, sex is a negative factor for physical activity. Physical activity levels have declined dramatically across both sexes during childhood and adolescence,^{1,2} particularly among adolescent girls.³ It has been evident that adolescent boys are more physically active than adolescent girls.^{1,2,4,5} Recently, researchers have devoted great effort and commitment to promoting physical activity participation among adolescent girls.^{6,7}

Empirical studies have indicated that the decrease in adolescent girls' physical activity participation is not only in Americans^{6,7} but also in Taiwanese.⁸ Such a decrease of adolescent girls' physical activity levels is closely related to the

decrease in physical education enrollment.⁶ Although the overall physical activity levels decrease as girls age, the participation in sports team could increase the physical activity participation of adolescent girls.⁷ Compared with the two aforementioned self-reported studies for physical education registration and sports participation,^{6,7} one accelerometer-based study has found that school-based and community-based interventions could modestly improve physical activity among middle-school girls.³

Studies of physical activity in relation to ethnicity have been well documented. The majority of the empirical studies have suggested that non-white ethnicity is a negative factor for physical activity.^{9,10} One self-reported study has found that, compared with Whites or Caucasians, eighth grade African-American girls spend less time in participating in physical activity but more time in television viewing.¹¹ All the national reports by the Centers for Disease Control and Prevention (CDC) have indicated that non-White children, particularly Hispanic and African-American children, have lower

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participation in both organized and nonorganized physical activity, lower physical education registration, and lower levels to meet recommended physical activity levels.^{12–14} For example, one report has indicated that 62.9% of Hispanic children participated in exercise ≥ 3 days per week compared to 69.1% for African–American children.¹⁵ However, these studies were conducted with self-reported surveys and no specific grade groups of girls were mentioned. Daily physical activity participation among adolescent girls as measured by objective instruments has been scarce. In response, the present study was designed to investigate adolescent girls' physical activity levels during weekdays.

A large variety of factors including school children's personal attributes, psychosocial aspects and environmental factors (e.g., school, community, and family) influence physical activity levels. In the present study, the subjects were middle-school girls with a relatively small age range, and the students' socioeconomic status (SES) should be an important factor in their physical activity level. For instance, in a study regarding the impact of SES on children's physical activity participation, it was reported that children aged 10–17 years were more likely to participate in physical activity ≥ 3 days per week when the family income increased.¹⁵ Also, children from families living below the federal poverty level were the least likely to exercise regularly, when compared to children from non-poverty families.¹⁵ For example, access to sports activities outside of school often requires transportation or money for access to club sports, as well as parent time to accompany children to their activity.⁹

In addition to the self-reported survey, there are many new equipment-based assessment tools available to measure physical activity, including but not limited to accelerometer, heart-rate monitor, and pedometer. Mostly because of its acceptable price and ease of use for large studies, one-function pedometers, which count steps only, have been used in the majority of pedometer-related studies.^{16–24} Steps only from pedometers cannot reflect physical activity characteristics such as intensity. For example, it is hard to say that 6000 steps per day are not enough for a 12-year-old girl to maintain optimal body mass index. If this girl spent 2 hours physically moving to obtain the step number, her steps per minute for that day could not reflect the physical activity intensity. In that case, the intervention strategy should just increase her physical activity duration but not intensity. Two-function pedometers count steps and time simultaneously. They cannot capture physical activity intensity directly, but can provide more detailed information about children's physical activity participation, and are helpful for promoting physical activity levels. However, these pedometers have only been recently used in the field with limited research.²⁵

Few studies have been conducted in the United States to analyze middle-school girls' daily physical activity levels using two-function pedometers, therefore, this study intended to examine middle-school girls' daily physical activity levels as measured by pedometer-based steps per day, physical activity time and steps per minute, as well as the differences between various ethnicities. Specifically, three research

questions were proposed in this study. (1) Do the daily steps, daily physical activity time, and steps per minute reflect the same levels of middle-school girls' daily physical activity participation? (2) Do middle-school girls' daily physical activity levels meet the existing children's physical activity recommendations? (3) What are the ethnicity differences of middle-school girls' physical activity levels?

Methods

Participants

Participants were recruited from three urban public middle schools located in the Southwestern United States, using a convenience sampling method. A total of 104 female students participated in this study. Their mean age was 12 years with a standard deviation of 0.965 (Table 1). The sample was consistent with the ethnic distribution in this particular metropolitan area.

Support letters from the school principals were obtained, and approval from the Institutional Review Board of the university was received. Contact with each school principal was made to initiate the recruitment process. Recruitment consisted of sending home with all eligible girls an envelope that contained a parental consent form and a student assent form. Once students provided each of the above signed forms, they were then permitted to participate in this study. All the data collection was conducted in the school cafeteria 30 minutes before the school started from Tuesday to Friday morning.

Instruments

State and local middle school youth risk behavior survey

Demographic information, parents' education, and household yearly income were collected from the parents by using the State and Local Middle School Youth Risk Behavior Survey (SLMSYRBS). This instrument is a modification of the 2007 Middle School Youth Risk Behavior Survey (MSYRBS¹⁵). It has an acceptable reliability and a validity of $\kappa = 61–100\%$.

Pedometer

This study used a W4L Neo II pedometer (Plainfield, IL, USA) to count daily steps and physical activity time to assess

Table 1
Descriptive characteristics of participants by school.

	School 1	School 2	School 3	Total	%
No. of participants	51	14	39	104	
Age (yr)	12 \pm 0.92	11 \pm 0.48	12 \pm 0.95	12 \pm 0.94	
Grade					
6	22	13	13	48	46.2
7	18	1	12	31	29.8
8	11	0	14	25	24
Ethnicity					
Caucasian	23	6	7	36	34.5
Hispanic or Latino	26	6	25	57	54.6
African–American and others	2	2	7	11	11.0

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