Physical Activity of Adolescents in a Medium-Sized City in China

PENGYU DENG*, YOSSHIIKO ISIIHARA*, HISASHI NAITO*
*Graduate School of Health and Sports Science, Juntendo University, Chiba, Japan

Objective: An important strategy for achieving healthier body compositions is to encourage lifetime physical activity (PA) participation in overweight or obese adolescents. The purpose was to compare the association between PA and obesity among adolescents in China, and to identify the factors that influence the PA and obesity.

Methods: In 2013, a cross-sectional study was involved 962 Chinese children and adolescents aged 12-16 years (mean age 14.9±0.9). The adolescents were classified as normal weight (NW), overweight (OW), and obese (OB), according to the BMI cut-offs that was determined by an obesity working in China. The adolescents were recruited for anthropometric measurements and to complete a standardized PA questionnaire. Other confounding variables such as the parents’ demographic information, and lifestyle factors were also collected through the questionnaire.

Results: Nine hundred thirty-seven valid data were collected from the adolescents. The prevalence of obesity was 8.8% (boys: 9.9%, girls: 7.5%) for junior high-school students (JS) and 7.8% (boys: 12.7%, girls: 4.3%) for high-school students (HS). Regardless of the sex and weight status, the probabilities for achieving PA for HS were less than JS. Moreover, the OW and OB groups had significantly less PA, watched more television, or used the computer more often than the NW groups (p<0.05).

Conclusion: The adolescents consistently failed to meet the established PA recommendations and supported the age-related declines in PA. In this study, we highlighted the importance of promoting PA to adolescents, especially those who are OW and OB.

Key words: physical activity, adolescents, questionnaire, China

Introduction

Childhood obesity is a pandemic that is associated with physical and psychological morbidities in children. It also contributes to an increase in non-communicable chronic diseases and premature mortality in adulthood. In mainland China, the rate of increase in childhood obesity prevalence exceeds the trends seen in many other countries over the last 2 decades. Satisfactory results in childhood obesity control have been obtained through tactics that stimulate the decrease in sedentary behaviors. According to Santaliestra-Piasias et al., children and adolescents spend much of their leisure time with low intensity and low caloric expenditure activities. Thus, spending more time in less vigorous activities, such as watching TV, and using the computer, has contributed to weight gain in adolescents. The main physiopathology of this disorder is the positive balance of energy intake.

An important strategy for achieving healthier body compositions is to encourage lifetime physical activity (PA) participation among overweight or obese children and adolescents. PA surveillance in developed countries has focused primarily on sports and exercise either during or before school. Likewise, we know little about the physical inactivity (e.g., television watching, studying, or passive games) of youth in developing countries.

As a developing country, China is currently experiencing rapid changes in health and nutrition that are linked to political and social reforms such as...
were initiated more than 20 years ago. Although there are differences among regions, previous reports suggested that the epidemic of childhood overweight and obesity in China has been spreading all over the country since the end of the twentieth century. In order to respond to this situation, the Chinese government released a new policy in 2007, requiring daily 1 h PA to help the children achieve current Chinese PA guidelines (i.e., doing any kind of PA for a total of 60 minutes or more per day). However, the Chinese National Physical Fitness and Health Surveillance reported in 2010 that only 22.7% of Chinese students aged 9–18 had achieved the goals of the Chinese PA guideline. Moreover, studies of physical activity questionnaires in China mainly focused on people living in the super urban metropolis. There were no related reports involving people from medium-sized cities such as Loudi. Thus, the purpose of this study is to compare the association between PA and obesity in adolescents, and to identify the factors that influence the PA and obesity in South China.

Method

1. Participants

A cross-sectional study was performed involving 962 participants (500 boys and 462 girls), aged 12–16 years, who were recruited from a middle and high school in Loudi (a city in South China). Those students who refused to participate were excluded from the study. Participants were included if they appeared healthy, and without any health problems that might inhibit PA. For participants who had difficulty understanding the questionnaire, the trained interviewer explained it to them. The subjects provided their informed consent to participants in a study protocol, which adhered to the Declaration of Helsinki, and was approved by the ethical committee of the Juntendo University.

2. Anthropometrics

All anthropometric data were collected by trained staff and supervised by the school nurse. Height and body weight were taken by using a portable stadiometer, and digital scale (TCS-200-RT; YaoYi, Shanghai, China). Height was measured to the nearest 0.1 cm without shoes, and body weight was measured to the nearest 0.1 kg in light underwear. BMI was calculated using the following standard equation: BMI = weight in kg/height squared in meter. Weight status, i.e., normal weight (NW), overweight (OW) and obese (OB) were determined according to the Working Group on Obesity in China with age- and sex-specific cut-offs.

3. Questionnaire development

The present study was conducted from September to October 2013. We used a questionnaire to characterize the levels of PA that were performed in the preceding seven days before the questionnaires were administered, which had been translated and adapted to exclude PA. The questionnaire consisted of questions about sports and games as well as PA at school, and in their leisure time, including weekends. The Chinese short-form version of the International Physical Activity Questionnaire (IPAQ) was used to measure the level of PA. The short form measures PA across all domains of leisure time, work transportation, and household tasks. It asks the respondents to report the duration (in minutes) and frequency (days) of performing working, moderate to vigorous physical activity (MVPA), for at least 10 minutes per session, during the previous 7 days. The IPAQ short form was considered flexible enough to be used in telephone interviews or for self-administered applications, and adaptable enough to apply across cultures.

Other confounding variables such as the health status, self-efficacy, family, and peer support for PA, screen-based behaviors, and sports facilities in the neighborhood, were also collected through the questionnaires. The screen-based behaviors included using the computer and playing electronic games. Children reported the total time that they engaged in these activities during weekdays and weekends in the past week according to 15 items (range 0–15).

4. Statistical analysis

Both boys and girls were divided into three groups (NW, OW, and OB). Analyses were conducted by using the SPSS statistical software (SPSS Inc., IBM, USA). The results were given as mean ± SD or n (%), as appropriate. We estimated
the overweight and obesity (%) prevalence among the different groups. Student’s t-test and Kruskal-Wallis ANOVA were used to determine significant differences between the weight status and the frequencies of screening time. When the Kruskal-Wallis ANOVA was significant, the Mann-Whitney U test was used in a post hoc analysis to determine significance of differences. A p-value < 0.05 was considered significant.

Results

1. Participant characteristics

The anthropometric characteristics of the sample, such as weight, height, and BMI are shown in Table-1. Nine hundred thirty-seven participants were evaluated in this study, with 482 boys and 455 girls, aged 12-16 years. The prevalence of overweight and obesity were 13.8% and 9.9% as well as 12.6% and 7.5% for the boys and girls’ junior high school (JS) participants aged 12 to 13 years, respectively (Table-2). Among high school (HS) participants aged 14 to 16 years, the prevalence of overweight and obesity were 20.9% and 12.7% as well as 18.4% and 4.3% for the boys and girls, respectively. In this sample, the prevalence of OB was higher among the boys (p<0.05).

2. The probability of failing to achieve the WHO recommendations

The relationship between weight status and the
probability of failing to achieve the WHO recommendations (60 min of MVPA per day) for JS and HS participants are shown in Figure-1. The probability of failing to achieve the WHO recommendations for adolescents varied among the student groups. Among the boys JS participants, this was 64.7%, 63.6%, and 76.0% in the NW, OW, and OB groups, respectively. Among the girls JS participants, the probability was 70.7%, 72.7%, and 81.5% in the NW, OW, and OB groups, respectively. The probability of failure was 77.0%, 80.0%, and 71.4% for the NW, OW, and OB boys HS participants, and 17.5%, 28.4%, and 35.2%, and 13.6%, 21.6%, and 36.4%, for the NW, OW, and OB girls HS participants, respectively. The boys had significantly less screen time than their girls (p<0.05). The percentage of screen time of more than 2 hours per day for adolescents was 17.1%, 24.2%, and 28.0% for the NW, OW, and OB boys JS participants, respectively. Among the girls JS participants, the probabilities were 20.1%, 18.0%, and 35.7% for the NW, OW, and OB, respectively. For the NW, OW, and OB boys HS participants, the probabilities of screen time were 17.5%, 28.4%, and 35.2%, and 13.6%, 21.6%, and 36.4%, for the NW, OW, and OB girls HS participants, respectively. The boys had significantly less screen time than their girls (p<0.05). The percentage of screen time of more than 2 hours was significantly higher in OB compared to NW groups for the girls’ participants (p<0.05). This was not observed in the boys.

3. The probabilities of screen time

The relationship between weight status and screen time for JS and HS participants are shown in Figure-2. The percentage of screen time of more

Discussion

This study presents data on the relationship between PA and obesity among adolescents in a medium-sized city in the south of China. Furthermore, there was strong evidence to show that higher the values of BMI, the higher the probabilities of failing to achieve the recommendations, and the prevalence of Chinese youth, especially OW and OB who exceed the recommended screen time
guideline increased significantly.

Some factors that may be associated with the increasing rates of overweight and obesity among adolescents in China have been investigated. Similar to previous reports, our results also showed that OW and OB adolescents were spending more screen time hours compared to NW adolescents. Chen et al. found that spending more hours watching television and surfing the internet were significantly associated with the increased risk of obesity among the Chinese youth. Moreover, Ahn et al. reported that nutrition transition was accelerating and the result of this trend was a rapid increase in obesity and chronic diseases.

As shown in this study, approximately 60% of adolescents spend more than two hours on screen time per day. In this context, previous studies have shown a direct association between hours spent in front of the screen and weight. This fact may be associated with the lack of parental control over this habit, which results in children desiring the sweets and candy that are shown in TV or computer advertisements.

The results in this study may be due to the high priority that Asian cultures place on education, and the academic pressure to excel is put on the students by their parents and schools. The time spent in sedentary educational activities increased steeply after 3 years of follow-up in both boys and girls, corresponding to the time when students are preparing for junior high school or high school graduation exams, followed by entry into high school or university. During this time, students often spend more time on extracurricular tutoring in addition to homework, including evening classes in private institutions as well as private classes in order to prepare students for the final junior high school or high school examinations.

The lack of association between the screen time and socioeconomic status and income that was observed in this study differs from previous studies. When evaluating screen time among schoolchildren form Niteroi, RJ, Vasconcellos et al. found that this practice was significantly more prevalent among girls. Regarding socioeconomic status, a previous study showed its positive association with screen time. Moreover, according to Keihner et al., lower income adolescents spend more time on activities such as watching TV compared to those belonging to higher income families.

Corroborating these results, Babey et al. also found that adolescents who were more involved in PA spent less time watching TV or using the computer. Furthermore, the association between excess weight and daily hours watching TV that was observed in this study confirms the results reported by Vasconcellos et al. which also found a significant direct association between these variables. Moreover, this study also supports the results reported by Santaliestra-Pasias et al. who found that the reduction of time spent in sedentary behaviors can be used as a strategy to address adolescents obesity.

We recognize some strengths and weaknesses in our study. The study includes a relatively large and diverse sample, a comprehensive measure of the lifestyle environment and physical activity according to the different weight status of the adolescents in China. Limitations include the use of the questionnaire rather than objective assessment tools like the accelerometer to measure physical activity levels. Nonetheless, questionnaires are widely accepted in large-scale surveys with reasonable reliability for analysis. Secondly, the relatively small sample size, as well as the convenience sampling method used in our study, limited the general applicability of the study. Finally, the current research employed cross-sectional data and we therefore cannot draw causal conclusions on the basis of these findings.

Conclusion

In this survey, the failure of the adolescents to consistently meet established PA recommendations supported the age-related declines in PA. Therefore, it is necessary to stimulate interactive activities and promote more active lifestyles, by reducing the time that young individuals spend in front of the screen time, which contributes to the reduction of PA and excess weight in this population. The interplay between weight statuses, PA, sex, age, and the influence of obesity therein remain inadequately understood and require further research.
Acknowledgements

The researchers would like to thank the adolescents and their families who participated in this study. The authors wish to express their sincere appreciation to Mr. Wenquan, Wu and Mr. Liangfu, Zhou for their technical assistance.

Conflict of Interest

The authors declare that there are no conflicts of interest.

References