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Original article

# Physical activity among Chinese school-aged children: National prevalence estimates from the 2016 Physical Activity and Fitness in China—The Youth Study

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## Abstract

**Purpose:** To present national estimates of participating in moderate-to-vigorous physical activity (MVPA) and adherence to the recommendations of 60-min total daily MVPA among Chinese school-aged children and to assess demographic differences in MVPA.

**Methods:** Cross-sectional analyses of data from the 2016 Physical Activity and Fitness in China—the Youth Study. Participants were 90,712 primary, junior middle, and junior high school children (boys: 47%; girls: 53%), recruited from 1204 rural and urban schools across 32 administrative provinces and regions in the Mainland of China. Main outcomes were (a) average MVPA minutes per day in the previous 7 days by self-reports and (b) percentage meeting MVPA recommendations.

**Results:** Average MVPA time was 45.4 min/day, with boys having more MVPA (47.2 min/day) than girls (43.7 min/day) overall and across the 3 school grade categories. About 30% of participants met MVPA recommendations, with a higher percentage of boys (32%) than girls (28%) overall and across the 3 grades categories. Urban school children outperformed rural children in terms of MVPA time. Overall, boys were more likely to meet MVPA recommendations (adjusted odds ratio [aOR] = 1.19, 95% confidence interval [CI]: 1.16-1.22) compared with girls; children in higher grades (junior middle [aOR = 0.92, 95% CI: 0.87-0.98] and junior high [aOR = 0.59, 95% CI: 0.53-0.66]) were less likely to meet recommendations compared with primary school children. The odds of meeting recommendations did not differ between urban and rural children ( $p = 0.07$ ), but urban boys were found to be more likely to meet recommendations compared with rural boys (aOR = 1.14, 95% CI: 1.06-1.19).

**Conclusions:** Overall, the average MVPA minutes per day among Chinese school-aged children is low, and less than one-third of them meet MVPA recommendations. These results were most evident among junior middle and junior high school children and those living rural areas.

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**Keywords:** Children and adolescents; Exercise; Moderate-to-vigorous physical activity; Sedentary behavior

## 1. Introduction

The health benefits of regular physical activity (PA) for school-aged children have been well documented, including promoting growth and development and improving physical fitness.<sup>1-3</sup> Current global PA recommendations call for children and adolescents to engage in at least 60 min of daily moderate

to vigorous intensity PA (MVPA).<sup>3-5</sup> However, a large proportion of school-aged children in both developed and developing countries remains insufficiently active for achieving optimal health benefits.<sup>6-10</sup> It is estimated that, globally, approximately 80% of adolescents (13-15 years old) are not achieving the minimum recommended guidelines for MVPA.<sup>11</sup>

China, the largest developing country, has experienced major changes in social, economic, and built environments after nearly 30 years of economic reforms.<sup>12</sup> These changes have made a significant impact on health and lifestyle as witnessed by an increased level of physical inactivity<sup>8,13</sup> and unhealthy weight<sup>14,15</sup> and decreased or unchanged levels of physical fitness<sup>16,17</sup> among school-aged children. In 2010, a national

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survey of 166,812 children found that only 22.7% engaged in any type of PA for 60 min/day.<sup>18</sup> Another study of accelerometry-based MVPA among 2163 urban city children showed that only 9% of boys and 2% of girls met the recommended 60 min MVPA per day.<sup>19</sup> Other studies have also shown a high prevalence and increased trend of sedentary time among school children.<sup>8,13,20</sup>

As part of an on-going public health effort to track and evaluate PA in school-aged children, in 2016 the Physical Activity and Fitness in China—The Youth Study (PAFCTYS) was conducted. Using the PAFCTYS data, the purposes of this study are to present recent national prevalence estimates of daily MVPA and adherence to the recommended 60-min MVPA among Chinese school-aged children and to assess differences in MVPA and adherence to MVPA recommendations by sex, residence locale, and school grades.

## 2. Methods

### 2.1. Study design and sampling procedure

The data were acquired from the PAFCTYS, a national survey project sponsored by the Chinese Ministry of Education and conducted in fall 2016. The PAFCTYS employed a cross-sectional, multistage sampling design to survey PA and assess physical fitness of children and adolescents in primary, junior middle, and junior high schools from the school education system in China. The general sampling framework provides a representation in geography, economic development, and rural-urban diversity. Within this framework, target students were recruited using a 3-stage non-probability cluster sampling method described below.

In the first stage of sampling selection, from 22 provinces, 4 direct-controlled municipalities (Beijing, Chongqing, Shanghai, and Tianjin), 5 autonomous regions, and 1 Xinjiang Production and Construction Corps (an independent division within Xinjiang Uygur Autonomous Region), 4 local administrative cities were selected from each of 28 province-level units, and 8 districts were selected from each of the 4 direct-controlled municipality units. Given the expected urban-rural socioeconomic differences in our research outcomes, a selection of cities and districts was made with stratification by socioeconomic status within each urban and rural stratum. Accordingly, among the administrative cities, 1 town in a rural area and 1 district in an urban area were selected. Similarly, among direct-controlled municipalities, 4 towns in a rural area and 4 districts in an urban area were selected. For the second stage of sampling selection, 2 primary schools, 1 junior middle school, and 1 junior high school sample units were randomly recruited from a complete listing of all schools that were located within each sampling stratum (local town or district). The third stage was the selection of school grades within a sample school in which 1-2 grade classes were recruited. Among junior middle and junior high schools, student inclusion required that each grade class consist of at least 60 students (30 boys and 30 girls) whereas among primary schools, student inclusion required that each grade class consist of at least 30 students (15 boys and 15 girls). If the pre-specified grade-

specific student quota was not met, additional schools within a sample town or district were recruited to achieve the planned student enrollment number. This sampling process resulted in a range of 32 to 35 schools from each of the provinces and municipalities. Data collection took place between October and November 2016.

The study protocol was approved by the Ethics Committee of Shanghai University of Sport, and permission to conduct the study was obtained from the teachers and principals of the participating schools. All the children involved in the study, and their parents or guardians, were specifically advised that participation was completely voluntary. Verbal informed consent was obtained from all parents or guardians, and positive assent was obtained verbally from all the children prior to data collection. Data were collected and analyzed anonymously.

### 2.2. Study participants

Participants were 125,281 children from primary schools (Grades 4-6,  $n = 43,863$ ), junior middle schools (grades 7-9,  $n = 40,978$ ), and junior high schools (grades 10-12,  $n = 40,440$ ) schools, with student ages ranging from 9 to 17 years old.

### 2.3. Procedures

Following a standardized survey administration protocol, trained research assistants administered the survey during pre-arranged regular school hours. Students completed the survey either online (25%) or on a paper version (75%) in a classroom setting. The purpose of the study was explained to the school physical education teachers and students prior to data collection. Children were given detailed instructions on how to fill out the survey and were provided ample time for questions.

### 2.4. Measures

With the exception of body height and weight, all measures used in this study were based on self-reports from surveys. Details of each measure in this study are described below.

#### 2.4.1. Physical activity

PA data were ascertained via 2 items adapted from the International Physical Activity Questionnaire—Short Form,<sup>21</sup> which has been shown to have adequate psychometric properties in Chinese student populations.<sup>22</sup> The 2 items record the activity of 2 intensity levels: (1) moderate activities such as leisure cycling and (2) vigorous activities such as aerobic exercise. At each school grade level, participants were asked about the frequency (number of days they performed each activity) during the last 7 days and the duration (in minutes) they were involved in performing each activity for at least 10-min duration per session. The MVPA minutes were summed from the 2 intensity levels and divided by 7 to derive the average number of minutes per day of MVPA for each child. To examine the prevalence of adherence to meeting PA recommendations, children were categorized as meeting PA recommendations if their MVPA time equaled 60 min or more per day.

#### 2.4.2. Other measures

Sociodemographic measures included participants' sex, age, height, and body weight. Information on parent or guardian

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