

Article

Influencing Factors of Sports Activities of Urban Migrant Children Based on Intelligent Evaluation

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Abstract: In this paper, a cluster sampling method was used to randomly select 1308 young children from the southern part of Fujian Province, China, and the short format of the International Physical Activity Questionnaire (IPAQ) was used to investigate their physical activity. Logistic regression was used to analyze the influencing factors of children's moderate-to-vigorous physical activity (MVPA) time. Results: The MVPA time deficit rate of urban migrant children in southern Fujian was 90.1%, and that of girls (92.2%) was significantly higher than that of boys (88.5%); Multivariate logistic regression analysis found that gender, parents' support on sports, and sports grounds near their homes were the main factors affecting the lack of MVPA time for urban migrant children.

Keywords: children; migrant children; physical activity; moderate-to-vigorous physical activity; regression analysis

1. Introduction

In recent years, physical activity and obesity in young children has become an issue of widespread international concern, with declining physical fitness and rising obesity rates and health expenditure occurring worldwide. Physical activity is an important driving factor for early healthy development [1]. At present, insufficient physical activity has been identified as a major risk factor for global death. It has been pointed out that physical activity is closely related to obesity, cardiovascular metabolic diseases, bone health, and other health indicators, and it has different effects on individual mental health and cognitive development [2]. It is well known that human energy expenditure is mainly influenced by basal metabolic rate (BMR), food kinetics, and physical activity. The first two of these components are largely genetically determined, whereas physical activity is not genetically influenced. Physical activity plays an important role in the development of obesity. Physical activity increases energy expenditure and is the component of energy expenditure that has the greatest range of variability. Early childhood is a period of continuous development and improvement of the individual body and function, and it is also a critical period for developing good health habits. The World Health Organization defines physical activity as any physical activity that requires energy consumption. For children, it mainly includes walking, crawling, running, jumping, balancing, cycling, skipping, and other activities [3]. Physical activity is generally divided into low intensity physical activity, moderate intensity physical activity, and high intensity physical activity according to different exercise intensity [4]. In 2019, the World Health Organization (WHO) released the Guidelines for Physical Activity, Sitting Behavior, and Sleep of Children under 5, which emphasized the use of moderate-to-vigorous physical activity (MVPA) to replace screen time and sitting behavior, so as to obtain the maximum health benefits [3]. There are already gyms full of screens, or exergames that promote physical activity with the use of screens. However, the majority of children's screens are currently used for activities such as watching television, playing video games, tablet use, surfing the internet, and



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using smartphones. These screen activities lead to reduced physical activity in children and have many negative effects on the physical and mental health of young children. In 2018, the Sports Guide for Preschool Children (3–6 years old) (Expert Consensus Version), which was jointly developed by the Beijing Sport University of China, the Capital Institute of Pediatrics, and the General Administration of Sport of the People's Republic of China, also suggested that children should spend no less than 60 min of physical activity with moderate or higher intensity throughout the day [5]. At present, the survey data shows that as many as 81.0% of adolescents and children are physically inactive globally [6], and only 20% of children meet the daily moderate intensity physical activity requirements recommended by the World Health Organization [7]. The results of the research on outdoor physical activity of children in Guangdong, China show that only 15.6% of children meet the requirements of moderate-to-vigorous physical activity [4], which is lower than the general level. Therefore, it is very important to pay attention to the relevant factors of children's physical activity and physical activity behavior, and to carry out targeted and effective intervention to promote children's health.

Research on physical activity in young children is relatively recent, and there is a lack of relevant research evidence for different types of children [8] and for exploring the factors influencing the duration of moderate-to-vigorous physical activity in groups of children aged 3–6 years [9]. Some studies have pointed out that there are differences in moderate-to-vigorous physical activity between rural and urban areas [10], but there are few studies on the physical activity of migrant children. Urban migrant children refers to children aged 0–17 who flow from rural areas to cities and live in the inflow place for more than half a year [11]. This study focuses on the physical activity of urban migrant children aged 3–6. In the context of social transformation, the scale of the social migrant population is growing day by day, and the data of migrant children is growing at the same time. Due to the restriction of the urban–rural dual system for a long time, urban migrant children cannot enjoy the same urban life as urban children, and they tend to be marginalized and disadvantaged in the entire social structure [12]. Large scale urban migrant children have become a special group to be cared for. According to the communiqué of the seventh national population census of Fujian Province, the migrant population in Fujian Province was 13.661 million, which was 33.36% more than that in 2010. Xiamen and Quanzhou, two cities in southern Fujian, are the largest gathering areas of migrant populations in Fujian Province. This study investigated the moderate-to-vigorous physical activity of 3–6-year-old children in Xiamen and Quanzhou, and explored the influencing factors of moderate-to-vigorous physical activity time shortages in order to provide a reference for the intervention and guidance of children's physical activity, and enrich the research content on the physical activity of special populations.

2. Materials and Methods

2.1. Research Object

From July 21 to August 16, 2022, cluster sampling method was adopted in Xiamen and Quanzhou, two cities in the southern region of Fujian Province. Using a randomization method, kindergartens in Xiamen and Quanzhou, Fujian Province, China, were stratified according to the nature of the kindergarten (public and private) and the location of the kindergarten (cities and towns [13]). Stratified random sampling was then performed to select four kindergartens from each city. A total of 1481 children from eight kindergartens were selected as the research objects, and the parents of children filled in the questionnaire. Inclusive criteria of subjects: (1) Aged 3–6 years; (2) Normal physical and mental development; (3) From the countryside to the city, and living in the inflow place for more than half a year; (4) Parents sign the uniform letter of information. Exclusion criteria: (1) Suffering from mental and psychological diseases; (2) Suffering from physical diseases that lead to inability to carry out normal physical activities. After strictly eliminating the questionnaires that did not conform to logic and had missing items, 1308 valid questionnaires were obtained, with an effective rate of 88.32%. There were 758 male students (57.95%) and 550 female students

(42.05%); 446 people aged 3–4 (34.10%), 451 people aged 4–5 (34.48%), and 411 people aged 5–6 (31.42%).

2.2. Research Tools

The research adopted the questionnaire of “Children’s Physical Activity”, which includes: (1) Basic information. It was formulated by the research group based on previous research and expert consultation feedback, including basic information such as sex, age, gestational age, birth weight, nature of kindergarten, father’s education level, father’s exercise frequency, mother’s education level, mother’s exercise frequency, annual household income, parents’ support, family sports space, family sports equipment and sports grounds near the home; (2) Physical activity survey: The International Physical Activity Questionnaire Short Form (IPAQ-SF) was used to conduct the survey, and children were asked about the frequency and cumulative time (min) of three different intensities of physical activities in the past 7 days: low intensity physical activity, moderate intensity physical activity, and high intensity physical activity. The IPAQ questionnaire is considered as an acceptable measurement method for sports activities on a continuous scale [14]. Through extensive tests, it has been used in academic research in many countries [15], and the test results in China also show that it has good reliability and validity [16]. In this study, “(frequency of moderate intensity physical activity * accumulative time of each time + frequency of high intensity physical activity * accumulative time of each time)/7” was used to calculate the average daily time of moderate and high intensity physical activity. ≥ 60 min/d was considered as normal exercise time, and < 60 min/day was considered as insufficient exercise time.

2.3. Quality Control

Before the survey, the research group trained the teachers in charge of the kindergarten on the questionnaire requirements and recovery standards. When distributing the questionnaire, the preschool teachers explained the purpose of the survey and filled in the notes to the parents, and explained the items such as high-intensity, moderate intensity, and low intensity physical activities in the questionnaire. The parents were required to evaluate the children’s physical activities according to their actual physical activities, so as to reduce the deviation of the results caused by parents’ failure to understand the questionnaire. In addition, parents could contact the members of the research group through the contact information on the questionnaire for further consultation. The questionnaire was cleaned and coded in strict accordance with the IPAQ data cleaning and outlier elimination principles [17] and data truncation principles, and any questionnaire with missing activity frequency and time or illogical data was eliminated.

2.4. Statistical Methods

SPSS21.0 software was used for statistical analysis of the data obtained, which mainly included general descriptive statistics, χ^2 test and logistic regression analysis.

3. Results

3.1. MVPA Time of Urban Migrant Children

In this study, a total of 1308 urban migrant children were included in the study. The study found that 1178 people were underactive in moderate-to-vigorous physical activity every day, accounting for 90.1%. A total of 810 boys (88.5%) and 507 girls (92.2%) had insufficient moderate-to-vigorous physical activity time; 405 children aged 3–4 (90.8%), 409 children aged 4–5 (90.7%) and 364 children aged 5–7 (88.6%) had insufficient moderate-to-vigorous physical activity time. The difference between different sex was statistically significant ($\chi^2 = 4.768$, $p = 0.029$); there was no significant difference between different ages ($\chi^2 = 1.503$, $p = 0.472$).

3.2. Single Factor Analysis on MVPA Time Shortage of Urban Migrant Children

As is shown in Table 1, the reporting rate of insufficient moderate-to-vigorous physical activity time for urban migrant children was in sex ($\chi^2 = 4.768$, $p = 0.029$); data for the categories are as follows: father's educational level ($\chi^2 = 10.664$, $p = 0.005$); mother's exercise frequency ($\chi^2 = 8.678$, $p = 0.013$); annual household income ($\chi^2 = 12.050$, $p = 0.007$); parents' support ($\chi^2 = 17.089$, $p = 0.000$); family sports space ($\chi^2 = 11.630$, $p = 0.003$); and sports grounds near home ($\chi^2 = 13.350$, $p = 0.001$). The differences were statistically significant (all p values < 0.05).

Table 1. Single factor analysis of insufficient MVPA time for urban migrant children.

Factor	Options	Number of People	Insufficient MVPA Time	χ^2 Value	p Value
Gender	Male	758	671 (88.5%)	4.768	0.029
	Female	550	507 (92.2%)		
Father's cultural level	High school and below	952	873 (91.7%)	10.664	0.005
	Junior college	196	169 (86.2%)		
	Bachelor degree or above	160	136 (85.0%)		
Mother's exercise frequency	Never	277	262 (94.6%)	8.678	0.013
	1–2 times a week	774	691 (89.3%)		
	≥ 3 times a week	257	225 (87.5%)		
Annual household income	$\leq 30,000$	166	158 (95.2%)	12.050	0.007
	30,000 to 70,000	363	322 (88.7%)		
	7–120,000	518	474 (91.5%)		
	$\geq 120,000$	261	224 (85.8%)		
Parents' support	Not paying much attention	614	569 (92.7%)	17.089	0.000
	Commonly	370	336 (90.8%)		
	More attention	324	273 (84.3%)		
Family sports space	More	243	206 (84.8%)	11.630	0.003
	Commonly	942	855 (90.8%)		
	Less	123	117 (95.1%)		
Sports grounds near home	More	389	333 (85.6%)	13.350	0.001
	Commonly	792	725 (91.5%)		
	Less	127	120 (94.5%)		

3.3. Multifactor Logistic Regression Analysis on MVPA Time Shortage of Urban Migrant Children

Moderate-to-vigorous physical activity time (normal = 0, insufficient = 1) was taken as the dependent variable. In order to avoid the possibility of omission of important factors, the test water of the included variables was set as 0.2 [18]. Gender, birth age, nature of the kindergarten, father's education level, father's exercise frequency, mother's education level, mother's exercise frequency, annual household income, parents' support, family sports space, family sports equipment, and sports grounds near the home were introduced into the regression equation as independent variables (see Table 2 for variable assignment). The forward (LR) method was used for multivariate logistic regression analysis. The model Hosmer Lemeshow goodness of fit test resulted in $\chi^2 = 2.795$, $p = 0.431$. The accuracy of the predicted value and the measured value was 90.1%, and the regression model fit the actual situation well.

A multifactorial analysis found that, gender, parental support for sports, and sports grounds near their homes were the main influencing factors on the lack of moderate-to-vigorous physical activity time among urban migrant children ($p < 0.05$). As shown in Table 3 that the occurrence rate of insufficient moderate-to-vigorous physical activity time was 1.516 times higher among girls than boys (OR = 1.516, 95% CI: 1.029–2.232, $p = 0.035$). Parental support for young children's physical activity was an important protective factor for urban migrant children's moderate-to-vigorous physical activity time. The occurrence

rate of insufficient moderate-to-vigorous physical activity time was 0.485 times higher for children whose parents supported physical activity for young children than for those whose parents did not care to support physical activity for young children (OR = 0.485, 95% CI: 0.314–0.751, $p = 0.001$). The occurrence rate of insufficient moderate-to-vigorous physical activity time was 1.639 times higher for children with relatively average sports grounds near their homes compared to children with more sports grounds near their homes (OR = 1.639, 95% CI: 1.113–2.412, $p = 0.012$) and 2.482 times higher for children with less sports grounds near their homes compared to children with more sports grounds near their homes (OR = 2.482, 95% CI: 1.089–5.655, $p = 0.030$).

Table 2. Logistic Regression variable assignment table.

Variable	Assignment
Gender	Male = 1, Female = 1
Gestational age at birth	<37 weeks = 1, ≥ 37 weeks = 2
Nature of kindergarten	Public = 1, private = 2
Father's cultural level	High school and below = 1, junior college = 2, undergraduate and above = 3
Father's movement frequency	Never = 1, 1–2 times a week = 2, ≥ 3 times a week = 3
Maternal education level	High school and below = 1, junior college = 2, undergraduate and above = 3
Mother's exercise frequency	Never = 1, 1–2 times a week = 2, ≥ 3 times a week = 3
Annual household income	$\leq 30,000$ = 1, 30,000 to 70,000 = 2, 70,000 to 120,000 = 3, $\geq 120,000$ = 4
Parents' support	Less attention = 1, generally = 2, more attention = 3
Family sports space	Larger = 1, general = 2, smaller = 3
Family sports equipment	More = 1, general = 2, less = 3
Sports grounds near home	More = 1, general = 2, less = 3

Table 3. Multifactor logistic regression analysis of MVPA time shortage of urban migrant children.

Arguments and Constants	Option	β Value	Wald Value	p Value	OR Value	OR Value 95% CI
Gender	Female	0.416	4.438	0.035	1.516	1.029–2.232
Parents' support	Not paying much Attention			Reference group		
	Commonly	−0.191	0.636	0.425	0.826	0.516–1.321
	More attention	−0.723	10.542	0.001	0.485	0.314–0.751
Sports grounds near home	More			Reference group		
	Commonly	0.494	6.273	0.012	1.639	1.113–2.412
	Less	0.909	4.681	0.030	2.482	1.089–5.655
Constant		1.555	21.227	0.000	4.736	

4. Discussion

As mentioned earlier, physical activity increases the body's basal metabolic rate, burns calories, and helps to reduce the incidence of obesity. Bad health behaviors, such as decreased physical activity and increased sedentary behavior of children, are important factors that lead to poor health status in adulthood and frequent health complications such as overweight and obesity [19]. With the improvement of economic levels and the enhancement of public health awareness, the physical activity of children has received unprecedented attention [20]. Early prevention and intervention in early childhood is crucial to reduce the incidence rate of chronic diseases [21]. Therefore, an accurate assessment of the physical activity of young children is of great significance for formulating effective physical activity intervention plans. The main methods of measuring movement in the population are questionnaires and wearable device monitoring. Wearable device monitoring methods are more objective in recording the intensity and duration of children's

physical activity, but have problems with high cost, long wearing time, and inaccurate identification of movement categories. In contrast, the questionnaire method is easier to implement and easier to conduct in large groups. In this study, the International Physical Activity Questionnaire Short Form (IPAQ-SF), which is widely used internationally, was used to measure children's physical activity. The results of this study show that 90.1% of migrant children in Xiamen and Quanzhou, southern Fujian Province, China, are under-active in moderate-to-vigorous physical activity every day. Compared with other data studies, among Canadian preschool children and adolescents aged 5–7 years, only 13% of boys and 6% of girls meet the requirement of accumulating 60 min of moderate-to-vigorous physical activity every day [22]. The moderate-to-vigorous physical activity time shortage rate of children in European countries varies greatly. The proportion of children who can achieve 60 min or more of physical activity every day varies from 2.0% (Cyprus) to 14.7% (Sweden) [23]. However, the satisfaction rate of children with moderate-to-vigorous physical activity in Guangdong is 15.6% [4], and the proportion of children and adolescents who usually reach one hour of moderate-to-vigorous physical activity per day in Shanghai is 16.5% [24]. It can be seen that the physical activity of children in various countries around the world is quite different, but it is not ideal in general. The physical activity of the urban migrant children group concerned in this study is more severe than the available data. The reason may be related to the busy work of parents of urban migrant children, high pressure, and lack of attention to children's physical activities. For a long time, the phenomenon of "valuing intelligence over physical fitness" in traditional education has been common, which is particularly prominent among vulnerable groups. Some parents believe that doing homework is more important than sports, which directly leads to the problem of insufficient physical activity of children. The World Health Organization pays close attention to the situation of physical inactivity, and released the Global Action Plan for Promoting Physical Activity from 2018 to 2030 in 2018, where in it set the goal of reducing the proportion of physical inactivity by 15% by 2030 [6]. In view of the serious shortage of moderate-to-vigorous physical activity time for urban migrant children, timely intervention and guidance should be given to ensure the healthy development of vulnerable children.

The reporting rate of moderate-to-vigorous physical activity time shortage among children of different genders is different. The proportion of boys' moderate-to-vigorous physical activity time shortage is 88.5%, and girls' moderate-to-vigorous physical activity time shortage is 92.2%. The results of this study show that gender is the main influencing factor for urban migrant children's moderate-to-vigorous physical activity time shortage. Multifactor analysis shows that girls' moderate-to-vigorous physical activity time shortage is 1.516 times that of boys. This is consistent with almost all research results. It has been found that, after controlling for sex, race, and BMI Z-score, only sex and BMI Z-score were significant correlates of objective MVPA, while only sex was a significant correlate of the objective total PA [25]. A Canadian study of primary school students also found that boys were 1.683 times more likely than girls to achieve 60 min of moderate-to-vigorous physical activity on weekends [26]. This may be related to the gender characteristics that boys are more active and have a higher level of coordination of rough sports [27]. Therefore, different types of intervention and sports guidance should be carried out for urban migrant children according to different genders. In general, the differences in thinking between men and women are caused by a variety of factors. Biological factors, socio-cultural factors, educational and environmental factors, psychological factors, and so on may lead to the differences in male and female thinking. The differences in male and female thinking are due to a number of factors. First, biology is an important reason. There are significant differences in male and female brain structure and physiological mechanisms, which lead to differences in male and female thinking. For example, in the male brain, the hippocampus is larger than in women, which leads to men being better at spatial cognition and map memory. Other parts of the brain, such as the language center, are larger in women than in men, leading to better verbal expression and understanding. Secondly, social and cultural factors are also important reasons for the differences in thinking between men and

women. Social differences in the status, roles, and expectations of men and women lead to differences in the way men and women think. For example, society expects men to be independent, strong, and capable of leadership, while women are expected to be gracious, caring, and empathetic. Such expectations influence not only differences in how men and women think, but also differences in how they behave, interact, and make decisions. Due to sex differences, girls prefer lighter paced, less vigorous sports such as artistic gymnastics, rope skipping, and yoga, while boys prefer more vigorous, faster, and more confrontational sports such as football, basketball, rugby, and fencing. However, it is important to stress that although there are sex differences between boys and girls in physical activities, we should not blindly exaggerate them. Instead, we should take care to guide children's interest in physical activities to minimize gender differences, so that both boys and girls can enjoy and participate in physical activities.

This study found that family background factors and parents' support were the influencing factors of moderate-to-vigorous physical activity of urban migrant children. The differences in moderate-to-vigorous physical activity time of urban migrant children with different father's education level, mother's exercise frequency, annual household income and parents' support had statistical significance. Among them, parents' support of children's sports is an important protective factor for urban migrant children's moderate-to-vigorous physical activity time. The results of this study show that the reporting rate of children's moderate-to-vigorous physical activity time shortage in families that pay more attention to children's sports was lower than that in families that pay less attention to children's sports. This is consistent with previous studies that have found parental sports support to be beneficial in promoting physical activity in children [14]. A study on children's sports activities during COVID-19 showed that parents' encouragement behavior was directly related to children's physical activity level, while parents' higher concern about COVID-19 during the epidemic was related to the reduction of physical activity support behavior [28]. A regional survey in China on moderate-to-vigorous physical activity among children and adolescents in Shanghai also found that parental encouragement and supervision of physical activity had a significant effect on 60 min of moderate-to-vigorous physical activity per day among children and adolescents ($p < 0.05$) [24]. The family is the first important environment for children to develop their living habits. The degree of parents' support of children's sports behavior is the most direct contributing factor for children to engage in physical activity. Therefore, parents of urban migrant children should establish a healthy concept, as well as actively support, encourage, and urge children to participate in moderate-to-vigorous physical activity, so as to promote the health and healthy growth of children.

5. Conclusions

This study found that the moderate-to-vigorous physical activity time of urban migrant children in different family sports spaces and sports grounds near their homes was different. Among them, the risk factor of insufficient moderate-to-vigorous physical activity time for urban migrant children is the relative shortage of sports grounds near their homes. Based on the ecosystem theory, children's physical activities are not only affected by individual level and family characteristics, but are also closely related to the community level environment near their homes [29]. Community sports environments, such as fitness trails, squares, and provided amusement facilities and equipment, provide available space and facilities for children's physical activities. Because of their convenience and free cost, they are a favorable supplement to low-income groups' sports venues [30]. Therefore, they are important physical activity places for migrant children whose parents are busy with work and whose family economic conditions are slightly insufficient. It has also been found that spaces, such as parks near the home, can affect young children's moderate-to-vigorous physical activity after controlling for relevant variables in the study [31]. Therefore, attention should be paid to the development and provision of community sports venues and equipment to provide sports conditions for vulnerable migrant children.

To sum up, the lack of time for moderate-to-vigorous physical activity for urban migrant children is serious. 90.1% of children do not meet the requirements of the Sports Guide. It is urgent for the government and administrative departments to introduce more specific programs to increase the physical activity of vulnerable migrant children. The insufficient moderate-to-vigorous physical activity time of urban migrant children is not only related to individual factors, but also closely related to family level and community environment. Departments at all levels should actively intervene, pay special attention to migrant children's families with low educational backgrounds and low incomes, and give targeted lectures and family guidance. Parents of children, especially mothers, should actively participate in physical exercises to provide good examples for children. The community should actively strengthen the construction of a community sports environment, provide a convenient sports environment for children in vulnerable families, and increase the amount of children's sports. This study takes up a very important issue of public health in the area of physical activity of young people (children aged 3–6). This is an important and significant area of influence for many policies, because good health and well-being are two universal goals of humanity, which are now recognized as fundamental human rights and important components of the equitable development of human, economic, and social potential. In this perspective, the research results presented in the article are an important premise for shaping physical activity as a guarantor of public health of the Chinese population—especially among people migrating from rural areas to urban areas. Thus, the study is a source of extremely important analytical data. There are also limitations in this study. On the one hand, this study is a cross-sectional study, so it is impossible to further infer the cause and effect from the research results. Sampling was done according to the principle of random sampling, which ensured that each individual in the study population had an equal chance of being selected. In the future, we should further explore the findings of this study. On the other hand, this study was mainly conducted in the form of self-reporting. Although the IPAQ-SF used is an internationally recognized scale, the children's physical level reported by parents may be affected by recall bias, social expectation, and misunderstanding, and there is a reporting bias. In the future, the physical activity level should be measured in a subjective and objective way to improve the accuracy of the report.

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