

# Correlation between Food Intake and Physical Activity Level of Young Primary School Students

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**Abstract:** To understand the food intake and physical activity level of some young primary school students in Hefei, and to explore the correlation between diet, physical activity level and obesity, the "questionnaire on food intake and physical activity level of primary school students" was used to investigate the daily food intake, BMI and daily physical activity of Grade 1-3 students in 10 primary schools in Hefei, and the effects of daily food intake and physical activity level on overweight young primary school students were analyzed. There were significant differences in the proportion of overweight and obesity between boys and girls ( $P < 0.05$ ), and there were significant differences in the proportion of sweets consumption between boys and girls ( $P < 0.05$ ). The proportion of sweet food intake was higher in boys; The daily intake ratio of dairy products, green leafy vegetables and fruits was low, and there was no significant difference between male and female students ( $P > 0.05$ ). The intake of meat and grain exceeded the daily recommended amount, and the proportion of male and female students was large, and there was no significant difference between male and female students ( $P > 0.05$ ). More than half of the young male and female pupils met the daily recommended physical activity above medium intensity, and there was no significant difference between men and women ( $P > 0.05$ ). There is a positive correlation between food intake structure and physical activity level and overweight in young primary school students.

**Keywords:** low age; food intake; physical activity; sedentary

## 1. Introduction

Overweight and obesity among adolescents has become a worldwide problem. The development of social modernization has promoted people's intake of high fat, high protein, high sugar foods and puffed foods [1]. In addition, the excessive use of network life and mobile electronic devices has exacerbated the reduction of teenagers sedentary lifestyle and physical activity. Diabetes, hypertension, dyslipidemia and heart disease and other non infectious chronic diseases

(noncommunicable chronic diseases NCD) younger trend of development is more serious [2].

Relevant studies on child epidemiology show that eating patterns and physical activity habits play a key role in the health impact of obese children: Children's poor eating habits and imbalance of body hormones lead to an increase in the number and total amount of food intake. In addition, the increase of fatigue reduces children's relative exercise [3].

At present, more studies focus on the dietary patterns of adult groups and the intervention of related chronic diseases, while few studies focus on the dietary patterns and habits of young primary school students [4]. Studies have shown that children's eating habits and exercise behavior at a young age are closely related to their healthy life behavior in adulthood [5]. Therefore, the dietary pattern of young primary school students is worthy of attention [6]. At the same time, due to the fast pace of modern life and the disorder of work and rest rhythm of urban families, parents are unable to pay attention to their children's diet, sports and other behaviors. The increase in the consumption and frequency of "unhealthy" foods (such as fast food, soft drinks and candy) among young children has greatly increased the risk of non communicable chronic diseases. On the other hand, a healthy lifestyle, including eating fruits, vegetables, dairy products, low-fat and low sugar foods and regular physical exercise, has a positive impact on the physical and mental development of middle-aged and elderly people, and helps to prevent and control non communicable diseases and overweight [7].

This study hopes to provide a practical basis for the accurate promotion of physical health through the correlation research and analysis of food and energy intake and physical activity level of young primary school students.

## 2. Object and Method

### 2.1. Objects

The stratified cluster sampling method was used to select the students of grades 1-3 from 10 primary schools in Hefei, Anhui Province, aged from 6 to 8 years old. A total of 453 young male and female primary school students were investigated, of which the effective sample number was 408. The parents of the children investigated

in this study signed the informed consent form, and did not use drugs and limit dietary calories during the study period.

## 2.2. Method

### 2.2.1. Food intake questionnaire survey

All questionnaires in this study were filled in and retrieved daily through class wechat or nailing software. All questionnaires were completed by parents and children. The online collection includes: Students' height, weight and food questionnaire of the previous day. Children and parents recall the intake frequency of various foods in the previous day (several times a day/week/month/year), and estimate the average intake of various foods each time through standard tableware. Food intake was estimated using (previous day food questionnaire quada-3). The purpose of the questionnaire is to evaluate the dietary intake of school-age children and answer them in the family environment. Quada-3 is a graphical tool designed to remind students to obtain data on food intake the previous day. The illustration arranges six meals in chronological order: breakfast, morning snacks, lunch, afternoon snacks, dinner and evening snacks. Each meal contains 21 different foods or food combinations. The subjects were divided into low, medium and high intake groups according to the third quartile of the total average daily intake of various foods.

### 2.2.2. Physical measurement and evaluation

The surveyors trained by the teachers of the research group shall conduct on-site measurement and obtain data. According to the standard technology, a digital electronic scale (plena, lumina 02550) is used to obtain the weight, with a maximum weighing capacity of 150kg and an accuracy of 100g. Height measured with a portable body sounder (welmy) with a scale of 0.1cm according to the standard specification. Body mass index (BMI) is calculated using the following formula:  $BMI = \text{weight} / \text{height}^2 (m)$ . During the measurement, the subjects wear light clothes, take off their shoes and take the standard standing posture. The skinfold thickness of triceps brachii and subscapular angle was measured with a skinfold thickness meter, accurate to 0.1mm. During the measurement, the muscles of the subjects were relaxed and the measured parts were fully exposed. The above indexes are measured twice to reduce the error. The percentage of body fat (BF%) was calculated from the measured value of skinfold thickness; Fat body mass index (FMI) and fat free body mass index (FFMI) were calculated by body fat content, height and weight measurements.

### 2.2.3. Measurement of physical activity level

The physical activity level of young primary school students was measured by adolescent physical activity questionnaire (paq - cn). The questionnaire takes wechat as the media, sends it to parents, and fills in the relevant questions in the questionnaire in the form of common memory, so as to reflect the individual's physical activity level in the past week. The physical activity level module

of this questionnaire includes the content and intensity of physical activity in daily physical education class, recess, noon, evening and weekend from Monday to Friday. The scores of PAQ were counted, and the physical activity level of adolescents was divided into the following three categories: low-intensity physical activity level ( $PAQ \leq 2$ ), medium-intensity physical activity level ( $2 < PAQ < 3$ ) and high-intensity physical activity level ( $PAQ > 3$ ). Sedentary behavior questionnaire (asaq - cn) this questionnaire calculates the average daily time (in minutes) of sedentary behavior in each category in a week by classifying, recording and counting the sedentary behavior time of students in a day.

## 2.3. Data Processing and Analysis

Spss22.0 software was used for statistics and analysis. T-test was used for different food intake, physical activity level and body shape. There was significant difference ( $P < 0.05$ ).

## 3. Results and Analysis

### 3.1 Comparison of Body Shape Indexes of Young Pupils

The body shape of 1408 young pupils aged 6 to 10 from the school system was evaluated. As can be seen from table 1, overweight and obesity account for 17.5% and 6.1% of boys and 12.1% and 6.1% of girls respectively. There was significant difference in the proportion of overweight and obesity between boys and girls ( $P < 0.05$ ).

**Table 1.** Comparison of body shape indexes of young pupils

Gender	Number of cases	Overweight n (%)	Obesity n (%)	P
boys	730	127(17.5)	44(6.1)	0.021
girls	678	82(12.1)	41(6.1)	

### 3.2 Comparison of Daily Food Intake of Young Pupils

It can be seen from table 2 that the sweet food intake of boys and girls is in a high proportion, and there is a significant difference between the sweet food intake proportion of boys and girls ( $P < 0.05$ ). At the same time, the sweet food intake proportion of boys is higher; More than half of the students reported that they drank soft drinks every day, boys (65.3) and girls (62.1), and there was no significant difference in soft drink intake between male and female students ( $P > 0.05$ ); More than half of boys (77.7%) and girls (75.9%) reported that they had not eaten packaged snacks the previous day, and there was no significant difference between boys and girls ( $P > 0.05$ ); In addition, it can be seen that the daily intake proportion of dairy products, green leafy vegetables and fruits of male and female students is low, and there is no significant difference between male and female students ( $P > 0.05$ ). The intake of meat and grain exceeded the daily recommended amount, and the proportion of male and female students was large, and there was no significant difference between male and female students ( $P > 0.05$ ).

**Table 2.** Comparison of daily food intake of young pupils

Food	Recommended	Boys n	Girls n	P
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group	quantity (%)	(%)	(%)	
sweet food	1	518(86.1)	557(79.8)	0
soft drink	0	246(65.3)	271(63.1)	0.99
Packaged snacks	0	474(77.7)	510(75.9)	0.47
Milk or dairy products	3	29(4.9)	35(5.1)	0.91
Green leafy vegetable	3	105(17.5)	115(16.5)	0.63
Fruits	3	21(3.6)	37(5.4)	0.13
Meat	2	372(61.8)	401(57.4)	0.11
grain	1	498(82.8)	605(86.6)	0.57

### 3.3 Comparison of Daily Physical Activity of Young Pupils

According to table 3, 51.2% and 56.4% of boys and girls participated in medium and high intensity physical activities every day, 48.8% and 43.6% of boys and girls participated in medium and high intensity physical activities for less than 60min every day, and there was no significant difference between boys and girls (P>0.05). 32.8% of girls and 35.0% of boys met the daily physical activity recommendation. There was no significant difference between male and female children (P>0.05).

**Table 3.** Comparison of daily physical activity of young pupils

Recommendable projects	Boys n (%)	Girls n (%)	P
MVPA≥60min	350 (51.2)	348 (56.4)	0.063
MVPA<60min	333 (48.8)	269 (43.6)	
ST<2h	224 (32.8)	216 (35.0)	0.403
ST≥2h	459 (67.2)	401 (65.0)	

### 4. Discussion

Childhood obesity is a worldwide public health problem. At the same time, the younger age of childhood obesity has also been paid attention by public health researchers. In 2018, the average percentage of overweight and obese children was 23%.The main causes of overweight and obesity in children can be attributed to various lifestyle behaviors related to the imbalance between calorie intake and energy consumption [8].

The purpose of this study was to analyze the dietary intake and physical activity levels of a representative sample of school-age children aged 6 to 10 in the region. The results showed that the prevalence of overweight and obesity among young students was very high, the dietary intake structure was obviously unreasonable, and the sedentary level was high. This situation shows that measures need to be taken to encourage and promote the surveyed young children to adhere to healthier behaviors, with a view to having a positive impact on their current and future health [9].The co-occurrence or cluster study of lifestyle related to food and energy intake, such as diet related behavior, sedentary behavior and physical exercise of young children, has shown that the

occurrence of healthy and unhealthy behaviors affecting young children is becoming more diversified [10].

About 50% of the children analyzed in this study did not meet the recommendation of ≥ 60 minutes per day (more than moderate physical activity).The results show that about 75% of children's sedentary level exceeds the recommended two hours, which is similar to other studies. Sedentary level is related to poor eating habits, high weight and low physical activity of young children. The decrease in physical activity and the increase in sedentary behavior time are worrying, especially in childhood, because it significantly increases the possibility of obesity and other diseases. In conclusion, the daily sedentary level of young pupils is too long, the level of physical activity is lower than the recommended value, and the food intake and film and television structure are unreasonable. This is related to the detection rate of obesity in young pupils. Therefore, it is suggested that relevant education departments can adopt relevant health policy guidance to conduct more scientific behavioral intervention on the diet and physical activities of young primary school students.

### Acknowledgements

Authors would like to thank all the participants who performed voluntarily and their best effort during protocol. The present study was funded by the: Anhui educational science research project (No. jk20012); Anhui Provincial Teaching Research Project (No. 2019jyxm0235); 2020 provincial quality engineering teaching research project of colleges and universities in Anhui Province (No. 2020jyxm0860).

### References

- [1] Wang, E.M.; Xu Q.; Chen B.L. Sleep time, intake of fruits and vegetables and their relationship with body mass index of school-age children in Changzhou. *Modern preventive medicine*, **2015**, Volume 42, No 2, pp. 242-244.
- [2] Liu, F.; Zhang, J.Y.; Xu, H. Research progress on adolescent obesity status and early influencing factors. *Modern preventive medicine*, **2018**, Volume 45, No 3, pp. 420-422.
- [3] Wang, X.L.; Wang, H.J.; Su, C. Multilevel study on the impact of urbanization level on overweight and obesity in children and adolescents in nine provinces of China. *Health research*, **2016**, Volume 45, No 6, pp. 888-896.
- [4] Ma, Y.; Lin, S.F.; Jiang, L.; et al. Correlation between sleep time exercise and overweight and obesity among adolescents in three cities of Guangdong. *China school health*, **2017**, Volume 38, No 3, pp. 338-344.
- [5] Lu, Q.Y.; Hou, F.L.; Sun, Y.; et al. Study on the relationship between sleep time, diet pattern and overweight and obesity among adolescents aged 11~13 in Xuzhou, Jiangsu Province. *Chinese Journal of epidemiology*, **2014**, Volume 35, No 4, pp. 381-385.
- [6] Deng, Y.S.; Liang, J.P.; Zong, Y.N.; et al. Influencing factors of breakfast and bedtime meal for primary and middle school students in Guangzhou. *Chinese school health*, **2018**, Volume 39, No 9, pp. 1292-1296.
- [7] Shen, Y.H.; Jiang, C.; Qu, X.Q.; et al. Nutrition and dietary behavior of primary and secondary school students in four districts and counties of Beijing. *China school health*, **2018**, Volume 39, No 6, pp. 847-850.

- [8] Ding, C.C.; Guo, H.J.; Gong, W.Y.; et al. Influence of parents on breakfast behavior of primary and middle school students in four cities of China. *Health research*, **2016**, Volume 45, No 6, pp. 915-920.
- [9] Wang, S.F.; Xu, Z.Z. Analysis of dietary behavior habits of urban adolescents in Anhui Province. *Anhui Journal of preventive medicine*, **2009**, Volume 15, No 3, pp. 184-200.
- [10] Dai, J.S.; Zhang, Y.K. Investigation on dietary habits and sports nutrition of some middle school students in Nanjing. *Journal of Nanjing Institute of Physical Education (NATURAL SCIENCE EDITION)*, **2008**, Volume 7, No 2, pp. 1-5.