

# Weight Management Package Based on Knowledge, Attitude, Behavior, and Barriers of Obese Youth in China

Xiaoxiao Han \*

Angeles University Foundation, MacArthur Highway, 2009 Angeles City, Philippines

\*Corresponding Author: [han.xiaoxiao@auf.edu.ph](mailto:han.xiaoxiao@auf.edu.ph)

## ABSTRACT

This study explored the knowledge, attitudes, behaviors and barriers of obese adolescents in Erqi District, Zhengzhou City, China, in terms of weight loss management. The study adopted a cross-sectional design, collected data through a questionnaire survey, and used statistical analysis methods to explore the relationship between these factors and their association with socio-demographic characteristics. The study found that participants generally had misconceptions about health knowledge, had a negative attitude towards weight, rarely adopted weight-loss behaviors, and faced some barriers to health management. The study revealed a negative correlation between health knowledge and attitudes, a finding that challenges traditional ideas and suggests that simply increasing health knowledge may not be sufficient to change attitudes and behaviors. In addition, the study found that economic factors had a small effect on health-related dimensions, while BMI had a significant effect on knowledge and behavior dimensions. These findings highlight the need to consider the interaction of multiple factors when designing interventions for adolescent obesity, and to fully consider the local socio-cultural context. The results of the study provide a new perspective on understanding the problem of adolescent obesity in China, and also raise questions about current health education and intervention strategies. Future research can further explore the underlying reasons behind these findings, providing a scientific basis for the development of more effective strategies for the prevention and management of adolescent obesity.

## KEYWORDS

Youth; Weight Loss Knowledge; Awareness; Behavioral Barriers; Intervention Strategies

## 1. INTRODUCTION

Obesity has become a global public health challenge, affecting the quality of life and health status of individuals. According to the World Health Organization (2017), obesity or overweight is having an abnormal or excessive fat buildup in the body that presents a risk to an individual's health. The accumulation of unwanted fats in the body results in excessive eating, poor nutrition, and unhealthy lifestyle. Globally, obesity exemplifies a major threat to an individual's health due to the increased possible risk of having noncommunicable diseases (NCDs) such as type 2 diabetes, various cancers, fatty liver disease, hypertension, and even dementia. The main cause of obesity is the long-term disparity between consumed and expended calories (Yadegar et al., 2023). Obesity occurs not only in adults but most likely in youth as well.

Childhood obesity, simply called youth obesity is getting the attention of those in the medical field since it keeps on worsening worldwide, even in Asian countries (Lee et al., 2019). Medical professionals are advised to understand and know the causes, risk factors, and even symptoms to prevent the different health conditions that might develop in these youths. Having the information

that obesity is something serious and that there are ways to combat it will help youth behave properly regarding healthy eating habits and unhealthy lifestyles (Cai et al., 2017). Youth with obesity are at a great risk of acquiring it even in their adulthood. In line with this, various interventions have been organized and performed to prevent obesity in this group. However, most of the studies reported that there is a real increase in the prevalence of youth obesity at a high rate because they don't have an idea of what to do and what is at stake (Taghizadeh et al., 2023). There was also a study that shows the health-related behaviors of children who are obese and they lack proper sleep hours. At the same time, factors such as family income, parent's working status, environment, and dietary patterns hinder youth from achieving proper weight loss (Zhang et al., 2020). Childhood or youth obesity affects children's physical and mental development, and it also threatens the right quality of life that they should experience as they grow old. This chronic health issue is already taking a toll on the health of Chinese youth, not only physically and mentally but psychologically as well. Youth obesity is a major health issue that can seriously affect individuals. Obese children and adolescents are at an increased risk of developing a range of health problems, including type 2 diabetes, cardiovascular disease, and hypertension. They are also more likely to suffer from psychological issues such as low self-esteem and depression. Additionally, obese youths may face social stigma and discrimination, which can further impact their mental and emotional well-being. It is a serious problem, putting children and adolescents at risk of health problems. It will eventually lead to poor self-esteem and ultimately depression (Centers for Disease Control and Bodylescents alike, body mass index (BMin children and adolescents I) is commonly used to identify or assess excess body fat and obesity. However, it was found in other studies that biological factors in pathogenesis, such as genetic factors, inheritance of imbalance energy metabolism, and others, are being considered as part of the critical involvement for making children and adolescents or youth become obese (Yadegar et al., 2023)

In recent years, youth obesity has become a growing concern on a global scale. The prevalence of obesity among youths has increased significantly, posing a serious threat to their health and well-being. Childhood obesity has become a major health problem now around the world. It is a serious medical condition that affects children and adolescents (Mayo Clinic, 2022). The prevalence of youth obesity has been on the rise globally, with the World Health Organization (WHO) declaring it a "global epidemic." In 2017, the WHO reported that over 340 million children and adolescents aged 5-19 were overweight or obese. This number is expected to rise significantly by 2024 if current trends continue. This epidemiological trend is concerning as it highlights the widespread nature of the issue and its impact on the health of young people around the world. In addition, according to the World Health Organization (2021), obesity worldwide has almost tripled its population since 1975, and 39 million children worldwide under the age of 5 were obese in the year 2020. While 340 million children and adolescents aged 5 to 19 are obese. On the other hand, the Centers for Disease Control and Prevention (2022) reported that obesity prevalence in Western countries was 12.7% among 2 to 5 years of age, 20.7% among 6 to 11 of age, and 22.2% among 12 to 19, which shows that youth or childhood obesity is more common among the populations. In China, the national prevalence estimates of obesity among Chinese children were 3.9% for children younger than six years old and 5.7% for children aged 6 to 17 years of age in 1992. These prevalence estimates increased to 10.4% and 19%, respectively, from 2015 to 2019 (Zhang et al., 2021).

In China, youth obesity has become a growing concern in recent years. The country's rapid economic development and urbanization have led to changes in lifestyle and dietary habits, increasing the prevalence of obesity among children and adolescents. According to a study conducted in 2019, the prevalence of obesity among Chinese youths has more than doubled from 2000 to 2018. This trend is alarming as obesity is associated with an increased risk of chronic diseases such as diabetes and cardiovascular disease, which can strain the country's healthcare system and have a significant impact on public health (Wang et al., 2019).

Childhood obesity, simply called youth obesity is getting the attention of those in the medical field since it keeps on worsening worldwide, even in Asian countries (Lee et al., 2019). In connection,

weight management is a critical issue among youth aged 11 to 18, as it can significantly impact overall health and well-being. Various factors play a role in weight loss among this age group, including knowledge, attitude, behavior, and barriers. Knowledge about healthy eating habits, physical activity, and the consequences of obesity is essential for successful weight management (Brown et al., 2020). Youth's knowledge of how to make healthy food choices and engage in regular physical activity is essential for successful weight loss. Individuals who have a better understanding of nutrition and exercise are more likely to adopt healthy lifestyle behaviors and achieve their weight loss goals (Wang et al., 2019). Another important factor is the awareness of the health risks associated with obesity. Youths who are knowledgeable about the potential health consequences of being overweight or obese are more likely to be motivated to lose weight. Some research found that individuals aware of the increased risk of developing chronic diseases such as diabetes and heart disease due to obesity are more likely to take proactive steps toward weight loss (Li et al., 2020). Furthermore, existing weight loss programs and resources are available to obese youth in China. Youth's awareness of the various weight loss interventions, such as diet programs, exercise classes, and support groups, can influence their attitudes and behaviors toward weight loss. According to a study by Chen et al. (2021), participants knowledgeable about the different weight loss programs are more likely to seek help and support in their weight loss journey.

Attitude towards weight loss can also influence behaviors such as diet and exercise, as individuals with a positive attitude are likelier to engage in healthy habits (Ghosh et al., 2019). Attitude is a learned predisposition to respond in a consistently favorable or unfavorable manner toward a particular object, person, or situation (Fishbein & Ajzen, 2020). In the context of weight loss among obese youth in China, attitude refers to individuals' beliefs, feelings, and evaluations about their body weight and the importance of managing it. Positive attitudes towards weight loss are often associated with greater motivation, adherence to weight loss strategies, and improved overall outcomes. Individuals with positive attitudes toward weight loss may be more likely to seek out information, adopt healthier eating habits, and engage in regular physical activity compared to those with negative attitudes. In addition, attitudes towards weight loss significantly predicted weight loss behavior among obese youth in China. Youth who reported positive attitudes towards weight loss were more likely to engage in healthy behaviors such as following a balanced diet and exercising regularly. Conversely, individuals with negative attitudes toward weight loss were less likely to adhere to weight management strategies and were more prone to relapse (Wang et al., 2018).

Several barriers can hinder progress toward weight loss in youth, including lack of access to healthy foods, limited physical activity opportunities, and social stigma associated with weight issues (Booth et al., 2018). One of the main barriers to weight loss among obese youth in China is a lack of knowledge about healthy eating and exercise. Many obese youths in China lack the awareness and understanding of proper nutrition and physical activity that are necessary for weight loss. This lack of knowledge hinders their ability to make positive changes in their lifestyle and achieve weight loss goals (Wang et al., 2018). Additionally, attitude toward weight loss can also be a barrier for obese youth in China. Obese youth often have negative attitudes towards weight loss, viewing it as a difficult or unattainable goal. This negative attitude can prevent them from taking the necessary steps to lose weight and improve their health (Liu et al., 2020). Various barriers may hinder obese youth in China from successfully losing weight. These barriers can include a lack of access to healthy food options, limited availability of resources for physical activity, the social stigma surrounding obesity, and cultural beliefs about body image and weight. These barriers can make it challenging for obese youth to make positive changes in their lifestyle and achieve sustainable weight loss.

Furthermore, behavior plays a significant role in weight loss among obese youth in China. Unhealthy behaviors such as overeating, lack of physical activity, and sedentary lifestyle were common among obese youth in China. These behaviors contribute to weight gain and make it difficult for youth to achieve weight loss goals (Zhang et al., 2021). Behavior plays a crucial role in the success of weight loss interventions. In the context of obesity among youth in China, behaviors such as physical activity,

dietary habits, and adherence to weight loss programs can significantly impact the success of weight management efforts. The study conducted by researchers from 2018 to 2024 aimed to explore the relationship between behavior and weight loss outcomes among obese youth in China. By examining behaviors such as physical activity levels, dietary patterns, and adherence to weight loss recommendations, the researchers were able to identify key factors that influence weight loss success (Wang et al., 2019). The behavior in weight loss shows that individuals who engaged in regular physical activity, followed a healthy diet, and adhered to weight loss recommendations were more likely to achieve successful weight loss outcomes than those who did not. This highlights the importance of promoting positive behaviors and lifestyle changes as part of obesity prevention and intervention efforts. Factors such as lack of motivation, social stigma, and environmental challenges were identified as key barriers that hindered individuals from adopting healthy behaviors and achieving successful weight loss outcomes. By understanding these barriers, healthcare professionals and policymakers can develop targeted interventions to address these challenges and support behavior change among obese youth in China (Chen et al., 2021).

Public health promotion and education play a crucial role in addressing the issue of obesity among youth in China. By promoting healthy lifestyle choices, raising awareness about the risks of obesity, and providing education on proper nutrition and exercise, public health initiatives can help prevent and reduce obesity in this population. The study mentioned focuses on developing a weight management package tailored to the specific needs and challenges faced by obese youth in China to promote sustainable weight loss and overall well-being (Zhang & Sun, 2018). To design an effective weight management package, it is important to understand the factors contributing to obesity among youth in China. This includes examining their knowledge and attitudes toward weight management, identifying the barriers that prevent them from leading a healthy lifestyle, and assessing their behaviors related to diet and exercise. By taking a comprehensive approach that considers these factors, the study aims to create a package that addresses the root causes of obesity and provides sustainable solutions for weight loss and maintenance (Xu & Li, 2020).

The study explores the factors contributing to obesity among Chinese youth, including knowledge, attitude, barriers, and behavior related to weight management. By addressing these key factors, the study aims to provide valuable insights into effective strategies for combating obesity among this demographic. One of the key implications of this study is the recognition of the importance of addressing the knowledge and attitudes of obese youth in China regarding weight management. By understanding the underlying beliefs and perceptions that influence their behavior, interventions can be tailored to better meet the needs of this population. For example, promoting healthy eating habits and physical activity in a way that resonates with their attitudes and beliefs may encourage healthier behaviors and ultimately reduce the prevalence of obesity. Furthermore, identifying the barriers that obese youth face in terms of weight management is crucial in developing effective interventions. By understanding the challenges they encounter, such as social stigma or lack of access to healthy foods, efforts can be made to address these barriers and create a supportive environment for weight management. This may involve community-based initiatives or policy interventions that aim to improve access to healthy foods and promote physical activity among youth in China. Lastly, offers valuable insights into the factors contributing to obesity among Chinese youth and provides a roadmap for developing effective interventions. By addressing the knowledge, attitude, barriers, and behavior of obese youth, it is possible to create a supportive environment that promotes healthy behaviors and ultimately improves public health outcomes. This study is a significant contribution to the field of obesity research. It has the potential to positively impact the health and well-being of the youth population in China.

## **2. METHODS**

### **2.1. Research Design and Locale**

This study will use a Cross-sectional design. This research design is a method that allows researchers to gather data from a specific population at a single point in time. This design is commonly used in public health research to examine the prevalence of a particular health issue or behavior within a population. In the case of study participants aged 15 to 16 years, the need for parental assistance in completing the form was indicated, but parents were asked not to interfere with the completion of the form, which was to be based on the actual situation of the participant. The strength of a cross-sectional design lies in its ability to provide a snapshot of a population at a specific point in time (within the last 6 months-1 year). By examining the relationships between knowledge, attitude, behavior, and barriers in weight management among obese youth, the study can provide valuable insights into factors that impact their ability to manage their weight effectively. This information can be used to develop interventions and programs that target these specific factors to improve outcomes for obese youth.

The Erqi District in Zhengzhou City, Henan Province of China, serves as the research locale for a study on weight management among obese youth. This region was selected due to its high prevalence of obesity among young individuals and the potential impact of implementing a weight management package based on knowledge, attitude, behavior, and barriers. The Erqi District is one of the six urban districts in Zhengzhou City, Henan Province, China. With a population of over 1 million, it is a densely populated area with a mix of residential, commercial, and industrial zones. The district is characterized by rapid urbanization and industrialization, which have led to changes in dietary habits and lifestyle factors contributing to the rise in obesity rates among youth (Guo et al., 2019). Zhengzhou is the capital city of Henan Province in China; according to Guo et al. (2019), a survey on the current status and influencing factors of central obesity among adults in Zhengzhou City, which mentioned that 6,809 questionnaires were distributed and 6,657 valid questionnaires were recovered, with a questionnaire validity rate of 97.77%. There were 3,828 cases of central obesity, and the central obesity rate was 57.50%.

### **2.2. Study Participants**

The participants in the study are obese youth between the ages of 11 and 18 who reside in the Erqi District in Zhengzhou City, Henan Province of China. As obesity continues to be a growing concern among youth globally, particularly in China, it is essential to target this age group as they are at a critical stage of development where healthy habits can have a significant impact on their long-term health outcomes.

## **3. RESULT**

The survey data shows that the age of the participants is concentrated between 15 and 18 years old, with 18 years old having the highest percentage of participants at 27.08%. This indicates a relatively balanced age distribution of participants, but a slightly higher proportion of 18-year-old participants was the age group with the highest number of participants. In terms of gender, females accounted for 54.43% of the total number of participants, while males accounted for 45.57%. This indicates that there were slightly more female participants than male, and the gender ratio was more balanced. According to the BMI classification, 72.92% of the participants were in the "mildly obese" range and 27.08% were in the "obese" range. This means that most of the participants were in the "mildly obese" range and only a small number were in the "obese" range, reflecting the prevalence of overweight and obesity in the participant group.

**Table 1.** Basic information of Research Participants

Items	Options	Frequency	%
Age	15	95	24.74
	16	84	21.88
	17	101	26.30
	18	104	27.08
Sex	Female	209	54.43
	Male	175	45.57
BMI	Mildly obese BMI range index	280	72.92
	Obese BMI range index	104	27.08
Monthly spending	200-500 yuan	99	25.78
	501-1000 yuan	142	36.98
	Above 1000 yuan	62	16.15
	less than 100 yuan	81	21.09
Total		384	100.0

The monthly consumption levels of the participants showed that the majority of the participants' monthly consumption was concentrated in the range of 501 to 1,000 yuan, which accounted for the highest proportion, followed by 200 to 500 yuan, showing the diversity of the participants' consumption ability. This shows that the monthly consumption level of most participants is concentrated between 501 and 1,000 yuan, with the highest percentage, followed by 200-500 yuan, showing the diversity of participants' consumption ability. A comprehensive analysis of the data showed that the age of the participants was mainly concentrated in the high school stage (15 to 18 years old), which helps to understand the health status and behavioral habits of adolescents in this age group. There were slightly more female participants than male, but the gender ratio was generally balanced, which could ensure that the results of data analysis were representative.

Up to 72.92% of the participants were mildly obese, indicating that the problem of overweight is more prevalent in this group and needs to be taken seriously. Most of the participants had a monthly consumption of between 200 and 1,000 RMB, which reflected the economic status of the participants and may affect their dietary choices and health behaviors. These data provide the basis for subsequent studies. By analyzing in detail the health status of adolescents in different age groups, genders and economic backgrounds, targeted interventions can be developed to help improve their health.

The researchers evaluated the BMI values of the survey participants according to the international BMI scale, hid the actual BMI values through text coding, and categorized them into two groups according to the charts: "mildly obese BMI range index" and "obese BMI range index". The BMI indexes of the participating subjects were categorized, and the values within the range of "overweight" were categorized as "mild obesity BMI range index"; the values within the range of "obesity-extreme obesity" were categorized as "obesity BMI range index"; and the values within the range of "obesity-extreme obesity" were categorized as "obesity BMI range index". The "obese BMI range index" was categorized as "obese BMI range index".

#### 4. CONCLUSIONS

Studies have found that obese adolescents commonly have misconceptions and deficiencies in health knowledge. Many have negative attitudes towards important health knowledge such as balanced diet, daily breakfast and limiting junk food. This indicates that there is an urgent need to strengthen targeted health education to help adolescents develop correct health knowledge and concepts. Schools, families and the community should work hand in hand to adopt a variety of approaches to popularize health knowledge and improve the health literacy of young people.

Psychological distress and negative self-perception are common among obese adolescents. They usually think that they are less attractive than others, feel anxious and depressed about their weight, and believe that being overweight will have a negative impact on their social life. These negative attitudes reflect the serious impact of obesity on adolescent mental health. Schools and families should pay attention to the mental health of obese adolescents, provide necessary psychological guidance and support, and help them build self-confidence and a positive self-image.

It is found that obese adolescents seldom adopt weight reduction behaviors, such as eating less after weight gain, skipping meals or deliberately choosing foods favorable for weight reduction. Although they pay close attention to what they eat, the lack of weight loss behaviors suggests a lack of behavioral guidance and motivation. Schools and parents should provide behavioral guidance to adolescents and encourage them to adopt healthy ways of weight reduction, such as balanced diet and moderate exercise, to help them form good weight reduction behaviors.

Despite the low frequency of barriers, obese adolescents still face many barriers, such as difficulty in finding healthy food, high cost of healthy eating, lack of time for exercise, and psychological stress related to weight. These barriers are ubiquitous and require a comprehensive response. The government and society should improve relevant policies and environments, such as increasing the supply of healthy food, lowering the price of healthy food, and creating an exercise-friendly environment, in order to create conditions conducive to healthy weight loss for obese adolescents.

Studies have found that there is a complex interplay between health knowledge, attitudes, behaviors and barriers. Knowledge is negatively correlated with attitudes, but positively correlated with barriers and behaviors; attitudes are negatively correlated with barriers and behaviors; and barriers are positively correlated with behaviors. This suggests that interventions targeting weight loss in obese adolescents need to be systematic and holistic. A single knowledge education or attitude change may not be effective, and it is necessary to focus on eliminating barriers and guiding behaviors while improving knowledge to promote the formation of a virtuous circle.

This study reveals the problems and challenges in health knowledge, attitudes, behaviors, and barriers among Chinese obese adolescents, providing an important basis for targeted weight loss interventions. In the future, the government, schools, families and society should work together to adopt systematic, multilevel and comprehensive interventions to effectively improve the health literacy of obese adolescents, improve their physical and mental health, and help them grow up healthily. At the same time, more research is needed to explore in depth the factors affecting the weight loss of obese adolescents and their functioning mechanisms, so as to provide richer theoretical support and practical guidance for the development of effective intervention strategies.

## **5. RECOMMENDATIONS**

### **5.1. Strengthening Health Education in Schools**

Schools should incorporate health education into the formal curriculum system and offer mandatory courses such as nutrition and sports health to improve students' health literacy. At the same time, schools should organize health knowledge lectures, theme class meetings and other activities to popularize the knowledge and skills of healthy lifestyles. Schools should also improve the faculty and teaching resources for health education to provide students with professional and authoritative health guidance.

### **5.2. Improving School Sports Facilities and Programs**

Schools should increase investment in sports facilities and venues to provide students with a safe and convenient sports environment. The physical education curriculum should be more interesting and diversified, and more sports programs suitable for the characteristics and needs of different students

should be offered to increase students' motivation to participate in physical exercise. Schools can also organize a variety of extracurricular sports activities and competitions to cultivate students' interests and habits in sports.

### **5.3. Improve the School Food Environment**

School canteens should provide more healthy and nutritious food choices and reduce the supply of high-fat and high-calorie foods. School supermarkets and kiosks should limit the sale of unhealthy foods and beverages and increase the variety and quantity of healthy foods such as fresh fruits and yogurt. Schools should also strengthen the supervision of food safety and nutrition around the campus to create a favorable food environment for students.

### **5.4. Strengthening Home-School Cooperation**

Schools should maintain close communication with parents, provide regular feedback to parents on students' diet and exercise at school, and offer scientific health guidance. Parents should cooperate with the school's health education work, create a healthy living environment for their children at home, and set a good example by practicing good diet and exercise habits. Schools and families can also organize parent-child sports games, health knowledge competitions and other activities to enhance home-school cooperation and jointly promote the healthy growth of students.

### **5.5. Carry Out Targeted Mental Health Services**

Schools should pay attention to the mental health problems of obese students, carry out mental health screening, timely detection and intervention of psychological problems. Schools should be equipped with professional mental health teachers to provide personalized psychological counseling and guidance services for obese students. Schools can also carry out activities such as group counseling and peer support to help obese students build self-confidence and learn self-acceptance and emotional regulation.

### **5.6. Formulate Supportive Public Policies**

The government should formulate supportive public policies to create a healthy environment for young people to grow up in. This includes increasing funding for school health education, improving standards for the construction of school sports facilities, strengthening the management of food nutrition labeling, and restricting the advertising of unhealthy foods. The government should also strengthen the construction of public sports facilities to provide safe, convenient and low-cost sports venues for youth.

### **5.7. Conducting Social Publicity and Health Promotion Activities**

The government, schools, media and communities should jointly carry out health publicity and promotion activities to popularize knowledge of healthy lifestyles and create a social atmosphere of concern for health and sports. This may include organizing large-scale activities such as youth health festivals, health knowledge competitions, community games, etc., conducting public health publicity through television, radio, Internet and other media, and carrying out health education lectures and free medical consultations in the community.

### **5.8. Strengthening Scientific Research and Evaluation of Intervention Effects**

Scientific research on the health management of obese adolescents should be strengthened, in-depth exploration of the factors affecting the health behavior of obese adolescents and their role mechanisms, and the development and optimization of interventions and health management models

suitable for the characteristics of obese adolescents. At the same time, the evaluation of intervention effect should be strengthened, and the monitoring of obesity rate and tracking evaluation of intervention effect should be carried out on a regular basis, so as to summarize the lessons learned in time and improve the intervention strategies and measures.

## REFERENCES

- [1] Clarke, Victoria & Braun, Virginia. (2013). *Successful Qualitative Research: A Practical Guide for Beginners*.
- [2] Creswell, J.W. and Plano Clark, V.L (2011). *Designing and conducting mixed methods research*, 3rd ed. LA: SAGE Publication, Inc.
- [3] Zohrabi, M. (2013). *Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings Theory and Practice in Language Studies*, Vol. 3, No. 2, pp. 254-262
- [4] Aleman, A., Geppert, S. E., Knegeting, H., Dlabac-de Lange, J.J. (2018) Moderate effects of noninvasive brain stimulation of the frontal cortex for improving negative symptoms in schizophrenia: Meta-analysis of controlled trials. *Neuroscience & Biobehavioral Reviews*. (89), 111-118. Butzer, B. (2020). Bias in the evaluation of psychology studies: A comparison of parapsychology versus neuroscience. *EXPLORE* 16(6), 382-391. file:///C:/Users/Angel/Downloads/Psi%20Manuscript%20Preprint%20
- [5] Chen Jia, LIANG Jingtian, Wang Chengke (2023). Study on multiple participation mode of college students in exercise and weight loss based on "health education" [J]. *Guangxi Education*, 2023, (18):33-35+125.
- [6] FINA L (2023). Total Resident Population in Henan, China from 2010-2022. Statista 2024. Dec 11, 2023. <https://www.statista.com/statistics/1082433/china-population-in-henan/#:~:text=By%20the%20end%20of%202022,%2C%20Shaanxi%2C%20Anhui%20and%20Hubei>
- [7] He Bingxian (2023) A study on the effect of HIIT combined with aerobic exercise and resistance training on weight loss among 18-22 year old college students (CHKD doctoral and master's thesis full-text database thesis, Shandong Normal University) [https://kns.cnki.net/kcms2/detail?v=O0ap\\_2NIr0\\_vvgA6IC9Oi3nDufES6y0zN8NBKKEsuC9RxKPlrLmZPzS1Xh\\_dUzGJBWOkY8AHybEFi7ltbXrjkR40S54AtSzo1gFO2oNOOct\\_Cey10cl9sdMLQCJKJY&uniplatform=CHKD&language=CHS](https://kns.cnki.net/kcms2/detail?v=O0ap_2NIr0_vvgA6IC9Oi3nDufES6y0zN8NBKKEsuC9RxKPlrLmZPzS1Xh_dUzGJBWOkY8AHybEFi7ltbXrjkR40S54AtSzo1gFO2oNOOct_Cey10cl9sdMLQCJKJY&uniplatform=CHKD&language=CHS)
- [8] Hong Y, Ullah R, Wang JB, Fu JF. Trends of obesity and overweight among children and adolescents in China. *World J Pediatr*. 2023 Dec;19(12):1115- 1126. doi: 10.1007/s12519-023-00709-7. Epub 2023 Mar 15. PMID: 36920656; PMCID: PMC10015139.
- [9] Jie Zhang, Peng Xu, Feng Liu, (2020) One-child policy and childhood obesity, *China Economic Review*, Volume 59, 2020, 100938, ISSN1043- 951X, <https://doi.org/10.1016/j.chieco.2016.05.003>
- [10] Lee CY, Yusof HM, Zakaria NS. Knowledge, Attitude and Behaviours Related to Weight Control and Body-Image Perceptions among Chinese High School Students. *Malays J Med Sci*. 2019 Sep; 26(5):122-131. doi: 10.21315/mjms2019.26.5.11. Epub 2019 Nov 4. PMID: 31728124; PMCID: PMC6839653.
- [11] Li Cai, Ting Zhang, Jun Ma, Lu Ma, Jin Jing, Yajun Chen, (2017) Self-perception of weight status and its association with weight-related knowledge, attitudes, and behaviors among Chinese children in Guangzhou, *Journal of Epidemiology*, Volume 27, Issue 7, 2017, Pages 338-345, ISSN0917-5040, <https://doi.org/10.1016/j.je.2016.08.011>
- [12] Li Zhilong (2023). Study on the Weight Loss Effect of Continuous/Intermittent High Intensity Intermittent Training with Different Exercise Levels on Young Obese Women (CHKD Doctoral and Master's Thesis Database, Thesis, Hebei Normal University) [https://kns.cnki.net/kcms2/detail?v=aGn3Ey0ZxcDYDD4FZEvm\\_wXudyBIFHKuPBrSNRJAmRZh0JhIZt3zHOTf9\\_FIE0kmBw\\_IS5ZzX5JNdtzHES6PLf\\_hYNMPtPdeO0DaHgkIh6wZXchDjM6-YGqkwssEhyfLR2&uniplatform=CHKD&language=CHS](https://kns.cnki.net/kcms2/detail?v=aGn3Ey0ZxcDYDD4FZEvm_wXudyBIFHKuPBrSNRJAmRZh0JhIZt3zHOTf9_FIE0kmBw_IS5ZzX5JNdtzHES6PLf_hYNMPtPdeO0DaHgkIh6wZXchDjM6-YGqkwssEhyfLR2&uniplatform=CHKD&language=CHS)