

Psychological assessment of children and adolescents with obesity

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Abstract

Objective: This study aimed to analyse the psychological conditions and behaviour of a group of Chinese children and adolescents with obesity, and to develop an intervention for these young patients.

Methods: A group of 72 patients aged from 4 to 15 years were recruited from an obesity clinic. Patients, or the parents of children younger than 12 years, filled out a series of self-report questionnaires, and the responses were recorded and analysed.

Results: The 72 children and adolescents with obesity had a mean age of 9.14 ± 2.18 years. The body mass index-z scores of children with obesity showed a significant positive correlation with the level of impulsive behaviour, motivational impulses, and cognitive instability (inattention). Children with obesity quickly responded with extreme emotions, and these responses were positively correlated with the degree of obesity (slight, intermediate, or severe obesity).

Conclusion: Children and adolescents being treated for obesity have many underlying psychological problems, including emotional instability and impulsivity, and are prone to extreme emotional-psychological problems. These difficulties are positively correlated with the degree of obesity. Therefore, clinical treatment of these problems requires not only use of medication, improved nutrition, and healthy exercise, but also addressing underlying psychologic problems.

Keywords

Body mass index, children, obesity, psychology, body composition, impulsive behaviour

Date received: 29 March 2017; accepted: 12 June 2017

Introduction

Over the past 30 years, obesity has become a worldwide epidemic. In China, rapid socio-economic development, and high-calorie and high-fat foods have become increasingly popular in children's diet. These factors have become a major source of obesity in children. As a result, the prevalence of overweight and obesity among children

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and adolescents in China has rapidly increased. In 2010, 8.1% of Chinese children and adolescents (aged 7–18 years) were obese and 11.1% were overweight.¹

Childhood obesity is also a public health problem worldwide.^{2,3} In 2010, the World Health Organization (WHO) estimated that 43 million preschool-aged children (35 million in the developing world) were overweight or obese, and the worldwide prevalence has risen from 4.2% in 1990 to 6.7% in 2010.⁴ Studies have also revealed that obesity in children and adolescents may persist into adulthood, and it is closely related to morbidity and mortality of some chronic diseases in adulthood.⁵ This increases the prevalence of obese-related diseases, such as type 2 diabetes mellitus or heart disease, which in turn increases health-care costs.⁶

However, while such physical conditions have been extensively studied, the mental wellbeing and psychiatric health of children and adolescents suffering from obesity have not been well studied. The results of clinical psychological studies have indicated that children and adolescents with obesity also often have psychological issues, such as impaired self-awareness, low self-esteem,⁷ low levels of happiness and satisfaction, inferiority, anxiety,⁸ and depression.⁹ Additionally, these young patients often present with behavioural problems, such as little ability to live independently, poor labour skills, limited exercise capacity, and poor body balance and autonomic function, along with a lack of social adaptability.^{10–15}

We performed an observational study of 72 children and adolescents who visited our hospital's Obesity Specialist Clinic. All of the participants had their body composition analysed and took psychological tests regarding psychological and behavioural characteristics. This study aimed to identify correlations between the degree of obesity and the occurrence of psychological problems. This study could help identify

potential young patients with obesity who are inclined to develop psychological problems (e.g., inferiority complex).

Subjects and methods

Subjects

A total of 72 children aged 4 to 15 years who visited the Obesity Specialist Clinic at the Affiliated Shanghai Children's Medical Center, School of Medicine, Shanghai Jiaotong University, were recruited for the study between July 2013 and February 2014. All of the participants were required to meet the following inclusion criteria: aged 3 to 16 years and able to understand the questionnaire survey. Exclusion criteria included obesity of other causes. The questionnaire was filled out by patients aged 12 years or older or by the parents of patients younger than 12 years. This research was approved by the Shanghai Children's Medical Center (Protocol #SCMCIRB-201131) and conducted according to the principles expressed in the Declaration of Helsinki. Written informed consent was obtained from legal guardians, and assent was obtained from patients older than 12 years old.

Body composition

The subjects' body composition was measured with the Body Composition Analyzer Inbody 720 (InBody Co, Ltd., Seoul, Korea). Height was measured with the subjects in their bare feet (accuracy: 0.1 cm). Before measurement, the subjects were asked to avoid exercise and other activities, and had fasted for 2 h. Minimal clothing was worn, and defecation and urination were required before measurement. Metal accessories were not allowed. The subjects were advised to stand as still as possible during measurement. Body composition was measured with segmental multi-frequency bio-electrical impedance analysis using eight electrodes connected to the subjects' arms

and legs. The body composition measurement session lasted 90 seconds. We could acquire body water, muscle, fat content, basal metabolism, the waist-to-hip ratio (WHR), and the degree of obesity via body composition measurement. Additionally, the WHR is an indicator of centripetal obesity. The WHO recommends to define males whose WHR is greater than 0.90 and females whose WHR is greater than 0.85 as centripetal obesity. The Chinese domestic standard of centripetal obesity is males whose WHR is greater than 0.90 and females whose WHR is greater than 0.80.¹⁶

Questionnaire survey

Children 12 years and older filled out a questionnaire survey. Parents completed the survey for children younger than 12 years old. Medical and behavioural characteristics were evaluated mainly with the Self-Control Scale (SCS),¹⁷ the Behavioural Inhibition/Behavioural Activation Scales (BIS/BAS),¹⁸ the Positive and Negative Affect Scale (PANAS),¹⁹ and the Barratt Impulsiveness Scale (BIS).²⁰

SCS. The SCS describes the ability to override or change one's inner responses, interrupt undesired behavioural tendencies, and refrain from acting on them. This scale contains 36 items and is rated on a 5-point scale (1 = not at all; 5 = very much). The SCS has five dimensions of general capacity for self-discipline, deliberate/nonimpulsive action, healthy habits, work ethics, and reliability.

BIS/BAS. The BIS is a measure of regulating aversive motives, in which the goal is to move away from something unpleasant. The BAS is a measure of regulating appetitive motives, in which the goal is to move toward something desired.

Each item of this questionnaire is a statement that a person may either agree

with or disagree with. For each item, the person indicates how much he/she agrees or disagrees with what the item says. Only one response to each statement should be chosen. Items are scored on a 4-point scale: 1 = very true for me, 2 = somewhat true for me, 3 = somewhat false for me, and 4 = very false for me. Items other than 2 and 22 are reverse-scored.

PANAS. The 20-item PANAS was developed with a sample of undergraduate students and validated with adult populations. The PANAS comprises two mood scales, with one measuring positive affect and the other measuring negative affect. Each item is rated on a 5-point scale ranging from 1 = very slightly or not at all to 5 = extremely to indicate the extent to which the respondent has felt this way in the indicated time frame. The authors have used this scale to measure affect at this moment, today, the past few days, the past week, the past few weeks, the past year, and generally (on average).

BIS. The BIS-11 is a questionnaire designed to assess the personality/behavioural construct of impulsiveness. This scale is the most widely cited instrument for assessment of impulsiveness. The BIS has been used to advance our understanding of this construct and its relationship with other clinical phenomena for 50 years. The current version of the BIS-11 is composed of 30 items describing common impulsive or non-impulsive (for reverse-scored items) behaviours and preferences. Items are scored on a 4-point scale as follows: rarely/never = 1, occasionally = 2, often = 3, almost always/always = 4.

Criteria

Criteria for body mass index. Body mass index (BMI) criteria were established as follows. The z-score of BMI distribution was calculated using the WHO's Anthro version

3.2.2 software (WHO Anthro, Geneva, Switzerland) for children younger than 5 years old, or with WHO AnthroPlus version 1.0.4 software for children aged 6 years or older. Overweight was defined once the BMI-z score was > 1.0 , and obesity was defined once the BMI-z score was > 2.0 .²¹

Body weight. Based on height and body weight adjusted for age, the following categories were established: (1) weight that was 20% higher than standard body weight was defined as overweight; (2) weight that was 20%–30% above standard body weight was defined as mild obesity; (3) weight that was 30%–50% above standard body weight was defined as intermediate obesity; and (4) weight that was 50% above standard body weight was defined as severe obesity.²²

Statistical analysis

Statistical analysis was performed with SPSS for Windows version 17.0 (IBM Corp, Armonk, NY, USA). Quantitative data are expressed as mean \pm standard deviation (SD). Quantitative data with normal distribution were compared with the independent samples t-test and those with abnormal distribution were compared with non-parametric tests between two groups. Spearman's correlation comparison was used to compare the correlation between

two variables. A value of $P < 0.05$ was considered statistically significant.

Results

General characteristics

The 72 subjects included 55 boys and 17 girls. The mean age was 9.14 ± 2.18 years (range: 4–15 years) (Table 1). Centripetal obesity was found in 56 children (77.8%; 39 boys and 17 girls). Of the 72 children, overweight was observed in six children, mild obesity in five, intermediate obesity in 10, and severe obesity in 51 according to Chinese body mass standards. A total of 18 children were overweight and 54 were obese according to WHO suggestions.

BMI-z score and psychological characteristics

Among the 72 children and adolescents, the mean BMI-z score was 2.65 ± 1.19 . The BMI-z score was positively correlated with the BIS score and BIS/BAS score ($P < 0.05$) (Table 2).

The BMI-z score was positively correlated with cognitive instability, motivational impulsivity, and stability scores of the BIS ($P < 0.05$). The stability of motivational impulsivity increased with an increase in severity of obesity ($P < 0.05$) (Table 3). The BMI-z score showed no relationship with

Table 1. General characteristics of the children with obesity.

Characteristics	Mean \pm SD or n	Characteristics	Mean \pm SD or n
Mean age (y)	9.14 ± 2.18	Age range (y)	4–16
Sex(boy/girl)	55/17	Height (cm)	144.30 ± 16.77
Body weight(kg)	54.38 ± 19.01	BMI	25.37 ± 5.20
Skeletal muscle content (kg)	18.71 ± 7.68	BMI-z	2.65 ± 1.19
Fat content (kg)	20.27 ± 9.72	Waist-to-hip ratio	0.90 ± 0.07
Mean obesity, degree (%)	136.31	Mean body fat (%)	35.97
		Basal metabolism (kcal)	1092.03 ± 273.69

BMI: body mass index.

the second order factors of the BIS/BAS (Table 3).

Degree of obesity and psychological characteristics

According to age-standardized height and body weight, the children and adolescents were divided into four groups: overweight, mild obesity, intermediate obesity, and severe obesity groups. The subjects' psychological characteristics were then compared among the groups. Pairwise comparison using the independent t-test was performed

for the psychological scale score between two different groups. The psychological characteristics were not significantly different among the four groups, except for a significant difference in the PANAS score between those in the mild obesity group and those in the intermediate obesity group ($P = 0.026$) (Table 4).

Discussion

This study aimed to analyse the association between obesity and psychological behaviour by measuring body composition, calculating the degree of obesity, and investigating psychological behavioural problems through questionnaires. Our study enrolled 72 children who visited an obesity outpatient clinic, among whom the ratio of boys to girls was 55/17, which is consistent with the current condition of Chinese children with obesity. The incidence of obesity in children is increasing yearly. The prevalence of obesity in boys was higher than that in girls. This finding is consistent with a report on the prevalence of overweight and obesity in

Table 2. Relationship of the BMI-z score with psychological characteristics in the subjects.

Questionnaire	BIS	SCS	BIS/BAS	PANAS
Pearson's correlation coefficient	0.247	0.170	0.235	-0.037
P value	0.037*	0.153	0.047*	0.762

* $P < 0.05$.

Table 3. Correlation of the BMI-z score with the BIS and BIS/BAS scores.

	BMI-z score		BMI-z score	
	Pearson's correlation coefficient	P value	Pearson's correlation coefficient	P value
BIS			BIS/BAS score	
Attention impulse	0.160	0.179	BAS Drive	0.060
Attention	-0.019	0.873	BAS Fun Seeking	0.199
Cognitive instability	0.308	0.009***	BAS Reward	0.222
			Responsiveness	
Motivational impulsivity	0.240	0.042*	BIS	0.157
Motivation	0.117	0.328		0.188
Stability	0.273	0.020*		
Unplanned impulse	0.116	0.331		
Self-control	0.073	0.540		
Cognitive complexity	0.100	0.402		

BMI: body mass index; BIS: Barratt Impulsiveness Scale; BIS/BAS: Behavioural Inhibition/Behavioural Activation Scales.
* $P < 0.05$; ** $P < 0.01$.

Table 4. Correlations between the degree of obesity and BIS score, self-control score, activation of behavioural inhibition, and PANAS score.

	Mild obesity		Intermediate obesity		Severe obesity	
	Mean	P value	Mean	P value	Mean	P value
BIS score						
Overweight	-3.433	0.478	-3.133	0.448	-3.422	0.322
Mild obesity	-	-	0.300	0.945	0.012	0.997
Intermediate obesity	-	-	-	-	-0.288	0.917
Self-control score						
Overweight	1.667	0.670	-0.133	0.968	1.176	0.673
Mild obesity	-	-	-1.800	0.611	-0.490	0.871
Intermediate obesity	-	-	-	-	1.310	0.558
Activation of behavioural inhibition						
Overweight	-2.833	0.532	-4.033	0.298	-4.147	0.202
Mild obesity	-	-	-1.200	0.770	-1.314	0.708
Intermediate obesity	-	-	-	-	-0.114	0.965
PANAS score						
Overweight	9.900	0.075	-1.400	0.765	4.357	0.269
Mild obesity	-	-	-11.3000	0.026*	-5.543	0.196
Intermediate obesity	-	-	-	-	5.757	0.071

Note: The *P* values were obtained by independent *t*-tests. BIS: Barratt Impulsiveness Scale; PANAS: Positive and Negative Affect Scale; -: missing data. **P* < 0.05.

boys (23.4%) and girls (14.5%) aged 7–18 years in 2010.¹ By measuring body composition in every child, we found that 77.8% of them had centripetal obesity. Previous studies have shown that centripetal obesity in children and adolescents is associated with hyperinsulinaemia, hyperleptinaemia, and insulin resistance.²³ Body composition measurements can provide information on fat, muscle content, and basal metabolic rate, which can be used for weight loss programs and follow-ups.

Furthermore, we obtained SCS, BIS, BIS/BAS, and PANAS questionnaire results and compared them with the BMI-*z* score in children with obesity. Most previous studies^{14,24} compared children with obesity with healthy children and found that children with obesity had more serious psychological problems than healthy children. In recent years, children and teens with obesity have been found to have psychological

complications. The most frequent complications include body dissatisfaction, depression, anxiety, uncontrolled eating, unhealthy and extreme weight control behaviours, and a sense of shame and/or inferiority.^{9–14} Results from several studies have shown that people with obesity are often severely stigmatized²⁵ and are frequently stereotyped as ugly, stupid, mean, and lazy.²⁶ One study showed that when children were presented with pictures of children with a range of physical characteristics, including disabilities, the picture representing the obese child was one of the least liked and least likely to be considered a potential playmate by the children in the study.²⁷ If obesity is not addressed, the growth and development of these young people will be impaired, and physical and psychological diseases will result. Without intervention, these young patients may develop adverse emotions, such as anxiety,

fear, and worry, and may retreat, and develop depression and apathy. Additionally, a sense of remorse and self-condemnation over time will lead to psychopathology.

Other studies exploring associations between obesity and psychosocial concerns among youth have found mixed results. In a study of 30,000 adolescents, Neumark-Sztainer et al.²⁸ found strong positive associations between obesity and weight-specific concerns and behaviours (e.g., body dissatisfaction and unhealthy weight control behaviours). However, associations of obesity with global psychological concerns, such as emotional wellbeing, suicidal ideation, peer concerns, and future job concerns, were minimal.

In this study, we chose children with obesity as the research subjects, and we assessed the degree of obesity and psychological scaling using correlation analysis. We found that the BMI-z score was positively correlated with the BIS score. This finding suggested that the severity of obesity was positively associated with behavioural and psychological impulses. The BMI-z score was also positively associated with the BIS/BAS score. This finding indicated that children with obesity are susceptible to extreme emotions, such as anxiety, fear, excitation, and happiness, which are positively correlated with the severity of obesity.

We also evaluated the correlation of obesity with impulse and emotion. The BMI-z score was positively correlated with cognitive instability, motivational impulsivity, and stability scores of the BIS. This finding indicated that the degree of obesity was positively associated with attention instability and inattention and positively correlated with motivational impulsivity. Motivational impulsivity is the internal mental process or internal power that activates and maintains individual activities in the guidance of a specific goal. The stability

of motivational impulsivity increased with an increase in severity of obesity.

The study has some limitations. Although the demographics of affected children and the medical history of their parents were collected in this study, the sample size was small, and subgroup analysis was not performed.

Notably, some parents and society still fail to recognize the importance of psychological problems in children. Clinicians should pay more attention to psychological counselling in these children during clinical guidance on body weight loss. Therefore, integrating professionals with a psychological counselling background into a child weight management team is important.

Taken together, our findings and previous studies suggest that obese children and adolescents have some psychological problems, such as impulsivity, inattention, and extreme emotions. These psychological problems are positively correlated with the severity of their obesity. Psychological counselling is necessary for these young patients and for their parents. Clinicians can actively guide and help alter the patients' incorrect thoughts, reduce the relevant psychological complications, and improve compliance with efforts to control body weight. These steps will help these patients establish a healthy lifestyle. Therefore, integrating psychological consulting into body weight management programs for children and teens, with the cooperation of a multidisciplinary treatment team, is crucial.

Declaration of conflicting interest

The Authors declare that there is no conflict of interest.

Funding

This study was funded by a grant from Shanghai Shenkang Hospital Development Center (No: SHDC12014205).

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