



Effect of the Intervention Dominated by Rational-Emotive Therapy on Obese Children's Mental Health

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Abstract

Background: Due to economic development and lifestyle changes, childhood obesity and psychological problems are becoming increasingly prominent. However, only a few studies have investigated the available psychological interventions for obese children. In this study, an eight-week empirical research on obese children was conducted where rational-emotive therapy was combined with group exercise.

Methods: A total of 110 obese children from 2 public primary schools in Fujian Province, China were selected via cluster random sampling. They were randomly divided into an experimental group and a control group, with 55 children in each group. The experimental group received an integrated intervention dominated by rational-emotive therapy, while the control group did not receive any intervention. After eight weeks of intervention, a comparative measurement was conducted on both groups.

Results: The decrease in BMI observed in the experimental group was significantly greater than that observed in the control group, and such difference was statistically significant ($P < 0.05$). The decrease in depression observed in the experimental group was greater than that observed in the control group, and such difference was statistically significant ($P < 0.05$). The experimental group reported reductions in all eight factors of mental health after the intervention, and the differences were statistically significant ($P < 0.001$).

Conclusion: The proposed intervention model can effectively reduce obese children's BMI and depression levels and improve their mental health. The results of this study provide scientific basis for the timely prevention of childhood obesity and negative psychological problems.

Keywords: Rational-emotive therapy; Mental health; Obese children

Introduction

Obese children have severe psychological problems. Obesity is a chronic metabolic disease caused by multiple factors, among which genetic and environmental factors significantly contribute to its occurrence and progression (1). According to its causes, obesity can be classified into simple

and pathological types, and childhood obesity is mostly classified as simple obesity (2). With the development of social economy and changes in people's dietary patterns and lifestyle, being overweight and obese is becoming increasingly common among children and poses independent



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risk factors that threaten their physical and mental health. Children's psychological behavior, which results from the interaction between their innate qualities and acquired environments, is considered a cause of obesity and a possible behavioral change resulting from this condition (3). Children with depression often have comorbidities represented by social anxiety and multiple behavioral disorders, which are highly detrimental to their physical and mental health. Due to the societal biases against obese individuals and poor self-assessment among obese children, obesity can also adversely affect children's mental health, and the resulting undesirable psychological states may lead to unhealthy eating and exercise behaviors that can increase these children's food intake, reduce their self-esteem, and hinder their participation in outdoor activities, ultimately resulting in obesity (4-5).

To control the weight of obese children, targeted psychological interventions should be carried out according to their developmental characteristics, age, and gender. Sepúlveda et al used a family-centered multidisciplinary intervention to achieve weight loss among obese children and found that this intervention also improved the children's emotional state (6). Stabouli et al followed evidence-based medicinal methods in designing primary interventions for obese children, including nutrition, diet, and psychotherapy, and found that the quality of life of children who received the primary interventions was significantly improved compared with those children who only received nutrition and dietary interventions (7). Liu et al adopted an integrated treatment method, which required joint efforts from family doctors, child health doctors, and parents, and used psychological correction as the main approach and WeChat groups as carriers to treat 110 obese children in the experimental group; they reported that this method had a significant psychological treatment effect on obese children and their parents and improved the emotions of the former (8). In sum, the treatment methods integrated with psychological interventions are particularly effective in treating simple obesity. However, despite the multiple reports on the application of

various intervention measures for controlling children's weight, only a few studies have proposed psychological interventions that specifically target obese children.

In this study, rational-emotive therapy was proposed on the basis of "ABC theory" (9). It has been widely used in the practical fields of psychological counseling and social work as well as in education and training. For example, after intervening in 44 adolescents with depression, Yang et al found that combining rational-emotive behavior therapy with personalized psychological care can effectively reduce illness stigma among children and adolescents with depression, alleviate their depressive symptoms, and encourage their use of positive coping strategies (10). Wei et al found that rational-emotive behavior therapy can effectively improve the hope level, negative emotions, and coping strategies of patients with depression, thereby enhancing treatment effectiveness (11). Bu applied rational-emotive therapy to alleviate social avoidance among patients with skin diseases (12). In a study of 70 rational-emotive therapy outcomes, Adigun et al found that higher potency of rational emotive behavioural therapy for reduction in mathematics anxiety among deaf learners than relaxation therapy (13). While rational-emotive therapy has favorable therapeutic effects on psychological problems, no previous study has investigated its application in treating psychological problems among obese children.

In sum, obesity and psychological issues, such as depression and anxiety, are becoming increasingly prominent among children and seriously affect their physical and mental health. Only a few studies have explored the psychological factors of obese children, with some empirical studies focusing on the use of rational-emotive therapy in treating their psychological problems. Therefore, obese children were taken as the participants in this study to understand the intervention effect of rational-emotive therapy on their anxiety, depression, and mental health and to provide objective reference for future research on these children's physical and mental health.

Materials and Methods

Two public primary schools of a similar size were randomly selected using cluster random sampling from a community in Fuzhou, Fujian Province, China in 2024. Primary school students in grades 1-2 were excluded given that they may underperform in comprehending the psychological items in the questionnaire. Without interfering with the overall teaching plan of each school and affecting the students' academic performance, obese children were selected by height and weight from all students in grades 3–6 of the two schools according to the obesity criteria for Chinese school-age children and adolescents formulated by the Working Group on Obesity in China. Only those students who met the following inclusion criteria were included: 1) students who met the obesity criteria during the obesity screening; 2) students whose parents signed an informed consent form; and 3) students without congenital metabolic diseases (such as congenital heart disease). A total of 177 obese students were screened, among which 110 were included after satisfying the above inclusion criteria. This study was approved by the ethics committee, and all participants took part in the study voluntarily.

Tools

Social Anxiety Scale for Children (SASC) (14): This scale consists of 10 items and involves 2 major factors for measuring social anxiety among children. The scores of these two major factors are moderately correlated ($r=-0.27$) at a significant level. Factor 1, namely, fear of negative evaluation, is rated by items 1, 2, 5, 6, 8, and 10, while factor 2, namely, social avoidance and distress, is rated by items 3, 4, 7, and 9. Each item is rated on a 3-point scale, with “0=never,” “1=sometimes,” and “2=always.” A higher score corresponds to a more severe social anxiety. The average scores for male and female students in China are 8.3 and 9.8 points, respectively. SASC has a Cronbach's α of 0.76 and a two-week test-retest reliability of 0.67.

Depression Self-Rating Scale for Children (DSRSC) (15): This scale consists of 18 items rated on a 3-point scale, with “0=never,” “1=occasionally,” and “2=frequently.” Reverse scoring is applied for items 1, 2, 4, 7, 8, 9, 11, 12, 13, and 16, and the scores are converted statistically. This scale has a total score of 36 points, with a cutoff score of 15 points. A higher score corresponds to a more severe depression. The Chinese version of this scale has good psychometric characteristics for Chinese children. DSRSC has a three-month test-retest reliability of 0.53, a split-half reliability of 0.74, and a Cronbach's α of 0.73.

Mental Health Test (MHT) (16): MHT is a widely used psychological test scale for primary and secondary school students in China. This scale has a total reliability of 0.921, and each of its subscales has reliabilities ranging from 0.628 to 0.795. MHT is particularly suitable for grade 4 primary school students to grade 3 high school students in China and demonstrates high reliability and validity. This scale was subjected to another reliability test in this study, and its Cronbach's α based on standardized items was 0.781, indicating that MHT has high reliability on the whole and is appropriate for this study. In this scale, the objects pointed to by anxiety emotions and the behaviors generated by anxiety are the two aspects used for measurement. MHT has 100 items divided into 8 subscales, namely, learning anxiety, interpersonal anxiety, loneliness tendency, self-blame tendency, hypersensitivity tendency, physical symptoms, terror tendency, and impulsivity tendency. A score of 8 points or more for each subscale indicates lower levels of mental health, while a score of below 8 points indicates higher levels of mental health.

Self-Designed Demographical Data Survey Form: A demographical data survey form compiled by the researchers was used to collect the general demographic information of the participants, such as their name, gender, age, grade, and whether they are left behind or not.

BMI and weight measurement: BMI and weight were measured using a height-weight scale (DHM15-A type, Zhengzhou Dingheng

Electronic Technology Co., Ltd), a body mass scale (Beijing Hong TAT Sports Technology Development Co., Ltd.) with a tape measure, and the Inbody3.0 multi-frequency segmented bioelectrical impedance body composition scale (Biospace, South Korea).

Intervention method

The participants were randomly divided into the experimental group and the control group, with 55 participants in each group. The control group received routine in-campus education without any additional extracurricular sports or psychological counseling. In addition to routine in-campus education, the experimental group was intervened continuously for eight weeks and underwent a behavioral intervention dominated by rational-emotive therapy once a week. This intervention was delivered as follows: ① Psychological diagnosis. The researchers actively communicated with the obese children to accurately and comprehensively identify their negative emotional reactions and irrational cognitive beliefs. They used scientific wordings to clearly point out thinking biases, belief misconceptions, and cognitive deficiencies among these children and to encourage them to adopt the view that their negative mentality stems from their irrational cognitive beliefs. ② Perception. While consciously outputting more positive evaluations, the researchers led the obese children to actively discover their inappropriate behavioral patterns, specific external manifestations, the causes and harmfulness of their negative emotions, the internal correlation between their irrational cognitive behaviors or negative emotions and their own sedentary and unhealthy eating habits, the occurrence, progression, and outcomes of their obesity, and the adverse effects of their irrational emotions, behaviors, cognition, and beliefs. ③ Communication. The participants were asked to make a list of their irrational-emotive behaviors. Afterward, they were guided to make changes fundamental on the cognitive level, reject their unreasonable beliefs in favor of rational ones,

make their own decisions about their health, demonstrate self-responsibility in managing their health, develop an independent and proactive attitude toward life, and persist in physical exercise. ④ Re-education. Based on the list compiled by the participants, the researchers evaluated whether each participant's existing irrational-emotive behaviors have been corrected after the intervention and then checked for any new irrational-emotive behaviors. They also guided the participants to vent out their negative emotions in reasonable ways and through suitable channels, encouraged their parents to show their love and care for their children, motivated the participants to actively monitor and face their physical changes, and cultivated their persistence in physical exercise and healthy eating. Under the guidance of the research team, the experimental group engaged in extracurricular physical group exercises 3 times a week for 8 weeks, with each session lasting 50 minutes.

Statistical methods

The SPSS 23.0 statistical software was used to analyze and process the data. The categorical variables were described using the number of cases (n) and frequency (%), while the continuous variables were described using mean (\bar{x}) \pm standard deviation (s). A comparison between the two groups of obese children in terms of their BMI, depression, and mental health scores was conducted using t-test, with $P < 0.05$ indicating statistical significance.

Results

Demographic data

All 110 participants completed the study. The two groups of participants showed no statistically significant differences in their gender, age, BMI, family history of obesity, self-rated academic performance, and exercise planning, thereby indicating full comparability (Table 1).

Table 1: Comparison of demographic data between the experiment and control groups

Variable		experimental group (n=55)	Control group (n=55)	t/ χ^2 /Z	P
Gender	Male	31	35	0.498	0.535
	Female	24	20		
Age (yr)		10.5 \pm 2.1	10.7 \pm 2.2	0.276	0.758
BMI		21.2 \pm 3.4	21.1 \pm 3.5	0.377	0.686
Family history of obesity	Yes	39	38	0.199	0.820
	No	16	17		
Self-rated academic performance	Excellent	12	11	0.216	0.797
	Good	16	19		
	General	20	17		
	Poor	7	8		

Effect of the intervention on BMI

As shown in Table 2, no statistically significant difference was observed between the BMI of the two groups before the intervention ($P=0.695$). After the intervention, the experimental group reported a significant decrease in BMI ($P<0.001$),

while the control group showed no significant changes in BMI ($P=0.634$). The experimental group showed a much more significant decrease in BMI compared with the control group, and such difference was statistically significant at $P=0.000$.

Table 2: Comparison of changes in BMI before and after the intervention between the two groups

Group	Before intervention	After intervention	Difference before and after intervention	Comparison of P-values within the group
experimental group (n=55)	21.2 \pm 3.4	17.7 \pm 2.8	3.5 \pm 2.4	<0.001
Control group (n=55)	21.1 \pm 3.5	20.7 \pm 3.4	0.4 \pm 1.1	0.634
P	0.795	0.010	0.000	

Effect of the intervention on depression

As shown in Table 3, no statistically significant differences were observed in the total depression

scores of the experiment and control groups before the intervention ($P=0.689$).

Table 3: Comparison of changes in depression before and after the intervention between the two groups

Group	Before intervention	After intervention	Difference before and after intervention	Comparison of P-values within the group
experimental group (n=55)	15.9 \pm 5.8	12.7 \pm 5.2	3.2 \pm 3.2	<0.001
Control group (n=55)	15.7 \pm 6.0	15.2 \pm 6.2	0.5 \pm 1.7	0.711
P	0.749	0.001	0.000	

After the intervention, the total social depression scores of the two groups decreased to varying degrees. Specifically, the score of the experimental group showed a statistically significant decrease after the intervention ($P<0.001$), while that of the control group did not show any statistically significant decrease ($P=0.741$). Meanwhile, in terms of total social anxiety score, the experimental group reported a higher decrease in its score compared with the control group, and such difference was statistically significant ($P=0.000$).

Effect of the intervention on mental health

Table 4 shows no significant differences in the eight factors of mental health (i.e., learning anxiety,

interpersonal anxiety, loneliness tendency, self-blame tendency, hypersensitivity tendency, physical symptoms, terror tendency, and impulsivity tendency) between the experiment and control groups before the intervention ($P>0.05$). However, after the intervention, the control group reported a slight decrease in these eight factors, but these changes were not significant ($P>0.05$). Meanwhile, the experimental group reported a decrease across all eight factors after the intervention, and these changes were statistically significant ($P<0.001$). In sum, these two groups reported significant differences between their mental health indicators after the intervention ($P<0.001$).

Table 4: Comparison of changes in mental health before and after the intervention between the two groups

Factor	Group	Pre-intervention	Post-intervention	Change	<i>P</i> of inter-group comparison
Learning anxiety	experimental group (n=55)	10.9±2.8	7.5±1.9	3.4±1.8	<0.001
	Control group (n=55)	10.7±2.9	10.2±2.8	0.5±1.7	0.678
	<i>P</i>	0.739	<0.001	<0.001	
Interpersonal anxiety	experimental group (n=55)	5.9±1.8	3.7±1.6	2.2±1.5	<0.001
	Control group (n=55)	5.8±1.6	5.6±1.5	0.2±1.0	0.841
	<i>P</i>	0.868	<0.001	<0.001	
Loneliness tendency	experimental group (n=55)	5.6±1.7	3.6±1.5	2.0±1.1	<0.001
	Control group (n=55)	5.4±1.8	5.2±1.5	0.2±0.6	0.769
	<i>P</i>	0.745	<0.001	<0.001	
Self-blame tendency	experimental group (n=55)	5.2±2.6	2.9±2.2	2.3±1.8	<0.001
	Control group (n=55)	5.5±2.5	5.0±2.2	0.5±1.7	0.553
	<i>P</i>	0.597	<0.001	<0.001	
Hypersensitivity tendency	experimental group (n=55)	5.4±1.8	4.3±1.7	1.1±1.7	<0.005
	Control group (n=55)	5.5±1.9	5.4±1.9	0.1±1.7	0.837
	<i>P</i>	0.823	<0.005	<0.001	
Physical symptoms	experimental group (n=55)	4.9±2.8	2.3±2.5	2.6±2.2	<0.001
	Control group (n=55)	4.8±3.0	4.6±2.8	0.2±1.7	0.668
	<i>P</i>	0.885	<0.001	<0.001	
Terror tendency	experimental group (n=55)	2.9±2.1	2.2±1.8	0.7±1.7	<0.010
	Control group (n=55)	3.1±2.3	3.0±2.3	0.1±1.1	0.821
	<i>P</i>	0.704	<0.001	<0.001	
Impulsivity tendency	experimental group (n=55)	6.6±2.8	4.7±2.5	1.9±2.2	<0.001
	Control group (n=55)	6.9±2.6	6.6±2.5	0.3±1.7	0.779
	<i>P</i>	0.638	<0.001	<0.001	

Discussion

Impact of rational-emotive therapy on BMI among obese children

The BMI of the participants was significantly reduced after the intervention, and the proportion of exercise time each ≥ 30 minutes was higher than that before the intervention, thereby suggesting that exercise intervention based on trans-theoretical models can effectively encourage exercise and promote weight loss among obese children. As a special group of individuals, children are witnessing gradual changes in their bodies. Some weight loss methods designed for adults are therefore unsuitable for children. Due to their poor self-control, obese children may face challenges in continuing with exercise and dietary interventions that are widely believed to be effective, thereby resulting in poor exercise effectiveness, undermining their confidence, and ultimately leading to weight loss failure. The proposed exercise intervention based on rational-emotive therapy provides targeted intervention guidance and encouragement according to the staged characteristics of obese children and guides them in gradually changing their behaviors, forming healthy habits, and maintaining a healthy lifestyle (17). As they continue with their exercise, weight control, and healthy diet, these children can ultimately reduce their BMI.

Impact of rational-emotive therapy on depression among obese children

The combination of rational-emotive therapy and physical exercise alleviates the depression among obese children. A review reveals that after a lifestyle intervention, the anxiety symptoms of the experimental group were significantly reduced compared with those of the control group, but this intervention had no significant effect on depression, thereby indicating that the use of a single method cannot effectively the psychological problems of obese children (18). In the current study, rational-emotive therapy was integrated with group physical exercise (three times a week),

and this intervention significantly reduced the BMI and depression among obese children. First, rational-emotive behavior interventions allow researchers to understand and evaluate the inner realities in children from the perspective of these children themselves and to implement reasonable and timely intervention measures. By improving their understanding of depression in multiple cognitive dimensions, researchers can alleviate physical anxiety and inferiority among obese children and relieve their emotional distress brought about by depression (19). Second, under the instruction from researchers, the participants gradually recognized and corrected their irrational-emotive behavioral patterns and mastered methods for identifying reasonable and unreasonable emotions, including correct self-thinking and transforming negative to positive emotions, so as to enhance their resistance to external stressors, facilitate their formation of healthy lifestyles and positive psychological behaviors, and reinforce their ability to cope with the shocks of obesity with a stable and optimistic mindset (20). Third, group exercise is conducive to creating a favorable physical and mental environment, and an appropriate, regular exercise can promote the secretion of endorphins in the brain, which make individuals feel relaxed and happy and relieve their tension and depression (21). Exercise also increases levels of neurotransmitters, including serotonin and norepinephrine, which are beneficial for alleviating depression.

Impact of rational-emotive therapy on the mental health of obese children

After the eight-week intervention, the experimental group demonstrated significant reductions in all eight factors of mental health and an overall improvement in their mental health. Meanwhile, the control group showed no significant changes, thereby confirming that the intervention can significantly improve the mental health of obese children. First, the primary objective of rational-emotive therapy is to change people's negative thinking. The intervention focused on helping children identify and challenge their unreasonable

self-evaluation and absolutist thinking styles (22). Second, emotional regulation is another objective of rational-emotive therapy. By changing their irrational thinking patterns, rational-emotive therapy enables children to regulate and alleviate their negative emotions, avoid the negative effects of anxiety and loneliness, and improve their overall mental health. Group exercise is widely believed to relax the psychological state of obese children (23). For example, when fully focused on the movements during exercise, obese children can temporarily forget about their troubles in learning and life. Group exercise can also strengthen their social skills. During exercise, the body produces endorphins that can bring psychological pleasure, thus alleviating anxiety and depression among children and improving their mental health (24). Exercise also encourages children to face their learning and life with an optimistic attitude and helps them control their impulsive behaviors.

Conclusion

Obese children were subjected to an eight-week rational-emotive therapy supplemented by group exercise. The randomized comparison analysis of the experiment and control groups before and after the intervention reveals that the experimental group reported a significantly higher decrease in their BMI compared with the control group, a significant decrease in their total social depression score, and significant reductions in all eight factors of mental health. In sum, physical exercise combined with rational-emotive therapy can effectively reduce the BMI of obese children, significantly promote weight loss, effectively alleviate their anxiety, help them cope with and solve their problems in a positive manner, significantly reduce their psychological problems (e.g., learning anxiety, interpersonal anxiety, and loneliness tendency), and improve their overall mental health. These results provide an objective reference for addressing childhood obesity and improving obese children's mental health. However, this study only focused on obese children coming

from a single region, thus limiting the representativeness of the sample. Future research should expand their population scope to include children from different regions.

Journalism Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interests.

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