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Synergistic Dietary Regulation and Psychological Intervention for Emotional Eating in Children and Adolescents

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Abstract

Childhood and adolescent obesity has become a serious public health problem, showing a rapid increase and a trend towards younger onset. Obesity is closely related to emotional eating (EE), yet there is a lack of integrated prevention and control research targeting this issue. Current research largely treats EE as a co-occurring behavior of obesity, with insufficient discussion on collaborative prevention and control in children and adolescents, and a lack of systematic pathway construction for the combined application of dietary and psychological interventions. This paper, based on the "physiological-psychological-social" ecosystem theory, takes EE as the core entry point to analyze its physiological mechanism of association with obesity, reviews the research progress of dietary regulation and psychological interventions such as cognitive behavioral therapy and mindfulness intervention, and constructs an integrated obesity prevention and control pathway that combines precise dietary regulation with psychological intervention at the family, school, and community levels. This study provides a theoretical and practical basis for improving the effectiveness of childhood and adolescent obesity prevention and control and perfecting the multi-party collaborative system, and also provides a new overall approach for related prevention and control work. Future research still needs to conduct large-scale longitudinal studies, combined with digital technology and policy support, to achieve personalized and precise management of EE and obesity in children and adolescents, while promoting the further implementation of the multi-party collaborative prevention and control system.

Keywords

synergistic dietary regulation, psychological intervention, emotional eating

1. Introduction

The World Health Organization (WHO) defines obesity as abnormal or excessive fat accumulation that has adverse effects on health. Using BMI (Body Mass Index) combined with age and sex percentiles as indicators for obesity assessment, overweight is defined as a BMI ≥ the 85th percentile and < the 95th percentile for the same age and sex, while obesity is defined as a BMI ≥ the 95th percentile for the same age and sex. Childhood and adolescent obesity has become an unavoidable public health problem in the modern era. According to the Report on Nutrition and Chronic Diseases of Chinese Residents (2020) and several

recent studies, the obesity rate among Chinese children and adolescents has gradually increased from 2.1% in 2002 to 13.0% in 2022, showing a trend towards younger age and wider prevalence [1]. It is predicted that by 2030, the number of overweight/obese and severely obese individuals aged 7-18 will increase by 39 million (180.6%) and 4.3 million (430.0%), respectively [2].

It is currently known that childhood and adolescent obesity is closely related to various diseases such as atherosclerosis, hypertension, and metabolic syndrome, and also affects mental health, social adaptability, and quality of life. Childhood and adolescence are periods of significant physiological and psychological changes and rapid growth. Facing academic pressure and peer relationships, children may experience negative psychological states, leading to emotional eating (EE) or even binge eating disorders. Current research lacks a holistic approach targeting EE, often viewing it merely as a co-occurring behavior of obesity, and there is insufficient description of integrated and coordinated interventions for obesity prevention and control during this specific period in childhood and adolescence. This paper, based on the "physiological-psychological-social" ecosystem theory, takes EE as its core entry point, systematically analyzes its association mechanism with obesity, and constructs an integrated prevention and control pathway combining precise dietary regulation and psychological intervention. This provides a basis and reference for improving the effectiveness of childhood and adolescent obesity prevention and control and perfecting the school-family-community collaborative system.

2. Definition and Impact of Emotional Eating in Children and Adolescents

Emotional eating (EE) refers to binge eating behavior that occurs under the influence of negative emotions such as anxiety and irritability, rather than being triggered by genuine physiological hunger. This eating behavior is a pattern of emotional regulation that uses high-fat, high-sugar, and high-energy foods to cope with emotional problems, alleviate inner pain, and other negative emotions, rather than choosing food based on physiological indicators of hunger and satiety. Physiological hunger is a gradual, manageable physiological phenomenon; after normal eating, one feels satisfied and does not experience feelings of helplessness or self-pity. EE often occurs suddenly rather than gradually. In this state, the individual loses the ability to rationally judge the taste and appeal of food, blindly pursuing high-energy foods, and is often accompanied by feelings of guilt afterward.

EE can have serious adverse effects on the physical and mental health of children and adolescents. In terms of physical health, EE is often accompanied by unhealthy eating habits, such as binge eating and a preference for high-sugar and high-fat foods. These unhealthy eating habits can lead to a range of health problems, including increased body fat, obesity, and metabolic disorders. Long-term unhealthy eating can also increase the risk of cardiovascular disease, metabolic syndrome, and diabetes. In terms of mental health, in the short term, EE can provide immediate emotional relief and short-term, low-cost cognitive shifts through the reward pathway mechanism of high-sugar, high-fat foods, alleviating negative emotions to some extent. However, in the long term, EE itself is related to anxiety and depression; it is only a short-term relief method and cannot fundamentally improve psychological problems. Uncontrolled eating can exacerbate negative psychological states, increase individual stress, and lead to a decline in emotional regulation ability. Simultaneously, the emergence of psychological problems may further induce eating behavior, creating a vicious cycle of EE – worsening mood – more severe EE, forming a compensatory behavior vicious cycle.

EE also has negative effects on individual behavior. First, EE is often accompanied by unbalanced energy intake and irregular eating habits, further disrupting children's and adolescents' existing eating habits. This not only affects physical health but may also impact daily life and work efficiency. At the same time, EE not only causes changes in dietary structure, but is also related to academic pressure, excessive use of social media, lack of sleep and frequency of individual social activities. Children and adolescents may refuse to share food and reduce the frequency of communication in daily social situations, thereby affecting their relationship with others and increasing social conflict and feelings of isolation.

3. Underlying Physiological Mechanisms of Emotional Eating

Adolescence is a unique period in development when the independence of decisions made each day is growing, and the influence of peers on personal attitudes and beliefs, such as self-esteem and body image, is

also growing. Studies indicate that adolescence is a period of heightened body dissatisfaction and low self-esteem becomes a risk factor of maladaptive adolescent behaviors like restrictive dieting, clinical eating disorders, and substance misuse. As body dissatisfaction includes negative feelings about their bodies and appearance, eating episodes can be provoked by emotional regulation (instead of physical hunger). Therefore, mood regulation disruption, changes in weight status, and negative body image are probable to interact to contribute to emotional eating (EE).

The brain-gut axis is a central regulatory network that consists of a bidirectional neuroendocrine circuit that interacts between diet and homeostasis of the central nervous system. The microbial ecosystem in the gut is extremely sensitive to the dietary inputs, and nutritional quality directly alters the composition, diversity, and functional ability of the enteric microbiota. The gut-derived signals (orexigenic/anorexigenic lipoproteins, pro-inflammatory mediators, neuroactive microbial metabolites) are sent to the central nervous system, where they have significant effects on ingestive decision-making and affective states. Obesogenic dietary habits and dysregulated intake interfere with microbial homeostasis in the gut, triggering dysbiosis and systemic persistent inflammation. Chronic inflammation, in its turn, correlates with impaired reward processing in the ventral striatum, which is manifested by a lower level of striatal dopamine production, release, and bioavailability. This hypodopaminergic type of phenotype impairs motivational activity and prefrontal inhibitory regulation of the emotions in eating leading to compensatory reward-seeking behaviour in the form of extreme food consumption to sustain hedonic satisfaction [3].

Negative emotional conditions (including chronic stress and anxiety) can stimulate the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis in the brain to influence such important hormones that control metabolism and appetite. Hypothalamus-pituitary-adrenal axis activation results in elevated blood cortisol levels, which disrupt carbohydrate metabolism, encourages the deposition of abdominal fat and stimulates appetite (particularly high-sugar and high-fat food cravings), causes EE, which results in insulin resistance and visceral fat accumulation; at the same time, impulsivity control deficits, abnormal sensitivity of the reward system (such as enhanced response of the nucleus accumbens to food cues), and decreased executive function have all been confirmed by functional magnetic resonance imaging (fMRI) and longitudinal cohort studies as psychological predictors of obesity risk [4].

The mesolimbic dopaminergic system is a system with a central point of nucleus accumbens that plays the role of the core neural circuit of the food reward effect. High sugar, high-fat ultra-processed foods can directly stimulate this pathway, which supports healthy dopamine release, triggering strong euphoria, and leads to the formation of food addiction-like behaviors. At the same time, there is progressive functional degradation of the prefrontal cortex, which controls executive control and decision-making, making it difficult to inhibit impulses to eat palatable foods. This eventually leads to a disregulation of the reward-inhibitory balance: excess reward drive and lack of inhibitory control.

Besides this, the levels of ghrelin are greatly negatively associated with insulin resistance in obese children. Research has shown that obese children normally have lower levels of circulating ghrelin which is a sign of more severe insulin resistance. This change can be an adaptive reaction of the body to the surplus of energy, but it is also strongly related to the maladaptation in the regulation of appetite and energy metabolism [5].

4. Research Advances in Dietary Modulation and Psychological Interventions for Emotional Eating

4.1 Dietary Regulation Strategies

Controlling dietary energy is a key measure for the healthy growth and development of children and adolescents and the control of obesity. Attention should be paid to reasonable energy distribution and energy intake of each component. The recommended daily energy ratio of the three energy nutrients is: carbohydrates 50% to 55%, protein 20% to 25%, and fat 20% to 30%. Dietary regulation should be carried out gradually, paying attention to the weight and psychological changes of children and adolescents. It is also necessary to limit the intake of ultra-processed foods, as it has been proven that such foods often contain high energy and are consistently associated with adverse mental health outcomes [6].

In addition to controlling energy intake, it is necessary to achieve a balanced diet in daily life. According to the Dietary Guidelines for Chinese School-Age Children (2022), which mentions the recommended intake and proportion of each layer of the food pyramid for children and adolescents of different ages. At the same time, specific dietary patterns such as the Mediterranean diet can be adopted to regulate the daily dietary structure. The components in this dietary pattern (polyphenols, omega-3 fatty acids, etc.) can enhance vagal nerve tone, reduce neuroinflammation, and support the structural integrity of the brain regions that support interoceptive processing, thereby reducing EE at the physiological level [7].

On the basis of meeting food variety and nutrient requirements, regular eating behavior is indispensable for obesity management. Increase focus while eating, pay attention to the satiety signal, and reduce overeating caused by lack of concentration. Learn to distinguish between physiological hunger and emotional hunger, and delay eating for 10-20 minutes before deciding, first adjusting your state by drinking water, taking a walk, or deep breathing. The eating speed needs to be controlled, and the time should be 20-30 minutes.

4.2 Psychological Intervention Approaches

Cognitive Behavioral Therapy (CBT) can help participants identify stressors and the emotions they cause, and combine them with adaptive techniques to replace food cravings, thereby reducing food intake. This method is considered an effective gold standard for treating obesity and eating disorders. Its core mechanism is to break the conditioned reflex of negative emotions - overeating through cognitive restructuring and behavioral modification. A meta-analysis and systematic review on EE found that CBT showed the greatest promise in reducing EE [8]. Children and adolescents' abstract thinking and cognitive restructuring abilities are not yet mature, so adult-style CBT cognitive restructuring training cannot be carried out directly. The core principles of CBT need to be made concrete, gamified, and lifelike.

Mindfulness intervention is widely regarded in today's society as intentional and non-judgmental attention to the present moment. It originates from Buddhist meditation and is often achieved through meditation and yoga. Studies have confirmed that mindfulness can reduce BMI and waist-to-hip ratio, improve obesity-related physiological indicators, improve dietary choices and exercise habits, reduce impulsive behavior, improve eating disorders, and improve mental health outcomes [9]. For example, in a pilot randomized trial of multi-component mindfulness intervention for overweight/obese Chinese adolescents, the Dutch Dietary Behavior Questionnaire (DEBQ) showed significant weight loss after intervention; reduced EE behavior output; and significantly improved mindful eating and eating self-efficacy ($P<0.02$) [10].

As a third-wave cognitive-behavioral therapy (CBT), Acceptance and Commitment Therapy (ACT) has demonstrated clinical efficacy in the management of obesity, and is widely recognized as a valuable intervention strategy for addressing eating disorders and body image disturbances. Multiple studies have shown that incorporating ACT intervention measures helps reduce EE, but the relevant results still need further confirmation. Unlike the cognitive restructuring of CBT, ACT focuses on cultivating psychological flexibility and reduces individuals' avoidance behavior (i.e., EE) of negative emotions by accepting negative emotions and committing to value behaviors. Children and adolescents' abilities to express and accept emotions are still developing. ACT interventions should focus on foundational training in emotion recognition + emotion acceptance, rather than adult-style value promises.

In addition, other psychological techniques, such as Adaptive Dialectical Behavior Therapy (DBT), have the core advantage of integrating emotion regulation, interpersonal efficacy, and mindfulness skills. Through systematic emotion regulation training, it improves children and adolescents' tolerance to negative emotions and reduces impulsive EE. With the development of digitalization, various emerging psychotherapies, such as augmented reality (VR) and digital DBT, are increasingly being used to address food cravings and obesity caused by EE in children and adolescents, showing some effectiveness in reducing overeating.

5. Construction of a Collaborative Prevention and Control Pathway for Dietary Regulation and Psychological Intervention

To address the complexity of childhood and adolescent obesity, biopsychosocial interventions adopt a holistic strategy that encompasses lifestyle and dietary adjustments, the management of comorbid

psychological issues, and the mitigation of barriers to treatment adherence. A multi-dimensional approach encompassing physiological, psychological, and social aspects, along with targeted prevention and control in areas such as families, schools, and communities, combines daily diet with psychological intervention to increase effectiveness, creating a favorable living environment and ecosystem for controlling EE and preventing obesity.

5.1 Family-Based Collaborative Intervention

The family atmosphere has a subtle influence on children and adolescents' eating habits, lifestyles, and psychological states. Studies have shown that parents' positive attitudes towards healthy eating, the availability of healthy food, and parental supervision have a positive effect on shaping children's positive lifestyles and healthy weight management concepts [11]. Reducing parental eating pressure can reduce children's external eating, thereby leading to weight loss. Parents need to accept children's negative emotions, provide alternative outlets for eating behaviors, avoid ridicule and harsh behavior, and act as stable family companions. Through education and guidance, improve children and adolescents' awareness of healthy lifestyles. It is also recommended to combine mindfulness-based dietary interventions with other dietary psychological interventions for self-monitoring, along with positive incentive measures.

5.2 School-Based Collaborative Intervention

Schools are important social structures for the development and growth of children and adolescents. As the primary socialization venue for children and adolescents, they should systematically provide psychological support and health promotion resources. A cross-sectional survey of teachers in various professions in the United States showed that students received an average of only 14.4 hours of nutrition education, and only one-quarter of schools met the recommended 25 hours [12]. Schools need to be equipped with professional psychological teachers, offer systematic courses on mental health and healthy lifestyles, guide students to establish positive body image and self-acceptance, and use cognitive behavioral techniques to help regulate EE. In addition, comprehensive intervention measures can be implemented by providing reasonable school meals, combined with mental health, nutrition education, and outdoor activities to improve the weight and mental health of adolescents.

5.3 Community-Based Collaborative Intervention

Neighborhood and community-level factors exert a profound impact on pediatric obesity risk. Areas with robust infrastructure supporting physical activity and accessible, nutritious food options are associated with lower BMI levels among children and adolescents. In contrast, socioeconomically disadvantaged neighborhoods often present multiple barriers to healthy living: limited access to affordable nutritious foods, insufficient opportunities for regular physical activity, and inadequate healthcare access collectively elevate the likelihood of obesity development [13]. Research has demonstrated that social engagement activates key brain regions involved in reward processing, and fostering meaningful social connections is critical for buffering the negative effects of social isolation on emotional eating (EE). Beyond traditional behavioral interventions, digital platforms—including online support communities, discussion forums, and social media groups—provide accessible, supportive social environments. These spaces allow young people to share personal experiences, navigate challenges, celebrate progress, and exchange practical strategies, empowering children and adolescents with obesity to select social support approaches that align with their unique needs.

6. Conclusion

The paper focuses on physical and mental health issues of children and adolescents, with an in-depth exploration of obesity as a result of emotional eating (EE). The study explores definitions, mechanisms and methods of assessment, synthesizing the available knowledge and incorporating practical knowledge. It provides a holistic intervention model that integrates dietary modifications, with psychological assistance, based on a biopsychosocial model. The framework is designed to give a theoretical and practical guideline on health promotion and management of obesity in the youth.

Nevertheless, the available studies on nutritional and psychological treatment of this particular population (children and adolescents) are disjointed. The creation of such an integrated system requires the cooperation

of all the sectors of the society to promote healthy growth. Moving forward, longitudinal, large-scale research should be a priority in future studies, and the use of digital technologies and policy frameworks must be used to establish enabling environments. It will help manage EE and obesity on a more personalized and accurate treatment in the pediatric population.

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Conflicts of Interest

The authors declare no conflict of interest.

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