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The Impact of Emotional Eating Behavior on Psychological Health in Patients with Bulimia Nervosa and Corresponding Intervention Approaches

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Abstract

The excessive eating behavior in patients with Binge Eating Disorder (BED) is influenced by physiological, psychological, and personality factors, with emotional eating serving as a core mechanism. Studies indicate that negative emotions significantly increase the risk of binge eating, while impaired inhibitory control and dysregulation of the neural reward system are underlying mechanisms. Emerging evidence suggests that gut microbiota may exacerbate this cycle by modulating mood and feeding behavior via the gut-brain axis. Interventions should integrate psychological strategies (e.g., mindfulness) and physiological modulation (e.g., microbiota-based therapies).

Keywords: Binge Eating Disorder, Negative Emotion, Mindfulness, Microbiota, Gut-Brain Axis.

Introduction

The American Psychiatric Association (APA) defines Binge Eating Disorder (BED) as recurrent episodes of binge eating accompanied by marked distress, during which individuals experience a sense of loss of control and consume large amounts of food. Unlike bulimia nervosa, individuals with BED do not engage in recurrent inappropriate compensatory behaviors to prevent weight gain, such as self-induced vomiting, misuse of laxatives, or excessive exercise [1]. Additional features of BED include eating much more rapidly than usual, eating until uncomfortably full, eating large amounts of food when not physically hungry, eating alone due to embarrassment about the quantity consumed, and feelings of self-disgust, depression, guilt, or significant distress after binge episodes. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), the binge eating must occur, on average, at least once per week for three months. Cases where all diagnostic criteria are met except that the binge episodes occur less

frequently than once per week or for a duration of less than three months are classified under Other Specified Feeding or Eating Disorder (OSFED).

A World Health Organization (WHO) survey across 14 countries estimated the worldwide prevalence of BED to be approximately 1.4%, with the typical age of onset around 23 years [2]. In China, a study of over 2,000 adolescents revealed that about 0.7% met the diagnostic criteria for BED [3]. In Western countries such as those in Europe and the United States, BED is the most prevalent eating disorder, with a lifetime prevalence of nearly 3% in the general population [4]. Notably, BED is increasingly observed among younger adults, particularly young adult women, university students, and highly educated individuals [2]. Although binge eating episodes occur at similar frequencies in males and females, men are less likely to experience significant distress related to the behavior, and therefore less frequently meet the full diagnostic criteria for BED [5].

Emotion can influence eating behavior, and eating can, in turn, affect emotion [6]. According to emotion regulation theory, negative emotions increase the motivation to eat, and eating subsequently reduces negative affect [7]. Thus, the excessive eating behavior in individuals with BED may stem from emotional dysregulation [8]. Such emotion-driven unhealthy eating behaviors often contribute to a range of health problems and may predispose individuals to various diseases [9]. Furthermore, changes in modern dietary habits—such as increased consumption of coffee, high-fat, and high-sugar foods—coupled with sedentary lifestyles associated with work pressure, can disrupt the gut microbiota, which in turn influences emotion and cognition [10]. Therefore, it is essential to understand the relationship between eating behavior and emotion in patients with BED and to develop interventions targeting the maladaptive cycle of eating and emotion.

1. Current Research on Emotion and Binge Eating Behavior

In numerous experiments investigating the relationship between emotion and eating, corresponding emotions are first induced in participants. Subsequently, their responses are measured by having them view images of high-calorie and high-sugar foods or by placing them in real eating environments to observe their choices. Metrics such as food intake and attentional bias are commonly used as outcome indicators [11].

From an evolutionary perspective, negative emotions convey signals of caution and the need for careful processing [12]. This is because negative emotions indicate that something may be wrong in the environment, prompting individuals to engage in more deliberate and rational thinking [13]. However, in the context of eating behavior, negative emotions often lead to impulsive overeating or even binge eating without thorough reflection [14].

In a study by Sproesser et al. [15], participants were assigned to scenarios involving social exclusion, neutral interaction, or social inclusion. They then underwent a sham taste test in which their intake of ice cream was measured. The results showed that participants in the social exclusion condition experienced more negative emotions and consumed significantly more ice cream than those in the other two groups.

It is noteworthy that overvaluation of weight and shape—an independent risk factor—is associated with pathological behaviors such as dietary restraint and weight preoccupation even among obese individuals without BED, potentially amplifying emotional eating tendencies [16]. Another social psychological study demonstrated that negative emotions induced by life events significantly increased the consumption of available chocolates and grapes [11]. A meta-analysis on the effects of positive and negative emotions on eating behavior also confirmed a causal relationship between negative emotions and increased food intake [17]. Collectively, these findings suggest that emotional eating is a core behavioral manifestation in patients with binge eating disorder [18].

2. The Relationship Between Emotion and Binge Eating Behavior and Its Underlying Mechanisms

As a clinical eating disorder, Binge Eating Disorder (BED) is closely associated with emotional states [19]. Some researchers suggest that individuals with BED engage in maladaptive eating behaviors as a means of regulating acute negative emotions [19]. However, such negative adaptive emotion regulation strategies—including excessive food intake—can lead to further systemic eating disturbances [20].

The perception of "deliciousness" varies among individuals. Fried foods, widely regarded as highly palatable across cultures, often evoke strong desires and impulses. These are typically modulated by robust inhibitory control mechanisms [21]. Thus, dysregulated eating may also stem from impaired inhibitory control [22][23]. According to self-control theory, individuals experiencing negative emotions are more prone to binge eating because such emotions disrupt long-term self-monitoring and positive goals (e.g., maintaining a healthy weight or promoting longevity), shifting behavior toward immediate gratification and short-term hedonic pursuits [24]. The transdiagnostic theory further posits that negative emotions weaken the capacity to restrict food intake, and binge eating is maintained through the alleviation of these negative emotional states [25].

A study using a food-related anti-saccade task to assess inhibitory control, conflict processing, and self-monitoring in BED patients (where food stimuli were randomly presented on either side with instructions to avoid looking toward them) found that individuals with BED performed

significantly worse on initial saccades compared to controls. Moreover, they exhibited stronger attentional bias toward food—particularly under negative emotional conditions—than toward non-food stimuli. These results suggest that negative emotion may be a key factor impairing inhibitory control in BED [26]. Neurobiological studies have also shown that cognitive conflicts (e.g., self-ideal discrepancy) and dichotomous thinking regarding weight ("fat/thin" extreme cognition) further undermine inhibitory control in BED patients [16].

Similar patterns are observed in bulimia nervosa (BN), where inhibitory control is directly influenced by emotion. An event-related potential (ERP) study compared BN patients under negative vs. neutral mood states while viewing high- and low-calorie food images. Subjective ratings of pleasure and appetite were also collected. The results indicated that BN patients in a negative mood reported stronger desires to eat and showed reduced P300 amplitudes in response to high-calorie foods, suggesting that negative emotion diminishes available cognitive resources and enhances eating motivation [27].

However, some researchers argue that excessive dietary restraint may heighten reactivity to food cues and other stimuli—including stress and negative emotions [28]. High cognitive restraint is common and plays a significant role even in childhood obesity [28][29].

Maladaptive eating behaviors in BED can also be interpreted through addiction-related theories, as both share overlapping regulatory mechanisms—such as attributing high reward value to palatable food cues [30]. Evidence indicates that highly palatable foods can induce dependency similar to substances of abuse. While drugs directly activate reward pathways via pharmacological actions, palatable foods operate through rapid sensory input, slower post-ingestive processes (e.g., elevated blood glucose), and gut-derived signaling feedback [18]. Such foods activate brain reward systems, triggering opioid and dopamine release and limbic signaling. Gut dysbiosis (e.g., reduced Akkermansia, increased Firmicutes) influences vagal nerve signaling via metabolites (e.g., SCFAs, KYNA), leading to hyperactivation of the nucleus accumbens (NAc) dopamine system and driving cravings for high-reward foods [31]. This establishes a powerful reinforcement loop for obtaining palatable foods [32].

Opioid release serves as a defense mechanism against stress and negative emotions [33]. It promotes intake of palatable foods, which in turn sustains opioid release [18]. Thus, eating becomes an effective coping strategy for negative emotions, forming a neurobiologically anchored adaptive addiction [34].

Animal studies support that negative emotional experiences heighten the sensitivity of reward circuits to physical stimuli [32]. For instance, distress impairs prefrontal behavioral control while increasing sensitivity to threat and reward cues [35]. Negative emotions (e.g., social defeat) modulate glucocorticoid release, which sensitizes the brain's reward system to food and drugs, amplifying appetitive responses [36].

3. Intervention Approaches

Mindfulness is defined as a self-regulatory practice involving the conscious and sustained attention to present-moment internal or external experiences, characterized by an open, accepting, and non-judgmental attitude [37]. A growing body of research indicates that mindfulness plays a significant role in eating disorders [38]. A meta-analysis on mindfulness and eating disorders found a negative correlation between mindfulness levels and disordered eating behaviors [39].

Mindfulness Meditation Training (MMT) exerts beneficial effects on a range of outcomes through mechanisms including attentional regulation, emotion regulation (encompassing reappraisal, exposure, extinction, and reconsolidation), and enhanced executive functions such as inhibitory control [40]. Significant improvements have been observed in individuals with emotional binge eating following mindfulness-based interventions [41][42][43]. Clinical studies confirm that mindful eating, as an 8-week short-term intervention, can reduce the frequency of binge episodes (from 7 to 3 times per week), lower BMI, and improve emotional eating by enhancing satiety signaling and regulation [44]. However, long-term multidisciplinary support is essential to prevent weight regain, as mindfulness is closely linked to emotion regulation, and many patients with eating disorders lack adaptive emotional regulation skills [45]. Empirical evidence indicates that experiential avoidance mediates the relationship between negative emotions and emotional eating [46]. Mindfulness-based therapies can improve emotion regulation by reducing emotion-related avoidance [39].

Mindfulness training mitigates repetitive negative thinking and emotions associated with eating disorders [47]. Such repetitive negative thoughts include excessive focus on the present, past, or future [48]. Specifically, mindfulness training encourages sustained attention to present-moment experiences, thereby preventing over-engagement with internal thoughts [47]. Mindfulness interventions guide individuals to eat in response to physiological hunger and satiety cues rather than external or emotional triggers [39]. A notable advantage of mindfulness training is the maintenance of intervention effects for a considerable period after the program ends [49]. For example, participants in a combined mindfulness and cognitive behavioral therapy program showed a significant reduction in binge eating symptoms three months post-intervention [50].

The gut is the primary organ for digestion and absorption of nutrients. The communication between the gastrointestinal tract and brain functions such as cognition and emotion occurs via the brain-gut axis—a bidirectional signaling system [51]. Depression, an affective disorder, is characterized by core symptoms including predominant negative affect, diminished interest or pleasure, and reduced volitional behavior [52]. Depression, which represents a state of persistent negative emotion, has been associated with gut microbial dysbiosis [52]. For instance, one study found that alterations in gut microbiota due to magnesium-deficient diets may contribute to

depressive behaviors [51]. Both animal and clinical studies also indicate that anxiety is linked to commensal microbiota, and pathogenic infections can induce anxiety-like behaviors [53].Chinna Meyyappan [54] conducted a review of 28 clinical studies involving psychiatric disorders and found that transplanting healthy microbiota into patients with mental disorders led to a reduction in depressive and anxiety symptoms, whereas transferring microbiota from patients with mental disorders to healthy subjects resulted in the transmission of depressive and anxiety symptoms. Exposure to stress alters the host's normal microbiota, triggering inflammatory responses, impairing nutrient absorption, and disrupting neurotransmitter metabolism, ultimately leading to neurological dysfunction and the emergence of depressive symptoms [55][56]. A case study during a 105-day closed-environment mission in Lunar Palace 1, which monitored three Chinese astronauts, demonstrated that specific microbial species differentially influenced positive and negative emotions [57].

These findings suggest that microbiota-based dietary interventions may aid in the treatment of psychiatric disorders, including binge eating disorder (BED) [58]. Restoring microbial balance can mitigate negative emotions via the gut-brain axis [58][59]. Targeting the "microbiota-gut-brain axis" represents an emerging therapeutic strategy: probiotics (e.g., Bifidobacteria) can modulate serotonin (5-HT) synthesis, improving mood and impulse control [31]; supplementation with kynurenic acid (KYNA) or restoration of Faecalibacterium prausnitzii may suppress binge eating behavior [31]; fecal microbiota transplantation (FMT), already preliminarily effective in anorexia nervosa, holds potential for BED treatment [31].

A randomized controlled trial from Australia demonstrated that improving diet quality could effectively treat major depressive disorder. The results showed that the dietary intervention group (following a Mediterranean-style healthy diet) exhibited significantly greater reductions in depression scores over 12 weeks compared to the control group [52]. An earlier multinational survey found an inverse correlation between global fish consumption and the prevalence of depression [60]. Another study suggested that unsaturated fatty acids in fish oil may reduce the incidence of depression by increasing Bifidobacterium levels in the gut, thereby influencing the central nervous system via the gut-brain axis [61].

In a 2-month randomized, double-blind, placebo-controlled study, 39 patients with chronic fatigue syndrome were randomly assigned to receive either Lactobacillus casei or a placebo daily. Fecal samples were analyzed before and after the intervention, and the Beck Depression Inventory and Beck Anxiety Inventory were used to assess depressive and anxiety symptoms. The results indicated that the group receiving Lactobacillus casei showed a significant reduction in anxiety symptoms compared to the placebo group [62]. Benton et al. [63] proposed that consuming probiotic-fermented yogurt could improve mood in individuals with low mood.

Current pharmacological treatments for major depression in Europe and other regions often target the monoaminergic system, including serotonin (5-HT) [64]. Bifidobacterium longum, a

beneficial gut microbiota species, has been shown to increase plasma tryptophan levels, thereby influencing serotonin synthesis [55]. Collectively, these findings indicate that interventions through healthy diets or probiotic supplementation can help reduce anxiety, depression, and other negative emotions.

4. Conclusion

For patients with Binge Eating Disorder (BED), emotion and eating form a bidirectional, cyclical system. Therefore, interventions targeting dietary patterns or mindfulness training may help individuals maintain both physical and psychological health. Specifically, a Mediterranean-style healthy diet can reduce tendencies toward overeating by improving physical health, thereby supporting psychological well-being. Conversely, regulating negative emotions or cultivating positive emotions contributes to psychological health, which in turn promotes physical health.

Future research should aim to develop more detailed dietary intervention protocols and more systematic and comprehensive mindfulness-based paradigms—integrating mindful eating, microbiota modulation, and cognitive restructuring (e.g., reducing dichotomous thinking about body weight). Notably, there is a significant lack of psychotherapeutic research on BED in children and adolescents, underscoring the urgent need to develop non-weight-focused intervention strategies [65]. Such efforts will help advance and refine the understanding of the relationship between binge eating disorder and emotional regulation.

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