

The role of emotional eating as relief mechanism from psychological distress and its impact on overall wellbeing

O papel da alimentação emocional como mecanismo de alívio do sofrimento psicológico e seu impacto no bem-estar geral

El papel de la alimentación emocional como mecanismo de alivio del malestar psicológico y su impacto en el bienestar general

1 Joanna Michalina Jurek  [ORCID](#)

2 Agnieszka Maruda - [ORCID](#)

Affiliation of authors: **1** [Myalgic Encephalomyelitis/Chronic Fatigue Syndrome Research Unit, Division of Rheumatology, [The Vall d'Hebron University Hospital Research Institute](#), Universitat Autònoma de Barcelona, Barcelona, Spain]; **2** [[University of Economics](#), European Studies Niepodleglosci 10, Poznan, Poland]

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ABSTRACT:

Emotional eating, characterized by the consumption of highly palatable and calorie dense foods in response to psychological distress and negative emotions, poses a significant challenge to global public health and well-being. Based on the studies showing the complex interplay between emotional states and dietary choices, highlighted the motivational role of

relief seeking, which according to a Hull's drive reduction theory, emphasizes the role of internal drives and external cues. Inability to cope with negative feelings and/or high tension indicates that emotion regulation can be a critical factor in maintaining well-being, as adaptive regulation protects against negative emotions and external stressors; which if not developed properly, can lead to avoidant coping strategies, which can contribute to eating disorder symptoms. Therefore, dysregulation of the hedonic and homeostatic food intake, compromised cortical control, and alterations in the gut signaling are implicated in obesity triggered by stress-induced eating. Therefore this review aim to further discuss these observations to provide better understanding of the role of emotional eating in providing a relief from the psychological distress, emphasizing impact of the food on the reward system; while providing insights in emerging holistic mitigating approaches which by promoting alternative coping mechanisms and adequate nutrition and supplementation, may help to aid the emotional eating management and reduce burden on related to that illnesses.

Keywords: emotional eating, comfort food, stress, dopamine, reward system, temporary relief, obesity

RESUMO:

A alimentação emocional, caracterizada pelo consumo de alimentos altamente palatáveis e densos em calorias em resposta ao sofrimento psicológico e às emoções negativas, representa um desafio significativo para a saúde pública e o bem-estar globais. Com base nos estudos que mostram a complexa interação entre estados emocionais e escolhas alimentares, destacou o papel motivacional da busca de alívio, que, de acordo com a teoria de redução de impulsos de Hull, enfatiza o papel dos impulsos internos e dos sinais externos. A incapacidade de lidar com sentimentos negativos e/ou alta tensão indica que a regulação emocional pode ser um factor crítico na manutenção do bem-estar, uma vez que a regulação adaptativa protege contra emoções negativas e factores de stress externos; que, se não for desenvolvido adequadamente, pode levar a estratégias de enfrentamento evitativas, o que pode contribuir para sintomas de transtorno alimentar. Portanto, a desregulação da ingestão alimentar hedônica e homeostática, o comprometimento do controle cortical e as alterações na sinalização intestinal estão implicados na obesidade desencadeada pela alimentação induzida pelo estresse. Portanto, esta revisão visa discutir melhor essas observações para

proporcionar uma melhor compreensão do papel da alimentação emocional no alívio do sofrimento psicológico, enfatizando o impacto da comida no sistema de recompensa; ao mesmo tempo que fornece insights sobre abordagens holísticas emergentes de mitigação que, ao promover mecanismos alternativos de enfrentamento e nutrição e suplementação adequadas, podem ajudar a auxiliar o gerenciamento emocional da alimentação e reduzir a carga sobre doenças relacionadas a essas doenças.

Palavras-chave: alimentação emocional, comida reconfortante, estresse, dopamina, sistema de recompensa, alívio temporário, obesidade

RESUMEN:

La alimentación emocional, caracterizada por el consumo de alimentos muy sabrosos y ricos en calorías en respuesta a angustia psicológica y emociones negativas, plantea un desafío importante para la salud y el bienestar públicos globales. Sobre la base de los estudios que muestran la compleja interacción entre los estados emocionales y las elecciones dietéticas, se destacó el papel motivacional de la búsqueda de alivio, que según la teoría de reducción de impulsos de Hull, enfatiza el papel de los impulsos internos y las señales externas. La incapacidad para afrontar sentimientos negativos y/o tensión alta indica que la regulación de las emociones puede ser un factor crítico para mantener el bienestar, ya que la regulación adaptativa protege contra las emociones negativas y los factores estresantes externos; que si no se desarrolla adecuadamente, puede conducir a estrategias de afrontamiento evitativas, que pueden contribuir a los síntomas del trastorno alimentario. Por lo tanto, la desregulación de la ingesta de alimentos hedónica y homeostática, el control cortical comprometido y las alteraciones en la señalización intestinal están implicados en la obesidad provocada por la alimentación inducida por el estrés. Por lo tanto, esta revisión tiene como objetivo analizar más a fondo estas observaciones para proporcionar una mejor comprensión del papel de la alimentación emocional a la hora de proporcionar un alivio del malestar psicológico, enfatizando el impacto de la comida en el sistema de recompensa; al mismo tiempo que proporciona información sobre enfoques holísticos de mitigación emergentes que, al promover mecanismos alternativos de afrontamiento y una nutrición y suplementación adecuadas, pueden ayudar a ayudar en el manejo de la alimentación emocional y reducir la carga relacionada con esas enfermedades.

Palabras clave: alimentación emocional, comida reconfortante, estrés, dopamina, sistema de recompensa, alivio temporal, obesidad

Introduction

When people feel tension of unmet needs or feeling stressed (again tension) they may develop the habit of eating or reaching for comfort food, known as emotional eating. This phenomenon is a behavior characterized by consumption of large amounts of highly palatable and caloric dense foods in response to emotional state of stress, but also while experiencing other negative emotions, including anger, fear, boredom, sadness, and loneliness [1].

Stress, defined as a physiological response to a stressor, triggers the activation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to increased synthesis of glucocorticoids and glucose availability to meet the metabolic demands of the stress response. The hypothalamus, particularly the corticotropin-releasing hormone neurons, plays a pivotal role in this process, ultimately resulting in cortisol secretion [2].

Emotional eating is considered a complex behavior with significant implications for the overall health, including weight management and mental wellbeing. Although many potential risk factors for emotional regulation through food have been identified to date, the tendency to overconsumption of foods under stress have been proposed to be an important psychological factor associated with metabolic alterations and obesity [3], which along with deficits in emotion regulation, possibly leading to its accumulation and development and/or progression of psychological disorders [4].

The core concept unifying various theories is the equilibrium between the human body and its surroundings, encompassing dietary choices, emotional states, and behavior, influenced by individual traits such as genetics and character. When this equilibrium is maintained, it promotes well-being, overall health, and happiness. Conversely, an imbalance in this delicate interplay can precipitate adverse health outcomes and disease development rooted in emotional eating [4]. Consequently, understanding the importance of the emotional states on food intake can help in prevention of disordered eating, especially in individuals experiencing psychological distress. Therefore, the main aim of this review is to present and discuss the cases of emotional eating in an European context, while

highlighting the need for relief, which in this case, is driven by certain dietary habits, negatively impacting on the overall health.

Motivations for emotional eating - secondary reinforcers and basic needs

According to Clark L. Hull's theory, there are two key components of motivation: drive and cue. A drive is an internal state of tension caused by unmet physiological needs, while a cue is an environmental stimulus that triggers behavior aimed at reducing the drive. For example, hunger (drive) may be triggered by the sight or smell of food (cue), which motivates the individual to eat and reduce the hunger drive. According to Hull, the reduction of the drive acts as a reinforcement for that behavior.

This theory reduces all behavior to a simple, physiological explanation, ignoring the influence of cognitive, emotional, and social factors on behavior. The premise of drive reduction theory is that all individuals have the same set of physiological needs. However, this is not always the case. For example, some people may have a higher need for achievement or social affiliation that cannot be explained solely by physiological drives. Although drive reduction theory is not a complete explanation of human behavior, it is an important starting point for understanding the complex relationships between motivation and behavior.

Criticism of drive reduction theory appears in public discourse "Although drive reduction theory provides a strong argument for explaining the biological processes of motivation, it lacks the ability to generalize to all cases of motivation"[5].

The argument becomes the allegation that the drive theory cannot explain a person's motivation to withstand a tense action or behavior, because such action is not aimed at restoring a state of balance while increasing the level of stress or fear (extreme sports such as bungee or parachute jumping). Another common accusation is that one of the biggest problems with Hull's drive reduction theory is that it does not account for how secondary reinforcers reduce drives [6]. Unlike primary drives such as hunger and thirst, secondary drives do nothing to directly reduce physiological and biological needs.

Recently conducted a cross-sectional study on European Population, including participants from 12 European countries, including Croatia (1538 participants; 17.0%), Greece (498 participants; 5.5%), Hungary (500

participants; 5.5%), Italy (541 participants; 6.0%), Latvia (636 participants; 7.0%), Lithuania (507 participants; 5.6%), the Netherlands (521 participants; 5.8%), Poland (586 participants; 6.5%), Portugal (1314 participants; 14.5%), Romania (821 participants; 9.1%), Serbia (498 participants; 5.5%), and Slovenia (1093 participants; 12.1%) confirmed the associations between food consumption, emotional conditions, and emotional eating behavior. Briefly, by using a Motivations for Food Choices Questionnaire (Eating Motivations, EATMOT) the emotional aspects of food consumption were determined and analyzed through employing linear regression, the associations between the emotional eating behavior and emotional conditions such as stress, depression, loneliness, emotional consolation, and reasons to improve physical and psychological conditions were identified. Analysis of emotional conditions and food consumption between the European countries reported the highest frequency of comfort eating to cope with stress in Lithuania and the lowest in Hungary. Similar results were obtained for boredom eating, helping to relax, and food consolation when lonely. In addition, Lithuanians also had a higher frequency of eating sweets when depressed and the perception of food as an emotional consolation; whereas Latvians reported eating food to keep alert and awake and to make themselves feel better than the other countries. Although the overall emotional eating behavior was the highest in Lithuania and Hungary, significant differences were found between European countries in emotional eating behavior during different emotional states, only except between Greece and Italy [7].

Emotional eating and its contribution to disordered eating patterns

Emotion regulation, as a complex, is an integral part of achieving overall state of well-being. It involves the awareness and acceptance of experienced emotions, as well as the ability to adhere to personal goals even when experiencing negative feelings. Adaptive emotion regulation has been shown to have a protective role in mitigating negative emotions and aiding individuals to cope with external stressors [8]; which otherwise deficits, may result in emotional dysregulation and experiencing a high level of negative feelings, possibly leading to development and/or progression of psychological disorders and social problems, such as low self-esteem, depression, and social stigma [9].

The ability to regulate emotions appears to be crucial for maintaining wellbeing, thus expressive suppression has been negatively correlated with well-being indicators, including life satisfaction and positive affect; whereas cognitive reappraisal was found to be positively related with well-

being outcomes and similar inverse correlations were found with symptom-related outcomes [10]. Nevertheless, compromised emotional regulation, defined as being unable to monitor, evaluate and accordingly modify emotional reactions to certain situations, can fail in adequate adaptation to situational demands. This issue seems to be common for individuals with mental disorders, such as people with schizophrenia, depression and/or anxiety. These individuals have demonstrated a shared pattern of difficulties when relating and responding to emotional distress [11], characterized by an increased tendency to engage with maladaptive strategies, such as behavioral disengagement, denial, self-distraction, and self-blame [12], which have been associated with emotional eating. This process, known as emotional eating, serves as a tangible manifestation of the intricate interplay between emotions and dietary choices. Understanding the dynamics of emotional eating is crucial, as it unravels a significant contributing factor to disordered eating patterns and sheds light on the intricate relationship between emotional well-being and nutrition.

Avoidant coping strategies, such as distraction and avoidance of emotions, have been found to contribute to an increase in eating disorder symptoms, especially in the long term manner, showing that using distraction and avoidance of emotions during meal times lead to worsening of the bulimic symptoms 1 month after the assessment [13]. Consequently, dysregulation of the balance between hedonic and homeostatic food intake regulation, compromised cortical control, and changes in gut signaling play crucial roles in obesity. Notably, gut peptides like ghrelin, leptin, and insulin can influence the central dopamine system, contributing to neuroplastic changes that affect reward circuits. In anorexia nervosa, gut-to-brain signaling mechanisms remain poorly understood, but reduced responsiveness of homeostatic brain regions to oral sucrose intake suggests altered interoceptive signaling's influence on eating behavior. A disease model proposes a mismatch between actual interoceptive representations of the digestive system and negative interoceptive memories, leading to hypervigilance and emotional arousal in eating disorders. In obesity, this mismatch drives compulsive overeating to achieve expected rewards. Mechanisms underlying the failure to correct this mismatch remain unclear but may involve learning and reinforcement processes [14].

In addition, overeating can be an avoidant coping, which allows one to disconnect from a perceived stressor or reduce tension indirectly [15, 16]. Interestingly, similar observations of applying avoidant coping were

reported in the general population over COVID-10 pandemic, showing that medical students experiencing psychological distress were more likely to develop either avoidant coping behaviors (self-distraction, behavioral disengagement, denial) or emotion-focused coping behaviors (venting, acceptance, self-blame, substance use, religion), which were further linked with depression, being overweight/obese and soft drink consumption [17]. Also, an exposure to high levels of self-reported psychological distress about health during COVID-19 pandemic have been shown to significantly influence eating behaviors. Interestingly, worries related to the future and consequences of the pandemic were associated with emotional eating, in particular intake of high-sugar foods and beverages in vulnerable individuals experiencing psychological tension compared to the overall population [18].

Strategies for stress mitigation - need for emotion of relief

Hijacking the reward system using substances or behaviors to the point that they are used for relief rather than pleasure becomes stressful. This stress can also reinforce the whole cycle, because not only does seeking immediate relief become an escape from what was there in the first place (shame, fear, etc.), but over time people even begin to escape the stress of seeking relief. It becomes even seeking relief from seeking relief. Studies suggest that both decreased negative affect and increased positive affect may simultaneously contribute to the emotion of relief [19].

People crave for instant relief more than for pleasure. Relief itself becomes a reward in today's fast-paced world and lack of time. The reward is not so much what people gain (the motivation to strive for something), but what people are running away from (motivation to escape trouble). Taking this into consideration and calling this phenomenon as seeking relief helps people struggling with eating disorders by:

- 1)** Noticing that people seek relief not debauchery or hedonism,
- 2)** Craving for reducing tension may lead to design other ways of reducing tension and replace BED/OCD behaviors with them
- 3)** Notice that the pursuit of relief is as strong as the pursuit of pleasure, Self-reported emotional eaters consume more food under stress if they experience heightened stress reactivity and emotional relief from stress upon eating [20]. People who are emotional eaters are more likely to feel out of control and stressed. They often lack self-confidence and will feel worthless. Their escape from those feelings may be comfort food and/or acts of eating – to feel instant relief. Feeling of guilt after those actions

increases their level of stress, and that increases craving for relief. And in their case eating alleviates emotional pain.

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This theory reduces all behavior to a simple, physiological explanation, ignoring the influence of cognitive, emotional, and social factors on behavior. The premise of drive reduction theory is that all individuals have the same set of physiological needs. However, this is not always the case. For example, some people may have a higher need for achievement or social affiliation that cannot be explained solely by physiological drives. Although drive reduction theory is not a complete explanation of human behavior, it is an important starting point for understanding the complex relationships between motivation and behavior.

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Joining Hull's drive and cue theory with 16 desires from Steven Reiss [21 - 23] and the Reiss Motivation Profile it is worth noticing that each desire when fulfilled reduces tension and restores balance that provides relief. Reiss's 16 needs are genetically and environmentally determined. Out of all sixteen needs, eating is a physical one. According to the model, a high value of the eating desire means that people care about food and

savor it. They have a good appetite, love eating well and enjoy cooking. They like discovering new tastes and find it difficult to say no to food not out of hunger, but because they like eating.

Going back to biological drives - they are the most primal. They result from the body's innate needs - such as the need for food, sensory stimulation, or sexual experiences. As a result of experience, new - secondary, learned (acquired) biological needs are created. Their satisfaction becomes necessary to maintain biological balance. These secondary biological needs are the source of psycho-biological drives.

And according to the RMP model, fulfilling all 16 needs to the optimal extent (combination for every human is unique) restores peoples balance. When those genetically and environmentally determined needs are not met, for people with a high need to enjoy food, the activity of eating certain types of food or binging serves as a bypass to achieve balance. If most of the needs are not met, excessive "satisfaction" with food becomes a counterweight to other needs that have no chance of being satisfied. That being said, the activity of eating in unhealthy ways helps restore psychological balance once some of the other 16 needs are not properly satisfied.

Looking closely at people struggling with eating disorders as individuals who seek balance by providing relief from imbalance can help develop an approach to treating the disorder. Psycho-biological drives are created thanks to familiarization and pleasure experienced in contact with various stimuli. When it comes to food, some foods, apart from satisfying our hunger, taste better. Some of them so much that they can lead to addictions.

Starting from primary biological needs

- 1) food – nutrients necessary for life,
- 2) sensory stimulation – any, it can be e.g. touch,
- 3) sexual experiences – regardless of their specific form.

Moving on to secondary biological needs:

- 1) specific food – tuna or chocolate,
- 2) a specific type of stimulation – crunching, biting, tasting,
- 3) specific sexual experiences - eating food can become a replacement.

And so psycho-biological drives emerge: what is initially just pleasant. It is no longer necessary, but above all it is pleasant. Thanks to this, it gradually becomes a necessity, and perhaps even a compulsion. Especially if/when other needs are not met.

Emotional eating as coping mechanisms leading to relief from distress

Emotional eating by some individuals can be developed as a coping mechanism, in which food is used to cope with difficult emotions, and it is typically not related to physical hunger [24]. Although many risk factors were implicated in emotional eating, experiencing psychological distress have been proposed to be an important contributor to over consumed energy dense foods, which additionally was also associated with metabolic alterations and obesity [3]. A cross-sectional, questionnaire-based study assessing the relationship between emotion dysregulation, psychological distress, emotional eating, and body weight determined as BMI in adults aged between 20 and 35 years of age, have shown that emotion dysregulation can be considered as contributor to higher levels of psychological distress and emotional eating, which in turn, was related to higher BMI among Italians [8].

Interestingly, the results of a recent study conducted on European populations related associations between emotional status, such as stress, depressive mood, loneliness, boredom, and emotional consolation as reasons for food consumption. For example, compared to the reference country - Croatia, Poles had higher chances for consuming food as a way of coping with stress (10% more), as well as eating upon loneliness (16% more) and boredom (31% more). Interestingly, Polish participants were less likely to consume sweets when stressed as well as upon emotional consolation [7].

Furthermore, when considering socio-economic determinants and gender influences, females were more likely to eat sweets when depressed, also, those without a university education, single, divorced, or widowed, as well as subjects who never or rarely follow a healthy diet nor never exercise were more prone to use consolidation by eating food. On the other hand, participants who were underweight or normal weight were less likely to engage with emotional eating behavior when compared to overweight and obese individuals [7]. Noteworthy, an increase in motivation for health behaviors was associated with a decrease, while emotional reasons for food consumption were associated with an increase in the risk of food

consumption as consolation when lonely. An increase in motivation for healthy nutrition behaviors was associated with a decrease in the probability while an emotional reason for food consumption was associated with an increase in the chances of eating food when bored [7].

Psychological distress and reward system: role of the food

Stress can impact food intake through various mechanisms within the central nervous system and energy homeostasis. Acute stress can either increase or decrease food consumption, depending on several factors such as sex/gender, stress duration, food accessibility, and macronutrient quality. Chronic stress, on the other hand, often leads to weight gain, independent of dietary choices [25]. Individuals, who are engaging in emotional eating, have been found to exhibit elevated anxiety and cortisol levels in response to stress; whereas anticipation of food rewards in their case led to reduced activation in mesolimbic reward regions, including caudate, nucleus accumbens and putamen compared to non-emotional eaters, overall indicating for the disrupted neuroendocrine and neural responsiveness to psychosocial stress amongst otherwise-healthy emotional eaters, who demonstrated hyperactive HPA-axis response coupled with hypoactivation in reward circuitry. In addition, that differential responsiveness to stress was suggested by the researchers as a potential risk factor in the development of maladaptive eating behaviors [26].

Although many factors can influence dietary choices, the reward system in the brain, being involved in the processing of the pleasure derived from eating (liking) and the desire for food (wanting) may play a crucial role in the regulation of food intake and importantly, food choice. Food characteristics, such as taste, smell, texture, and temperature contribute to the subjective pleasantness of food and rely on the mesolimbic dopamine system. The greater the impact of a substance or behavior on the release of dopamine, the smaller the dose and the shorter the time required to develop addiction and switch from pleasure to relief. In that case, palatable foods containing high levels of sugars are expected to cause increased release of dopamine in the nucleus accumbens, making them more rewarding [27]. The reward system itself does not change its architecture, but instead of the initial pleasure, a feeling of relief and respite begins to "ride" along the same road. What is important - feeling of relief is a positive emotion experienced when something unpleasant, painful or distressing has not happened or has come to an end. In many cases the reward system is activated by feeling relief from something. Even before addiction takes over comfort food or the act of eating can provide

not a reward but a temporary relief from everyday tension and emotional pain at the very beginning. Consequently, repeated exposure to food with high fat and sugar content can result in compulsive food consumption, poor control of food intake, and food stimulus conditioning, suggesting that palatable food can disrupt endogenous homeostatic regulation of food intake through activation of the reward system [27]. This appears to be constituent with a reported high consumption of servings of fats, refined grains, red meats, grams of sugar, and high energy intake and a high percentage of carbohydrates fats, saturated fats, and proteins among individuals suffering from emotional disturbances, who also had a high risk of binge episodes, which can be explained by the combination of sugary and fatty foods that may generate positive feedback in the brain reward system, triggering overeating [28].

Food choices under stress

Stress-induced eating, often characterized by the preference for highly palatable comfort foods, has been extensively studied in animals. The amygdala (BLA) has been identified as a critical region involved in dampening stress, with lesions in the BLA leading to normal cortisol levels in response to stress. This phenomenon is mediated partly through the reward system, potentially promoting synaptic remodeling. However, the exact mechanisms behind how comfort foods reduce stress remain unclear, although this has significant implications for weight-related issues. Emotional eating, which includes stress-induced eating, is associated with conditions like depression and obesity, particularly in young adults [25]. A recent explorative study including nutrigenetic intervention with The Genome-based Mexican (GENOMEX) diet as a strategy obesity management and prevention based on acting on individual self-efficacy, emotion perception and rewarding behaviors can be efficient in decreasing risk factors previously linked with obesity-related chronic diseases. Prior the intervention, the measured the reward-based eating drive among participants recruited in this study, although varying in the depression, which in 47% was minimal, 39% mild, 10.7% moderate, and 4% described as severe RED, did not change, but it was correlated with a higher intake of fats. In this group also mood was found as an important influencing factor on unhealthy eating in 71.7% of subjects, whereas 76.9% experienced binge episodes triggered by anxiety. Sugars were the most consumed foods during binge episodes (42.2%). Furthermore, both low self-efficacy levels and binge episodes were associated with high consumption of unhealthy foods. After the intervention, 10.7% of subjects reported a reduction in perception of negative emotions and increased level

of self-efficacy, which overall led to improvements in unhealthy eating decisions [29].

Can emotional eating bring relief from psychological distress?

As far as emotional eating is concerned we need a clear distinction between reaching for tasty food and reaching for the act of eating. Dopamine secretion in the reward system increases by 55% because of eating tasty food. It seems to be little compared to how other substances and behaviors (sex 100%, alcohol 200%, nicotine 225%, cocaine 400%, amphetamine 1000% and tasty food 50%) however, food is the most accessible and at the same time ubiquitous. And people cannot survive without eating, that is why they can't put it aside [30 - 32].

Therefore, to acquire relief, people reduce the stress of life with food. If we have no chance of satisfying them in several or a dozen areas of needs, then the one that is most available and its excessive satisfaction (in this case, food) becomes an outlet for the tension caused by the dissatisfaction of other needs. Eating is no longer just for the pleasure of enjoying it, but becomes a prosthesis for reducing the tension caused by the dissatisfaction of other needs. Understanding food reinforcement is critical to revealing the mechanisms underlying overeating and therefore designing appropriate strategies to mitigate the burden of the obesity epidemic accompanied by rising cases of eating disorders such as binge eating, food addiction, obesity, and overeating [29].

The brain's reward system responds to food through different pathways, and the circuits that trigger the pleasurable release of dopamine are interconnected with the activity of hunger neurons. Nevertheless, the ever-increasing availability of energy-dense and highly palatable foods demonstrates the influence that reward-related signals can exert on eating behavior. The pleasant feeling of temporary relief from stress, problems, and difficult things, over time the reward circuit in the brain is activated and over the time people reach for more food, eat excessively, and in extreme cases, emotional eating may turn into an eating disorder.

It develops as a coping mechanism, quick fix to any sort of unpleasant feeling and tension. For some people the type of food is important, but for some, like bulimic patients, more important is the act of eating than the type of the food. Both – emotional eating and binge eating disorder (BED) lead to temporary relief.

When food addiction is taken into consideration it affects the reward system. However, it is worth emphasizing that at the stage of addiction to comfort food or the act of eating itself, the reward system is taken over by a feeling of temporary relief. Even if at the very beginning the addiction reward circuit has been activated by pleasure, when addiction occurs, the reward system is taken over by the desire for relief. Many addicts say that overeating or vomiting is not about initial pleasure anymore, but about the feeling of instant relief.

Implications for treatments that bring long-term relief from psychological distress

Emotional eating is a common problem which is going to increase in its burden resulting from increase in reported stress and mental issues among populations worldwide. Therefore there is an urgent need for the development of mitigating approaches. For effective clinical practice addressing the prevalent issue of emotional eating employing effective strategies is paramount in helping individuals break free from this cycle.

Firstly, it is crucial to assist patients in identifying the triggers behind their emotional eating episodes, which can range from stress, anxiety, loneliness, to boredom. Once these triggers are recognized, clinicians can guide their patients in discovering healthier alternatives to cope with these emotions, such as meditation, yoga, or regular exercise to alleviate stress and anxiety. In addition to physical activity, it may not only help to relieve the tension and stress, as well as positively impact on brain functioning and cognition, helping in modulating the responsiveness of reward regions of the brain to stimuli, in particular food. It has been shown that the duration of exercise minutes per week is correlated to the brain responses within the amygdala, insula, and medial orbitofrontal cortex, upon the exposure to food images. Interestingly, the higher levels of exercise were significantly correlated with lower responsiveness within the medial orbitofrontal cortex and left insula to high-calorie foods. Furthermore, activation of these regions was positively correlated with preference ratings for high-calorie foods, particularly those with a savory flavor. These observations, may suggest that prescribing individuals struggling with emotional overeating with regular physical exercise may confer health benefits beyond its primary effects on cardiovascular fitness and energy expenditure, thus contributing to better dietary choices [33].

Secondly, encouraging the establishment of consistent, balanced meal times can also aid in managing physical hunger, making it easier to address emotional triggers without resorting to food. Promoting mindful eating

practices is another valuable approach, emphasizing the importance of paying attention to the sensory aspects of food, which can lead to a greater appreciation of meals and help prevent overindulgence. For example, dietary intervention, like The Genome-based Mexican (GENOMEX) diet, which is based on the local whole foods like beans, corn tortilla, amaranth, chia and pumpkin seeds, tomato, nopal, seasonal leafy greens and avocado may be beneficial for enhancing mood and self-efficacy, attributed to high content of enhancing appetite and low processed products, which aiding the adequate energy balance. In addition, this low processed diet, being rich in fiber and antioxidants with prebiotic and probiotic activity, which additionally may help regulate gut microbiota performance in terms of mood and cognition by maintaining a bidirectional communication with the central nervous system. This interesting observation may suggest that consumption of food with prebiotic/probiotic value may ameliorate unhealthy food behavior and negative emotions by restoring the gut-brain axis [29].

Finally, a recently emerging area of using microbial-based psychobiotics, which are made of using specific probiotic strains exerting beneficial effects on the brain function, may help in modulation response to stressful situations. An example of bacteria with psychobiotic properties are predominantly *Lactobacillus* and *Bifidobacterium* genus, due to their ability to produce neuroactive substances such as γ -aminobutyric acid (GABA) and serotonin, which exert effects on the brain-gut axis [34] thus reduce severity of symptoms of psychiatric illness [35]. To date, these preparations have shown to have therapeutic potential in addressing symptoms of mental health disorders like depression, anxiety, and PTSD, while encompassing changes in mood, personality dimensions, and sleep quality. Nevertheless, the therapeutic potential of psychobiotics can vary widely, depending on the neuropsychiatric condition itself [36]. In case of stress and anxiety management [34], some studies confirmed the ability of certain strains to produce metabolites acting as neurotransmitters and neurochemicals, can influence the brain-gut axis and further the stress response coordinated via HPA axis. For example, a preliminary study, in which supplementation with *Lactobacillus paracasei* HII01 (12.5×10^9 CFU/g) after 12 weeks in fatigued participants significantly reduced salivary cortisol level when compared to the baseline [37]; whereas supplementation of *Lactobacillus helveticus* R0052 and *Bifidobacterium longum* R0175, as well as *Lactobacillus plantarum* 299v has been shown to significantly reduce the HPA axis response to stress, what was observed as reduced salivary cortisol levels [38]. Consequently, following observations

may help to expand available therapeutic options for individuals suffering with emotional eating, which based microbiome-targeted interventions, while including dietary and lifestyle modifications, could enhance the recovery and restore appropriate relation with food [39]. Nevertheless, further research is needed in order to develop safe, personalized psychedelic therapies, standardize integration therapy, assess long-term effects, and explore applications for a wider range of disorders.

Conclusion

In conclusion, emotions might provoke emotional eating behavior. The appropriate way to handle stress, depression, or other emotional states is important in conditions of being emotionally overwhelmed. The public should be educated on how to handle different emotional states and learn ways to get to know and fulfill their personal needs. The focus should be moved somehow from emotional eating and the consumption of unhealthy food to healthy lifestyle practices, including regular exercise and healthy eating habits. Healthy lifestyle combined with meeting personal needs (according to RMP) may reduce craving for relief resulting from eating. Thus, it is necessary to halt these negative health effects on human health through public health programs. Therefore, to mitigate the negative health effects on human health through public awareness of the significance of dietary fiber foods within dietary patterns. The focus should be moved from emotional eating and the consumption of unhealthy food to healthy lifestyle practices, including regular exercise and healthy eating habits.

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