

Hedonic hunger: eating for desire and not calories

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Abstract

Hedonic hunger can be described as a state where an individual experiences recurrent feelings, thoughts, and desires about food in the absence of energy deprivation. Living in an obesogenic environment where cheap, tasty foods are available in plentiful amounts is one of the major causes of hedonic hunger development. Hedonic hunger can be analyzed using a power of food scale (PFS) which estimates appetite and not palatable food consumption. The current epidemic of obesity globally (termed as "globesity" by WHO) is seen to be majorly driven by the hedonic eating system and an imbalance in the energy homeostasis system. Previous studies indicate that hedonic hunger and obesity are associated, and a weak but no significant correlation exists between BMI and PFS score. It can lead to the development of various lifestyle disorders in the longer run. High levels of pleasure-driven hunger can even lead to detrimental health outcomes like poor glycaemic control, unhealthy dietary behavior, and increased lipid profile levels which are aggravated explicitly in cardiovascular diseases. With the adaptation to western dietary lifestyle, people are keener to opt for food options that can be damaging and harmful when low levels of self-control, dietary motivation, and healthy dietary habits are absent. Apart from the reward regulation system, which has a direct effect on hedonic hunger, certain external factors like emotional eating, meals and meal preparation, food cravings, sleep, physical activity, stress, social media, portion size, peer influence, an atmosphere of a restaurant can also promote more than required intake of food. This review article summarizes the above findings taking into account the plethora of research studies conducted so far.

Keywords

Hedonic hunger, Reward, Obesogenic environment, Obesity, Palatable foods, Food intake

Imprint

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Introduction

The term hedonic hunger can be described as "one's preoccupation with foods and the urge to consume them for the sake of pleasure and in the absence of physical hunger." Since ancient times the primary motive behind eating was to survive by maintaining the energy homeostasis levels and avoiding starvation. Due to the transition of changing lifestyle, unhealthy dietary habits, and the presence of an obesogenic environment, most of the food consumption in today's world occurs for reasons other than energy deprivation [1]. Food is one of the intense pleasures in life. The growing ratio of food consumption in humans is stimulated by delight and not the need for energy-giving calories giving rise to "non – homeostatic" eating or "hunger for pleasure." In a food-abundant environment characterized by a large number of low cost, readily available, and palatable, energy-dense foods, which are always universal, it is possible that hedonic hunger can affect eating patterns over homeostatic eating activity[2]. The psychobiological system usually consists of homeostatic and hedonic characteristics of hunger which work mutually and affect food consumption[3]. The homeostatic pathway controls the energy balance and is coordinated by the hypothalamus; it responds to the inner signs of energy requirement and incentive to eat when there is depletion in energy levels[4]. In comparison, the hedonic eating pathway weakens homeostatic regulation throughout ample energy, and there is an inclination towards eating more delicious foods. Neurobiological studies conducted in both humans and animals show that when a flavorsome food commonly high in fat/salt/sugar is consumed, it increases the activation in the reward-related areas in the brain, which in turn causes the release of dopamine[5]. The levels of dopamine secreted are related to the feeling of happiness that is obtained after consuming it. According to Stice, sometimes, the oral, sensory, and gustatory properties of palatable foods such as smell the taste can also induce dopamine release[6].

The influential theory of reward suggests that it is a distinct procedure that considers a pleasure com-

ponent and a non – pleasure component that can be termed as “liking” and “wanting.” Enjoying food is subjective to the delight obtained from it, and desiring it is the motivational bit of reward, and its related environmental indication is also called “incentive salience attribution”[7]. However, it has been suggested that recent development in the research area should emphasize more on the difference between “liking” (pleasure-based eating) and “wanting” (incentive to indulge in eating) and its relation to behaviors of consumption of foods in humans[8]. The hedonic eating system seems to be independent of the homeostatic pathway. It plays a vital role in eating behavior by increasing the desire to eat, inhibiting the signs of fullness, and ultimately leading to high energy-dense foods[9].

Studies previously aimed at differentiating hedonic versus homeostatic hunger showed that the palatability of food is highly associated with hedonic hunger due to its rewarding properties even when there is no energy deficit. Combining an environment filled with highly palatable foods makes it more “psychologically available” for consumption, leading to widespread hedonic hunger [10]. Hedonic hunger can be analyzed using a power of food scale (PFS) which estimates appetite and not than palatable food consumption and consists of three domains which include the availability of food, presence of food, and how the food tastes and it is now considered as a new measure of appetite[11].

This review article aims to elaborate briefly and summarize the extensive research studies conducted on hedonic hunger so far and look into various other aspects. Existing literature enumerates hedonic hunger’s role in developing obesity, different long-term and short-term health effects linked with hedonic hunger, and its impact on eating behavior [12]. Few studies have also tried to analyze the role of self-regulation or self-control on hedonic hunger and various factors which can influence or affect hedonic hunger scores. Most of the studies have considered the western population, and robust research in the Indian population is still missing[13].

Hedonic hunger and its association with obesity

The prevalence of obese and overweight individuals globally is around 1.9 billion and 650 million individuals, respectively. The current epidemic of obesity stems from an imbalance between the modern life-

style/environment which includes unhealthy dietary habits (consumption of energy-dense foods), sedentary lifestyle, and inner attributes like strong attraction towards foods and food signals, delayed mechanism of fullness, and increased metabolism rate[14]. The development of obesity is the outcome of gene-environmental interaction, controlled by neuronal and hormonal systems, and overeating plays a dominant role in obesity. It activates regular intake of tasty and calorie-rich foods when no physical hunger is present. The constant accessibility of such highly delicious foods inhibits the dopamine reward circuit in the brain both oral and after the food is ingested[15].

Accumulating evidence establishes a clear link between obesity and the brain reward activation system. Obese compared with normal-weight individuals show a more significant response to the anticipated food intake than actual food intake. Regions in the brains responsible for food coding sensory and hedonic properties include gustatory and somatosensory areas [16]. There is greater activation in these regions in response to predicted food intake and consumption. Still, there is delayed activation in the striatum region of the brain throughout food intake, which increases the chances for overeating leading to frequent gain in weight. A similar observation was found, which also showed decreased dopamine receptor activity which can predispose them to excessive food intake. Animal studies also suggest that repeated or excessive consumption of sweets and foods rich in fat can cause reduced activity of Dopamine receptors and a reduction in sensitivity towards dopamine receptors [17].

A measurable component of hedonic hunger that is the sensitivity to palatable foods and their rewarding properties, can be assessed by the power of food scale (PFS) forms a crucial element for identifying the association of BMI with Hedonic hunger. BMI, in turn, represents the nutritional status in terms of obese and overweight individuals. A weak and not statistically significant association between PFS score and BMI was observed in a clinical study conducted. For overweight & obese individuals, the PFS score might be related to overeating tendencies compared to BMI. Findings indicated that severely obese patients without a history of gastric bypass surgery had higher PFS scores. There was an apparent increase in their levels of hedonic hunger compared to patients who underwent gastric bypass surgery earlier. Obese individuals with a history of gastric bypass surgery or bariatric

surgery exhibit low levels of hedonic hunger compared to patients with a history of gastric bypass or bariatric surgery. Specific obesity-related eating behaviors like selective observation to food signals, food cravings, eating disorders like binge eating with self-administered overeating were also observed with high hedonic hunger levels. Individuals with higher PFS scores have increased chances to develop loss of control (LOC) overeating for both normal BMI populations and obese BMI populations. In a study conducted among women, hedonic hunger score was found to be high in obese women compared to non-obese women.

In agreement with previous data, a study also showed no significant correlation between P-PFS score and BMI in obese and healthy weight individuals. Various other authors have demonstrated a similar lack of correlation in specific samples of young adults, young adult women, healthy students, obese and overweight women[18]. However, a weak positive correlation was seen when both the samples were merged. This association mainly resulted because of significant group dissimilarity in PFS score among obese and normal-weight patients. Among the three categories in the power of food scale, the PFS score for food availability is strongly associated with the development of obesity. In contrast, the PFS score for the taste of food had a minute or no relation. With each unit increase in the P-PFS score for food availability, the chances of being obese increase approximately two times.

Effect of hedonic hunger on eating behaviour

Hedonic hunger is linked with maladaptive eating behavior, including frequently consuming more significant portions of food, eating unhealthy foods between regular meals, and eating when not hungry. Pleasure-driven hunger can be both desirable and dangerous. Today's obesogenic environment provides foods that are palatable, cheap, and accessible and has the power to stimulate hedonic appetite on their own. Edible foods refer to foods that are acceptable by the palate or taste buds. They are energy-dense and are primarily rich in fat and sugar or both[19]. The consequent weight gain linked with the rewarding properties of flavourful foods, which are rich in fat and sugar, predisposes the risk for developing obesity, hypertension, diabetes, gallbladder disease, and cardiovascular problems. Increased consumption of fast foods also has a role to play with metabolic syndrome in children and adolescents. Hedonic hunger is seen

to be more prevalent in females than males, but on the contrary, when choosing a food, they tend to focus more on health-based aspects of the food rather than taste compared to males. Younger adolescents are less worried about health and more bent towards how a particular food tastes.

Studies have shown that people having high levels of hedonic hunger have more excellent processing in the optic areas of the brain when both words and pictures representing highly palatable foods are shown to them. When presented with options, they are more likely to select unhealthy snack foods. Research conducted illustrated that high levels of hedonic hunger can be one of the causes of unhealthy dietary behaviors. Centrally obese people suffering from type 2 diabetes mellitus had unfavorable cardiometabolic findings, high levels of pleasure based hunger and harmful nutritional habits, including irregular meal patterns and diet, frequent intake of sweet foods like pastry, desserts, etc. Hedonic hunger also has an independent and inverse relationship with glycaemic control, and obese individuals with type 2 diabetes had high levels of hedonic hunger. A significant positive relation between hedonic hunger and glycaemic power was noted.

According to[20], individuals tend to eat for the sake of happiness and delight and not to meet the nutritional intake. Hedonic behavior can mislead the consumers when choosing foods because they cannot control their nutrient intake when consuming foods and are not ready to compromise on their taste buds for health. On examining the association between hedonic hunger, health interest on habit, and sodium intake, it was found that pleasure-driven need and health interest affect practice. Still, no impact on sodium input was seen because of the tendency to eat for taste; there was no control on the salt intake, leading to ignoring health and nutritional aspects like the development of hypertension in the future.

There is growing evidence among clinical and non-clinical samples that high levels of hedonic hunger can lead to losing control over overeating, which can be an essential feature of binge eating and gaining weight. No proper evidence exists on the relationship between eating disorders and hedonic hunger among individuals. Results from a study conducted revealed that individuals suffering from bulimia nervosa (BN) scored remarkably increased levels of hedonic hunger when compared to individuals suffering from oth-

er eating disorders like a restrictive type of anorexia nervosa, binge, or purging type of anorexia nervosa, and individuals only suffering from anorexia nervosa. It can also be assumed that notable weight gain among individuals with anorexia nervosa (AN). These findings remained consistent even after adjusting for restrained eating or suppression of weight. More evidence is needed to establish a strong correlation between hedonic hunger and eating disorders.

Role of self-regulation and motivation on hedonic hunger

Self-control is one of the crucial predictors for hedonic hunger. Despite living in a food-scarce environment, health-conscious individuals tend to maintain their weight throughout and are not affected by the high availability of flavorsome and tasty foods in their surroundings. People with increased levels of inhibitory control depict lesser stories of overeating, snacking frequency, and less intake of unhealthy snacks compared to the population with decreased levels of self-control. However, findings indicate that individuals with insufficient or low levels of inhibitory control are susceptible to overeating and unhealthy snacking when palatable food cues are present[21]. The activity of hedonic hunger or its effect is hampered under conditions of high self-control.

Self-determination theory (SDT) lays out an imperative layout for understanding the reasons that encourage food consumption. According to SDT, two types of motivation exist: “autonomous motivation” and “controlled motivation.” Autonomous motivation can be characterized by choices or decisions one makes for themselves; on the other hand, a controlled basis can be marked as the desire to satisfy others. The study reports that adults with autonomous motivation and goal setting are more likely to adapt to healthier choices like eating more fruits and vegetables. Individuals with a controlled basis are more likely to eat palatable foods, including flavorsome foods high in salt and sugar. The result was similar to other studies conducted. Some studies indicate that adolescents with higher inner drive consume a healthier diet and are resilient to hedonic hunger. Hence, they are less likely to consume too many servings of fast food. However, adults expressed opinions about how autonomous motivation develops after experiencing incidences where fast food consumption made them sick or ill. It is also to be noted that a controlled basis does not predict the

consumption of palatable food. Some chances managed cause is not always associated with adverse health aspects. Findings also indicate that autonomous motivation may predict higher consumption of fatty foods and starchy foods. Dietary motivation does not fluctuate with hedonic hunger, but few studies suggest that specific clinical procedures may allow for a shift in that motivation.

The concept of self-motivation also includes a between-person trait and a within-person trait. The role of hedonic hunger as a between-person (BP) trait or within-person (WP) was examined by Cushing, 2018 which reported that between a person and within-person qualities. Demonstrated hedonic hunger. Between people trait findings included increased consumption of fatty food and within-person traits included high consumption of starchy foods, which concludes that there might be individual differences in consumption of palatable foods depending on whether hedonic hunger is between personality traits or within-person traits. Another essential predictor for hedonic hunger is a habit, and Hedonic hunger is strongly associated with practices. Unhealthy habits can reduce self-efficacy and the potential benefits of dietary planning or self-monitoring, and the desire to eat tempting foods may nullify one’s routine and behavioral change. A significant positive correlation between hedonic hunger and habit was reported. The desire to eat overrules one’s consciousness and one’s ability to say no.

Factors affecting hedonic hunger and palatable food intake

Various environmental and external factors can have the potential to induce hedonic hunger through direct or indirect mechanisms. Studies so far have reported the correlation of multiple parameters such as obesity, motivation, self-control, abundant food environment, and the role of unhealthy dietary habits. Among all the other correlations, lifestyle habits or diet can be a significant factor influencing hedonic hunger. Some of that are listed below.

1) Emotional Eating.

Emotional eating encompasses an umbrella term influenced by certain emotional disorders symptoms such as imprudent response to a negative situation (negative urgency) or loss of interest in activities with reduced pleasure (anhedonia), which can predict an increase in hedonic hunger. Mason et al., 2020 studied

a relationship between changes in emotional disturbance problems and hedonic hunger. Since food is a coping mechanism for emotions, increased levels of hedonic hunger were seen with the increase in general anxiety, negative urgency, obsessive-compulsive disorder, and decreased anhedonia. Few studies have also shown that stress can be a recognized factor that promotes hedonic hunger or eating for reward, contributing to a larger calorie intake. Cravings for a particular type of food have also been associated with eating problems like eating disorders. There seems to be a direct relationship between food cravings and consumption of highly palatable foods, which can also lead to harmful health effects in the future, fostering the development of obesity. Food cravings usually occur for high sugar and high-fat foods and ultimately results in their consumption because of the high palatability.

2) Meals & Meal preparations

Family meals are protective and preservative for shaping an adolescent's healthy eating behaviors, reported by various Cross-sectional and longitudinal studies. The data the study conducted enumerates that feeds with the family provides an environment in which trust and communication are present, there is structured routine and ritual to occur which are likely to exhibit healthful eating behavior among adolescents. In contrast adults, or adolescent who is living alone or away from home due to various reasons like for educational purposes or occupational purposes can harm health and nutritional food intake. They are more likely to choose ready-to-eat meals, including packaged foods, foods available at grocery stores and fast-food restaurants, which can negatively affect the energy intake levels by consuming more palatable foods and may play a role in developing more palatable foods hedonic hunger.

3) Social media and portion size

Non-broadcast sources of food exposure which includes social media sites like Instagram, Facebook, Twitter, etc. are likely to promote more consumption of energy-dense but nutritionally poor foods which are commonly high in sugar, fat, or salt, which can also be one of the significant risk factors for increased levels of hedonic hunger. Studies imply that different sources of food exposure and recurrent television viewing are positively linked to adolescent's

intake of food and eating behavior. To a certain extent, it can be suspected that portion can also affect hedonic hunger score. Because if standard portion sizes are not followed, intake of larger portion size of high energy-dense food can act promote weight gain in children and adults

4) Sleep and physical activity

Lack of proper sleep duration and its link with a cluster of diseases like obesity, cardiovascular diseases, type 2 diabetes, and hypertension can be facilitated by dietary intake changes. According to shorter sleep duration leads to total caloric intake, fat intake, and there are limited studies for lowered intake of fruits and vegetables and a lack of quality diets. Lack of sleep or sleeping for fewer hours can also lead to irregular eating behavior, reducing the number of meals from 4-5 to fewer meals per day, and recurrent intake of calorie-dense, highly appetizing foods at night. However, the role of hedonic hunger on sleep remains unexplored, but high information on palatable foods can be considered one of the risk factors.

Concerning physical activity, it was shown that individuals with high levels of physical activity could resist consumption of high fat, non-sweet, and sweet foods and select bigger portion sizes for delayed consumption, and individuals with decreased levels of physical activity preferred consuming highly palatable foods, which was associated with increased desire and motivation for energy-dense foods. Severe session of exercise reduces the reward activity for energy-dense foods and is associated with lower desire and motivation to eat high fat, energy-dense foods

5) Other factors which influence food intake

To enlist a few of them, it mainly includes factors like eating atmosphere, which provides for odor, temperature, lighting, and noise. People consume more during winters than in summers because more energy is required to maintain their temperature. Warm or soft lighting in a restaurant can promote more consumption of foods. The effect of odor on food consumption is still unknown and not very well researched. It was shown that when the music in a cafeteria or restaurant is soft and slow, it promotes slower but higher consumption of food and drinks. Also, there is a chance of increased food intake when eaten with more people because of the relaxing and comfortable environment provided.

Extensive research in the area of factors influencing or affecting hedonic hunger is still undermined. There is a need to study and understand and a mechanism by which they induce hedonic hunger.

Conclusion

Changes in food availability both physically and psychologically have given rise to a new term called “hedonic hunger” and given rise to an eating movement that was never seen before. It is considered one of the moderating factors for obesity. The chances of being obese increase with an increase in hedonic hunger levels, and it is seen to be more prevalent in obese populations than other people with normal BMI. Eating for pleasure or enjoyment triggers a brain reward system and has shown increased response to the signals of palatable food in brain regions that underlie neural and perceptual responses. No evidence exists on the amount of food eaten during high levels of hedonic hunger, and it is only related to the individual’s desire to eat palatable foods. Increasing levels of hedonic hunger can be one of the major concerns worldwide because of its adverse effects on specific diseases, dietary behavior, and overall food intake of an individual. Habits, dietary motivation, and self-control can play a role in suppressing hedonic hunger levels. Pleasure-driven hunger has caused a shift in eating patterns. While buying food, consumers focus more on the taste aspect rather than paying attention to the nutritional and health part of a particular food. The constant presence of fast foods and various delicious foods on platforms like social media and restaurants leads to widespread hedonic hunger, especially when food is just a click away. Proper nutritional and dietary interventions are required to control hedonic hunger; since food holds an integral part of our day-to-day life, it cannot be eliminated. Hence “moderation is the key.” Further studies in this area should examine the role of hedonic hunger on snacking behavior, eating disorders, factors affecting it, and making food choices because these topics still lack proper evidence, especially in India.

Statement on ethical issues

Research involving people and/or animals is in full compliance with current national and international ethical standards.

Conflict of interest

None declared.

Author contributions

The authors read the ICMJE criteria for authorship and approved the final manuscript.

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