Chapter 13

Evaluation of Eating Disorder Within the Scope of Addiction Concept

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Abstract

Nutrition is the consumption of adequate amounts of food necessary for the body to sustain life. Nutrition is an emotional as well as a physical need and this has led to the creation of the concept of emotional eating. This form of eating, which emerged out of physical need, gave birth to eating disorders and the related concept of addiction. Eating disorders were not a topic that was emphasized much until the 20th century and were categorized and collected in the publication of DSM-5. Although eating addiction is not included in the DSM as a diagnostic criterion, it is widely used as a concept. Current research supports the concept of eating addiction and research is still ongoing.

1. GENERAL INFORMATION

1.1. Eating and Nutrition

The food substances that are essential for our bodies are called nutrients. Our main nutrients are carbohydrates, proteins, fats, minerals and vitamins. These nutrients are divided into macro and micro nutrients. Macro nutrients (carbohydrates, fats, proteins) provide energy, while micro nutrients (vitamins and minerals) contribute to and help the regulation of the events in the body. In order for the body to benefit from these nutrients, they must be consumed in sufficient amounts, digested and utilized by the cells (Aksoy, 2008).

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In the following years, researches concluded that a balanced diet is necessary for health and the amount to be consumed should be moderate, which led to the birth of the concept of nutritional guidance. Accordingly, nutrients were researched and analyzed, and standards showing the amount of nutrients that should be consumed daily were established. The values included in the nutritional guidelines, which vary according to countries, were prepared under the leadership of Hacettepe University in 2002 in Turkey and were made available under the name of "Turkey Specific Nutrition Guidelines" by the Ministry of Health in 2004. According to this guide, food s are divided into 4 groups (Milk Group / Meat Group / Vegetable and Fruit Group / Bread and

Grains Group) and foods from all four groups should be available at every meal in order to have an adequate, healthy and balanced diet. While consumption below the recommended amount impairs health in growth and development, consumption above the recommended amount causes chronic diseases and obesity (Merdol, 2015).

Nutrition is the consumption of the required amount of nutrients needed for the continuation of life in good health. Nutrition is a compulsory need for our life and it should start from the womb for our immunity (Baysal A, 2004).

Nutrition is important for physical and sensory needs. Because health in the physical sense depends on meeting the biochemical needs of tissues and cells in the body with important nutrients obtained from food. The concept of health in the sensory sense is the understanding that food affects the mental and physical structure of people (Aksoy, 2008).

Adequate and balanced nutrition is one of the basic and most important elements for both the society and the individuals who make up the society to live in a healthy and strong way, to develop economically and socially, to increase the level of welfare, and to survive in peace and security (Sevim & Güldemir, 2019).

In prehistoric times, nutrition was limited to filling the stomach, but with the transition to settled life, table setting and an increase in food varieties emerged. As different foods started to be used together, the concept of "flavor" came to the fore. In 400 BC, Hippocrates emphasized the relationship between nutrition and health and stated that healing could be achieved with food and that medication should not be used when healing could be achieved with food. This sentence has passed into the international literature as *"let food be your medicine and medicine be your food"* (Merdol, 2015).

1.2. Emotional Eating

Psychological characteristics of the person affect eating attitudes emotionally or cognitively. This is seen not only in overweight or obese individuals but also in individuals with ideal weight (Özkan & Bilici, 2018).

The concept of emotional eating is defined as an eating disorder developed in response to the emotions felt. All positive and negative emotions can affect this behavior (İnalkaç &

Arslantaş, 2018). It is seen that people who have negative emotions and have difficulty overcoming this emotion consume more food than necessary in order to use the comforting effect of food (Macth, 2008). While this concept was initially associated with the factor that causes bulimic patients to engage in binge eating behavior, later research has discovered its relationship with binge eating attacks. It has been found that this overeating behavior in response to negative emotions is seen in obese individuals, overweight individuals who are on a diet, and women with eating disorders. Individuals who tend to be thinner due to external factors tend to diet strictly and may exhibit emotional eating behavior in order to combat the resulting negative emotions. Emotional eating becomes more important in these groups showing restriction behavior related to eating (Sevinçer and Konuk 2013).

The characteristics that distinguish emotional eating from hunger are; emotional eating desire comes suddenly, especially high-calorie foods are preferred, it is difficult to reach the feeling of satiety, and as a result of eating, regret and guilt occur. While satisfying foods are preferred in normal hunger, hunger develops slowly and guilt is not felt as a result of satiety (Gürdöl, 2018).

Emotional eating behavior has started to be the subject of new research and has not yet been included as a diagnostic criterion in DSM-5. However, it is thought to be considered as a form of bulimia nervosa (BN) and will be effective in the treatment of eating disorders by taking place as a different diagnosis with its inclusion in new research (İnalkaç & Arslantaş, 2018). It can lead to more advanced eating addiction or binge eating disorder. It is a fact that many morbid obesity patients have emotional eating habits (Ünal 2018).

In a study conducted with female patients diagnosed with restrictive Anorexia Neurosis (AN) and Bulimia Neurosis (BN) for emotional eating behavior, it was determined that mood affects eating behavior and these patients have deficiencies in emotion regulation. According to the results of the study, individuals with both disorders reported that their moods were

negative and that they used dysfunctional emotion regulation methods. In addition, BN patients exhibited more eating behaviors in case of unhappiness, while AN patients ate less than normal. In cases where they felt happy, BN patients reported less eating behavior than normal, while AN patients reported eating more than normal (Adrian et al., 2021). Considering all these results, we can say that mood is effective on eating, and the eating behaviors of patients diagnosed with eating disorders are affected by mood.

In order to control emotional eating behavior, the factors that cause overeating should be identified and people should be asked to keep an eating diary if necessary. In the next step, a therapeutic activity (such as sports, massage, music and warm showers) should be substituted in order to relieve the emotional state/feeling of emptiness that triggers eating. In addition, the biochemical aspect of eating should be examined to see whether the centers related to appetite are transmitting the correct message (Gürdöl, 2018).

2. EATING DISORDERS

Eating disorders are the occurrence of physical and psychosocial deterioration in a person's eating habits, appearance and thoughts about the amount of weight. Wrong thoughts that occur in the person affect eating behavior (Merdol, 2015).

Eating and feeding disorders are a group of psychiatric disorders with a chronic course caused by the interaction of many different factors. It also develops comorbidity with disorders such as depression, anxiety disorders and obsessive-compulsive disorders, which may also complicate the treatment process. For this reason, there is no single treatment method and a multidisciplinary team work is needed. Since it can be detected in line with the information provided by people, a smaller amount of diseases can be detected than the actual rate (Yılmaz, 2019).

In a study conducted on eating disorders, it was found that the rate of eating disorders was higher in women than in men, the group between the ages of 18-30 and 31-40 had a higher rate of eating disorders compared to the group between the ages of 46-60, and the rate of satisfaction with their body decreased by 14% in those with eating disorders (Cengiz et al., 2022).

2.1. Eating Disorders and Emotions

The relationship between lifelong eating behavior and emotions has been researched for a long time and this situation causes problems such as eating disorders as well as enjoying food. Eating behavior, which is affected

by many factors, is associated with positive and negative emotions such as stress, sadness, excitement, happiness and joy (Özkan & Bilici, 2018).

The emergence of eating disorders involves multiple factors and eating behavior can be influenced by many factors. One of these factors is emotions, and many emotions are experienced in this process. Although people exhibit eating behavior to avoid sadness in the short term, they feel shame and guilt due to eating in the long term. In this sense, emotion regulation is important, and it has been found that individuals who learn to regulate emotions move away from eating attacks (Faraji & Fırat, 2022). Sadness also has the effect of increasing or decreasing eating behavior, and individuals show eating behavior only to regulate emotion without enjoying food (Russ, 1998).

Eating disorders and inadequate emotion regulation cause the inability to control impulses and exhibit purposeful behaviors in the process of experiencing negative emotions. In this context, studies have shown that people diagnosed with eating disorders have difficulty coping with negative emotions (Özsoy, 2021).

In a study on Binge Eating Disorder, it was found that eating attacks increased with negative emotions, only unhealthy foods were consumed during the attacks, and the feeling of sadness caused by being alone triggered the depressive mood accompanying the disease and increased the number of attacks (Güven et al., 2020). It is seen that negative mood causes both eating attacks and unhealthy eating behaviors.

In those diagnosed with bulimia nervosa disorder, the shame they feel in the eating cycle is felt excessively and causes the repetitive display of disordered eating behavior (Faraji & Fırat, 2022).

2.2. Classification of Eating Disorders

The World Health Organization (WHO) defines health as a state of well-being in physiological, psychological and social aspects, not limiting it to concepts such as disease or disability. While all these aspects complement each other, disruption in any one of them leads to deterioration in the other. In addition, mental and behavioral problems constitute the basis of psychiatric disorders. Nutrition plays an important role in the majority of psychiatric disorders. Nutritional problems seen in this group of patients, the relationship between food and nutrients and diseases are addressed in order to be treated (Akbulut 2015).

Classifying diseases and combining similar characteristics makes them easier to assess and treat. In this sense, there are two basic classifications:

International Classification of Diseases (ICD) and Diagnostic and Statistical Manual of Mental Disorders (DSM) (Akbulut 2015).

Eating disorders were not studied much until the 20th century and no specific classification was made. With the DSM published by the American Psychiatric Association, eating disorders started to be mentioned. With the publication of DSM-5 in 2013, eating disorders were grouped into 8 subcategories. These categories are anorexia nervosa, bulimia nervosa, binge eating disorder, pica, rumination disorders, and avoidant/restrictive eating disorders (Demirer & Yardımcı, 2020). Anorexia neurosis, bulimia neurosis and binge eating disorder cover adolescence and adulthood. Pica, Rumination Disorder and Avoidant/Restricted Food Intake Disorder are disorders that occur especially in childhood (Morrison, 2016). Therefore, these disorders are discussed in more detail in order to understand disorders that cover adolescence and adulthood:

2.2.1. Anorexia Nervosa (AN):

The 3 main indicators of anorexia nervosa are excessive reduction in food intake, excessive concern about weight gain, and a distorted body perception that they are overweight (Morrison, 2016). In these individuals, eating behavior is obsessed with food. Although they do not eat much, food-related thoughts are present in a large part of their minds and they spend most of their time talking, thinking and preparing food for others. They also suffer from hyperactivity and think that they can deserve to eat by practicing heavy and rigidly prescribed exercises. This is how they can combat guilt about eating (Smolin et al., 2020). It is a disorder characterized by an intense effort not to gain weight despite being underweight as a result of perceiving the body differently in terms of shape and weight. The treatment is long-term and hospitalization is necessary due to impaired physiological functionality (Merdol, 2015).

The diagnostic criterion of amenorrhea (cessation of menstrual bleeding) in anorexics has been removed in DSM-5 and it is stated that this diagnostic criterion has many reasons that are not related to weight loss. In addition, blood pressure is generally lower, skin becomes dry, hormone levels drop, anemia and decreased bone density are observed (Kring and Johnson, 2017). The mortality rate is 6 times higher in people with this disease and is accompanied by depression and anxiety. It is also more common in women, and the proportion of men is one-third of women. Unlike other disorders, no time period is specified for the diagnostic criteria, and it is evaluated by looking at subtypes and body mass index (Morrison, 2016).

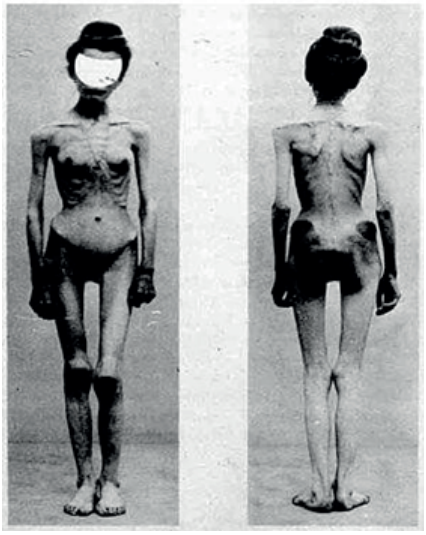

Figure 1: Physical appearance of an individual diagnosed with anorexia nervosa, https://tr.m.wikipedia.org/wiki/Anoreksiya_nervoza Date of access: 04.12.2022

2.2.2. Bulimia Nervosa (BN):

These people overeat, gain weight as a result of eating and at the same time try to stop gaining weight. Unlike anorexics, body weight is not low. Bouts of binge eating are seen and they prefer excessive calorie foods at such times (Merdol, 2015). A certain proportion of these patients are obese, but surprisingly their weight is usually normal. They also do not eat regularly and use laxatives as well as fasting and excessive exercise after eating. Due to the lack of control, shame and regret are the emotional state after binge eating. This is why they usually eat when they are alone. Depression and stress trigger overeating behaviors. In addition, the act of vomiting is the critical behavior in receiving this diagnosis, almost all of them exhibit vomiting behavior (Morrison, 2016). While these patients are aware that their behavior is wrong, anorexics have no such awareness. In the treatment of bulimics, cognitive behavioral therapy methods are followed with the aim of replacing overeating behavior with normal eating behavior (Merdol, 2015).

They exhibit compensatory behaviors such as vomiting, not eating and excessive exercise to prevent weight gain. In these people, binge eating is of 2 types; the first is eating more than a normal person would eat in a short time, and the second is that the person loses control and does not know where to stop. DSM-5 defines bulimia as a period of binge eating and

compensatory behaviors at least once a week within 3 months. In DSM-4-TR, the frequency was two times a week. In addition, the non-exclusion subtype was removed from the DSM-5 because it was difficult to distinguish between non-exclusion and binge eating disorder (Kring & Johnson, 2017).

Bulimia nervosa is more common than AN, with a higher prevalence in women than in men, as in AN. In addition, lower tooth enamel is damaged to the point of destruction due to vomiting. It is comorbid with mood disorders, anxiety disorders, impulse control disorders and substance abuse. The person is diagnosed after exhibiting inappropriate behavior at least once a week for 3 months (Morrison, 2016). Attacks are followed by days of self-starvation and people exhibit more antisocial behaviors. Complications are many and electrolyte disorders, pharyngitis and esophagitis can be seen due to the use of laxatives and diuretics (Sencer & Orhan, 2005).

2.2.3. Binge Eating Disorder (BED):

These individuals usually exhibit rapidly recurring binge eating behavior when they are alone and cannot control themselves (Merdol, 2015). As in bulimia nervosa, binge eating behavior is observed in a short period of time, but unlike bulimia nervosa, laxative use and vomiting behavior are not observed (APA 2013). It is usually initiated after a failed diet, typically when feeling sad or anxious, and high-calorie/ tasty foods are preferred. Due to fast eating, the feeling of fullness is realized much later and guilt follows (Morrison, 2016). People with BED are usually obese, but not all obese people have the disorder (Kring & Johnson, 2017).

The main feature of this disease is the excessive amount of food eaten and loss of control on overeating behavior. It is seen in 2% of adults and the incidence in women is 2 times higher than in men. This disorder can also be seen in people with Type 2 diabetes. In addition, these people find it very difficult to lose weight. Within 3 months, binge eating behavior at least once a week is sufficient for the diagnosis (Morrison, 2016). Complications include obesity-associated diabetes, high blood pressure and cholesterol, gallbladder and heart diseases (Smolin et al., 2020).

Table 1: Comparison of eating disorder types in terms of certain characteristics, (Morrison, 2016) Date of access: 01.12.2022

	Anorexia Nervosa	BulimiyaNervosa	Binge Eating Disorder
Binge Eating	No.	Yes	Yes
Self-Perception	Abnormal (perceives as overweight	Affected by the weight and shapeof the body	Not much affected
Compensatory Behaviors	Yes	Yes	No.
Body weight Low	Yes	No.	No.
Feeling a Lack of Control	No.	Yes	Yes

3. NEUROBIOLOGY OF EATING

Neural and endocrine systems play a role in the regulation of eating behavior. While the neural system interacts with the hormones secreted from the digestive system and regulates food intake, the Arcuate nucleus of the hypothalamus also plays a role in food intake. These effects on food intake appear as appetizing or unappetizing (Orhan, 2021).

Brain regions that affect appetite, peptides synthesized from these regions, molecules such as glucose and fatty acids that provide information about the amount of fuel in the body, some neurotransmitters (such as neuropeptide Y, serotonin, dopamine, noradrenaline) and some hormones (such as ghrelin, leptin, peptide YY) are involved in the energy homeostasis that the hypothalamus regulates (Gürdöl, 2018). Neurons forming a network create a feeling of hunger and satiety in line with the messages they receive from surrounding tissues, Nucleus Tractus Solitarii (NTS) and higher centers of the brain. There are neural extensions and communication between the NTS and the hypothalamus (Sencer & Orhan, 2005).

Table 2: Hormones and neurotransmitters affecting eating behavior, https://www.facebook.com/fizyolojisayfasi/photos/a.464963570202091/954453451253098/?type=3 Access Date: 01.12.2022

HORMONES AND NEUROTRANSMITTERS AFFECTING EATING BEHAVIOR	
ENJOYMENT INCREASING	**APPETITE SUPPRESSANT**
Neuropeptide Y (NPY)	Alpha Melanocyte-stimulating hormone
Agouti-related Protein (AGRP)	Leptin
Melanin concentrating hormone (MCH)	Serotonin
Oreksin	Norepinephrine
Endorphins	Corticotropin-releasing hormone (CRH)
Galanin	Insulin
Glutamate- GABA	Cholecystokinin (CCK)
Cortisol	Glucagon-like peptide
Ghrelin	Cocaine-Amphetamine-regulated transcript (CART)
Endocannabinoids	Peptide YY (PYY)

Ghrelin is a neuropeptide secreted from the stomach and its presence in the circulation affects feeding. It increases the release of growth hormone, Adenocorticotropic (ACTH), neuropeptide Y and insulin and thus eating behavior increases (Aksoy, 2008). This hormone stimulates the hunger center of the hypothalamus, and its secretion ends when the stomach responds full (Orhan, 2021).

Leptin is an antagonist of ghrelin. It acts on food intake, gastric emptying and energy balance by modulating neuropeptides in the hypothalamus. It also suppresses eating behavior by acting through cholecystokinin and vagus. When the hormone level increases with weight gain, resistance develops and a vicious cycle occurs, resulting in obesity (Aksoy, 2008). It suppresses appetite by increasing metabolic rate. It also suppresses neurons that synthesize Neuropeptide- Y (NPY), an appetite stimulating hormone. NPY has effects just like the hormone Ghrelin. Like leptin, insulin hormone also reaches the arcuate nucleus via circulation and inhibits NPY synthesis (Gürdöl, 2018). Leptin is secreted from fat cells and transmits the satiety signal to the brain. The increase in leptin level in the blood is related to the amount of fat, and the occurrence of an increase provides signal transmission to the hypothalamus and causes appetite suppression and energy burning

(Orhan, 2021). While leptin is known as satiety hormone with this feature, Ghrelin is called hunger hormone because it is secreted in case of hunger. The balance between these two hormones is important and if it is disrupted, eating disorders will occur.

Neuropeptide Y is the most important neurotransmitter in internal messages and is the strongest hunger stimulant. In order for the feeling of satiety to occur as a result of messages from the environment, it chooses to suppress NPY (Sencer and Orhan, 2005).

Peptide YY (PYY) hormone is stimulated by foods rich in fat and protein. The reason why protein-based nutrition is preferred in diets is to try to activate this hormone. It is an appetite suppressant and slows stomach emptying. It is the antagonist of NPY hormone (Gürdöl, 2018).

Eating addiction may be thought to be caused by disruptions in gene expression of hormones such as Agouti's relationship peptide (AgRP), Proopiomelanocortin (POMC), leptin, ghrelin at the hypothalamic level or in communication between neurons (Uzbay, 2015). In order to understand weight control and eating disorders, it is important to understand the neuropeptide and hormonal changes of appetite. Thus, it provides new opportunities in the treatment process (Zincir, 2014).

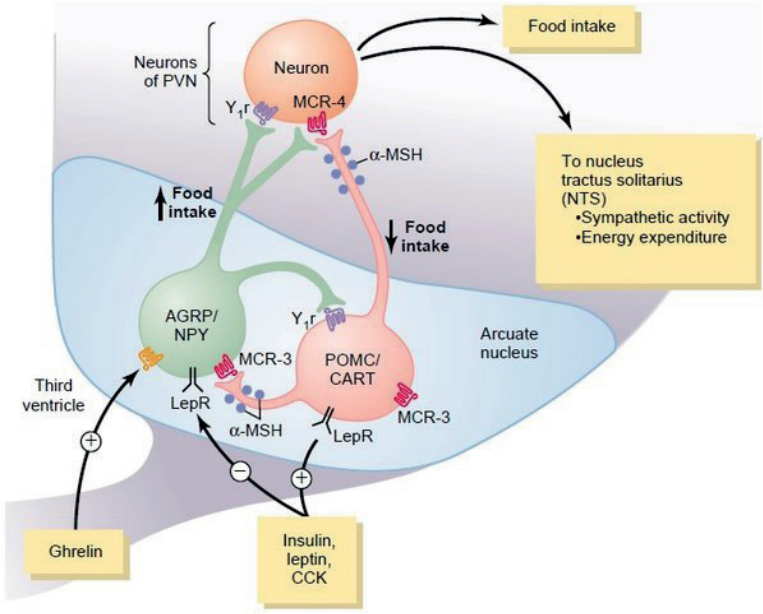

Figure.2: Arcuate Nucleus and Hormones Regulating Energy Balance in the Brain, https://www.quora.com/How-does-brain-chemistry-affect-nutrition

Access Date: 10.10.2023

CRH: Corticotropin releasing hormone; MCH: Melanin concentrating hormone; MC4R: Melanocortin

4 receptor; αMSH: Alpha melanocyte stimulating hormone; NPY: Neuropeptide Y; POMC: Propiomelanocortin; TRH: Thyrotropin releasing hormone.

Nutrition is a natural need and the nutrients needed are taken into the body in this way. When insufficient nutrients and energy are taken, nutrient stores are used through various mechanisms. Starvation caused by nutrient deficiencies affects many systems in metabolism and leaves permanent traces. These inadequacies affect hormone levels, immune and nervous systems and create disorder in the body. This can even lead to behaviors such as aggression and violence. Food intake low in tryptophan and low cholesterol levels affect the amount of serotonin neurotransmitter, resulting in a decrease in the amount of serotonin; accordingly, it causes aggressive behaviors (Özenoğlu & Ünal, 2015). Accordingly, changes in mood, decrease in food consumption, increase in energy consumption and weight loss occur (Akbulut, 2015). In addition, serotonin and dopamine are interrelated, and low serotonin levels cause an increase in dopamine levels, and vice versa, an increase in dopamine levels and a decrease in serotonin levels can cause unwanted aggressive behaviors (Özenoğlu & Ünal, 2015).

When we look at the relationship between eating and stress, a strong link has been found between obesity and stress. In acute stress, energy is needed in both cases due to the "fight or flight" alarm in the organism, and acceleration of metabolism with oxygen use is given in response to stress. In this case, appetite decreases and oxidation increases. In chronic stress; insulin resistance develops and glucose transport decreases accordingly. Negative nitrogen balance is observed with acceleration of protein degradation. Activation of the hypothalamic- pituitary-adrenal (HPA) axis is activated, resulting in an increase in cortisol level and thus appetite, resulting in weight gain (Gürdöl, 2018). It has also been found that ATP axis activity in obese people is 25% lower than non-obese people. Accordingly, it was found that 22% less energy was consumed in total erythrocytes compared to non-obese people (Sencer & Orhan, 2005).

4. THE CONCEPT OF ADDICTION

Addiction is an important disease characterized by the development of tolerance, withdrawal, failures to quit, loss of control over use, material and moral losses, and disruption of work and social life (Kring & Johnson, 2017). It is a widespread modern disease that directly or indirectly affects

every stage of the lives of both the individual and their relatives. The disease is widespread throughout the population (Dinçer, 2019).

Addiction can be generally defined as an unstoppable desire for an object, individual or entity and a pathological behavior associated with the mind. Although it harms the person mentally, physically and socially, people cannot stop this obsessive state and want to continue. While we think of a chemical or herbal substance when we think of addiction, today there are also behavioral addiction types where behaviors are at the forefront and medical treatment is needed (Uzbay, 2015).

The term "addiction" is a common term in today's society, although there is no consensus on an established clinical definition. In clinical practice, there is no formal diagnosis for addiction. Instead, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) states that the term can be used to describe severe substance use disorders (APA, 2013).

4.1. Behavioral Addiction

Reward pathways and the dopamine neurotransmitter are associated not only with addictive substances but also with basic needs such as hunger, thirst and sexuality (Uzbay, 2015).

It is thought that the perception of behaviors in behavioral addictions as rule-breaking or egodystonic with excessive desire to define the behavior is important in making a diagnosis. In the version before DSM-5, the removal of the criterion of "legal problems related to the substance" and the replacement of the criterion of craving can be interpreted as a harbinger that behavioral addiction types may be included in the diagnostic classification in the future (Evren, 2020).

The reason why behavioral addictions are derived with many names (e.g. gaming addiction, digital game addiction, obsessive-compulsive gaming) is that they include different views. According to one view, these behaviors can be interpreted as addiction, compulsion according to another view, or impulsivity according to another perspective. However, one of the reasons for considering these behaviors as addiction is that they are initially egosyntonic or hedonic, but then the pleasure received may decrease over time (Potenza et al, 2009).

4.2. Eating Addiction

Recently, dietary habits have changed and people no longer consume food for survival, but also engage in eating behavior for other reasons. As a

result of the changes in foods due to the development in the food industry, there has been a transition to foods that are high in energy; contain sugar, fat and additives; have low nutritional value and can be easily taken. Thus, the food eaten served as a reward and started to be preferred due to its accessibility (Dimitrijević et al., 2015).

The symptoms included in the DSM criteria for addiction are also seen in eating addiction. Loss of control is also present in eating addiction. They eat faster than individuals without eating addiction, show eating behavior even though they are not hungry, and as a result of overeating, feelings of shame, guilt, depression and disgust arise. Despite their anxiety, they cannot stop themselves from eating. Fatty and sugary foods are thought to trigger this condition. This condition can also be seen in the non-clinical population. 9% of people of normal weight and 21% of people diagnosed with obesity show this behavior. Another common symptom is unsuccessful attempts to stop consumption. This is indicated by high annual expenditure on diet products. Another symptom is that rather than engaging in activity and eating healthy foods, people prefer unhealthy ones and prefer eating to activity. When food cravings come, all other activities can be reduced, and consuming food brings happiness (Dimitrijević et al., 2015).

Eating addiction was first used in the literature by Theron Randolph in 1956 (Adrian & Gearhardt, 2014). After the researches, scales were developed at Yale to evaluate this concept as a clinical diagnosis. In 2009, Gearrhardt and colleagues developed the Yale Eating Addiction Scale (YEAS) consisting of 27 items with 1440 university students (Gearhardt et al., 2009). The Turkish validity and reliability study of the scale was conducted in 2012 by applying it to 156 clinical and non-clinical individuals (Bayraktar et al., 2012).

The concept of eating addiction is complex, previous studies were unreliable in defining eating addiction, but after the development of the standardized Yale Eating Addiction Scale (EES), it has shown more promising results. Research in this area has primarily focused on the distinction between obesity and eating addiction, as eating addiction is also seen in individuals with low body mass index or normal weight (Dimitrijević et al., 2015).

Although binge eating has not been included in the DSM-5 diagnostic criteria like gambling addiction due to insufficient empirical evidence, the debate about the addictive potential of food has continued. Organizations such as the American Society of Addiction Medicine (ASAM) have chosen to include "food addiction" in the list of possible addictive disorders. It states that behavioral addictions involve similar brain changes and neural pathways

as in substance addiction (American Society of Addiction Medicine: Definition of addiction - Long version, 2011).

In 2006, it was found that patients receiving inpatient addiction treatment in Michigan had a higher rate of bariatric surgery than the normal population. In addition, when we look at the history of these patients, they did not have any previous addiction. It was found that they had tried the substance after the surgical procedure. This event was interpreted by Dr. Hopper and Dr. Saules as the decrease in the amount of food eaten by people with eating addiction after the stomach reduction operation and the substitution of another addictive substance instead of food. It can be said that food activates the reward pathway of the brain like a substance (Uzbay, 2015). In another study conducted with people who underwent the same surgical operation, it was found that people who previously reported more problems with high glycemic index and high sugar/low fat foods were more likely to develop a new substance addiction after the operation, and they stated that this created a cross-sensitivity (Fowler et al., 2014).

For decades, critics have delayed the inclusion of nicotine in the concept of addiction and its prevention, arguing that its addictiveness is different from that of other drugs (e.g. alcohol, opiates) because tobacco use does not cause visible intoxication and there is no physical distress as with morphine. Whether eating addiction is valid or not is an empirical question, but criticism can lead to mistakes such as the delay in defining tobacco as a substance addiction. The next steps should focus on identifying specific addictive substances and examining individual differences that may increase the risk of addiction (Schulte, 2015).

Considering the sociocultural effects; praising thinness and promoting this thinness in the virtual environment has a significant effect on people's body perception. In addition, according to gender, the incidence of eating disorders is higher in women than in men. Another effect is the objectification of the female body, where women are known for their bodies while men are known for their achievements. When the personality characteristics of these individuals are analyzed, it has been observed that they have negative affectivity, perfectionism, and low self-awareness (Kring & Johnson, 2017).

Eating behavior is also regulated by hedonic systems. This system is the excessive desire for food that is considered delicious and the pleasure derived from eating. Individuals with this type of nutrition consume pleasure-oriented consumption rather than adequate and balanced nutrition. It is suggested that dopamine has an effect on the formation of this desire and there are also studies showing that delicious foods activate the reward

system. Accordingly, when sugar, fat and carbohydrate consumption is high, these foods increase the amount of dopamine and opioids (Orhan, 2021).

4.2.1. Studies on Eating Addiction

In a related study conducted at Yale University in 2009, brain regions associated with eating addiction were identified. Forty-eight women participating in the study were given milk shakes with milk, after an eating addiction test and brain imaging study were conducted. Looking at the brain images of individuals with high test results; higher activation was detected in the caudate nucleus, medial orbitofrontal cortex, anterior cingulate cortex and amygdala. These regions are associated with substance addiction. In the same study group, increased activation in the dorsolateral prefrontal cortex, which is known to be related to willpower, was detected when the pleasant food was resisted, and decreased activation in the lateral orbitofrontal cortex after drinking milkshakes, as in substance addicts. According to the results of this study, increased activation in reward-related areas of the brain and decreased activation in inhibitory brain regions were similar to substance addiction (Gearhardt et al., 2011). The orbitofrontal cortex plays a role in the regulation of impulses and emotions, and in case of decreased activation, impulsive behaviors emerge (Yener, 2002). This part also causes behavior in the form of craving. According to the results of this study, it was determined that low activation of the orbitofrontal cortex makes it difficult for the person to stop himself/herself against the pleasant food, and it can be said that this region has an important role in eating addiction (Uzbay, 2015). In another study conducted with the EEG system, it was found that people who were found to have eating addiction by scoring high on the NADS had increased functional connectivity in the frontal and parietal areas, similar to people with substance addiction (Imperatori et al., 2015).

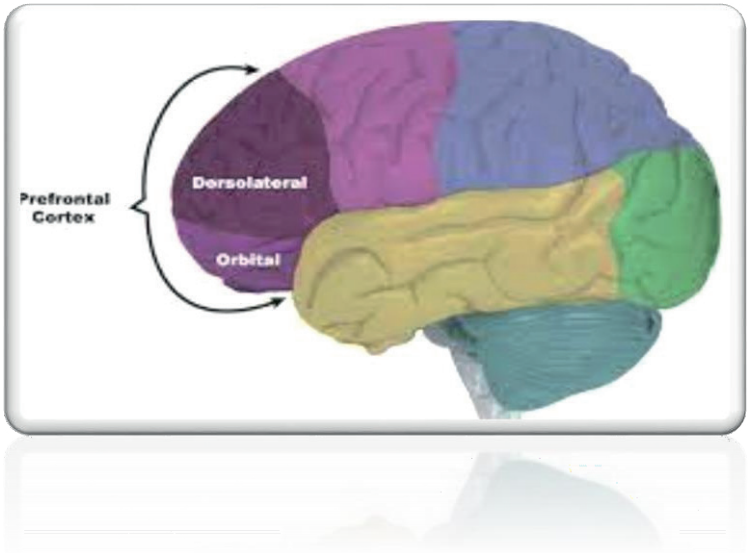

Figure 3: Parts of the Prefrontal Cortex. (These parts are located in the prefontal region and are involved in volitional functions through the reward system), McGee, 2004 Date of Access: 26.11.2022

The brain's reward system interacts with the limbic system, which controls behaviors such as eating and drinking. When hunger occurs, this control system tries to fulfill this need for survival and begins to search for food. The information generated as a result of hunger- induced imbalance in the organism stimulates the ventral tegmental area (VTA), from which nerve axons reach the Nucleis Accubens. From this area, dopamine is released. This mesolimbic pathway is also seen in the imbalance caused by the absence of a chemical substance. When the mesolimbic system is activated, food is sought if it was previously unknown how to obtain it. For example, if the experimental animal in the cage has found the food by pressing the pedal, it will place it in the hippocampus and the next time it is hungry, it will go directly to the area where it will obtain the food and press the pedal. However, it should be kept in mind that experimental animals can exhibit pedal pressing behavior and spend time in this area without being hungry (Uzbay, 2015). A study conducted on primates proves this. It was found that in the case of permanent conditioning of chocolate in primates, they spent more time in the environment where they received chocolate, while no such behavior was encountered in the control group and they did not make a place preference. It was concluded that chocolate can act like a chemical substance by conditioning (Duarte et al., 2014).

One animal study showed that rats conditioned on sugar-sweetened pellets no longer responded to the reward they were conditioned to when given naltrexone, an opiate antagonist (Le Merrer and Stephens, 2006). However, in another study, rats fed high-fat food did not show opiate-like withdrawal when given naloxone, an opiate antagonist, as with sugar. This suggests that food composition is related to food addiction and that the opiate system in the brain may be differentially affected by fatty food compared to sugar (Corwin, 2011). There have been many studies investigating the relationship between food addiction and the opiate system, and although the results cannot say that food is an addictive substance, the results obtained against opiate antagonists suggest that the opiate system plays a role in food-related reward (Gordon et al., 2018).

Colantuoni et al (2001) compared brain chemistry changes in rats with intermittent and excessive glucose intake to rats given a normal food diet. They found that exposure to highly palatable food in an intermittent eating pattern resulted in increased activation of dopamine D1 and μ-opioid-1 receptors, as well as reduced binding of dopamine D2 receptors in the dorsal striatum.

In another study, subjects were given an appetite suppressant that blocked dopamine function, and the blockade was not effective in adults who scored higher for addiction on the NADL test compared to the control group. This suggested that dopamine signaling strength was altered in adults who ate more food and were thought to have an eating addiction, similar to that seen in adults with substance use disorders. It was also found that high-scoring participants reported more food cravings after tasting their favorite delicious foods (such as potato chips, chocolate and cookies) (Davis et al., 2014).

In a study conducted to define the relationship between food addiction and anxiety level, it was found that when the amount of high-calorie (high-fat and sugary) products given to obese mice was reduced, they exhibited excessive food seeking behavior, and in the open field test, they spent more time at the edges and less time in the middle area and exhibited anxiety behavior (Pickering et al., 2009). In a similar study, it was observed that mice fed high- fat foods showed increased cortisol levels and more anxiety symptoms after the diet was stopped (Sharma et al., 2013).

The nuclei of the hypothalamus are directly involved as hunger and satiety centers. These centers determine our state of eating. The area responsible for the hunger center is defined as the lateral nucleus, while the part responsible for the satiety center is the ventromedial nucleus. The hypothalamus thus controls the cycle of hunger and satiety (Aksoy, 2008). However, in the

studies conducted on this subject, the lesions in these regions do not show a complete picture of Aneroxia nervosa or Bulimia nervosa. For example, as a result of a lesion in the lateral nucleus, the animal does not feel hunger and behaves indifferent to food. On the contrary, anorexics are very interested in food and starve themselves even though they feel hungry. Accordingly, a dysfunctional hypothalamus cannot be mentioned. In addition, other studies have found that serotonin and dopamine neurotransmitters are associated with anorexic and bulimic individuals (Kring & Johnson, 2017).

In another study, a relationship was found between appetite levels of emotions such as sadness, stress, happiness and excitement and body mass index. In negative emotions and situations, the eating tendency of students with eating addiction was found to be higher compared to students without eating addiction. In addition, in the research conducted with students with eating addiction, restrictive eating, emotional eating and external eating scores were found to be higher than students without eating addiction (Dinçer, 2019).

In the study looking at the relationship between eating addiction and impulsivity, it was concluded that those who met the criteria for eating addiction were more impulsive than the other group according to the score of obese and Binge Eating Disordered individuals on the Yale Eating Addiction Scale (YED). In addition, in another study comparing eating addiction, impulsivity and Body Mass Index results, a significant relationship was found between the three topics (Murphy et al., 2014). In another study looking at the relationship with impulsivity, a statistically significant relationship was found between eating addiction and impulsivity subscales and it was found that impulsivity subscales increased eating addiction (Kandeğer, 2016).

In a study examining the relationship between insomnia and eating addiction in university students, the prevalence of eating addiction was found to be 12% and was found to increase compared to the rates in previous studies. A high degree of significance was found between insomnia severity and eating addiction, and it was interpreted that they were risk factors for each other. The researcher stated that circadian rhythms were disrupted as a result of individuals starting to sleep at late hours with technology, which led to obesity and other disorders related to metabolism (Kandeğer, 2016).

In a study aiming to conduct a comprehensive meta-analysis on food addiction, a total of 31 articles and 47 studies were selected from Pubmed and PsychInfo, filtering out those containing quantitative and empirical studies. The results of all these systematic reviews support the validity of food addiction as a diagnostic construct in general, especially as it relates

to high-energy foods in terms of added sweeteners and refined ingredients. Most studies in the current review reported evidence of symptoms related to neurological changes and impaired control, with fewer studies assessing preoccupation, chronicity, relapse, social impairment and risky use. They concluded that behavioral and substance-related aspects of food addiction appear to be intertwined, but that the substance (very tasty food) component may be more prominent than behavior (eating) in the diagnostic classification of this phenomenon. The meta- analysis also found that the most common foods associated with addiction symptoms were those high in added fats and/or refined carbohydrates such as sugar. These findings are consistent with previous literature. As a result of all screening studies, it was suggested that more studies like this should be conducted for the treatment of eating addiction (Gordon et al., 2018).

In a study conducted with adults with obesity who had high scores on the NADS scale, it was found that they reported significant craving behavior, hedonic feeding, and sweet food cravings. In addition, the same high-scoring obese group showed more impulsivity than the control group (Davis et al., 2011).

In their study with rats, Johnson and Kenny (2010) found that rats that were given unlimited access to high-calorie foods (pork, sausage, cheesecake, chocolate) continued to consume the food even though they were given a deterrent conditional stimulus (electric shock to their feet). On the other hand, rats that were given limited eating rights or fed normal food decreased food consumption when the aversive stimulus was presented.

5. CONCLUSION

Although eating addiction is not included in the DSM as a diagnostic criterion, it is widely used as a concept. Eating and nutrition is a mandatory behavior for our daily life and a balanced diet is extremely important for healthy development. Eating behavior is not only the result of a physiological need, but can also be emotionally driven, resulting in the concepts of emotional eating and hedonic consumption.

Studies with animals have started to increase as well as studies with humans. As a result of the development of the Yale Eating Addiction Scale (YEAS) and the completion of the validity and reliability study, researches have started to gain more momentum. However, although there is still no conclusive evidence that food is addictive, studies have found that excessive consumption of sugar/carbohydrate/fatty foods in the macronutrient group has an addictive effect similar to the chemicals in substance addiction and

activates/inhibits similar brain regions. Research also shows that eating addiction is not only a concept for the group diagnosed with obesity and binge eating disorder. Continuing research on the subject is important in terms of discovering curative treatments for people.

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