

**COMMENTARY**

# The Effects of Anorexia on Adolescents

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Received: August 3, 2023

Accepted for publication: November 6, 2023

Published: November 16, 2023

## Introduction

According to Missouri Baptist University researchers, in the United States, 95% of the people that have an eating disorder are from ages 12 through 25.<sup>1</sup> Eating disorders are a heavily misunderstood subject throughout the world. Commonly, many people deny the prominence of eating disorders, leading to a major effect on adolescents. Due to this, many adolescents suffer from this disorder alone and without help. In a national statistic reported by the National Library of Medicine, it was found that 3-20% of all eating disorders lead to death.<sup>2</sup> The recognition of the causes and effects of eating disorders is imperative because the more society understands, there will be a greater sense of awareness to help prevent the increase of fatal eating disorders.

## What is Anorexia?

Anorexia nervosa, or anorexia is typically defined as the neurotic loss of appetite.<sup>3</sup> Anorexia, in other words, is a mental disorder that leads an individual to constantly think about their weight and body shape from a negative perception created through the patient's brain.<sup>4</sup> Anorexia, in some cases, is known to stem from small habits and evolves into a larger issue, eventually leading to several risk factors which affect a patient's quality of life. In critical cases, anorexia nervosa may lead to hospitalization, a variety of health issues, and even death. Anorexia is

acknowledged to have the highest death rate compared to other mental disorders.<sup>5</sup> Anorexia is also commonly known for permanently affecting a patient's brain negatively, in most cases, for the rest of their lives. Anorexia is not usually spoken about socially, as patients with anorexia will not speak about their illness, especially if they are aware of the issue.

## Diagnosis

Currently, the most reliable method of diagnosis for anorexia patients is The Diagnostic and Statistical Manual of Mental Health Disorders, 5th edition (DSM-5TR). The DSM-5TR is the most recent and relevant publication for diagnosis which covers anorexia symptoms in detail and variety, as anorexia symptoms vary from person to person. A patient must fit the three main criteria according to the DSM-5-TR for anorexia to be diagnosed: Restriction, Fear, and Lack of Recognition.<sup>6</sup> Restriction is shown through a patient's habit of restricting calorie intake, based on the individual's body mass index (BMI). Fear is presented in an individual's mental perception of body weight. Lack of Recognition is exhibited through the development of body dysmorphia, leading to a warped perception of the severity of their circumstances.<sup>7</sup>

## Symptoms

Anorexia is an illness that begins psychologically and progresses to various physical

components. Common physical and psychological symptoms of anorexia include but are not limited to, frequent headaches, dizziness, anemia, loss of muscle mass, irritability, excessive hair loss, loss of a woman's menstrual cycle, constipation, fatigue, nausea, and lanugo.<sup>8</sup>

## Medical Complications

Anorexia is commonly conceptualized as being connected to other mental and physical disorders, many of which come as a future result of malnutrition and a consequence of insufficient vitamin and mineral intake. Anorexia is known to affect adolescence the most in the long term, as several organs in the body are affected through future growth and development.<sup>9</sup> With time, anorexia is known for causing other medical problems such as anemia, muscle weakness, infertility, osteoporosis, damage to the heart, damage to the brain, and multi-organ failure.<sup>10</sup> Since the human body develops the most during adolescence, anorexia is known for delaying puberty. In females, anorexia permanently affects fertility, as hormones and nutrients necessary for growth and development are not available. Other minor medical complications that may arise from long-term anorexia in adolescence are carotenoderma, hyperpigmentation, excessive acne, dermatitis, paronychia, and striae distensae.<sup>11</sup> Psychologically, many comorbid disorders arise as a result of anorexia. Mood disorders are the most common comorbid disorders of anorexia nervosa at 60.4%. Many mood disorders which arise from anorexia include depression, general anxiety, personality disorders, and many phobias which correlate to eating or weight gain.<sup>12</sup>

## Prevalence

Due to social and psychological factors, 2.7% of adolescents are diagnosed with anorexia nervosa with lifetime prevalence of 0.3%.<sup>13,14</sup> According to Newport Academy, anorexia is most prevalent in teenagers than adults and children. Adolescence is a common time for the onset of anorexia nervosa. Though social media was created to be a place for joyful communication and memories, many teens from the ages of 13-18 have admitted to being socially influenced.<sup>15</sup> As a result, media influence has increased low self-esteem, stress, and anxiety, making it the largest risk range for those who have anorexia. The widespread use of social media, such as Tumblr or Instagram, can give adolescents an unrealistic view of their bodies and lead to eating disorders such as anorexia to fit that view. With women and teen girls

being more commonly diagnosed with anorexia, it is crucial to remember that females are not the only ones. According to Newport Academy, 10% of teenage males are diagnosed with anorexia.<sup>16</sup> Factors like shame, denial, or a lack of knowledge about the severity of their problem, have many adolescents going untreated or choosing not to seek treatment.

## Neurobiological Aspects of Anorexia

### *Cognitive and Physiological Background*

Anorexia nervosa alters the way one discerns food. For instance, a study using magnetic resonance imaging on female patients with acute anorexia alongside patients without anorexia found that when patients were shown photos of high-caloric drinks, the hippocampus and the left amygdala of the brain exhibited signs of activity.<sup>17</sup> Other studies show increased activation of both the left and right amygdala.<sup>18</sup> The left amygdala is associated with sustained and verbal emotions, while the right amygdala is associated with dynamic and visual emotions, and the hippocampus plays a vital role in memory and learning. The response displayed by the patients with anorexia was the same as that of individuals who had an aversion to a phobia, in contrast to patients who were healthy and expressed delight or neutrality.<sup>19</sup> Many functional magnetic resonance imaging studies found that because of a lack of nutrition, patients with anorexia also had decreased gray and white brain matter.<sup>20</sup> These fMRI studies also show that the disorder alters the brain activity in the cingulate cortex which is responsible for linking reward and punishment information.

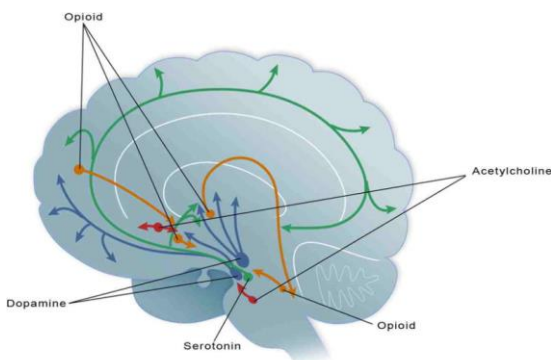
Limbic and cognitive pathways have been highlighted in research for structural and functional differences in someone who has anorexia inclusive of neurochemical changes. According to other studies, there have been abnormalities in the orbitofrontal cortex. Its function is to signal when to stop eating, while the dorsal striatum controls habitual behaviors. The altering of the right insula controls and alters your perception of taste.<sup>21</sup> Utilizing neuroimaging, researchers and scientists have found that there is a change in gray matter volume and cortical thickness within the brain. These results show us that restricting food intake does affect brain structure and function.<sup>22</sup>

### *The Brain's Reward Systems and How They Come into Play in Neurochemistry*

According to the National Association of Anorexia Nervosa and Associated Disorders, when

dopamine is released from the dorsal striatum of an anorexic person, it causes anxiety instead of satisfaction or pleasure.<sup>23</sup> For example, an individual without anorexia may eat a serving of cake and will be motivated by dopamine to have a second serving. However, in the mind of someone with anorexia nervosa, the motivation given by dopamine forgoes its function. In the mind of an individual with anorexia, the process of eating is broken down, making it difficult to understand the reward processing and how to learn from the rewards.<sup>24</sup> Due to this, patients become highly sensitive to punishment.

A study done based on animal models showed that there are projections from the hypothalamus to the nucleus accumbens (NAc).<sup>25</sup> The NAc indicates reward in conducting natural behaviors such as sex, exercise, and in particular, feeding. As shown in Fig. 1, there are neural pathways specific to eating disorders. NAc is involved in mediating emotion and motivation. The mesolimbic system transports dopamine to the NAc and is involved in pleasurable sensations. It is also a location for endogenous opioids to modulate dopamine (DA) release and orosensory—relating to oral innervation—reward process.<sup>26</sup> Serotonin (5-HT) also plays a big role in feeding behavior, being related to your satiety. In conclusion, behavioral neuroscience suggests that there is dysregulation of the reward systems in your neurotransmitters shown by studies utilizing people who have eating disorders such as anorexia nervosa.<sup>27</sup>



Dopamine (blue), serotonin (green), acetylcholine (red) and opioids (orange) have each been indicated in disordered eating. This schematic illustrates some of the neuronal projections that research indicates are of particular interest in the regulation.<sup>28</sup>

## Cultural Influences

### Western Culture

Western culture tends to glorify small and slim bodies. The prevalence of obesity and being overweight, despite affecting a majority of the population, remains stigmatized. The origin of this unknown bias has caused many adolescents to develop problems such as body dysmorphia and internalized societal expectations. Especially within social media, the unrealistic bodies depicted cause many to engage in dieting and weight loss to conform to societal expectations.<sup>29</sup> Western culture tends to associate slimness with power and self-discipline, compared to other cultures like the Samoan culture which emphasizes the importance of nutrition and eating a variety of foods.

### Asian Culture

Asian culture is collectivistic, meaning that group autonomy is underscored while individual autonomy is not the community's main priority. For this reason, pressure is set on individuals to fit into cultural and societal norms. Another idea that Asian culture emphasizes is the idea of 'filial piety', which is having an immense amount of respect for elders, which may create pressure on individuals to conform to societal norms, including body image standards. For example, in Thailand, various stores for plus-sized individuals are called "Moo Moo" and "Love Calories", in an effort to degrade them.<sup>30</sup>

## Diet Culture

Diet culture is a way of life that groups unhealthy foods with fatness and healthy foods with thinness. Individuals who follow diet culture tend to comment on others' weight loss and thinness, while also bashing those who eat unhealthy or maybe are overweight. Many who follow diet culture are fearful of weight gain and look down on gaining weight. Diet culture is not just that, diet culture also instills fear in others of weight gain, one of the diagnostic criteria for anorexia.<sup>31</sup>

### Diet Culture: An Early Beginning

During the 19th century, also known as the Victorian Era, diet culture began to take a prominent role in society. This era saw rises in many young women's restrictive patterns mostly due to the emergence of many obsessions with achieving an hourglass silhouette.<sup>32</sup> During this era, many ate small portions of bland food while avoiding more indulgent

dishes. Corsets also reinforced eating smaller portions and having a perfect body. There was immense pressure, mentally and physically, to conform to societal standards, which in turn caused these individuals to suffer from malnutrition and eating disorders.

### *Diet Culture: 20th Century*

The 20th century marked a turning point in the history of diet culture. With the rise of mass media, beauty standards became heavily influenced by Hollywood films and advertisements. Slim figures were idealized and equated with success and desirability. This led to the emergence of countless diet products, programs, and fads promising quick weight loss and a perfect silhouette.<sup>33</sup>

### *Diet Culture: 21st Century*

The 21st century has undergone immense industrialization and many other changes. One of the main factors contributing to the rise of dieting and eating disorders today is the availability of information via technology.<sup>34</sup> Adolescents today have easy access and are exposed to a wealth of online resources that claim to provide advice on weight loss and "perfect" body ideals. Many times, this information is misleading, contributing to distorted body image perceptions and promoting unhealthy habits.

### *Social Influences*

Many individuals on the social media app called "TikTok" have gone out of their way to create pro-anorexia accounts, where information about weight loss and weight loss methods are shared and encouraged. These accounts, often called "pro-ana" or "Mia" accounts, can be dangerous. They can be viewed or interacted with, whereby the app's algorithm will continue to advertise these videos to adolescents. This may influence adolescents to engage in disordered eating or develop body image issues. For this reason, about 81% of 10-year-olds are afraid of being fat.<sup>35</sup> Predisposing adolescents to this sort of behavior could later manifest into a greater fear of gaining weight, and exposing them to disordered eating.

Via their TV show "Keeping Up with the Kardashians" and social media apps such as Instagram, the Kardashian family has been able to influence others into striving to look like them, despite their family having undergone a variety of surgical procedures. Their social media platforms and reality

TV shows showcase their glamorous lifestyles, which often include a consistent emphasis on their body sizes and appearances. Adolescents, who are in a vulnerable period of self-discovery, tend to be heavily influenced by these unrealistic beauty standards promoted by Kardashian influencers. One element that the Kardashian family has gone under scrutiny for is photoshopping on Instagram. On several occasions the family has been caught using FaceTune to shrink their waists, make their lips bigger, widen their hips, and then lying about editing their photos, causing their viewers to want to reach an unrealistic body image. Along with their photo editing, the family has denied their use of Botox and other procedures which further make their viewers believe that their bodies are somehow achievable through natural remedies. Other influencers like Gigi and Bella Hadid are idolized for their slender physique, further glorifying the concept of being skinny. Designers like Karl Lagerfeld and fashion magazines like Vogue have indirectly contributed to this culture by showcasing predominantly slim figures. This can be detrimental especially since 69% of girls in 5th-12th grade reported that magazine pictures influenced their idea of a perfect body shape".<sup>36</sup> The fashion industry has long been known for promoting thinness as the ideal body type, using underweight models in runway shows and advertising campaigns. Playboy magazine, a very influential magazine, has also been known to hire underweight models. According to the National Institute of Health, 75% of these women were less than 85% of their ideal body weight.<sup>37</sup> These social influences may be a cause and the reason why adolescents engage in risky behavior to reach an unrealistic body standard.

### **Management and Treatments**

Patients with anorexia only recognize the disorder when the mental illness is dangerous or life-threatening, therefore it is strongly emphasized that the illness should be caught in the early stages. Management and treatments for anorexia range from physiological therapy to hospitalization.<sup>38</sup>

Typical treatments for eating disorders such as anorexia consist of different types of therapy, education on the disorder, and medication. Some of the different types of therapies include cognitive behavioral therapy, family-based therapy, and psychotherapy.<sup>39</sup> These different types of therapies focus on the patient's mental as well as physical well-being. For instance, cognitive behavioral therapy is a type of psychotherapy focusing on the mental health of the patient. It focuses on the patient's behaviors,

thoughts, and feelings related to their eating disorder.<sup>40</sup> After helping the patient change their eating habits, cognitive behavioral therapy helps the patient acknowledge and adjust the twisted thoughts that originally led to developing anorexia.<sup>41</sup> Education and awareness are also important elements to help address anorexia. One way the patient or a family member could educate themselves is to research different ways to manage it. A few techniques they could implement to help manage anorexia involve nutritional management, terminating purging behaviors, and seeking professional help from dietitians.<sup>42</sup> With the help of professional dietitians, the patient can work on both nutritional management and putting a stop to purging behaviors.<sup>43</sup> Professional dietitians help by providing counsel to help patients with their eating behaviors. They accomplish this by providing individualized meal plans and suggestions on different meals that the patient could start with, as they begin their “healing” and improvement journey.

Even though there are no notable medications that could “fix” anorexia, there are a variety of therapies that can help treat as well as manage those who are diagnosed with anorexia. For instance, in older generations, doctors used a variety of different methods/therapies that they claimed would help their patients. Unfortunately, most of these methods ended up affecting the patients even more, and would sometimes even lead to their deaths. Some of the therapies that specialists used to use include parentectomy, lobotomies, shock therapy, and neuromodulation. Parentectomy is the removal of the parents from the teen's life in order to check for any improvement in their physical and mental health. By withdrawing the parents from the teen's life the specialists hoped that the patients would improve mentally and begin eating more. Lobotomy therapy/Lobotomy is a procedure in which specialists split the white fibers of the frontal lobes to stop illnesses and make them go away.<sup>44</sup> Lobotomies have caused many controversies throughout the years and have been widely considered to be one of the craziest procedures one could get back then to try to fix their mental illnesses. It is well known that anorexia was sometimes dealt with by lobotomies. However, it is also known that lobotomies didn't have the best effects. Most of the time, lobotomies didn't work and would have serious consequences on the individual's intellect and personality.<sup>45</sup>

Shock therapy was also a common way to deal with mental and physical illnesses such as anorexia. Shock therapy is the use of electroconvulsive therapy to improve severe mental issues and their symptoms.<sup>46</sup> Shock therapy was well

known for providing rapid relief and improvements of some serious and severe mental conditions.<sup>47</sup> It was also known that, although not typically used to treat anorexia, in some cases it helped “fix” it. Finally, unlike the previous methods and therapies, neuromodulation was one of the least common practices used to treat anorexia and it was typically only used in hard-to-treat cases.<sup>48</sup> Neuromodulation is a procedure done by altering nerve activity through targeted stimuli such as shock stimulation or by the use of chemical agents.<sup>49</sup> Although sometimes not successful, it would typically alter the brain in a way that the patient's depressive and anxiety symptoms were long gone. After the procedures, it was also observed that with time, the patient's weight was restored up to 20%.

The treatments used today are family-based therapy and Psychotherapy. Family-based therapy is when family members help the patient learn healthy eating habits until the patient can get to a healthy state in their weight and get rid of the unhealthy habits.<sup>50</sup> The parents also help the child by controlling the patient's diet and what they need to eat and help them listen to their body and get them the nutrients they need. Psychotherapy is a form of therapy that helps the patient recognize the problem and helps control the patient's emotions and feelings.<sup>51</sup> This therapy helps anorexic patients learn about themselves and understand why it happens. They do this to help overcome challenges in the patient's daily life. This helps people become more confident in themselves and can help the patient get better.<sup>52</sup>

## Conclusion

The causes and effects of anorexia have a significant on society, specifically among adolescents. It is crucial to spread awareness of this disorder across America to prevent more adolescents from falling into the trap of a false reality that will cause horrible consequences. Fortunately, in recent years, there has been an emergence of new uses for existing medications such as olanzapine, traditionally used to manage schizophrenia. This research has demonstrated a potential to help manage symptoms of anorexia including an association with BMI increase and better sleep quality.<sup>15</sup> This new research has caused promising results in the treatment of anorexia which can be a big breakthrough in the management of this disorder.

## Acknowledgements

Monica Betancourt-Garcia, MD, Program Director;  
Melissa Eddy, MS, Program Manager

## Funding

Funded by DHR Health Institute for Research & Development; DHR Health; Region One ESC GEARUP College Ready, Career Set!; Region One ESC GEARUP College Now, Career Connected; Region One ESC PATHS; Region One ESC Upward Bound Math & Science; Benavides ISD; and Jubilee Academy-Brownsville

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