

Does Anorexia Nervosa Resemble an Addiction?

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Abstract: Anorexia nervosa is a severe psychiatric disorder characterized by unrelenting self-starvation and life-threatening weight loss. The relentlessness with which individuals with anorexia nervosa pursue starvation and in some cases exercise despite the negative physical, emotional, and social consequences parallels features of addictive disorders. From a clinical perspective, individuals with anorexia nervosa behave similarly to individuals with substance abuse by narrowing their behavioral repertoire so that weight loss, restricting food intake, and excessive exercise interfere with other activities in much the same way that substance abuse does. However, fundamental differences exist between anorexia nervosa and substance abuse that suggest anorexia nervosa is not an addiction in and of itself.

Keywords: Anorexia nervosa, addiction, eating disorders, reward, substance abuse.

Anorexia nervosa is a severe psychiatric disorder characterized by unrelenting self-starvation and accompanying life-threatening weight loss. Diagnostic criteria include a failure to maintain a minimal body weight, fear of gaining weight or becoming fat, disturbances in perception of shape or weight, and amenorrhea [1]. For many individuals, what begins as a typical diet spirals into an out of control cycle of maladaptive behaviors designed to facilitate weight loss. Despite what is quite often a state of severe emaciation, individuals with anorexia nervosa may deny they are too thin and continue to lower the standard for their “ideal” weight. Individuals with the restricting subtype of anorexia nervosa engage primarily in dietary restriction, while individuals with the binge eating/purging subtype engage in both dietary restriction and periods of binge eating and/or the use of inappropriate compensatory behaviors, such as self-induced vomiting, laxative and/or diuretic abuse. Many individuals transition between the two subtypes over the course of illness [2, 3], with one study reporting that more than half of individuals with the restricting subtype of anorexia nervosa crossed over to the binge eating/purging subtype and one-third gained weight and met criteria for bulimia nervosa [4].

Although excessive exercise is not currently considered a formal diagnostic criterion for anorexia nervosa, physical activity has been termed a fundamental feature of the disorder in some individuals [5, 6]. Early descriptions of anorexia nervosa describe the seemingly paradoxical role of exercise during starvation, with patients exhibiting symptoms of restlessness and disproportionate levels of activity despite being extremely emaciated (for review of case reports, see [5]). Estimates based on retrospective assessments suggest that up to 80% of individuals with anorexia nervosa have engaged in some form of excessive and/or strenuous physical activity during the course of their disorder; on cross-sectional assessment, 30-50% of patients endorsed recent “excessive” or “compulsive” engagement in

exercise behavior, or symptoms of exercise “dependence” (for review, see [7]). Individuals hospitalized for anorexia nervosa will work at a progressive ratio task to gain access to exercise and this motivation is correlated with pre-admission levels of commitment to exercise [8]. Moreover, excessive exercise in anorexia nervosa has been associated with lower minimum BMI, younger age, higher scores on anxiety, perfectionism, and eating disorder symptom measures, more obsessions and compulsions, and greater persistence [9]. Although the impact of excessive exercise on course and outcome of anorexia nervosa is not fully understood, some evidence suggests that excessive exercise worsens prognosis [10, 11].

The etiology of anorexia nervosa is unknown, is likely to be multifactorial and complex, and includes neurobiological, genetic, and environmental contributions. Cultural factors do play a role in the development of anorexia nervosa, particularly in Western culture where dieting and a drive for thinness are extremely prevalent. However, anorexia nervosa affects only 0.5%-1.0% of women in the general population despite the near-universal emphasis on dieting and weight loss. Moreover, case descriptions of anorexia nervosa date back to the middle of the 19th century when thinness was not as widely desirable, suggesting that factors other than culture are important in the pathogenesis of this disorder. Familial studies suggest that first-degree relatives of individuals with anorexia nervosa have an approximately ten-fold greater lifetime risk of having anorexia nervosa than relatives of unaffected individuals, with twin studies demonstrating that a considerable portion of observed familial aggregation is due to additive genetic factors (for review, see [12]). Moreover, core personality traits also appear to be relevant, as individuals with anorexia nervosa are frequently anxious, obsessional, and perfectionistic and display marked rigidity and over control [13-17]. High rates of comorbidity exist between anorexia nervosa and anxiety disorders, and in most cases the onset of an anxiety disorder precedes the onset of the eating disorder [18-20]. Although these anxious and obsessional traits are more pronounced during starvation, they are also present prior to the onset of illness and remain following long-term recovery, suggesting that they may increase the vulnerability to developing anorexia nervosa [21, 22].

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The course of anorexia nervosa is extremely variable, with some individuals recovering fully after a brief episode of illness whereas others have a chronic and relapsing course. Some evidence suggests a better prognosis in individuals with anorexia nervosa that endorse an earlier onset and shorter duration. Over time, approximately 50%-60% of individuals with anorexia nervosa recover, 20%-30% partially recover, and 10%-20% remain chronically ill [23, 24]. Overall, treatment strategies for anorexia nervosa are limited and pharmacological treatments in particular have had surprisingly little efficacy during the acute phase of illness or in preventing relapse (for review, see [25]). The development of effective pharmacological treatments for this illness would be enhanced if the mechanisms maintaining the abnormal behaviors characteristic of anorexia nervosa were better understood. Factors that initiate the onset of dieting may be distinct from factors that maintain self-starvation once weight loss has progressed [26]. The factors maintaining self-starvation likely include both psychological and physiological processes. While a number of neurobiological abnormalities have been identified in anorexia nervosa, the degree to which they are causal remains unclear, given that treatments aimed at correcting these abnormalities generally do not lead to significant improvement.

The relentlessness with which individuals with anorexia nervosa pursue starvation despite profound negative physical, emotional, and social consequences is similar to the maladaptive cycle seen in individuals with addiction. Comorbidity between eating disorders and substance abuse is high, with 27% of individuals with anorexia nervosa having a comorbid substance use disorder [27] and 32% of female callers to a cocaine abuse hotline having a diagnosable eating disorder [28]. In a comprehensive longitudinal study of individuals seeking treatment for eating disorders [29], 17% had a diagnosis of drug abuse and dependence, with particularly high rates for amphetamines (8%) and cocaine (7%). While individuals with the restricting subtype of anorexia nervosa have been found to engage in one third of the amount of substance abuse compared to the binge eating/purging subtype of anorexia nervosa [30], severity of caloric restriction has been found to be a significant predictor of psychostimulant use, *independent* of diagnostic eating disorder category [31]. Some evidence suggests that anorexia nervosa precedes substance use disorder, suggesting that women with anorexia nervosa may initially engage in substance use in an effort to enhance weight loss [32]. Moreover, individuals who developed an eating disorder prior to substance use disorder appear to have an earlier onset of the eating disorder with greater comorbid pathology, compared to individuals that developed substance use disorder first [33].

From a reward perspective, food restriction has been shown to increase the reinforcing effects of drugs of abuse, and this effect has been demonstrated across species, drug class, and route of administration (for review, see [34]). For example, food restriction increased the reinforcing efficacy of orally delivered cocaine in monkeys [35] and increased self-administration of amphetamine and cocaine in adult male rats [34, 36]. In studies of lateral hypothalamic self-stimulation, drugs of abuse produce a dose-dependent lowering of reward threshold; food restriction potentiated

these effects in adult male rats [37, 38]. Moreover, this effect was not due to differences in drug bioavailability or drug metabolism, as both systemic and intracerebroventricular administrations were potentiated by food restriction [37]. In conditioned place preference studies, food restriction in adult male rats increased amphetamine (at a low dose only; [39]) and cocaine induced conditioned place preference [40]. Conversely, psychostimulants are also known to have powerful suppressive effects on appetite. Thus, a maladaptive cycle may develop, wherein self-imposed food restriction increases the vulnerability to taking a psychostimulant to aid in suppressing food intake and the psychostimulant, in turn, decreases appetite, thereby resulting in greater food restriction and weight loss.

The high rate of comorbidity between anorexia nervosa and substance abuse, and the ability of food restriction and drugs of abuse to modulate the reinforcing effects of each other, raises the question of whether anorexia nervosa resembles an addiction. Both anorexia nervosa and substance abuse commonly begin during adolescence, a period of vulnerability for the development of addictive behaviors, and often begin as a conscious decision to engage in a behavior (i.e., consume a drug or go on a diet). Over time individuals report an unrelenting and uncontrollable drive to pursue the maladaptive behavior. Individuals with anorexia nervosa behave similarly to individuals with substance abuse by narrowing their behavioral repertoire so that weight loss, restricting food intake, and excessive exercise interfere with other activities. This is reminiscent of individuals with addiction, who forgo many activities and responsibilities for the sake of seeking out and consuming drugs of abuse. Moreover, individuals with anorexia nervosa often engage in dietary restriction as a mechanism for modulating anxiety and dysphoric mood, in much the same way individuals with substance abuse modulate mood with drug use. When food intake in anorexia nervosa does occur, anxiety increases in a similar manner to anxiety often reported during periods of drug abstinence, e.g. withdrawal.

Despite these similarities, there are critical differences between anorexia nervosa and addiction. While the main goal of an individual with substance abuse is to pursue the immediate effects of the drug on mood and/or behavior, the goals of an individual with anorexia nervosa are both immediate and long-term. The immediate effects of dieting produce feelings of hunger that may produce a false sense of control over one's body, and thereby a sense of control over one's life. The long-term effects of dieting and starvation produce sustained weight loss and thinness which take on an irrationally important value. The cultural consequences for thinness are far different than the consequences for intoxication from alcohol or the consequences for paranoia and psychosis from drugs of abuse. In western culture, dieting and a drive for thinness are endorsed, thus rewarded, by a significant majority of women, and it is not uncommon for individuals with anorexia nervosa to receive positive reinforcement for their weight loss and dieting behaviors. In contrast, while social alcohol use is widely accepted across cultures, drug abuse and alcohol abuse and attendant misbehavior are not and therefore do not provide the same level of societal acceptance obtained from dieting and thinness. Relatedly, many individuals with anorexia nervosa express persistent pleasure in their ability to maintain an

inappropriately low weight, and are expressly ambivalent about gaining weight. Individuals with drug addiction more frequently acknowledge a desire to stop abusing drugs, but have trouble avoiding relapse.

Finally, in considering whether anorexia nervosa is “an addiction”, one must consider what these individuals might be addicted to. In traditional terms, drug addiction has been associated with physical or psychological dependence on a psychoactive substance that produces reliable and rapid changes in brain chemistry. In anorexia nervosa, however, there is no substance of abuse; in fact, many individuals report emotional reward from the *absence* of food intake, the effects of which are prolonged, not acute. One possible theory that arises is whether individuals with anorexia nervosa are “addicted” to the sensation of controlling hunger, and that this hunger serves as a mediator for continued weight loss. Thus, excessive self-control in the ability to ignore hunger may somehow have become reinforcing. Drugs of abuse cause a noticeable abrupt change in subjective effects that at most last several hours without additional dosing. The parallel to a long-term feeling of hunger is difficult to draw. When drug users are not actively taking drugs, they are often preoccupied, looking forward to their next bout of drug use, such that they are using drugs or planning to use drugs most of the time. The individual with anorexia nervosa spends prolonged periods *not* eating and obsessing about *not* eating which in some ways parallels the obsession seen in drug users in the absence of acute intoxication. However, individuals with anorexia nervosa are also preoccupied with food, and often pursue careers related to nutrition; they are drawn intensely to a substance, food, whose consumption they avoid. The excessive exercise observed in some individuals with anorexia nervosa may more closely resemble the pattern of drug use among substance abusers in that exercise, like drug use, is a behavior with a clear onset that may produce a rapid change in psychological state. It is also conceivable that weight loss produces alterations in the reward system resembling effects produced by drugs of abuse somehow making weight loss and/or starvation rewarding, however more research is needed to confirm this hypothesis. Why such a phenomenon would occur in individuals with anorexia nervosa, but not in normal individuals who find starvation aversive is far from clear. It is clearly very difficult to understand the notable similarities between anorexia nervosa and addictions without greater clarity about the complex disturbances in the processing of rewards that characterize this illness.

Future Research Questions:

- Individuals with anorexia nervosa behave similarly to individuals with substance abuse by narrowing their behavioral repertoire so that weight loss, restricting food intake, and excessive exercise interfere with other activities. Future research should determine whether weight loss produces alterations in the reward system resembling the effects produced by drugs of abuse, thereby making weight loss and/or starvation rewarding.
- One possible theory related to anorexia nervosa and addiction is that individuals with anorexia nervosa are “addicted” to the sensation of controlling hunger, and that this hunger serves as a mediator for continued weight loss. Future research should determine how excessive self-control in the ability to ignore hunger becomes reinforcing in these individuals.

Key Learning Objectives:

- The relentlessness with which individuals with anorexia nervosa pursue starvation despite profound negative physical, emotional, and social consequences is similar to the maladaptive cycle seen in individuals with addiction. However, fundamental differences exist between anorexia nervosa and substance abuse that suggest anorexia nervosa is not an addiction in and of itself.
- In considering whether anorexia nervosa is “an addiction”, one must consider what these individuals might be addicted to. In traditional terms, drug addiction has been associated with physical or psychological dependence on a psychoactive substance that produces reliable and rapid changes in brain chemistry. In anorexia nervosa, however, there is no substance of abuse; in fact, many individuals report emotional reward from the *absence* of food intake, the effects of which are prolonged, not acute.

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