

The Role of Food Addiction in Clinical Research

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Abstract: Recent research has uncovered neurobiological and behavioral similarities between substance dependence and excess consumption of highly processed foods. These findings have led to the theory that food addiction may play a role in obesity and disordered eating. The inclusion of validated food addiction measures in clinical research, such as the Yale Food Addiction Scale, will add to the understanding of the clinical utility of this concept. Further exploring the food-addiction construct may also lead to a better clinical understanding of obesity and eating disorders and suggest future avenues for more effectively treating these problems.

Keywords: Food addiction, obesity, binge eating disorder, substance dependence.

INTRODUCTION

Despite increased clinical and research efforts, obesity rates continue to rise and obesity-related disease may soon become the number one leading cause of preventable death in the United States [1]. Although obesity treatments can be effective in helping people lose weight in the short term, most people regain the lost weight in the long term [2]. Recent findings have suggested that obesity may parallel another type of chronically relapsing problem, substance dependence¹. Applying an addiction framework to obesity may lead to the incorporation of addiction-focused psychological and pharmacological treatments, which could enhance the effectiveness of current weight-loss treatments. To assess the usefulness of the addiction perspective, it will be necessary to examine the clinical utility of the addiction construct for clinical research of eating-related problems. In the remainder of this paper, we will briefly discuss 1) the current evidence linking excess food consumption and substance dependence 2) the development and validity of the Yale Food Addiction Scale and 3) the potential clinical implications of applying a food addiction perspective to eating-related problems including obesity.

PARALLELS BETWEEN EXCESS FOOD CONSUMPTION AND SUBSTANCE DEPENDENCE

Excess food consumption and substance dependence share both neurobiological and behavioral features. Rats given a diet of processed foods (e.g., cheesecake, bacon) exhibit changes in the mesolimbic dopamine system that are implicated in addiction, such as reduced dopamine D2 receptors [3]. Moreover, these rats will continue to seek out processed foods despite negative consequences (i.e., electric shocks), which is another hallmark of addiction [3]. "Sugar-addicted" rats also display signs of withdrawal and tolerance, as well as cross sensitization to other drugs (e.g., amphetamines) [4]. In humans, similar patterns of neural activation are related to the consumption of palatable foods and drugs of abuse [5,6], as well as cravings for both foods and drugs [7,8]. With respect to clinically significant eating-related problems, obesity (like substance dependence) is associated with reduced dopamine D2 receptors in the mesolimbic system [9], and a number of behavioral symptoms of substance dependence are also common among individuals with binge eating disorder (BED), like continued use

despite negative consequences and loss of control over consumption [10]. These similarities have led to the theory that highly processed foods may be capable of triggering an addictive process that contributes to compulsive eating behavior [6, 11, 12]. Although the parallels in neurobiological responses and behavioral symptoms of substance dependence and eating-related problems are intriguing, these findings do not provide direct support for an addictive process involved in excess food consumption.

DEVELOPMENT OF THE YALE FOOD ADDICTION SCALE

A more precise way to identify addictive-like eating behavior involves the application of diagnostic criteria developed for substance dependence to food consumption. Substance dependence is currently diagnosed when three or more symptoms are met within a 12-month period and clinically significant impairment or distress is present (See Table 1) [13]. Recently, the Yale Food Addiction Scale (YFAS) was developed to operationalize the construct of food addiction by applying the Diagnostic and Statistical Manual of Mental Disorders IV-Text Revision (DSM IV-TR) criteria for substance dependence to the consumption of foods implicated in previous research on food addiction (high-fat and high-sugar foods) [14]. The YFAS provides two scoring options: 1) a dichotomous food addiction "diagnosis" based upon the criteria for a substance dependence diagnosis (i.e., three or more symptoms plus clinically significant impairment or distress) and 2) a continuous "symptom" count that ranges from 0 to 7 symptoms (not including impairment or distress). In the preliminary validation of the YFAS, both versions of the measure exhibited adequate reliability, as well as convergent validity with other measures of eating pathology and discriminant validity relative to measures of alcohol use and impulsivity. Further, both versions of the YFAS accounted for unique variability in binge eating behavior above and beyond other measures of eating pathology [14]. A recent study found that higher YFAS scores were associated with increased activation in the anterior cingulate cortex, medial orbitofrontal cortex, amygdala, dorsolateral prefrontal cortex, and caudate in response to food-related cues and reduced activation in the lateral orbitofrontal cortex in response to palatable food consumption [15]. These same brain regions have also been implicated in reactivity to drug-related cues and drugs consumption [15], providing further support for the validity of the YFAS.

IMPLICATION FOR CLINICAL RESEARCH

Although the initial findings surrounding the validity of both the YFAS and the food addiction construct are promising, many important questions remain. The inclusion of the YFAS, or other

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¹In the current study, the terms substance dependence and addiction will both be used to refer to a substance dependence diagnosis as defined in the Diagnostic and Statistical Manual of Psychiatric Disorders IV-Text Revision.

Table 1. Diagnostic Criteria for Substance Dependence as Stated by the DSM-IV-TR^a

1. Tolerance, as defined by either of the following: a) The need for markedly increased amounts of the substance to achieve intoxication or desired effect. b) Markedly diminished effect with continued use of the same amount of the substance.
2. Withdrawal, as manifested by either of the following: a) The characteristic withdrawal syndrome for the substance. b) The same (or closely related) substance is taken to relieve or avoid withdrawal symptoms.
3. Taking the substance often in larger amounts or over a longer period than was intended.
4. There is a persistent desire or unsuccessful effort to cut down or control substance use.
5. Spending a great deal of time in activities necessary to obtain or use the substance or to recover from its effects.
6. Giving up social, occupational, or recreational activities because of substance use.
7. Continuing the substance use with the knowledge that it is causing or exacerbating a persistent or recurrent physical or psychological problem.

^aPlease see reference [13]

measures of addictive-like eating behavior in samples of obese individuals and those suffering from eating disorders will be crucial to establishing the clinical utility of the food addiction construct. Although we believe that food addiction is likely to be highly prevalent within obese samples, it is not our suggestion that obesity is solely or primarily a result of food addiction. Obesity is a heterogeneous disorder that has been linked to diverse causes including thyroid dysfunction and lack of physical activity [16]. Further, even when obesity is caused by overconsumption of high-calorie foods, heavy use is not equivalent to addiction. Alcohol use provides an illustrative example. Although 40% of college students binge drink [17], only 6% meet the full-criteria for substance dependence [18]. Thus, assuming that all obese individuals are addicted to high-calorie foods would likely result in an over-identification of food addiction. Similarly, one should not assume that all individuals suffering from food addiction will be obese. Individuals exhibiting addictive-like patterns of eating may also engage in compensatory behaviors (e.g., periods of dietary restrictions, excessive exercising) to keep their body mass index (BMI) within a normal range. Thus, relying solely on BMI as an indicator of food addiction may lead to under-identification of addictive-like eating behavior.

Although there may be considerable comorbidity between food addiction and bulimia nervosa (BN), a major significant concern regarding food addiction is the potential overlap with BED. Substance dependence and BED share many of the same criteria, including loss of control, continued use despite negative consequences, and an inability to cut down on consumption [19], and BED has also been implicated in obesity [20]. Given this overlap, it is possible that assessment of food addiction will not provide any incremental validity in understanding clinically significant eating-related problems. Alternatively, food addiction may be associated with specific subtypes within samples of individuals with eating disorders. Current research suggests that there may be two subtypes of individuals with BED: 1) pure dietary binge eaters that binge in response to dietary restraint and 2) mixed dietary-negative affect

binge eaters who exhibit binge eating in response to both dietary restraint and mood disturbances [21, 22]. It is possible that separate mechanisms may be driving binge eating for these different subtypes. Whereas pure dietary binge eaters may be triggered by rigid food rules, mixed dietary-negative affect binge eaters may be driven more by an addictive process. Thus, mixed dietary-negative affect binge eaters may be more likely to exhibit attributes associated with substance dependence (e.g., impulsivity) [23], or experience elevated food cravings in response to stress or distressing emotions.

The food addiction criteria assessed by the YFAS may also capture clinically significant pathology that would not typically receive an eating disorder diagnosis or would be classified as an eating disorder not otherwise specified (EDNOS). A binge eating episode as defined in a diagnosis of BED involves consumption of a large amount of food occurring within a discrete period of time [13]. Therefore, chronic overeating that occurs during a longer period of time would not fall under a BED diagnosis. In contrast, a substance dependence diagnosis does not provide any specific time requirements in defining problematic use [13]. Thus, someone may be given a diagnosis of alcohol dependence regardless of whether they binge drink in a short period of time or drink large volumes of alcohol over the course of the day. Individuals classified with EDNOS due to failure to meet the time requirements for binge episodes might nonetheless meet the criteria for food addiction. Thus, the assessment of food addiction may be useful in identifying previously unclassified or unspecified eating pathology. Moreover, food addiction may predict risk for weight gain above and beyond eating disorder diagnoses by assessing constructs that are not typically measured in disordered eating, such as withdrawal and tolerance. The development of withdrawal and tolerance is associated with an increased risk of problematic use in substance dependence [24,25]. Exploration of tolerance and withdrawal to highly palatable foods in humans is just beginning, but 13.5% and 16.3% of participants met criteria for tolerance and withdrawal, respectively, based on the preliminary validation of the YFAS. Like substance dependence, the development of withdrawal and tolerance to highly palatable foods may encourage overconsumption and weight gain in some individuals.

If food addiction as measured by the YFAS does prove useful in identifying a subset of obese individuals and individuals with eating disorders who suffer from an addictive process, this information may be useful in predicting treatment outcomes including resistance to current treatments and likelihood of relapse. The inclusion of food addiction assessments in clinical research may also allow participants to be matched more effectively with treatments. Another important consideration is the application of abstinence-focused approaches to disordered eating. Achieving and maintaining abstinence is a primary goal for many substance-dependence treatments and 12-step approaches (e.g., Overeaters Anonymous) apply this rationale to problematic eating by encouraging members to abstain from trigger foods. However, elevated dietary restraint is implicated in the development of eating disorders [26], thus abstinence-based approaches to overeating may exacerbate disordered eating. However, many substance dependence treatment approaches do not require abstinence and may prove especially beneficial for individuals with addictive-like eating behavior, such as motivational interviewing, relapse prevention, cue-exposure and response-prevention paradigms. From a research perspective, incorporation of an addiction framework may lead to new directions including studies examining the effects of food consumption on the body, brain, and mind of at-risk individuals. Such studies might improve our understanding of neurobiological mechanisms that contribute to excess food consumption, and might ultimately lead to the development of new pharmacotherapies targeting obesity and eating disorders.

SUMMARY

In sum, recent findings have uncovered neurobiological and behavioral parallels between substance dependence and excess consumption of highly palatable foods. Studies of clinical populations (e.g. obese and eating disordered samples) that assess addictive-like eating behaviors using validated measures like the YFAS may lead to an improved understanding of the overlap between substance dependence and eating-related problems. In addition, the evaluation of the food-addiction construct may result in a better clinical understanding of obesity and eating disorders, and suggest future avenues for the development of effective treatments for addressing these problems.

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