INTRODUCTION

The assumption that certain foods or nutrients such as sugar can be addictive is widely held in the general population. In studies from the United Kingdom, more than 90% of participants thought that some people are addicted to certain foods and about 25% indicated that they perceived themselves as being “food addicted.” These self-perceptions, however, seem to be easily influenced by media reports: when the researchers provided participants with a bogus newspaper article that claimed that “food addiction is real,” more than 50% indicated that they perceived themselves to be addicted to some foods.

Given the widespread availability of and easy accessibility to processed, high-calorie foods, and the high prevalence rates of obesity in the past decades, many people (including scientists) assume that a potential addiction to certain foods is a phenomenon of the 21st century. In actuality, the first scientific papers that introduced an addiction perspective on eating even date back to the end of the 19th and the beginning of the 20th century. Nevertheless, both media reports about and scientific investigations of “food addiction” have risen sharply in the past 5–10 years.

The reasons for this interest in the topic can be found in the apparent parallels between substance use and overeating. For example, substance use is often preceded by a strong desire to consume the substance. Such cravings can be found for both drugs of abuse (e.g., alcohol, tobacco, caffeine, illegal drugs) and foods (including nonalcoholic beverages), and it appears that behavioral aspects as well as cognitive and neural mechanisms of craving experiences are largely similar across different substances (including food). Other parallels between substance use and overeating include loss of control over consumption and unsuccessful attempts to reduce consumption. However, these are not the only symptoms of addictive behavior. Therefore, it is inevitable to address the scientific definitions of addiction to be able to evaluate the concept of “food addiction” properly.

DEFINITIONS OF ADDICTION

According to the American Society of Addiction Medicine, addiction is a primary, chronic disease of brain reward, motivation, memory, and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social, and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors. It is characterized by inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one’s behaviors and interpersonal relationships, and a dysfunctional emotional response. Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment or engagement in recovery activities, addiction is progressive and can result in disability or premature death (www.asam.org/quality-practice/definition-of-addiction).

Similar (but not equivalent) to this definition, the current version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) specifies 11 symptoms of substance use disorder:

1. Taking the substance in larger amounts or over a longer period than intended
2. Having a desire or unsuccessful efforts to cut down or control substance use
3. Spending much time to obtain or use the substance or recover from its effects
4. Having substance cravings
5. Failing to fulfill major role obligations because of substance use

6. Tolerance
7. Withdrawal
8. Cravings
9. Continuing use despite harm
10. Substance use in increasing amounts
11. Persistent desire or unsuccessful efforts to cut down or control substance use
6. Continuing substance use despite social or interpersonal problems
7. Reducing important activities because of substance use
8. Using the substance in situations that can be physically hazardous
9. Continuing substance use despite physical or psychological problems
10. Developing tolerance to the effects of the substance
11. Having withdrawal symptoms after cessation of substance use

In addition, gambling disorder has been included in DSM-5 as a non–substance-related, addictive disorder. Given this inclusion of both substance-related and behavioral addictions in DSM-5, it has also been suggested that when considering overeating from an addiction perspective, a conceptualization as “eating addiction” (in terms of a behavioral addiction) may be more appropriate than a conceptualization as “food addiction” (in terms of a substance-related disorder).

MEASURING ADDICTION-LIKE EATING IN HUMANS
Several approaches have been developed to assess “food addiction” or “eating addiction” in humans. These are based on self-identification of addiction-like eating with single questions, interview techniques, and standardized questionnaires (Table 16.1). The great majority of studies has used the Yale Food Addiction Scale (YFAS), which was originally designed by “translating” the seven symptoms of substance dependence in DSM-IV to refer to food and eating. Because of the changes made to the diagnostic criteria for substance use disorder in DSM-5, a revised version (YFAS 2.0) has been developed that aims to assess 11 symptoms of “food addiction.” Two items assess a clinically significant impairment or distress because of one’s eating behavior. These questions are crucial for calculation of a diagnostic score of “food addiction”: individuals are only classified as “food addicted” when they endorse at least 2 of the 11 symptoms and meet the impairment/distress criterion.

“FOOD ADDICTION” AND OBESITY
“Food addiction” as measured with the YFAS relates to higher body mass index (BMI). In nonobese adults, prevalence rates of “food addiction” range between 5% and 15%. Two studies that used a child version of the YFAS in children and adolescents reported prevalence rates between 3% and 7%. In obese adults, prevalence rates range between 15% and 20% but reach up to 30%–50% in treatment-seeking adults with extreme obesity. Similarly, 38% of obese adolescents recruited at the beginning of an in-patient weight-loss program were classified as “food addicted.” Therefore, although a relationship between “food addiction” and body weight exists, neither can obesity be equated with “food addiction” nor is “food addiction” restricted to individuals with obesity.

“FOOD ADDICTION” AND EATING DISORDERS
Prevalence rates of “food addiction” in adults with binge eating disorder range between 40% and 50% and are even more than 80% in adults with bulimia nervosa. There is also a moderate overlap between YFAS scores and night eating severity. Surprisingly, a substantial number of adolescents and adults with restrictive anorexia nervosa also meet the YFAS criteria, which may be due to the fact that these individuals interpret items differently and, thus, the scale may be not valid in this population. In conclusion, although there is a relatively weak—but positive—association between “food addiction” as measured with the YFAS and BMI, it appears that there is a much larger overlap between “food addiction” and eating disorders.

IMPLICATIONS AND CONTROVERSIES
Adopting an addiction perspective on eating disorders and obesity has practical implications that include nosology, prevention, and therapy of these disorders. For example, some advocates of the concept argue that “food addiction” is a condition that is distinct from established eating disorders and, thus, should be included as an addictive disorder in diagnostic classification systems. Obesity prevention approaches may be inspired by tobacco control policies. Similar to groups such as Overeaters Anonymous that incorporate an addiction framework, cognitive-behavioral treatments for obesity, or eating disorders such as bulimia nervosa may be adjusted accordingly. Finally, pharmacological approaches inspired by addiction treatments have also been proposed.
Adversaries of the “food addiction” concept, however, have criticized these suggestions. While some of the critiques refer to potential adverse effects of creating a “new” disorder, others refer to the lack of validity of the concept as a whole or that it is simply not necessary.

Table 16.2 presents some of the controversies that are discussed in the “food addiction” field. As a detailed discussion of arguments raised by both sides is beyond the scope of this chapter, readers are referred to the extensive literature on this topic.\(^9,28–36\)

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**TABLE 16.1**
Approaches to Measure “Food Addiction” or “Eating Addiction” in Humans

<table>
<thead>
<tr>
<th>Types</th>
<th>Descriptions</th>
<th>References</th>
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<tbody>
<tr>
<td>INTERVIEWS</td>
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<tr>
<td>Semistructured interview</td>
<td>Themes (e.g., the 11 diagnostic criteria for substance use disorder in DSM-5) mentioned in semistructured interviews on how participants experienced their over- or binge eating were analyzed</td>
<td>Curtis and Davis(^{37})</td>
</tr>
<tr>
<td>Structured interview</td>
<td>The substance dependence module of the Structured Clinical Interview for DSM-IV Axis I Disorders was modified with the term substance referring to binge eating</td>
<td>Cassin and von Ranson(^{38})</td>
</tr>
<tr>
<td>QUESTIONNAIRES</td>
<td></td>
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<tr>
<td>Addiction-like Eating Behaviour Scale</td>
<td>15-item questionnaire that conceptualizes addiction-like eating behavior as a behavioral (i.e., not substance-related) addiction</td>
<td>Ruddock et al.(^{39})</td>
</tr>
<tr>
<td>Eating Addiction Questionnaire</td>
<td>22-item questionnaire that conceptualizes addiction-like eating behavior as a behavioral (i.e., not substance-related) addiction</td>
<td>von Ranson(^{40})</td>
</tr>
<tr>
<td>Eating Behaviors Questionnaire</td>
<td>20-item questionnaire that conceptualizes addiction-like eating behavior as a substance-related addiction based on the seven diagnostic criteria for substance dependence in DSM-IV; a child and an adult version are available</td>
<td>Merlo et al.(^{41})</td>
</tr>
<tr>
<td>Yale Food Addiction Scale</td>
<td>25-item questionnaire that conceptualizes addiction-like eating behavior as a substance-related addiction based on the seven diagnostic criteria for substance dependence in DSM-IV; a 9-item short version and a 25-item child version are also available</td>
<td>Gearhardt et al.(^{10})</td>
</tr>
<tr>
<td>Yale Food Addiction Scale 2.0</td>
<td>35-item questionnaire that conceptualizes addiction-like eating behavior as a substance-related addiction based on the 11 diagnostic criteria for substance use disorder in DSM-5; a 13-item short version is also available</td>
<td>Gearhardt et al.(^{11})</td>
</tr>
<tr>
<td>SELF-IDENTIFICATION</td>
<td></td>
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<tr>
<td>Single question</td>
<td>For example, “Are you a chocolate addict?”,” “Do you agree with the following statement: ‘I believe to be a food addict?’”, or “Do you feel that you are addicted to some foods?”</td>
<td>Hetherington and Macdiarmid(^{44})</td>
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</table>

\(DSM\), Diagnostic and Statistical Manual of Mental Disorders.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Proponents’ View</th>
<th>Opponents’ View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>“Food addiction” can be defined and assessed by “translating” existing diagnostic criteria for substance use disorder to refer to food and eating. “Food addiction” refers to processed, high-caloric foods, and thus, these foods can be avoided in exchange for healthy, low-caloric foods. People usually crave and overconsume palatable, high-fat, and/or high-sugar foods (and not low-caloric, bland foods), and thus, “food addiction” is substance-related and not merely behavioral. There is a large overlap between “food addiction” and problematic eating behaviors such as binge eating, which supports convergent validity of the “food addiction” concept.</td>
<td>The category of (processed, high-calorie) foods is too broad, and there is disagreement over the exact “translation” of symptoms or whether this procedure is valid in the first place. Eating food is necessary for survival, and thus, abstinence is not possible. As the addiction potential of each drug of abuse can be traced back to a specific, single substance (e.g., ethanol, nicotine, tetrahydrocannabinol), “food addiction” cannot be a substance-related disorder (but maybe a behavioral addiction). There is a large overlap between “food addiction” and problematic eating behaviors such as binge eating, which shows that the “food addiction” concept is not sufficiently different from existing conditions and, thus, does not warrant classification as a distinctive disease phenotype.</td>
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<tr>
<td>Animal models</td>
<td>Animal models support an addictive response to sugar.</td>
<td>The methods applied in animal models create an artificial eating schedule that is not representative of human eating behavior.</td>
</tr>
<tr>
<td>Neurobiology</td>
<td>Reward-related brain mechanisms in response to substance use and food consumption are very similar, which supports the “food addiction” model. Effects of different drugs of abuse are not uniform (e.g., there is no intoxication syndrome described for tobacco in DSM-5), which means that certain foods can be addictive although they are not intoxicating.</td>
<td>Reward-related brain mechanisms in response to substance use and food consumption are overlapping, but a close examination also reveals substantial differences. Foods are not intoxicating, which means they cannot be addictive.</td>
</tr>
<tr>
<td>Implications</td>
<td>“Food addiction” should be included as an addictive disorder in diagnostic classification systems. Obese individuals find the “food addiction” concept helpful, and the focus on addictive foods decreases self-blame and the stigma of personal failure. The “food addiction” model implies adopting an addiction perspective on eating disorder and obesity treatment, which includes that potentially addictive foods should be abandoned from one’s diet. When certain foods can have an addiction potential, public policy actions need to be taken, which may be inspired by tobacco control regulations.</td>
<td>Changes in the diagnostic criteria for eating disorders in DSM-5 reduced the number of EDNOS diagnoses, and most individuals that are classified as “food addicted” are already covered by the diagnostic criteria for full or low-frequency bulimia nervosa and binge eating disorder. The “food addiction” concept distracts attention away from the significant role of exercise for weight loss and maintenance and may create a new stigma. Success rates of cognitive–behavioral therapy for bulimia nervosa and binge eating disorder are high, and its goal is to achieve a flexible, balanced, and moderate food consumption with no forbidden foods. As only a subset of obese individuals show an addiction-like eating behavior, an addiction framework would be inappropriate for the majority of obese individuals. The “food addiction” concept is not necessary to justify such efforts, and the food industry may present “food addiction” as a rare disorder that does not warrant policy changes to influence the general public’s eating.</td>
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</table>

*DSM*, Diagnostic and Statistical Manual of Mental Disorders; *EDNOS*, Eating Disorder Not Otherwise Specified.
CONCLUSIONS
In contrast to popular beliefs, “food addiction” is not a new idea that was invented in recent years to explain rising prevalence rates of obesity. Instead, an addiction perspective on eating disorders and obesity has been controversially discussed for many decades. Only a subset of obese individuals show an addiction-like eating behavior, and thus, the obesity pandemic cannot be explained by addiction-like eating or addictive foods. On the contrary, many individuals with binge eating meet the proposed “food addiction” criteria, and thus, addiction-like eating appears to be primarily related to eating pathology and only secondarily related to body weight. Although progress in this field has been made by developing measures in an effort to standardize and guide further investigations, researchers are nowhere near to find a consensus about a proper definition of or even about a name for addiction-like eating (e.g., “food addiction,” “eating addiction,” “food use disorder”), the validity of the concept, or its usefulness and practical implications. Whether or not researchers will someday agree on a unified definition of addiction-like eating and if “food addiction is real,” providing an addiction framework in the prevention and treatment of eating disorders and obesity will likely be helpful in some instances but will be unnecessary or even counterproductive in others. Hopefully, future studies will reveal for which aspects or for whom this is the case.

REFERENCES