A comprehensive model of food addiction in patients with binge-eating symptomatology: The essential role of negative urgency

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Abstract

Background: Food addiction has been widely researched in past years. However, there is a debate on the mechanisms underlying addictive eating and a better understanding of the processes associated to these behaviors is needed. Previous studies have found characteristic psychological correlates of food addiction, such as high negative urgency, emotion regulation difficulties and low self-directedness, in different samples of adults with addictive eating patterns. Still, it seems difficult to disentangle effects independent from general eating disorder psychopathology. Therefore, this study aimed to test a comprehensive model under control of eating disorder severity, in order to find independent predictors of food addiction.
Methods: 315 patients with eating disorder diagnoses on the binge-eating spectrum were assessed in personality, emotion regulation, negative urgency, eating disorder symptomatology, and food addiction by self-report. Hypothesis-driven structural equation modeling was conducted to test the comprehensive model.
Results: The only independent predictor found for food addiction was negative urgency, while self-directedness and emotion regulation predicted negative urgency and were highly related to eating disorder symptomatology, but not to food addiction.
Conclusions: Altogether the model suggests that low self-directedness and difficulties in emotion regulation are related to higher eating disorder symptomatology in general. Those patients who, in addition to these traits, tend to act impulsively when in negative mood states, are at risk for developing addictive eating patterns. Urgency-based treatments are therefore recommended for this subgroup of patients.
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1. Introduction

In the modern world, food is omnipresent, which for some individuals is associated to difficulties with regard to the regulation of food intake. This is especially the case for

products which are highly processed, high in sugar and/or fat content, and therefore potentially addictive [1,2]. Increased consumption of rewarding food can lead to increased compulsive intake associated with a loss of its hedonic properties [3,4]; this type of eating behavior has been referred to as "food addiction" (FA) [5,6]. FA can lead to becoming overweight and is associated not only with obesity, but also with eating disorders (EDs), especially binge-eating disorder (BED) and bulimia nervosa (BN), but possibly also binge-eating behavior in patients diagnosed with Other Specified Feeding or Eating Disorders (OSFEDs) [4,7–9]. Excess weight, in turn, is associated with cardiovascular disease, cancer, and diabetes [10]. Therefore, research into addictive eating patterns is important and a better understanding of the processes underlying these behaviors would be helpful in improving prevention programs and treatments for obesity and ED.

As former research has shown, FA is related to high negative urgency (defined as the urge to act rashly under the

influence of negative emotions), low self-directedness (defined as self-confidence and capacity to direct behavior to long-term goals) and difficulties in emotion regulation in people with [9] and without [11,12] a diagnosis of ED. Furthermore, the relationship between self-directedness and eating disorder psychopathology has been shown to be moderated by emotion regulation difficulties [13].

There is a growing body of literature that recognizes the importance of FA; however, until now there is no comprehensive model testing the interplay of personality and emotion related factors in addictive eating behaviors. Furthermore, it seems important to find psychological correlates of FA and to identify possible specificities of ED patients scoring high in FA, since it is possible that FA and binge-eating might represent two sides of the same coin and almost all patients with BN receive a "diagnosis" of FA according to the commonly used self-report Yale Food Addiction Scale [7,14,15]. In order to conclude if FA significantly differs from DSM-categorized EDs, or if it might be better placed on the far end of a continuum from homeostatic eating to severe binge-eating [4,16,17], further understanding is needed.

Therefore, the objectives of the current study were to test a comprehensive model of FA and related constructs, while controlling for ED severity and other potential cofounders such as sex, age, and ED duration. Starting from the theoretical background which indicates specific correlates of FA [9,11–13], a hypothesis-driven model was established and then tested through confirmatory structural equation modeling. Firstly, from the results of a former study, it was inferred that low scores in the personality trait self-directedness would predispose subjects to higher scores on FA [9]. Secondly, it was expected from further studies, that higher negative urgency [9,11,12] and more difficulties in emotion regulation [12,18,19] would predict higher FA scores. Emotion regulation difficulties and negative urgency were expected to be highly interrelated [12], wherefore these two predictors were included into the model on the same predictive level.

Thirdly, self-directedness was expected to additionally have an indirect effect on FA through its influence on negative urgency and difficulties in emotion regulation. With regard to difficulties in emotion regulation, it has been shown in a former study that the influence of self-directedness on disordered eating was partly mediated by difficulties in emotion regulation [13]. As for negative urgency, there is not much research with regard to the cause-and-effect relation between self-directedness and negative urgency and both have greatly heritable components [20,21]; however, there were some theoretical considerations which led to the inclusion of self-directedness as a predictor of both negative urgency and difficulties in emotion regulation. Self-directedness is a broadly defined personality concept, which is described as the ability of an individual to act purposefully and to adapt behavior towards long-term goals and values [22], while negative urgency refers to a more specific behavior, i.e. rash action under negative emotional states. Thereby, it is assumed

that not perceiving oneself as an integrated individual, not taking responsibility for one's actions and having difficulties to focus on long-term goals (low self-directedness) increase the likelihood of finding difficulties to endure negative emotional states and to control impulses under distress and thus enhance the likelihood of acting on the current, precipitating need instead of using some strategy to regulate the emotion and direct behavior towards long-term goals. That is to say, low self-directedness in this model leads to more difficulties to regulate emotions and to enhanced proneness to negative-emotion-based rash action (negative urgency), which on the other hand leads to an increased risk of engaging in potentially harmful and addictive behaviors (FA). Negative urgency was furthermore shown to be a mediator between neuroticism and addictive behaviors [23], and there is a substantial overlap between neuroticism and self-directedness [24], wherefore a similar relation can be expected here. Negative urgency has also been shown as an important moderator between emotional instable personality traits and psychopathology in general and alcohol use in specific [25,26]. For these reasons, negative urgency was included as an intervening variable between self-directedness and FA/ED symptomatology, on the same level with difficulties in emotion regulation. A graphical representation of the proposed model including formerly found correlation coefficients is available in the supplementary material (Fig. S1).

2. Methods

2.1. Participants

A total of 315 patients (292 females, 23 males) were recruited for study participation as consecutive referrals from the ED Unit of the Department for Psychiatry at Bellvitge University Hospital during a time period from September 2013 to May 2016. All patients meeting BN ($n = 176$) or BED ($n = 61$) diagnostic criteria, and OSFED patients with binge-eating symptomatology ($n = 78$) were included into the study. Patients were diagnosed according to the criteria of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [27], by means of a face-to-face, semistructured interview. See Table 1 for sociodemographic information and clinical characteristics of the total sample (Table S1 contains detailed descriptive statistics for each diagnostic subtype group).

2.2. Assessment

Internal consistency for all the measures analyzed in this study was between very good ($\alpha = .81$ for the UPPS-P negative urgency scale) to excellent ($\alpha = .95$ for EDI-2-total scale) (Table S1 contains the α-values for each scale).

The *Yale Food Addiction Scale* (YFAS-S) [28] is a self-report measure with 25 item, which are assigned to seven scales, referring to the DSM-IV [29] criteria for substance dependence: (1) tolerance, (2) withdrawal, (3)