

Food addiction and bulimia nervosa: new data based on the Yale Food Addiction Scale 2.0

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## Abstract

Previous research on “food addiction” as measured with the *Yale Food Addiction Scale* (YFAS) showed a large overlap between addiction-like eating and bulimia nervosa. Most recently, a revised version of the YFAS has been developed according to the changes made in the diagnostic criteria for substance use disorder in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5). The current study examined prevalence and correlates of the YFAS2.0 in individuals with bulimia ( $n = 115$ ) and controls ( $n = 341$ ). Ninety-six percent of participants with bulimia and 14% of controls received a YFAS diagnosis. A higher number of YFAS2.0 symptoms was associated with lower interoceptive awareness, higher depressiveness, and higher impulsivity in both groups. However, a higher number of YFAS2.0 symptoms was associated with higher body mass and weight suppression in controls only and not in bulimic participants. The current study is the first to show a large overlap between bulimia and “food addiction” as measured with the YFAS2.0, replicating and extending findings from studies, which used the previous version of the YFAS. Compensatory weight control behaviors in individuals with bulimia likely alleviate the association between addiction-like eating and higher body mass. Thus, the large overlap between bulimia and “food addiction” should be taken into consideration when examining the role of addiction-like eating in weight gain and obesity.

## Keywords

Food addiction; Yale Food Addiction Scale; Bulimia nervosa; Eating Disorder Diagnostic Scale; Impulsivity

## Introduction

“Food addiction” refers to the idea that certain foods (e.g., highly processed, high-calorie foods) may have an addictive potential and that some forms of overeating may represent an addicted behavior (Meule, 2015). Although this concept is controversially discussed in the scientific community (Benton, 2010; Rogers & Smit, 2000; Wilson, 2010; Ziauddeen & Fletcher, 2013), it has received increasing interest in recent years (Meule, 2015). This popularity of the food addiction concept can be, in part, attributed to the development of the *Yale Food Addiction Scale* (YFAS), which was the first standardized self-report measure for the assessment of addiction-like eating (Gearhardt, Corbin, & Brownell, 2009). The YFAS consists of 25 items and asks participants about their eating behavior during the past year. Importantly, items are based on the diagnostic criteria for substance dependence in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994), which were translated to refer to food and eating. Likewise, scoring of the scale allows for calculating a symptom count, that is, the number of endorsed “food addiction” symptoms, which can range between zero and seven symptoms. The scale also asks for a clinically significant impairment or distress resulting from individuals’ eating behavior. When at least three symptoms are met and a clinically significant impairment or distress is present, individuals receive a “food addiction” diagnosis.

In 2013, a new version of the DSM (DSM-5) was released, which includes revised diagnostic criteria for substance use disorder (American Psychiatric Association, 2013). Specifically, four new criteria were added and diagnostic thresholds were lowered such that the presence of two symptoms (and a clinically significant impairment or distress) suffices to receive a diagnosis of substance use disorder (for a discussion of the four new criteria in relation to food and eating, see Meule & Gearhardt, 2014b). Given these substantial changes in the diagnostic criteria for substance use disorder, the YFAS has been revised recently

(Gearhardt, Corbin, & Brownell, 2016). The YFAS2.0 consists of 35 items for measuring eleven “food addiction” symptoms. Besides having more items, the YFAS2.0 differs from the original YFAS in some other aspects as well (e.g., changes in item wordings and response options).

Studies using the previous version of the YFAS showed that a high percentage of individuals with bulimia nervosa receive a YFAS diagnosis (more than 80%; Gearhardt, Boswell, & White, 2014; Granero et al., 2014; Meule, von Rezori, & Blechert, 2014). Thus, bulimia is the diagnostic group with the highest prevalence of YFAS diagnoses (i.e., prevalence is higher than in individuals with anorexia, binge eating disorder, and obese individuals with or without binge eating disorder; Meule & Gearhardt, 2014a). In the initial validation study of the YFAS2.0, two diverse, yet not nationally representative, samples from the US were investigated and approximately 14-15% of participants received a YFAS2.0 diagnosis (Gearhardt et al., 2016). However, no data in individuals with bulimia have been reported for the YFAS2.0 yet. Due to the addition of symptoms and changes made in item wording, scoring, and diagnostic thresholds, it remains to be tested if using the YFAS2.0 in individuals with bulimia will produce results similar to the previous version.

In the current study, prevalence of YFAS2.0 diagnoses was examined in individuals with bulimia and in controls, using the German version of the YFAS2.0 (Meule, 2016) in an online questionnaire survey. Based on findings with the previous version of the YFAS (Gearhardt et al., 2014; Granero et al., 2014; Meule et al., 2014), it was expected that a high percentage of individuals with bulimia (more than 80%) would receive a YFAS2.0 diagnosis. Based on findings with the English version of the YFAS2.0 (Gearhardt et al., 2016), it was expected that a significantly lower percentage of controls (approximately 15%) would receive a YFAS2.0 diagnosis.

Moreover, little is known about the correlates of addiction-like eating in bulimic individuals. For example, while scores on the YFAS and YFAS2.0 have generally been found to be associated with overweight and obesity (Gearhardt et al., 2016; Pursey, Stanwell, Gearhardt, Collins, & Burrows, 2014), it has been suggested that this relationship may be attenuated in bulimic individuals because of their compensatory weight-control behaviors (Meule, 2012). Therefore, as a secondary aim, correlates of the YFAS2.0 were examined. Based on findings with the previous version of the YFAS (Granero et al., 2014; Meule & Gearhardt, 2014a) and with the English version of the YFAS2.0 (Gearhardt et al., 2016), it was expected that a higher number of YFAS2.0 symptoms would be associated with higher body mass index (BMI), a lack of interoceptive awareness, higher depressiveness, and higher impulsivity. As weight suppression (i.e., the difference between highest past weight and current weight) has been associated with weight gain and eating pathology (Schaumberg et al., 2016), it was tested if it was also related to higher “food addiction” symptomatology. Finally, it was explored if group moderated the expected associations between the above-mentioned variables, that is, if they were different in individuals with bulimia and controls.

## Methods

### *Participants and procedure*

The study was approved by the institutional review board at the University of Salzburg. Participants were recruited via online forums targeted at eating disordered individuals (e.g., Facebook groups for individuals with bulimia) and via student mailing lists at several German universities. The study was advertised as a study on “attitudes and eating behavior” and it was explicated that both individuals with and without eating disorders were invited to participate. Three × 50€ were raffled among participants who completed the entire set of questions. The study’s website at [www.soscisurvey.de](http://www.soscisurvey.de) was visited 1590 times. One-thousand and thirty-eight individuals started the survey and, of these, 663 finished the survey.

Applying the website's data quality check, which is based on the time spent on each page, lead to exclusion of two participants. Of the remaining 661 participants, 100 received an eating disorder diagnosis other than bulimia based on the *Eating Disorder Diagnostic Scale* (EDDS) – DSM-5 version. As there were only few participants in each diagnostic group, however, these participants were excluded from further analyses. Of the remaining 561 participants, 118 received a diagnosis of bulimia nervosa and 443 participants did not receive an eating disorder diagnosis based on the EDDS. As individuals with bulimia all had a BMI > 18.5 kg/m<sup>2</sup> (as this is one criterion for receiving a diagnosis of bulimia according to the EDDS), control participants with a BMI < 18.5 kg/m<sup>2</sup> were excluded. Finally, as there were only three men with a diagnosis of bulimia, men were excluded from further analyses, resulting in a final sample of  $n = 115$  women with bulimia and  $n = 341$  female controls without eating disorders (Table 1).

### *Measures*

*Sociodemographic and anthropometric data.* Participants provided their age (years), sex (male/female), height (cm), current weight (kg), and highest weight (kg) at their current height. Body mass index was calculated as current weight divided by squared height (m). Weight suppression was calculated by subtracting current BMI from highest BMI (highest weight divided by squared height).

*Yale Food Addiction Scale 2.0 (YFAS2.0).* The 35-item YFAS2.0 (Gearhardt et al., 2016; Meule, 2016) was used for measuring addiction-like eating. A symptom count can be calculated, which can range between zero and eleven symptoms. Furthermore, a diagnostic score can be calculated (“food addiction” vs. no “food addiction”) and diagnoses can be further specified as *mild*, *moderate*, or *severe*, depending on the number of symptoms present. Internal consistency was  $\alpha = .970$  in the current study.

*Eating Disorder Diagnostic Scale (EDDS) – DSM-5 Version.* The 23-item DSM5-version of the EDDS (Meule & Blechert, 2015; Stice, 2014) was used for diagnosing eating disorders (for agreement with interview measures, see Sysko et al., 2015). This self-report scale generates diagnostic scores for the following disorders: anorexia nervosa, bulimia nervosa, binge eating disorder, atypical anorexia nervosa, low frequency bulimia nervosa, low frequency binge eating disorder, purging disorder, and night eating syndrome.

*Eating Disorder Inventory-2 (EDI-2) – interoceptive awareness subscale.* The 10-item interoceptive awareness subscale of the EDI-2 (Garner, 1991; Thiel et al., 1997) was used for measuring uncertainty and concern with regard to perceiving and identifying feelings and hunger signals. Higher scores represent lower interoceptive awareness. Internal consistency was  $\alpha = .918$  in the current study.

*Center for Epidemiologic Studies Depression Scale – short form (CES-D).* The 15-item short form of the CES-D (Hautzinger, Bailer, Hofmeister, & Keller, 2012; Radloff, 1977) was used for measuring depressive symptoms in the past week. Higher scores represent higher depressiveness. Internal consistency was  $\alpha = .944$  in the current study.

*Barratt Impulsiveness Scale – short form (BIS-15).* The 15-item short form of the BIS (Meule, Vögele, & Kübler, 2011; Spinella, 2007) was used for measuring trait impulsivity. Higher scores represent higher impulsivity. Internal consistency was  $\alpha = .810$  in the current study.

### *Data analyses*

Groups were compared regarding frequencies of YFAS2.0 diagnoses with a  $\chi^2$ -test and regarding continuous study variables with independent *t*-tests. Linear regression analyses were used to examine differential relationships between continuous study variables and food addiction symptoms as a function of group. Specifically, moderation analyses were conducted

with PROCESS for SPSS (Hayes, 2013), where continuous study variables, group (bulimia vs. controls), and their interaction predicted the number of YFAS2.0 symptoms. This was done for each variable separately (BMI, weight suppression, interoceptive awareness, depressive symptoms, impulsivity; Table 2). Continuous study variables were mean-centered before calculating the product term.

## Results

Groups did not differ in age, but individuals with bulimia had higher BMI and weight suppression, more YFAS2.0 symptoms, lower interoceptive awareness, higher depression scores, and higher impulsivity (Table 1). All but five individuals with bulimia nervosa received a YFAS2.0 diagnosis (Table 1). Of these, 103 (93.6%) were *severe*, 6 (5.46%) were *moderate*, and 1 (0.91%) was *mild*. A significantly lower proportion of controls received a YFAS2.0 diagnosis (Table 1). Of these, 34 (69.4%) were *severe*, 7 (14.3%) were *moderate*, and 8 (16.3%) were *mild*.

Lower interoceptive awareness, higher depression scores, and higher impulsivity were associated with more YFAS2.0 symptoms, independent of group (Table 2). However, there were significant interaction effects between group and BMI and between group and weight suppression when predicting the number of YFAS2.0 symptoms (Table 2). Body mass was positively associated with the number of YFAS2.0 symptoms in controls ( $b = 0.13$ ,  $SE = 0.03$ ,  $p < .001$ ), but not in individuals with bulimia ( $b = 0.02$ ,  $SE = 0.03$ ,  $p = .575$ ). Similarly, weight suppression was positively associated with the number of YFAS2.0 symptoms in controls ( $b = 0.14$ ,  $SE = 0.06$ ,  $p = .011$ ), but not in individuals with bulimia ( $b = -0.03$ ,  $SE = 0.06$ ,  $p = .663$ ). Note that these results were not due to the difference in BMI between groups: we also examined these interaction effects after randomly excluding normal-weight controls so that groups did not differ BMI and the interactions were similarly found.

## Discussion



In the current study, almost all participants with bulimia (96%) received a YFAS2.0 diagnosis. Results are in line with studies, in which the previous version of the YFAS was used, which similarly found that prevalence rates of “food addiction” range between 80% and 100% in individuals with bulimia (Gearhardt et al., 2014; Granero et al., 2014; Meule et al., 2014). Thus, it appears that the changes made in the YFAS2.0 do not affect the association between bulimia and addiction-like eating. In controls without eating disorders, 14% received a YFAS2.0 diagnosis, which is similar to the prevalence rates found with the English version of the YFAS2.0 (approximately 15%; Gearhardt et al., 2016). Thus, although there is a high overlap between eating disorders (particularly bulimia) and “food addiction”, there is also a substantial subset of individuals without eating disorders who receive a YFAS2.0 diagnosis.

There has been considerable interest in the role of “food addiction” for weight gain and development of obesity (Meule, 2012). While the present study showed that psychological correlates of “food addiction” symptomatology (interoceptive awareness, depression, impulsivity), which have been found previously (Granero et al., 2014; Meule & Gearhardt, 2014a), were similarly found in individuals with bulimia and controls, associations with BMI and weight suppression were moderated by group. Specifically, higher BMI and weight suppression were associated with YFAS2.0 symptoms in controls, but not in participants with bulimia. As has been suggested previously (Meule, 2012), it seems plausible that the positive association between BMI and YFAS2.0 scores is alleviated within the population of individuals with bulimia because of their compensatory weight control behaviors. Specifically, higher “food addiction” symptomatology is likely related to more frequent purging in bulimic individuals, which counteracts weight gain.<sup>1</sup> This, and the fact that those with bulimia already display very high levels of weight suppression, may similarly explain the absent association between higher weight suppression and more YFAS2.0 symptoms in bulimic participants, although weight suppression was associated with YFAS2.0 symptoms in controls.

Interpretation of results is, of course, limited by the use of self-report measures in the current study. For example, it is known that self-reported height is usually overestimated while self-reported weight is underestimated (Connor Gorber, Tremblay, Moher, & Gorber, 2007). However, there are also studies showing that although these discrepancies exist, data are usually sufficiently accurate (Pursey, Burrows, Stanwell, & Collins, 2014). Although preliminary data regarding agreement of EDDS diagnoses with interview measures have been reported (Sysko et al., 2015), it is likely that the EDDS overestimates the prevalence of eating disorder diagnoses. Nevertheless, as the aims of the current study were to report on associations between the YFAS2.0 and other measures (and not on the prevalence of diagnoses of bulimia), we would argue that these associations are probably not much affected by the absolute numbers of diagnoses. Notwithstanding these limitations, the current study provides first data on the relationship between bulimia and “food addiction” as assessed with the YFAS2.0. Results show that, similar to the previous version of the YFAS, there is a very strong overlap between bulimic symptomatology and addiction-like eating. This strong overlap needs to be taken into consideration when reporting and interpreting associations between “food addiction” and body mass.

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#### Footnote

<sup>1</sup>Note that the frequency of vomiting was indeed negatively (but not significantly) correlated with BMI ( $r = -.166, p = .076$ ) and positively (but not significantly) correlated with the

number of YFAS2.0 symptoms ( $r = .155, p = .098$ ) in participants with bulimia in the current study.

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Table 1

Frequencies of YFAS2.0 diagnoses and means of continuous study variables for individuals with bulimia nervosa and controls without eating disorders

	Bulimia nervosa ( <i>n</i> = 115)	Controls ( <i>n</i> = 341)	Test statistic	<i>p</i>
Age (years)	<i>M</i> = 26.4 ( <i>SD</i> = 8.76)	<i>M</i> = 26.3 ( <i>SD</i> = 7.42)	$t_{(454)} = 0.17$	.866
Body mass index (kg/m <sup>2</sup> )	<i>M</i> = 26.1 ( <i>SD</i> = 8.00)	<i>M</i> = 23.1 ( <i>SD</i> = 5.00)	$t_{(454)} = 4.71$	< .001
Weight suppression (kg/m <sup>2</sup> )	<i>M</i> = 4.14 ( <i>SD</i> = 4.02)	<i>M</i> = 2.30 ( <i>SD</i> = 2.58)	$t_{(454)} = 5.68$	< .001
Yale Food Addiction Scale (diagnoses)	<i>n</i> = 110 (95.7%)	<i>n</i> = 49 (14.4%)	$\chi^2_{(1)} = 250$	< .001
Yale Food Addiction Scale (symptoms)	<i>M</i> = 8.91 ( <i>SD</i> = 2.22)	<i>M</i> = 2.00 ( <i>SD</i> = 2.79)	$t_{(454)} = 24.1$	< .001
Eating Disorder Inventory-2 (interoceptive awareness)	<i>M</i> = 40.7 ( <i>SD</i> = 8.56)	<i>M</i> = 24.6 ( <i>SD</i> = 8.74)	$t_{(454)} = 17.1$	< .001
Center for Epidemiologic Studies Depression Scale – short form	<i>M</i> = 28.6 ( <i>SD</i> = 8.99)	<i>M</i> = 12.9 ( <i>SD</i> = 8.92)	$t_{(454)} = 16.4$	< .001
Barratt Impulsiveness Scale – short form	<i>M</i> = 35.9 ( <i>SD</i> = 7.46)	<i>M</i> = 30.8 ( <i>SD</i> = 5.89)	$t_{(454)} = 7.47$	< .001

Table 2

Results from linear regression analyses, in which the number of food addiction symptoms was predicted by continuous study variables, group, and their interactions

Predictors	YFAS2.0 symptoms		
	<i>b</i>	<i>SE</i>	<i>p</i>
Body mass index			
Body mass index	0.10	0.02	<.001
Group	6.78	0.29	<.001
Body mass index × group	-0.11	0.04	.010
Weight suppression			
Weight suppression	0.10	0.04	.026
Group	6.88	0.30	<.001
Weight suppression × group	-0.17	0.08	.043
Interoceptive awareness			
Interoceptive awareness	0.12	0.01	<.001
Group	5.44	0.42	<.001
Interoceptive awareness × group	-0.06	0.03	.070
Depression			
Depression	0.09	0.01	<.001
Group	5.74	0.42	<.001
Depression × group	-0.04	0.03	.226
Impulsivity			
Impulsivity	0.08	0.02	<.001
Group	6.62	0.31	<.001
Impulsivity × group	-0.05	0.04	.211

*Notes.* Continuous study variables were mean-centered before calculating the product term.

Group represents control participants (coded with 0) and individuals with bulimia (coded with 1).