Assessment of food addiction using the Yale Food Addiction Scale 2.0 in individuals with binge-eating disorder symptomatology: Factor structure, psychometric properties, and clinical significance

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ARTICLE INFO	ABSTRACT
Keywords: Food addiction Binge-eating disorder Psychometric properties	The Yale Food Addiction Scale 2.0 (YFAS) assesses addiction-like eating of palatable foods based on the 11 diagnostic criteria for substance use disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). This study was the first to investigate the factor structure, psychometric properties, and clinical significance of the YFAS 2.0 in individuals with binge-eating disorder (BED) symptomatology. Data were analysed from 220 community-based participants who met criteria for "probable BED" based on self-report symptom frequency. Classification of food addiction (FA) was met by 42.3% of the sample. The YFAS 2.0 exhibited a unidimensional structure, adequate internal consistency, and convergent and incremental validity. YFAS 2.0 scores contributed the largest percentage of unique variance in psychological distress and impairment over other BED features (overvaluation of weight and shape, binge eating, BMI), highlighting the clinical significance of the FA construct in BED. Support for the validity and reliability of the YFAS 2.0 in individuals with BED-like symptoms was found. Findings also suggest that the presence of FA may represent a more disturbed group of BED characterised by greater general and eating disorder-specific psychopathology. Our findings overall highlight the potential need to screen and assess addictive-like eating behaviours during interventions for BED.

1. Introduction

Food addiction (FA) refers to the idea that certain foods (e.g., highly processed, calorie dense) may trigger an addictive-like response in some individuals (Davis et al., 2011). A growing body of evidence has identified numerous similarities linking excess food consumption and addiction. For example, early work in animal models has demonstrated that rats exhibited biological and behavioural attributes of addiction (e.g., decreased sensitivity of dopamine, desire to obtain food in spite of adverse consequences, withdrawal etc.) with highly processed foods (Avena et al., 2008). Moreover, neuroimaging studies have also shown that ingesting either highly processed foods or drugs activated similar neural systems, and that the dopamine-related neural activation was comparable between obese and drug-addicted patients (Stice et al., 2009; Volkow et al., 2008). Finally, several behavioural indicators of addiction have also shown to be present in disturbed eating behaviours in humans, such as a loss of control, an inability to stop problematic use, and continued use in spite of adverse consequences (Davis et al., 2011).

Although this concept of food addiction (FA) remains controversial,

it has received an enormous amount of scientific attention in recent years (e.g., Davis, 2013; Gearhardt et al., 2011a). Part of the popularity of the FA concept comes from the development of the initial 25-item Yale Food Addiction Scale (YFAS; Gearhardt et al., 2009), which was the first self-report measure to operationalise FA and assess addiction-like eating based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria for substance dependence (American Psychiatric Association, 1995).

An updated version of the YFAS (YFAS 2.0; Gearhardt et al., 2016) was recently developed to coincide with the revised criteria for substance use disorder (SUD) presented in the latest DSM (DSM-5; American Psychiatric Association, 2013). In the DSM-5, SUDs are no longer classified as substance abuse *or* substance dependence, but now reflect a single disorder with severity specifiers (mild, moderate, severe) based on the number of symptoms exhibited. A DSM-5 diagnosis of SUD is based on 11 criteria, which include the previous features of substance dependence (e.g., tolerance, withdrawal) from the DSM-IV and one new criterion related to craving. The threshold for a DSM-5 SUD diagnosis requires that at least two of the 11 criteria are met over a 12-month period. The YFAS 2.0 reflects these changes by containing 35-

item items assessing the same 11 criteria for SUDs (but modified in a way to reflect an addictive-like response to palatable food) as well as impairment and distress. Evidence upholds the psychometric properties of the YFAS 2.0 in non-clinical normal weight and overweight samples, including a well-replicated one-factor structure, adequate internal consistency, and convergent and incremental validity (Aloi et al., 2017; Brunault et al., 2017; Gearhardt et al., 2016; Granero et al., 2018; Meule et al., 2017).

Although the YFAS 2.0 has been utilised in several diverse samples, its factor structure and psychometric properties have yet to be examined in individuals exhibiting binge-eating disorder (BED) symptoms. Investigating the YFAS 2.0 in BED would be beneficial for answering questions about its validity, as many features of BED (e.g., loss of control, continued engagement despite negative consequences, consuming more than planned etc.) appear comparable to the features found in SUD (Davis, 2013). It is worth pointing out, however, that the psychometric properties of the *original* YFAS have been established in BED samples. For example, in a treatment-seeking BED sample, Gearhardt et al. (2012) replicated the unidimensional structure of the original YFAS, reported significant correlations between YFAS symptom scores and measures of eating disorder psychopathology (i.e., convergent validity), and found YFAS scores to predict incremental variance in binge eating after controlling for relevant confounds. However, as the number and content of items in YFAS 2.0 differs from the original YFAS, ensuring that the unidimensional structure and psychometric properties of this updated version are upheld in BED-like samples is needed before recommending its use in this population.

Another gap in this literature is that there has been no empirical investigation toward the "clinical significance" of the FA construct in BED. According to the DSM-5, a construct/symptom is considered clinically significant when it is associated with either marked distress or impairment in functioning (APA, 2013). Understanding which constructs/symptoms meet this criteria for clinical significance in BED is important for informing decisions around what to target or prioritize during treatment, and it may also help with the refinement of the diagnostic criteria of this new eating disorder subtype (Mitchison et al., 2018). Current evidence in BED consistently highlights the importance of overvaluation of weight and shape, binge eating behaviour, and comorbid obesity as potential factors contributing to, or explaining variance in, the distress and impairment experienced in this population (Harrison et al., 2015; Linardon, 2016; Mitchison et al., 2018; Perez and Warren, 2012). However, the clinical significance of FA in BED, in terms of its ability to also explain unique variance in distress and impairment, is unknown.

This study thus had two aims. First, we aimed to examine the psychometric properties of the YFAS 2.0 in individuals with BED-like symptoms, by testing its factor structure, internal consistency, convergent validity (i.e., correlations with measures of body weight and disordered eating), and incremental validity (i.e., whether it predicts unique variance in binge eating after controlling for relevant confounds). Second, we aimed to investigate the clinical significance of the FA construct, by testing whether FA predicts unique variance in psychological distress and impairment above and beyond participant demographics (i.e., age, sex, and ethnicity) and other clinically significant BED features (i.e., overvaluation of weight and shape, binge eating frequency, BMI) in individuals with BED symptomatology.

2. Method

2.1. Participants and procedure

Participants in the present study were recruited as part of an ongoing larger survey study on body image and disordered eating. Only participants meeting criteria for "probable BED" (referred hereafter) were included in this study, based on the following Eating Disorder Examination Questionnaire criteria: (a) endorsement of objective binge

eating on at least four days in the past month, and (b) the absence of regular (i.e., ≥ twice in past month) extreme weight-control behaviours (i.e., self-induced vomiting, laxative or diuretic misuse, extreme dietary restriction, and excessive exercise). In the absence of an interview assessment, the phrase "probable BED cases" is used over "individuals with BED". This algorithm for classifying probable BED cases has been applied extensively in several prior studies (e.g., Harrison et al., 2016, 2015; Mitchison et al., 2018). In total, 302 participants (21% of the total respondents) met probable BED criteria. Eighty-two of these probable BED cases dropped out of the study prior to completing the YFAS 2.0. There were no statistically significant differences between probable BED cases who did and did not complete the YFAS 2.0 on any variable ($ps > 0.05$). Thus, all subsequent analyses were performed on the 220 probable BED cases who completed the YFAS 2.0. The mean age of the 220 participants was 29.54 ($SD = 8.00$) and the mean BMI was 25.95 ($SD = 5.97$). Majority of participants were female (94%) and Caucasian (80%). Other ethnicities reported were Hispanic (8.2%), Asian (5%), African American (1.8%), Native American (0.5%), Pacific Islander (0.5%), and "other" (4.1%).

Participants were recruited primarily through social media outlets (Twitter, Facebook, Instagram etc.), online forums, word-of-mouth, and snowballing techniques. As this was part of a larger ongoing study, participants were notified that the nature of the project was to understand and identify risk, protective, and maintaining factors for problematic eating behaviours, and that their participation would involve completing an online questionnaire battery taking approximately 30 min. Respondents were then provided with a link to an online questionnaire battery. The online questionnaire was delivered through Qualtrics. Participants completed the questionnaires in the same order and at a time and location of convenience. To check the validity of responses, we ensured that no duplicate IP addresses were present and that the survey was not completed in an unrealistically short amount of time (e.g., 5 min). No validity check items were administered. No compensation was provided. Informed consent was obtained from all participants. Ethics approval was obtained.

2.2. Measures

2.2.1. Demographic information

Participants were asked to report their age in years, the weight (in kg's or lbs) and height (in cm or feet), their sex, and their ethnicity. No other demographic information was collected. Participant BMI was calculated by the following formula: kg/m^2. We did not take any measures to limit or record the geographic location of participants.

2.2.2. Yale Food Addiction Scale 2.0 (YFAS 2.0)

The YFAS 2.0 is a 35-item self-report questionnaire designed to assess symptoms of FA experienced over the past year based on the 11 DSM-5 diagnostic criteria for SUD (Gearhardt et al., 2016). It assesses 11 FA criteria (see Table 1) and significant distress/impairment associated with food. Each item is rated on an 8-point scale, ranging from 0 (never) to 7 (every day). A dichotomous rating can be assigned for each item (endorsed vs not endorsed) depending on the cut-off defined by Gearhardt et al. (2016). A criterion is met when one or more item representing that symptom criterion is endorsed. Two scoring options are available: *a symptom count* version (the total number of criteria met in addition to clinical significance, ranging from 0–11) and a *diagnostic version* (diagnosis of FA when two or more criteria are met plus clinically significant impairment and distress). Severity levels of FA can be calculated, ranging from *mild* (2–3 symptom criteria met plus impairment/distress), *moderate* (4–5 symptom criteria met plus impairment/distress), to *severe* (6 or more symptom criteria met plus impairment/distress) FA. The YFAS 2.0 can be seen at following link: https://fastlab.psych.lsa.umich.edu/yale-food-addiction-scale/.

Table 1
Prevalence and standardized factor loadings of each symptom criteria.

YAS 2.0 Criteria	Met criteria	Did not meet criteria	Factor loading	SE
Consumed more than planned	108 (49.1%)	112 (50.9%)	0.69*	0.06
Unable to cut down or stop	116 (52.7%)	104 (47.3%)	0.89*	0.03
Great deal of time spent	92 (41.8%)	128 (58.2%)	0.79*	0.05
Important activities given up	81 (36.8%)	139 (63.2%)	0.75*	0.05
Use despite physical/ emotional consequences	110 (50.0%)	110 (50.0%)	0.93*	0.03
Tolerance	61 (27.7%)	159 (72.3%)	0.85*	0.04
Withdrawal	88 (40.0%)	132 (60.0%)	0.77*	0.05
Use despite interpersonal/ social consequences	62 (28.2%)	158 (71.8%)	0.62*	0.07
Failure in role obligation	54 (24.5%)	166 (75.5%)	0.72*	0.06
Use in physically hazardous situations	43 (19.5%)	177 (80.5%)	0.61*	0.08
Craving	69 (31.4%)	151 (68.6%)	0.82*	0.05
Impairment or distress	98 (44.5%)	122 (55.5%)	–	–

* $p < 0.001$.

2.2.3. Eating Disorder Examination Questionnaire (EDE-Q)

The EDE-Q is a 28-item self-report measure assessing the severity eating disorder symptoms experienced over the past 28 days (Fairburn and Beglin, 1994). A global score was used in this study which was calculated by averaging the scores of the four subscales: shape concerns, weight concerns, eating concerns, and dietary restraint. Higher scores reflect greater symptom severity. Overvaluation of weight and shape was also calculated by averaging scores on items 22 and 23 (i.e., importance of shape/weight on self-worth) to create a composite overvaluation score, consistent with earlier work (Grilo et al., 2010; Linardon et al., 2018a, 2018b, 2018c). Internal consistency was $\alpha = 0.90$ for the global score and $\alpha = 0.87$ for the overvaluation of weight and shape composite score in this study. The number of binge eating days experienced over the past month was also used.

2.2.4. Clinical Impairment Assessment (CIA)

The CIA is a 16-item measure designed to assess psychosocial impairment that occurs as a result of eating disorder symptoms experienced over the 28 days (Bohn et al., 2008). Items are rated along a 4-point scale, ranging from 0 (not at all) to 3 (a lot), and are summed to produce a total score. Higher scores reflect a greater degree of psychosocial impairment secondary to ED symptoms. Internal consistency for the total score was $\alpha = 0.94$ in this study.

2.2.5. Depression Anxiety Stress Scale (DASS)

The DASS is a 21-item measure designed to assess psychological distress (Lovibond and Lovibond, 1995). It is composed of three subscales (depression, anxiety, and stress), each comprised of 7 items, rated along a 5-point scale ranging from 0 (never) to 4 (almost always). We used the total score as a measure of global psychological distress, which was calculated by summing all items. Higher scores reflect greater psychological distress. Internal consistency for the total score was $\alpha = 0.92$ in this study.

3. Results

3.1. Preliminary analyses

BMI was the only variable with missing data. Ten participants (4.5%) did not provide their height and/or weight. These data were missing completely at random and were estimated using the expectation maximisation method. One univariate and multivariate outlier was detected. Since this case comprised less than 1% of the sample, and that their inclusion and exclusion had no impact on our results, we retained

it in the analyses (Field, 2013). Skewness and kurtosis for each variable were within recommended limits for regression analyses, indicating no violations to normality (Kline, 2010).

3.2. Factor structure

Confirmatory factor analysis (CFA) was performed to examine the unidimensional structure of the YFAS 2.0 from 11 dichotomous indicators (i.e., the 11 symptoms) using the robust least squares estimator (Mplus; Muthén and Muthén, 2010). Following recommendations (Gearhardt et al., 2016), the two YFAS 2.0 items measuring impairment and distress were not included in the CFA because these items reflect clinical significance of the full syndrome rather than being indicators of the separate symptoms. Model fit was evaluated through the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean-square error of approximation (RMSEA). Excellent model fit is demonstrated through CFI and TFI values ≥ 0.95 and RMSEA values < 0.05 and an acceptable model fit is demonstrated through CFI and TFI values between 0.90 and 0.94 and RMSEA values between 0.05 and 0.10 (Hu and Bentler, 1999).

A unidimensional model for the YAS 2.0 was shown to have an excellent-acceptable fit: $\chi^2 (df = 44) = 126.37, p < 0.001$, CFI = 0.96, TLI = 0.95, RMSEA = 0.09. All symptom criteria had standardized factor loadings (all $ps < 0.001$) for the single factor of 0.61 or higher. Table 1 presents all factor loadings.

3.3. Internal consistency

Internal consistency of the 11 YFAS 2.0 symptoms was assessed with Kuder–Richardson's alpha for dichotomous variables. The Kuder–Richardson's α was 0.86, which is indicative of good internal consistency.

3.4. Food addiction classification

The average number of FA symptoms met was 4.01 ($SD = 3.36$, range = 0–11), and the percentage of participants who met the threshold for each diagnostic criterion ranged from 19.5% to 52.7% (see Table 1). For the diagnostic cut-off (i.e., ≥ 2 criteria + impairment) 93 participants (42.3%) met the FA criteria. For the diagnostic scoring option, 13 (5.9%) were classified as mild (2–3 symptoms), 15 (6.8%) were classified as moderate (4–5 symptoms), and 65 (29.5%) were classified as severe (6+ symptoms).

3.4.1. Group differences

Participants meeting the diagnostic cut-off for FA were compared on demographic and clinical variables with participants not meeting the diagnostic cut-off. Age, sex, ethnicity, and obesity status did not differ significantly between the two groups (Table 2). Participants classified with FA had a significantly higher BMI and significantly higher scores on each measure of eating disorder psychopathology, psychosocial impairment, and psychological distress than the non-FA group. Group differences were not tested among the severity levels as there were too few participants meeting the mild and moderate criteria to allow for meaningful comparisons.

3.5. Convergent validity

Convergent validity was tested by examining the bivariate associations between YFAS 2.0 symptom scores on clinical variables. YFAS 2.0 symptom scores were significantly and positively correlated with BMI, binge eating, overvaluation of weight and shape, EDE-Q global scores, clinical impairment, and psychological distress. Correlations ranged from 0.20 to 0.66 (Table 3).

Table 2
Group differences on demographic and clinical variables.

Variable	Food addiction (n = 93) n (%)	No food addiction (n = 127) n (%)	χ^2	p	V
Sex			2.62	0.16	0.11
Female	90 (96.7%)	116 (91.3%)			
Male	3 (3.3%)	11 (8.7%)			
Ethnicity			2.46	0.12	0.10
White/Caucasian	79 (84.9%)	97 (76.4%)			
Other	14 (15.1%)	30 (23.6%)			
Obesity status			0.87	0.41	0.06
Obese (≥ 30 BMI)	24 (25.8%)	26 (20.5%)			
Not obese (<30 BMI)	69 (74.2%)	101 (79.5%)			
	M (SD)	*M* (SD)	t	p	d
Age	29.54 (8.36)	29.53 (7.76)	−0.01	0.99	0.00
BMI	26.86 (5.42)	25.29 (5.07)	−2.19	0.03	0.29
Binge Eating	12.01 (7.78)	8.18 (5.99)	−3.96	<0.001	0.55
Overvaluation of weight and shape	5.06 (1.42)	3.31 (1.72)	−8.25	<0.001	1.11
EDE-Q global	3.74 (0.98)	2.46 (1.01)	−9.69	<0.001	1.29
Clinical impairment assessment	27.09 (9.88)	12.59 (8.28)	−11.83	<0.001	1.42
Psychological distress	24.61 (11.82)	16.72 (10.59)	−5.19	<0.001	0.70
YFAS 2.0 symptom score	6.86 (2.64)	1.94 (2.04)	−15.95	<0.001	2.08

Table 3
Pearson correlations between study variables.

Variable	1	2	3	4	5	6	7
1. YFAS 2.0 symptom scores							
2. BMI	0.20**						
3. Binge eating	0.37***	0.14*					
4. Overvaluation of weight and shape	0.45***	0.18**	0.16*				
5. EDE-Q global	0.56***	0.14*	0.21**	0.73***			
6. Clinical Impairment assessment	0.66***	0.13	0.21**	0.59***	0.76***		
7. Psychological Distress	0.39***	0.02	0.07	0.32***	0.34***	0.51***	

*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

3.6. Incremental validity

To test the incremental validity, a hierarchical multiple regression was conducted to determine whether YFAS 2.0 symptom scores would predict incremental variance in binge eating after controlling for potential confounds. In Step 1, age, BMI, overvaluation of weight and shape, EDE-Q global, CIA, and psychological distress scores were entered into the regression. YFAS 2.0 symptom scores were added in Step 2. Step 1 accounted for only 6.5% ($p = 0.026$) of variance in binge eating. Including YFAS 2.0 symptom scores significantly increased the proportion of variance in binge eating accounted for by the model (F_{change} [1, 212] = 21.04, $p < 0.001$), uniquely accounting for 8.4% of variance in binge eating ($\beta = 0.39$, $p < 0.001$).

3.7. Clinical significance

The clinical significance of FA was tested through two hierarchical regressions examining whether YFAS 2.0 symptom scores predicts incremental variance in clinical impairment and psychological distress after controlling for demographics (i.e., age, sex, ethnicity) and other

Table 4
Hierarchical multiple regressions predicting clinical impairment scores.

Step	Variable	B	S.E	β	t	sr^2
1	Age	−0.18	0.08	−0.13*	−2.32	0.02
	Sex	2.84	1.59	0.06	1.09	0.00
	Ethnicity	0.30	1.56	0.01	0.19	0.00
	BMI	0.57	0.12	0.03	0.46	0.00
	Binge eating	0.18	−0.09	0.11*	1.97	0.01
	Overvaluation of weight and shape	3.55	0.35	0.56***	10.04	0.29
	$R^2 = 0.38$, F (6, 213) = 21.58, $p < 0.001$					
2	Age	-0.16	0.06	−0.11*	−2.44	0.01
	Sex	1.36	2.21	0.03	0.62	0.00
	Ethnicity	−0.28	1.34	−0.01	−0.21	0.00
	BMI	−0.05	0.10	−0.02	−0.48	0.00
	Binge eating	−0.05	0.08	−0.03	−0.64	0.00
	Overvaluation of weight and shape	2.33	0.32	0.37***	7.12	0.10
	YFAS 2.0 symptom scores	1.73	0.19	0.51***	9.15	0.17
	$R^2_{change} = 0.17$, F_{change} (1, 212) = 83.81, $p < 0.001$					

*** $p < 0.001$; **$p < 0.01$.
* $p < 0.05$.

Table 5
Hierarchical multiple regressions predicting psychological distress scores.

Step	Variable	B	S.E	β	t	sr^2
1	Age	−0.15	0.09	−0.10	−1.52	0.01
	Sex	−1.76	3.16	−0.04	−0.55	0.00
	Ethnicity	−2.19	1.92	−0.08	−1.15	0.01
	BMI	−0.07	0.15	−0.03	−0.49	0.00
	Binge eating	0.08	0.11	0.05	0.79	0.00
	Overvaluation of weight and shape	2.15	0.43	0.33***	5.00	0.10
	$R^2 = 0.12$, F (6, 213) = 4.97, $p < .001$.					
2	Age	−0.13	0.09	−0.09	−1.44	0.01
	Sex	−2.80	3.02	−0.06	−0.93	0.00
	Ethnicity	−2.61	1.83	−0.08	−1.43	0.01
	BMI	−0.15	0.14	−0.07	−1.03	0.00
	Binge eating	−0.07	0.11	−0.04	−0.68	0.00
	Overvaluation of weight and shape	1.39	0.45	0.20**	2.89	0.03
	YFAS 2.0 symptom scores	1.31	0.26	0.35***	4.71	0.08
	$R^2_{change} = 0.08$, F_{change} (1, 212) = 22.13, $p < 0.001$					

*** $p < 0.001$.
** $p < 0.01$; *$p < 0.05$.

BED features (i.e., BMI, overvaluation of weight and shape, binge eating). Results of these analyses are presented in Tables 4 and 5. As seen, all predictors in Step 1 accounted for a significant proportion of variance in clinical impairment and psychological distress scores. Inclusion of YFAS 2.0 symptom scores in Step 2 significantly increased the proportion of variance in clinical impairment and psychological distress scores accounted for by the model, uniquely explaining 17% and 8% of variance, respectively.

4. Discussion

We investigated the nature of FA as measured by the YFAS 2.0 in a community sample of individuals with probable BED. Several of our findings offer support for the psychometric properties of the YFAS 2.0. First, the YFAS 2.0 exhibited a unidimensional structure with excellent fit, which was consistent with the factor structure reported in the initial validation paper (Gearhardt et al., 2016) and in several studies with samples of non-clinical normal weight and overweight/obese individuals (e.g., Aloi et al., 2017; Brunault et al., 2017; Meule et al., 2017). Second, the YFAS 2.0 exhibited good internal reliability, demonstrating that the 11 FA symptoms were similarly measuring one underlying factor. Third, nearly half of our sample met the diagnostic

threshold for FA, and endorsed an average of four FA symptoms, which were highly similar to the rates reported in prior research investigating the original YFAS in treatment-seeking BED samples (Gearhardt et al., 2013; Gearhardt et al., 2012). This finding demonstrates that there is a strong — but not an entirely overlapping — association between FA and BED. Fourth, FA classification and symptom count were significantly associated with a higher BMI and more severe BED symptoms, psychological distress, and psychosocial impairment, providing evidence for the YFAS 2.0′s convergent validity. Finally, FA symptom scores accounted for unique variance in binge eating beyond other confounds (e.g., demographics, other BED symptoms, psychological functioning), upholding the YFAS 2.0′s incremental validity. Overall, present findings provide support for the validity and reliability of the YFAS 2.0 in individuals with BED-like symptomatology.

Another noteworthy finding in this study was that the clinical significance of FA in BED-like cases was clearly demonstrated. In particular, FA symptom scores were shown to explain more unique variance in psychological distress and psychosocial impairment than other established features of BED, including overvaluation of weight and shape, binge eating behaviour, and BMI (Mitchison et al., 2018). These findings, although cross-sectional, provide the necessary statistical and foundational evidence to suggest that the presence of FA symptoms may be one of the many facets contributing to the impaired functioning and psychopathology commonly observed in BED cases (Javaras et al., 2008). However, additional longitudinal research extending from our findings is clearly needed to clarify the temporal nature of these relationships.

Important implications for the assessment and treatment of BED emerged. First, that the existence of FA may indicate a more disturbed BED presentation characterised by greater psychopathology highlights the importance of practitioners ensuring that they gather information in routine assessments on the nature and severity of any FA symptoms experienced in those with BED. Such information may enable more targeted and personalized treatment options for individuals with BED or BED-like symptomatology presenting with co-occurring FA. Second, incorporating evidence-based treatment techniques used for SUD (e.g., motivational enhancement, craving-focused coping skills) into established BED treatment packages (e.g., cognitive-behavioural therapy) could afford an added benefit to therapeutic outcomes in those with BED also exhibiting comorbid FA (Gearhardt et al., 2011b). Incorporating such treatment techniques and testing their potential additive benefits for BED treatment could be helpful in identifying the mechanisms underpinning the development, maintenance, and treatment of maladaptive eating behaviour.

Findings from this study must be interpreted in light of its limitations. First, this was a cross-sectional design, so we cannot make any conclusions regarding the directions of the observed relationships. It is crucial that well-designed prospective studies are conducted to confirm the temporal or possible causal nature of these relationships and to test whether FA predicts a more chronic course of BED over time. Second, we relied on self-report assessment of BED symptoms to identify "probable BED" cases. While agreement between self-report and interview assessments on BED features is generally good (Berg et al., 2011), it is possible that participants may have overestimated their frequency of binge eating, Moreover, we did not assess other BED criteria (e.g., marked distress during binge eating, speed of eating), and although such criteria are rarely used for research purposes (Grilo and White, 2011), our sample had to be characterised as "probable BED cases" rather than "individuals with BED". Research replicating our findings in individuals with a formal BED diagnosis is needed. Third, findings from the present sample are limited in their generalizability. Data were only obtained from a sample primarily of Caucasian women with probable BED. Our findings can therefore not be generalized to males or women of different ethnic backgrounds, and to other eating disorder symptomology profiles, including those with bulimia nervosa and anorexia nervosa. Future research is needed to test the validity and

reliability of the YFAS 2.0 in more diverse clinical and non-clinical samples.

To conclude, the present study examined the FA construct as measured by the YFAS 2.0 in individuals with BED-like symptomatology. Our findings provided strong support for the YFAS 2.0′s psychometric properties, including a unidimensional structure, good internal consistency, and evidence of convergent and incremental validity. FA also contributed the largest percentage of unique variance in psychological distress and impairment over other established BED features (i.e., overvaluation, binge eating, BMI), which highlights the potential importance of ensuring that addictive-like eating behaviour is screened and assessed during BED treatment.

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