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BRIEF REPORT

Secondary analysis of YFAS 2.0 symptom counts, impairment/distress, and food addiction severity in adults with overweight/obesity

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Abstract

Purpose Understanding the complexities of obesity is important for developing effective interventions. Evidence is growing that addictive-like tendencies toward foods may contribute to obesity in some individuals. The Yale Food Addiction Scale (YFAS, YFAS 2.0) was developed to identify individuals with addictive-like eating behaviors. Diagnosing food addiction (FA) requires meeting a symptom threshold plus clinically significant impairment/distress (self-perceived), but the utility of the impairment/distress criteria remains controversial. This secondary analysis compared individuals who did not meet the FA symptom criteria, met the symptom, but not the impairment/distress criteria, and met both criteria.

Methods This secondary analysis of data from a randomized controlled pilot study involving 83 adults with overweight/obesity used descriptive statistics and Univariate ANOVAS to compare YFAS 2.0 and Weight and Lifestyle Inventory responses among the groups.

Results Twenty-eight individuals did not meet the FA symptom criteria, 20 met the symptom, but not the impairment/distress criteria, and 35 met both criteria. Of the latter, 80.0% had severe, 8.6% had moderate, and 11.4% had mild FA. Age at onset of overweight was lower with severe than with mild FA ($p = 0.023$).

Conclusions The YFAS 2.0 identified a distinct group with severe FA and a group who met the FA symptom threshold, but not the impairment/distress criteria. Few participants perceived impairment/distress unless they endorsed ≥ 6 symptoms. Adding clinical interviews may aid in assessing impairment/distress and addictive-like eating behaviors, particularly in those meeting the FA symptom, but not the impairment/distress criteria. Better characterization of these groups may help targeting obesity interventions.

Trial registration number NCT03431831, 1/30/2018.

Level of evidence Level III, case-control analytic study.

Keywords Eating behavior · Food addiction · Obesity · Yale Food Addiction Scale 2.0

Introduction

Obesity is a major health concern that is associated with numerous comorbidities and elevated health care expenditures [1]. Understanding the complexities of obesity

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is important for developing effective interventions. In the past decade, the concept of food addiction (FA) has emerged as a growing area of empirical research. There is neurobiological and behavioral evidence that addictive-like tendencies toward foods (especially highly processed foods) may contribute to overweight/obesity in some individuals [2] and growing interest in the implications of FA for treating overweight/obesity.

One of the first efforts to elucidate the clinical significance of FA was the development of the Yale Food Addiction Scale (YFAS), a validated diagnostic tool for identifying individuals with addictive-like eating behaviors [3]. The original YFAS (25 questions) was based on the Diagnostic and Statistical Manual of Mental Disorder (DSM) IV criteria for substance dependence [4]. The subsequent version, YFAS 2.0 (35 questions), was based on the DSM-5 criteria for substance-use disorder (SUD) [5]. Both versions have two scoring options, (1) a symptom count (YFAS range = 0–7, YFAS 2.0 range = 0–11) and (2) diagnostic scoring involving meeting a symptom threshold (YFAS ≥ 3, YFAS 2.0 ≥ 2), and the presence of clinically significant impairment or distress (self-perceived) [3]. An important difference between the two versions is that the YFAS 2.0 differentiates level of severity of FA based on symptom counts (mild 2–3, moderate 4–5, severe ≥ 6), in parallel with the DSM-5 severity specifiers for SUDs [3].

Researchers using these tools report that many individuals meet the symptom threshold for a FA diagnosis, but not the clinical impairment/distress criteria [6]. Therefore, Ouellette et al. [6] explored symptom counts and the importance of the impairment/distress criteria in diagnosing FA in a study of individuals with severe obesity using a 16-item version of the original YFAS. They found that 35% of participants met the symptom criteria for FA, but only 16% also met the impairment/distress criteria [6]. Notably, those meeting the YFAS symptom threshold for a FA diagnosis had similar levels of general psychological distress regardless of whether they endorsed impairment/distress related to their addictive-like eating [6]. This suggests that the YFAS symptom severity threshold alone may identify clinically significant eating pathology associated with broader indices of psychological distress. However, no known studies have used the YFAS 2.0 to examine symptom severity thresholds (mild, moderate, severe) and their influence on self-perception of impairment/distress.

Therefore, this secondary analysis of data from a pilot study involving individuals with overweight/obesity explored the relationship between YFAS 2.0 symptom scores and endorsement of impairment/distress. We hypothesized that those perceiving impairment/distress would have greater FA severity (higher symptom counts). We also evaluated similarities and differences among FA− participants who did not meet the symptom criteria for FA (FA− < threshold), FA− participants who met the symptom criteria for FA, but not the impairment/distress criteria (FA− ≥ threshold), and FA+ participants. This included evaluating responses to select questions from the Weight and Lifestyle Inventory (WALI) questionnaire [7] as an exploratory analysis to compare features of the three groups.

Methods

Data for this secondary analysis were collected from individuals participating in a pilot study that evaluated the efficacy of four interventions for treating obesity in individuals who were positive (FA+) and negative (FA–) for FA based on the YFAS 2.0 [8]. We conducted this study in Scottsbluff, Nebraska, USA in accordance with University of Nebraska Medical Center IRB protocol 763-16-FB.

Participants

We informed potential participants [adults age 19–65 years with overweight (BMI 25 to < 30 kg/m^2) or obesity (BMI ≥ 30 kg/m^2)] about the study and consented those who chose to participate. We recruited 83 participants through referrals by Regional West Physicians Clinic providers and through snowballing. Participants' self-reported racial identifications were Caucasian (71.1%), Hispanic (27.7%), and African American (1.2%). Most participants were women (89.2%) [9].

Measures

This secondary analysis focused on participants' baseline responses to the YFAS 2.0 [5] and select questions from the WALI [7]. These questionnaires were completed as part of participants' intake documents. The YFAS 2.0 was used to determine participant's FA status (+ or −) and severity if positive. The WALI collects comprehensive information about an individual's weight history and lifestyle to help identify issues and inform treatment plans. Select WALI responses were used to explore factors that may influence endorsement of FA symptoms and the perception of impairment/distress. These included how long participants had been overweight (age first overweight by ≥ 10 lb), factors in their home environment (maternal and paternal BMI), their motivation to lose weight, and the number of reported medical comorbidities.

Data analysis

We used descriptive statistics to explore YFAS 2.0 and WALI responses and Univariate ANOVAs to evaluate differences among participant groups (FA− < threshold, FA− ≥ threshold, FA+) and levels of FA severity (mild, moderate, severe) if FA+. We used Fisher's Least Significant Difference test to evaluate differences among means. Significance was evaluated at $\alpha = 0.05$. IBM® SPSS® Statistics software (Version 25) was used for all analyses.

Results

FA status

Individuals were FA− if they endorsed ≤ 1 symptom and/or did not meet the impairment/distress criteria. Individuals were FA+ if they endorsed ≥ 2 symptoms and impairment/distress. In this study, 48 participants (57.8%) were FA− at baseline and 35 participants (42.2%) were FA+ at baseline. We further examined these groups by exploring participants' endorsement of symptoms and clinical significance and their WALI responses.

Symptoms and clinical significance

Twenty-eight participants were FA− because they endorsed fewer symptoms than the threshold for FA. Over half (60.7%, $n = 17$) did not endorse any symptoms and the remainder (39.3%, $n = 11$) endorsed one. Of those who endorsed one symptom, three (27.3%) also endorsed impairment/distress.

Three-fourths (75%, $n = 12$) of the 16 participants who met the symptom criteria for mild FA (endorsing 2 or 3 symptoms) did not endorse impairment/distress and, therefore, were considered FA−. Only four (25%) met both the symptom and impairment/distress criteria and were diagnosed with mild FA.

Similarly, two-thirds (66.7%, $n = 6$) of the nine participants who met the symptom criteria for moderate FA (endorsing 4 or 5 symptoms) did not endorse impairment/distress and, therefore, were considered FA−. Only three (33.3%) met both the symptom and impairment/distress criteria and were diagnosed with moderate FA.

In contrast, 92.9% ($n = 26$) of the 28 participants meeting the symptom criteria for severe FA (endorsing ≥ 6 symptoms) also met the impairment/distress criteria and were diagnosed with severe FA. Only two (7.1%) did not perceive impairment/distress and, therefore, were considered FA−; both endorsed six symptoms, the minimum criteria for severe FA.

Thus, of the 48 participants who were FA− at baseline, 52.1% ($n = 25$) met neither the symptom nor the impairment/distress criteria, 6.3% ($n = 3$) self-perceived impairment/distress while only endorsing one symptom, and 41.7% ($n = 20$) met the symptom criteria for FA (endorsing 2–6 symptoms) but did not perceive impairment/distress. Of the 35 participants who were FA+ at baseline, 80.0% ($n = 28$) were in the severe category, 8.6% ($n = 3$) were in the moderate category, and 11.4% ($n = 4$) were in the mild category [9]. Participants with severe FA endorsed an average of 9.1 symptoms (SD = 1.8). Nine (32.1%) endorsed all 11 symptoms, 5 (17.9%) endorsed 10, and 5 (17.9%) endorsed 9.

WALI responses by participant group

We evaluated responses to select WALI [7] questions to explore similarities and differences among participant groups (FA− < threshold, $n = 28$; FA− greater than or equal to. threshold, $n = 20$; FA+, $n = 35$) and how these factors might influence endorsement of FA symptoms and the perception of impairment/distress.

Participant's average BMI at baseline was 38.5 kg/m^2 (SD = 8.5). Age at onset of overweight (when first overweight by ≥ 10 lb) ranged from 5 to 41 years ($M = 18.0$, SD = 8.2) (Table 1). For a quarter of participants (26.9%), onset occurred by age 10. Most participants had at least one parent who was overweight or obese (73.3% of mothers and 70.6% of fathers with BMI data available). For many, both parents were overweight or obese (50.7% of those with data for both). Participants were highly motivated to lose weight ($M = 8.9$, SD = 1.3) based on a scale of 1–10 (Table 1). Of those completing the medical history, most (84.2%) reported having at least one of the 24 medical conditions listed in the WALI ($M = 4.0$, SD = 3.1, range = 0–15) (Table 1).

Participant BMI ($p = 0.093$), age at onset of overweight ($p = 0.338$), parental BMI [mother ($p = 0.408$), father ($p = 0.769$)], and motivation to lose weight ($p = 0.420$) did not differ among participant groups (FA− < threshold, FA− greater than or equal to. threshold, and FA+) (Table 2). The average number of reported medical comorbidities tended to be greater for those who were FA+; however, differences were not significant ($p = 0.063$) (Table 2). The top three reported comorbidities were the same for all three groups: joint or bone problems (affecting 50.0%, 50.0%, and 60.6%, respectively), back problems (affecting 42.3%, 45.0%, and 57.6%, respectively), and bodily pain (affecting 34.6%, 35.0%, and 52.9%, respectively).

Table 1 Descriptive statistics for select variables from the Weight and Lifestyle Inventory questionnaire [7] for participants with overweight/obesity who were positive and negative for food addiction as determined by the Yale Food Addiction Scale 2.0 (YFAS 2.0) [5]

	All participants		All FA−		FA−[a]				All FA+		FA+[d]					
					< Threshold[b]		≥ Threshold[c]				Mild[e]		Moderate[f]		Severe[g]	
	N	*M* (SD)	*N*	*M* (SD)	*N*	*M* (SD)	*N*	*M* (SD)	*N*	*M* (SD)	*N*	*M* (SD)	*N*	*M* (SD)	*N*	*M* (SD)
Participant BMI (kg/m^2)	83	38.5 (8.5)	48	36.8 (8.6)	28	36.4 (9.1)	20	37.3 (8.2)	35	40.9 (7.9)	4	38.5 (9.1)	3	37.2 (8.2)	28	41.6 (7.9)
Age became overweight (years)	78	18.0 (8.2)	44	18.9 (8.9)	26	19.9 (7.9)	18	17.4 (10.1)	34	16.9 (7.1)	4	23.5 (4.7)	3	23.0 (15.4)	27	15.2 (5.5)
Maternal BMI (kg/m^2)	75	31.8 (10.6)	45	32.3 (12.3)	26	30.7 (11.9)	19	34.6 (12.8)	30	30.9 (7.6)	4	28.9 (7.0)	3	30.4 (4.4)	23	31.3 (8.2)
Paternal BMI (kg/m^2)	68	30.7 (9.4)	41	30.5 (10.2)	24	31.4 (12.3)	17	29.3 (6.3)	27	30.9 (8.2)	3	39.3 (4.7)	3	25.0 (2.1)	21	30.5 (8.2)
Motivation (scale: 1–10)	83	8.9 (1.3)	48	8.8 (1.4)	28	8.8 (1.4)	20	8.9 (1.3)	35	9.1 (1.3)	4	9.5 (1.0)	3	9.0 (1.0)	28	9.0 (1.3)
Comorbidities (number)	76	4.0 (3.1)	44	3.3 (3.0)	25	3.4 (3.4)	19	3.1 (2.5)	32	4.9 (3.0)	3	3.7 (1.5)	2	3.5 (3.5)	27	5.2 (3.1)

[a]FA−: Negative for food addiction (≤ 1 symptom and/or no impairment/distress)

[b]< Threshold: FA− participants who did not meet the symptom criteria for FA

[c]≥ Threshold: FA− participants who met the symptom criteria for FA, but not the impairment/distress criteria

[d]FA+: Positive for food addiction (≥ 2 symptoms plus impairment/distress)

[e]FA+ with 2–3 symptoms plus impairment/distress

[f]FA+ with 4–5 symptoms plus impairment/distress

[g]FA+ with ≥ 6 symptoms plus impairment/distress

Table 2 Results of univariate ANOVA analyses of select variables from the Weight and Lifestyle Inventory questionnaire [7] comparing participants with overweight/obesity by food addiction[a] symptom groups[b] and severity[c]

Variable	*F*	(*df*)	*P*	η^2	Power
Symptom groups					
Participant BMI (kg/m^2)	2.442	(2, 80)	0.093	0.058	0.478
Age became overweight (years)	1.100	(2, 75)	0.338	0.028	0.236
Maternal BMI (kg/m^2)	0.909	(2, 72)	0.408	0.025	0.201
Paternal BMI (kg/m^2)	0.263	(2, 65)	0.769	0.008	0.090
Motivation (scale: 1–10)	0.420	(2, 80)	0.420	0.010	0.116
Comorbidities (number)	2.873	(2, 73)	0.063	0.073	0.546
FA severity					
Participant BMI (kg/m^2)	0.609	(2, 32)	0.550	0.037	0.143
Age became overweight (years)	4.304	(2, 31)	0.022*	0.217	0.706
Maternal BMI (kg/m^2)	0.171	(2, 27)	0.844	0.012	0.074
Paternal BMI (kg/m^2)	2.713	(2, 24)	0.087	0.184	0.485
Motivation (scale: 1–10)	0.267	(2, 32)	0.767	0.016	0.089
Comorbidities (number)	0.573	(2, 29)	0.570	0.038	0.136

*Significant at $\alpha = 0.05$

[a]Food addiction (FA) status was determined using the Yale Food Addiction Scale 2.0 [5]. Participants who did not meet the symptom and/or impairment/distress criteria were considered FA negative (FA−). Participants who met both the symptom and impairment/distress criteria were considered FA positive (FA+)

[b]Symptom groups were (1) FA− participants who did not meet the symptom criteria for FA (FA− < threshold, $n = 28$), (2) FA− participants who met the symptom criteria for FA, but not the impairment/distress criteria (FA− ≥ threshold, $n = 20$), and (3) FA+ participants who met both the symptom and impairment/distress criteria (FA+, $n = 35$)

[c]FA severity groups were (1) mild (FA+ participants who endorsed 2–3 symptoms plus impairment/distress, $n = 4$), (2) moderate (FA+ participants who endorsed 4–5 symptoms plus impairment/distress, $n = 3$), and severe (FA+ participants who endorsed ≥ 6 symptoms plus impairment/distress, $n = 28$)

WALI responses by FA severity

For FA+ participants, we explored whether the above variables differed by severity of symptoms by comparing those with mild, moderate, and severe FA. Of these variables, only age at onset of overweight differed with severity of FA (Table 2); it was lower for those with severe FA than for those with mild FA ($p = 0.023$). Mean age at onset of overweight did not differ between those with moderate FA and those with mild FA ($p = 0.921$), though there was a nonsignificant trend toward lower age at onset for those with severe FA ($p = 0.058$).

Discussion

This secondary analysis evaluated the similarities and differences among FA− participants who did not meet the symptom criteria for FA, FA− participants who met the symptom criteria for FA, but not the impairment/distress criteria, and FA+ participants who met both the symptom and impairment/distress criteria.

Several of the factors evaluated were similar among all three groups, including participant, maternal, and paternal BMIs. It was also common for participants to have at least one parent who was overweight or obese. These patterns may, in part, reflect shared genetic factors and eating and activity behaviors within families. Participants in all three groups were highly and similarly motivated to lose weight, which may reflect the recruitment strategies of the parent study, as all individuals were seeking assistance to lose weight. Though most participants were highly motivated to lose weight at the onset of this study, whether that level of motivation persists, differs among groups over time, and/or leads to behavioral/biometric changes requires further study, including evaluating the possible influence of self-perception of impairment/distress.

Though few participants with mild or moderate levels of FA symptoms endorsed impairment/distress, most (92.9%, $n = 26$) with severe levels (≥ 6 symptoms) did. This suggests that the YFAS 2.0 identified a distinctive group of individuals with severe FA who not only exhibited addictive-like eating behaviors, but experienced those behaviors as clinically significant. Results also suggest that early onset of obesity may be a risk factor for severe FA, highlighting the importance of early identification and intervention for youths with overweight.

Consistent with other studies [10], the majority of participants who met the YFAS 2.0 diagnostic criteria for FA were in the severe category. The high number of symptoms endorsed and self-perception of impairment/distress suggest that individuals with severe FA may need greater support to address the consequences of their addictive-like eating than those with less severe or without FA. As the YFAS 2.0 FA symptoms were based on the criteria for SUDs, interventions used to treat SUDs may be effective for individuals with severe FA and should be evaluated.

Of interest is the group of FA− participants who met the symptom criteria for FA, but not the impairment/distress criteria. Such an intermediate group has been described when using the original YFAS [6] and the YFAS 2.0 [10]. In this study, the majority of these individuals met the symptom criteria for mild (60%, $n = 12$) or moderate (30%, $n = 6$) FA; only two (10%) met the symptom criteria for severe FA. This pattern suggests that severity of symptoms may influence perception of impairment/distress. It

also raises questions about whether these individuals truly exhibit addictive-like eating behaviors or only experience indicators that may be more commonly associated with overeating more broadly (e.g. cravings, loss of control) [10]. Alternatively, these individuals may not fully recognize the influence that their eating behaviors have on their mood, functioning, or health.

In this study, most participants reported ≥ 1 medical comorbidity. Those who were FA+, particularly those with severe FA, tended to report more comorbidities than those who were FA−, which may have contributed to their endorsement of impairment/distress. Personal observations by the PI (TA) suggest that some meeting the symptom criteria for FA, but not the impairment/distress criteria, may not have recognized the connection between their health issues and their overweight/obesity. Ouellette et al. [6], suggested that some may not perceive the impact of their excess weight because they have become used to their weight/eating problems. However, although most participants in this study had been living with overweight/obesity for much of their lives, those in the severe FA+ group tended to have an earlier onset of overweight. Perhaps these individuals also developed comorbidities at a younger age, which may have influenced their perception of impairment/distress. Gearhardt et al. [3] suggest that perceptions of consequences may, in part, be contextual (e.g. influenced by family, peers, and/or their environment), as may be the case in this study where most participants were from home environments where one or both parents were overweight or obese. These factors may affect an individual's perception of what is normal and how much their excess weight affects their lives. This also raises questions about whether the public is aware of the wide range of health issues associated with overweight/obesity and whether they attribute their health problems to being overweight/obese or to other causes, such as getting older.

Limitations of this secondary analysis include the small sample size (data were from a pilot study), particularly for individuals with mild and moderate FA. This limited the strength of these analyses and contributed to the possibility of type I error.

These findings add to the discussion of the importance of symptom severity and self-perception of impairment/distress in diagnosing FA. Most individuals identified as FA+ using the YFAS 2.0 were categorized as having severe FA. As earlier age of onset of overweight was associated with severe FA, early identification and intervention for youth with overweight is important. Adding clinical interviews may enhance assessment of impairment/distress and addictive-like eating behaviors [3, 6]. Such interviews could improve our understanding of those who meet the symptom, but not the impairment/distress criteria for FA and aid in discerning whether these individuals truly exhibit addictive-like eating. Understanding of the characteristics of all three groups may provide insights that could improve individually tailored interventions for obesity.

What is already known on this subject?

Addictive-like tendencies toward foods may contribute to overweight/obesity in some individuals. Researchers using the YFAS and YFAS 2.0 have observed a subset of individuals that meet the symptom, but not the clinical impairment/distress criteria for a FA diagnosis. The YFAS 2.0 allows identification of FA severity, but no known studies have examined the association of symptom endorsement and the impairment/distress criteria based on the YFAS 2.0 severity thresholds.

What this study adds?

The majority of individuals who met the full diagnostic criteria for FA based on the YFAS 2.0 were categorized as severe. Individuals who endorse two or more symptoms but no impairment/distress may not exhibit the addictive-like eating phenotype the YFAS 2.0 was designed to capture or may have limited insight. The development of a clinical interview is necessary to better understand this group. Earlier age of onset of overweight was associated with severe FA, suggesting the importance of early identification and intervention efforts for youth with overweight.

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Code availability Not applicable.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Ethical approval was obtained from the University of Nebraska Medical Center Institutional Review Board (IRB protocol 763-16-FB).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Consent for publication Not applicable.

Availability of data and material The datasets generated during and/or analyzed during the current study are available from the principal investigator (TA) on reasonable request.

References

1. Apovian CM (2016) Obesity: definition, comorbidities, causes, and burden. Am J Manag Care 22:s176-185
2. Schulte EM, Avena NM, Gearhardt AN (2015) Which foods may be addictive? The roles of processing, fat content, and glycemic load. PLoS ONE 10:e0117959. https://doi.org/10.1371/journal.pone.0117959
3. Gearhardt AN, Schulte EM, Schiestl ET (2019) Food addiction prevalence: Development and validation of diagnostic tools. In: Cottone P, Moore CF, Sabino V, Koob GF (eds) Compulsive eating behavior and food addiction, 1st edn. Academic Press, New York, pp 15–39
4. Gearhardt AN, Corbin WR, Brownell KD (2009) Preliminary validation of the Yale Food Addiction Scale. Appetite 52:430–436. https://doi.org/10.1016/j.appet.2008.12.003
5. Gearhardt AN, Corbin WR, Brownell KD (2016) Development of the Yale Food Addiction Scale Version 2.0. Psychol Addict Behav 30:113. https://doi.org/10.1037/adb0000136
6. Ouellette AS, Rodrigue C, Lemieux S, Tchernof A, Biertho L, Bégin C (2018) Establishing a food addiction diagnosis using the Yale Food Addiction Scale: a closer look at the clinically significant distress/functional impairment criterion. Appetite 129:55–61. https://doi.org/10.1016/j.appet.2018.06.031
7. Wadden TA, Foster GD (2006) Weight and lifestyle inventory (WALI). Obesity 14:99S-118S
8. Aguirre T, Struwe L, Koehler A, Kreman R, Bowman R, Schulte E, Pierce K, Bloodgood M, Holloway J (2018) Impact of four obesity interventions on biometric measures of individuals positive and negative for food addiction. Arch Psychiatry Ment Health 2:1–5. https://doi.org/10.29328/journal.apmh.1001002
9. Aguirre T, Bowman R, Kreman R, Holloway J, LaTowsky J, Stricker M, Struwe L, Schulte E, Koehler A, Pierce K, Bloodgood M (2018) Pre-intervention characteristics in weight loss participants scoring positive and negative for food addiction. Clin Nutr Metab 1:1–3. https://doi.org/10.15761/CNM.1000103
10. Meule A, Gearhardt AN (2019) Ten years of the Yale Food Addiction Scale: a review of version 2.0. Curr Addict Rep 6:218–228. https://doi.org/10.1007/s40429-019-00261-3