



Validation of the Hungarian version of the Yale Food Addiction Scale 2.0 (YFAS 2.0)

Afework Tsegaye^{a,*}, Zsófia Németh^{g,h}, Eszter Kotyuk^b, Virág Scheller^c, Klaudia Szabó^a, Orsolya Pachner^a, Renáta Cserjési^b, Zsolt Demetrovics^{b,d,e}, H.N. Alexander Logemann^{b,f}

^a Institute of Education and Psychology at Szombathely, ELTE Eötvös Loránd University, Budapest, Hungary

^b Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary

^c Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary

^d College of Education, Psychology and Social Work, Flinders University, Adelaide, Australia

^e Centre of Excellence in Responsible Gaming, University of Gibraltar, Gibraltar, Gibraltar

^f Department of Clinical, Neuro and Developmental Psychology, Vrije Universiteit Amsterdam, Amsterdam, Netherlands

^g Semmelweis University Institute of Pancreatic Diseases, Budapest, Hungary

^h Institute of Translational Medicine, Semmelweis University, Budapest, Hungary

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ABSTRACT

Background: The Yale Food Addiction Scale 2.0 (YFAS 2.0) was recently updated to assess food addiction according to the DSM-5 criteria for substance-related and addictive disorders. This study aimed to validating the YFAS 2.0 on the Hungarian sample.

Method: A cross-sectional descriptive study was conducted with a sample of 605 participants. The instruments used for data collection included the YFAS 2.0, Three-Factor Eating Questionnaire Revised 21-Items (TFEQ-R21), The 21-item Barratt Impulsiveness Scale Revised (BIS-R-21), Depression, Anxiety and Stress Scale (DASS-21). The factor structure, internal consistency and convergent validity of the Hungarian version of the YFAS 2.0 were evaluated.

Results: Proportion to the current sample Food Addiction was 18.5 %. Confirmatory factor analysis supported a good fit for the single-factor model. The YFAS 2.0 symptom count demonstrated a positive correlation with TFEQ-R-21 subscales, ranging from 0.12 to 0.54, with BIS-R-21 subscales ranging from 0.24 to 0.49, and with DASS-21 subscales ranging from 0.41 to 0.50. The H-YFAS 2.0 food addiction severity was significantly associated with TFEQ-R-21, BIS-R-21, and DASS-21 subscales of the scales. All of which were statistically significant ($p < 0.001$), indicating acceptable convergent validity.

Conclusion: The Hungarian version of the YFAS 2.0 has been validated in a nonclinical sample, demonstrating its utility as an effective tool for screening food addiction.

1. Introduction

The prevalence of obesity reached the status of an epidemic in 2014, and more than 2.5 billion adults are considered overweight, of which 890 million are obese (WHO, 2024). Projections for the year 2030 suggest that on a global scale, approximately 1.02 billion adults will be obese (Lingvay, Cohen, Roux, & Sumithran, 2024). One main contributing factor to obesity is the evolutionary preference for foods high in fat, sugar, salt, refined carbohydrates, and sweeteners. These ingredients are now prevalent in processed and refined foods, which have been suggested to possess an abuse potential similar to that of addictive

substances such as cocaine and alcohol (Gearhardt, Davis, Kushner, & Brownell, 2011; Ifland, Preuss, Marcus, Rourke, Taylor, Burau, & Manso, 2009; Spring et al., 2008).

The concept of Food Addiction (FA) posits that certain foods, particularly those that are highly processed, highly palatable, and high in calories, may possess addictive properties (Gearhardt, Corbin, & Brownell, 2016; Gearhardt et al., 2011). Several studies show that the mechanisms underlying food addiction involve pathways similar to those observed in drug addiction (Furlong, Jayaweera, Balleine, & Corbit, 2014; Thorgeirsson et al., 2013). Compulsive eating can occur when the act of consuming food becomes uncontrollable, similar to

* Corresponding author at: Szombathely, Károlyi Gáspár tér 4, Hungary.

E-mail address: Afework.tsegaye@ppk.elte.hu (A. Tsegaye).

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patterns seen in substance abuse and addiction (Volkow, Wang, Fowler, & Telang, 2008). In addition to this, the neurobiological processes involved in excessive food consumption and substance abuse overlap significantly (Kalon et al., 2016). Specifically, all drugs of abuse are known to increase dopamine levels in the mesolimbic reward system, a key pathway in the brain associated with pleasure and reinforcement (Tomasí & Volkow, 2013; Volkow, Wang, Fowler, Tomasí, & Baler, 2011; Volkow et al., 2008). Indeed, the same neural circuits are implicated in regulating the rewarding and reinforcing properties of both drug addiction and compulsive eating (Avena, Rada, & Hoebel, 2008; Kenny & Shaw, 2011). Hence, repeated consumption of hyper-palatable foods, leads to a diminished dopaminergic response over time. This down-regulation of dopamine, a neurotransmitter associated with pleasure and reward, results in increased impulsivity and compulsive behaviors in response to food-related cues (Volkow, Wang, & Baler, 2011; Volkow, Wise, & Baler, 2017).

Substance dependence is characterized by the compulsive use of a drug, often to the detriment of other important activities and responsibilities. This compulsive behavior tends to intensify with repeated access to the drug (Avena et al., 2008; García-García et al., 2014). Similarly, individuals addicted to non-drug activities, such as palatable food (i.e., high contains of sugar, fat, salt and caffeine substances) and gambling, report experiencing comparable patterns of compulsive behavior (Ifland et al., 2009; Potenza, 2008). These behaviors interfere with their daily life and functioning in much the same way. In addition, poor inhibitory control has been associated with Body Mass Index (BMI), maladaptive eating, and negative effect (Tsegaye et al., 2021). Indeed, individuals with obesity and eating disorders often show addiction symptoms such as a desire for obtain food, high impulsivity, functional impairment, tolerance, craving, and withdrawal (Güngör, Çelebi, & Akvardar, 2021; Penzenstadler, Soares, Karila, & Khazaal, 2019). This parallel suggests that the underlying mechanisms of addiction may be similar across different types of addictive behaviors, whether they involve substances or activities.

Food addiction has been proposed as a transdiagnostic construct, encompassing behaviors and psychological features that overlap with various eating and substance-related disorders (Fernandez-Aranda, Karwautz, & Treasure, 2018). This overlap has sparked debate in the scientific community about whether FA warrants classification as a distinct diagnosis or whether it is sufficiently captured by existing diagnoses in the DSM-5 and ICD-11, such as binge eating disorder or bulimia nervosa (Meule, 2019). Indeed, a separate FA diagnosis argue that it highlights the neurobiological mechanisms related to addictive-like eating behaviors, such as heightened reward sensitivity, compulsive overeating, and loss of control over certain foods (Gearhardt et al., 2011). Such characteristics closely resemble the criteria for substance use disorders, providing a convincing rationale for FA as an independent diagnosis. On the other hand, critics argue that the diagnostic criteria for FA may describe symptoms that are already present in other eating disorders, calling into doubt the need for FA as a separate diagnosis (Imperatori et al., 2016; Meule, Gearhardt, & Arbor, 2014). This perspective suggests that framing FA within a broader spectrum. Recognizing FA as a transdiagnostic construct emphasizes its complex relationship with eating disorders and addictive behaviors, further underlining the importance of validating tools like the YFAS 2.0 in different cultural contexts.

The Diagnostic and Statistical Manual of Mental Disorders (DSM) has evolved through multiple editions, notably the fifth (DSM-V) edition. These editions have played a pivotal role in establishing precise diagnostic criteria for various mental health conditions (American Psychiatric Association, 2013). However, the concept of Food Addiction (FA) has not yet gained formal recognition within this framework. The first tool that has emerged to assess this phenomenon is the Yale Food Addiction Scale (YFAS) (Gearhardt, Corbin, & Brownell, 2009). Following the published DSM-5 in 2013, the updated version YFAS 2.0 was published in 2016 according to DSM-5 (Gearhardt et al., 2016). The

YFAS 2.0 validated in a non-clinical US sample. The YFAS 2.0 demonstrated good fit on Confirmatory Factor Analysis for one-factor model of FA (CFI = 0.958; TLI = 0.974; RMSEA = 0.108) and good internal consistency the Kuder-Richardson's coefficient 0.90 (Gearhardt et al., 2016).

Recently, the Yale food addiction scale 2.0 (YFAS 2.0) is the most commonly used instrument to assess food-related addictive behaviors, which adapted/ translated a number of languages such as Spanish (Granero et al., 2018), Japanese (Khine et al., 2019), Turkish (Buyuktuncer et al., 2019), Persian (Ghanbari et al., 2022), French (Brunault et al., 2016), Portuguese (Gonçalves, Bastos, & Vieira, 2021), and German (Meule, Müller, Gearhardt, & Blechert, 2017). According to the best of our knowledge, no validation of the translated YFAS 2.0 has been conducted with a Hungarian sample. Therefore, with this study, we aimed to evaluate the psychometric properties of the Hungarian version of the Yale Food Addiction Scale 2.0 (YFAS 2.0) in a non-clinical sample.

2. Methods

2.1. Participants and procedure

A total of 605 Hungarian native adults participated in our study between the 1st of March and 15th of May 2024. Participants were recruited via various social media platforms through advertisements that outlined the aim and purpose of the research. The advertisements provided a link to the Qualtrics platform (Qualtrics, 2005), where participants accessed the informed consent, and completed a self-report questionnaire. The inclusion criteria required participants to be at least 18 years old and native speakers of Hungarian. Exclusion criteria included pregnancy, diagnosis of any eating disorder, and cognitive impairment. Participants voluntarily took part in the study and did not receive any form of monetary compensation. The study was approved by the Research Ethics Committee of the Faculty of Education and Psychology, ELTE Eötvös Loránd University and adhered to the principles outlined in the Declaration of Helsinki. All participants provided informed consent before completing the online self-report questionnaire hosted on Qualtrics platform.

2.2. Materials

Demographics: Participants were asked to provide information about basic demographics, including age, gender, marital status, occupation, and self-reported height and weight were used to compute participants BMI (kg/m²).

The Yale Food Addiction Scale 2.0 (YFAS 2.0) (Gearhardt et al., 2016).

The YFAS 2.0 is a self-report scale adapted to assess addictive eating behaviors based on DSM-5 SRAD criteria during in the past year. The scale consists of 35 items, which are scored on an eight-point Likert scale (ranging from 0 “never” to 7 “every day”). The YFAS 2.0 evaluates 11 symptoms of Food Addiction (FA) and one clinical impairment criterion such as: overeating, attempts to quit, time spent, social/occupational activities give up, consequences, tolerance, withdrawal, Social and interpersonal problems, Failure to obligation, physically hazardous situations, craving and clinically significant impairment or distress. Each item is scored dichotomously based on the threshold determined by the original version of the YFAS 2.0 (Gearhardt et al., 2016). Each of these 11 diagnostic criteria was considered fulfilled if one or more of the relevant questions for each criterion reached the threshold. A final symptom count score can be calculated by adding up all endorsed symptoms, which can range between 0 and 11.

In line with the diagnostic criteria for substance use disorder in DSM-5, participants can be categorized into mild FA (2 or 3 symptoms), moderate FA (4 or 5 symptoms), severe FA (6 or more symptoms), and no FA (one or fewer symptoms). Every FA diagnosis also requires the presence of the impairment or distress criteria.

Three-Factor Eating Questionnaire Revised 21-Item (TFEQ-R21) (Czeglédi and Urbán, 2010).

We used TFEQ-R21 to assess the participants eating behaviors. The TFEQ-R21 has three subscales: cognitive restraint of eating (CR) six items, uncontrolled eating (UE) nine items and emotional eating (EE) six items. TFEQ-R21 applies a 4-point Likert scale (ranging from 1 “definitely false” to 4 “definitely true”) to assess these three domains. The reliability of the three subscales ranged between 0.79 and 0.91. Cronbach’s alphas in the present study ranged between 0.82, and 0.93.

The 21-item Barratt Impulsiveness Scale Revised (BIS-R-21) (Kapitány-Fövényi et al., 2020).

The BIS-R-21 was used to assess impulsivity. The BIS-R-21 has three subscales: Cognitive Impulsivity (9 items), Behavioral Impulsivity (5 items), and Impatience/Restlessness (7 items). The questionnaire applies a 4-point Likert scale (ranging from 1 “Rarely/Never” to 4 “Almost Always/Always”). The reliability of the three subscales ranged between 0.77, and 0.84. Cronbach’s alphas in the present study ranged between 0.71, and 0.75. The scores for three subscales are derived by summing the ratings for all respective items.

The Depression, Anxiety and Stress scale (DASS-21)(Lovibond and Lovibond, 1995).

The Depression, Anxiety and Stress Scale (DASS-21) was used to assess depression, anxiety, and stress symptoms. DASS-21 applies a 4-point Likert scale (ranging from 0 “Never” to 3 “Almost always”) to assess these three domains (each by seven items)(Sinclair et al., 2012). Cronbach’s alphas in the present study ranged between 0.81 and 0.89.

2.3. Data analyses

Statistical analyses were conducted using the IBM SPSS Statistics Version 29 (IBM Corp, 2023). Descriptive statistics were utilized to analyze sample characteristics. To score the scale, all item scores are transformed to dichotomous format (i.e., 0 and 1), based on the threshold determined by the YFAS 2.0 validation (Gearhardt et al., 2016; Meule et al., 2017). A Confirmatory Factor Analysis (CFA) for dichotomous data was conducted to assess the one-factor structure for the 11H-YFAS 2.0 diagnostic criteria using R statistical environment (Rosseel, 2012). Similar to the original version items assessing impairment or distress were omitted in CFA analysis since they pertain to the clinical significance of the entire syndrome rather than serving as indicators of individual criteria (Gearhardt et al., 2016). Model fit was evaluated using the root-mean-square error of approximation (RMSEA) < 0.10, comparative fit index (CFI) > 0.90, Tucker–Lewis index (TLI) > 0.90, and standardized root-mean-square residual (SRMR). Internal consistency of the 11 YFAS 2.0 symptoms was evaluated with Kuder–Richardson’s alpha for dichotomous variables. We assessed the construct and discriminant validity of both the diagnostic and the symptom count versions by examining the associations between FA (assessed using either the diagnostic or the symptom count H-YFAS 2.0 version) and the following measures such as BMI, TFEQ R-2, BIS-R-21 and DASS 21 score. We used parametric mean comparison tests (analysis of variance), Chi-square, and person’s correlation tests, as appropriate.

3. Results

3.1. Descriptive statistics

The final sample consisted of 605 participants, of which 81.2 % were women, ($n = 491$), 18.3 % were male ($n = 111$), and 0.5 % did not disclose ($n = 3$). The participants ages ranged from 18 to 83-year-olds ($M = 38.9$, $SD = 15.06$). The self-reported Body Mass Index (BMI) ($M = 25.4$, $SD = 7.59$). The distribution of BMI categories was as follows: 53.6 % were of normal weight ($n = 324$; $BMI = 18.5$ – 24.9), 26.9 % were overweight ($n = 163$; $BMI = 25.0$ – 29.9), 15.9 % were obese ($n = 96$; $BMI \geq 30$), and 3.6 % were underweight ($n = 22$; $BMI < 18.5$).

3.2. CFA and internal consistency

Confirmatory factor analysis was carried out the test the original one factor structure of the H-YFAS 2.0. the model 1 results confirmed the adequate translation of the questionnaire: $\chi^2 = 3243$, $df = 44$, $p < 0.001$, RMSEA = 0.091 CI [0.082–0.101], CFI = 0.919; TLI = 0.899; SRMR = 0.045. All criteria had factor loadings for the single factor of 0.62 and higher, and the Kuder–Richardson coefficient of 0.91 and McDonald omega 0.93 indicated good internal consistency reliability. The mean H-YFAS 2.0 symptom count was 1.82 ($SD = 2.92$, range = 0–11). The proportions of the subjects who met the threshold for each diagnostic criterion ranged from 61(10.1 %) to 185 (30.6 %). From the diagnostic cutoff (i.e., threshold met for two or more diagnostic criteria plus impairment/distress), a total of 112 (18.5 %) of participants met the threshold for Food Addiction (FA). Regarding severity, 22 (3.6 %) met the mild criteria, 27 (4.5 %) met the moderate criteria, and 63(10.4 %) met the severe threshold based on DSM-5 criteria using the YFAS 2.0. The internal consistency reliability of the Hungarian version of the Yale Food Addiction Scale 2.0 (H-YFAS 2.0) was assessed using Cronbach’s alpha of the eleven symptoms was $\alpha = 0.91$.

3.3. Convergent and discriminant validity

The association between BIS-R-21 subscales (cognitive impulsivity, behavioral impulsivity and restlessness) and the H-YFAS 2.0 FA present, and symptom count strong correlations this supported the convergent validity (Table 1). The TFEQ-R21 subscales (uncontrolled eating, and emotional eating) was significantly associated with H-YFAS 2.0 symptom count, with uncontrolled eating ($r = 0.55$) and emotional eating ($r = 0.51$) showing strong relationships, while cognitive restraint exhibited a weaker correlation ($r = 0.12$). The DASS-21 depression scale and anxiety scale were significantly associated with AF diagnosis by the H-YFAS 2.0, as well as with symptom count (Table 1). Food addiction scores differed by weight class, $F(3, 601)$, 19.57, $p < 0.001$, $\eta^2 = 0.08$. Scores were significantly higher in obese ($M = 3.5$, $SD = 4.0$) relative to overweight ($M = 2.2$, $SD = 3.2$), normal weight ($M = 1.1$, $SD = 2.0$), and underweight ($M = 0.6$, $SD = 1.7$) participants. The YFAS 2.0 symptom count scores were associated with cognitive restraint however, it was not associated with the diagnostic version of the YFAs 2.0 (Table 1).

4. Discussion

The concept of Food Addiction (FA) suggests that certain foods particularly those that are highly processed, palatable, and calorie-dense may exhibit addictive properties (Gearhardt et al., 2016). However, there is a lack of instruments available to assess FA effectively. The Yale Food Addiction Scale 2.0 (YFAS 2.0) has been introduced as an updated tool subsequent to the publication of the DSM 5. The scale has been validated in multiple languages however, to the best of our knowledge, the YFAS 2.0 has not been validated in Hungarian sample.

The current study aimed to evaluate the psychometric properties of the Hungarian version of the Yale Food Addiction Scale 2.0 (H-YFAS 2.0) in a large non-clinical sample. Our findings indicate that the Hungarian version is a robust tool with strong psychometric properties, demonstrating reliability and a fully comparable structural to the original version of one factorial structure. Confirmatory Factor Analysis (CFA) results support a one-factor model, demonstrating good internal consistency (Cronbach’s alpha = 0.91), consistent with the English version (Gearhardt et al., 2016) and French version (Brunault et al., 2016). Our results confirm that the scale is a reliable measure to assess FA symptoms in a non-clinical sample.

Our results revealed that 18.5 % of participants met the diagnostic criteria for FA, defined as the presence of two or more symptoms plus clinically significant impairment/distress. Our results a slight difference from previous version of the YFAS 2.0 studies, such as the English of YFAS 2.0 (15.8 %) (Gearhardt et al., 2016), the Turkish (11.8 %)

Table 1

Associations of age, BMI, and questionnaire measures with YFAS2.0 diagnoses and symptoms count.

	No risk of Food Addiction (N = 493) M (SD)	At risk of Food Addiction (N = 112) M (SD)	t	p	d	r symptoms	p
Age (Years)	39.51(15.67)	36.46 (12.96)	1.91	0.009	0.077	0.07	0.66
BMI (kg/m ²)	24.57 (4.88)	29.06 (13.84)	-5.80	0.001	0.236	0.26	<0.001
BIS-R-21							
Cognitive Impulsivity	14.12 (3.46)	16.16 (3.87)	-5.48	0.041	0.245	0.24	<0.001
Behavioral Impulsivity	9.26 (2.32)	11.41 (3.19)	-8.21	0.001	0.335	0.45	<0.001
Restlessness	12.31 (3.08)	15.99 (4.39)	-10.46	0.001	0.426	0.49	<0.001
TFEQ-R-21							
Uncontrolled eating	17.06(4.82)	23.33(5.58)	-12.96	0.03	0.527	0.55	<0.001
Cognitive restraint	13.44(4.26)	15.69(3.92)	-5.06	0.07	0.206	0.12	0.004
Emotional eating	10.21(4.26)	15.99(4.93)	-12.46	0.07	0.508	0.51	<0.001
DASS-21							
Depression	11.09 (4.11)	16.57(6.12)	-11.50	<0.001	0.468	0.49	<0.001
Anxiety	11.38(3.73)	15.99(5.02)	-10.99	<0.001	0.447	0.51	<0.001

Note. We compared participants with and without risk of food addiction using parametric mean comparison tests (analysis of variance) and pearson's correlation test. BMI = Body Mass Index; BIS-R-21 = The 21-item Barratt Impulsiveness Scale Revised; TFEQ-R21 = Three-Factor Eating Questionnaire Revised 21-Item; DASS-21 = Depression, Anxiety and Stress Scale.

(Buyuktuncer et al., 2019). According to Hungarian central statistical office reported that 55.5 % of Hungarian aged 15 and older are obese and overweight (Központi Statisztikai Hivatal, 2018). The person with Higher BMI often show addiction symptoms such as a desire to obtain food, high impulsivity, functional impairment, tolerance, craving, and withdrawal (Güngör et al., 2021; Penzenstadler et al., 2019). Our current results support a significant association between higher BMI and H-YFAS 2.0 symptom count. These facts may contribute to the slightly elevated FA prevalence observed in Hungarian sample. Approximately 20 % of the population is affected by FA, with higher rates among overweight or obese individuals, particularly women over 35 years old (Pursey, Stanwell, Gearhardt, Collins, & Burrows, 2014). Notably, 81 % of our sample were of women, with mean age exceeding 35 years.

In line with the English (Gearhardt et al., 2016), Italian (Aloi, Rania, Rodri, Fazio, & Segura-garcia, 2017), and German (Meule et al., 2017) versions our findings show that the severe FA was more common than moderate and mild FA. Participants with fewer symptom endorsements were less likely to meet the threshold for clinically significant impairment or distress, contributing to the higher prevalence of severe FA.

A significantly larger proportion of individuals in the obese sample received an H-YFAS 2.0 diagnosis, these results are in accordance with previous studies (Gearhardt et al., 2016; Meule et al., 2017). Furthermore, FA diagnosis rates were notably higher among overweight and obese participants, corroborating the established link between FA and higher BMI. Notably, the correlation between BMI and FA symptom count, while statistically significant, represents a small effect size, suggesting that weight status may play a secondary role in the FA construct compared to psychological and behavioral factors. These findings suggest that interventions targeting FA should consider weight-related factors to enhance effectiveness.

The convergent validity of the H-YFAS 2.0 was supported by significant correlations between FA diagnosed, symptom count, and related constructs, including uncontrolled eating, cognitive impulsivity, behavioral impulsivity, and restlessness, aligning with findings from previous studies (Morita et al., 2019; Meule et al., 2017; Schulte & Gearhardt, 2017) and demonstrate that FA, as assessed by H-YFAS 2.0, captures key behavioral and psychological features consistent with food addiction theory. The strong correlations between AF and uncontrolled eating and emotional eating highlight the relevance of impulsive and dysregulated eating patterns to the AF construct. In contrast, the weaker correlation with cognitive restraint reflects the divergent validity of the H-YFAS 2.0, as cognitive restraint represents deliberate and controlled eating behavior that is conceptually distinct from AF. These differences in correlations magnitudes further support the exact validity of the H-YFAS 2.0 in capturing both convergent and divergent of eating-related behaviors. Furthermore, H-YFAS 2.0-diagnosed FA strong correlations with depression and anxiety, consistent with findings from the Italian

and Persian versions (Aloi et al., 2017; Ghanbari et al., 2022). Prior research has showed that associations between FA and psychopathological disorders (Granero et al., 2018), a systematic review suggested a moderate positive association between YFAS-diagnosed FA and depression and anxiety (Burrows et al., 2017; Eichen, Lent, Goldbacher, & Foster, 2013; Ghanbari et al., 2022). These results support the evidence base association between food addiction and mental health and emphasize the importance of addressing these comorbid conditions in clinical and research settings.

Participants diagnosed with FA exhibited higher BMI, cognitive and behavioral impulsivity, restlessness, uncontrolled eating, depression, and anxiety scores. These associations highlight the interconnectedness between FA and broader psychological and behavioral issues, consistent with the existing literature (Gearhardt et al., 2009; Pursey et al., 2014; Schulte & Gearhardt, 2017), and further supports the high convergent validity the Hungarian version of the YFAS 2.0.

5. Limitations

The findings of this study should be interpreted in light of its limitations. First, FA was assessed using a self-report measure, which may limit the evaluation of other factors potentially influencing the results. Second, data collection was conducted online, potentially introducing selection or response bias. However, prior research has demonstrated that online surveys yield results comparable to those from paper-and-pencil methods, with no significant impact on the psychometric properties of the questionnaires (Mayr, Gefeller, Prokosch, Pirkil, & Fr, 2012). Third due to the cross-sectional design of study, test-retest validity could not be assessed. It will be essential for future researcher to implement objective measure to assess BMI and other eating disorder relating behavior and test-retest validity of the tool to extend the present findings. Fifth, our sample was not gender balanced, thus limiting the generalizability of our findings. Future research should look for gender invariance to guarantee that observed difference are not impacted may measuring biases between genders. Sixth, the online survey format limited our ability to conduct formal clinical assessments for exclusion criteria. However, we implemented measures such as self-reported exclusion criteria and response quality checks to enhance data validity and reliability within the constraints of remote data collection.

6. Conclusions

In conclusion, the Hungarian version of the YFAS 2.0 is a reliable and valid tool for assessing FA symptoms based on the DSM-5 criteria for substance-related and addictive disorders in a nonclinical sample and results might not generalize to clinical populations. Hence, future research should explore its psychometric properties in clinical

populations.

CRediT authorship contribution statement

Afewerk Tsegaye: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Zsófia Németh:** Writing – review & editing, Data curation, Conceptualization. **Eszter Kotyuk:** Writing – review & editing, Methodology, Formal analysis. **Virág Scheller:** Writing – review & editing. **Klaudia Szabó:** Writing – review & editing, Data curation, Conceptualization. **Orsolya Pachner:** Writing – review & editing. **Renáta Cserjési:** Writing – review & editing, Conceptualization. **Zsolt Demetrovics:** Writing – review & editing, Conceptualization. **H.N. Alexander Logemann:** Writing – review & editing, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

References

- Aloi, M., Rania, M., Rodri, R. C., Fazio, P. D., & Segura-garcia, C. (2017). Validation of the Italian version of the Yale Food Addiction Scale. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, 22(3), 527–533. <https://doi.org/10.1007/s40519-017-0421>
- American Psychiatric Association (APA) (2013). Diagnostic and Statistical Manual of Mental Disorders (DSM-V). 5th Edition, American Psychiatric Publishing, Washington DC. Doi:10.1176/appi.books.9780890425596.
- Avena, N. M., Rada, P. A., & B. G. H. (2008). Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake. *Neuroscience & Biobehavioral Reviews*, 32(1), 20–39. <https://doi.org/10.1016/j.neubiorev.2007.04.019>
- Brunault, P., Courtois, R., Gearhardt, A. N., Gaillard, P., Journiac, K., & Cathelain, S. (2016). Validation of the French Version of the DSM-5 Yale Food Addiction Scale (YFAS 2.0) in a Nonclinical Sample. *The Canadian Journal of Psychiatry*, 61(9), 597–602. <https://doi.org/10.1177/0706743716673320>
- Burrows, T., Skinner, J., McKenna, R., & Rollow, M. (2017). Food addiction and associations with mental health symptoms : A systematic review with meta-analysis. *Journal of Human Nutrition and Dietetics*, 31(2), 145–156. <https://doi.org/10.1111/jhn.12532>
- Buyuktuncer, Z., Akyol, A., Ayaz, A., Nergiz-unal, R., Aksoy, B., Cosgun, E., & Ozdemir, P. (2019). Turkish version of the Yale Food Addiction Scale : Preliminary results of factorial structure , reliability , and construct validity. *BMC Psychology*, 38 (1), 1–8. <https://doi.org/10.1186/s41043-019-0202-4>
- Czeglédi, E., & Urbán, R. (2010). Hungarian adaptation of three-factor eating questionnaire Revised 21-item. *Magyar Pszichológiai Szemle*, 65(3), 463–494. <https://doi.org/10.1556/MPSzle.65.2010.3.2>
- Központi Statisztikai Hivatal. Egészségi állapot és egészségmagatartás, 2016– 2017. Budapest: Központi Statisztikai Hivatal (2018). p. 23.
- Eichen, D. M., Lent, M. R., Goldbacher, E., & Foster, G. D. (2013). Exploration of ' Food Addiction ' in overweight and obese treatment-seeking adults. *Appetite*, 67, 22–24. <https://doi.org/10.1016/j.appet.2013.03.008>
- Fernandez-Aranda, F., Karwautz, A., & Treasure, J. (2018). Food addiction: A transdiagnostic construct of increasing interest. *European Eating Disorders Review*, 26 (6), 536–540. <https://doi.org/10.1002/erv.2645>
- Furlong, T. M., Jayaweera, H. K., Balleine, B. W., & Corbit, L. H. (2014). Binge-Like consumption of a palatable food accelerates habitual control of behavior and is dependent on activation of the dorsolateral striatum. *The Journal of Neuroscience*, 34 (14), 5012–5022. <https://doi.org/10.1523/JNEUROSCI.3707-13.2014>
- García-García, I., Horstmann, A., Jurado, M. A., Garolera, M., Chaudhry, S. J., Margulies, D. S., & Neumann, J. (2014). Reward processing in obesity, substance addiction and non-substance addiction. *Obesity Reviews*, 15(11), 853–869. <https://doi.org/10.1111/obr.12221>
- Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2009). Preliminary validation of the Yale Food Addiction Scale. *Appetite*, 52(2), 430–436. <https://doi.org/10.1016/j.appet.2008.12.003>
- Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2016). Development of the Yale Food Addiction Scale version 2.0. *Psychology of Addictive Behaviors*, 30(1), 113–121. <https://doi.org/10.1037/adb0000136>
- Gearhardt, A. N., Davis, C., Kuschner, R., & Brownell, K. D. (2011). The addiction potential of hyperpalatable foods. *Current Drug Abuse Reviews*, 4(3), 140–145. <https://doi.org/10.2174/1874473711104030140>
- Ghanbari, N., Nooripour, R., Firoozabadi, A., Saeid, T., Var, P., & Wisniewski, P. (2022). Psychometric assessment of Persian translation of Yale Food Addiction Scale Version 2.0. *Journal of Eating Disorders*, 10(1), 1–9. <https://doi.org/10.1186/s40337-022-00689-5>
- Gonçalves, S. F., Bastos, B., & Vieira, A. I. (2021). Psychometric properties and convergent and divergent validity of the Portuguese Yale Food Addiction Scale 2.0 (P-YFAS 2.0). *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, 1–11. <https://doi.org/10.1007/s40519-021-01218-0>
- Granero, R., Gearhardt, A. N., Mestre-bach, G., Neto-antao, M. I., Riesco, N., Stewart, T., & Casanueva, F. F. (2018). Validation of the Spanish Version of the Yale Food Addiction Scale 2.0 (YFAS 2.0) and clinical correlates in a sample of eating disorder, gambling disorder, and healthy control participants. *Frontiers in Psychiatry*, 9, 208. <https://doi.org/10.3389/fpsy.2018.00208>
- Güngör, E. S., Çelebi, C., & Akvardar, Y. (2021). The relationship of food addiction with other eating pathologies and impulsivity : A Case-control study. *Frontiers in Psychiatry*, 12, 1–9. <https://doi.org/10.3389/fpsy.2021.747474>
- IBM Corp. Released (2023). IBM SPSS statistics for Windows, Version 29.0.2.0 Armonk, NY: IBM Cop. <https://www.ibm.com/analytics/spss-statistics-software>.
- Ifland, J. R., Preuss, H. G., Marcus, M. T., Rourke, K. M., Taylor, W. C., Burau, K., & Manso, G. (2009). Refined food addiction : A classic substance use disorder. *Medical Hypotheses*, 72(5), 518–526. <https://doi.org/10.1016/j.mehy.2008.11.035>
- Imperatori C, Fabbriatore M, Vumbaca V, Innamorati M, Contardi A, Farina B (2016). Food Addiction: definition, measurement and prevalence in healthy subjects and in patients with eating disorders. *Riv Psichiatri*, 51(2):60-5. doi: 10.1708/2246.24196.
- Khine, M. T., Minagawa, A., Li, Y., Naito, H., & Yatsuya, H. (2019). Validation of the Japanese Version of the Yale Food Addiction Scale 2.0 (J-YFAS 2.0). *Nutrients*, 11 (687). <https://doi.org/10.3390/nu11030687>
- Kalon, E., Hong, J. Y., Tobin, C., & Schulte, T. (2016). Psychological and neurobiological correlates of food addiction. *International Review Neurobiology*, 129, 85–110. <https://doi.org/10.1016/bs.im.2016.06.003>
- Kapitány-Fövényi, M., Urbán, R., Varga, G., Potenza, M. N., Griffiths, M. D., Szekely, A., & Demetrovics, Z. (2020). The 21-item Barratt Impulsiveness Scale Revised (BIS-R-21): An alternative three-factor model. *Journal of Behavioral Addictions*, 9(2), 225–246. <https://doi.org/10.1556/2006.2020.00030>
- Kenny, P. J., & Shaw, G. B. (2011). Review reward mechanisms in obesity : New insights and future directions. *Neuron*, 69(4), 664–679. <https://doi.org/10.1016/j.neuron.2011.02.016>
- Lingvay, I., Cohen, R. V., Roux, C. W., & Sumithran, P. (2024). Obesity in adults. *The Lancet*.
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335–343. [https://doi.org/10.1016/0005-7967\(94\)00075-U](https://doi.org/10.1016/0005-7967(94)00075-U)
- Mayr, A., Gefeller, O., Prokosch, H., Pirk, A., & Fr, A. (2012). Web-based data collection yielded an additional response bias d but had no direct effect on outcome scales. *Journal of Clinical Epidemiology*, 65, 970–977. <https://doi.org/10.1016/j.jclinepi.2012.03.005>
- Meule, A., Gearhardt, A. N., & Arbor, A. (2014). Food Addiction in the Light of DSM-5. *Nutrients*, 6, 3653–3671. <https://doi.org/10.3390/nu6093653>
- Meule, A., Müller, A., Gearhardt, A. N., & Blechert, J. (2017). German version of the Yale Food Addiction Scale 2.0: Prevalence and correlates of 'food addiction' in students and obese individuals. *Appetite*, 115, 54–61. <https://doi.org/10.1016/j.appet.2016.10.003>
- Meule, A. (2019). A critical examination of the practical implications derived from the food addiction concept. *Current Obesity Reports*, 8, 11–17. <https://doi.org/10.1007/s13679-019-0326-2>
- Penzenstadler, L., Soares, C., Karila, L., & Khazaal, Y. (2019). Systematic review of food addiction as measured with the yale food addiction scale : Implications for the Food Addiction Construct. *Current Neuropsychopharmacology*, 17(6), 526–538. <https://doi.org/10.2174/1570159X16666181108093520>
- Potenza, M. N. (2008). The neurobiology of pathological gambling and drug addiction : An overview and new findings. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1507), 3181–3189. <https://doi.org/10.1098/rstb.2008.0100>
- Pursey, K. M., Stanwell, P., Gearhardt, A. N., Collins, C. E., & Burrows, T. L. (2014). The prevalence of food addiction as assessed by the yale food addiction scale: A systematic review. *Nutrients*, 6(10), 4552–4590. <https://doi.org/10.3390/nu6104552>
- Qualtrics (2005). Qualtrics. Provo, UT, USA. Retrieved February 2024, from <https://www.qualtrics.com>.

- Rosseel, Y. (2012). lavaan : An R package for structural equation modeling. *Journal of Statistical Software*, 48(2).
- Schulte, E. M., & Gearhardt, A. N. (2017). Development of the Modified Yale Food Addiction Scale Version 2.0. *European Eating Disorders Review*, 25(4), 302–308. <https://doi.org/10.1002/erv.2515>
- Sinclair, S. J., Siefert, C. J., Slavin-Mulford, J. M., Stein, M. B., Renna, M., & Blais, M. A. (2012). Psychometric Evaluation and Normative Data for the Depression, Anxiety, and Stress Scales-21 (DASS-21) in a Nonclinical Sample of U.S. Adults. *Evaluation and the Health Professions*, 35(3), 259–279. <https://doi.org/10.1177/0163278711424282>
- Spring, B., Schneider, K., Smith, M., Kendzor, D., Appelhans, B., Hedeker, D., & Pagoto, S. (2008). Abuse potential of carbohydrates for overweight carbohydrate cravers. *Psychopharmacology (Berl)*, 197(4), 637–647. <https://doi.org/10.1007/s00213-008-1085>
- Thorgeirsson, T. E., Gudbjartsson, D. F., Sulem, P., Besenbacher, S., Styrkarsdottir, U., Thorleifsson, G., & Consortium, T. A. G. (2013). Sequence variants at CHRNA6 and CYP2A6 affect smoking behavior. *Nature Genetics*. <https://doi.org/10.1038/ng.573>
- Tomasi, D., & Volkow, N. D. (2013). Striatocortical pathway dysfunction in addiction and obesity: Differences and similarities. *Critical Reviews in Biochemistry and Molecular Biology*, 48(1), 1–19. <https://doi.org/10.3109/10409238.2012.735642>
- Tsegaye, A., Guo, C., Stoet, G., Cserjési, R., Kokonyei, G., & Logemann, H. N. A. (2021). The relationship between BMI, maladaptive eating, negative affect and inhibitory control in a neutral, food, and money context. *BMC Psychology*, 10(4), 1–9. <https://doi.org/10.1186/s40359-021-00712-5>
- Volkow, N. D., Wang, G. J., Fowler, J. S., Tomasi, D., & Baler, R. (2011). Food and drug reward: Overlapping circuits in human obesity and addiction. *Current Topics in Behavioral Neurosciences*, 11, 1–24. https://doi.org/10.1007/7854_2011_169
- Volkow, N. D., Wang, G. J., Fowler, J. S., & Telang, F. (2008). Overlapping neuronal circuits in addiction and obesity: Evidence of systems pathology. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1507), 3191–3200. <https://doi.org/10.1098/rstb.2008.0107>
- Volkow, N. D., Wang, G., & Baler, R. D. (2011). Reward , dopamine and the control of food intake : Implications for obesity. *Trends in Cognitive Sciences*, 15(1), 37–46. <https://doi.org/10.1016/j.tics.2010.11.001>
- Volkow, N. D., Wise, R. A., & Baler, R. (2017). The dopamine motive system : Implications for drug and food addiction. *Nature Reviews Neuroscience*, 18(12), 741–752. <https://doi.org/10.1038/nrn.2017.130>
- World Health Organization (WHO) (2024). Obesity and overweight. Retrieved September25, 2024., from <https://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight>.