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Title: Validation of the French version of the DSM-5 Yale Food Addiction Scale (YFAS 2.0) in a nonclinical sample

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Abstract

Objective: The Yale Food Addiction Scale (YFAS) is the only questionnaire that assesses food addiction (FA) based on substance dependence criteria in the Diagnostic and Statistical Manual of Mental Disorders (DSM), Fourth Edition, Text Revision. Following recent updating of addiction criteria, a new DSM-5 version (YFAS 2.0) has been developed. Our study tested the psychometric properties of the French YFAS 2.0 in a nonclinical population.

Method: We assessed 330 nonclinical participants for FA (French YFAS 2.0), eating behaviour and eating disorder (Binge Eating Scale, Emotional Overeating Questionnaire, Three-Factor Eating Questionnaire-R18, Questionnaire on Eating and Weight Patterns-Revised, Eating Disorder Diagnostic Scale). We tested the scale's factor structure (confirmatory factor analysis based on 11 diagnostic criteria), internal consistency, and construct and incremental validity.

Results: Prevalence of FA was 8.2%. Our results supported a one-factor structure similar to the US version. In both its diagnostic and symptom count versions, the YFAS 2.0 had good internal consistency (Kuder-Richardson alpha was .83), and was associated with BMI, binge eating, uncontrolled and emotional eating, binge eating disorder, and cognitive restraint. FA predicted BMI above and beyond binge eating frequency. Females had a higher prevalence of FA than males but not more FA symptoms.

Conclusions: We validated a psychometrically sound French version of the YFAS 2.0 in a nonclinical population, in both its symptom count and diagnostic versions. Future studies should investigate psychometric properties of this questionnaire in clinical populations potentially at risk for FA (i.e., patients with obesity, diabetes, hypertension or other metabolic syndrome risk factors).

Clinical Implications

- The French YFAS 2.0 is a reliable tool to assess food addiction symptoms based on DSM-5 criteria for addictive disorders.
- It has a one-factor structure and high convergent validity with BMI, emotional eating, binge eating symptoms and binge eating disorder.
- Differential use of the diagnostic and symptom count versions depending on the population and hypotheses considered.

Limitations

- We did not assess the sensitivity and the specificity of the YFAS 2.0 against a semi-structured instrument.
- The cross-sectional study design did not enable test–retest validity to be established.
- We did not assess the questionnaire’s validity in clinical populations (patients with eating disorders, obesity or other metabolic risk factors).

Key Words: food addiction, addictions, behavioral addictions, substance use disorders, Yale Food Addiction Scale 2.0, psychometric, factor analysis, eating disorders, binge eating, addictive disorders.

Abbreviations

BES Binge Eating Scale

BMI Body Mass Index

DSM-IV-TR Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision

DSM-5 Diagnostic and Statistical Manual of Mental Disorders, 5th edition

EDDS Eating Disorder Diagnostic Scale

EOQ Emotional Overeating Questionnaire

FA Factor analysis

QEWPR Questionnaire on Eating and Weight Patterns Revised

ROC Receiver Operator Characteristic

TFEQ Three-Factor Eating Questionnaire

TFEQ-R18 Revised 18-item version of Three-Factor Eating Questionnaire

YFAS Yale Food Addiction Scale original version (based on DSM-IV-TR criteria)

YFAS 2.0 New version of Yale Food Addiction Scale (based on the DSM-5 criteria)

Introduction

Drug addiction is a chronic relapsing disorder characterized by compulsion to seek and take the drug, a loss of control over drug-seeking and drug-taking behaviours, and the continued use of the drug despite its adverse consequences.¹ It has recently been suggested that addictions should also include compulsive engagement in some pleasurable activity, such as gambling, gaming, internet use, sex, exercising, eating or shopping, in addition to pharmacologic rewards.² Apart from gambling disorder, which has been included in a new behavioural addiction category of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), more research is needed before considering the potential inclusion of these other activities as addictive disorders.¹

Despite the fact that food is widely available in western societies, that eating is an essential and frequent human activity, and that certain foods have powerful addictive and rewarding effects similar to drugs,^{3,4} the hypothesis that some individuals are addicted to food or to their eating behaviour has only recently been proposed.⁵ Gearhardt et al. recently proposed the concept of food addiction (FA) as a specific phenotype defined by applying the DSM-IV-TR diagnostic criteria for substance dependence to certain foods, particularly processed foods high in added sugar, fat and salt.⁶ This led to the development of the first self-administered questionnaire assessing FA symptoms: the Yale Food Addiction Scale (YFAS, hereafter called “original YFAS”).⁷ Further studies demonstrated the excellent psychometric properties of the original YFAS, including a one-factor structure, excellent internal consistency and very good

convergent validity with measures of binge eating.⁷ This questionnaire has been cross-culturally validated, including Chinese,⁸ French,⁹ German,¹⁰ Italian,¹¹ Spanish¹² and Turkish¹³ versions, allowing a growing body of research in this field.¹⁴ FA was found to be more prevalent in single and obese individuals,¹⁵ in those with higher levels of depression, higher impulsivity, higher prevalence of post-traumatic stress disorder, higher prevalence rate for diagnosis of Attention Deficit Hyperactivity Disorder in childhood,¹⁶⁻¹⁹ and in patients with alterations in brain circuitry similar to those found in drug addiction (elevated activation in reward circuitry in response to food cues and reduced activation of inhibitory regions in response to food intake).²⁰

With the recent update of DSM-5 diagnostic criteria, an update of the original YFAS was needed to take into account four new criteria, namely craving, use despite interpersonal or social consequences, failure in role obligations, and use in physically hazardous situations. An updated version could also help determine whether the DSM-5 criteria for addictive disorders could be applicable to food and whether food addiction could be included in the international diagnostic classifications as an addictive disorder. To this end, Gearhardt et al. designed the US version of the YFAS 2.0 and validated it in a nonclinical population²¹: they used confirmatory factor analysis based on the 11 diagnostic criteria to compare a one-factor model and a two-factor model (seven DSM-IV-TR criteria plus craving vs. three DSM-IV-TR criteria of abuse recently added in the DSM-5). They finally retained a one-factor structure based on fit indices (the two-factor solution did not result in noticeably improved fit and the two factors of the two-factor model were highly correlated). This validation study demonstrated the excellent psychometric properties of the YFAS 2.0, with a one-factor structure and high convergent validity with measures of disinhibited eating, obesity, and weight cycling. Regarding

discriminant validity, the US version of the YFAS 2.0 was not significantly correlated with dietary restraint, and approximately half the participants with an FA diagnosis did not meet criteria for an existing eating disorder. Additionally, the YFAS 2.0 exhibited incremental validity by accounting for variance in elevated BMI above and beyond binge eating frequency. To our knowledge, there is currently no French version of the YFAS 2.0, and no studies investigating the prevalence of FA and its associated factors as assessed by the DSM-5 criteria.

This study aimed to measure the psychometric properties of a French version of the YFAS 2.0 in a nonclinical sample by establishing its factor structure (confirmatory factor analysis), its internal consistency, its construct validity with eating disorder diagnosis, binge eating symptoms, uncontrolled eating, emotional eating and emotional overeating (convergent validity) and with cognitive restraint (discriminant validity), and its incremental validity (does the YFAS 2.0 symptom count explain unique variance in BMI above and beyond binge eating frequency?). We hypothesized that the French YFAS 2.0 had a one-factor structure, good internal consistency, high convergent validity with BMI, binge eating and emotional eating, and no correlation with cognitive restraint.

Methods

Participants and Procedures

A total of 330 volunteers participated in our study between May 2014 and May 2015. They were recruited through a web-based questionnaire, created using Sphinx software (Sphinx Plus 2 version 5.1.0.4),²² sent to students from the Department of Psychology and Medicine of Tours University (n=164; 49.7% of the sample) and their families (n=166; 50.3% of the sample).

Students proposed the questionnaire to their family members who participated based on volunteering. We differentiated results from the students and family members answers. We ensured that only adults were included in the family sample. The YFAS translation procedure was the same as the one used in the validation of the French version of the original YFAS (see Brunault et al.⁹ for more details regarding the translation procedure): (1) translation, (2) blind-backward translation, (3) comparison between the two versions and modification if necessary, and finally (4) test of a pilot version in 10 controls and 10 patients, and modification of the scale if necessary. The final French version of the YFAS 2.0 can be found in Table 1.

Measures

We used measures assessing the same constructs as Gearhardt et al.²¹ in their YFAS 2.0 validation study, collecting socio-demographic characteristics (i.e., age, sex, marital status), current BMI, previous maximal BMI, and using self-administered questionnaires assessing the same constructs (see below and Gearhardt et al.²¹ for more details).

Food addiction (Yale Food Addiction Scale version 2.0)

The YFAS 2.0 is a 35-item self-report scale designed by Gearhardt et al.²¹ to assess FA symptoms over the previous 12 months based on the 11 diagnostic criteria for Substance-Related and Addictive Disorders proposed in the DSM-5.¹ In this way, the YFAS 2.0 assesses 11 FA criteria (for a detailed description, see Supplementary Table 1), including the seven previous food-related DSM-IV-TR criteria (consumption more than planned; persistent desire or unsuccessful efforts to cut down or control consumption of certain foods; great deal of time spent; important activities given up; use despite physical/psychological consequences;

tolerance; withdrawal);⁶the four new criteria in the DSM-5 (i.e., craving, use despite interpersonal or social consequences, failure in role obligations, and use in physically hazardous situations), and significant distress in relation to food.

Each item is rated on an 8-point Likert-type scale ranging from 0 (never) to 7 (every day). Each item can be rated dichotomously (endorsed or not endorsed) depending on specific cut-offs that Gearhardt et al. defined for each item by examining the specificity for each response option based on Receiver Operator Characteristic (ROC) curves (see Gearhardt et al.²¹ for more details). Based on these thresholds, each of the 11 diagnostic criteria is met when one or more item representing that criterion is endorsed (see Supplementary Table 1 for the detailed scoring instructions for the YFAS 2.0).²¹ The YFAS 2.0 provides two scoring options: a diagnostic version (FA is diagnosed when the participant reports two or more symptoms during the previous 12 months plus clinically significant impairment or distress) and a symptom count version (number of FA symptoms experienced in the previous 12 months, ranging from 0 to 11). FA is mild if there are two or three symptoms and clinically significant impairment/distress, moderate if there are four or five symptoms and significant impairment/distress, and severe if there are six or more symptoms and significant impairment/distress.^{1, 21}

Details of the psychometric properties of the English version of the YFAS 2.0 are described above in the Introduction.

Binge eating (Binge Eating Scale)

The Binge Eating Scale (BES) is a 16-item questionnaire designed to assess severity of binge eating using behavioural, affective, and cognitive symptoms (cut-off \geq 18).²³ The BES is a

reliable tool for assessing binge eating disorder and has been validated in French.²⁴ In our sample, Cronbach's α was .89.

Eating disorders (Questionnaire on Eating and Weight Patterns-R and the Eating Disorder Diagnostic Scale)

We screened for eating disorders based on DSM-5 criteria using the Questionnaire on Eating and Weight Patterns-R (QEWP-R)²⁵ (for binge eating disorder and bulimia nervosa) and the Eating Disorder Diagnostic Scale²⁶ (for anorexia nervosa).

Eating behaviour characteristics (Emotional Overeating Questionnaire, Revised 18-item version of the Three Factor Eating Questionnaire)

We assessed emotional overeating using the Emotional Overeating Questionnaire (EOQ) which identifies the frequency of overeating in response to six emotions (anxiety, sadness, loneliness, tiredness, anger, and happiness) with high internal consistency ($\alpha=0.85$).²⁷ In our sample, Cronbach's α was .81.

We used the revised 18-item version of the Three Factor Eating Questionnaire (TFEQ)^{28,29} to assess uncontrolled eating (tendency to eat more than usual due to a loss of control over intake accompanied by subjective feelings of hunger; this subscale encompasses the previous "disinhibition" and "hunger" subscales of the 51-item TFEQ), emotional eating (inability to resist emotional cues) and cognitive restraint (conscious restriction of food intake in order to control body weight or to promote weight loss). The scores were calculated as described by de Lauzon et al.²⁸: the theoretical ranges for the items were 9–

36 for uncontrolled eating, 3–12 for emotional eating and 6–24 for cognitive restraint. In our sample, Cronbach's α was .89.

Statistical Analyses and Ethical Considerations

Analyses were conducted using AMOS (SPSS Inc., Chicago, IL, USA)³⁰ for confirmatory factor analyses and using the *R* statistical package version 2.15.2³¹ with the psych package³² for the other statistics. Statistical analyses included descriptive statistics and examination of the psychometric properties of the scale (factor structure, item statistics, internal consistency, construct validity and incremental validity).

To test the factor structure of the French YFAS 2.0, we used the same procedure than Gearhardt et al.²¹: we conducted confirmatory factor analyses based on the 11 diagnostic criteria to compare a one-factor model and a two-factor model (seven DSM-IV-TR criteria plus craving vs. three former DSM-IV-TR criteria of abuse recently added in the DSM-5). To assess the internal consistency of the scale, we used Kuder-Richardson alpha (KR-20) and McDonald's omega. We used KMO statistics to assess the sampling adequacy.

We assessed the construct 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 version of the YFAS) and the following measures: socio-demographic characteristics, weight-related variables, eating disorder diagnosis, binge eating, emotional eating and emotional overeating (convergent validity) and cognitive restraint (discriminant validity). We used chi-squared tests, parametric mean comparison tests (ANOVA) or Pearson's correlation tests, as appropriate.

We used hierarchical multiple regression to test incremental validity: does the YFAS 2.0 symptom count predict elevated BMI above and beyond binge eating frequency (item 3 of the QEWP-R)?

There were no missing data, as all of the questions required a response to proceed to the next page of the survey. Our study did not require institutional review board approval because it was not considered biomedical research under French law; however, it followed the tenets of the Declaration of Helsinki.

Results

Sample Characteristics

Table 2 presents the socio-demographic characteristics, weight-related variables and prevalence of each FA symptom. Participants had a mean age of 28.9 years (SD 11.3, range=18-76) and a mean current BMI of 23.3 kg/m² (SD 4.9). Supplementary Table 2 presents and compares the sociodemographic characteristics of students vs. family members). Prevalence of FA was 8.2%. Mean number of FA symptoms was 1.1 (SD 1.9), with no significant difference between men and women (0.7 SD 1.3 vs. 0.8 SD 1.4; p=0.65). Ten percent were underweight (BMI<18.5kg/m²), 65.2% were normal weight (18.5kg/m²≤BMI<25kg/m²), 16.4% were overweight (25kg/m²≤BMI<30kg/m²), and 8.5% were obese (BMI≥30kg/m²). Table 3 presents the prevalence of eating disorders and the eating behaviour characteristics of our population. Sixteen out of the 27 participants with FA (59.3%) had significant binge eating.

Item Statistics, Factor Structure, and internal consistency

Table 4 summarizes the item statistics, including the mean, standard deviation, and item-total correlation for each item.

Results and fit indices of confirmatory factor analyses are presented in Table 5. The one-factor model had adequate fit indices (Confirmatory Fit Index=CFI was .887, Root-Mean-Square error of approximation=RMSEA was .083) with all factor loadings greater than .32. In line with Gearhardt et al.²¹ YFAS 2.0 validation study and consistent with Gillespie et al.'s examination of the factor structure of substance use disorder symptoms³³, we retained a one-factor solution because the two-factor model did not result in noticeably improved fit (CFI=.891, RMSEA=.082) and the two factors of this two-factor model were highly correlated ($r=.69$, $p<.001$). The internal consistency of the YFAS 2.0 (11 diagnostic criteria plus significant distress) was good (KR-20=.83, Mc Donald omega=.86) and higher than the one observed with the DSM-IV-TR diagnostic criteria of our sample (7 diagnostic criteria plus significant distress; KR-20=.74). Sampling adequacy was very good (KMO=.86). Mean inter-item correlation was .26 for the 7 DSM-IV-TR criteria and $r=.30$ for the 11 DSM-5 criteria.

Convergent validity of the YFAS 2.0 (diagnostic version)

Participants with FA (vs. without) were more frequently female, had higher current weight, BMI and higher previous maximal BMI (Table 2). They had a higher prevalence rate for DSM-5 binge eating disorder but not for bulimia nervosa or anorexia nervosa (Table 3). Participants with FA had higher scores for binge eating, uncontrolled eating and emotional eating ($p<0.001$).

They also ate more frequently in response to negative and positive emotions (i.e., anxiety, sadness, loneliness, anger, tiredness, happiness) (Table 3).

Convergent validity of the YFAS 2.0 (symptom count version)

Table 4 presents the factors associated with the YFAS symptom score: the YFAS symptom score was associated with higher current BMI and higher previous maximal BMI, but not with marital status, age or gender. The YFAS symptom score was associated with diagnosis of binge eating disorder, higher scores for binge eating, uncontrolled eating, emotional eating, and eating in response to negative or positive emotions such as anxiety, sadness, loneliness, anger, tiredness or happiness. It was not associated with diagnosis of anorexia nervosa, or bulimia nervosa.

Discriminant validity of the YFAS 2.0 (diagnostic and symptom count versions)

FA diagnosis and symptom count were associated with higher cognitive restraint (Table 4).

Incremental validity of the YFAS 2.0

In simple linear regression, binge eating frequency was a significant predictor of BMI ($t=2.59$, $\beta=.14$, $p<.01$), accounting for 1.7% of the variance. In hierarchical multiple regression, when YFAS 2.0 symptom count was entered in the model, binge eating was no longer a significant predictor ($t=.61$, $\beta=.04$, $p=.55$), and YFAS 2.0 symptom count was a significant predictor ($t=4.71$, $\beta=.27$, $p<.001$), accounting for an additional 6% of the variance in BMI ($F=14.67$, $p<.001$).

Discussion

This study demonstrated that the French version of the YFAS 2.0 is a reliable tool to diagnose FA and FA symptoms based on the DSM-5 criteria for Substance-Related and Addictive Disorders. It has a one-factor structure, good internal consistency, and high convergent validity with measures of binge eating, emotional eating, BMI, and with diagnosis of DSM-5 binge eating disorder. We did not confirm the discriminant validity of the YFAS with cognitive restraint found in the US validation study. The YFAS symptom count predicted BMI above and beyond binge eating frequency. These results demonstrate that the addiction model is relevant and applicable to food consumption, and that FA seems to be a unitary concept and construct, related to but different from traditional eating disorders.²¹

The one-factor structure and good internal consistency of the French version of the YFAS 2.0 is in line with the results obtained with the DSM-5 version of the YFAS.²¹ Interestingly, the addition of the four new criteria in the DSM-5 (including craving) did not modify the one-factor structure of this scale, and even improved its internal consistency. The YFAS 2.0 also corrected a limitation of the original YFAS: the lack of reliability of items related to “persistent desire or unsuccessful efforts to cut down or control use”.³⁴ In the French YFAS 2.0, this item was endorsed by 12.1% of the sample (vs. 90.1% in the original YFAS), indicating better assessment of this diagnostic criterion in the YFAS 2.0. Prevalence of FA was higher in the US sample than in the French sample (see Supplementary Table 4 for a comparison of FA prevalence and criteria in the original French YFAS, the French YFAS 2.0 and the US YFAS 2.0), probably due to cultural differences or differences in BMI (in our sample, one participant out of four was overweight or obese vs. one out of two in the US

sample²¹). The adequate factor loadings observed for all of the 12 dichotomous diagnostic criteria (11 diagnostic DSM criteria plus significance questions) suggest that the DSM-5 addiction criteria applied to food assess a unitary concept.

Although the DSM-5 thresholds have been lowered for addictive disorders (i.e., 2 criteria out of 11 are necessary for diagnosis in the DSM-5, compared to 3 out of 7 in the DSM-IV-TR), we found no significant increase in the prevalence rate for DSM-5 FA (Supplementary Table 3). The lower thresholds for the 11 addiction criteria might have been counterbalanced by the higher YFAS 2.0 thresholds for each item.

Interestingly, FA was associated with emotional eating which is in line with the high comorbidity between FA, emotional dysregulation,³⁵ and mood and anxiety disorders.^{5,36} Our results are in line with Bruch and Kaplan's psychosomatic theory, which postulates that food intake increases in response to an internal state of emotional arousal, such as anxiety or depression, and that this could partly explain weight gain.^{37,38} Although FA was associated with higher BMI, it is still unclear whether FA could be a direct cause of weight gain and whether treatment for FA could improve weight. FA prevalence was higher among women than among men, but the mean number of FA symptoms did not differ between women and men. Because men have generally more difficulty than women at processing and expressing emotions,³⁹ use of the symptom count version (number of FA criteria met) may be more useful than the diagnostic version (diagnosis) for men.

We did not confirm the YFAS discriminant validity with cognitive restraint found in the US validation study,²¹ probably because of cultural differences or differences in samples (by

including young students, our participants may have had higher cognitive restraint and lower BMI).

This study has a number of limitations, including use of a self-administered questionnaire (future studies should first design and validate a semi-structured diagnostic instrument to test the sensitivity and specificity of the YFAS 2.0), use of self-report for height (often overestimated) and weight (often underestimated), no assessment of the test-retest reliability of the scale, and use of the YFAS 2.0 in a nonclinical population. Future research should test its psychometric properties in patients with eating disorders or with diseases potentially associated with FA (i.e., obesity, diabetes, hypertension or other metabolic syndrome risk factors).

By validating the French version of the YFAS 2.0, this study provides an opportunity to study the “food addiction” phenotype and its associated factors in greater depth. Before including FA in the international classification of diseases –a subject that is still hotly debated– the similarities of this phenotype with other addictions in terms of disease course, phenomenology, comorbidity, neurobiological mechanisms, and response to treatment must be identified, as well as its specificities.⁴⁰ If it is included, it must then be determined whether FA should be conceptualized as a substance-related disorder,⁴¹ as a behavioural addiction⁴² or as a “mixed” substance-related and behavioural addiction. This could have important practical implications, such as choosing the most appropriate therapeutic strategy for a given patient (including psychotherapy and substitution or substance replacement therapy), and developing effective harm reduction programs or even public health policies. It also highlights the importance of investigating each patient’s mental representations and values associated with

food, which may explain how and why an individual chooses food rather than another substance or behaviour in a stressful situation.

Conclusions

This study demonstrated that the French version of the YFAS 2.0 is a reliable tool for assessing FA symptoms based on the DSM-5 criteria for substance-related and addictive disorders. We demonstrated that the YFAS 2.0 can be used either to diagnose FA or to assess the number of FA symptoms in a nonclinical sample. Future studies should test the validity of the YFAS 2.0 in other nonclinical and clinical samples. The assessment of a “food addiction” phenotype using this DSM-5-based questionnaire is an important preliminary step in order to identify its risk factors and prior to discussing the pro and cons of considering FA as an addictive disorder. To contribute to this debate, future studies should investigate FA in patients who experience harm related to their FA, including obesity and other metabolic syndrome risk factors or metabolic complications (e.g. type 2 diabetes, hypertension, dyslipidemia, atherosclerosis, stroke, or coronary heart disease).

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TABLES

Table 1. French version of the Yale Food Addiction Scale 2.0

Consignes pour remplir le questionnaire :

Ce questionnaire porte sur vos habitudes alimentaires de **l'année passée**. Pour chaque question, merci d'entourer le chiffre (0, 1, 2, 3, 4, 5, 6 ou 7) qui correspond le mieux à vos habitudes alimentaires des 12 derniers mois. Les gens ont parfois du mal à contrôler la quantité de nourriture qu'ils peuvent manger, comme par exemple:

- Les aliments sucrés comme les glaces ou les crèmes glacées, le chocolat, les beignets, les biscuits, les gâteaux et les bonbons.
- Les féculents comme le pain, le pain de mie, les sandwichs, les pâtes et le riz.
- Les aliments salés comme les chips, les bretzels et les biscuits apéritifs.
- Les aliments gras comme le steak, les charcuteries, le bacon, les hamburgers, les cheeseburgers, les fromages, les pizzas et les frites.
- Les boissons sucrées comme le soda, la limonade et les boissons énergétiques.

Pour les questions suivantes, l'expression « CERTAINS ALIMENTS » sera utilisée. Dans ce cas, merci de penser à TOUT aliment ou boisson indiqué(e) dans la liste ci-dessus ou à TOUT AUTRE(S) aliment(s) qui vous a (ont) posé un problème au cours de **l'année passée**.

| AU COURS DES 12 DERNIERS MOIS : | Jamais | Moins d'une fois par mois | Une fois par mois | 2 à 3 fois par mois | Une fois par semaine | 2 à 3 fois par semaine | 4 à 6 fois par semaine | Tous les jours |
|--|---------------|----------------------------------|--------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------|-----------------------|
| 1. Lorsque j'ai commencé à manger certains aliments, j'en ai mangé beaucoup plus que prévu. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. Il m'est arrivé(e) de continuer à manger certains aliments même lorsque je n'avais plus faim. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. J'ai mangé jusqu'à me sentir « mal » physiquement. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. J'ai été très inquiet(e) à l'idée de diminuer ma consommation de certains types d'aliments, mais j'en continué à en manger. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. J'ai passé beaucoup de temps à me sentir endormi(e) ou fatigué(e) après avoir trop mangé. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. J'ai passé beaucoup de temps à manger certains aliments au cours de la journée. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. Lorsque je n'avais pas certains aliments à ma disposition, j'ai fait des efforts pour en acheter. Par exemple, je suis allé(e) dans un magasin pour acheter ces aliments alors que j'avais d'autres aliments à la maison. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. J'ai mangé certains aliments si souvent ou en si grande quantité que j'ai arrêté de faire d'autres choses importantes, comme par exemple travailler ou passer du temps avec ma famille ou mes amis. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. J'ai eu des problèmes avec ma famille ou mes amis à cause de la quantité de nourriture que je mange. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. J'ai évité certaines activités au travail, à l'école ou certaines activités sociales par peur de manger trop dans ces situations. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| AU COURS DES 12 DERNIERS MOIS : | Jamais | Moins d'une fois par mois | Une fois par mois | 2 à 3 fois par mois | Une fois par semaine | 2 à 3 fois par semaine | 4 à 6 fois par semaine | Tous les jours |
|--|---------------|----------------------------------|--------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------|-----------------------|
| 11. Lorsque j'ai diminué ou arrêté ma consommation de certains aliments, je me suis senti(e) irritable, stressé(e) ou triste. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. Lorsque j'ai diminué ou arrêté ma consommation de certains aliments et que j'ai eu des symptômes physiques, j'ai mangé ces aliments pour me sentir mieux. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. Lorsque j'ai diminué ou arrêté ma consommation de certains aliments et que je me suis senti(e) irritable, stressé(e) ou triste, j'ai mangé ces aliments pour me sentir mieux. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. Lorsque j'ai diminué ou arrêté ma consommation de certains aliments, j'ai eu des symptômes physiques comme par exemple des maux de tête ou de la fatigue. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15. Lorsque j'ai diminué ou arrêté ma consommation de certains aliments, j'ai constaté que j'avais un besoin plus important ou une envie irrésistible de manger ces aliments. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16. Mon comportement vis-à-vis de la nourriture et de l'alimentation a été source de souffrance. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17. J'ai eu beaucoup de problèmes dans ma vie à cause de la nourriture et de l'alimentation, comme par exemple des problèmes pour gérer le quotidien, des problèmes au travail, à l'école, avec la famille ou encore des problèmes de santé. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18. Des fois, je me suis senti(e) si mal à cause de mon alimentation excessive que cela m'a empêché de faire des choses importantes, comme travailler ou passer du temps avec mes amis ou ma famille. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19. Mon alimentation excessive m'a empêché(e) de m'occuper correctement de ma famille ou de faire des tâches ménagères. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20. J'ai évité des opportunités professionnelles ou relationnelles parce que je ne pouvais pas manger certains aliments dans ces situations. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21. J'ai évité certaines activités sociales car dans ces situations, certaines personnes n'étaient pas d'accord avec la quantité de nourriture que je pouvais manger. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. J'ai continué à manger le(s) même(s) type(s) d'aliment(s) ou la même quantité de nourriture bien que cela ait été responsable de problèmes psychologiques. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. J'ai continué à manger le(s) même(s) type(s) d'aliment(s) ou la même quantité de nourriture bien que cela ait été responsable de problèmes physiques. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24. Le fait de manger la même quantité de nourriture qu'avant ne me donne plus le même plaisir qu'avant. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25. J'ai vraiment voulu diminuer ou arrêter ma consommation de certains aliments, mais je n'y suis pas arrivé. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26. J'ai eu besoin de manger de plus en plus pour avoir le même effet qu'avant, comme par exemple avoir moins de stress, avoir moins de tristesse ou avoir plus de plaisir. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| AU COURS DES 12 DERNIERS MOIS : | Jamais | Moins d'une fois par mois | Une fois par mois | 2 à 3 fois par mois | Une fois par semaine | 2 à 3 fois par semaine | 4 à 6 fois par semaine | Tous les jours |
|--|---------------|----------------------------------|--------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------|-----------------------|
| 27. Je n'ai pas réussi correctement au travail ou à l'école car je mangeais trop. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28. J'ai continué à manger certains aliments même si je savais que c'était dangereux pour ma santé physique. Par exemple, j'ai continué à manger des bonbons alors que je savais que j'avais du diabète, ou j'ai continué à manger des aliments gras alors que je savais que j'avais des problèmes cardiaques. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29. J'ai eu des envies si fortes pour certains aliments que je ne pouvais plus penser à autre chose. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30. J'ai eu des envies si fortes pour certains aliments que c'était comme si je devais absolument les manger tout de suite. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31. J'ai essayé de diminuer ou d'arrêter ma consommation de certains aliments, mais je n'ai pas réussi. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32. J'ai essayé mais n'ai pas réussi à diminuer ou à arrêter de manger certains aliments. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 33. En mangeant, il m'est arrivé(e) d'être tellement inattentif (inattentive) que j'aurai pu être blessé(e) (par exemple en conduisant une voiture, en traversant la rue ou en utilisant une machine ou un instrument dangereux). | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 34. En pensant à la nourriture et à l'alimentation, il m'est arrivé(e) d'être tellement inattentif (inattentive) que j'aurai pu être blessé(e) (par exemple en conduisant une voiture, en traversant la rue ou en utilisant une machine ou un instrument dangereux). | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 35. Mes amis et ma famille ont été inquiets de la quantité de nourriture que je pouvais manger. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Item optionnel n°1. Merci d'entourer TOUS les aliments pour lesquels vous avez eu des problèmes (c'est-à-dire des difficultés à en contrôler la consommation).

| | | | | | |
|-----------------------|----------|--------------|-------------|-----------|-----------------------|
| Glaces/Crèmes glacées | Chocolat | Pommes | Beignets | Brocolis | Biscuits |
| Gâteaux | Bonbons | Pain | Pain de mie | Sandwichs | Laitues |
| Pâtes | Fraises | Riz | Chips | Bretzels | Biscuits apéritifs |
| Carottes | Steak | Charcuteries | Bananes | Bacon | Hamburgers |
| Cheeseburgers | Fromages | Pizzas | Frites | Sodas | Aucun de ces aliments |

Item optionnel n°2. Merci d'indiquer ici s'il y a d'autre(s) aliment(s) pour lesquels vous avez eu des problèmes (c'est-à-dire des difficultés à en contrôler la consommation). Merci d'indiquer uniquement les aliments qui ne sont pas dans la liste ci-dessus.

.....

.....

Items#1 and #2 are optional and are not present in the US version of the YFAS 2.0. These 2 items are not used in the determination of the food addiction diagnosis nor in the calculation of the number of food addiction symptoms endorsed, but we included them here because they were included in the original YFAS and they help to determine which types of foods are problematic.

Table 2. Descriptive statistics of the overall sample, and comparison of participants with and without food addiction

| | Overall sample (n=330) | Participants without food addiction (n=303) | Participants with food addiction (n=27) | Statistic test | p |
|---|---------------------------|--|--|----------------|--------|
| <i>Sociodemographic characteristics</i> | | | | | |
| Age (years) | 28.9 ± 11.3 | 28.8 ± 11.4 | 27.6 ± 11.0 | F=.25 | 0.62 |
| Gender (male)** | 19.7% (65) | 21.5% (65)** | 0% (0)** | $\chi^2=7.21$ | <0.01 |
| Marital status (married or in a relationship) | 35.8% (118) | 36.3% (111) | 29.6% (8) | $\chi^2=.48$ | 0.49 |
| <i>Weight-related variables</i> | | | | | |
| Weight (kg)* | 65.7 ± 16.3 | 65.2 ± 15.7* | 72.0 ± 21.5* | F=4.35 | <0.05 |
| BMI (kg/m ²)** | 23.3 ± 4.9 | 23.1 ± 4.5** | 25.9 ± 7.7** | F=8.32 | <0.01 |
| Previous maximal BMI (kg/m ²)*** | 24.8 ± 5.2 | 24.6 ± 4.7* | 27.9 ± 8.8* | F=10.57 | <0.001 |
| <i>Food addiction prevalence and symptoms</i> | | | | | |
| Prevalence of food addiction | 8.2% (27) | - | - | - | - |
| Mild food addiction | 3.3% (11) | - | - | - | - |
| Moderate food addiction | 2.1% (7) | - | - | - | - |
| Severe food addiction | 3.0% (9) | - | - | - | - |
| Number of food addiction symptoms*** | 1.1 ± 1.8 | 0.7 ± 1.4*** | 5.0 ± 3.5*** | F=194.98 | <0.001 |
| Food consumed in larger quantities or over a longer period than intended*** | 20% (66) | 16.5% (50)*** | 59.3% (16)*** | $\chi^2=28.33$ | <0.001 |
| Persistent desire or unsuccessful efforts to cut down or control consumption of certain foods*** | 12.1% (40) | 8.9% (27)*** | 48.1% (13)*** | $\chi^2=35.83$ | <0.001 |
| Considerable time spent to obtain, consume, or recover from effects of food*** | 12.4% (41) | 10.2% (31)*** | 37.0% (10)*** | $\chi^2=16.37$ | <0.001 |
| Giving up important social, occupational, or recreational activities because of food consumption*** | 7.6% (25) | 4.0% (12)*** | 48.1% (13)*** | $\chi^2=69.13$ | <0.001 |
| Continuing to eat certain foods despite physical or psychological problems*** | 7.9% (26) | 4.3% (13)*** | 48.1% (13)*** | $\chi^2=65.70$ | <0.001 |
| Tolerance*** | 6.4% (21) | 3.0% (9)*** | 44.4% (12)*** | $\chi^2=71.56$ | <0.001 |
| Withdrawal*** | 7.9% (26) | 4.6% (14)*** | 44.4% (12)*** | $\chi^2=54.17$ | <0.001 |
| Continued consumption despite social or interpersonal problems*** | 13.3% (44) | 8.9% (27)*** | 63.0% (17)*** | $\chi^2=62.68$ | <0.001 |
| Failure to fulfill major role obligation*** | 3% (10) | 1.7% (5)*** | 18.5% (5)*** | $\chi^2=24.00$ | <0.001 |
| Use in physically hazardous situations*** | 9.1% (30) | 6.6% (20)*** | 37.0% (10)*** | $\chi^2=27.79$ | <0.001 |

| | | | | | |
|---|-----------|--------------|---------------|----------------|--------|
| Craving*** | 8.2% (27) | 4.6% (14)*** | 48.1% (13)*** | $\chi^2=62.52$ | <0.001 |
| Significant distress in relation to food*** | 9.7% (32) | 1.7% (5)*** | 100% (27)*** | $\chi^2=273.8$ | <0.001 |

4

Legends: Descriptive data are presented as mean \pm standard deviation or percentage (number). We compared participants with and without food addiction using parametric mean comparison tests (ANOVA) and chi-squared tests.

* p<0.05; ** p<0.01; *** p<0.001 indicate variables significantly associated with food addiction diagnosis

BMI: Body Mass Index.

Table 3. Prevalence of eating disorders and eating behaviour characteristics in the overall sample, and comparison of participants with and without food addiction

| | Overall sample (n=330) | Participants without food addiction (n=303) | Participants with food addiction (n=27) | Statistic test | p |
|--|---------------------------|--|--|----------------|--------|
| <i>Eating disorders according to DSM-5 criteria (QEWP-R and EDDS)</i> | | | | | |
| Anorexia nervosa | 1.5% (5) | 1.7% (5) | 0% (0) | $\chi^2=.45$ | 0.50 |
| Bulimia nervosa | 3.0% (10) | 3.3% (10) | 0% (0) | $\chi^2=.92$ | 0.34 |
| Binge eating disorder* | 4.2% (14) | 3.3% (10)* | 14.8% (4)* | $\chi^2=5.51$ | <0.05 |
| <i>Binge eating (mean BES score)***</i> | 8.5 ± 7.6 | 7.5 ± 6.7*** | 18.8 ± 9.0*** | F=65.95 | <0.001 |
| <i>Eating behaviour characteristics (TFEQ)</i> | | | | | |
| Cognitive restraint*** | 11.8 ± 4.0 | 11.3 ± 3.8*** | 16.4 ± 3.5*** | F=45.36 | <0.001 |
| Uncontrolled eating*** | 18.4 ± 5.2 | 18.0 ± 5.0*** | 22.8 ± 4.7*** | F=23.00 | <0.001 |
| Emotional eating*** | 6.4 ± 2.7 | 6.2 ± 2.7*** | 8.4 ± 2.5*** | F=16.51 | <0.001 |
| <i>Emotional overeating (EOQ total score)**</i> = Eating in response to ... | 2.8 ± 3.8 | 2.5 ± 3.0** | 6.8 ± 7.9** | F=36.38 | <0.01 |
| Anxiety*** | 0.8 ± 1.1 | 0.7 ± 1.0** | 1.6 ± 1.7** | F=20.49 | <0.001 |
| Sadness*** | 0.5 ± 0.9 | 0.4 ± 0.8* | 1.2 ± 1.5* | F=21.00 | <0.001 |
| Loneliness*** | 0.5 ± 0.9 | 0.4 ± 0.8* | 1.3 ± 1.6* | F=21.74 | <0.001 |
| Tiredness*** | 0.4 ± 1.0 | 0.4 ± 0.9 | 1.0 ± 1.7 | F=10.92 | <0.001 |
| Anger*** | 0.3 ± 0.7 | 0.2 ± 0.6* | 1.0 ± 1.6* | F=28.84 | <0.001 |
| Happiness** | 0.4 ± 0.7 | 0.3 ± 0.6 | 0.7 ± 1.2 | F=8.83 | <0.01 |

Legends: Descriptive data are presented as mean ± standard deviation or percentage (number). We compared participants with and without food addiction using parametric mean comparison tests (ANOVA) and chi-squared tests.

* p<0.05; ** p<0.01; *** p<0.001 indicate variables significantly associated with food addiction diagnosis

QEWP-R: Revised Questionnaire on Eating and Weight Patterns; EDDS: Eating Disorder Diagnostic Scale; BES: Binge Eating Scale; TFEQ-R18: Revised 18-item version of Three-Factor Eating Questionnaire; EOQ: Emotional Overeating Questionnaire.

Table 4. Association between the YFAS symptom score, sociodemographic characteristics, weight-related variables, and eating disorders and behaviours

| | Statistic test | <i>p</i> |
|---|----------------|----------|
| <i>Sociodemographic characteristics</i> | | |
| Age (years) | r=.02 | .72 |
| Gender (male) | F=1.74 | .19 |
| Marital status (married or in a relationship) | F=.14 | .70 |
| <i>Weight-related variables</i> | | |
| Weight (kg)*** | r=.24 | <.001 |
| BMI (kg/m ²)*** | r=.29 | <.001 |
| Previous maximal BMI (kg/m ²)*** | r=.27 | <.001 |
| <i>Eating disorders according to DSM-5 criteria (QEWP-R and EDDS)</i> | | |
| Anorexia nervosa | F=2.46 | .12 |
| Bulimia nervosa | F=1.73 | .19 |
| Binge eating disorder** | F=6.72 | <.01 |
| <i>Binge eating (mean BES score) ***</i> | r=.60 | <.001 |
| <i>Eating behaviour characteristics (TFEQ)</i> | | |
| Cognitive restraint*** | r=.26 | <.001 |
| Uncontrolled eating*** | r=.44 | <.001 |
| Emotional eating*** | r=.37 | <.001 |
| <i>Emotional overeating (EOQ total score)</i> | r=.55 | <.001 |
| <i>= Eating in response to ...</i> | | |
| Anxiety*** | r=.45 | <.001 |
| Sadness*** | r=.46 | <.001 |
| Loneliness*** | r=.47 | <.001 |
| Tiredness*** | r=.36 | <.001 |
| Anger*** | r=.37 | <.001 |
| Happiness*** | r=.21 | <.001 |

Legends: We compared participants with and without food addiction using parametric mean comparison tests (ANOVA) and Pearson's correlation test.

** p<0.01; *** p<0.001.

BMI: Body Mass Index.

Table 5. Factor loadings for the 1- and 2-factor structures of the Yale Food Addiction Scale 2.0 (confirmatory factor analyses)

| | One-factor structure ^a | Two-factor structure ^b | |
|---|-----------------------------------|-----------------------------------|-------------------|
| | Factor 1 loadings | Factor 1 loadings | Factor 2 loadings |
| <i>Food consumed in larger quantities or over a longer period than intended</i> | .32*** | .32*** | - |
| <i>Persistent desire or unsuccessful efforts to cut down or control consumption of certain foods</i> | .70*** | .70*** | - |
| <i>Considerable time spent to obtain, consume, or recover from effects of food</i> | .40*** | .40*** | - |
| <i>Giving up important social, occupational, or recreational activities because of food consumption</i> | .53*** | .53*** | - |
| <i>Continuing to eat certain foods despite physical or psychological problems</i> | .51*** | .51*** | - |
| <i>Tolerance</i> | .57*** | .57*** | - |
| <i>Withdrawal</i> | .54*** | .53*** | - |
| <i>Continued use despite social or interpersonal problems</i> | .54*** | - | .51*** |
| <i>Failure to fulfill major role obligations</i> | .50*** | - | .46*** |
| <i>Eating certain foods in physically hazardous situations</i> | .65*** | - | .61*** |
| <i>Craving, or a strong desire or urge to eat certain food</i> | .74*** | .73*** | - |

^aThis one-factor model was significant with the corresponding fit indices: $\chi^2=143.01$, df(degrees of freedom)=44; χ^2 (CMIN)/df=3.25, $p=.001$; CFI (Comparative fit index)=.887; IFI (Incremental fit index)=.888; RMSEA (Root Mean Square Error of Approximation)=.083 [.068-.0098]; ECVI (Expected Cross-Validation Index)=.635.

^b This two-factor model (factor 1=seven DSM-IV-TR criteria plus craving; factor 2:three former DSM-IV-TR criteria of abuse recently added in the DSM-5) was significant with the corresponding fit indices: $\chi^2=138.23$, df (degrees of freedom)=43; χ^2 (CMIN)/df=3.22; $p=.001$; CFI (Comparative fit index)=.891; IFI (Incremental fit index)=.893; RMSEA (Root Mean Square Error of Approximation)=.082 [.067 - .0098]; ECVI (Expected Cross-Validation Index)=.627. Factor 1 and Factor 2 were significantly correlated ($r=.69$, $p<.001$). *** $p<.001$.

SUPPLEMENTARY MATERIALS

Supplementary Table 1 (Table S1). Scoring instructions for the YFAS 2.0

These scoring instructions are those described in Gearhardt et al.'s validation study of the YFAS 2.0.²¹ Each question falls under a DSM 5 Substance-Related and Addictive Disorders (SRAD) symptom criterion or clinical impairment/distress:

1) Substance taken in larger amount and for longer period than intended

Questions #1, #2, #3

2) Persistent desire or repeated unsuccessful attempts to quit

Questions #4, #25, #31, # 32

3) Much time/activity to obtain, use, recover

Questions #5, #6, #7

4) Important social, occupational, or recreational activities given up or reduced

Questions #8, #10, #18, #20

5) Use continues despite knowledge of adverse consequences (e.g., emotional problems, physical problems)

Questions, #22, #23

6) Tolerance (marked increase in amount; marked decrease in effect)

Questions #24, #26

7) Characteristic withdrawal symptoms; substance taken to relieve withdrawal

Questions #11, #12, #13, #14, #15

8) Continued use despite social or interpersonal problems

Questions #9, #21, #35

9) Failure to fulfill major role obligation (e.g., work, school, home)

Questions #19, #27

10) Use in physically hazardous situations

Question #28, #33, #34

11) Craving, or a strong desire or urge to use

Questions #29, #30

12) Use causes clinically significant impairment or distress

Questions #16, #17

Each question has a different threshold: 0 = threshold not met, 1 = threshold is met

- 1) Once a month: #9, #10, #19, #27, #33, #35
- 2) Two to three times a month: #8, #18, #20, #21, #34
- 3) Once a week: #3, #11, #13, #14, #22, #28, #29
- 4) Two to three times a week: #5, #12, #16, #17, #23, #24, #26, #30, #31, #32
- 5) Four to six times a week: #1, #2, #4, #6, #7, #15, #25

After computing the threshold for each question, sum up the questions under each criterion (e.g. Tolerance, Withdrawal, Clinical Significance, etc.). If the score for the symptom criterion is ≥ 1 , then the criterion has been met and is scored as 1. If the score is = 0, then the symptom criterion has not been met and is scored as 0.

Example:

Tolerance: (#24 =1) + (#26 = 0) = 1, Criterion Met

Craving (#29=0) + (#30 = 0), Criterion Not Met

Failure to fulfill role obligations (#19 =1) + (#27 = 1), Criterion Met and scored as 1

For the symptom count scoring option, add up all of the scores for each of the 11 criterion (e.g. Tolerance, Withdrawal, Use Despite Negative Consequence, ...). Do not add clinical significance to the score. This score should range from 0 to 11 (0 symptoms to 11 symptoms.)

For the “diagnosis” scoring option (“diagnostic version”), a participant can meet criteria for mild, moderate or severe food addiction. Both the symptom count score and the clinical significance criterion are used.

No Food Addiction = 1 or fewer symptoms

No Food Addiction = Does not meet criteria for clinical significance

Mild Food Addiction = 2 or 3 symptoms and clinical significance

Moderate Food Addiction = 4 or 5 symptoms and clinical significance

Severe Food Addiction = 6 or more symptoms and clinical significance

Supplementary Table 2 (Table S2). Descriptive statistics and comparison between students and their family members

| | Students (n=164) | Family members (n=166) | p |
|---|---------------------|------------------------------|--------|
| <i>Sociodemographic characteristics</i> | | | |
| Age (years)*** | 21.7 ± 2.9*** | 35.5 ± 12.3*** | <0.001 |
| Gender (male)*** | 11.6% (19)*** | 27.7% (46)*** | <0.001 |
| Marital status (married or in a relationship) | 14% (23) | 57.2% (95) | 0.49 |
| <i>Weight-related variables</i> | | | |
| Weight (kg)*** | 61.7 ± 13.6*** | 69.7 ± 17.8*** | <0.001 |
| BMI (kg/m ²)*** | 22.2 ± 3.8*** | 24.5 ± 5.6*** | <0.001 |
| Previous maximal BMI (kg/m ²)*** | 23.6 ± 4.0*** | 26.1 ± 6.0*** | <0.001 |
| <i>Food addiction prevalence and symptoms</i> | | | |
| Prevalence of food addiction | 10.4% (17) | 6% (10) | 0.15 |
| Mild food addiction | 3.7% (6) | 2.4% (4) | - |
| Moderate food addiction | 3.0% (5) | 1.2% (2) | - |
| Severe food addiction | 3.7% (6) | 2.4% (4) | - |
| Number of food addiction symptoms | 1.2 ± 2.0 | 0.9 ± 1.8 | 0.15 |
| <i>Eating disorders according to DSM-5 criteria (QEWP-R and EDDS)</i> | | | |
| Anorexia nervosa* | 3.0% (5)* | 0% (0)* | <0.05 |
| Bulimia nervosa | 4.3% (7) | 1.8% (3) | 0.19 |
| Binge eating disorder | 3.7% (6) | 4.8% (8) | 0.60 |
| Binge eating (mean BES score)* | 9.3 ± 7.6* | 7.6 ± 7.4* | <0.05 |
| <i>Eating behaviour characteristics (TFEQ)</i> | | | |
| Cognitive restraint | 11.7 ± 3.9 | 11.8 ± 4.1 | 0.76 |
| Uncontrolled eating | 18.7 ± 5.0 | 18.2 ± 5.2 | 0.40 |
| Emotional eating | 6.7 ± 2.6 | 6.2 ± 2.8 | 0.09 |
| <i>Emotional overeating (EOQ total score)</i> | | | |
| = Eating in response to ... | 3.1 ± 4.0 | 2.5 ± 3.6 | 0.18 |
| Anxiety** | 0.9 ± 1.1** | 0.6 ± 1.0** | <0.01 |
| Sadness | 0.6 ± 0.9 | 0.4 ± 0.8 | 0.07 |
| Loneliness | 0.6 ± 0.9 | 0.4 ± 0.9 | 0.20 |
| Tiredness | 0.4 ± 1.0 | 0.4 ± 1.0 | 0.73 |
| Anger | 0.3 ± 0.6 | 0.3 ± 0.8 | 0.97 |
| Happiness | 0.4 ± 0.7 | 0.4 ± 0.7 | 0.86 |

Legends: Descriptive data are presented as mean ± standard deviation or percentage (number). We compared participants with and without food addiction using ANOVA and chi-squared tests.

* p<0.05; ** p<0.01; *** p<0.001. BMI: Body Mass Index.

Supplementary Table 3 (Table S3). Item statistics for the Yale Food Addiction Scale 2.0

| | Mean | SD | Item-total correlation |
|---|------|-----|------------------------|
| <i>Food consumed in larger quantities or over a longer period than intended</i> | | | |
| Item 1. | .09 | .28 | .51 |
| Item 2. | .11 | .31 | .35 |
| Item 3. | .08 | .28 | .45 |
| <i>Persistent desire or unsuccessful efforts to cut down or control consumption of certain foods</i> | | | |
| Item 4. | .05 | .21 | .45 |
| Item 25. | .01 | .10 | .36 |
| Item 31. | .08 | .28 | .66 |
| Item 32. | .02 | .15 | .39 |
| <i>Considerable time spent to obtain, consume, or recover from effects of food</i> | | | |
| Item 5. | .10 | .30 | .44 |
| Item 6. | .03 | .17 | .24 |
| Item 7. | .01 | .10 | .22 |
| <i>Giving up important social, occupational, or recreational activities because of food consumption</i> | | | |
| Item 8. | .03 | .16 | .43 |
| Item 10. | .04 | .20 | .50 |
| Item 18. | .02 | .15 | .46 |
| Item 20. | .02 | .15 | .26 |
| <i>Continuing to eat certain foods despite physical or psychological problems</i> | | | |
| Item 22. | .05 | .21 | .47 |
| Item 23. | .04 | .20 | .39 |
| <i>Tolerance</i> | | | |
| Item 24. | .04 | .19 | .59 |
| Item 26. | .05 | .22 | .62 |
| <i>Withdrawal</i> | | | |
| Item 11. | .03 | .17 | .54 |
| Item 12. | .06 | .23 | .58 |
| Item 13. | .02 | .14 | .56 |
| Item 14. | .05 | .23 | .62 |
| Item 15. | .02 | .13 | .62 |
| <i>Continued use despite social or interpersonal problems</i> | | | |
| Item 9. | .05 | .21 | .38 |
| Item 21. | .02 | .13 | .38 |
| Item 35. | .11 | .31 | .55 |
| <i>Failure to fulfill major role obligations</i> | | | |
| Item 19. | .01 | .10 | .26 |
| Item 27. | .05 | .23 | .55 |
| <i>Eating certain foods in physically hazardous situations</i> | | | |
| Item 28. | .07 | .26 | .52 |
| Item 33. | .09 | .28 | .73 |

| | | | |
|--|-----|-----|-----|
| Item 34. | .02 | .12 | .57 |
| <i>Craving, or a strong desire or urge to eat certain food</i> | | | |
| Item 29. | .07 | .26 | .71 |
| Item 30. | .06 | .24 | .71 |
| <i>Clinically significant impairment or distress</i> | | | |
| Item 16. | .08 | .27 | .66 |
| Item 17. | .04 | .20 | .41 |

Legends: a mean of 0.09 for item 1 indicates that 9% of the sample scored above the cut-off. Item-total correlation indicates the correlation between each item and the total score for the 35 items.

Supplementary Table 4 (Table S4). Comparison of the French version of the original YFAS, the French version of the YFAS 2.0 and the US version of the YFAS 2.0

| SRAD Diagnostic Indicators | French version of the original YFAS | French version of the YFAS 2.0 | US version of the YFAS 2.0 |
|---|-------------------------------------|--------------------------------|----------------------------|
| Prevalence of food addiction | 8.7% | 8.2% | 14.6% |
| Consumed more than planned | 16.1% | 20.0% | 19.6% |
| Unable to cut down (=persistent desire or unsuccessful efforts to cut down or control consumption of certain foods) | 90.1% | 12.1% | 16.7% |
| Great deal of time spent | 19.0% | 12.4% | 17.2% |
| Important activities given up | 9.4% | 7.6% | 23.9% |
| Use despite physical/emotional consequences | 19.7% | 7.9% | 16.3% |
| Tolerance | 23.5% | 6.4% | 12.0% |
| Withdrawal | 11.8% | 7.9% | 22.5% |
| Use despite social/interpersonal consequences | - | 13.3% | 14.4% |
| Failure in role obligation | - | 3% | 17.7% |
| Use in physically hazardous situations | - | 9.1% | 18.7% |
| Craving*** | - | 8.2% | 13.4% |
| Impairment or distress | 9.9% | 9.7% | 16.7% |

Legends: YFAS, Yale Food Addiction Scale; SRAD, Substance-related and addictive disorders. The impairment or distress indicator is only used in the diagnostic computation (not the symptom summary score). Craving, failure in role obligation, use despite interpersonal/social consequences, and use in physically hazardous situations were not assessed in the original YFAS.