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Prevalence of Social, Cognitive, and Emotional Impairment Among Individuals with Food Addiction

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Declarations

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Conflicts of interest/Competing interests

The authors declare that they have no conflict of interest.

Availability of data and material

Data can be made available upon request.

Code availability

Not applicable.

Authors' contributions

Both authors contributed to the study conception and design. Data collection and analysis were performed by Emilie Lacroix. The first draft of the manuscript was written by Emilie Lacroix and both authors contributed to editing the manuscript. Both authors read and approved the final manuscript.

Ethics approval

This study was approved by the Conjoint Faculties Research Ethics Board of the University of Calgary (REB16-1791). The study was performed in accordance with the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS)*, comparable to the 1964 Helsinki Declaration.

Consent to participate

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

Consent to publish

Not applicable.

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Abstract

Purpose: The clinical utility of the construct of food addiction has been heavily debated. Though food addiction has been associated with psychosocial impairment in clinical samples, it is critical to examine these associations in non-clinical samples, to obtain unbiased evidence regarding this phenomenon's clinical significance. It is also unknown which types of impairment are most common in food addiction. This observational study explored the association of self-reported food addiction with impairment in the domains of social, cognitive, and emotional functioning. **Methods:** Participants (356 university students and 544 adults recruited through Mechanical Turk) completed the Yale Food Addiction Scale 2.0 and Clinical Impairment Assessment 3.0 questionnaire. **Results:** Food addiction showed large correlations with emotional (r = .55, .57), social (r = .56, .59), and cognitive impairment (r = .58, .53) in the student and Mechanical Turk samples, respectively. The most common difficulties endorsed were emotional (e.g., feeling ashamed or critical of oneself, upset, or worried due to one's eating habits), followed by social and cognitive. **Conclusions:** Food addiction was strongly associated with psychosocial impairment in two non-clinical samples, suggesting this phenomenon merits further investigation. We found substantial associations of food addiction with emotional as well as social and cognitive impairment.

No level of evidence rating (basic science)

Key words: Food addiction, overeating, emotional impairment, cognitive impairment, social impairment

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Introduction and Aims

Debate has surrounded the concept of food addiction, the notion that individuals can become addicted to certain foods. Criticisms abound regarding the food addiction construct and limitations of the evidence in support of it, centering on two points: that the central features of substance use disorders do not translate to food and eating; and that there is insufficient evidence regarding pharmacological effects of food on the brain [1]. Another key question is whether food addiction is associated with clinically significant psychosocial impairment, i.e., to a degree that would warrant its conceptualization as a form of psychopathology. To meet criteria for food addiction on the Yale Food Addiction Scale [YFAS; 2], individuals must endorse at least two symptoms as well as distress ("My behavior with respect to food and eating causes significant distress") and/or impairment ("I experience significant problems in my ability to function effectively because of food and eating"). However, these questions do not distinguish among the different types of distress or impairment experienced. Though YFAS scores have consistently been associated moderately to strongly with self-reported depression, anxiety, and stress [r = .76 - .79; 3], which are indicators of psychological distress, the relative prevalence and severity of impairment across different domains (i.e. social, cognitive, and emotional functioning) has not yet been ascertained using a psychosocial impairment measure developed specifically for populations with disordered eating.

Understanding the relationship of food addiction with various forms of psychosocial impairment may help gauge the clinical significance of this eating pattern. Robust associations with validated measures of psychosocial impairment would support conceptualizing food

addiction as a form of psychopathology, whereas the absence of such associations would suggest that the construct pathologizes normative patterns of overeating. Because clinical samples, by design, include only individuals with symptoms distressing and impairing enough to prompt treatment-seeking, it is particularly important to examine associations with psychosocial impairment in non-clinical samples, while controlling for potentially confounding variables, in order to obtain less biased evidence regarding the clinical significance of this phenomenon. Understanding which areas of psychosocial functioning are most strongly impacted by food addiction could also inform clinical decision-making by suggesting areas to target and monitor in treatment.

Aims

This observational study compared, in two non-clinical samples, the relative strength of associations of food addiction with different types of psychosocial impairment. We also controlled for potential confounds of gender, age, emotional eating, reward-driven eating, binge eating, and general disordered eating, and examined which types of impairment were most commonly reported by individuals who met, versus did not met, YFAS criteria for food addiction. Given previously-documented associations, we hypothesized that food addiction would be strongly associated with emotional impairment. Investigations of cognitive and social impairment were exploratory, given the lack of prior research examining self-reported impairment in these areas.

Method

Participants

Participants were 356 students (80.7% female, 55.3% White) enrolled in undergraduate psychology courses at a Canadian university, who participated in exchange for bonus course

credit; and 544 paid participants (70.3% female, 83.1% White) recruited through Mechanical Turk (MTurk), a crowdsourcing platform, in 2017. Student participants were aged 18-53 years (M = 20.45, SD = 3.49), and MTurk participants were aged 19-79 years (M = 38.58, SD = 12.55). Mean body mass index (kg/m^2, based on self-reported weight and height) was 22.25 (SD = 3.42) in students and 29.33 (SD = 8.83) in the MTurk sample. Participants were required to be at least 18 years old. MTurk workers were also required to have a 90% approval rate for previous work and a U.S. bank account.

To increase confidence regarding the validity of our data, we employed four quality control strategies: attention check questions; deleting responses from surveys completed in under 10 minutes; screening time stamps for batches of responses obtained at identical times; and screening free-form responses to two survey questions ("If you have ever felt addicted to food, please list which foods or types of foods" and "If you have ever felt addicted to eating, please tell us more about your experience") for answers that were composed of language from the survey itself, or appeared otherwise unusual.

Measures

Food Addiction. The Yale Food Addiction Scale 2.0 [YFAS 2.0; 2] applies DSM-5 substance use disorder criteria to food. The YFAS includes 35 items scored from 0 (*Never*) to 7 (*Every day*), and yields a total score, a continuous symptom count, and a categorization regarding the presence of food addiction (None = $\leq$1 symptom, and/or lack of distress or impairment; Mild = 2 to 3 symptoms plus distress and/or impairment; Moderate = 4 to 5 symptoms plus distress and/or impairment; Severe = $\geq$6 symptoms plus distress and/or impairment). For total scores, Cronbach's α was .94 (student sample) and .95 (MTurk sample).

Psychosocial Impairment. The Clinical Impairment Assessment questionnaire [CIA 3.0; 4] taps psychosocial impairment related to eating disorder symptoms over the past 28 days. The CIA's 16 items are scored on a 4-point scale from 0 (*not at all*) to 3 (*a lot*). Global scores range from 0 to 48, with higher scores indicating greater global psychosocial impairment attributable to eating pathology. The CIA averages item responses to derive scores reflecting impairment in specific domains: *social impairment*, i.e., impact on relationships and avoidance of social situations (5 items); *cognitive impairment*, i.e., self-reported difficulty thinking, concentrating, or focusing at work (5 items); and *emotional impairment*, i.e., emotional symptoms like feeling upset, guilty, or ashamed (6 items). For the global score, Cronbach's α was .95 (students) and .94 (MTurk workers). For the three subscales, alpha ranged from .87 to .95 in the student and MTurk samples.

Emotional Eating. The Dutch Eating Behavior Questionnaire [5] is a 33-item questionnaire containing three subscales. We administered the emotional eating subscale (13 items), which assesses overeating in response to negative emotions. Cronbach's α for the emotional eating subscale was .96 in students, and .97 in MTurk workers.

Reward Driven Eating. The Power of Food Scale [6] assesses the hedonic appetitive drive to consume palatable foods beyond homeostatic need (i.e., hunger) in food-abundant environments. The PFS has 15 items rated on a Likert scale ranging from 1 (*do not agree at all*) to 5 (*strongly agree*), yielding scores ranging from 5-75, with higher scores indicating a greater responsiveness to the food environment (i.e., greater sensitivity to the constant availability of food). Cronbach's α was .93 in students and .95 in MTurk workers.

Binge Eating Frequency and General Disordered Eating. The Eating Disorder Examination – Questionnaire [7] is a 32-item questionnaire designed to assess eating-related

psychopathology with a focus on the past 28 days. Most items are scored on a 7-point Likert scale from 0 (*no days*) to 7 (*every day*), whereas other items request exact frequency (number of times) over the past 28 days. For the present study, we used the global score reflecting overall severity of eating pathology. Cronbach's α for the global score was .96 for students and .93 for MTurk workers. We also used items 13 to 15 to obtain the number of binge-eating episodes reported over the past four weeks.

Analyses

Analyses were performed separately for the student and MTurk samples. We examined mean scores on each domain of impairment and the individual items that comprise these domains, among individuals who met versus did not meet criteria for food addiction. Correlational analyses were performed between food addiction and psychosocial impairment, with partial correlations controlling in a second step for gender, age, emotional eating, reward-driven eating, binge eating frequency, and general disordered eating. To determine whether food addiction was more strongly associated with specific types of impairment, we used the *t*-difference procedure [8] to compare one-tailed zero-order Pearson's correlation strength of YFAS total scores with scores representing each domain of impairment.

Results

Three-hundred-and-ninety-nine students and 728 MTurk workers completed the survey. Data were deleted for 41 students (10.28%) and 184 MTurk workers (25.27%) due attention-check question failures and/or survey completion times under 10 minutes. The final sample comprised 356 students and 544 MTurk workers. We identified no identical time stamps or questionable free-form responses. Less than 1% of data was missing, and according to Little's

Missing Completely at Random test, these data were missing completely at random [$\chi^2(14110) = 4828.39$, $p = 1.00$].

Of the students, 10.1% ($n = 36$) met criteria for food addiction (2.8% mild, 0.6% moderate, 6.7% severe), and 89.9% ($n = 320$) did not meet criteria. Of MTurk participants, 22.6% ($n = 123$) met criteria for food addiction (2.4% mild, 3.5% moderate, 16.7% severe), and 77.4% ($n = 421$) did not meet criteria. The YFAS total score showed large correlations with emotional impairment ($r = .55, .57$), social impairment ($r = .56, .59$), cognitive impairment ($r = .58, .53$), and global impairment ($r = .62, .65$) in the student and MTurk samples, respectively, $p < .001$. The *t*-difference procedure did not indicate, in either sample, significant differences in strength of correlation of food addiction with different types of impairment, $p > .05$. After using partial correlations to control for gender, age, emotional eating, reward-driven eating, binge eating frequency, and general disordered eating, associations decreased in magnitude but remained statistically significant for emotional impairment (Students: $r = .11$, $p = .017$; MTurk: .08, $p = .029$), social impairment (Students: $r = .29$, $p < .001$; MTurk: .29, $p < .001$), cognitive impairment (Students: $r = .28$, $p < .001$; MTurk: .25, $p < .001$), and global impairment (Students: $r = .29$, $p < .001$; MTurk: .26, $p < .001$).

Table 1 presents mean values for each domain of impairment in both samples, among individuals who met, and did not meet, criteria for food addiction. Electronic supplementary materials present a more detailed version of this table, with mean item responses and a breakdown of food addiction diagnostic categories (mild, moderate, severe). In the student sample, paired samples t-tests indicated the mean values for each type of impairment differed significantly from each other, both for individuals with food addiction and those without food

addiction. In the MTurk sample, mean values were also all significantly different from one another, both for individuals with food addiction and those without food addiction.

Discussion

Food addiction was more common among participants recruited through MTurk (22.6%) than university students (10.1%). This difference is consistent with previous findings that MTurk workers tend to endorse clinical symptoms to a substantially greater degree than college or community samples [9]; we speculate this difference may be related to their self-selection into MTurk or to correlated demographic differences.

In both samples, we found strong associations of food addiction with emotional (e.g., feeling upset or ashamed), social (e.g., interference with relationships and reduced willingness to enjoy meals with loved ones), and cognitive impairment (e.g., difficulty concentrating and impaired performance at work), supporting the clinical significance of this eating pattern. Once we controlled for potential confounds, associations decreased in magnitude but remained statistically significant. The association with emotional impairment decreased the most, perhaps due to the closer overlap of this domain with our control variables, and particularly with emotional eating. In light of the substantial overlap in content of food addiction with the constructs that were controlled for (particularly emotional eating, reward-driven eating, binge eating frequency, and general disordered eating), the small to medium associations between food addiction and clinical impairment appeared to be robust. Our findings regarding emotional impairment are consistent with previous studies that have documented associations of food addiction with greater psychological distress [3] and emotional dysregulation [10]. This study is,

to our knowledge, the first to compare the association of food addiction with these forms of psychosocial impairment.

The finding that individuals with food addiction reported more emotional consequences than social and cognitive impairment suggests directions for future research and possibly clinical practice: if longitudinal studies confirm that food addiction temporally precedes emotional consequences, reduction of emotional impairment may be worthy of investigation as a target of food addiction treatment. When selecting measures to assess treatment efficacy, we encourage researchers to assess psychosocial impairment as part of progress and outcome monitoring. It may be informative to administer a measure of overall impairment such as the CIA [4].

Limitations and Future Directions

There are three major limitations of this study. First, data were obtained via self-report, which may have inflated the relationships observed due to common method bias. Second, there is substantial overlap in item content between our measure of food addiction and clinical impairment, which may also have inflated the relationships observed. In addition to the two items directly asking about distress and impairment, YFAS items include wording related to social impairment (e.g., "I had problems with my family or friends because of how much I overate") that closely parallel items on the CIA (e.g., "...interfered with your relationships with others"). Despite several examples of similarly-worded items, correlation between YFAS and CIA scores was far from perfect, increasing confidence that the two questionnaires are indeed assessing distinct constructs. Third, this study was cross-sectional and so does not permit causal inferences. The current study assumes that addictive-like eating may lead to psychosocial impairment, but we cannot rule out that the associations we observed were due to the opposite relationship. Longitudinal research designs may establish whether food addiction symptoms

temporally precede psychosocial impairment, and whether reductions in symptoms lead to improvements in social, emotional, and cognitive functioning. The association between food addiction and psychosocial impairment that we observed may also be due to confounding factors that were not assessed in the current study, such as other comorbid psychological disorders. In particular, anxious and depressive symptoms may contribute to the association, and their role in food addiction merits further scrutiny. It will also be important to assess binge eating disorder symptoms in greater detail than the current study, where only self-reported frequency of binge eating was assessed.

Future studies may build on our results by examining the relationship between food addiction and psychosocial impairment in samples such as individuals with eating disorders and those seeking treatment for addictive-like eating, weight loss, or both. Because other forms of eating pathology may also contribute to psychosocial impairment, it may be informative to conduct diagnostic interviews to assess binge eating disorder, anorexia nervosa, and bulimia nervosa, and to assess other forms of eating pathology such as dietary restriction and emotional eating.

Conclusions

The present results help understand how a controversial phenomenon, addictive-like eating, relates to psychosocial impairment. Food addiction was strongly associated with psychosocial impairment in two non-clinical samples, suggesting this phenomenon merits additional attention. We found substantial associations of food addiction with emotional impairment as well as social and cognitive impairment.

What is already known on this subject?

Food addiction is a relatively new concept, and its clinical utility has not yet been established. In clinical and non-clinical samples, self-reported food addiction has been associated with indicators of distress and impairment, such as depressive symptoms. The prevalence of social, cognitive, and emotional impairment, and the strength of their associations with food addiction, has not yet been directly compared using a measure specifically developed for use with populations who have disordered eating.

What this study adds?

We directly compared the prevalence of self-reported social, cognitive, and emotional impairment in individuals with food addiction. Though emotional impairment was most commonly endorsed, food addiction scores were strongly associated with all three forms of impairment. As treatments are being developed to address food addiction, emotional impairment represents an important target for intervention and outcome monitoring.

Compliance with ethical standards

All authors declare that they have no conflicts of interest. The first author was supported by a Fonds de recherche du Québec - Santé (FRQS) Master's Training Award and a Vanier Canada Graduate Scholarship. Funding sources had no role in study design, collection, analysis, or interpretation of data, writing the manuscript, or the decision to submit the manuscript for publication. Ethical approval was obtained from the University of Calgary Conjoint Faculties Research Ethics Board (REB#16-1791). Participants all provided informed consent prior to inclusion in the study.

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Table 1

Levels of psychosocial impairment of subgroups with and without food addiction

	Students (n = 356)		Mechanical Turk (n = 544)	
	Food Addiction	No Food Addiction	Food Addiction	No Food Addiction
Type of Impairment	M (SD)	M (SD)	M (SD)	M(SD)
Emotional	2.13 (0.88) [ab]	0.89 (0.76)[de]	2.15 (0.75)[gh]	0.96 (0.80)[jk]
Social	1.01 (0.89) [ac]	0.25 (0.45)[df]	1.11 (0.87)[gi]	0.35 (0.54)[jl]
Cognitive	0.79 (0.75) [bc]	0.21 (0.38)[ef]	0.68 (0.61)[hi]	0.23 (0.42)[kl]
Total	21.81 (11.73)	7.69 (7.76)	21.85 (10.01)	8.65 (8.21)

Note. Superscript letters denote significant differences in pairs of means among the types of impairment. [a] $t(35) = -8.09$, $p < .001$; [b] $t(35) = 10.03$, $p < .001$; [c] $t(35) = 3.16$, $p = .003$; [d] $t(319) = -20.48$, $p < .001$; [e] $t(319) = 0.75$, $p < .001$; [f] $t(319) = 2.45$, $p = .015$; [g] $t(122) = -14.96$, $p < .001$; [h] $t(122) = 21.28$, $p < .001$; [i] $t(122) = 7.72$, $p < .001$; [j] $t(420) = -19.04$, $p < .001$; [k] $t(420) = 20.86$, $p < .001$; [l] $t(420) = 6.55$, $p < .001$].

Supplementary Material

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Article Title: Prevalence of Social, Cognitive, and Emotional Impairment Among Individuals with Food Addiction

Journal Name: Eating and Weight Disorders

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Supplementary Electronic Table

Levels of impairment and item means among subgroups with mild, moderate, severe, and no food addiction

	Students				MTurk			
Impairment Domain, *Item*	None *n* = 320	Mild *n* = 10	Moderate *n* = 2	Severe *n* = 24	None *n* = 421	Mild *n* = 13	Moderate *n* = 19	Severe *n* = 91
Personal Impairment	**5.36 (4.53)**	**10.90 (5.20)**	**6 (7.07)**	**14.17 (4.73)**	**5.76 (4.81)**	**12.38 (6.78)**	**12.05 (4.18)**	**13.16 (4.23)**
...made you feel critical of yourself?	1.31 (0.91)	2.30 (0.82)	1.00 (1.41)	2.67 (0.70)	1.34 (0.99)	2.38 (1.04)	2.53 (0.61)	2.42 (0.76)
...made you feel ashamed of yourself?	0.86 (0.89)	1.80 (0.63)	1.00 (1.41)	2.38 (0.88)	0.99 (0.96)	2.00 (1.29)	2.05 (0.85)	2.19 (0.86)
...made you feel guilty?	0.83 (0.89)	1.70 (1.25)	1.00 (1.41)	2.29 (0.95)	0.97 (0.98)	2.08 (1.19)	2.00 (1.15)	2.14 (0.91)
...made you feel like a failure?	0.51 (0.77)	1.50 (1.27)	1.00 (1.41)	1.96 (1.12)	0.66 (0.88)	2.08 (1.26)	1.68 (0.95)	2.02 (0.93)
...made you upset?	0.95 (0.92)	1.80 (1.14)	0.50 (0.71)	2.38 (0.88)	0.92 (0.89)	2.08 (1.19)	1.84 (0.83)	2.24 (0.92)
...made you worry?	0.91 (0.88)	1.80 (1.03)	1.50 (0.71)	2.5 (0.83)	0.87 (0.90)	1.77 (1.24)	1.95 (1.03)	2.15 (0.88)
Social Impairment	**1.27 (2.26)**	**3.00 (3.80)**	**1.50 (0.71)**	**6.21 (4.46)**	**1.75 (2.71)**	**3.85 (3.69)**	**3.95 (3.29)**	**6.13 (4.53)**
...interfered with your relationships with others?	0.22 (0.54)	0.60 (0.97)	0.50 (0.71)	0.96 (0.95)	0.32 (0.63)	0.85 (0.80)	0.58 (0.84)	1.16 (1.14)
...stopped you going out with others?	0.20 (0.49)	0.40 (0.52)	0.00 (0.00)	1.13 (1.15)	0.34 (0.67)	0.54 (0.88)	0.79 (0.79)	1.20 (1.16)
...interfered with your doing things you used to enjoy?	0.29 (0.64)	0.70 (0.95)	1.00 (0.00)	1.54 (1.14)	0.42 (0.73)	1.23 (1.17)	1.16 (1.07)	1.57 (1.12)
...made it difficult to eat out with others?	0.26 (0.57)	0.70 (0.95)	0.00 (0.00)	1.25 (1.11)	0.35 (0.69)	0.69 (0.95)	0.68 (0.89)	1.13 (1.14)
...interfered with meals with family or friends?	0.29 (0.61)	0.60 (0.97)	0.00 (0.00)	1.33 (1.17)	0.31 (0.60)	0.54 (0.66)	0.74 (0.73)	1.07 (1.00)
Cognitive Impairment	**1.06 (1.92)**	**2.80 (3.88)**	**1.00 (1.41)**	**4.67 (3.66)**	**1.15 (2.09)**	**2.31 (2.78)**	**2.63 (2.54)**	**3.70 (3.15)**
...made you forgetful?	0.14 (0.42)	0.40 (0.97)	0.00 (0.00)	0.71 (0.86)	0.19 (0.49)	0.38 (0.65)	0.42 (0.84)	0.59 (0.75)
...made you absent-minded?	0.22 (0.51)	0.40 (0.97)	0.00 (0.00)	0.83 (0.92)	0.20 (0.48)	0.46 (0.78)	0.42 (0.69)	0.71 (0.92)
...affected your ability to make everyday decisions?	0.19 (0.46)	0.50 (0.97)	0.00 (0.00)	0.75 (0.74)	0.20 (0.48)	0.38 (0.77)	0.42 (0.61)	0.74 (0.81)
...affected your work performance (if applicable)?	0.14 (0.41)	0.40 (0.70)	0.00 (0.00)	0.79 (0.98)	0.17 (0.46)	0.15 (0.38)	0.37 (0.68)	0.51 (0.72)
...made it difficult to concentrate?	0.38 (0.61)	1.10 (0.99)	1.00 (1.41)	1.58 (1.18)	0.38 (0.64)	0.92 (0.64)	1.00 (0.82)	1.15 (0.83)
Global Impairment	**7.69 (7.76)**	**16.70 (11.47)**	**8.50 (9.19)**	**25.04 (10.80)**	**8.65 (8.21)**	**18.54 (11.22)**	**18.63 (7.64)**	**23.00 (10.11)**

Note. Clinical impairment was assessed using the Clinical Impairment Assessment questionnaire (CIA 3.0; Bohn & Fairburn, 2008). Food addiction was assessed using the Yale Food Addiction Scale 2.0 (YFAS 2.0; Gearhardt et al., 2016), yielding categorical diagnoses of food addiction: None = ≤1 symptom, and/or did not endorse either of the two YFAS items about distress and impairment; Mild = 2 to 3 symptoms plus distress and/or impairment; Moderate = 4 to 5 symptoms plus distress and/or impairment; and Severe = ≥6 symptoms plus distress and/or impairment.

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