

## Highlights

- Food addiction is associated cross-sectionally with psychosocial impairment among women and men across the weight spectrum.
- Psychosocial impairment is explained both directly by food addiction symptoms themselves, and indirectly through body image disturbance.
- Due to its critical role in explaining clinical impairment among individuals with food addiction, body image disturbance merits further exploration as a feature or prognostic indicator for food addiction.

Body Image Disturbance Partially Mediates the Relationship Between Food Addiction and  
Psychosocial Impairment: Theoretical and Clinical Implications

**Abstract**

**Background:** The aims of the current study were to explore the association of food addiction (FA) with psychosocial impairment and examine the extent to which this association was explained directly by FA symptoms themselves, versus through body image disturbance.

**Materials and Methods:** Participants (356 university students and 544 crowdsourced adults) completed self-report measures of FA (the Yale Food Addiction Scale; YFAS), psychosocial impairment (the Clinical Impairment Assessment questionnaire; CIA), and body image disturbance, and reported their body mass index (BMI) and gender. **Results:** Endorsement of distress and/or impairment on the YFAS corresponded to ratings of psychosocial impairment on the CIA. Structural equation models indicated the relationship between FA and psychosocial impairment was partially mediated by body image disturbance. The indirect effect of body image disturbance explained nearly as much variance in psychosocial impairment as did FA scores. Neither BMI nor gender significantly moderated any direct or indirect pathways from food addiction to psychosocial impairment. **Conclusions:** Food addiction is associated with clinical impairment in men and women across the weight spectrum. A large portion of psychosocial impairment associated with food addiction may be explained by body image disturbance. Due to its critical role in explaining psychosocial impairment, body image disturbance warrants increased attention in FA research.

*Key words:* Body image disturbance, food addiction, gender, psychosocial impairment

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Body Image Disturbance Partially Mediates the Relationship Between Food Addiction and  
Psychosocial Impairment: Theoretical and Clinical Implications

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### 1. Introduction

Polarizing debate surrounds the question of whether individuals can become addicted to food (Lacroix, Tavares, & von Ranson, 2018; Schulte, Potenza, & Gearhardt, 2018; Ziauddeen & Fletcher, 2013). Within the scientific community, perspectives on the food addiction (FA) construct vary radically, ranging from enthusiastic acceptance (Davis, et al., 2011), to viewing it as the inappropriate medicalization of common hedonic eating behaviour (Finlayson, 2017). Nevertheless, the Yale Food Addiction Scale (YFAS; Gearhardt, Corbin, & Brownell, 2009; Gearhardt, Corbin, & Brownell, 2016), a questionnaire designed to assess FA by applying substance use disorder criteria to food and eating behaviour, has been widely used (Meule & Gearhardt, 2014; Meule & Gearhardt, 2019). To be classified as having FA, respondents must endorse at least three symptoms, as well as distress (“My eating behavior caused me a lot of distress”), impairment (“I had significant problems in my life because of food and eating. These may have been problems with my daily routine, work, school, friends, family, or health”), or both.

Since the development of the YFAS, evidence has accumulated regarding the clinical significance of FA. YFAS scores have been associated with a range of indicators of psychosocial impairment (i.e., difficulties in domains of life such as mood and self-perception, cognitive functioning, interpersonal functioning, and work performance) such as more severe eating pathology (Granero, et al., 2014), depression (Borisenkov, Tserne, & Bakutova, 2018; Granero, et al., 2014), and non-suicidal self-injury (Carlson, et al., 2018), as well as poorer executive function (Steward, et al., 2018) and health-related quality of life (Wiedemann, et al., 2018).

Qualitative studies have highlighted life domains that may be impacted by FA, with individuals describing consequences in interpersonal (e.g., avoidance of social situations), psychological (e.g. emotions such as guilt), and professional (e.g. distraction at work) functioning (Lacroix, et al., 2019; Paterson, Lacroix, & von Ranson, 2019).

Not everyone who feels addicted to food will view their eating behaviour as a source of problems in their life or cause for concern. Meadows, Nolan, and Higgs (2017) found that 43% of their participants, who were university students, reported feeling addicted to food, yet did not meet YFAS criteria. Similarly, many individuals may report significant FA symptomatology on the YFAS (i.e., three or more symptoms), yet not endorse distress or impairment on this measure: this group represented 41% of participants in a community sample (Gearhardt, et al., 2011) and 35% of adults with overweight and obesity seeking weight-loss treatment (Eichen, Lent, Goldbacher, & Foster, 2013). Examples from the qualitative literature further illustrate the diversity in experiences with FA: whereas some people describe severe psychosocial impairment related to FA (Lacroix, et al., 2019; Paterson, et al., 2019), others may not experience such an outcome, or may even view FA through a positive lens (e.g., "I perceive food addicts to be those who love to cook and explore different types of food and always have food on their mind"; Ruddock, Dickson, Field, & Hardman, 2015).

For whom, and under what circumstances, is FA associated with psychosocial impairment? Answering this question may help reconcile divergent perspectives regarding the clinical utility of the FA construct. For some individuals, FA symptoms may yield few, if any, negative consequences, and it would be inappropriate to medicalize these symptoms through the application of a psychiatric label. For others, the same symptoms may cause significant distress and lead to debilitating outcomes in multiple life domains.

Three factors may help explain the wide range of severity in psychosocial impairment reported by individuals with FA. The first of these factors is body size. Though FA has been observed to impact individuals across the weight spectrum, including individuals who are underweight or within the normal weight range (Meule, 2012) according to their body mass index (BMI; kg/m<sup>2</sup>), as well as individuals with eating disorders such as anorexia nervosa and bulimia nervosa (Meule & Gearhardt, 2019), it has generally been positively associated with BMI (e.g.,  $r = .17$ ; Meule, Vögele, & Kübler, 2012). In qualitative studies of addictive-like eating, participants have described psychosocial impairment primarily in relation to weight gain, rather than eating behaviours themselves (Lacroix, et al., 2019; Paterson, et al., 2019). Furthermore, internalized weight stigma has been shown to predict the longitudinal transition from self-perceived FA to meeting YFAS criteria, which requires the endorsement of distress and impairment (Meadows & Higgs, 2020). Taken together, these findings suggest that weight status may be a key component in understanding for whom FA is most problematic.

Would FA symptoms be perceived as a problem if one were not distressed by body changes? Beyond actual body size, subjective perceptions and evaluations of one's body may also play a critical role in determining the extent of psychosocial impairment among people with FA. Body image disturbance—defined as concern, distress, and dissatisfaction with one's appearance (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999)—has demonstrated moderate, positive correlations with FA (Imperator, et al., 2018). Similar to FA, body image disturbance is positively associated with BMI but impacts individuals across the weight spectrum (Ålgars, et al., 2009). Subjective evaluations of one's body may be more important than actual weight or body shape: in men and women, body dissatisfaction has been more strongly associated than actual BMI with outcomes such as psychosocial functioning and physical health-

related quality of life (Wilson, Latner, & Hayashi, 2013). Given these observations, body image disturbance merits investigation as a potential mediator of the relationship between FA and psychosocial impairment.

Gender may also be related to levels of psychosocial impairment among individuals with FA. Compared to men, women are more likely to meet YFAS criteria (Brunault, et al., 2017; Landis, Beal, & Tesluk, 2000) and to have overweight/obesity and associated health impacts (Hallam, Boswell, DeVito, & Kober, 2016). Women also report higher levels of weight bias internalisation and concern with weight and shape (Boswell & White, 2015), and more negative body image (Murnen, 2011) than men. Given these gender differences in the prevalence and impact of body image and eating concerns, as well as the higher emphasis that society places on women to meet restrictive body ideals (Murnen, 2011), women may be at higher risk not only for experiencing FA symptoms, but also for being more strongly negatively impacted by these symptoms, particularly through their impact on body image.

BMI, gender, and body image disturbance merit investigation as potential moderators and mediators of the relationship between FA and psychosocial impairment. In order to adequately represent the range of individuals with FA, it is necessary to investigate these questions in large, non-clinical samples.

### **1.1 Aims**

The primary aims of this study were to examine whether: 1) body image disturbance (i.e., dissatisfaction with, and overvaluation of, weight or shape) mediated the association between FA and psychosocial impairment; and 2) gender and BMI moderated the direct and indirect pathways from FA to psychosocial impairment. An exploratory aim was to explore the extent to which responses to the YFAS questions about distress and impairment corresponded with a

measure of psychosocial impairment. We hypothesized that FA would predict psychosocial impairment partly through increases in body image disturbance (a partial mediation), and that both direct and indirect pathways from FA to psychosocial impairment would be strongest for women and individuals with higher BMIs. Regarding our exploratory aim, we hypothesized that YFAS scores would be positively correlated with CIA scores, and that CIA scores would be higher among participants who endorsed distress and/or impairment on the YFAS.

To capture diversity in severity of symptoms and levels of psychosocial impairment, we used two separate samples that were collectively diverse in BMI, symptom severity, and level of psychosocial impairment. In addition to allowing for a more complete picture of the relationship between FA and psychosocial impairment along the continuum of severity, examining moderated mediation in two separate samples allowed us to examine whether results converged, i.e., whether pathways from FA to impairment were similar in these two very different samples.

## **2. Materials and Methods**

### **2.2 Participants**

Our sample included two groups recruited in 2017: undergraduate students enrolled in psychology courses, who received bonus course credit; and participants through Mechanical Turk (MTurk), who were paid USD \$0.50 for approximately 20 minutes of work. Recruitment announcements stated: “The University of Calgary is researching addictive eating patterns. If you have struggled with severe food cravings or found it difficult to control your eating, you could provide valuable information about your experiences, which may help researchers understand and treat addictive-like eating.” All participants were required to be at least 18 years old; MTurk workers were also required to own a U.S. bank account and have at least a 90% approval rate for previous work. Participants gave informed consent prior to participating.



To increase confidence in the validity of our data, particularly for MTurk participants, we employed the following recommended quality control strategies (Simone, 2019): attention-check questions; deleting responses from surveys completed impossibly quickly (i.e., under 10 minutes); tracking study time stamps to screen for batches of responses obtained at the same exact time; and examining responses to open-ended 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 unusual answers, or answers that appeared to be composed of language extracted from the survey itself. The three attention-check questions (e.g., “While watching television, I have had a fatal heart attack”) were embedded within the survey, and we deleted the data of participants who responded to any “catch” questions in a manner that indicated they were not paying attention.

## 2.3 Measures

**2.3.1 Food Addiction (FA).** The Yale Food Addiction Scale 2.0 (YFAS 2.0; Gearhardt, et al., 2016) assesses FA by applying DSM-5 substance use disorder symptom criteria to food. The YFAS has 35 items scored on a Likert scale from 0 (*Never*) to 7 (*Every day*), and yields a total score (which was used for the present study), continuous symptom count, and categorical “diagnosis” of FA (No FA =  $\leq 1$  symptom, and/or lack of distress or impairment; Mild FA = 2 or 3 symptoms plus distress and/or impairment; Moderate FA = 4 or 5 symptoms plus distress and/or impairment; Severe FA = 6 or more symptoms and distress and/or impairment).<sup>1</sup> For total scores, Cronbach’s  $\alpha$  was .94 (student sample) and .95 (MTurk sample).

**2.3.2 Psychosocial Impairment.** The Clinical Impairment Assessment questionnaire (CIA 3.0; Bohn & Fairburn, 2008) assesses psychosocial impairment related to eating disorder

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<sup>1</sup> We report YFAS symptom counts and categorical diagnoses for descriptive purposes only.

features over the past 28 days. The CIA contains 16 items scored on a 4-point Likert scale from 0 (*not at all*) to 3 (*a lot*), assessing impairment in the following domains: *social*, i.e., impact on relationships and avoidance of social situations (5 items); *cognitive*, i.e., difficulty thinking, concentrating, or focusing (5 items); and *personal*, i.e., emotional symptoms such as feeling upset, guilty, or ashamed (6 items; Bohn, et al., 2008). Items are summed to yield a total score ranging from 0 to 48, with higher scores indicating greater psychosocial impairment. For the global score, Cronbach's  $\alpha$  was .95 (students) and .94 (MTurk workers).

**2.3.3 Body mass index (BMI; kg/m<sup>2</sup>).** BMI was calculated from self-reported height and weight.

**2.3.4 Body Image Disturbance.** The Eating Disorder Examination – Questionnaire, version 6.0 (EDE-Q 6.0; Fairburn & Beglin, 2008) is a 32-item questionnaire derived from a structured interview designed to assess eating-related psychopathology with a focus on the past 28 days (Fairburn & Cooper, 1993). We used a brief three-factor version of the EDE-Q (e.g., Grilo, Henderson, Bell, & Crosby, 2013; Grilo, Reas, Hopwood, & Crosby, 2015) that comprises seven items, loading onto three factors: Dietary Restraint, Shape/Weight Overvaluation, and Body Dissatisfaction. These items are scored on a 7-point Likert scale from 0 (*no days*) to 6 (*every day*). In this study, we combined the four items from the shape/weight overvaluation and body dissatisfaction subscales in order to yield a latent body image disturbance factor ( $\alpha$ : .93 - .94).

## 2.4 Analyses

Analyses were performed separately for the student and MTurk samples. To address our exploratory question regarding whether responses to the YFAS items about distress (“My eating behavior cause me a lot of distress”) and impairment (“I had significant problems in my life

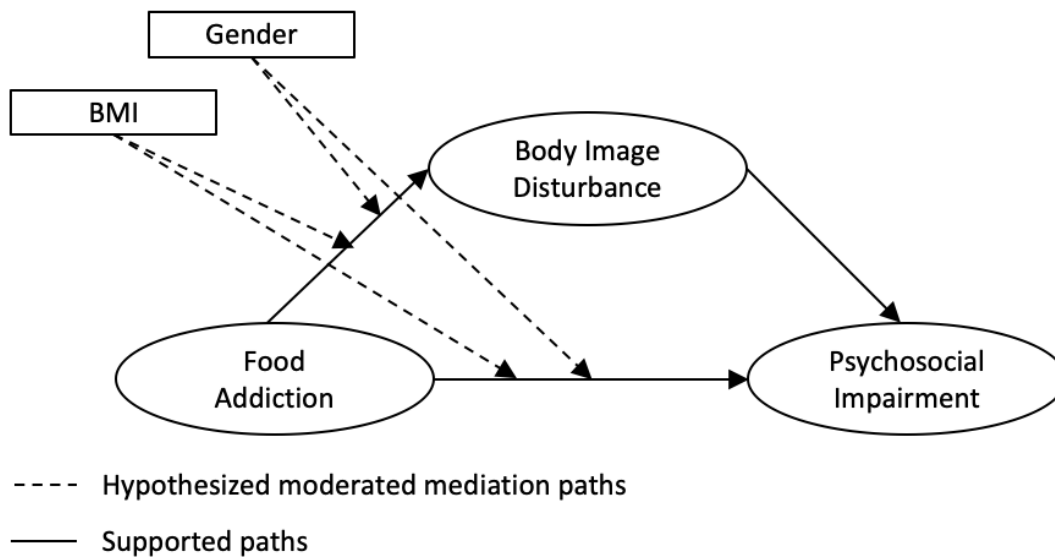
because of food and eating. These may have been problems with my daily routine, work, school, friends, family, or health”) corresponded to psychosocial impairment, we computed the mean response to these two YFAS items and examined the Pearson correlation of this value with CIA total scores. We also performed ANOVAs to compare levels of clinical impairment among participants who endorsed distress and/or impairment on the YFAS, versus those who did not.

We examined the moderated mediation model presented in Figure 1 using structural equation modeling (SEM) with Bayesian estimation procedures in Mplus 8 (Muthén & Muthén, 2012). Bayesian estimation procedures make inferences based on the data available using Markov Chain Monte Carlo (MCMC) estimation, a sophisticated type of bootstrapping that gracefully handles non-normal and skewed distributions that arise when testing indirect and mediated effects. FA, psychosocial impairment, and body image disturbance were constructed as latent variables: scale items were employed as indicators of the constructs, allowing for estimation and removal of measurement error associated with the observed variables (Ullman, 2006). Empirical comparisons have demonstrated that parceling (i.e., summing several items to serve as indicators under each latent variable) generally produces more parsimonious, better-fitting, and less-biased models (Coffman & MacCallum, 2005; Landis, et al., 2000; T. D. Little, Cunningham, Shahar, & Widaman, 2002). Items from the CIA were grouped into parcels based on the domains of personal, social, and cognitive impairment identified by a factor analytic study (Bohn, et al., 2008). For the YFAS, items were randomly parceled, a method that has demonstrated equivalence to content- and factor analytic parceling methods (Landis, et al., 2000). Given the small number of EDE-Q Body Image Disturbance items, we did not parcel this scale. The first models examined the effect of FA on psychosocial impairment through body image disturbance. To examine moderated mediation, we examined the effects of interactions of

our moderator variables (BMI and gender) with BID and FA scores, on CIA total scores. To facilitate interpretation when interaction effects were significant, we planned to estimate conditional direct and indirect effects at different values of moderator variables (BMI and gender) by computing direct and indirect associations between FA and CIA scores at three levels of BMI: low (individuals with BMI <1 SD of the mean, i.e. < 18.83 kg/m<sup>2</sup> in the student sample and < 20.5 kg/m<sup>2</sup> in the MTurk sample), medium (individuals with BMI within 1 SD of sample means), and high (individuals with BMI > 1 SD above the mean, i.e., > 25.67 kg/m<sup>2</sup> in the student sample and > 38.16 kg/m<sup>2</sup> in the MTurk sample). Similarly, for significant interactions with gender, we planned to estimate direct and indirect associations between FA and CIA scores for women and men separately. Model fit was evaluated using the chi-square test statistic, Root Mean Square Error of Approximation (RMSEA ≤ 0.06), Standardized Root Mean Square Residual (SRMR ≤ 0.08), Comparative Fit Index (CFI ≥ 0.95), and Tucker-Lewis Index (TLI ≥ 0.95), following cut-off values suggested by Hu and Bentler (1999).

Figure 1

*Proposed model for the moderated mediation pathways between food addiction and psychosocial impairment*



### 3. Results

#### 3.1 Descriptive Statistics

Our survey was completed by 399 students and 728 MTurk workers. Due to failure of one or more attention-check questions and/or survey completion in under 10 minutes, data were deleted for 41 students (10.28%) and 184 MTurk workers (25.27%), resulting in a final sample of 356 students and 544 MTurk workers. We identified no batches of responses with identical time stamps, nor questionable responses to open-ended questions. Less than 1% of data was missing for all variables, and Little's (1988) MCAR (Missing Completely at Random) test indicated that data were missing completely at random [ $\chi^2(14110) = 4828.39, p = 1.00$ ]. Case-wise deletion was used for all analyses. Demographic characteristics of the two study samples, as well as means, standard deviations, score ranges, and frequency of YFAS food addiction

classifications, are presented in supplemental materials. Correlations among study variables are presented in Table 1.

Table 1

*Correlations among study variables*

	1	2	3	4	5
1. YFAS total score			.65**	.35**	.48**
2. YFAS distress and impairment	.71**		.55**	.28**	.43**
3. CIA Psychosocial impairment	.62**	.51*		.33**	.70**
4. Body mass index	.12*	.04	.26**		.40**
5. Body image disturbance	.46**	.38**	.78**	.27**	

*Note.* YFAS = Yale Food Addiction Scale; CIA = Clinical Impairment Assessment

questionnaire. Correlations in the student sample ( $n = 356$ ) appear below the diagonal.

Correlations in the Mechanical Turk sample ( $n = 544$ ) appear above the diagonal. \*  $p < .05$ , \*\*  $p < .001$

Regarding our exploratory aim, mean response to the two YFAS items on distress and impairment was strongly correlated with total scores on the CIA in the student ( $r = .51, p < .001$ ) and MTurk ( $r = .55, p < .001$ ) samples. A one-way ANOVA indicated that participants who endorsed distress and/or impairment (Students [ $n = 41$ ]:  $M = 20.93, SD = 11.31$ ; MTurk [ $n = 128$ ]:  $M = 21.46, SD = 10.20$ ) had higher CIA total scores than those who did not endorse distress or impairment (Students [ $n = 317$ ]:  $M = 7.62, SD = 7.76$ ;  $F(1, 356) = 94.77, p < .001$ ; MTurk [ $n = 416$ ]:  $M = 8.61, SD = 8.17$ ;  $F(1, 542) = 214.11, p < .001$ ).

### 3.2 Test of Mediation Hypotheses

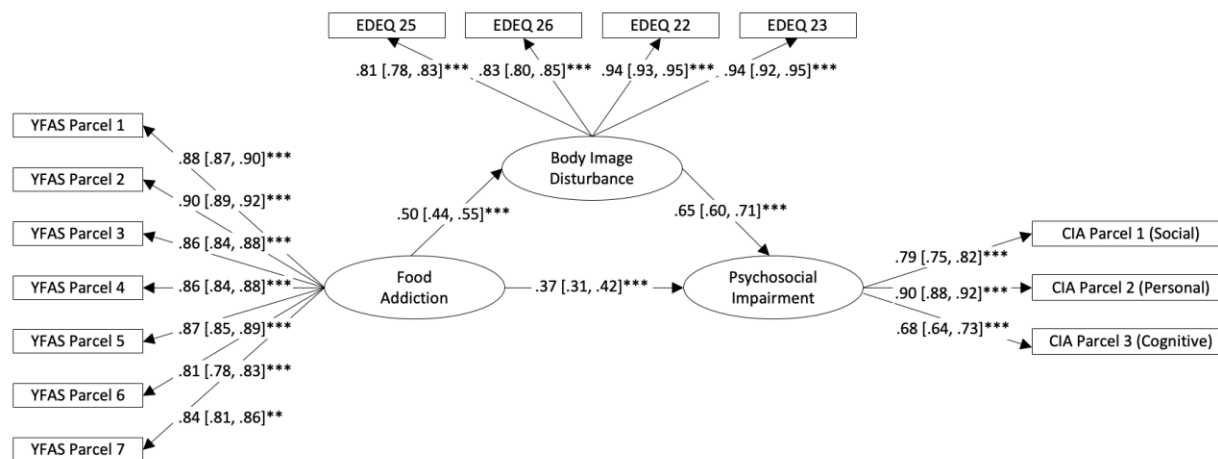
For both samples, factor loadings of all item parcels onto their respective latent variables (i.e., FA or psychosocial impairment) were significant, as were loadings of the items on the latent body image disturbance factor. Fit indices approached standards of acceptability for the student ( $\chi^2(74) = 656.68, p < .001, RMSEA = .15, SRMR = .06, CFI = .88, TLI = .85$ ) and MTurk ( $\chi^2(74) = 1200.10, p < .001, RMSEA = .17, SRMR = .07, CFI = .86, TLI = .82$ ) samples. Modification indices and standardized residuals for covariances were examined for all models; however, recommendations were not implemented due to the theoretical unjustifiability of doing so and their possible negative impact on parameter value replication (Hermida, 2015).<sup>2</sup> Results showed a significant indirect effect of FA on psychosocial impairment through body image disturbance in both the student ( $\beta = .34, SE = .04, p < .001, 95\% CI [.27, .41]$ ) and MTurk ( $\beta = .31, SE = .03, p < .001, 95\% CI [.26, .36]$ ) samples. This indirect effect accounted for 49.8% (students) and 43.6% (MTurk sample) of the total explained variance in psychosocial impairment. The direct effect of FA on psychosocial impairment was also significant in both the student ( $\beta = .34, SE = .04, p < .001, 95\% CI [.25, .42]$ ) and MTurk ( $\beta = .40, SE = .05, p < .001, 95\% CI [.32, .47]$ ) samples, accounting for 50.1% (students) and 56.4% (MTurk sample) of the total explained variance in psychosocial impairment. Relationships among latent variables were similar between the two samples, so the student and MTurk samples were pooled ( $N = 902$ ), and paths were estimated for the total sample (see Figure 2) to permit a single display of the results.

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<sup>2</sup> In light of sub-optimal model fit, moderated mediation analyses were replicated using an observed (rather than latent) variable approach. These path models were consistent with our latent variable SEM analyses.

Figure 2

*Partial mediation of the relationship between food addiction and psychosocial impairment*



*Note.* Results of a mediation model in the total pooled sample ( $\chi^2(72) = 1720.53, p < .001$ , RMSEA = .16, SRMR = .06, CFI = .87, TLI = .84). YFAS = Yale Food Addiction Scale; EDEQ = Eating Disorder Examination Questionnaire; CIA = Clinical Impairment Assessment questionnaire. Standardized coefficients [confidence intervals] are presented. \*\*\*  $p < .001$ .

### 3.3 Tests of Moderated Mediation Hypotheses

We specified a series of moderated mediation models that examined separately whether the direct pathway from FA to psychosocial impairment, and the indirect pathway through body image disturbance, were contingent upon gender and BMI.

**3.3.1 BMI.** BMI did not moderate any direct or indirect pathways between FA and psychosocial impairment in either sample,  $p > .05$ ,

**3.3.2 Gender.** Gender did not moderate any direct or indirect pathways between FA and psychosocial impairment in either sample,  $p > .05$ .



#### 4. Discussion

The current study increases understanding of pathways between FA and psychosocial impairment, identifying body image disturbance as an important partial mediator of this relationship. The strong association of FA with psychosocial impairment aligns with studies that have documented associations of FA with depression, anxiety, and cognitive impairment (e.g., Ivezaj, White, & Grilo, 2016; Ouellette, et al., 2018; Steward, et al., 2018). However, body image disturbance explained a substantial portion of the psychosocial impairment associated with FA: the indirect pathway through body image disturbance accounted for nearly half of the total explained variance in psychosocial impairment in the student and MTurk samples, respectively, whereas the direct effect of FA symptoms was responsible for the remaining explained variance. This finding was consistent across two samples that differed in recruitment source, demographics, and mean BMI, and included collectively diverse levels of participant symptomatology.

Our findings highlight the importance of body image disturbance in explaining psychosocial impairment among individuals with FA. Body image has not been a major focus in prior research on FA, with studies not typically assessing body image disturbance or, at best, conceptualizing it as a secondary consequence of associated weight gain, rather than a central feature of the experience of FA that may explain outcomes. One exception is a recent longitudinal study that found a related construct, fear of weight-related stigma, prospectively predicted worsening FA symptomatology over time (Meadows & Higgs, 2020). Future research may continue to explore the importance of body image disturbance in explaining psychosocial impairment among individuals with FA. Studies that replicate our findings in clinical samples, and using longitudinal designs to establish temporal precedence, will be important next steps that

may determine whether body image disturbance merits consideration as a feature of, or prognostic indicator for, FA. At minimum, given that neither the YFAS (Gearhardt, et al., 2016) nor alternative measures of addictive-like eating such as the Addiction-like Eating Behaviour Scale (Ruddock, Christiansen, Halford, & Hardman, 2017) take into account body image disturbance, it may be a construct worth assessing separately in future studies on FA.

Contrary to our hypothesis, gender did not moderate any pathways from FA to psychosocial impairment. As depicted in Supplementary Table 1, women had higher FA, psychosocial impairment, and body image disturbance, consistent with prior evidence of gender differences in *absolute* levels of eating pathology (Murnen, 2011). However, our results did not provide any evidence of gender differences in the underlying *relationships among* these latent constructs. Based on our findings, a man and woman who report identical FA symptoms, in the absence of other information, may be expected to experience equivalent degrees of associated psychosocial impairment.

Though FA was positively associated with BMI, with effects ranging from small to medium, our study failed to provide evidence for a moderating role of BMI. We expected impairment would be greatest among people with higher BMIs; however, the strength of the direct and indirect pathways between FA and psychosocial impairment did not differ based on BMI. Prior research has found high prevalence of FA not only among people with BED, but also among those with bulimia nervosa and anorexia nervosa (Imperatori, et al., 2016). Thus, our results suggest that, although there may be a positive or non-linear (Meule, 2012) relationship between FA and BMI, their link may be somewhat weaker than what is evinced by common stereotypes linking FA and obesity (DePierre, Puhl, & Luedicke, 2013). FA may be a transdiagnostic construct that can lead to clinically significant impairment for individuals across

the weight spectrum. In contrast to the conclusion from a qualitative study that “weight gain...appeared to dictate participants’ levels of distress” (Paterson, et al., 2019), our study indicated that people with FA who have BMIs in the “healthy” or “underweight” ranges may experience an equivalent degree of psychosocial impairment, both directly related to their eating behaviours, and indirectly through disturbances in body image.

In determining levels of psychosocial impairment, could one’s actual body size be less important than the degree to which one *perceives* themselves to have gained weight due to their FA, or *expect* their FA to lead to future weight gain? A potentially important distinction to explore in future studies is the difference between actual body size (BMI) and perceived or feared weight gain, distinct from body image disturbances of body dissatisfaction and shape/weight overvaluation.

#### **4.1 Clinical Implications**

Proposed treatments for FA have included pharmacotherapy (e.g., opioid antagonists aimed at reducing cravings), stimulus control strategies to aid in the avoidance of hyperpalatable foods, and cognitive-behavioural therapy and motivational interviewing to encourage clients to engage in other behaviours that provide rewarding alternatives to eating (Schulte, Joyner, Schiestl, & Gearhardt, 2017; Vella & Pai, 2017). Though such strategies may help clients reduce addictive-like eating, we expect that neglecting to address body image disturbance could limit treatment effectiveness. The direction of the relationship between body image disturbance and psychosocial impairment among individuals with FA remains to be established, and is particularly important to study in clinical samples. If a causal role is established for body image disturbance, it may be worthy of focus in the treatment of addictive-like eating, perhaps through the application of evidence-based treatments designed for this purpose (Cash & Hrabosky, 2004).

Given we did not find that gender or BMI moderated pathways to psychosocial impairment, researchers and clinicians alike should be aware of possible blind spots that could prevent them from recognizing clinically-significant addictive-like eating. Specifically, it should not be assumed that anyone is or is not struggling with addictive-like eating because of their gender or body size. Consistent with prior research in community (Meule, 2012) and eating disorder samples (Meule & Gearhardt, 2019), FA may be associated with impairment among men, and among individuals with low or average BMIs. Rigorous assessment of addictive-like eating and body image disturbance, as well as the application of predetermined cut-offs and decision-making criteria, would help guard against potential blind spots in the recognition of addictive-like eating.

#### **4.2 Limitations and Future Directions**

This research is not without limitations. First, our study was cross-sectional, precluding causal inferences. It is worth noting that true mediation cannot be tested with a cross-sectional design. Second, as our samples were non-clinical, it is unknown whether our results would generalize to clinical populations. Because we found similar results in two separate samples that differed both in demographics and levels of eating pathology, we speculate that our findings could be replicated in clinical samples. Third, although our samples were collectively diverse in age, education level, recruitment source, and degree of severity of FA and psychosocial impairment, they were both convenience samples that were predominantly female. Unfortunately, transgender and gender-non-binary individuals were underrepresented in our study, with numbers too small to permit meaningful comparisons or separate testing of structural models within these heterogeneous groups. Purposive recruitment strategies may improve representation of men and people with other gender identities, ensuring that the resultant

conceptualizations of FA reflect their experiences. Fourth, we relied exclusively on web-administered self-report surveys, and thus the relationships we observed may have been inflated due to common method bias. Our SEM approach, in which we modeled latent variables and accounted for measurement error, may have mitigated somewhat against this possibility. However, self-reported weight and height in particular, though highly correlated with measured weight and height ( $r=.89$  to  $.98$ ; Kuczmarski, Kuczmarski, & Najjar, 2001; Rowland, 1990), may have underestimated overweight and obesity (Gil & Mora, 2011), and could have introduced measurement error that would have reduced our power to detect moderation.

Although we statistically examined the contributions of FA and body image disturbance to psychosocial impairment, in future research, it may be worth including separate or modified instruments to specifically assess impairment stemming from these distinct sources. Future studies may also build on our results by examining mediators and moderators of the relationship between FA and psychosocial impairment in clinical and treatment-seeking samples, with better representation of transgender and gender-non-binary individuals. Finally, longitudinal and experimental research designs are essential next steps in order to determine whether body image disturbance plays a causal role in determining levels of psychosocial impairment among individuals with FA.

### **4.3 Conclusions**

The present results help better understand how a controversial phenomenon, FA, relates to psychosocial impairment. FA scores explained substantial variance in psychosocial impairment, suggesting this phenomenon merits clinical attention. However, nearly half of the relationship between FA and psychosocial impairment was explained by body image disturbance, which has rarely been taken into account in addictive-like eating research to date.

Further research is needed to replicate our mediation model in clinical populations and examine the role of body image disturbance using longitudinal designs. To avoid blind spots in recognizing clinically significant FA, particularly among men and individuals without elevated BMIs who may not fit stereotypical presentations but still be strongly impacted, there is a need for more thorough assessment of psychosocial impairment than existing FA questionnaires permit.

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### **Contributors**

Emilie Lacroix and Kristin von Ranson designed the study. Emilie Lacroix conducted the statistical analysis and wrote the first draft of the manuscript. Kristin von Ranson contributed to revisions and approved the final manuscript.

### **Conflict of Interest**

All authors declare that they have no conflicts of interest.

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