

## Self-perceived food addiction:

Meadows, Angela; Nolan, Laurence J; Higgs, Suzanne

DOI:

[10.1016/j.appet.2017.03.051](https://doi.org/10.1016/j.appet.2017.03.051)

License:

Creative Commons: Attribution-NonCommercial-NoDerivs (CC BY-NC-ND)

*Document Version*

Peer reviewed version

*Citation for published version (Harvard):*

Meadows, A, Nolan, LJ & Higgs, S 2017, 'Self-perceived food addiction: Prevalence, predictors, and prognosis', *Appetite*, vol. 114, pp. 282-298. <https://doi.org/10.1016/j.appet.2017.03.051>

[Link to publication on Research at Birmingham portal](#)

### General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

### Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact [UBIRA@lists.bham.ac.uk](mailto:UBIRA@lists.bham.ac.uk) providing details and we will remove access to the work immediately and investigate.

1 **ABSTRACT**

2 Food addiction is controversial within the scientific community. However many  
3 lay people consider themselves addicted to certain foods. We assessed the  
4 prevalence and characteristics of self-perceived “food addiction” and its  
5 relationship to a diagnostic measure of “clinical food addiction” in two samples:  
6 (1) 658 university students, and (2) 614 adults from an international online  
7 crowdsourcing platform. Participants indicated whether they considered  
8 themselves to be addicted to food, and then completed the Yale Food Addiction  
9 Scale, measures of eating behavior, body image, and explicit and internalized  
10 weight stigma. Participants in the community sample additionally completed  
11 measures of impulsivity, food cravings, binge eating, and depressive  
12 symptomatology. Follow-up data were collected from a subset of 305 students  
13 (mean follow-up 280 ± 30 days). Self-perceived “food addiction” was prevalent,  
14 and was associated with elevated levels of problematic eating behavior, body  
15 image concerns, and psychopathology compared with “non-addicts”, although  
16 individuals who also received a positive “diagnosis” on the Yale Food Addiction  
17 Scale experienced the most severe symptoms. A clear continuum was evident for  
18 all measures despite no differences in body mass index between the three groups.  
19 Multinomial logistic regression analyses indicated that perceived lack of self-  
20 control around food was the main factor distinguishing between those who did  
21 and did not consider themselves addicted to food, whereas severity of food  
22 cravings and depressive symptoms were the main discriminating variables  
23 between self-classifiers and those receiving a positive “diagnosis” on the Yale  
24 Food Addiction Scale. Self-perceived “food addiction” was moderately stable

25 across time, but did not appear predictive of worsening eating pathology. Self-  
26 classification as a “food addict” may be of use in identifying individuals in need of  
27 assistance with food misuse, loss-of-control eating, and body image issues.

28

29 **Keywords**

30 Food addiction; Food use disorder; Disordered eating; Eating self-efficacy; Body  
31 Image.

## 32 **Introduction**

33 The concept of “food addiction” has attracted great interest within the scientific  
34 community, particularly in terms of implications for public policy on obesity  
35 prevention and management (Gearhardt, Grilo, DiLeone, Brownell, & Potenza,  
36 2011). The Yale Food Addiction Scale (YFAS) was developed to identify  
37 individuals exhibiting addictive-like behaviours with respect to foods, and is  
38 based on the DSM-IV-TR criteria for diagnosis of substance dependence  
39 (Gearhardt, Corbin, & Brownell, 2009). These criteria identify seven potential  
40 symptoms of addiction syndromes, namely: taking the substance in larger  
41 amounts or over a longer period than intended; persistent desire or unsuccessful  
42 attempts to reduce or stop use; continued use of the substance despite negative  
43 consequences; excessive time or money spent obtaining the substance;  
44 important social, occupational, or leisure activities reduced because of use of the  
45 substance; withdrawal symptoms when the substance is discontinued; and  
46 requiring larger amounts of the substance to achieve the same effects, i.e.  
47 tolerance. Endorsement of three or more of these criteria in the previous year,  
48 along with clinically significant distress or impairment, is required to receive a  
49 positive “diagnosis” (YFAS+). Based on these criteria, the prevalence of “food  
50 addiction” in student and non-clinical populations is generally between  
51 approximately 5% and 15%<sup>1</sup>, although significantly higher rates have been  
52 observed in obese or eating disorder samples (for a review, see Pursey, Stanwell,  
53 Gearhardt, Collins, & Burrows, 2014).

54

---

<sup>1</sup> One study in a student sample reported much higher rates of YFAS+ diagnoses (24%; Murphy, Stojek, & MacKillop, 2014).

55 Positive diagnosis on the YFAS has been linked to a range of other problem  
56 eating behaviors, including binge eating, emotional eating, elevated food cravings,  
57 impaired self-control around food, night eating syndrome, and eating disorder  
58 psychopathology in both community and clinical samples, with similar findings  
59 reported when using the a continuous symptom score, i.e. the number of  
60 symptoms endorsed (Burmeister, Hinman, Koball, Hoffmann, & Carels, 2013;  
61 Davis, Curtis, Levitan, Carter, Kaplan, & Kennedy, 2011; Gearhardt et al., 2009;  
62 Koball, Clark, Collazo-Clavell, Kellogg, Ames, Ebbert, & Grothe, 2016; Meule,  
63 Hermann, & Kübler, 2015; Nolan & Geliebter, 2016). Scores on the YFAS have  
64 also been associated with depression, anxiety, and attentional deficit  
65 hyperactivity disorder, weight and shape concern, and reduced quality of life  
66 (Brunault, Ducluzeau, Bourbao-Tournois, Delbachian, Couet, Réveillère, & Ballon,,  
67 2016; Burmeister et al., 2013; Davis et al., 2011; Eichen, Lent, Goldbacher, &  
68 Foster, 2013; Koball et al., 2016; Meule, Lutz, Vögele, & Kübler, 2012). However,  
69 the existence of “food addiction” remains highly contentious among the scientific  
70 community, with some authors questioning whether the mechanisms underlying  
71 “food addiction” are equivalent to those seen in more traditional substance use  
72 disorders (Long, Blundell, & Finlayson, 2015; Ziauddeen, Farooqi, & Fletcher,  
73 2012).

74

75 In contrast, the concept of “food addiction” is widely accepted within the lay  
76 population. In a series of studies in students and staff of a UK university, only 6 of  
77 364 recruited participants did not believe in the existence of “food addiction”  
78 (Ruddock, Christiansen, Jones, Robinson, Field, & Hardman, 2016; Ruddock,  
79 Dickson, Field, & Hardman, 2015). A qualitative study in a low-income, ethnically

80 diverse US sample also found the concept of “food addiction” was almost  
81 universally accepted (Malika, Hayman, Miller, Lee, & Lumeng, 2015), supporting  
82 the generalizability of these findings.

83

#### 84 **Lay conceptualization of “food addiction”**

85 Few studies have explored what the concept of “food addiction” means to those  
86 who self-diagnose as such and to the lay population in general. Hetherington and  
87 Macdiarmid (1993) reported that self-confessed “chocolate addicts” scored  
88 highly on items that would map onto DSM-IV criteria for substance dependence.  
89 However, when asked what made them feel they were addicted to chocolate,  
90 76% responded that it was their inability to control consumption. No other  
91 criteria were widely endorsed. More recently, an online qualitative study  
92 reported that understanding of “food addiction” was similar in those who did  
93 and did not consider themselves to be addicted to food, with the most frequently  
94 mentioned characteristics being reward-driven eating, preoccupation with food,  
95 and a perceived lack of self-control around food (Ruddock et al., 2015). This  
96 result suggests that lay understanding of the term “food addiction” may be  
97 driven predominantly by perceptions of control around food, or eating self-  
98 efficacy. However, other characteristics emerging from qualitative studies  
99 include non-physiological eating, e.g. in the absence of hunger, frequent and  
100 uncontrollable food cravings, usually for specific, energy-dense foods, eating  
101 despite negative health consequences, and devoting time and effort to obtain the  
102 craved food (Malika et al., 2015; Ruddock et al., 2015), which are similar to the  
103 conceptualization of substance use disorders used in clinical diagnosis,

104 particularly since the addition of “cravings” to the diagnostic criteria in the DSM-  
105 5 (American Psychiatric Association, 2013).

106

### 107 **Prevalence of self-perceived food addiction**

108 Limited evidence from studies of lay appreciation of “food addiction” suggests  
109 that self-perceived food addiction (SPFA) is more prevalent than food addiction  
110 measured using the YFAS (Corwin & Grigson, 2009). A website poll of overweight  
111 adolescents provided a definition of addiction as “feeling driven to a behaviour  
112 even though the person knows that it will damage her/his health or social life”.  
113 Based on this description, approximately one-third of the participants believed  
114 they were addicted to food (Pretlow, 2011). In contrast, another study simply  
115 asked children and adolescents, “Do you think you are addicted to food?”  
116 Approximately one-third of the sample answered positively to this question  
117 (Merlo, Klingman, Malasanos, & Silverstein, 2009). However, this item was  
118 placed at the end of the questionnaire following a number of questions based on  
119 DSM-IV criteria for substance dependence, which may have influenced responses.  
120 Consequently, these studies might not have fully captured self-attribution of food  
121 addiction. Nevertheless, the previously cited study by Ruddock and colleagues  
122 (2015) reported a similar proportion of adults (29%) self-classified as food  
123 addicted, and this number was unaffected by the *a priori* presence or absence of  
124 a definition of “food addiction”.

125

126 **Characterization of SPFA**

127 Although SPFA appears to be prevalent in the general population, little is known  
128 about the characteristics of this “condition”, whether particular constructs can  
129 uniquely predict SPFA, or what distinguishes it from YFAS-diagnosed food  
130 addiction. It has been suggested that SPFA is not reflective of any addictive-like  
131 processes but rather may be a way in which individuals with low eating self-  
132 efficacy can explain, to themselves and others, their “failure” to control their  
133 intake, whilst attributing the problem to a biological mechanism rather than a  
134 personal weakness (Rogers & Smit, 2000).

135

136 Some support for the attribution hypothesis comes from an experimental study  
137 that randomly allocated 60 students to either a condition in which they read a  
138 sham newspaper article explaining that “food addiction” was “real” or one in  
139 which they were told that it was a myth, and, in effect, an excuse for lack of self-  
140 control (Hardman, Rogers, Dallas, Scott, Ruddock, & Robinson, 2015). Students  
141 were then asked if they thought they were addicted to foods. Subsequently,  
142 students in the “myth” condition were less likely to self-classify as food addicts  
143 than students in the “real” condition, although over a quarter nevertheless did so  
144 (27% versus 57%, respectively). The authors concluded that SPFA is simply a  
145 convenient external attribution to explain “problematic” eating behavior, whose  
146 use is abrogated by receiving disaffirming information about the existence of the  
147 construct. However, an alternative explanation is that participants may be  
148 unwilling to admit to a researcher that they may have a condition that they have  
149 just been told does not exist; this possibility is supported by the fact that the  
150 manipulation check regarding the belief that foods can be addictive indicated



151 only neutrality rather than disagreement in the “myth” group, consistent with  
152 demand characteristics or embarrassment as much as with success of the  
153 manipulation.

154

155 Whether SPFA is indeed simply an attribution response to dysregulated eating  
156 behaviors or a construct that is related to YFAS-diagnosed food addiction, it is  
157 likely to be characterized by a range of cognitions and behaviors associated with  
158 disordered eating that distinguish it from the experience of individuals who do  
159 not self-classify as food addicted. Nevertheless, we would expect these  
160 cognitions and behaviors to be less severe than those reported by YFAS+  
161 individuals, who, by definition, experience clinically significant distress or  
162 impairment associated with their condition.

163

#### 164 *Eating cognitions and behaviors*

165 In terms of eating behavior, self-perceived food addicts are likely to report more  
166 dietary restraint, less reliance on internal signals to trigger eating, more eating in  
167 response to affective or situational cues, and lower eating self-efficacy, that is,  
168 low perceived self-control around food (Berman, 2006; Lowe, 1993; Tylka, 2006),  
169 compared with individuals who do not consider themselves addicted to food. In  
170 contrast, SPFA is unlikely to be characterized by clinically significant eating  
171 pathology, and this is likely to be a key distinguishing factor between SPFA and  
172 YFAS-diagnosed “food addiction”.

173

174 *Body image*

175 Elevated weight and shape concerns have been reported in community and  
176 clinical samples of adults and adolescents who receive a YFAS+ diagnosis  
177 compared with those who do not meet the diagnostic criteria for “food addiction”  
178 (YFAS-; Gearhardt, White, Masheb, & Grilo, 2013; Gearhardt, Boswell, & White,  
179 2014; Meule et al., 2015), although body image has received less attention than  
180 other constructs as a factor associated with food addiction. Nevertheless, the role  
181 of body dissatisfaction in the development and maintenance of eating pathology  
182 is well established (Stice, 2002), and we would expect self-perceived food  
183 addicts to be more concerned about their appearance, have worse body image,  
184 and greater weight concern than “non-addicts”.

185

186 *Weight stigma*

187 Endorsement of negative stereotypes about higher-weight individuals and  
188 weight-related self-stigma have been consistently linked to disordered eating  
189 behaviors (Durso & Latner, 2008; Puhl, Moss-Racusin, & Schwartz, 2007; Schvey,  
190 Roberto, & White, 2013), including YFAS-diagnosed “food addiction” (Burmeister  
191 et al., 2013). Thus, we would expect elevated scores on measures of anti-fat  
192 attitudes and weight self-stigma in SPFA+ individuals compared with those who  
193 do not self-classify as addicted to food.

194

195 *Validation seeking*

196 Self-worth that is contingent on external factors, such as appearance or the need  
197 for others’ approval, has been linked to a range of disordered eating behaviours

198 (Clabaugh, Karpinski, & Griffin, 2008; Crocker, 2002). More specifically, high  
199 need for approval and fear of social rejection is associated with greater dietary  
200 restraint, body shape, eating, and weight concerns, emotional eating, bulimic  
201 symptoms, and global eating pathology in both community and eating-  
202 disordered populations (Hayaki, Friedman, Whisman, Delinsky, & Brownell,  
203 2003; Teal Pedlow & Niemeier, 2013). Indeed, mediation analyses suggest that  
204 need for the approval of others may be an important predictor of body shape  
205 dissatisfaction and disordered eating in non-clinical samples (Teal Pedlow &  
206 Niemeier, 2013); however, this construct has yet to be explored in the context of  
207 “food addiction”.

208

### 209 **Study 1a**

210 The purpose of the present research was to explore the prevalence and  
211 characterization of self-perceived food addiction, and to determine whether  
212 SPFA+ individuals can be identified by a level of the cognitions and behaviors  
213 generally associated with problem eating that distinguish it from both clinical  
214 “food addiction” (YFAS+) and from the experiences of individuals who do not  
215 self-classify as food addicts (non-food addicts, NFA). Note, in the present study,  
216 we assign the status SPFA+ to individuals who *do* self-classify as food addicts, but  
217 who do not experience clinically significant distress or impairment and who  
218 therefore *do not* receive a YFAS+ diagnosis. We proffered the following  
219 hypotheses:

220 H1: SPFA+ would be significantly more prevalent than YFAS+ “food  
221 addiction”.

222 H2: Compared with NFA individuals, SPFA+ individuals would report  
223 more dietary restraint, eat less in response to internal hunger cues, experience  
224 lower eating self-efficacy, and more disordered eating behaviour overall, greater  
225 investment in appearance-based domains of self-worth, poorer body image,  
226 higher anti-fat attitudes and weight-related self-stigma, and greater need for  
227 external validation. However, we also predicted that scores on these measures  
228 would indicate less severity than found in YFAS+ participants.

229 H3: In terms of discrimination between the groups, we predicted that  
230 perceived self-control around food would be the main discriminating factor  
231 between SPFA+ and NFA participants, whereas clinically significant eating  
232 pathology would be the main discriminating factor between YFAS+ and SPFA+  
233 participants, being present in the former but not the latter.

234

235

## 236 **Methods**

### 237 *Participants*

238 Data were collected from 658 psychology students at the University of  
239 Birmingham, who participated in an online study entitled “Easy online eating  
240 survey” for course credit between January 2013 and December 2014. The  
241 majority of the sample identified as female (90%; 9% male, 1% declined to  
242 answer), and White (76%; 3% Asian – Chinese, 6% Asian – Indian, 3% Asian –  
243 Pakistani, 2% Asian – Other, 2% Black – African, 1% Black – Caribbean, 1%  
244 White/Black Caribbean, 2% White/Asian, 1% Other – Mixed, 1% Other, and 2%  
245 declined to answer). The mean age of the sample was 18.7 years (SD 1.3, range

246 17–36). BMI was calculated from self-reported heights and weights, with a mean  
247 value of 22.0 kg/m<sup>2</sup> (SD 3.9, range 14.0–44.5; 10.2% underweight, 55.6% normal  
248 weight, 9.9% overweight, and 2.7% obese; data were not available for the  
249 remaining 21.6% of the sample). The study was approved by the University of  
250 Birmingham Ethical Review Committee, and informed consent was obtained  
251 from all participants.

252

### 253 *Measures*

#### 254 *Food Addiction*

255 Participants were initially asked a simple yes/no question: “Do you feel that you  
256 are addicted to some foods?” Participants then completed the Yale Food  
257 Addiction Scale (YFAS), a 25-item self-report scale measuring addictive  
258 behaviours with respect to certain foods (Gearhardt et al., 2009). The YFAS can  
259 produce a continuous symptom count score as well as a clinical diagnosis of food  
260 addiction. In line with the DSM-IV-TR scoring criteria for substance dependence,  
261 upon which the YFAS was based, participants must endorse a minimum of three  
262 of the seven symptoms plus experience clinically significant distress or  
263 impairment in order to receive a positive diagnosis. Kuder-Richardson’s  $\alpha$   
264 was .82 in this sample. Participants who received a positive “diagnosis” on the  
265 YFAS were classified as YFAS+, independent of their response to the question of  
266 self-perceived food addiction. Those who did not receive a YFAS+ “diagnosis” but  
267 who nevertheless considered themselves addicted to foods were classified  
268 SPFA+. The remainder, who were both YFAS- and SPFA- , were classified NFA.  
269

270 *Eating Behavior*

271 Current dieting status was assessed with a single item asking participants to self-  
272 designate as either currently dieting to lose weight, currently dieting or watching  
273 food intake so as not to gain weight, or not currently dieting (Massey & Hill,  
274 2012).

275

276 Dietary restraint was assessed using the 10-item Restraint Scale (RS) (Herman &  
277 Polivy, 1980). The scale is made up of two subscales: concern for dieting and  
278 weight fluctuation. The scale appears to capture a history of chronic dieting, and  
279 does not necessarily represent current calorie restriction (Lowe, 1993). Item  
280 scoring varies but items are summed to create a total scale score, with a possible  
281 range of 0 to 35. Higher scores are indicative of more restrained eating.

282 Cronbach's  $\alpha$  was .84 in the present sample.

283

284 Perceived self-control over eating was assessed using the Eating Self-Efficacy  
285 Scale (ESES) (Glynn & Ruderman, 1986). The ESES is a 25-item measure that  
286 assesses perceived ability to control eating under a range of situational and  
287 emotional conditions. Responses are graded on a 7-point Likert scale ranging  
288 from 1 (No difficulty controlling eating) to 7 (Most difficulty controlling eating),  
289 and items are averaged to provide a total scale score. Higher scores represent  
290 more perceived difficulty in controlling eating, and are therefore indicative of  
291 *reduced* eating self-efficacy. The ESES has previously been shown to correlate  
292 with YFAS symptom count (Burmeister et al., 2013). Cronbach's  $\alpha$  was .91 in the  
293 present sample.

294

295 Eating in response to non-physiological cues was assessed using the Intuitive  
296 Eating Scale (IES) (Tylka, 2006), a 21-item questionnaire that measures the  
297 extent to which an individual responds to internal rather external eating cues.  
298 Participants record to what extent they disagree with a range of statements such  
299 as “I stop eating when I feel full (not overstuffed)” and “I trust my body to tell me  
300 what to eat”, using a 5-point Likert scale ranging from 1 (Strongly disagree) to 5  
301 (Strongly agree), and items averaged to provide a total scale score. Higher scores  
302 indicate more intuitive eating, therefore, lower scores are equated with more  
303 non-physiological eating. Intuitive eating is negatively associated with chronic  
304 dieting, general eating pathology, unhealthy weight control practices, binge  
305 eating frequency, and food preoccupation (Denny, Loth, Eisenberg, & Neumark-  
306 Sztainer, 2013; Madden, Leong, Gray, Horwath, Jeffrey, Epstein, et al., 2012; Tylka,  
307 Calogero, & Daníelsdóttir, 2015). Cronbach’s  $\alpha$  was .82 in the present sample.  
308  
309 Finally, general eating pathology was assessed using the Eating Attitudes Test  
310 (EAT-26) (Garner, Olmsted, Bohr, & Garfinkle, 1982), a widely used 26-item  
311 measure assessing the extent of symptoms and concerns characteristic of eating  
312 disorders. Possible scores can range from 0 to 78, and scores of 20 or greater  
313 suggest increased risk of clinical eating disorders (Anderson, De Young, &  
314 Walker, 2009). Scores on the EAT-26 are highly correlated with both a YFAS  
315 diagnosis and the symptom count (Gearhardt et al., 2009). Cronbach’s  $\alpha$  was .89  
316 in the present sample.  
317

318 *Body Image*

319 Body image was assessed using four subscales of the Multidimensional Body  
320 Self-Relations Questionnaire – Appearance Scales (MBSRQ-AS; Brown, Cash, &  
321 Mikulka, 1990; Cash, 2000). The Appearance Orientation subscale (Cronbach’s  $\alpha$   
322 = .89) assesses how important appearance is to the participant and includes 12  
323 items, for example, “It is important that I always look good,” and “I check my  
324 appearance in a mirror whenever I can.” The Appearance Evaluation subscale ( $\alpha$   
325 = .90) includes seven items, such as “I like my looks just the way they are,” and  
326 “Most people would consider me good-looking.” The Overweight Preoccupation  
327 subscale ( $\alpha = .83$ ) includes four items, e.g. “I constantly worry about being or  
328 becoming fat.” The Self-Classified Weight subscale ( $\alpha = .88$ ) is made up of two  
329 items where respondents classify their body weight on a scale from “Very  
330 Underweight” to “Very Overweight”, and also how they think others would  
331 classify them. All items are scored 1 to 5 and mean scores calculated for each  
332 subscale.

333



334 *Weight Stigma*

335 Explicit weight stigma was tested using two subscales from the Anti-Fat  
336 Attitudes Questionnaire-Revised (AFAQ-R) (Quinn & Crocker, 1999). The Dislike  
337 subscale ( $\alpha = .92$ ) comprises 10 items, such as, “I have a hard time taking fat  
338 people too seriously,” and “I have an immediate negative reaction when I meet a  
339 fat person.” The Willpower subscale ( $\alpha = .90$ ) assesses beliefs about the  
340 controllability of body weight, and includes eight items, such as, “Fat people can  
341 lose weight if they really want to,” and “The medical problems that overweight  
342 people have are their own fault.” Both subscale are scored on a 10-point Likert  
343 scale from 0 (Very strongly disagree) to 9 (Very strongly agree), and mean scores  
344 are calculated for each subscale. Higher scores indicate more negative attitudes.  
345 Scores on the Dislike subscale have previously been linked with more addictive-  
346 like eating behaviors in a treatment-seeking weight-loss population, although no  
347 association was found for weight-controllability beliefs (Burmeister et al., 2013).

348

349 Weight self-stigma was assessed using the 12-item Weight Self-Stigma  
350 Questionnaire (WSSQ; Lillis, Luoma, Levin, & Hayes, 2010). Most of the previous  
351 work on weight self-stigma and eating behavior has utilized a global measure of  
352 internalized weight stigma; in contrast, the WSSQ comprises two subscales that  
353 distinguish between self-devaluation and fear of stigma from others. Some  
354 evidence suggests that these aspects of weight self-stigma may be differentially  
355 related to eating behavior and psychological wellbeing (Farhangi, Emam-  
356 Alizadeh, Hamed, & Jahangiri, 2016; Lillis et al., 2010). The Self-Devaluation  
357 subscale ( $\alpha = .93$ ) assesses shame and self-blame with respect to body weight,  
358 and includes items such as, “I feel guilty because of my weight problems,” and “I

359 became overweight because I'm a weak person." The Fear of Enacted Stigma  
360 subscale ( $\alpha = .85$ ) assesses worries about being stigmatized by others because of  
361 weight, for example, "Others are ashamed to be around me because of my weight."  
362 Items are scored on a five-point Likert scale from 1 (Completely Disagree) to 5  
363 (Completely Agree). Sum scores were calculated with a possible range from 0 to  
364 30 for each subscale. Higher scores are indicative of increased self-stigma.  
365 As some of the items on this scale are mainly applicable to participants who  
366 believe they have a weight problem, this section did not initially have a forced  
367 response requirement. However, an interim quality check after the first week of  
368 data collection identified a large amount of missing data on this instrument. Of  
369 the 157 participants completing the survey in the first week, 132 (84%) did not  
370 complete this measure. Given the prevalence of weight dissatisfaction even  
371 among lean individuals, it appeared that many students were skipping these  
372 questions simply because they could, and a decision was made to make this  
373 section non-optional. Individuals who did not consider themselves to have a  
374 weight problem could simply disagree with the relevant statements. See below  
375 for details of missing data handling.  
376

377 *Validation Seeking*

378 The extent to which participants' behavior was driven by the need for external  
379 validation was assessed using the 18-item Validation-Seeking subscale of the  
380 Goal Orientation Inventory (Dykman, 1998). This scale assesses personality in  
381 terms of goal motivation, specifically, the extent to which an individual is driven  
382 by the need to receive external validation of their self-worth. A typical item is,  
383 "Whether it be in sports, social interactions, or job/school activities, I feel like I'm  
384 still trying to prove that I'm a worthwhile, competent, or likeable person." Items  
385 are scored on a seven-point Likert scale ranging from 1 (Strongly disagree) to 7  
386 (Strongly agree), with a sum score calculated for the scale. Scores can range from  
387 18 to 126, with higher scores indicating greater need for external validation.  
388 Cronbach's  $\alpha$  was .97 in the present sample.

389

390 *Demographics and anthropometrics*

391 Finally, participants were asked to provide age, gender, and ethnicity, and to  
392 report height and weight measurements, which were used to calculate BMI. The  
393 option to decline to answer any of these questions was provided. As with the  
394 Weight Self Stigma Questionnaire, 84% of the first 157 participants chose not to  
395 provide height and/or weight information. Thus, these two items were made  
396 non-optional at the same times as the WSSQ. However, responses were entered  
397 into a text box, so students were able to type, "I don't know", or "I'd rather not  
398 answer", etc., if they so wished, and a small number did so.

399

400 *Handling of missing values*

401 In order to determine the impact of missing data for weight self-stigma and BMI,  
402 the relationship between these measures and key study outcome variables was  
403 explored for the participants completing the study before and after these  
404 questions became mandatory. There were no differences in proportion of  
405 respondents classified in each food addiction category between the two groups.  
406 Additionally, there were no statistically significant differences in continuous  
407 study variables between the two groups. Missing values analysis confirmed that  
408 the data were missing completely at random (Little's MCAR test  $\chi^2 (57) = 28.2, p$   
409  $= 1.0$ ). Thus, missing data on these variables were imputed using the expectation  
410 maximization (EM) method. The EM method is an iterative procedure that  
411 estimates the means, covariance matrix, and correlation of scale variables with  
412 missing values based on the likelihood under the distribution of the variable – in  
413 this case, a normal distribution, and which is suitable for data that are missing  
414 completely at random. Each iteration is conducted in two steps: first, an E step  
415 uses log-likelihood to produce a conditional expectation of the missing data  
416 given the observed values and current estimate of the parameters, e.g.  
417 correlations; the second M step performs full information maximum likelihood  
418 estimation as though the missing data had been filled in, to compute parameters  
419 that maximise the expected log-likelihood from the E step. These parameter  
420 estimates are used in the subsequent E step, and the process repeats until  
421 convergence is achieved. Missing values on demographic variables (gender and  
422 ethnicity) were not imputed and were deleted pairwise; consequently, sample  
423 size varied slightly by analysis.

424

425 *Statistical analysis*

426 Gender differences were tested using independent *t*-tests and ethnicity  
427 differences using  $\chi^2$  tests. Given the small sample sizes for most of the non-White  
428 ethnic groups, ethnicity was dichotomized into White and Other Ethnicities for  
429 subsequent analyses, unless otherwise stated. Statistical significance was  
430 indicated by *p* values < .05, unless otherwise stated.

431

432 Descriptive statistics are provided for prevalence of each food addiction category  
433 (H1). Inter-group differences by food addiction status were assessed using  $\chi^2$   
434 tests for categorical outcomes and univariate ANOVA for continuous outcomes  
435 with Welch's robust *F* as the omnibus test of significance. In line with our  
436 hypothesis that SPFA+ would be characterized by scores between those of YFAS+  
437 and NFA (H1 and H2), significant ANOVAs were probed with planned contrasts,  
438 first comparing YFAS+ with SPFA+, and then SPFA+ with NFA. As these contrasts  
439 are non-orthogonal, a conservative alpha criterion was set at .01. Zero-order  
440 bivariate correlations were calculated between YFAS symptom count and all  
441 study outcomes. To explore the predictors hypothesized to differentiate between  
442 those who did and did not consider themselves addicted to food (SPFA+ and  
443 NFA) and between self-perceived and YFAS-diagnosed food addicts (SPFA+ and  
444 YFAS+) (H3), multinomial logistic regression was conducted, using SPFA+ as the  
445 reference group.

446 Analyses in all studies were conducted using SPSS for Mac, Version 23.

447

448 **Results**

449 *Preliminary analyses*

450 Men and women did not differ on YFAS symptom count, food addiction category,  
451 dieting status, eating self-efficacy, eating attitudes, appearance evaluation and  
452 orientation, or validation-seeking goal orientation (all  $p > .05$ ); however, women  
453 scored significantly higher than men on dietary restraint scale, internalized  
454 weight stigma, overweight preoccupation, and self-classified weight, and lower  
455 on intuitive eating, and anti-fat attitudes. Additionally, although YFAS+  
456 classification prevalence did not differ by ethnicity, Whites were less likely to  
457 self-classify as food addicted than other ethnicities (39.9% versus 55.7%,  
458 respectively;  $\chi^2_{(2)} = 12.8, p = .002^2$ . Sex and ethnicity were therefore included as  
459 covariates in subsequent regression analyses. Food addiction status did not  
460 differ by age.

461

462 *H1: Prevalence and symptom endorsement in YFAS+, SPFA+, and NFA*

463 As predicted, SPFA was more prevalent than “food addiction” based on YFAS  
464 criteria. Over half of the participants (342/658) considered themselves to be  
465 addicted to some foods. Of these, however, only 56 (16%; 8.5% of total sample)  
466 met the YFAS diagnostic criteria. Thus, 286 individuals (43.5%) believed

---

<sup>2</sup> This effect was largely driven by participants identifying as of South Asian ethnicity (i.e., Asian – Indian or Asian – Pakistani;  $n = 64$ ; 64.1% SPFA+). Other ethnicities had prevalence rates between those identifying as White and South Asian. No differences in any other measure of eating behaviour, body image, weight stigma, or BMI were found between participants of South Asian and White ethnicity. Exploratory analyses were conducted using an alternative coding scheme with three groups: White, South Asian, and Other Ethnicities. This did not alter findings; thus we report results using dichotomous coding (1 = White, 0 = Other Ethnicities) for simplicity.

467 themselves to be addicted to foods but did not receive a YFAS+ diagnosis and  
468 were designated SPFA+. The remaining 316 participants (48.0%) were  
469 categorized as NFA.

470

471 Interestingly, thirteen of the fifty-six individuals meeting the criteria for YFAS+  
472 diagnosis did not consider themselves to be addicted to any foods. Independent  
473 *t*-tests and  $\chi^2$  tests indicated no significant differences between these two sub-  
474 types of YFAS+ participants on study outcomes, with the exception of one YFAS  
475 symptom and eating self-efficacy. Only 23.1% of YFAS+ participants who did not  
476 consider themselves addicted to food endorsed the symptom “Substance taken in  
477 larger amount and for longer period than intended”, compared with 60.5% who  
478 self-classified as food addicted ( $\chi^2_{(1)} = 5.6, p = .027, OR = 0.2$ ). Additionally, those  
479 who did not self-classify as addicted had a mean ESES score of 3.5, compared  
480 with 4.3 for those who also rated themselves as food addicts ( $t_{(54)} = 2.8, p = .008,$   
481  $d = 0.76$ ). Given the relatively minor differences between the two subtypes, and  
482 the small size of the YFAS+ category, all data were retained and grouped together  
483 into a single YFAS+ category. However, all subsequent analyses were conducted  
484 with and without these cases, and any differences reported.

485

486 Mean YFAS symptom count differed significantly between the three food  
487 addiction groups (Welch’s  $F_{(2,144)} = 183.6, p < .001$ , estimated  $\omega^2 = .36$ ), with  
488 higher symptom endorsement in the YFAS+ than in the SPFA+ group, and in the  
489 SPFA+ than the NFA group (Table 1; all pairwise comparisons  $p < .001$ ).

490 Nevertheless, 40% of SPFA+ participants endorsed three or more symptoms, the  
491 minimum required for a diagnosis of substance dependence, but because these

492 individuals reported no clinically significant distress or impairment as a result of  
 493 their symptoms, they did not receive a YFAS+ diagnosis. Consistent with  
 494 previous findings, the symptom “Persistent desire or repeated unsuccessful  
 495 attempts to quit” was endorsed highly by all three groups.

496

497

498 **Table 1. YFAS symptom endorsement by food addiction status**

	YFAS+ (n=56)*	SPFA+ (n=286)	NFA (n=316)	Total (n=658)
<b>Mean symptom count</b>	4.8	2.4	1.3	2.1
<b>Range</b>	3 – 7	0 – 7	0 – 7	
<b>% endorsing 3 or more symptoms</b>	100	40	9	30
<b>% endorsing each symptom*</b>				
Taken in larger amounts than intended	52 <sup>a</sup>	17 <sup>b</sup>	6 <sup>b</sup>	14
Persistent desire/unsuccessful attempts to quit	98 <sup>a</sup>	95 <sup>a</sup>	87 <sup>b</sup>	91
Effort to obtain/use	68 <sup>a</sup>	28 <sup>b</sup>	8 <sup>c</sup>	22
Important activities reduced	68 <sup>a</sup>	22 <sup>b</sup>	8 <sup>c</sup>	19
Continued use despite negative consequences	63 <sup>a</sup>	23 <sup>b</sup>	8 <sup>c</sup>	19
Tolerance	57 <sup>a</sup>	35 <sup>b</sup>	9 <sup>c</sup>	25
Withdrawal	71 <sup>a</sup>	19 <sup>b</sup>	4 <sup>c</sup>	16

499 <sup>a,b,c</sup> For each symptom, groups that do not share a superscript differ at the .05 level. Other  
 500 differences were non-significant.

501 Abbreviations: YFAS+, positive diagnosis on Yale Food Addiction Scale; SPFA+, self-perceived  
 502 food addiction without positive diagnosis on the YFAS; NFA, no food addiction.

503 \* With YFAS minor subtype (individuals who received a YFAS+ diagnosis but who did not  
 504 consider themselves to be addicted to food) excluded, N = 43; Endorsement for each symptom:  
 505 61%, 98%, 67%, 65%, 65%, 58%, 79%.

506

507 *H2: Characteristics of SPFA+ versus YFAS+ and NFA*

508 Participant characteristics by “food addiction” classification are shown in Table 2.

509 With the exception of weight controllability beliefs, which did not differ across

510 the three groups, the hypothesized gradient was apparent for all measures, with

511 the scores in the SPFA+ group falling between those in the YFAS+ and NFA

512 groups. Additionally, although mean BMI was not significantly different between



513 the three groups, the three food addiction groups were significantly different on  
514 all measures of eating behaviour, internalized weight stigma, appearance  
515 evaluation, overweight preoccupation, and validation-seeking behaviour. The  
516 YFAS+ participants had a mean score on the EAT-26 slightly above the cut-off of  
517 20, suggesting clinically relevant eating pathology. Additionally, YFAS+  
518 participants were significantly more likely to be weight-loss dieting than the  
519 other two groups (OR 3.9, 95% CI 2.2 to 6.9,  $p < .001$ ), and this relationship held  
520 when controlling for BMI. YFAS symptom count was significantly correlated with  
521 all outcomes measured, with the exception of weight-controllability beliefs.  
522

**Table 2. Group differences by food addiction status and correlation with YFAS symptom count**

	Possible range	YFAS+ (n=56)	SPFA+ (n=286)	No FA (n=316)	Test Statistic <sup>†</sup>	<i>p</i>	Effect size <sup>†</sup>	<i>r</i> <sup>‡</sup>
BMI		23.2 (5.5)	22.1 (3.5)	21.7 (3.2)	2.8	.06	.01	.15***
<i>Eating behavior</i>								
RS	0–35	18.7 (6.5) <sup>a</sup>	12.7 (5.7) <sup>b</sup>	10.7 (5.8) <sup>c</sup>	39.9	< .001	.11	.42***
ESES	1–7	4.1 (1.0) <sup>a</sup>	3.4 (1.1) <sup>b</sup>	2.6 (1.1) <sup>c</sup>	70.1	< .001	.17	.55***
IES	1–5	2.6 (0.5) <sup>a</sup>	3.1 (0.5) <sup>b</sup>	3.4 (0.5) <sup>c</sup>	76.2	< .001	.19	-.47***
EAT-26	0–78	22.5 (14.7) <sup>a</sup>	10.4 (10.0) <sup>b</sup>	8.6 (10.0) <sup>b</sup>	23.4	< .001	.06	.35**
Dieting status <sup>§</sup>					26.4	< .001	3.9 <sup>§</sup>	-.20***
WL Dieting		41.1% <sup>a</sup>	16.8% <sup>b</sup>	13.9% <sup>b</sup>				
Watching		26.8%	32.2%	29.4%				
Not Dieting		32.1% <sup>a</sup>	51.0% <sup>b</sup>	56.6% <sup>b</sup>				
<i>Body Image</i>								
Appearance orientation	1–5	3.8 (0.6) <sup>a</sup>	3.7 (0.6) <sup>a</sup>	3.5 (0.6) <sup>b</sup>	6.3	.002	.02	.10*
Appearance evaluation	1–5	2.3 (0.9) <sup>a</sup>	2.9 (0.8) <sup>b</sup>	3.1 (0.8) <sup>c</sup>	26.4	< .001	.07	-.33***
Overweight preoccupation	1–5	3.5 (0.9) <sup>a</sup>	2.8 (0.9) <sup>b</sup>	2.6 (1.0) <sup>c</sup>	27.5	< .001	.07	.32***
Self-classified weight	1–5	3.5 (0.9) <sup>a</sup>	3.2 (0.7) <sup>a</sup>	3.0 (0.6) <sup>b</sup>	10.3	< .001	.03	.24***
<i>Weight stigma</i>								
WSSQ								
WSSQ-Self	6–30	19.4 (5.7) <sup>a</sup>	13.5 (6.0) <sup>b</sup>	11.0 (5.3) <sup>c</sup>	56.9	<.001	.15	.45***
WSSQ-Fear	6–30	17.0 (5.7) <sup>a</sup>	12.9 (5.0) <sup>b</sup>	10.7 (4.2) <sup>c</sup>	40.3	<.001	.11	.38***
AFA Dislike	0–9	2.4 (1.8) <sup>a</sup>	2.0 (1.7) <sup>a</sup>	1.7 (1.3) <sup>b</sup>	6.4	.002	.02	.14***
AFA Willpower	0–9	4.9 (1.7)	5.1 (1.8)	5.0 (1.7)	0.4	.65	.00	.01
<i>Other</i>								
Validation seeking	18–126	84.8 (20.5) <sup>a</sup>	71.9 (23.3) <sup>b</sup>	62.1 (26.0) <sup>c</sup>	29.6	< .001	.08	.30***

524

Unless otherwise stated, data are means (standard deviation).

525

<sup>a,b,c</sup> Planned contrasts for continuous variables: *consecutive* food addiction categories that do not share a superscript differ at .01 level.

526

\* *p* < .05, \*\* *p* < .01, *p* < .001

527 †Test statistics are Welch's *F* for continuous variables and  $\chi^2$  for categorical variables. Effect sizes are  $\omega^2$  for ANOVA and odds ratios for  $\chi^2$  tests.  
528 §All pairwise comparisons calculated; groups not sharing a superscript differ at .05 level. Effect size is odds ratio for YFAS+ currently weight-loss dieting versus  
529 other groups currently weight-loss dieting. Dieting status coded 1= Weight-loss dieting, 2 = Watching, 3 = Not dieting  
530 Abbreviations: YFAS+, positive diagnosis on Yale Food Addiction Scale; SPFA+, self-perceived food addiction without positive diagnosis on YFAS; NFA, no food  
531 addiction; App, Appearance; BMI, Body Mass Index; RS, Restraint Scale; ESES, Eating Self-Efficacy Scale; IES, Intuitive Eating Scale; EAT-26, Eating Attitudes Test-  
532 26; OW Preocc, Overweight preoccupation; SCWt, Self-classified weight; WSSQ, Weight Self-Stigma Questionnaire; WSSQ-Self, Self-Devaluation subscale; WSSQ-  
533 Fear, Fear of Enacted Stigma subscale; AFA, Anti-fat Attitudes Questionnaire; WL, Weight loss.  
534

535 *H3: Unique predictors of SPFA status*

536 In order to identify whether SPFA+ could be distinguished from YFAS+ and NFA  
537 based on specific characteristics, multinomial logistic regression analysis was  
538 conducted with food addiction status as the outcome and SPFA+ as the reference  
539 category. We included the following predictors in the regression model: dietary  
540 restraint (RS) and overweight preoccupation were included based on their  
541 strong association with disordered eating behaviors; eating self-efficacy (ESES)  
542 was included as we expected perceived lack of self-control around food to be a  
543 major discriminating factor between SPFA+ and NFA, eating pathology (EAT-26)  
544 was included as it was hypothesized to distinguish between the YFAS+ and  
545 SPFA+ groups; additionally, we included both subscales of the WSSQ. Weight  
546 self-stigma is emerging as an important predictor of disordered eating behavior,  
547 but remains relatively unexplored in the context of food addiction, and the  
548 distinct roles of self-devaluation and fear of stigma from others have yet to be  
549 elucidated. Ethnicity and sex were entered as covariates.

550

551 Self-perceived food addiction was set as the reference category; thus predictors  
552 are tested for their ability to discriminate between, first, SPFA+ and YFAS+, and  
553 second, SPFA+ and NFA. The hypothesized model was a good fit for the data  
554 ( $\chi^2_{(16)} = 219.9, p < .001, \text{Nagelkerke } R^2 = .34$ ), and overall percentage of correct  
555 classification to food addiction groups was 63.2%. However, several of the  
556 hypothesized predictors did not significantly contribute to the model, and a  
557 number of reduced models were explored by sequential removal of predictors  
558 with non-significant likelihood ratio tests. Dietary restraint, overweight

559 preoccupation, and gender did not contribute to discrimination between SPFA+  
560 and either of the other two groups. Substituting current dieting status for dietary  
561 restraint did not change these findings. Deletion of these variables resulted in a  
562 more parsimonious model with no significant reduction in model fit ( $\chi^2_{(10)} =$   
563 208.9,  $p < .001$ , Nagelkerke  $R^2 = .33$ ), or predictive power. The final model is  
564 displayed in Table 3. The model correctly classified 20.0% of YFAS+, 59.9% of  
565 SPFA+ and 73.0% of NFA participants, with overall accuracy of 62.8%.

566 As predicted, eating pathology, as measured by the EAT-26, successfully  
567 distinguished between YFAS+ and SPFA+, but did not distinguish between SPFA+  
568 and NFA. The EAT-26 has a possible range of 0–78; thus, a 5-point higher score  
569 on the EAT-26 was associated with a 30% higher likelihood of being YFAS+  
570 compared with SPFA+. Eating self-efficacy was a significant predictor for both  
571 outcomes, but had a bigger role in differentiating between SPFA+ and NFA: for  
572 every 1-point increase in ESES score, an individual would be twice as likely to be  
573 SPFA+ as NFA. Higher weight-related self-stigma increased the likelihood of  
574 being YFAS+ compared with SPFA+, whereas fear of being stigmatized by others  
575 was associated with an increased likelihood of being SPFA+ compared with NFA,  
576 in each case, a 50–60% increase with each 5-point rise in the WSSQ subscales,  
577 which are scored 6 to 30. Ethnicity distinguished between SPFA+ and NFA, with  
578 White participants nearly three times as likely to be NFA rather than SPFA+, but  
579 did not distinguish between YFAS+ and SPFA+ status.

580

581

582 **Table 3. Multinomial logistic regression comparing predictors of SPFA+ with YFAS+ and**  
 583 **non-food addicts**

	B	SE	Sig.	OR	95% CI for OR	
					Lower	Upper
<i>YFAS vs SPFA</i>						
Intercept	-5.33	0.80	< .001			
EAT-26	0.06	0.01	< .001	1.06	1.03	1.09
ESES	0.36	0.16	0.03	1.43	1.04	1.97
WSSQ-Self	0.12	0.05	0.01	1.12	1.03	1.23
WSSQ-Fear	-0.03	0.05	0.55	0.97	0.88	1.07
Ethnicity	0.08	0.38	0.83	1.09	0.51	2.27
<i>SPFA vs NFA</i>						
Intercept	-3.10	0.35	< .001			
EAT-26	0.00	0.01	0.87	1.00	0.98	1.02
ESES	0.70	0.10	< .001	2.00	1.67	2.44
WSSQ-Self	-0.04	0.03	0.15	0.96	0.91	1.01
WSSQ-Fear	0.10	0.04	0.01	1.10	1.03	1.18
Ethnicity	-1.00	0.22	< .001	0.37	0.24	0.57

584 N=648

585 Abbreviations: YFAS+, Positive “diagnosis” on Yale Food Addiction Scale; SPFA+, self-perceived  
 586 food addict only; NFA, no food addiction; EAT-26, Eating Attitudes Test-26 (range 0–78); ESES,  
 587 Eating Self-Efficacy Scale (range 1–7); WSSQ, Weight Self-Stigma Questionnaire; Self-Devaluation  
 588 and Fear of Enacted Stigma subscales (both range 6–30);  
 589 Ethnicity scored 1 = White, 0 = Other ethnicities.

590

### 591 **Interim Discussion**

592 All three hypotheses were supported. First, as predicted, the prevalence of SPFA  
 593 was high, with exactly half of the 658 participants considering themselves to be  
 594 addicted to some foods. Only one in eight of these also received a positive  
 595 “diagnosis” on the YFAS, giving a YFAS+ rate of 8.5% for the whole sample,  
 596 consistent with findings from other studies in non-clinical populations (Meule,  
 597 2011). Secondly, despite very similar BMIs across the three food groups, all of  
 598 which fell within the “normal weight” range, a clear continuum existed for all  
 599 measures of eating behavior, body image, weight self-stigma, and validation  
 600 seeking, with SPFA+ individuals having scores intermediate to the YFAS+ and  
 601 NFA groups. However, only small differences in anti-fat attitudes were seen

602 across the three groups, and negative attitudes toward higher-weight individuals  
603 were low overall. Finally, as expected, SPFA+ did not display the same degree of  
604 eating pathology, as measured by the EAT-26, as did participants classified as  
605 YFAS+, and the two groups could be distinguished based on this measure. Also in  
606 line with hypotheses, self-perceived difficulty controlling eating significantly  
607 discriminated between SPFA+ and NFA; however, eating self-efficacy also  
608 significantly discriminated between SPFA+ and YFAS+, indicating that scores in  
609 the YFAS+ group were sufficiently higher than those in the SPFA+ group to make  
610 this possible, even when controlling for eating pathology. Interestingly, weight-  
611 related self-devaluation significantly discriminated between YFAS+ and SPFA+  
612 but not SPFA+ and NFA, whereas the opposite was true for fear of enacted  
613 weight stigma. The divergent roles of self-devaluation and fear of enacted stigma  
614 could be indicative of a multi-staged effect of weight stigma, with fear of stigma  
615 being an early driver of disordered eating behavior. The process by which weight  
616 stigma develops in an individual has yet to be explored; however, evidence from  
617 a study of mental illness stigma suggests that anticipation of stigma and  
618 discrimination from others is a predictor of self-devaluation (Quinn, Williams, &  
619 Weisz, 2015).

620

621 However, while the model accurately predicted over half of SPFA+ cases, the  
622 accuracy in classifying YFAS+ status was relatively low, correctly identifying only  
623 one in five participants with a YFAS+ “diagnosis”, suggesting that other  
624 constructs may be more important in differentiating between these two  
625 “conditions”.

626

627 Within the SPFA+ group – that is, those without a YFAS+ diagnosis – 40% of  
628 participants endorsed 3 or more YFAS symptoms, compared with only 9% in the  
629 NFA group, supporting the concept that SPFA does involve some addictive-like  
630 behavior and may be a milder form of YFAS+. A significant proportion of  
631 participants in studies using the YFAS endorse three or more symptoms in the  
632 absence of a positive diagnosis, with frequencies between 33% and 57%  
633 reported (Eichen et al., 2013; Gearhardt, White, Masheb, Morgan, Crosby, & Grilo,  
634 2012; Gearhardt, Yokum, Orr, Stice, Corbin, & Brownell, 2011). Three symptoms  
635 is the minimum requirement for a diagnosis of substance dependence according  
636 to the DSM-IV-TR criteria on which the YFAS was based, but in the absence of  
637 clinically significant distress or impairment resulting from their symptoms, a  
638 positive diagnosis is not made. In a previous study, Ruddock, Field, & Hardman  
639 (in press) confirmed that self-perceived food addicts endorse significantly more  
640 food addiction “symptoms” as defined by the YFAS than do those who do not  
641 consider themselves addicts (mean 3.2 versus 1.5) but that over 85% do not  
642 experience clinically significant distress.

643

644 It is not yet known whether individuals who present with elevated YFAS  
645 symptom count but who do not endorse the items relating to clinically significant  
646 distress are at an “intermediate” stage that might subsequently progress to a  
647 YFAS+ diagnosis. Little attention has yet been paid to the developmental  
648 progression of clinically significant “food addiction”; however, Ziauddeen and  
649 Fletcher (2013), proposed the existence of a “food abuse syndrome”,  
650 representing a potential early stage in the natural history of “food addiction”. If  
651 SPFA represents such an intermediate stage on the developmental pathway,



652 individuals who self-classify as food addicted may be at increased risk of  
653 developing clinically significant distress or impairment and qualifying for a  
654 YFAS+ diagnosis and its associated psychopathology.

655

#### 656 **Study 1b**

657 Study 1b involved the collection of follow-up data from the sample used in Study  
658 1a. This allowed us to examine the stability of food addiction status over time  
659 and to explore whether SPFA+ at baseline was predictive of worsening eating  
660 pathology or body image issues at follow-up. A small number of longitudinal  
661 studies have documented the progression and remission of disordered eating,  
662 sub-threshold, and threshold eating disorders in community samples. Across all  
663 eating disorder diagnoses, diagnostic stability is generally low; reported figures  
664 for remission rates for BED and sub-threshold BED, specifically, range from 35%  
665 to 100% within one to five years (Allen, Byrne, Oddy, & Crosby, 2013;  
666 Goldschmidt, Wall, Zhang, Loth, & Neumark-Sztainer, 2016; Stice, Marti, & Rohde,  
667 2013). The majority (85–90%) of participants without disordered eating at  
668 baseline appear to remain free of problematic eating behaviors over medium-  
669 term follow up (Goldschmidt et al., 2016). Cohort studies looking at the  
670 trajectory of disordered eating behavior in community samples report between  
671 3% and 12% of participants follow a symptom-escalation trajectory across a  
672 range of disordered eating behaviors (Fairweather-Schmidt & Wade, 2016).  
673 Thus, we made the following hypotheses:

674 H4: Both YFAS+ and SPFA+ would be relatively unstable, with at least half  
675 of participants in each category remitting to a less severe status at follow-up. In

676 contrast, NFA would be a highly stable classification. Approximately 5–10% of  
677 participants classified as SPFA+ at baseline would “progress” to a YFAS+  
678 diagnosis at follow-up.

679 H5: SPFA+ at baseline would be predictive of worsening scores on  
680 measures of disordered eating, body image, and weight self-stigma at follow-up.  
681

## 682 **Method**

### 683 *Participants*

684 A subset of participants from Study 1a was invited to participate in a follow-up  
685 study between October 2013 and December 2014. Due to the nature of the  
686 university’s research participation scheme, which is a course requisite for only  
687 1<sup>st</sup> and 2<sup>nd</sup> year undergraduates, and the timing of survey availability, only 308  
688 students who completed Study 1a were able to participate in the follow-up study,  
689 and all did so. Three students filled out the follow-up questionnaire less than  
690 seven days after completing the baseline questionnaire and their data were  
691 excluded from the analyses, giving a final follow-up sample of 305 (92% female,  
692 80% Caucasian, age 19.6 (1.5) years). After deletion of implausible values, mean  
693 BMI was 21.9 (3.7) kg/m<sup>2</sup>, with 11.1% of the sample categorised as underweight,  
694 70.5% normal weight, 12.1% overweight, and 3.9% obese; 2.6% missing.

695

### 696 *Measures*

697 Measures collected in Study 1b were the same as in Study 1a, with two  
698 exceptions. As explicit anti-fat attitudes were generally low in Study 1a, with  
699 little difference observed between food addiction groups, the AFAQ was omitted.

700 Additionally, the Goal Orientation Inventory was omitted as it was not critical to  
701 the hypotheses being explored in this follow-up study. All scales had good  
702 internal reliability, with Cronbach's alphas ranging from .76 to .97.

703

#### 704 **Statistical analysis**

705 Agreement of food addiction status at baseline and follow-up (H4) was tested  
706 using Cohen's  $\kappa$ . Following Landis and Koch (1977), a  $\kappa$  value between .21  
707 and .40 was considered fair, .41 and .60 moderate, .61 and .80 substantial,  
708 and .81 to 1 "almost perfect". Additionally, Goodman and Kruskal's  $\lambda$  was used as  
709 a directional measure of agreement. That is,  $\lambda$  measures reduction in error in  
710 predictive accuracy for follow-up classification when baseline classification is  
711 taken into account. A value of 1 would indicate that baseline classification  
712 perfectly predicts follow-up classification, whereas a value of 0 would suggest no  
713 predictive value (Field, 2013). Analysis of study outcomes by food addiction  
714 status was conducted as in Study 1a. Repeated measures *t*-tests were conducted  
715 to ascertain whether SPFA+ status at baseline was predictive of significantly  
716 worsening scores on measures of disordered eating, body image, or weight  
717 stigma (H5).

718

#### 719 **Results**

##### 720 *Preliminary analyses*

721 Length of follow-up ranged from 155 to 474 days (mean 280, SD 30 days), and  
722 did not differ by food addiction status (Kruskall-Wallis  $H_{(2)} = 4.03, p = .13$ ). At

723 follow-up, 7.5% of participants received a positive YFAS diagnosis, 34.4% were  
 724 self-perceived food addicts in the absence of a YFAS+ diagnosis, and 58.8% were  
 725 classed as non-addicts. No differences from baseline were observed in the  
 726 pattern or magnitude of outcome variables between the food addiction groups  
 727 (data not shown), with one exception: there were no longer any differences  
 728 between the three groups on appearance orientation (means 3.6, 3.6, and 3.5,  
 729 respectively; Welch's  $F_{(2,58)} = 0.9, p = .40$ ).

730

731 *H4: Stability of food addiction status*

732 Food addiction classification at baseline (T1) and follow-up (T2) is shown in  
 733 Table 4. Overall, food addiction status was moderately stable over the follow-up  
 734 period ( $\kappa = .474, p < .001$ ), although YFAS+ status was less stable than SPFA+ or  
 735 NFA. Only 42% of YFAS+ respondents at T1 retained the same classification at T2,  
 736 compared with 59% for SPFA+ and 84% for NFA. Looking at the predictive  
 737 power of baseline food addiction status, prediction accuracy for classification at  
 738 follow-up was significantly improved when using baseline group membership ( $\lambda$   
 739  $= .305, p < .001$ ); however, baseline SPFA+ status was not a significant predictor  
 740 of YFAS+ status at follow-up ( $Z = 0.2, ns$ ).

741

742 **Table 4. Comparison of food addiction status at baseline and follow-up**

	N	%	Z	p	Odds <sup>a</sup>
YFAS+ at T1	24				
T2 YFAS+	10	42%	6.1	< .001	0.7
T2 SPFA+	10	42%	0.6	ns	-
T2 NFA	4	17%	-2.7	< .01	-

SPFA+ at T1		123				
T2 YFAS+	10	8%	0.2	ns	-	
T2 SPFA+	73	59%	4.7	< .001	1.2	
T2 NFA	40	33%	-3.7	< .001	-	
NoFA at T1		158				
T2 YFAS+	3	2%	-2.6	< .01	-	
T2 SPFA+	22	14%	-4.4	< .001	-	
T2 NFA	133	84%	4.3	< .001	5.3	

743 <sup>a</sup>Odds of staying in the same group from baseline to follow-up.

744

745 *H5: SPFA+ as a predictor of worsening eating behavior, body image, and weight*

746 *stigma*

747 Baseline SPFA+ was not associated with increases in problem eating or

748 worsening body image at follow-up: repeated measures *t*-tests indicated no

749 change between T1 and T2 in any measure of eating behavior, overweight

750 preoccupation, self-classified weight, self-reported BMI, or weight-related self-

751 stigma or fear of stigma in this group. Conversely, appearance evaluation

752 improved slightly (2.9 to 3.0,  $t_{(122)} = 3.0$ ,  $p = .004$ ,  $d = .54$ ) and appearance

753 orientation decreased slightly (3.7 to 3.6,  $t_{(122)} = -2.2$ ,  $p = .03$ ,  $d = .40$ ) at follow-up.

754

## 755 **Interim Discussion**

756 Self-perceived food addiction appears to be a moderately stable condition over

757 time, at least on a par with YFAS+; thus, H4 was supported. However, the data do

758 not support H5; that is, SPFA+ does not appear to be a marker for worsening

759 pathology, at least over the time period tested here.

760

761 Overall, these findings confirm that SPFA represents a relatively stable condition  
762 that distinguishes self-perceived food addicts from YFAS+ and NFA individuals in  
763 a number of meaningful constructs related to eating, body image, and weight-  
764 related self-stigma, not simply their sense of self-control around food. However,  
765 in logistic regression models, these constructs alone resulted in low specificity  
766 for YFAS+ status, correctly classifying only 20% of YFAS+ individuals in Study 1a.

767

768 Our focus in Study 1 was on measures of disordered eating and body image  
769 whereas other research on food addiction has explored the roles of broader  
770 constructs such as cravings, clinical comorbidities – in particular, depressive  
771 symptoms, and trait impulsivity (Davis et al., 2011; Imperatori, Innamorati,  
772 Contardi, Continisio, Tamburello, Lamis, et al., 2014; Ivezaj, White, & Grilo, 2016;  
773 Meule & Kübler, 2012; Meule, Heckel, Jurowich, Vögele, & Kübler, 2014; Meule et  
774 al., 2015; Nolan & Geliebter, 2016). It is possible that inclusion of these  
775 constructs would improve the specificity of the predictive model and the ability  
776 to discriminate between YFAS+ and SPFA+ individuals. Impulsivity reflects rapid,  
777 disinhibited responses to internal or external cues irrespective of potential  
778 negative consequences, and has been associated with a variety of addiction  
779 disorders (de Wit, 2009; Morris & Voon, 2016). Impulsivity has also been linked  
780 to a range of pathological eating behaviors, including food addiction (Davis,  
781 2013; Gearhardt et al., 2009; Meule, 2013). Additionally, it may be possible to  
782 distinguish SPFA from YFAS-diagnosed food addiction on the construct of binge  
783 behavior. Notable similarities exist between binge eating disorder (BED) and  
784 YFAS-diagnosed food addiction in terms of diagnostic criteria, symptoms,  
785 comorbid psychopathology, and neurobiological pathways (Davis, Loxton,

786 Levitan, Kaplan, Carter, & Kennedy, 2013; Gearhardt, White, & Potenza, 2011),  
787 and co-occurrence is common. Thus severity of binge behavior may differentiate  
788 between YFAS+ and SPFA+ individuals.

789

## 790 **Study 2**

791 The purpose of study 2 was three-fold. First, we aimed to replicate findings from  
792 Study 1 in a non-student population. Second, we aimed to determine whether  
793 addition of constructs related more broadly to behavioral control improved the  
794 predictive accuracy of “food addiction” category beyond that achieved with only  
795 traditional measures of eating-related problems. The final aim of study 2 was to  
796 explore the utility of the food addiction categories in predicting psychopathology,  
797 beyond that attained by simply utilizing a continuous measure of symptom  
798 endorsement. In a review of studies utilizing the YFAS, Long et al. (2015) note  
799 that the majority of studies report findings in terms of the continuous YFAS  
800 symptom count, rather than exploring the utility of a YFAS+ diagnosis involving  
801 the requisite endorsement of clinically significant impairment or distress. The  
802 authors contend that the clinical utility of a YFAS+ “diagnosis” has yet to be  
803 firmly established, and can only be achieved if the “condition” itself is linked with  
804 specific clinical symptoms independently of the continuous symptom count.  
805 Given the continuum of symptom counts for each food addiction category  
806 observed in Studies 1a and 1b, and the previously described strong association  
807 between symptom count and psychopathology, we explored whether  
808 classification as either YFAS+ or SPFA+ explained additional variance in

809 psychopathology beyond that accounted for by their respective elevated  
810 symptom counts. We made the following hypotheses:

811           H6: The high prevalence of SPFA, and the continuum of scores on all  
812 measures would be replicated in this sample.

813           H7: Scores on the Binge Eating Scale and depressive symptoms would  
814 significantly differential between SPFA+ and YFAS+ in logistic regression models,  
815 and would increase the predictive accuracy of the models in correctly classifying  
816 YFAS+ participants. We expected that cravings, binge eating, and attentional  
817 impulsivity would differentiate between SPFA+ and NFA, but would not be  
818 sufficiently different to differentially predict SPFA+ and YFAS+.

819           H8: A YFAS+ diagnosis would explain additional variance in depressive  
820 symptoms, eating pathology in general, and binge eating specifically beyond that  
821 attributable to symptom count scores alone. We did not expect SPFA+  
822 classification to explain additional variance in psychopathology or disordered  
823 eating behavior beyond that explained by the elevated symptom count.

824

## 825 **Method**

### 826 *Participants*

827 Participants were recruited to an “Online eating survey” using Amazon’s  
828 Mechanical Turk (MTurk) worker pool. Eligibility criteria were initially limited to  
829 workers who had completed at least 100 previous “jobs” on the MTurk platform,  
830 and who had at least a 95% approval rating for their work, as this has been  
831 shown to improve data quality (Peer, Vosgerau, & Acquisti, 2014). An interim  
832 check on participant numbers and geographical location indicated that



833 participants from the Indian subcontinent were disproportionately represented.  
834 As we were unsure how cultural differences might impact on the findings, it was  
835 decided to limit future participants to those currently living in the US, Canada,  
836 UK, Ireland, Australia, and New Zealand. Additionally, to make the survey  
837 available to a wider sample, we reduced the required number of previous  
838 completed projects to 50, but increased the required approval rating to 100%.  
839 Participants were paid US \$0.50 for their time. Seven hundred and forty-seven  
840 participants provided informed consent and began the study. Of these, 660  
841 (88%) completed it. To ensure that participants were engaged in the survey, four  
842 “catch” questions were used. This practice also reduces the likelihood of  
843 automated form completion by “bots”, and is an additional method of ensuring  
844 high-quality data (Prince, Litovsky, & Friedman-Wheeler, 2012). Given the length  
845 of the survey, we allowed up to one incorrect response; however 46 participants  
846 incorrectly answered more than one “catch” question, and their data were  
847 excluded. Thus the final sample included 614 participants. Of these,  
848 approximately 9% chose not to provide any demographic data (50 did not report  
849 gender or profession, 54 did not report ethnicity, and 57 did not report  
850 education. Additionally, 63 did not provide height and weight information and  
851 thus BMI could not be calculated. Given that these variables were not critical to  
852 the study hypotheses, these participants were included in analyses, with missing  
853 values excluded pairwise. Of the remaining participants, 59.8% identified as  
854 female; 58.6% were White, 19.1% South-Asian/Indian, 5.2% African-American,  
855 3.4% Hispanic, and 13.7% other ethnicities; 65.6% had a college degree or higher,  
856 and just over half worked in white-collar professions, 9.6% were students,  
857 11.5% unemployed, 10.6% blue-collar workers, and 12.9% Other. Mean age was

858 35.1 years (SD 11.8, range 14 to 77) and mean BMI was 27.9 (SD 8.7, range 11.4  
859 to 84.9; 6.0% underweight, 37.1% normal weight, 21.3% overweight, and 27.4%  
860 obese by BMI category; 8.1% missing). The study was approved by the  
861 University of Birmingham Ethical Review Committee.

862

### 863 *Measures*

864 Participants completed the same questionnaires as in Study 1b. Additional  
865 demographic questions relating to education level and profession were added for  
866 this non-student sample. In addition, measures of binge eating, food cravings,  
867 trait impulsivity, and negative affect were included.

868

### 869 *Binge eating*

870 The Binge Eating Scale (BES), a 16-item questionnaire assessing the frequency  
871 and severity of behaviors, cognitions, and affect associated with binge eating.  
872 This self-report measure has been used in food addiction studies in non-eating  
873 disordered samples (e.g. Gearhardt et al., 2009; Imperatori et al., 2014), and  
874 scores on the BES have been shown to mediate the relationship between YFAS  
875 symptom count and psychopathology in treatment-seeking overweight and  
876 obese adults (Imperatori et al., 2014). The BES has good psychometric properties  
877 and strong agreement with expert interview-based assessments of binge eating  
878 problems (Gormally, Black, Daston, & Rardin, 1982). Item scoring varies by  
879 question, but a sum score is created for the whole scale, with a possible range of  
880 0 to 46. Accepted diagnostic cut-offs are 18–26 for moderate binge eating and 27

881 or higher for severe binge eating (Marcus, Wing, & Lamparski, 1985). Cronbach's  
882  $\alpha$  in the present study was .92.

883

#### 884 *Food cravings*

885 Trait food cravings were measured using the Food Craving Questionnaire–Trait  
886 (FCQ-T) (Cepeda-Benito, Gleaves, Williams, & Erath, 2000). This widely used  
887 scale comprises 39 items assessing cognitive, affective, and behavioral aspects of  
888 cravings across different situational contexts, including in the absence of a  
889 craved food, prior to, during, and after eating a craved food, and what triggers  
890 the cravings. In a large study of German university students, YFAS+ participants  
891 scored more highly than YFAS- participants on the total scale score and all  
892 subscales with the exception of anticipation of positive reinforcement, consistent  
893 with the increased cravings but absence of positive reward experienced in more  
894 traditional addictive conditions (Meule & Kübler, 2012). Subjects identify how  
895 often each of the items would apply to themselves, with items scored on a six-  
896 point Likert scale (1 = Never/not applicable to 6 = Always). Scores are summed  
897 to provide a total measure of food craving propensity, with a possible range of 39  
898 to 234. The scale showed excellent internal consistency in the present sample ( $\alpha$   
899 = .98).

900

#### 901 *Impulsivity*

902 Trait impulsivity was measured using the Barratt Impulsiveness Scale–Short  
903 Form (BIS-15) (Spinella, 2007). The BIS-15 is a relatively short measure,  
904 comprised of 15 items across three subscales, and is moderately to strongly

905 correlated with other commonly used, but longer, measures of impulsivity  
906 (Meule, Vögele, & Kübler, 2011; Spinella, 2007). The three subscales capture  
907 different aspects of impulsivity – namely attention, motor, and non-planning  
908 impulsivity. Attentional impulsivity assesses difficulty concentrating or  
909 remaining focused in the present; motor impulsivity refers to the tendency to act  
910 without thinking; and non-planning impulsivity is defined as a lack of  
911 forethought regarding future events. The subscales have previously been shown  
912 to correlate differentially with eating behaviour and food addiction symptoms.  
913 Attentional impulsivity, in particular, has been linked with food cravings,  
914 emotional eating, night eating, and YFAS symptom count in non-clinical samples  
915 (see Meule, 2013 for a review of measures of impulsivity and overeating),  
916 although some studies have also found significant, but smaller, correlations with  
917 the other subscales (e.g. Meule et al., 2015). Participants indicate how often they  
918 think or behave in certain ways, using a 4-point Likert scale (1 = Rarely/Never to  
919 4 = Almost always/Always). Sum scores for each subscale can range from 5 to 20.  
920 Internal reliability was adequate; Cronbach's  $\alpha$ s were .71, .79, and .71 for the  
921 Attention, Motor, and Non-planning subscales, respectively.

922

### 923 *Mood*

924 Depressed mood was measured using the Center for Epidemiological Studies–  
925 Depression scale (CES-D) (Radloff, 1977). This questionnaire measures recent  
926 negative affect, with participants indicating how often they have experienced  
927 each of the 20 items in the previous week. Items are scored on a 4-point Likert  
928 scale ranging from 0 (Rarely or none of the time, less than 1 day) to 3 (Most or all

929 of the time, 5–7 days). A sum score is created for the total scale with a possible  
930 range of 0 to 60. Scores greater than 16 are considered indicative of severe  
931 depressive symptoms, although the measure was developed and recommended  
932 for research purposes, rather than as a diagnostic tool. Nevertheless, it correlates  
933 well with clinical assessments of depression and is suitable for use in population  
934 studies and primary care (Radloff, 1977; Vilagut, Forero, Barbaglia, & Alonso,  
935 2016). Cronbach's  $\alpha$  in the present sample was .93.

936

### 937 *Handling of missing values*

938 As described above, missing values on demographic and anthropometric  
939 variables were not imputed, and these variables were deleted pairwise where  
940 relevant. Sample sizes therefore varied by analysis. Five participants had a total  
941 of eight missing data points on other study outcome measures. No variable had  
942 more than one data point missing. Given the very small number of missing data  
943 points, data imputation was deemed unnecessary, and missing values were  
944 replaced with participants' mean values for the respective scale or subscale.

945

### 946 *Statistical analysis*

947 In addition to the analyses conducted in Study 1 (H6), multinomial logistic  
948 regression was conducted in two stages. As a first step, the model tested in study  
949 1a was replicated in this non-student sample to confirm its generalizability. A  
950 second logistic regression was then conducted, adding in scores on the BES, FCQ-  
951 T, CES-D, and BIS-15 subscales. Improvements in model fit compared with the

952 basic model were assessed by changes in model  $\chi^2$ , pseudo-R<sup>2</sup>, and accuracy of  
953 food addiction status classification (H7).  
954 Hierarchical linear regressions were used to explore the relative utility of food  
955 addiction classification versus symptom count in predicting binge eating, general  
956 eating pathology, and depressive symptoms (H8). For each outcome, symptom  
957 count was entered into the regression equation first, and then food addiction  
958 classification was entered at the second step. Clinical utility was inferred if  
959 change in variance explained at step 2 was statistically significance.

960

## 961 **Results**

### 962 *H6: Characterization by food addiction status*

963 Eighty-four participants (13.7%) were classified as YFAS+, 249 (40.6%) as  
964 SPFA+, and the remaining 281 (45.8%) as NFA. Within the YFAS+ category, most  
965 (n=76) also self-classified as food addicts, but a small subset (n=8) did not. This  
966 subset did not differ from the larger group of YFAS+ participants on YFAS  
967 symptoms, but did differ on a number of other measures. YFAS+ participants  
968 who also self-classified as food addicted had higher scores on ESES, BES, and  
969 FCQ-T, and lower scores on the IES than YFAS+ participants who did not self-  
970 classify as food addicted. All subsequent analyses were run with and without  
971 these cases and the results did not differ; therefore, all YFAS+ participants were  
972 combined into a single group.

973

974 Symptom endorsement was very similar to that in the student sample, with two  
975 exceptions. In the present sample, a greater number of participants in each food

976 addiction group endorsed the symptoms “Continued use despite negative  
977 consequences” (72% YFAS+, 44% SPFA+, 17% NFA) and “Tolerance” (79%, 45%,  
978 and 21%, respectively). Food addiction status did not differ by gender, education  
979 level, or profession. However, consistent with findings in Study 1a, non-White  
980 ethnicity was associated with an increased likelihood of being SPFA+ than NFA.  
981 In addition, in the present sample, ethnicity was also associated with an  
982 increased risk of receiving a YFAS+ diagnosis. Again, the effect of ethnicity was  
983 driven predominantly by participants identifying as South Asian. Exploratory  
984 analyses revealed that South Asian respondents endorsed more YFAS symptoms  
985 (mean 3.2) than White and Other ethnicities (both 2.3;  $p \leq .001$ ). Significantly  
986 more South Asian participants endorsed almost all of the YFAS symptoms, with  
987 the exception of repeated failed attempts to quit or cut down and continuing use  
988 despite negative consequences. Examination of other study outcomes by gender  
989 indicates that South Asian participants reported either no difference or more  
990 favourable scores on almost all study outcomes compared with White and  
991 participants of other ethnicities. The one exception was for scores on the Food  
992 Cravings Questionnaire. South Asians reported statistically significant higher  
993 scores on all but two of the FCQ subscales, although the absolute difference in  
994 scores was small (South Asian 38.5, White 36.6, Other ethnicities 36.2,  $p = .01$ ).  
995 Overall food addiction status did not differ by age or sex. However, male and  
996 female participants differed on YFAS symptom count, dietary restraint, intuitive  
997 eating, EAT-26, and all measures of body image. Thus subsequent analyses were  
998 controlled for ethnicity and gender.  
999

1000 Participant characteristics by “food addiction” classification are shown in Table 5.  
1001 The three groups did not differ on BMI, appearance orientation, or non-planning  
1002 impulsivity, but were significantly different on all other measures, with the  
1003 SPFA+ having scores between those of the YFAS+ and NFA groups. The pattern of  
1004 eating behavior, body image, and weight self-stigma was very similar to that in  
1005 the student sample, although BMI was higher overall. However, participants in  
1006 the YFAS+ group had a mean EAT-26 score below the cut-off for clinically  
1007 relevant eating pathology, but did score within the range of BES associated with  
1008 moderately severe binge eating. Mean BES scores in the SPFA+ group did not  
1009 indicate clinically significant levels of binge behavior, but were significantly  
1010 higher than those in the NFA group. Likewise, food cravings, motor and  
1011 attentional impulsivity, and negative affect were elevated in the SPFA+ group. In  
1012 this sample, YFAS+ were less likely to be dieting than in the student sample,  
1013 although more likely to be watching what they ate so as to maintain their weight;  
1014 participants in the SPFA+ and NFA groups were more likely to be both weight-  
1015 loss dieting and watching in this sample compared with the student sample.  
1016 However, only the difference in SPFA+ participants who were weight-loss dieting  
1017 in the two samples was statistically significant ( $\chi^2_{(1)} = 4.6, p < .05$ ). Bivariate  
1018 correlations between YFAS symptom counts and study outcomes were similar to  
1019 those seen in the student sample, although there was no correlation with  
1020 appearance orientation. Additionally, symptoms count was moderately  
1021 correlated with all three BIS-15 subscales, and strongly correlated with food  
1022 cravings, binge eating, and depressive symptoms.



**Table 5. Group differences by food addiction status and correlations with YFAS symptom count**

	Range	YFAS+ (n=84)	SPFA+ (n=249)	No FA (n=281)	Test statistic <sup>†</sup>	<i>p</i>	Effect size <sup>†</sup>	<i>r</i> <sup>‡</sup>
BMI <sup>§</sup>		28.5 (8.5)	28.7 (9.6)	27.0 (7.8)	2.4	0.09	.00	.11*
<i>Eating behavior</i>								
RS	0–35	17.6 (6.6) <sup>a</sup>	15.7 (5.6) <sup>b</sup>	13.1 (5.7) <sup>c</sup>	23.0	< .001	.03	.38***
ESES	1–7	4.7 (1.1) <sup>a</sup>	3.5 (1.2) <sup>b</sup>	2.5 (1.2) <sup>c</sup>	128.9	< .001	.17	.49***
IES	1–5	2.8 (0.4) <sup>a</sup>	3.2 (0.5) <sup>b</sup>	3.5 (0.6) <sup>c</sup>	77.0	< .001	.11	-.42***
EAT-26	0–78	15.4 (10.9) <sup>a</sup>	10.4 (9.3) <sup>b</sup>	9.0 (9.5) <sup>b</sup>	11.6	0.001	.02	.16***
BES	0–46	22.8 (7.2) <sup>a</sup>	14.8 (8.3) <sup>b</sup>	9.0 (7.2) <sup>c</sup>	125.5	< .001	.17	.53***
FCQ-T	39–234	152.8 (26.3) <sup>a</sup>	116.8 (31.3) <sup>b</sup>	90.5 (31.8) <sup>c</sup>	167.7	< .001	.21	.54***
Dieting status <sup>¶</sup>					7.7	0.10	1.6 <sup>§</sup>	-.14**
WL Dieting		30.8% <sup>a</sup>	24.4% <sup>ab</sup>	19.6% <sup>b</sup>				
Watching		34.6%	40.0%	35.4%				
Not Dieting		34.6% <sup>ab</sup>	35.6% <sup>b</sup>	45.0% <sup>a</sup>				
<i>Body image</i>								
Appearance orientation	1–5	3.4 (0.6)	3.4 (0.6)	3.3 (0.7)	0.7	0.5	.00	-.05
Appearance evaluation	1–5	2.8 (0.9)	3.1 (0.9)	3.2 (0.9)	6.5	0.002	.01	-.21***
Overweight preoccupation	1–5	3.3 (0.8) <sup>a</sup>	2.8 (0.9) <sup>b</sup>	2.5 (0.9) <sup>c</sup>	35.6	< .001	.05	.30***
Self-classified weight	1–5	3.7 (0.8) <sup>a</sup>	3.6 (0.8) <sup>a</sup>	3.4 (0.8) <sup>b</sup>	7.1	0.001	.01	.22***
<i>Weight Stigma</i>								
WSSQ-SD	6–30	19.6 (4.7) <sup>a</sup>	16.1 (6.2) <sup>b</sup>	13.1 (5.8) <sup>c</sup>	56.6	< .001	.08	.38***
WSSQ-FS	6–30	19.1 (5.2) <sup>a</sup>	14.1 (6.0) <sup>b</sup>	11.9 (6.0) <sup>c</sup>	57.1	< .001	.08	.34***
<i>Other</i>								

BIS-15

BIS-15-M	5–20	11.2 (2.8) <sup>a</sup>	9.6 (2.6) <sup>b</sup>	8.7 (2.5) <sup>c</sup>	30.0	< .001	.05	.26***
BIS-15-A	5–20	11.3 (3.0) <sup>a</sup>	9.6 (2.7) <sup>b</sup>	8.8 (2.5) <sup>c</sup>	25.3	< .001	.04	.27***
BIS-15-NP	5–20	11.1 (3.0)	10.8 (3.1)	10.3 (3.0)	2.5	0.08	.00	.13**
CES-D	0–60	27.2 (9.9) <sup>a</sup>	16.1 (11.5) <sup>b</sup>	13.2 (10.8) <sup>c</sup>	62.9	< .001	.09	.30***

1024 Data are Means (Standard deviation) unless otherwise stated

1025 \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

1026 † Test statistics are Welch's  $F$  for continuous variables and  $\chi^2$  for categorical variables. Effect sizes are  $\omega^2$  for ANOVA and odds ratios for  $\chi^2$  tests.

1027 ‡ Correlation with YFAS symptom count

1028 §  $N = 555$ .

1029 ¶  $N = 563$ . All pairwise comparisons calculated; groups not sharing a superscript differ at .05 level. Odds ratio for YFAS+ currently weight-loss dieting versus other groups currently weight-loss dieting. Dieting status coded 1 = Weight-loss dieting, 2 = Watching, 3 = Not dieting.

1030 <sup>a,b,c</sup> Within variables, *consecutive* food addiction categories that do not share a superscript differ significantly at the .01 level.

1032 Abbreviations: YFAS+, positive diagnosis on Yale Food Addiction Scale;

1033 SPFA+, self-perceived food addiction without positive diagnosis on the YFAS; NFA, no food addiction; BMI, Body Mass Index; RS, Restraint Scale; ESES, Eating Self-

1034 Efficacy Scale; IES, Intuitive Eating Scale; EAT-26, Eating Attitudes Test-26; BES, Binge Eating Scale; FCQ-T, Food Craving Questionnaire-Trait; WL, Weight-loss;

1035 WSSQ-SD, Self-Devaluation subscale; WSSQ-FS, Fear of Stigma subscale; BIS-15, Barratt Impulsiveness Scale-15; BIS-15-M, Motor subscale; BIS-15-A, Attentional

1036 subscale; BIS-15-NP, Non-planning subscale; CES-D, Centre for Epidemiological Studies-Depression.

1037 Overall, there were no significant differences in dieting status between the food  
1038 addiction groups (Table 5).

1039

1040 *H7: Predictors of food addiction status*

1041 As a first step, the model tested in Study 1a was replicated in this non-student  
1042 sample. Scores on the Restraint Scale, EAT-26, ESES, Overweight Preoccupation  
1043 scale, and WSSQ Self-devaluation and Fear of enacted stigma subscales were  
1044 entered as predictors. Sex and ethnicity were entered as covariates. The model  
1045 was a good fit for the data but several of the hypothesized predictors did not  
1046 significantly contribute to the model. A series of reduced models were tested by  
1047 sequential removal of predictors with non-significant likelihood ratio tests. In  
1048 this way, overweight preoccupation, weight self-stigma, and gender were  
1049 removed from the model with no loss of model fit or predictive accuracy. The  
1050 final model was a good fit for the data ( $\chi^2_{(10)} = 229.2, p < .001$ ; Nagelkerke  $R^2 =$   
1051  $.40$ ), and correctly predicted 35.9% of YFAS+ cases, 55.6% of SPFA+ and 72.4%  
1052 of NFA, with overall accuracy of 60.5%. Predictive accuracy for YFAS+  
1053 classification was higher than in the student sample (20.0%).

1054

1055 The predictors that influenced the model were largely the same in this  
1056 community sample as in the student sample in Study 1a, with the exception of  
1057 the roles played by dietary restraint and weight self-stigma. First, dietary  
1058 restraint remained in the model and significantly predicted categorization as  
1059 SPFA+ versus NFA, with a 5-point increase in restraint scores being associated  
1060 with a 30% increased likelihood of being SPFA+. Restraint did not distinguish

1061 between YFAS+ and SPFA+. The significant roles of eating pathology (EAT-26)  
1062 and eating self-efficacy (ESES) were the same in both samples. However, while  
1063 weight self-stigma was a significant discriminator between YFAS+ and SPFA+ in  
1064 the student sample (OR 1.12,  $p = .01$ ), it did not contribute to the model in this  
1065 community sample. Fear of enacted weight stigma significantly discriminated  
1066 between SPFA+ and NFA in the present sample, but not between YFAS+ and  
1067 SPFA+, the opposite pattern to that seen in the student sample. There was also a  
1068 trend for non-White ethnicity to be associated with increased likelihood of  
1069 receiving a YFAS+ diagnosis, but this did not reach statistical significance (OR  
1070 0.55,  $p = .06$ ).

1071

1072 As a second step, scores on the BES, FCQ-T, CES-D, and BIS-M and BIS-A  
1073 subscales were added to the model. The BIS-NP subscale was not included as  
1074 scores did not differ between the three groups. Sequential removal of predictors  
1075 not contributing to the model led to the removal of dietary restraint, EAT-26,  
1076 WSSQ-Fear, and the BIS-15 attentional and motor subscales with no loss in  
1077 model fit or predictive accuracy. The final model is displayed in Table 6. The  
1078 model was a good fit for the data ( $\chi^2_{(10)} = 271.9, p < .001$ , Nagelkerke  $R^2 = .45$ )  
1079 and correctly predicted 41.0% of YFAS+ cases, 55.6% of SPFA+ cases, and 75.5%  
1080 of NFA cases, overall accuracy 62.7%.

1081

1082

1083 **Table 6. Multinomial logistic regression comparing predictors of SPFA with YFAS-**  
 1084 **diagnosed and non-food addicts**

	B	SE	Sig.	OR	95% CI for OR	
					Lower	Upper
<i>YFAS vs SPFA</i>						
Intercept	-6.95	0.91	< .001			
ESES	0.32	0.18	.07	1.37	0.97	1.94
FCQ-T	0.02	0.01	.01	1.02	1.01	1.03
BES	0.02	0.02	.32	1.02	0.98	1.07
CES-D	0.06	0.01	< .001	1.06	1.03	1.09
Ethnicity	-0.63	0.32	.05	0.53	0.29	0.99
<i>SPFA vs NFA</i>						
Intercept	-3.01	0.40	< .001			
ESES	0.38	0.12	.002	1.46	1.15	1.85
FCQ-T	0.01	0.01	.05	1.01	1.00	1.02
BES	0.04	0.02	.03	1.04	1.01	1.08
CES-D	-0.01	0.01	.56	0.99	0.97	1.01
Ethnicity	-0.88	0.22	< .001	0.41	0.27	0.64

1085 N=560

1086 Abbreviations: YFAS+, Positive “diagnosis” on Yale Food Addiction Scale; SPFA+, self-perceived  
 1087 food addiction without positive “diagnosis” on YFAS; NFA, no food addiction; ESES, Eating Self-  
 1088 Efficacy Scale (range 1–7); FCQ-T, Food Craving Questionnaire-Trait (range 39–234); BES, Binge  
 1089 Eating Scale (range 0–46); CES-D, Center for Epidemiological Studies-Depression scale (range 0–  
 1090 60)

1091 Ethnicity scored 1 = White, 0 = Other ethnicities.

1092

1093 In the final model, food cravings, depressive symptoms, and ethnicity were the  
 1094 only statistically significant discriminators between YFAS+ and SPFA+, with  
 1095 scores on the CES-D being the most important predictor. A 5-point increase was  
 1096 associated with a 30% increased likelihood of being YFAS+. Depressive  
 1097 symptoms did not distinguish between SPFA+ and NFA. Eating self-efficacy  
 1098 remained an important predictor. A 1-point increase in ESES score was  
 1099 associated with a 37% increased likelihood of being YFAS+ compared with  
 1100 SPFA+ and 46% increased likelihood of being SPFA+ versus NFA. Although food  
 1101 craving was a statistically significant discriminator in each comparison, the effect  
 1102 sizes were small. The FCQ-T is scored between 39 and 234, and each 5-point  
 1103 increase was associated with a 10% increased likelihood of being YFAS+

1104 compared with SPFA+, and a 5% increased likelihood of being SPFA+ compared  
1105 with NFA. Surprisingly, binge eating did not discriminate YFAS+ from SPFA+ but  
1106 did distinguish between SPFA+ and NFA. The BES has a possible range between 0  
1107 and 46. Each 5-point increase in BES score was associated by a 20% increased  
1108 likelihood of being SPFA+ compared with NFA. Participants of non-White  
1109 ethnicity were approximately twice as likely to be classified in each food  
1110 addiction category compared with White participants.

1111

1112 *H8: Clinical utility of food addiction classification*

1113 Finally, we tested whether food addiction classification explained additional  
1114 variance in depressive symptoms, binge eating severity, and general eating  
1115 pathology, beyond that accounted for by YFAS symptom count alone. To  
1116 determine the utility of a YFAS+ diagnosis, we conducted hierarchical linear  
1117 regressions with symptom count entered at step 1, and then diagnostic status  
1118 (yes/no) entered at step 2. As YFAS+ status is partly defined by clinically  
1119 significant distress or impairment, the analyses were repeated excluding YFAS+  
1120 participants to assess the utility of an SPFA+ classification compared with NFA.  
1121 The findings are summarised in Table 7.

1122

1123

1124

1125

1126

1127 **Table 7. Utility of food addiction status on psychopathology**

	Symptom count			YFAS+ diagnosis (yes/no)		
	<i>Adj R<sup>2</sup></i>	<i>F (1,612)</i>	<i>p</i>	$\Delta R^2$	$\Delta F (1,611)$	<i>p</i>
CES-D	.189	137.2	< .001	.009	13.4	< .001
EAT-26	.043	28.7	< .001	.008	5.0	.03
BES	.369	359.6	< .001	.024	24.5	< .001

  

	Symptom count			SPFA+ status (yes/no)		
	<i>Adj R<sup>2</sup></i>	<i>F (1,528)</i>	<i>p</i>	$\Delta R^2$	$\Delta F (1,527)$	<i>p</i>
CES-D	.089	52.7	< .001	0	0.09	.77
EAT-26	.025	14.4	< .001	0	0.04	.84
BES	.274	201.0	< .001	.025	18.8	< .001

1128 Abbreviations: YFAS+, Positive “diagnosis” on Yale Food Addiction Scale; SPFA+, self-perceived  
 1129 food addiction without positive “diagnosis” on YFAS; CES-D, Center for Epidemiological Studies-  
 1130 Depression scale; EAT-26, Eating Attitudes Test-26; BES, Binge Eating Scale  
 1131

1132

1133 In the full sample, positive diagnosis on the YFAS explained a small but  
 1134 statistically significant amount of variance in all three outcomes, beyond that  
 1135 accounted for by the YFAS symptom count. When the sample was restricted to  
 1136 non-YFAS+ participants, SPFA did not explain additional variance in depressive  
 1137 symptoms of eating pathology, but explained an additional 2.5% of the variance  
 1138 in binge eating severity.

1139

1140 **Interim Discussion**

1141 This study confirmed that SPFA is prevalent in the general community, and that  
 1142 individuals who self-classify as addicted to foods differ from those who do not on  
 1143 a range of parameters associated with eating and addiction problems. It also  
 1144 confirmed that self-perceived food addicts do not experience the severity of  
 1145 problems associated with a YFAS-based food addiction “diagnosis”. Thus H6 was  
 1146 supported.

1147 The logistic regression model derived in the student sample was largely  
1148 replicated in this community sample, with lower sense of self-control around  
1149 food increasing the likelihood of being YFAS+ compared with SPFA+, and SPFA+  
1150 compared with NFA. General eating pathology distinguished between YFAS+ and  
1151 SPFA+, but not between SPFA+ and NFA, as in the student sample. In both  
1152 samples, neither overweight preoccupation nor gender significantly predicted  
1153 classification between the groups. The main difference in the community sample  
1154 was that higher levels of dietary restraint, as measured by the Restraint Scale,  
1155 now increased the likelihood of being SPFA+ compared with NFA, but did not  
1156 distinguish the two “addiction” groups. Findings regarding weight self-stigma  
1157 and fear of stigma from others were inconsistent, and further research is needed  
1158 to elucidate these relationships, perhaps by experimentally manipulating weight  
1159 stigma. Non-White ethnicity was again associated with increased likelihood of  
1160 addictive-like eating behavior, despite either no difference or more favourable  
1161 scores on all study outcomes compared with White participants, and this finding  
1162 was driven predominantly by South Asian participants. This pattern was  
1163 therefore replicated in both a predominantly British student sample and an  
1164 international community sample with a large number of participants from the  
1165 Indian subcontinent.

1166

1167 Partial support for H7 was observed. Addition of measures of craving, binge  
1168 eating, impulsivity, and depressive symptoms to the regression models improved  
1169 classification accuracy for YFAS+ participants compared with the model that  
1170 used more traditional measures of disordered eating and body image only;  
1171 however, given the importance of these additional variables in addictive-like



1172 behaviors, the improvement was smaller than might have been expected.  
1173 Additionally, the variables predicted to significantly discriminate between YFAS+  
1174 and SPFA+ and between SPFA+ and NFA only partially supported our hypotheses.  
1175 As predicted, one of the main distinguishing feature between YFAS+ and SPFA+  
1176 was severity of depressive symptoms, with YFAS+ mean scores in the range  
1177 indicative of severe depression, while SPFA+ scores were much lower and just on  
1178 the cut-off point suggestive of clinically relevant symptoms. Although YFAS+  
1179 scores on the BES also indicated moderately severe binge behavior, while SPFA+  
1180 scores did not, BES was no longer a significant discriminant between these two  
1181 groups when depressive symptomatology was included in the model. General  
1182 eating pathology, as measured by the EAT-26, were also no longer a significant  
1183 predictor in this model. Contrary to our hypothesis, trait craving scores also  
1184 significantly discriminated between YFAS+ and SPFA+. This suggests that it is not  
1185 only distress about symptoms that distinguishes between these conditions, but  
1186 that severity of cravings in YFAS+ are noticeably more intense than in SPFA+. As  
1187 predicted, cravings and binge behavior distinguished between SPFA+ and NFA,  
1188 but attentional impulsivity did not. Eating self-efficacy remained a significant  
1189 discriminating variable between SPFA+ and NFA in the expanded model.  
1190 Finally, the data provide evidence for the clinical utility of the “diagnostic”  
1191 scoring method of the YFAS. A positive “diagnosis” on the YFAS explained  
1192 additional variance in binge eating, general eating pathology, and depressive  
1193 symptoms beyond that accounted for by the symptom count alone. As predicted,  
1194 believing oneself addicted to food, in the absence of a YFAS+ diagnosis, does not  
1195 explain additional variance in eating pathology or depression beyond YFAS  
1196 symptom count, although, contrary to predictions, it does make a small

1197 contribution to explaining the variance in binge eating scores, suggesting that  
1198 self-classification as a food addict does have some utility in identifying  
1199 problematic eating behavior beyond what can be inferred from the elevated  
1200 YFAS symptom counts in most SPFA+ participants.

1201

## 1202 **General Discussion**

1203 The present study is the first to explore the relative prevalence and  
1204 characteristics of “food addiction” using both a diagnostic measure of food  
1205 addiction and individuals’ own perceptions of their addiction status. Food  
1206 addiction status did not differ by age, sex, or BMI. Despite the absence of inter-  
1207 group differences in BMI, individuals receiving a YFAS+ diagnosis, those who  
1208 only self-classify as food addicts, and non-addicts differed significantly on almost  
1209 all measures of eating behavior, body image, and psychopathology. In all cases,  
1210 YFAS+ individuals experienced the most severe symptoms, followed by SPFA+,  
1211 and with the NFA group reporting only mild levels of problematic eating and  
1212 body image concerns. While SPFA+ participants did not report clinical levels of  
1213 eating pathology, they nevertheless exhibited significantly higher levels of  
1214 problematic eating behavior, more dietary restraint, and a reduced sense of  
1215 control around food than did “non-addicts”. These findings are strengthened by  
1216 being replicated in both a student sample, which was largely homogeneous  
1217 across demographic and anthropometric variables, and in a community sample  
1218 with a good gender balance, a broad age spectrum, and a wider range of BMI.  
1219 Although no data were available regarding participant income in the community  
1220 sample, using employment status as a proxy for socioeconomic status suggests

1221 that this was also quite varied within the community sample, and was also  
1222 unrelated to food addiction classification.  
1223  
1224 In contrast, ethnicity was a significant predictor of food addiction status in both  
1225 samples. In particular, individuals either resident in or whose families originated  
1226 from the Indian subcontinent reported significantly higher levels of addictive-  
1227 like eating symptomatology, and were also significantly more likely to self-  
1228 classify as food addicts. This effect was observed despite either no differences or  
1229 slightly preferable scores on all other measures of eating behavior and body  
1230 image in participants of South Asian ethnicity compared with White participants.  
1231 This finding is consistent with the wider literature on disordered eating in South  
1232 Asian ethnic samples (Dolan, Lacey, & Evans, 1990; Furnham & Adam-Saib, 2001;  
1233 Wardle, Bindra, Fairclough, & Westcombe, 1993), including sometimes atypical  
1234 presentations of eating disorders (Sharan & Sundar, 2015), but extends that  
1235 literature to include addictive-like eating behavior. From a clinical perspective,  
1236 the presence of addictive-like eating behavior in this population should be  
1237 investigated independent of evidence of traditional weight concerns or  
1238 pathological eating patterns.  
1239  
1240 This is also the first study to look at the stability of SPFA over time. Despite the  
1241 apparent subjective nature of SPFA, it appears to be a moderately stable  
1242 construct. Interestingly, SPFA appeared to be more stable over time than was a  
1243 YFAS-based “diagnosis”, with 59% of students who had received an SPFA+  
1244 classification at baseline, but only 42% of those receiving a YFAS+ classification,  
1245 maintaining the same status at follow-up. Only one previous study has examined

1246 the stability of a YFAS-based diagnosis over time. In an online survey of a  
1247 community sample, 54% of participants receiving a YFAS+ diagnosis at baseline  
1248 remained so after 18 months (Pursey, Collins, Stanwell, & Burrows, 2015, 2016).  
1249 However, the follow-up sample in that study suffered nearly 80% attrition  
1250 overall compared with baseline, and approximately 90% in individuals who were  
1251 YFAS+. The follow-up data indicate that those who were YFAS+ at follow-up had  
1252 a slightly higher mean symptom count and endorsement of individual symptoms  
1253 than the baseline sample, and suggest that the follow-up group were likely a  
1254 subsample for whom the questionnaire was particularly relevant. It seems  
1255 probable that the stability of YFAS+ in this subsample would be higher than if  
1256 more of the original sample had completed the second survey. In contrast, in the  
1257 present study, all baseline participants who were eligible to complete the follow-  
1258 up study did so.

1259

1260 The most reliably predictive variable among traditional measures of disordered  
1261 eating behavior and weight and shape concern that distinguished between the  
1262 three “food addiction” groups was perceived self-control around food, which is  
1263 also consistent with self-classifying individuals’ own qualitative descriptions of  
1264 their experiences (Hetherington & MacDiarmid, 1993; Ruddock et al., 2015).

1265 When factors associated with more severe eating pathology were included, self-  
1266 perceived control around food remained a significant predictor distinguishing  
1267 SPFA+ from NFA+, but food cravings and depressive symptoms were the main  
1268 discriminating variables between YFAS+ and SPFA+.

1269

1270 However, addition to the analyses of variables often linked with substance-use  
1271 and impulsivity disorders resulted in only a small improvement in classification  
1272 accuracy of YFAS+ status compared with that achieved when only traditional  
1273 measures of disordered eating and body image were included. The most recent  
1274 revision of the Diagnostic and Statistical Manual of Mental Disorders (5<sup>th</sup> edition;  
1275 DSM-5), released in 2013, combined the previously separate diagnostic criteria  
1276 for substance abuse and substance dependence into a new category of  
1277 Substance-Related and Addictive Disorders (SRADs; American Psychiatric  
1278 Association, 2013), which includes both substance use disorders and behavioral  
1279 addictions. This change resulted in the addition of several new symptom types,  
1280 most of which could be relevant to addictive-like eating behavior, and included  
1281 the incorporation of “cravings” into the diagnostic criteria (Meule & Gearhardt,  
1282 2014). The original version of the YFAS was created to reflect DSM-IV criteria for  
1283 substance use disorders, and thus did not include an assessment of craving  
1284 frequency or intensity; an updated version that reflects DSM-5 diagnostic criteria  
1285 has now been designed and validated (YFAS 2.0; Gearhardt, Corbin, & Brownell,  
1286 2016). It is possible that the addiction-related constructs used in the present  
1287 study would have better predictive accuracy for classifying YFAS+ diagnosis  
1288 based on this updated version of the scale.

1289

1290 Interestingly, binge eating behavior, a construct closely linked with food  
1291 addiction, did not distinguish between YFAS+ and SPFA+. Nevertheless, both self-  
1292 classification and YFAS-based diagnosis explained additional variance in binge  
1293 eating scores, beyond that accounted for by YFAS symptom counts, suggesting  
1294 that these classifications are capturing additional information. However, SPFA+

1295 status did not explain additional variance in a more general measure of eating  
1296 pathology or in depressive symptoms. In contrast, a YFAS+ diagnosis explained  
1297 additional variance in general eating pathology and depressive symptoms,  
1298 beyond that attributed to the symptom count alone. As a YFAS+ diagnosis  
1299 requires endorsement of clinically significant distress or impairment, in addition  
1300 to the presence of three or more symptoms, it is perhaps unsurprising that  
1301 depressive symptomatology should be such an important distinguishing factor  
1302 between YFAS+ and SPFA+.

1303

1304 It has been suggested that the categorical diagnostic criteria for eating disorders  
1305 are of limited clinical utility, and that eating disordered behaviours are more  
1306 usefully considered as lying on a continuum (Perosa & Perosa, 2004). Indeed, in  
1307 an 8-year longitudinal study of adolescent girls, Stice and colleagues (2009)  
1308 found that sub-threshold eating disorders were more prevalent than threshold  
1309 cases, that they were associated with significant functional impairment and  
1310 psychological distress. Davis (2013) has also advanced a spectrum hypothesis of  
1311 food misuse, beginning with intermittent passive overeating, and marked by  
1312 increasing severity, compulsion, and psychopathology, with the development of  
1313 “food addiction” at the end of the continuum. Further support for this continuum  
1314 hypothesis comes from two recent analyses of commonly used questionnaires  
1315 that assess different patterns of eating behavior (Price, Higgs, & Lee, 2015;  
1316 Vainik, Neseliler, Konstabel, Fellows, & Dagher, 2015). In one analysis, measures  
1317 of disinhibition, emotional eating, hedonic eating, and binge eating shared a  
1318 significant proportion of variance with a common latent factor, conceptualized as  
1319 “uncontrolled eating”; additionally, the individual questionnaires could be

1320 mapped onto a severity continuum of uncontrolled eating, from mild (eating  
1321 impulsivity) to severe (binge eating) (Vainik et al., 2015). In another study,  
1322 which included the YFAS, principal components analysis produced two factors:  
1323 the restraint subscales of two commonly used measures loaded onto one factor,  
1324 labelled “Dietary Restraint”, whereas all other subscales from measures  
1325 assessing hedonic, emotional, external, and disinhibited eating, and a sum score  
1326 from the YFAS, loaded onto a second factor, labelled “Food Reward  
1327 Responsiveness” (Price et al., 2015). Taken as a whole, the findings from the  
1328 present studies are consistent with the concept of both YFAS-diagnosed and self-  
1329 classified “food addiction” lying on a spectrum of “food misuse”, possibly  
1330 characterized by loss-of-control eating. Additionally, we propose that the most  
1331 extreme form of food misuse be classified as a “food use disorder” in preference  
1332 to the term “food addiction” (Nolan, 2017), in line with the revised nomenclature  
1333 utilized in the DSM-5.

1334

1335 Strengths of the present studies include replication of findings in two diverse  
1336 samples and follow-up data with no attrition. However, the follow-up period was  
1337 relatively short, and limited to a young, homogeneous, predominantly normal-  
1338 weight, student population. It may be useful to observe whether SPFA+ is  
1339 predictive of worsening eating pathology in a more diverse adult population.  
1340 Additionally, we examined the characteristics of both clinical and self-classified  
1341 “food addiction” in terms of both traditional measures of problem eating  
1342 behavior and body concerns, and also constructs more generally associated with  
1343 substance use disorders. A major limitation of the present studies is reliance on  
1344 self-report questionnaire measures. Nevertheless, a previous laboratory-based

1345 study found that SPFA+ individuals demonstrated a greater desire to eat and  
1346 consumed more high-fat snack foods after previously eating to satiety than did  
1347 SPFA- individuals, despite no differences between the groups in levels of hunger  
1348 of liking of the foods (Ruddock et al., 2016). Previous studies using neuroimaging  
1349 and genotypic analysis have identified objective correlates of YFAS-diagnosed  
1350 “food addiction” (Davis et al., 2013; Gearhardt, Yokum, et al., 2011). Future  
1351 studies could explore whether SPFA+ is also associated with altered  
1352 neurobiology or genotype compared with individuals who do not consider  
1353 themselves addicted to food. Another possible limitation is that self-classifying as  
1354 food addicted at the start of the study may have influenced how respondents  
1355 answered subsequent questions on the YFAS. However, it seems likely that the  
1356 reverse would also be true, and it was decided that a naïve response to a  
1357 question about “food addiction” would be a more reliable indication of the  
1358 prevalence of “food addiction” as conceived by the lay population. Finally, both of  
1359 these studies were conducted in non-clinical samples. Future studies should  
1360 explore the applicability of these findings to clinical samples of higher-weight  
1361 and/or eating disordered populations.

1362

### 1363 **Conclusion**

1364 Self-perceived “food addiction” is prevalent and is relatively stable over time.  
1365 Findings from the present studies in two diverse samples indicate that SPFA+  
1366 status is associated with elevated levels of disordered eating behavior,  
1367 overweight preoccupation, internalized weight stigma, impulsivity, and  
1368 depressive symptoms. Given that SPFA+ can be determined by a single question,



1369 it may provide a useful method for health care professionals to identify  
1370 individuals manifesting a potential “food use disorder”, who may need help with  
1371 food misuse, loss-of-control eating and body image issues.

1372

1373

1374 **References**

- 1375 Allen, K. L., Byrne, S. M., Oddy, W. H., & Crosby, R. D. (2013). DSM-IV-TR and  
1376 DSM-5 eating disorders in adolescents: Prevalence, stability, and  
1377 psychosocial correlates in a population-based sample of male and female  
1378 adolescents. *Journal of Abnormal Psychology, 122*(3), 720–732.  
1379 <http://doi.org/10.1037/a0034004>
- 1380 American Psychiatric Association. (2013). *Diagnostic and statistical manual of*  
1381 *mental disorders* (5th ed.). Washington, DC: APA.
- 1382 Anderson, D. A., De Young, K. P., & Walker, D. C. (2009). Assessment of eating  
1383 disordered thoughts, feelings, and behaviors. In D. B. Allison & M. L. Baskin  
1384 (Eds.), *Handbook of assessment methods for eating behaviors and weight-*  
1385 *related problems: Measures, theory, and research* (2nd ed., pp. 397–446). Los  
1386 Angeles, CA: Sage.
- 1387 Berman, E. (2006). The relationship between eating self-efficacy and eating  
1388 disorder symptoms in a non-clinical sample. *Eating Behaviors, 7*, 79–90.  
1389 <http://doi:10.1016/j.eatbeh.2005.07.004>
- 1390 Brown, T. A., Cash, T. F., & Mikulka, P. J. (1990). Attitudinal body image  
1391 assessment: Factor analysis of the Body-Self Relations Questionnaire.  
1392 *Journal of Personality Assessment, 55*(1–2), 135–144.  
1393 <http://doi.org/10.1080/00223891.1990.9674053>
- 1394 Brunault, P., Ducluzeau, P.-H., Bourbao-Tournois, C., Delbachian, I., Couet, C.,  
1395 Réveillère, C., & Ballon, N. (2016). Food addiction in bariatric surgery  
1396 candidates: Prevalence and risk factors. *Obesity Surgery, 26*(7), 1650–1653.  
1397 <http://doi.org/10.1007/s11695-016-2189-x>
- 1398 Burmeister, J. M., Hinman, N., Koball, A., Hoffmann, D. A., & Carels, R. A. (2013).  
1399 Food addiction in adults seeking weight loss treatment. Implications for  
1400 psychosocial health and weight loss. *Appetite, 60*, 103–110.  
1401 <http://doi.org/10.1016/j.appet.2012.09.013>
- 1402 Cash, T. F. (2000). MBSRQ Users' Manual. (3rd ed.) Available from  
1403 <http://www.body-images.com/assessments/mbsrq.html>
- 1404 Cepeda-Benito, A., Gleaves, D. H., Williams, T. L., & Erath, S. A. (2000). The  
1405 development and validation of the state and trait food-cravings  
1406 questionnaires. *Behavior Therapy, 31*(1), 151–173.  
1407 [http://doi.org/10.1016/S0005-7894\(00\)80009-X](http://doi.org/10.1016/S0005-7894(00)80009-X)
- 1408 Clabaugh, A., Karpinski, A., & Griffin, K. (2008). Body weight contingency of self-  
1409 worth. *Self and Identity, 7*(4), 337–359.  
1410 <http://doi.org/10.1080/15298860701665032>
- 1411 Corwin, R. L., & Grigson, P. S. (2009). Symposium overview – Food addiction: Fact  
1412 or fiction? *Journal of Nutrition, 139*(3), 617–619.  
1413 <http://doi.org/10.3945/jn.108.097691>

- 1414 Crocker, J. (2002). The costs of seeking self-esteem. *Journal of Social Issues*, 58(3),  
1415 597–615. <http://doi.org/10.1111/1540-4560.00279>
- 1416 Davis, C. (2013). Compulsive overeating as an addictive behavior: Overlap  
1417 between food addiction and binge eating disorder. *Current Obesity Reports*,  
1418 2(2), 171–178. <http://doi.org/10.1007/s13679-013-0049-8>
- 1419 Davis, C., Curtis, C., Levitan, R. D., Carter, J. C., Kaplan, A. S., & Kennedy, J. L. (2011).  
1420 Evidence that “food addiction” is a valid phenotype of obesity. *Appetite*,  
1421 57(3), 711–717. <http://doi.org/10.1016/j.appet.2011.08.017>
- 1422 Davis, C., Loxton, N. J., Levitan, R. D., Kaplan, A. S., Carter, J. C., & Kennedy, J. L.  
1423 (2013). “Food addiction” and its association with a dopaminergic multilocus  
1424 genetic profile. *Physiology & Behavior*, 118, 63–69.  
1425 <http://doi.org/10.1016/j.physbeh.2013.05.014>
- 1426 de Wit, H. (2009). Impulsivity as a determinant and consequence of drug use: A  
1427 review of underlying processes. *Addiction Biology*, 14(1), 22–31.  
1428 <http://doi.org/10.1111/j.1369-1600.2008.00129.x>
- 1429 Denny, K. N., Loth, K., Eisenberg, M. E., & Neumark-Sztainer, D. (2013). Intuitive  
1430 eating in young adults. Who is doing it, and how is it related to disordered  
1431 eating behaviors? *Appetite*, 60, 13–19.  
1432 <http://doi.org/10.1016/j.appet.2012.09.029>
- 1433 Dolan, B., Lacey, J. H., & Evans, C. (1990). Eating behaviour and attitudes to  
1434 weight and shape in British women from three ethnic groups. *British Journal*  
1435 *of Psychiatry*, 157, 523–8. <http://doi.org/10.1192/bjp.157.4.523>
- 1436 Durso, L. E., & Latner, J. D. (2008). Understanding self-directed stigma:  
1437 Development of the Weight Bias Internalization Scale. *Obesity*, 16 (Suppl 2):  
1438 S80–S86. <http://doi.org/10.1038/oby.2008.448>
- 1439 Dykman, B. M. (1998). Integrating cognitive and motivational factors in  
1440 depression: initial tests of a goal-orientation approach. *Journal of Personality*  
1441 *and Social Psychology*, 74(1), 139–158. <http://doi.org/10.1037/0022-3514.74.1.139>
- 1443 Eichen, D. M., Lent, M. R., Goldbacher, E., & Foster, G. D. (2013). Exploration of  
1444 “Food Addiction” in overweight and obese treatment-seeking adults.  
1445 *Appetite*, 67, 22–24. <http://doi.org/10.1016/j.appet.2013.03.008>
- 1446 Fairweather-Schmidt, A. K., & Wade, T. D. (2016). Characterizing and predicting  
1447 trajectories of disordered eating over adolescence. *Journal of Abnormal*  
1448 *Psychology*, 125(3), 369–380. <http://dx.doi.org/10.1037/abn0000146>
- 1449 Farhangi, M. A., Emam-Alizadeh, M., Hamed, F., & Jahangiry, L. (2016). Weight  
1450 self-stigma and its association with quality of life and psychological distress  
1451 among overweight and obese women. *Eating and Weight Disorders*.  
1452 <http://doi.org/10.1007/s40519-016-0288-2>

- 1453 Field, A. (2013). *Discovering statistics using IBM SPSS Statistics* (4th ed.). London:  
1454 Sage Publications.
- 1455 Furnham, A., & Adam-Saib, S. (2001). Abnormal eating attitudes and behaviours  
1456 and perceived parental control: a study of white British and British-Asian  
1457 school girls. *Social Psychiatry and Psychiatric Epidemiology*, *36*(9), 462–470.  
1458 <http://doi.org/10.1007/s001270170025>
- 1459 Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkle, P. E. (1982). The Eating  
1460 Attitudes Test: Psychometric features and clinical correlates. *Psychological  
1461 Medicine*, *12*, 871–878. <http://doi.org/10.1017/S0033291700049163>
- 1462 Gearhardt, A. N., Boswell, R. G., & White, M. A. (2014). The association of “food  
1463 addiction” with disordered eating and body mass index. *Eating Behaviors*,  
1464 *15*(3), 427–433. <http://doi.org/10.1016/j.eatbeh.2014.05.001>
- 1465 Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2009). Preliminary validation of  
1466 the Yale Food Addiction Scale. *Appetite*, *52*(2), 430–436.  
1467 <http://doi.org/10.1016/j.appet.2008.12.003>
- 1468 Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2016). Development of the Yale  
1469 Food Addiction Scale Version 2.0. *Psychology of Addictive Behaviors*, *30*(1),  
1470 113–121. <http://doi.org/10.1037/adb0000136>
- 1471 Gearhardt, A. N., Grilo, C. M., DiLeone, R. J., Brownell, K. D., & Potenza, M. N.  
1472 (2011). Can food be addictive? Public health and policy implications.  
1473 *Addiction*, *106*(7), 1208–1212. [http://doi.org/10.1111/j.1360-  
1474 0443.2010.03301.x](http://doi.org/10.1111/j.1360-0443.2010.03301.x)
- 1475 Gearhardt, A. N., White, M. A., Masheb, R. M., & Grilo, C. M. (2013). An  
1476 examination of food addiction in a racially diverse sample of obese patients  
1477 with binge eating disorder in primary care settings. *Comprehensive  
1478 Psychiatry*, *54*(5), 500–505.  
1479 <http://doi.org/10.1016/j.comppsy.2012.12.009>
- 1480 Gearhardt, A. N., White, M. A., Masheb, R. M., Morgan, P. T., Crosby, R. D., & Grilo, C.  
1481 M. (2012). An examination of the food addiction construct in obese patients  
1482 with binge eating disorder. *International Journal of Eating Disorders*, *45*(5),  
1483 657–663. <http://doi.org/10.1002/eat.20957>
- 1484 Gearhardt, A. N., White, M. A., & Potenza, M. N. (2011). Binge eating disorder and  
1485 food addiction. *Current Drug Abuse Reviews*, *4*(3), 201–207.  
1486 <http://doi.org/10.2174/1874473711104030201>
- 1487 Gearhardt, A. N., Yokum, S., Orr, P. T., Stice, E., Corbin, W. R., & Brownell, K. D.  
1488 (2011). Neural correlates of food addiction. *Archives of General Psychiatry*,  
1489 *68*(8), 808–816. <http://doi.org/10.1001/archgenpsychiatry.2011.32>
- 1490 Glynn, S. M., & Ruderman, A. J. (1986). The development and validation of an  
1491 Eating Self-Efficacy Scale. *Cognitive Therapy and Research*, *10*(4), 403–420.  
1492 <http://doi.org/10.1007/BF01173294>

- 1493 Goldschmidt, A. B., Wall, M. M., Zhang, J., Loth, K. A., & Neumark-Sztainer, D.  
 1494 (2016). Overeating and binge eating in emerging adulthood: 10-year  
 1495 stability and risk factors. *Developmental Psychology*, *52*(3), 475–483.  
 1496 <http://doi.org/10.1037/dev0000086>
- 1497 Gormally, J., Black, S., Daston, S., & Rardin, D. (1982). The assessment of binge  
 1498 eating severity among obese persons. *Addictive Behaviors*, *7*, 47–55.  
 1499 [http://doi.org/10.1016/0306-4603\(82\)90024-7](http://doi.org/10.1016/0306-4603(82)90024-7)
- 1500 Hardman, C. A., Rogers, P. J., Dallas, R., Scott, J., Ruddock, H. K., & Robinson, E.  
 1501 (2015). “Food addiction is real”. The effects of exposure to this message on  
 1502 self-diagnosed food addiction and eating behaviour. *Appetite*, *91*, 179–184.  
 1503 <http://doi.org/10.1016/j.appet.2015.04.052>
- 1504 Hayaki, J., Friedman, M. A., Whisman, M. A., Delinsky, S. S., & Brownell, K. D.  
 1505 (2003). Sociotropy and bulimic symptoms in clinical and non-clinical  
 1506 samples. *International Journal of Eating Disorders*, *34*, 172–176.  
 1507 <http://doi.org/10.1002/eat.10172>
- 1508 Herman, C. P., & Polivy, J. (1980). Restrained eating. In A. Stunkard (Ed.), *Obesity*  
 1509 (pp. 208–225). Philadelphia: Saunders.
- 1510 Hetherington, M. M., & MacDiarmid, J. I. (1993). “Chocolate addiction”: A  
 1511 preliminary study of its description and its relationship to problem eating.  
 1512 *Appetite*, *21*(3), 233–246. <http://doi.org/10.1006/appe.1993.1042>
- 1513 Imperatori, C., Innamorati, M., Contardi, A., Continisio, M., Tamburello, S., Lamis,  
 1514 D. A., ... Fabbriatore, M. (2014). The association among food addiction,  
 1515 binge eating severity and psychopathology in obese and overweight patients  
 1516 attending low-energy-diet therapy. *Comprehensive Psychiatry*, *55*, 1358–  
 1517 1362. <http://doi.org/10.1016/j.comppsy.2014.04.023>
- 1518 Ivezaj, V., White, M. A., & Grilo, C. M. (2016). Examining binge-eating disorder and  
 1519 food addiction in adults with overweight and obesity. *Obesity*, *24*(10), 2064–  
 1520 2069. <http://doi.org/10.1002/oby.21607>
- 1521 Koball, A. M., Clark, M. M., Collazo-Clavell, M., Kellogg, T., Ames, G., Ebbert, J., &  
 1522 Grothe, K. B. (2016). The relationship among food addiction, negative mood,  
 1523 and eating-disordered behaviors in patients seeking to have bariatric  
 1524 surgery. *Surgery for Obesity and Related Diseases*, *12*(1), 165–170.  
 1525 <http://doi.org/10.1016/j.soard.2015.04.009>
- 1526 Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for  
 1527 categorical data. *Biometrics*, *33*(1), 159–174.  
 1528 <http://doi.org/10.2307/2529310>
- 1529 Lillis, J., Luoma, J. B., Levin, M. E., & Hayes, S. C. (2010). Measuring weight self-  
 1530 stigma: the Weight Self-Stigma Questionnaire. *Obesity*, *18*(5), 971–976.  
 1531 <http://doi.org/10.1038/oby.2009.353>
- 1532 Long, C. G., Blundell, J. E., Finlayson, G. (2015). A systematic review of the

- 1533 application and correlates of YFAS-diagnosed 'food addiction' in humans:  
 1534 Are eating-related 'addictions' a cause for concern or empty concepts?  
 1535 *Obesity Facts*, 8, 386–401. <http://doi.org/10.1159/000442403>
- 1536 Lowe, M. R. (1993). The effects of dieting on eating behavior: A three-factor  
 1537 model. *Psychological Bulletin*, 114(1), 100–121.  
 1538 <http://doi.org/10.1037/0033-2909.114.1.100>
- 1539 Madden, C. EL, Leong, S. L., Gray, A., Horwath, C. C., Jeffery, R. W., Epstein, L. H., ...  
 1540 Dobson, A. (2012). Eating in response to hunger and satiety signals is  
 1541 related to BMI in a nationwide sample of 1601 mid-age New Zealand women.  
 1542 *Public Health Nutrition*, 15(12), 2272–2279.  
 1543 <http://doi.org/10.1017/S1368980012000882>
- 1544 Malika, N. M., Hayman, L. W., Miller, A. L., Lee, H. J., & Lumeng, J. C. (2015). Low-  
 1545 income women's conceptualizations of food craving and food addiction.  
 1546 *Eating Behaviors*, 18, 25–29. <http://doi.org/10.1016/j.eatbeh.2015.03.005>
- 1547 Marcus, M. D., Wing, R. R., & Lamparski, D. M. (1985). Binge eating and dietary  
 1548 restraint in obese patients. *Addictive Behaviors*, 10(2), 163–168.  
 1549 [http://doi.org/10.1016/0306-4603\(85\)90022-X](http://doi.org/10.1016/0306-4603(85)90022-X)
- 1550 Massey, A., & Hill, A. J. (2012). Dieting and food craving. A descriptive, quasi-  
 1551 prospective study. *Appetite*, 58(3), 781–785.  
 1552 <http://doi.org/10.1016/j.appet.2012.01.020>
- 1553 Merlo, L. J., Klingman, C., Malasanos, T. H., & Silverstein, J. H. (2009). Exploration  
 1554 of food addiction in pediatric patients: A preliminary investigation. *Journal*  
 1555 *of Addiction Medicine*, 3(1), 26–32.  
 1556 <http://doi.org/10.1097/ADM.0b013e31819638b0>
- 1557 Meule, A. (2011). How prevalent is “food addiction”? *Frontiers in Psychiatry*, 2, 61.  
 1558 <http://doi.org/10.3389/fpsy.2011.00061>
- 1559 Meule, A. (2013). Impulsivity and overeating: a closer look at the subscales of the  
 1560 Barratt Impulsiveness Scale. *Frontiers in Psychology*, 4, 177.  
 1561 <http://doi.org/10.3389/fpsyg.2013.00177>
- 1562 Meule, A., & Gearhardt, A. N. (2014). Food addiction in the light of DSM-5.  
 1563 *Nutrients*, 6(9), 3653–3671. <http://doi.org/10.3390/nu6093653>
- 1564 Meule, A., Heckel, D., Jurowich, C., Vögele, C., & Kübler, A. (2014). Correlates of  
 1565 food addiction in obese individuals seeking bariatric surgery. *Clinical Obesity*,  
 1566 4(4), 228–236. <http://doi.org/10.1111/cob.12065>
- 1567 Meule, A., Hermann, T., & Kübler, A. (2015). Food addiction in overweight and  
 1568 obese adolescents seeking weight-loss treatment. *European Eating Disorders*  
 1569 *Review*, 23(3), 193–198. <http://doi.org/10.1002/erv.2355>
- 1570 Meule, A., & Kübler, A. (2012). Food cravings in food addiction: The distinct role  
 1571 of positive reinforcement. *Eating Behaviors*, 13(3), 252–255.

- 1572 <http://doi.org/10.1016/j.eatbeh.2012.02.001>
- 1573 Meule, A., Lutz, A., Vögele, C., & Kübler, A. (2012). Women with elevated food  
1574 addiction symptoms show accelerated reactions, but no impaired inhibitory  
1575 control, in response to pictures of high-calorie food-cues. *Eating Behaviors*,  
1576 13(4), 423–428. <http://doi.org/10.1016/j.eatbeh.2012.08.001>
- 1577 Meule, A., Vögele, C., & Kübler, A. (2011). Psychometric evaluation of the German  
1578 Barratt Impulsiveness Scale – Short Version (BIS-15). *Diagnostica*, 57(3),  
1579 126–133. <http://doi.org/10.1026/0012-1924/a000042>
- 1580 Morris, L. S., & Voon, V. (2016). Dimensionality of cognitions in behavioral  
1581 addiction. *Current Behavioral Neuroscience Reports*, 3, 49–57.  
1582 <http://doi.org/10.1007/s40473-016-0068-3>
- 1583 Murphy, C. M., Stojek, M. K., & MacKillop, J. (2014). Interrelationships among  
1584 impulsive personality traits, food addiction, and body mass index. *Appetite*,  
1585 73, 45–50. <http://doi.org/10.1016/j.appet.2013.10.008>
- 1586 Nolan, L. J. (2017). Is it time to consider the "food use disorder?" *Appetite*.  
1587 <http://doi.org/10.1016/j.appet.2017.01.029>
- 1588 Nolan, L. J., & Geliebter, A. (2016). "Food addiction" is associated with night  
1589 eating severity. *Appetite*, 98, 89–94.  
1590 <http://doi.org/10.1016/j.appet.2015.12.025>
- 1591 Peer, E., Vosgerau, J., & Acquisti, A. (2014). Reputation as a sufficient condition  
1592 for data quality on Amazon Mechanical Turk. *Behavior Research Methods*,  
1593 46(4), 1023–1031. <http://doi.org/10.3758/s13428-013-0434-y>
- 1594 Perosa, L. M., & Perosa, S. L. (2004). The continuum versus categorial debate on  
1595 eating disorders: Implications for counselors. *Journal of Counseling &*  
1596 *Development*, 82, 203–206. [http://doi.org/10.1002/j.1556-](http://doi.org/10.1002/j.1556-6678.2004.tb00303.x)  
1597 [6678.2004.tb00303.x](http://doi.org/10.1002/j.1556-6678.2004.tb00303.x)
- 1598 Pretlow, R. A. (2011). Addiction to highly pleasurable food as a cause of the  
1599 childhood obesity epidemic: A qualitative internet study. *Eating Disorders*,  
1600 19(4), 295–307. <http://doi.org/10.1080/10640266.2011.584803>
- 1601 Price, M., Higgs, S., & Lee, M. (2015). Self-reported eating traits: Underlying  
1602 components of food responsivity and dietary restriction are positively  
1603 related to BMI. *Appetite*, 95, 203–210.  
1604 <http://doi.org/10.1016/j.appet.2015.07.006>
- 1605 Prince, K. R., Litovsky, A. R., & Friedman-Wheeler, D. G. (2012). Internet-  
1606 mediated research: Beware of bots. *Behavior Therapist*, 35(5), 85–88.
- 1607 Puhl, R. M., Moss-Racusin, C. A., & Schwartz, M. B. (2007). Internalization of  
1608 weight bias: Implications for binge eating and emotional well-being. *Obesity*,  
1609 15, 19–23. <http://doi.org/10.1038/oby.2007.521>

- 1610 Pursey, K. M., Collins, C. E., Stanwell, P., & Burrows, T. L. (2015). Foods and  
1611 dietary profiles associated with “food addiction” in young adults. *Addictive*  
1612 *Behaviors Reports*, 2, 41–48. <http://doi.org/10.1016/j.abrep.2015.05.007>
- 1613 Pursey, K. M., Collins, C. E., Stanwell, P., & Burrows, T. L. (2016). The stability of  
1614 “food addiction” as assessed by the Yale Food Addiction Scale in a non-  
1615 clinical population over 18-months. *Appetite*, 96, 533–538.  
1616 <http://doi.org/10.1016/j.appet.2015.10.015>
- 1617 Pursey, K. M., Stanwell, P., Gearhardt, A. N., Collins, C. E., & Burrows, T. L. (2014).  
1618 The prevalence of food addiction as assessed by the Yale Food Addiction  
1619 Scale: A systematic review. *Nutrients*, 6(10), 4552–4590.  
1620 <http://doi.org/10.3390/nu6104552>
- 1621 Quinn, D. M., & Crocker, J. (1999). When ideology hurts: Effects of belief in the  
1622 protestant ethic and feeling overweight on the psychological well-being of  
1623 women. *Journal of Personality and Social Psychology*, 77(2), 402–414.  
1624 <http://doi.org/10.1037/0022-3514.77.2.402>
- 1625 Quinn, D. M., Williams, M. K., & Weisz, B. M. (2015). From discrimination to  
1626 internalized mental illness stigma: The mediating role of anticipated  
1627 discrimination and anticipated stigma. *Psychiatric Rehabilitation Journal*,  
1628 38(2), 103–108. <http://doi.org/10.1037/prj0000136>
- 1629 Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research  
1630 in the general population. *Applied Psychological Measurement*, 1(3), 385–  
1631 401. <http://doi.org/10.1177/014662167700100306>
- 1632 Rogers, P. J., & Smit, H. J. (2000). Food craving and food “addiction”: a critical  
1633 review of the evidence from a biopsychosocial perspective. *Pharmacology,*  
1634 *Biochemistry, and Behavior*, 66(1), 3–14. [http://doi.org/10.1016/S0091-3057\(00\)00197-0](http://doi.org/10.1016/S0091-3057(00)00197-0)
- 1636 Ruddock, H. K., Christiansen, P., Jones, A., Robinson, E., Field, M., & Hardman, C. A.  
1637 (2016). Believing in food addiction: Helpful or counterproductive for eating  
1638 behavior? *Obesity*, 24(6), 1238–1243. <http://doi.org/10.1002/oby.21499>
- 1639 Ruddock, H. K., Dickson, J. M., Field, M., & Hardman, C. A. (2015). Eating to live or  
1640 living to eat? Exploring the causal attributions of self-perceived food  
1641 addiction. *Appetite*, 95, 262–268.  
1642 <http://doi.org/10.1016/j.appet.2015.07.018>
- 1643 Ruddock, H. K., Field, M., & Hardman, C. A. Exploring food reward and calorie  
1644 intake in self-perceived food addicts. *Appetite*, (in press). <http://doi.org/10.1016/j.appet.2016.12.003>
- 1646 Schvey, N. A., Roberto, C. A., & White, M. A. (2013). Clinical correlates of the  
1647 Weight Bias Internalization Scale in overweight adults with binge and purge  
1648 behaviours. *Advances in Eating Disorders*, 1(3), 213–223.  
1649 <http://doi.org/10.1080/21662630.2013.794523>



- 1650 Sharan, P., & Sundar, A. S. (2015). Eating disorders in women. *Indian Journal of*  
 1651 *Psychiatry*, 57(Suppl 2), S286–S295. <http://doi.org/10.4103/0019->  
 1652 5545.161493
- 1653 Spinella, M. (2007). Normative data and a short form of the Barratt  
 1654 Impulsiveness Scale. *International Journal of Neuroscience*, 117(3), 359–368.  
 1655 <http://doi.org/10.1080/00207450600588881>
- 1656 Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-  
 1657 analytic review. *Psychological Bulletin*, 128(5), 825–848.  
 1658 <http://doi.org/10.1037//0033-2909.128.5.825>
- 1659 Stice, E., Marti, C. N., & Rohde, P. (2013). Prevalence, incidence, impairment, and  
 1660 course of the proposed DSM-5 eating disorder diagnoses in an 8-year  
 1661 prospective community study of young women. *Journal of Abnormal*  
 1662 *Psychology*, 122(2), 445–457. <http://doi.org/10.1037/a0030679>
- 1663 Stice, E., Marti, C. N., Shaw, H., & Jaconis, M. (2009). An 8-year longitudinal study  
 1664 of the natural history of threshold, subthreshold, and partial eating  
 1665 disorders from a community sample of adolescents. *Journal of Abnormal*  
 1666 *Psychology*, 118(3), 587–597. <http://doi.org/10.1037/a0016481>
- 1667 Teal Pedlow, C., & Niemeier, H. M. (2013). Sociotropic cognition and eating  
 1668 disordered attitudes and behavior in young adults. *Eating Behaviors*, 14, 95–  
 1669 101. <http://doi.org/10.1016/j.eatbeh.2012.10.001>
- 1670 Tylka, T. L. (2006). Development and psychometric evaluation of a measure of  
 1671 intuitive eating. *Journal of Counseling Psychology*, 53(2), 226–240.  
 1672 <http://doi.org/10.1037/0022-0167.53.2.226>
- 1673 Tylka, T. L., Calogero, R. M., & Daniélsdóttir, S. (2015). Is intuitive eating the same  
 1674 as flexible dietary control? Their links to each other and well-being could  
 1675 provide an answer. *Appetite*, 95, 166–175.  
 1676 <http://doi.org/10.1016/j.appet.2015.07.004>
- 1677 Vainik, U., Neseliler, S., Konstabel, K., Fellows, L. K., & Dagher, A. (2015). Eating  
 1678 traits questionnaires as a continuum of a single concept. Uncontrolled eating.  
 1679 *Appetite*, 90, 229–239. <http://doi.org/10.1016/j.appet.2015.03.004>
- 1680 Vilagut, G., Forero, C. G., Barbaglia, G., & Alonso, J. (2016). Screening for  
 1681 depression in the general population with the Center for Epidemiologic  
 1682 Studies Depression (CES-D): A systematic review with meta-analysis. *PLoS*  
 1683 *ONE*, 11(5): e0155431. <http://doi.org/10.1371/journal.pone.0155431>
- 1684 Wardle, J., Bindra, R., Fairclough, B., & Westcombe, A. (1993). Culture and body  
 1685 image: Body perception and weight concern in young Asian and Caucasian  
 1686 British women. *Journal of Community & Applied Social Psychology*, 3(3), 173–  
 1687 181. <http://doi.org/10.1002/casp.2450030302>
- 1688 Ziauddeen, H., Farooqi, I. S., & Fletcher, P. C. (2012). Obesity and the brain: How  
 1689 convincing is the addiction model? *Nature Reviews. Neuroscience*, 13(4),

1690 279–286. <http://doi.org/10.1038/nrn3212>

1691 Ziauddeen, H., & Fletcher, P. C. (2013). Is food addiction a valid and useful  
1692 concept? *Obesity Reviews*, *14*, 19–28. [http://doi.org/10.1111/j.1467-](http://doi.org/10.1111/j.1467-789X.2012.01046.x)  
1693 [789X.2012.01046.x](http://doi.org/10.1111/j.1467-789X.2012.01046.x)