

# 1 Obesity stigma: Is the 'food addiction' label feeding 2 the problem?

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10 **Abstract:** Obesity is often attributed to an addiction to high-calorie foods. However, the effect of  
11 "food addiction" explanations on weight-related stigma remains unclear. In two online studies,  
12 participants ( $N=439$ ,  $N=523$ , respectively, recruited from separate samples) read a vignette about a  
13 target female who was described as 'very overweight'. Participants were randomly allocated to one  
14 of three conditions which differed in the information provided in the vignette: 1) in the "medical  
15 condition", the target had been diagnosed with food addiction by her doctor; 2) in the "self-  
16 diagnosed condition", the target believed herself to be a food addict; 3) in the control condition,  
17 there was no reference to food addiction. Participants then completed questionnaires measuring  
18 target-specific stigma (i.e. stigma towards the female described in the vignette), general stigma  
19 towards obesity (both studies), addiction-like eating behaviour and causal beliefs about addiction  
20 (Study 2 only). In Study 1, participants in the medical and self-diagnosed food addiction conditions  
21 demonstrated greater target-specific stigma relative to the control condition. In Study 2, participants  
22 in the medical condition had greater target-specific stigma than the control condition but only those  
23 with low levels of addiction-like eating behaviour. There was no effect of condition on general  
24 weight-based stigma in either study. These findings suggest that the food addiction label may  
25 increase stigmatising attitudes towards a person with obesity, particularly within individuals with  
26 low levels of addiction-like eating behaviour.

27 **Keywords:** food addiction; obesity; stigma; eating behaviour; attitudes

## 28 1. Introduction

29 According to recent statistics, more than one third of the world's population have overweight or  
30 obesity. In the UK these rates are even higher, with 64% of adults classed as having overweight or  
31 obesity [1]. Despite its prevalence, people with obesity frequently experience devaluation and  
32 discrimination (known as weight-related stigma) within educational, workplace, and healthcare  
33 settings [2]. Evidence also suggests that people may be more likely to face discrimination because of  
34 their weight than because of their ethnicity, gender, or sexual orientation [3]. Weight-related stigma  
35 has negative consequences for individuals' psychological and physical well-being [2,4,5], and may  
36 impede weight-loss by prompting maladaptive eating patterns and exercise avoidance [2].

37 Negative attitudes towards people with obesity can be exacerbated by beliefs about the *causes* of  
38 weight-gain. This is central to attribution theory which suggests that people make judgements about  
39 the cause of a condition and, in turn, these judgements determine their attitudes towards an  
40 individual [6,7]. For example, attributing obesity to factors that are within personal control (e.g. food  
41 choices) is thought to perpetuate obesity stigma [8]. Conversely, stigmatising attitudes may be  
42 attenuated by the belief that weight-gain is caused by uncontrollable factors (e.g. genetics). In support  
43 of this, weight-related stigma was found to be most prevalent amongst individuals who believed that  
44 obesity was within personal control and caused by a lack of will-power, inactivity, and overeating  
45 [9,10]. Similar findings have been obtained from studies in which participants' causal beliefs about  
46 obesity were experimentally manipulated. Specifically, participants who read an article that stated  
47 that obesity is caused by overeating and a lack of exercise demonstrated more stigmatising attitudes

48 than participants in a 'no-prime' control condition, or those who read a neutral article about research  
49 into memory skills [11,12]. Conversely, participants who were led to believe that obesity is caused by  
50 physiological factors (i.e. factors that are beyond personal control) demonstrated less weight-related  
51 stigma than those in a control condition [8,13].

52 One increasingly prevalent aetiological theory is that obesity is caused by an addiction to high-  
53 calorie foods [14]. Proponents of this idea suggest that food and drugs have similar effects on the  
54 brain and argue that the clinical symptoms of substance abuse coincide with the behaviours and  
55 experiences of people who engage in compulsive overeating [15,16]. While this idea is widely debated  
56 throughout the scientific community (e.g. [17–19]), the concept of food addiction has been readily  
57 accepted by the general public [20]. Indeed, research suggests that the majority of people believe that  
58 obesity can be caused by food addiction [21], and up to half of people believe that they are themselves  
59 addicted to food [22–24]. In light of its popularity, it is important to establish how food addiction  
60 models of obesity might affect weight-related stigma.

61 A small number of studies have examined the effect of the food addiction label on obesity stigma,  
62 however results to date have been inconsistent [25][26]. In one study [27], participants' attitudes  
63 towards a person with 'food addiction' were compared with attitudes towards persons with obesity,  
64 drug addiction, and disability. The study reported similarly high levels of stigma towards the "obese"  
65 and "food addict" labels and, when combined, these labels together elicited greater stigma than either  
66 label alone. These findings align with those obtained by Lee et al. [21] who found that, while the  
67 majority (72%) of survey respondents believed that obesity can be caused by a 'food addiction', more  
68 than half held the view that people with obesity are responsible for their condition (which would be  
69 expected to perpetuate obesity stigma). However, in contrast, Latner et al. [28] found that providing  
70 a food addiction explanation for obesity appeared to *reduce* weight-stigma. In this study, participants  
71 read one of two descriptions of a woman with obesity. In one condition (i.e. the 'food addiction'  
72 condition), the woman was described as fitting "the typical profile of someone who is addicted to  
73 food". In another condition (i.e. the 'non-addiction' condition), the woman was described as  
74 "someone who makes unhealthy food choices". The study found that participants in the food  
75 addiction condition displayed lower levels of stigma towards the woman, and towards people with  
76 obesity more generally, compared with those in the non-addiction condition.

77 Inconsistent findings in previous studies may be explained by differences in participants' causal  
78 beliefs about food addiction. Specifically, the effect of the "food addiction" label on obesity stigma  
79 may depend on the extent to which food addiction is perceived to be a legitimate medical condition.  
80 One qualitative study found that people with overweight and obesity were reluctant to label  
81 themselves as a food addict due to concerns that this would be viewed as an 'excuse' for overeating  
82 [29]. Indeed, providing excuses for weight gain may exacerbate negative attitudes towards those with  
83 obesity [30]. In contrast, attributing obesity to a medically diagnosed 'food addiction' may legitimise  
84 the condition and help to reduce weight-related stigma by removing personal responsibility from the  
85 individual [31,32].

86 To test these ideas, across two studies, we examined the effect of medically-diagnosed and self-  
87 diagnosed food addiction on weight-related stigma. Using a similar technique to Latner et al. [28],  
88 participants read one of three vignettes which described a woman with obesity. In the 'medical'  
89 condition, the vignette stated that the woman had been diagnosed with food addiction by her general  
90 practitioner (GP). In the 'self-diagnosed' condition, the vignette stated that the woman believed  
91 herself to be a food addict. There was no reference to food addiction in the control condition.  
92 Subsequent attitudes towards the woman (i.e. target-specific stigma) and obesity in general (i.e.  
93 general stigma) were then assessed. We hypothesised that weight-related stigma would be  
94 significantly *lower* in the medical condition, and *higher* in the self-diagnosed condition, relative to in  
95 the control condition. Based on previous findings [28], we predicted that the food addiction label  
96 would influence both target-specific and general weight-related stigma.

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# Study 1

## 2. Method

### 2.1. Participants

Female participants were invited to take part in a study into 'perceptions of employability among students'. Participants were recruited via social media advertisements and on internal webpages at the University of Liverpool, UK. Participants who were enrolled on the Psychology degree programme at the University received course credits in exchange for taking part. A total of 440 participants completed the survey (533 participants started the study but 93 did not complete all of the measures and so were excluded from analyses). To be eligible to take part, participants were required to be aged over 18 years old. The majority of participants were students (81%) and 90% of the sample were Caucasian. The mean age of participants was 21.2 y (SD=7.1) and the mean self-reported body mass index (BMI) was 22.2 kg/m<sup>2</sup> (SD=3.4). Participants with a self-reported BMI over 30 kg/m<sup>2</sup> (i.e. classified as having obesity) comprised 2.7% of the sample, 12.5% had a self-reported BMI between 25 – 29.9 kg/m<sup>2</sup> (i.e. 'overweight'), 76.8% had a self-reported BMI between 18.5 – 24.9 kg/m<sup>2</sup> (i.e. healthy weight), and 8.0% had a BMI below 18.5 kg/m<sup>2</sup> (i.e. 'underweight'). Participants provided informed consent prior to completing the study. Ethical approval was granted by the University of Liverpool's ethics committee (approval code: IPHS-1516-SMc-259-Generic RETH000619).

### 2.2. Procedure

The study was delivered via the online survey platform, Qualtrics (Qualtrics, Provo, UT, USA). Participants were asked to read an information sheet and, if they wished to continue with the study, were required to tick a consent box. On the first screen of the survey, a picture of a woman with obesity ("Paulina") was displayed, along with a short vignette which described her hobbies, family, and education (see online supplementary material). Paulina was also described as being 'very overweight'. Participants were randomly allocated to view one of three versions of the vignette: 1) In the 'medical' condition, the vignette stated that Paulina's "GP had recently diagnosed her as having a food addiction"; 2) in the 'self-diagnosed' condition, the vignette stated that Paulina "believes herself to be addicted to food"; 3) in the 'control' condition, there was no mention of food addiction. After reading the vignette, participants completed the measures in the following order: Modified Fat-Phobia Scale (M-FPS) (to assess target-specific stigma towards Paulina), employability questionnaire (included as part of the cover story), Anti-fat Attitudes (AFA; to assess general stigma towards people with obesity), and the Dutch Eating Behavior Questionnaire (DEBQ; to assess external, restrained, and emotional eating behaviour). Participants were then asked to indicate their gender, age, ethnicity, occupation, and height and weight (which were used to calculate BMI). They then completed the item about self-perceived food addiction. After completing the study, participants read a debrief sheet which explained the true aim of the study.

### 2.3. Measures

#### 2.3.1. Target Specific Stigma: Modified Fat-Phobia Scale (M-FPS)

The 14-item Fat Phobia Scale [33] was modified such that participants were asked to indicate their beliefs about a fictional individual named Paulina (Paulina was the name of the target female featured in the vignette. See Procedure section above). This scale consists of 14 pairs of antonyms which could be used to describe individuals with obesity (e.g. 'lazy' vs. 'industrious'). Higher scores on the M-FPS (i.e. indicative of more negative attitudes) have been positively associated with beliefs that obesity is within personal control [9]. Participants were required to indicate their perceptions

145 of Paulina by selecting one of five points between each pair of words. A mean score was calculated  
146 for each participant. Higher scores on this measure indicated more negative attitudes towards  
147 Paulina. In the current sample, the internal reliability of the M-FPS was high (Cronbach's  $\alpha = .834$ ).

### 148 2.3.2. General Stigma: Anti-fat Attitudes (AFA)

149 The AFA [8] consists of 13 items which assess stigmatising attitudes toward individuals with  
150 obesity (e.g. "I dislike people who are overweight or obese"). Responses are provided on a 9-point  
151 scale ranging from 'Very strongly disagree' to 'Very strongly agree' (in Study 1, a 5-point Likert scale  
152 was used but this was corrected to a 9-point scale in Study 2). Higher scores indicate stronger anti-  
153 fat attitudes. The scale comprises three subscales which assess dislike (i.e. obesity stigma), willpower  
154 (i.e. beliefs about weight controllability), and fear of fat (i.e. concerns about personal weight gain)  
155 (Cronbach's  $\alpha = .796$ ).

### 156 2.3.3. Dutch Eating Behavior Scale (DEBQ)

157 The DEBQ [34] consists of 33 items which assess eating behaviour. The scale comprises three  
158 subscales assessing Restrained Eating (DEBQ-R; 10 items), Emotional Eating (DEBQ-EM; 13 items),  
159 and External Eating (DEBQ-EX; 10-items). Previous research has demonstrated the ability of the  
160 DEBQ to predict restrictive eating tendencies [35], eating in response to external food-cues [36], and  
161 stress-induced eating [37]. Responses are recorded on a 5-point Likert-type scale ranging from  
162 'Never' to 'Very often'. Higher scores indicate greater restrained, emotional, or external eating. The  
163 DEBQ was included to ensure that participants did not differ, between conditions, with regards to  
164 their eating behaviour. The internal reliability for each of the subscales was high (DEBQ-R:  
165 Cronbach's  $\alpha = .933$ ; DEBQ-EX: Cronbach's  $\alpha = .869$ ; DEBQ-EM Cronbach's  $\alpha = .932$ ).

### 166 2.3.4. Self-perceived food addiction (SPFA)

167 To assess whether or not participants believed themselves to be a food addict, participants were  
168 presented with the statement "I believe myself to be a food addict" with response options "Yes" or  
169 "No". Similar measures have been used in previous research and positive responses on this  
170 assessment have been associated with greater food reward, overeating [23,38], and fear of being  
171 stigmatized by others [22].

### 172 2.3.5. Employability questions

173 For consistency with the study's cover story, seven items were included which assessed  
174 participants' beliefs about Paulina's employability (e.g. How likely would you be to employ  
175 Paulina?). Responses were recorded using Visual Analogue Scales (VAS) ranging from 0 (not at all)  
176 to 100 (extremely). Higher scores indicated more positive attitudes towards Paulina's employability.  
177 Analyses of the effect of condition on employability ratings are presented in the supplementary  
178 materials.

## 179 2.4. Data analysis

180 A MANOVA was conducted to check whether participants differed between conditions on age,  
181 BMI, and DEBQ subscale scores. Chi-squared tests were conducted to check for any differences  
182 between the proportion of students/non-students and Caucasian/non-Caucasian participants  
183 allocated to each condition. To examine the effect of condition on target-specific and general stigma,  
184 two ANOVAs were conducted with condition (i.e. control, medical, self-diagnosed) as the  
185 independent variable, and M-FPS (i.e. target specific stigma) and AFA (i.e. general stigma) scores as  
186 dependent variables. Where significant main effects were identified, these were followed up by  
187 inspecting pairwise comparisons.

188 We conducted exploratory analyses to examine whether self-reported BMI moderated the effect  
189 of condition on mean Modified Fat Phobia Scale (M-FPS) and Anti-Fat Attitudes (AFA) scores. To do  
190 this, we conducted two hierarchical multiple linear regression to examine the relative contributions

191 of BMI (centred) and condition to mean M-FPS scores and AFA scores. All three conditions were  
 192 dummy coded with the Control condition as the reference variable. To assign dummy codes, two  
 193 dummy variables were created:  $D_1$  (Medical) and  $D_2$  (Self-diagnosed). Participants in the medical  
 194 condition were assigned '1' to  $D_1$ , and '0' for  $D_2$ . Participants in the self-diagnosed condition were  
 195 assigned '0' to  $D_1$  and 1 to  $D_2$ . Participants in the control condition (i.e. the reference category) were  
 196 assigned 0 to both  $D_1$  and  $D_2$ . (see [44] for more information about dummy coding). Dummy-coded  
 197 conditions were then entered into Step 1 of each regression model, along with BMI. The interaction  
 198 terms (i.e. BMI x medical vs. control /self-diagnosed vs. control) were entered into Step 2 of the model.  
 199

200 Additional exploratory analyses were conducted to examine whether the effect of condition on  
 201 target-specific and general stigma was moderated by participants' age or DEBQ subscales. Further  
 202 details and results from these analyses are provided in the supplementary materials.  
 203

### 204 3. Results

#### 205 3.1. Participant characteristics

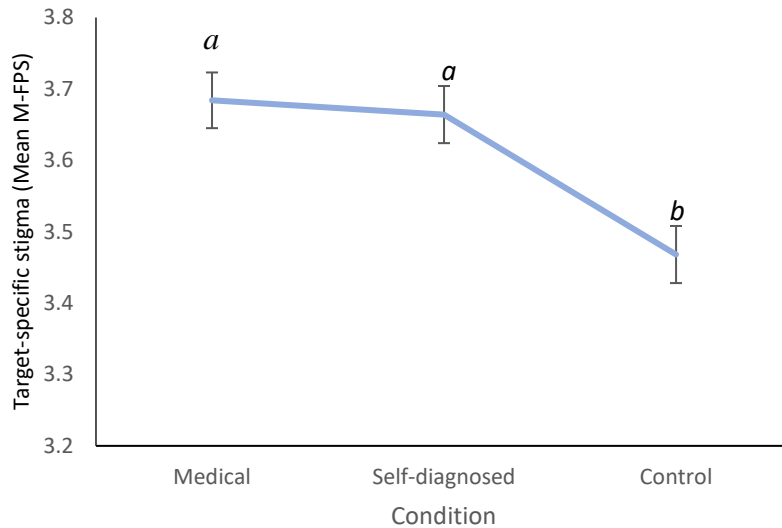
206 The MANOVA revealed that BMI differed significantly between conditions,  $F(2,434)=4.80$ ,  
 207  $p=.009$ ,  $\eta^2=.022$ . This was due to a higher mean BMI in the medical condition relative to the self-  
 208 diagnosed condition ( $p=.002$ ). Participant characteristics as a function of condition are displayed in  
 209 Table 1. Participants did not differ with regards to age or scores on DEBQ-subscales. Chi-squared  
 210 tests revealed no difference in the proportion of students/non-students, and Caucasian/non-  
 211 Caucasian participants in each condition.

212 **Table 1.** Participant characteristics as a function of condition. Results are means (standard deviations)  
 213 unless otherwise specified (\*significant difference,  $p<.05$ ).

Variable	Medical (N=148)	Self-diagnosed (N=144)	Control (N=146)	Between-group differences
Age (y)	21.09 ( $\pm 6.44$ )	21.07 ( $\pm 7.45$ )	21.38 ( $\pm 7.32$ )	$F(2,435)$ , $=.09$ , $p=.916$
BMI (kg/m <sup>2</sup> )	22.60 ( $\pm 3.22$ )*	21.60 ( $\pm 2.95$ )*	22.04 ( $\pm 2.93$ )	$F(2,432)$ , $=3.64$ , $p=.027$
DEBQ-Restraint	2.94 ( $\pm 0.96$ )	2.72 ( $\pm 0.90$ )	2.89 ( $\pm 0.86$ )	$F(2,436)$ , $=2.38$ , $p=.094$
DEBQ-Emotion	2.97 ( $\pm 0.90$ )	2.80 ( $\pm 0.90$ )	2.84 ( $\pm 0.86$ )	$F(2,436)$ , $=1.43$ , $p=.240$
DEBQ-External	3.34 ( $\pm 0.69$ )	3.21 ( $\pm 0.59$ )	3.35 ( $\pm 0.71$ )	$F(2,436)$ , $=1.95$ , $p=.143$
Ethnicity (% Caucasian)	93.3	91.0	86.4	$\chi^2(2)=4.12$ , $p=.127$
Occupation (% students)	83.2	83.3	81.6	$\chi^2(2)=.186$ , $p=.911$

#### 214 3.2. Effect of condition on target-specific and general stigma

215 There was a main effect of condition on mean Modified Fat Phobia Scale (M-FPS) score (i.e.  
 216 target-specific stigma),  $F(2,437)=9.07$ ,  $p<.001$ ,  $\eta^2=.040$ . Pairwise comparisons revealed that,  
 217 compared to those in the control condition, M-FPS scores were higher in the medical ( $p<.001$ ) and  
 218 self-diagnosed ( $p=.001$ ) conditions (Figure 1) (Control condition: Mean = 3.47, SD =0.47, range = 2.29  
 219 – 4.71; Self-diagnosed: Mean = 3.66, SD =0.48, range =2.71 – 4.93; Medical: Mean =3.68, SD =0.52,  
 220 range =1.00 – 5.00). There was no difference in mean M-FPS scores between those in the medical and  
 221 self-diagnosed conditions ( $p=.730$ ). There was no effect of condition on Anti-Fat Attitudes (AFA) total  
 222 scores (i.e. general stigma),  $F(2,437)=.754$ ,  $p=.471$ , (Control condition: Mean = 1.78, SD = 0.56, range =  
 223 0.31 – 3.46; Self-diagnosed: Mean = 1.71, SD =0.56, range =0.23 – 3.00; Medical: Mean = 1.72, SD = 0.56,  
 224 range =0.38 – 3.38).



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226 **Figure 1.** Mean M-FPS scores (i.e. target specific stigma) as a function of condition. Different letters indicate  
 227 significant differences. Higher scores indicate more negative attitudes towards Paulina (i.e., higher levels  
 228 of target-specific stigma). Error bars denote standard error.

229 **3.3. Moderating effect of BMI**

230 Hierarchical linear regression analyses were conducted to examine whether BMI moderated the  
 231 effect of condition on target-specific (i.e. M-FPS scores) and general (AFA scores) stigma. Results from  
 232 the exploratory analysis predicting M-FPS scores are provided in Table 2. In Step 1 and Step 2 of the  
 233 model, M-FPS scores were significantly predicted by both condition (medical vs. control and self-  
 234 diagnosed vs. control) and BMI; higher BMI was associated with lower M-FPS scores. However, M-  
 235 FPS scores were not significantly predicted by the BMI x Condition interaction terms in Step 2 of the  
 236 model.

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238 Neither BMI nor condition predicted AFA scores in Step 1 of the model ( $r^2=.005$ ,  $p=.510$ ), and the  
 239 inclusion of interaction terms in Step 2 did significantly improve the fit of the model  $r^2=.015$ ,  $p=.124$ ).

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241 **Table 2.** Regression output with mean M-FPS (i.e. target-specific stigma) as the dependent variable.

Model	B	SE	t	p
<i>Step 1</i>				
BMI	-.015	.007	-2.119	.035
Medical	.230	.056	4.109	<.001
Self-diagnosed	.189	.056	3.360	.001
<i>Step 2</i>				
BMI	-.034	.013	-2.547	.011
Medical	.223	.056	3.992	<.001
Self-diagnosed	.190	.056	3.360	.001
BMIxMedical	.031	.017	1.816	.070
BMIxSelf-diagnosed	.019	.019	.980	.327

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\*\* $p<.01$ . Step 1:  $r^2=.051$ ,  $p<.001$ ; Step 2:  $r^2=.058$ ,  $p=.194$

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247 **4. Interim discussion**

248 Study 1 found that female participants who were exposed to medical and self-diagnosed food  
249 addiction vignettes exhibited more target-specific stigma towards a woman with obesity, than those  
250 in the control condition. This is consistent with previous research in which the food addiction label  
251 was found to exacerbate stigmatising attitudes towards an individual with obesity and ‘food  
252 addiction’ [27].

253 One possibility is that ‘food addiction’ stigma may be particularly high amongst those who  
254 perceive addiction to be within personal control [7]. This is supported by previous research in which  
255 perceiving addiction as a disease, rather than due to personal choice, was associated with reduced  
256 stigma towards people with addictive disorders [39,40]. Similarly, biogenetic explanations have been  
257 found to reduce stigma towards obesity, problematic eating, and substance abuse, relative to  
258 behaviour-based explanations [10,31,41]. In Study 2, we examined whether the effect of food  
259 addiction condition on stigma would be moderated by the extent that addiction is viewed as a  
260 ‘disease’ relative to personal choice.

261 We also examined whether stigmatising attitudes towards the target with food-addiction would  
262 be moderated by individuals’ scores on a measure of addiction-like eating. Previous research has  
263 found that individuals with personal experience of addiction have less negative attitudes towards  
264 others with addiction [42]. Furthermore, social identity theory suggests that individuals view other  
265 ‘in-group’ members more favourably than out-group members [43]. We therefore predicted that the  
266 effect of condition on target-specific stigma would be attenuated in participants with greater levels  
267 of addiction-like eating behaviour.

268 Finally, we examined whether the effect of condition on target-specific and general stigma  
269 would differ between males and females. Previous research has found that females demonstrate less  
270 obesity-related stigma and stigma towards the ‘food addiction’ label than males [27]. We therefore  
271 hypothesised that the exacerbating effect of the food addiction label on stigma would be most  
272 pronounced in males.

273 To summarise, Study 2 examined the following hypotheses: 1) The effect of condition on target-  
274 specific and general stigma would be attenuated in those with greater support for the disease model  
275 of addiction. 2) The effect of condition on stigma would be attenuated in those who score highly on  
276 a measure of addiction-like eating, relative to those who score lower on addiction-like eating. 3) The  
277 effect of condition on stigma would be attenuated in females, relative to males.

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## 289 Study 2

### 290 5. Method

#### 291 5.1. Participants

292 Male and female participants, aged over 18 years, were invited to take part in a study into  
293 'employability perceptions'. A total of 523 (190 males; 314 females; 19 did not disclose their gender)  
294 participants completed the study. 610 participants started the online survey, but 87 either did not  
295 complete it or were aged under 18 years old and so were excluded from analyses. Participants were  
296 recruited from the University of Liverpool (n=333) and Newcastle University (n=190) in the UK. The  
297 mean age of participants was 27.1(SD=11.3) years, and the mean self-reported BMI was 23.6 kg/m<sup>2</sup>  
298 (SD=4.1). Participants with self-reported BMI over 30 kg/m<sup>2</sup> (i.e. classified as having obesity)  
299 comprised 7.1% of the sample, 21.6% had a self-reported BMI between 25 – 29.9 kg/m<sup>2</sup> (i.e.  
300 'overweight'), 64.4% had a self-reported BMI between 18.5 – 24.9 kg/m<sup>2</sup> (i.e. healthy weight), and  
301 5.5% had a self-reported BMI below 18.5 kg/m<sup>2</sup> (i.e. 'underweight'). Just over half of the sample  
302 were university students (n=275, 52.4%) and the majority were Caucasian (n=465, 88.9%). Ethical  
303 approval was granted by the relevant ethics committee at each of the two sites (University of  
304 Liverpool approval code: IPHS-1516-SMc-259-Generic RETH000619; Newcastle University approval  
305 code 1485/4293).

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#### 307 5.2. Materials and procedure

308 Study 2 used the same materials and procedure as Study 1 but with the following additional  
309 measures:

##### 310 5.2.1. Addiction Belief Scale (ABS)

311 The ABS [44] was used to measure beliefs about addiction. Nine items assessed the belief that  
312 addiction is a disease (disease subscale, Cronbach's  $\alpha = .590$ ), and nine items assessed the belief that  
313 addiction is within personal control (free will subscale, Cronbach's  $\alpha = .546$ ). Items were rated on a 5-  
314 point Likert scale ranging from 'strongly disagree' to 'strongly agree'. Higher scores indicate greater  
315 support for the belief that addiction is akin to a disease (disease subscale), and a matter of personal  
316 choice (free will subscale).

##### 317 5.2.2. Addiction-like Eating Behaviour Scale (AEBS)

318 The AEBS [45] consists of 15 items which assess the presence of behaviours that are commonly  
319 associated with addiction-like eating (e.g. 'I continue to eat despite feeling full'). Responses are  
320 provided on 5-point Likert Scales ranging from 'Strongly disagree' to 'Strongly agree', and from  
321 'Never' to 'Always'. The scale comprises two subscales: appetitive drive (9 items, Cronbach's  $\alpha = .890$ )  
322 and low dietary control (6 items, Cronbach's  $\alpha = .806$ ). Higher scores indicate greater addiction-like  
323 eating behaviour. Previous research suggests that this measure correlates positively with other  
324 measures of disinhibited eating (i.e. the Binge Eating Scale, [46]) and explains greater variance in BMI  
325 over and above other measures of 'food addiction' such as the Yale Food Addiction Scale [47].

##### 326 5.2.3. Data analysis

327 A MANOVA was conducted to check whether participants differed, between conditions, with  
328 regards to age, BMI, DEBQ subscales scores, and scores on the Addiction-like Eating Behaviour Scale  
329 (AEBS) and Addiction Belief Scale (ABS). Chi-squared tests were conducted to check for any  
330 differences between the proportion of students/non-students, Caucasian/non-Caucasian, and



331 males/females allocated to each condition. As in Study 1, two univariate ANOVAs were conducted  
 332 to examine the effect of condition on Anti-fat Attitudes (AFA; general stigma) and Modified-Fat  
 333 Phobia Scale (M-FPS) scores (target-specific stigma). Gender was also included in the model as a  
 334 between-subjects variable.

335 Hierarchical multiple linear regression analyses were conducted to examine whether any effects  
 336 of condition on target-specific and general stigma were moderated by support for the 'disease' model  
 337 of addiction (i.e. ABS-disease scores), and addiction-like eating behaviour (i.e. AEBS scores). All three  
 338 conditions were dummy coded with the Control condition as the reference variable. To assign  
 339 dummy codes, two dummy variables were created:  $D_1$  (Medical) and  $D_2$  (Self-diagnosed). Participants  
 340 in the medical condition were assigned '1' to  $D_1$ , and '0' for  $D_2$ . Participants in the self-diagnosed  
 341 condition were assigned '0' to  $D_1$  and 1 to  $D_2$ . Participants in the control condition (i.e. the reference  
 342 category) were assigned 0 to both  $D_1$  and  $D_2$ . (see [48] for more information about dummy coding).  
 343 Dummy-coded conditions were then entered into Step 1 of each regression model, along with  
 344 Addiction Belief Scale (disease subscale) or AEBS scores. The interaction terms (i.e. AEBS/Addiction  
 345 Belief Scale (disease subscale) x medical vs. control /self-diagnosed vs. control) were entered into Step  
 346 2 of the model. Separate regression analyses were conducted to examine the ability of each interaction  
 347 term to predict AFA scores (i.e. general stigma) and M-FPS scores (i.e. target-specific stigma).  
 348 Addiction Belief Scale (disease subscale) and AEBS scores were centered prior to analyses.

## 349 6. Results

### 350 6.1. Participant characteristics

351 Participants did not differ between conditions on any of the assessed characteristics (Table 3).

352 **Table 3.** Participant characteristics as a function of condition (Study 2).

Variable	Medical (N=178)	Self-diagnosed (N= 175)	Control (N=170)	Between-group differences
Age (y)	26.6(11.1)	26.9(10.9)	27.8(12.0)	F(2,511)=.34, p=.711
BMI (kg/m <sup>2</sup> )	23.6(4.5)	23.6(4.2)	23.5(3.7)	F(2,511)=.03, p=.974
DEBQ-Restraint	2.66(.91)	2.67(.86)	2.76(.90)	F(2,511)=.47, p=.626
DEBQ-Emotion	2.67(.90)	2.64(.98)	2.77(.99)	F(2,511)=1.16, p=.314
DEBQ-External	3.29(.58)	3.26(.57)	3.38(.55)	F(2,511)=2.44, p=.088
AEBS	36.57(9.65)	35.99(9.87)	36.05(8.70)	F(2,511)=.33, p=.720
ABS-disease	25.80(3.75)	25.19(3.92)	25.86(4.41)	F(2,511)=1.45, p=.236
ABS-Free Will	30.01(3.29)	29.95(3.72)	30.15(4.04)	F(2,511)=.14, p=.873
Ethnicity (% Caucasian)	89%	89%	88%	$\chi^2(2)=.119$ , p=.942
Occupation (% students)	57%	49%	52%	$\chi^2(2)=2.08$ , p=.354
Gender (% male)	42%	31%	38%	$\chi^2(2)=4.95$ , p=.084

353 Abbreviations: AEBS, Addiction-like Eating Behavior Scale; ABS, Addiction Beliefs Scale; DEBQ, Dutch Eating  
 354 Behaviour Scale.

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### 356 6.2. Effect of condition and gender on target specific stigma

357 In contrast to Study 1, there was no main effect of condition on target-specific stigma,  
 358 F(2,517)=.69, p=.501, (Control condition: Mean = 3.56, SD =0.48, range = 2.43 – 5.00; Self-diagnosed:  
 359 Mean = 3.63, SD =0.47, range =2.36 – 4.64; Medical: Mean =3.63, SD =0.47, range =2.57 – 4.93). Contrary  
 360 to hypothesis 3, there was no gender x condition interaction for target-specific stigma, F(2,517)=1.18,  
 361 p=.309. However, there was a main effect of gender, F(1,517)=5.13, p=.024,  $\eta^2=.010$ , such that males  
 362 had significantly higher scores on the Modified Fat Phobia Scale (M-FPS) than females i.e. they  
 363 showed higher levels of target-specific stigma (Males: M=3.67, SE=.034; Females: M=3.57, SE=.026).

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367 *6.3. Effect of condition and gender on general stigma*

368 As in Study 1, there was no effect of condition on Anti-fat Attitudes (AFA) scores (i.e. general  
369 stigma),  $F(2,517)=1.18$ ,  $p=.308$ , (Control: Mean = 4.34 , SD =1.00 , range =2.15 – 7.31; Self-diagnosed:  
370 Mean = 4.17, SD =1.00, range =1.54 – 7.15; Medical: Mean =4.29 , SD =1.09, range =1.31 – 7.85). Contrary  
371 to hypothesis 3, there was no gender x condition interaction,  $F(2,517)=.02$ ,  $p=.978$ . There was also no  
372 main effect of gender on AFA scores,  $F(1,517)=.02$ ,  $p=.978$ . For further analyses of gender differences  
373 on the AFA subscales, please see the supplementary materials.

374 *6.4. Effect of disease beliefs on stigma*

375 Scores on the disease subscale of the Addiction Belief Scale (ABS) significantly predicted mean  
376 Modified-Fat Phobia Scale (M-FPS) scores in Step 1 and Step 2 of the model such that higher scores  
377 on the scale (i.e. greater belief that addiction is akin to a disease) were associated with greater target  
378 specific stigma (i.e. higher M-FPS scores) (Table 4). However, M-FPS scores were not significantly  
379 predicted by condition, and there was no condition x ABS-disease interaction, contrary to our  
380 hypothesis. Step 1:  $r=.204$ ,  $r^2=.042$ ,  $p<.001$ ; Step 2:  $r=.204$ ,  $r^2=.042$ ,  $p=.972$ .

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383 **Table 4.** Regression output for ABS-disease with M-FPS (target-specific stigma) as the dependent  
384 variable.

	<b>B</b>	<b>SE</b>	<b>t</b>	<b>p</b>
<i>Step 1</i>				
Medical	.072	.050	1.427	.154
Self-diagnosed	.091	.051	1.797	.073
ABS-disease	.023**	.005	4.439	.000
<i>Step 2</i>				
Medical	.071	.050	1.415	.158
Self-diagnosed	.090	.051	1.781	.076
ABS-disease	.022**	.008	2.685	.007
ABS-Disease x Medical	.002	.012	.195	.846
ABS-Disease x Self-diagnosed	.000	.012	-.034	.972

385 \*\* $p<.01$ . *Note.* The control condition was used as the reference category against which medical and  
386 self-diagnosed conditions were compared. Abbreviations: ABS, Addiction Belief Scale. Step 1:  $r^2=.042$ ,  
387  $p<.001$ ; Step 2:  $r^2=.042$ ,  $p=.972$ ).

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Similarly, scores on the disease subscale of the ABS significantly predicted Anti Fat Attitude (AFA) scores (i.e. general stigma) in Step 1 and Step 2 of the model such that higher scores on the ABS-disease subscale predicted higher AFA scores (Table 5). Contrary to hypothesis 1, AFA scores were not significantly predicted by condition, and there was no interaction between condition and disease scores on AFA.

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407 **Table 5.** Regression output for ABS-disease with AFA (general stigma) as the dependent variable.

	B	SE	t	p
<i>Step 1</i>				
Medical	-.056	.109	-.516	.606
Self-diagnosed	-.146	.110	-1.331	.184
ABS-disease	.047**	.011	4.281	.000
<i>Step 2</i>				
Medical	-.053	.109	-.482	.630
Self-diagnosed	-.147	.110	-1.337	.182
ABS-disease	.059**	.018	3.295	.001
ABS- Disease x Medical	-.016	.027	-.582	.560
ABS-Disease x Self-diagnosed	-.021	.026	-.791	.429

408 \*\*p<.01 *Note.* The control condition was used as the reference category against which medical  
409 and self-diagnosed conditions were compared. Step 1: r=.198, r<sup>2</sup>=.039, p<.001; Step 2: r=.201, r<sup>2</sup>=.040,  
410 p=.707.

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413 *6.5. Addiction-like Eating Behaviour*

414 Addiction-like Eating Behaviour Scale (AEBS) scores and condition did not predict Modified Fat  
415 Phobia Scale (M-FPS) (target-specific stigma) scores in Step 1 of the model. However, inclusion of the  
416 interaction terms in Step 2 significantly improved the fit of the model. Regression coefficients  
417 revealed a significant interaction between AEBS scores and medical (vs. control) condition on M-FPS  
418 scores (Table 6).

419 **Table 6.** Regression output for AEBS scores with M-FPS (target-specific stigma) as the dependent  
420 variable.

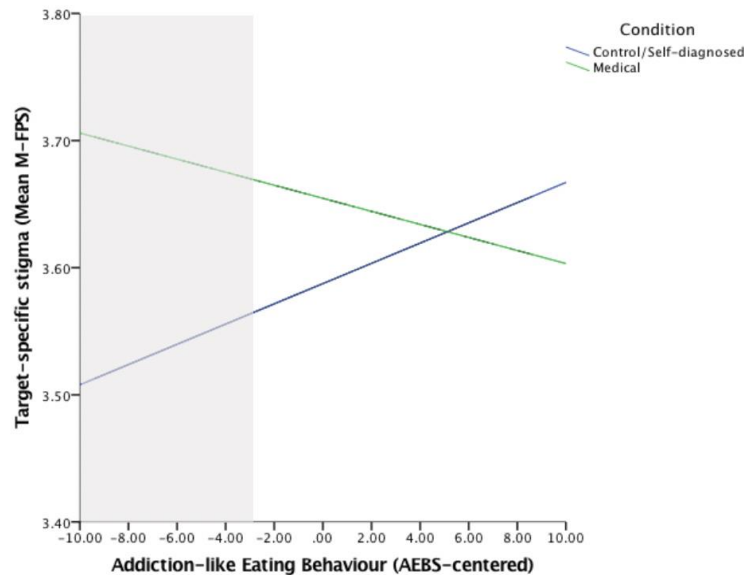
	B	SE	t	p
<i>Step 1</i>				
Medical	.067	.051	1.32	.186
Self-diagnosed	.071	.051	1.38	.168
AEBS	.003	.002	1.42	.156
<i>Step 2</i>				
Medical	.067	.051	1.32	.187
Self-diagnosed	.071	.051	1.39	.165
AEBS	.008	.004	1.90	.058
AEBS x Medical	-.013*	.006	-2.35	.019
AEBS x Self-diagnosed	.000	.006	-.065	.948

421 \*p<.05 *Note.* The control condition was used as the reference category against which medical and self-  
422 diagnosed conditions were compared. Abbreviations: AEBS, Addiction-like Eating Behavior Scale.  
423 Step 1: r<sup>2</sup>=.009, p=.214; Step 2: r<sup>2</sup>=.023, p=.020.

424 To further examine the interaction between AEBS scores and condition on M-FPS scores, we  
425 used the Johnson-Neyman technique [49] to identify the levels of addiction-like eating (i.e. AEBS  
426 scores) at which condition elicited a significant difference on M-FPS scores [50]. Using PROCESS  
427 (Version 3.1., [51]), the Medical (dummy-coded) condition was entered as the predictor variable,  
428 AEBS scores were entered as the moderator variable, and Self-diagnosed condition (dummy-coded)  
429 and the Self-diagnosed x AEBS interaction term were entered as covariates. Mean-FPS scores were  
430 entered as the dependent variable. This analysis showed that the Medical condition resulted in  
431 significantly greater M-FPS scores, relative to the Self-diagnosed and Control conditions (ps<.05), but  
432 only for those with low AEBS scores (centered AEBS score <= -2.81). Findings are therefore consistent

433 with our hypothesis that the effect of condition on stigma would be attenuated in those with higher  
434 levels of addiction-like eating behaviour.

435 The condition x AEBS scores model predicting (general stigma) AFA scores was not significant  
436 (Step 1:  $r=.069$ ,  $r^2=.005$ ,  $p=.484$ ; Step 2:  $r=.084$ ,  $r^2=.007$ ,  $p=.540$ ).



437

438 *Figure 2.* The effect of condition on M-FPS scores at different levels of addiction-like eating behavior  
439 (assessed using the AEBS). The shaded area represents the region of significance identified using the  
440 Johnson-Neyman technique.

## 441 7. Discussion

442 Across two studies, we examined the effect of the food addiction label on stigmatising attitudes  
443 towards an individual with obesity (i.e. target specific), and towards people with obesity more  
444 generally (i.e. general stigma). In Study 1, participants in both the medical and self-diagnosed food  
445 addiction conditions demonstrated greater target-specific stigma relative to the control condition.  
446 There was no effect of condition on general stigmatizing attitudes towards people with obesity.  
447 However, findings from Study 1 were not replicated in Study 2 in which we included both male and  
448 female participants. That is, we found no overall differences between the food addiction conditions  
449 and the control condition on target-specific stigma. The effect of condition on target-specific or  
450 general stigma was also not moderated by addiction disease beliefs (i.e. the extent to which addiction  
451 is perceived as a disease) or gender, in Study 2. However, there was a significant condition by  
452 addiction-like eating behavior interaction on target-specific stigma; participants who scored low on  
453 a measure of addiction-like eating demonstrated greater target-specific stigma in the Medical  
454 condition relative to Control and Self-diagnosed conditions. In contrast, target-specific stigma did  
455 not differ as a function of condition for those with high levels of addiction-like eating.

456 Findings from Study 1 are consistent with previous findings in which the food addiction label  
457 added to the stigma of obesity [27]. Higher levels of stigma towards the 'self-perceived' food-  
458 addicted target in the current study may reflect perceptions of food addiction as an 'excuse' for  
459 overeating. This is supported by qualitative evidence that individuals with overweight or obesity  
460 may be reluctant to label themselves as food addicts due to concerns that this would be perceived as  
461 an 'excuse' for their weight [29].

462 We predicted that the medical condition might legitimize the concept of food addiction and  
463 thereby reduce weight-related stigma (i.e., by removing personal responsibility from the individual).  
464 However, contrary to our hypothesis, in Study 1 we found that target-specific stigma was also higher  
465 in the medical condition compared to the control condition, and did not differ from levels observed  
466 in the self-diagnosed condition. This finding is inconsistent with predictions from attribution theory

467 [7] in which undesirable behaviours that are perceived as beyond personal control are thought to  
468 elicit less stigma than those that are perceived as controllable. One possibility is that food addiction  
469 explanations increase stigma by inadvertently emphasising the behavioural aspect of obesity. That  
470 is, food addiction may imply a loss of control over eating and previous studies have found that this  
471 may increase stigmatising attitudes towards obesity [52]. Another possible explanation is that food  
472 addiction, unlike other biological causes of obesity, is believed to be within personal control, and that  
473 medicalising the term does not remove perceptions of personal responsibility. Indeed, Lee et al. [21]  
474 reported that almost three quarters of people supported food addiction as a cause of obesity, and yet  
475 obesity was still viewed as a condition that individuals need to take responsibility for. It may  
476 therefore be the case that stigmatising attitudes towards 'food addicted' individuals are dependent  
477 upon the extent that addiction is perceived as being outside of personal control and/or akin to a  
478 disease. In relation to this, Study 2 examined whether the effect of food addiction condition on stigma  
479 would be attenuated in those with greater support for the disease model of addiction (results  
480 discussed below).

481 Study 1 therefore suggests that the food addiction label exacerbated stigmatising attitudes  
482 towards a woman with obesity, regardless of whether the food addiction was medically diagnosed  
483 or self-diagnosed. Notably, findings from Study 1 are inconsistent with those obtained in a previous  
484 study in which a 'food addiction' explanation for obesity elicited *lower* levels of target-specific and  
485 general stigma, than a control explanation [28]. This inconsistency may be attributable to the control  
486 conditions used in ours and Latner et al.'s [28] study; in the current study, participants in the control  
487 condition were not provided with any explanation for the target's weight status. In contrast,  
488 participants in Latner et al.'s [28] study read that obesity is caused by repeatedly choosing to consume  
489 high-calorie foods. By emphasising the role of personal choice, it is possible that the control condition  
490 used by Latner et al. [28] may have elicited greater stigma than a 'food addiction' explanation for  
491 obesity.

492 In Study 2, we found that greater support for the disease model of addiction was associated with  
493 *greater* target-specific and general stigma towards obesity. This finding was unexpected and is  
494 contrary to predictions derived from attribution theory. One possibility is that the perception of  
495 addiction as a 'disease' encourages the view that addicts are abnormal and perpetuates an 'us-them'  
496 distinction [53]. Holding disease views of addiction also suggests that the person's condition is  
497 irrevocable and permanent [54]. Another possibility is that causal beliefs about food addiction do not  
498 coincide with perceptions of other addictions. That is, individuals who support the 'disease' model  
499 for substance-based addictions may not necessarily attribute food addiction to a disease. Previous  
500 research supports this, indicating that addictions vary in the extent to which they are attributed to  
501 disease or personal choice. In particular, de Pierre et al. [39] found that food addiction was perceived  
502 as less of a disease and more within personal control compared with other addictions such as  
503 alcoholism. The measure of addiction beliefs (i.e. the ABS) used in the current study referred to  
504 addiction in general, and thus may not have reflected participants' beliefs about food addiction per  
505 se.

506 However, the moderating effect of addiction-like eating on target-specific stigma, observed in  
507 Study 2, suggest that medically diagnosed food addiction could exacerbate weight-related stigma but  
508 only for people with low levels of addiction-like eating tendencies. A possible explanation for this  
509 finding is that individuals with personal experience of problematic eating (i.e., high AEBS scores)  
510 may have identified more with the target in the vignette and thereby displayed less negative attitudes  
511 towards her food addiction (e.g. see [42] and [43]) as opposed to participants with low AEBS scores.

512 In Study 2, male participants demonstrated significantly higher target-specific stigma, relative  
513 to female participants. Males and females did not differ on a measure of general weight-related  
514 stigma. However, the lack of interaction between gender and condition is inconsistent with previous  
515 research [27] in which stigmatising attitudes towards a 'food addicted' target were lower in females,  
516 relative to males. This null result may be explained by the fact that, in the current study, males had  
517 significantly higher mean BMI than females (see Table S1). A previous study found that people with  
518 higher BMI hold less stigmatising attitudes towards the 'food addict' label, relative to those with

519 lower BMI [27]. Consistent with this, in Study 1, we found that higher BMI was associated with lower  
520 target-specific weight stigma. It is therefore possible that, in the current study, any moderating effect  
521 of gender on stigma may have been masked by the higher BMI of male, relative to female,  
522 participants. Future research should examine the moderating effect of gender on stigmatizing  
523 attitudes towards a food-addicted target in samples of males and females matched for BMI.

524 The inconsistent findings obtained across Studies 1 and 2 could not be attributable to the  
525 inclusion of males in Study 2 as the effect of condition on target-specific stigma was not moderated  
526 by gender. The sample tested in Study 2 comprised a larger proportion of older, non-students than  
527 the sample tested in Study 1. However, exploratory analyses revealed that the effect of condition on  
528 stigma was *not* moderated by student status or age (see online supplementary material). Differences  
529 between Studies 1 and 2 are therefore likely due to another (unknown) variable. Moreover, these  
530 findings suggest that effects of the food addiction label on weight-related stigma may not be  
531 generalisable across populations.

532

### 533 7.3. Limitations and future directions

534 There are several limitations to the current study that require consideration. Firstly, we note that  
535 the Addiction Belief Scale, used in Study 2, examined beliefs about the causes of addiction *in general*,  
536 and thus may not have captured individual differences in beliefs about the causes of food addiction.  
537 Future research could use an adapted version of the ABS (such as that used by de Pierre et al. [39]) to  
538 test whether food addiction stigma is attenuated in individuals who have greater support for a  
539 disease model of food addiction. Secondly, we did not examine whether participants believed the  
540 food addiction explanation for obesity, nor did we check whether participants had guessed the study  
541 aims. It is therefore possible that the effect of the food addiction label on stigma, observed in Study  
542 1, could be due to demand characteristics that were not present in Study 2. Thirdly, the use of a female  
543 target in the current study precludes the generalizability of our findings to males. Previous research  
544 suggests that females are more likely than males to be stigmatized due to their weight [55], and so  
545 attitudes towards the food addiction label may similarly differ as a function of the target's gender.  
546 Finally, it is important to consider that the findings may have been affected by the order in which the  
547 questionnaires were presented. In particular, the significant effect of condition on target-specific  
548 stigma (M-FPS) (in Study 1), and lack of effect of general stigma (AFA), may be due to the fact that  
549 participants completed the M-FPS immediately after reading the vignette, while general stigma (i.e.  
550 AFA scores) were assessed later in the study.

551 Future research should aim to clarify the effect of the food addiction label on weight-related  
552 stigma. This may be achieved by considering possible moderating effects of pre-existing beliefs about  
553 food addiction (e.g. the extent that it is a legitimate condition, whether it is controllable, etc.). There  
554 has been much debate in the scientific literature about whether addiction-like eating should be  
555 considered a substance-based 'food addiction' or a behavioural 'eating addiction' (e.g. [11]).  
556 Therefore, it will also be important to compare attitudes elicited by a 'food addiction' label, with  
557 attitudes towards an 'eating addiction' label. It would also be interesting to compare the effect on  
558 stigma of medically-diagnosed food addiction, with other medical causes of weight gain (e.g.  
559 hypothyroidism). Doing so would provide insight into whether the potential exacerbating effect of  
560 medicalisation on stigma, is specific to the food addiction label or whether it extends to the medical  
561 model per se. It is also possible that emphasizing the non-behavioural aspect of food addiction (e.g.  
562 brain differences to food) may reduce any deleterious effect of a medical diagnosis on stigma. More  
563 broadly, the clinical implications of food addiction labels on weight-related stigma must now be  
564 considered. In particular, it is important to consider whether the food addiction label may affect  
565 people's approaches to treatment (e.g. seeking pharmacological solutions rather than  
566 psychotherapy). It is also possible that, by perpetuating weight-related stigma, the food addiction  
567 label could be detrimental to psychological well-being and undermine people's attempts to lose  
568 weight.

569 **8. Conclusion**

570 The results indicate that the food addiction label may exacerbate stigmatising attitudes towards  
571 an individual with obesity. Furthermore, there is preliminary evidence that this effect may be most  
572 pronounced in people with low pre-existing levels of addiction-like eating behaviour. Further  
573 research is needed to determine the longer term effects of the food addiction label on weight stigma  
574 and the clinical implications.

575 **Supplementary Materials:** The following are available online at [www.mdpi.com/xxx/s1](http://www.mdpi.com/xxx/s1), Figure S1: Scores on  
576 AFA-Willpower subscale as a function of condition and gender. Table S1: Participant characteristics as a function  
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579 Ruddock and Michael Orwin; Formal analysis, Helen K. Ruddock and Michael Orwin; Methodology, Michael  
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581 Hardman; Writing – original draft, Helen K. Ruddock and Charlotte A. Hardman; Writing – review & editing,  
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