



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Exploring changes in body image, eating and exercise during the COVID-19 lockdown

Citation for published version:

Robertson, M, Duffy, F, Newman, E, Prieto Bravo, C, Ates, HH & Sharpe, H 2021, 'Exploring changes in body image, eating and exercise during the COVID-19 lockdown: A UK survey', *Appetite*, vol. 159, 105062, pp. 1-6. <https://doi.org/10.1016/j.appet.2020.105062>

Digital Object Identifier (DOI):

[10.1016/j.appet.2020.105062](https://doi.org/10.1016/j.appet.2020.105062)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Appetite

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Journal Pre-proof

Exploring changes in body image, eating and exercise during the COVID-19 lockdown: A UK survey

MacKenzie Robertson, Fiona Duffy, Emily Newman, Cecilia Prieto Bravo, Hasan Huseyin Ates, Helen Sharpe



PII: S0195-6663(20)31684-6

DOI: <https://doi.org/10.1016/j.appet.2020.105062>

Reference: APPET 105062

To appear in: *Appetite*

Received Date: 30 July 2020

Revised Date: 20 October 2020

Accepted Date: 29 November 2020

Please cite this article as: Robertson M., Duffy F., Newman E., Bravo C.P., Ates H.H. & Sharpe H., Exploring changes in body image, eating and exercise during the COVID-19 lockdown: A UK survey, *Appetite*, <https://doi.org/10.1016/j.appet.2020.105062>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2020 Published by Elsevier Ltd.

Exploring changes in body image, eating and exercise during the COVID-19 lockdown: A UK survey

Abstract

Early reports suggest that lockdown measures associated with the COVID-19 pandemic (e.g., social distancing) are having adverse consequences for people's mental health, including increases in maladaptive eating habits and body dissatisfaction. Certain groups, such as those with pre-existing mental health difficulties, may be especially at risk. The current study explored perceived changes in eating, exercise, and body image during lockdown within the United Kingdom, using an online survey (n = 264). There were large individual differences in perceived changes in eating, exercise, and body image in this period. Women were more likely than men to report increasing struggles with regulating eating, preoccupation with food and worsening body image. Those with a current/past diagnosis of eating disorders reported significantly greater difficulties in regulating eating, increased preoccupation with food, exercise thoughts and behaviours and concern about appearance, even when compared to those with other mental health and developmental disorders. Ongoing research to explore individual differences in the trajectories of change in eating, exercise and body image as lockdown measures ease will be important for understanding the full psychological impact of this pandemic and improve service and public health planning going forward.

Keywords

COVID-19, eating disorders, body image, eating behaviour, exercise, survey

1

2 Exploring changes in body image, eating and exercise during the COVID-19 lockdown: A
3 UK survey

4

5 Running title: BODY IMAGE, EATING AND EXERCISE DURING COVID-19

6

7 MacKenzie Robertson ¹

8 Fiona Duffy ¹

9 Emily Newman ¹

10 Cecilia Prieto Bravo ²

11 Hasan Huseyin Ates ¹

12 Helen Sharpe * ¹

13

14

15 1: School of Health in Social Science, University of Edinburgh, Teviot Place, EH8 9AG,
16 Edinburgh, UK

17 2: Usher Institute, University of Edinburgh, Teviot Place, EH8 9AG, Edinburgh, UK

18

19 * Corresponding author: Helen Sharpe, School of Health in Social Science, University of
20 Edinburgh, Teviot Place, EH8 9AG, Edinburgh, UK, helen.sharpe@ed.ac.uk, +44(0)131
21 6513 949.

22 Abstract

23 Early reports suggest that lockdown measures associated with the COVID-19 pandemic
24 (e.g., social distancing) are having adverse consequences for people's mental health,
25 including increases in maladaptive eating habits and body dissatisfaction. Certain
26 groups, such as those with pre-existing mental health difficulties, may be especially at
27 risk. The current study explored perceived changes in eating, exercise, and body image
28 during lockdown within the United Kingdom, using an online survey (n = 264). There
29 were large individual differences in perceived changes in eating, exercise, and body
30 image in this period. Women were more likely than men to report increasing struggles
31 with regulating eating, preoccupation with food and worsening body image. Those with
32 a current/past diagnosis of eating disorders reported significantly greater difficulties in
33 regulating eating, increased preoccupation with food, exercise thoughts and behaviours
34 and concern about appearance, even when compared to those with other mental health
35 and developmental disorders. Ongoing research to explore individual differences in the
36 trajectories of change in eating, exercise and body image as lockdown measures ease
37 will be important for understanding the full psychological impact of this pandemic and
38 improve service and public health planning going forward.

39 Keywords

40 COVID-19, eating disorders, body image, eating behaviour, exercise, survey

41 **1. Background**

42 In January 2020 the World Health Organisation declared Coronavirus disease 2019
43 (COVID-19) a Public Health Emergency of International Concern. The combination
44 of significant morbidity and rapid spread of the virus has led to unprecedented public
45 health measures on an international scale, resulting in significant restrictions to daily
46 life. A high proportion of countries have implemented “lockdown”, involving
47 restrictions on travel, social interaction and prohibition of public gatherings and social
48 events. In the United Kingdom (UK) lockdown measures were imposed on March 26,
49 2020. This involved a “stay at home” directive where people were asked to only leave
50 their home for essential purposes (e.g., keyworker roles, medical needs, to care for
51 others, one form of exercise a day, and essential food purchases). This was accompanied
52 by advice on “social distancing”, where people were required to maintain a distance
53 of two metres from each other, and “shielding” of physically vulnerable individuals by
54 minimising social interaction with them. While essential to prevent transmission of the
55 virus, evidence of a negative impact of these restrictions on mental health is emerging.
56 The Institute of Fiscal Studies analysed longitudinal data and found a substantial
57 deterioration in mental health during the period of COVID-19 lockdown in the UK, with
58 women, young people and those with pre-existing mental health difficulties particularly
59 affected (Banks & Xu, 2020). Furthermore, The UCL Covid-Social Study found that
60 anxiety symptoms in the UK sample decreased after lockdown measures were
61 implemented while depression scores rose, and that both anxiety and depression
62 symptoms started to reduce further after lockdown began to ease (Fancourt, Bu, Mak, &
63 Steptoe, 2020).

64 Due to the restrictions placed on people’s movements, and changes to the accessibility
65 of food throughout the day, lockdown may significantly influence people’s eating habits,
66 exercise behaviours, and body image. Some researchers have expressed concern about
67 the potential for lockdown measures to increase sedentary behaviours and irregular
68 eating patterns in the general population (Di Renzo et al., 2020; Naja & Hamadeh, 2020).
69 At the same time, other researchers have voiced concern about the potential impact on
70 vulnerable individuals, including those with pre-existing mental health difficulties
71 (Holmes et al., 2020), and the development or exacerbation of pre-existing, eating
72 disorder psychopathology (Touyz, Lacey, & Hay, 2020; Weissman, Bauer, & Thomas,

73 2020). Collective anxiety about weight gain during lockdown, and stigmatizing media
74 messages about the dangers of higher body weight, might contribute to increased body
75 shame and levels of disordered eating, especially in vulnerable populations such as
76 those with a current or historic eating disorder.

77 Rodgers and colleagues (2020) outlined three potential pathways through which eating
78 disorder symptomatology might develop or be exacerbated in those with existing
79 difficulties during the pandemic. The first pathway suggests that disruptions to daily
80 routines and restrictions to activities (e.g., limited exercise, grocery shopping and food
81 insecurity, social distancing and/or isolation, reduced access to treatment or alternative
82 coping strategies, irregular sleep) might increase eating disorder psychopathology. In
83 the second pathway, increased consumption of media (particularly social media) due to
84 social distancing measures could contribute to increased eating disorder
85 psychopathology. This is through increased exposure to harmful eating and appearance-
86 related content, as well as more general stressful or traumatic world events. The final
87 pathway proposes that the fear of contagion may increase levels of stress and
88 orthorexia-based cognitions, and subsequently increase the risk of disordered eating
89 behaviours. Other authors also highlight the potential impact of food insecurity
90 including financial ability to purchase binge foods (Touyz et al., 2020) and vulnerability
91 to increased binge episodes as a result of stockpiling or hoarding food (Cooper et al.,
92 2020; Termorshuizen et al., 2020) . Recent findings of the You-COPE study also highlight
93 the potential for emotional overeating, where one in two 16-24 year olds reported
94 overeating in response to their mood during lockdown (Pascual-Sanchez et al., 2020).

95 Data from non-clinical samples suggest that people commonly perceive changes to their
96 eating and exercise behaviours during lockdown. In a survey of over 3500 respondents
97 during Italian lockdown (Di Renzo et al., 2020), more than half of the participants
98 reported a change in their hunger and satiety perception (17% reporting reduced
99 appetite, 34% increased appetite) and most participants reported a change in their
100 consumption of “healthy” foods during lockdown (37% reported eating more, and 36%
101 eating less). Despite this, 48% of the sample perceived that they had gained weight
102 during lockdown. There was no significant change in activity levels during lockdown for
103 participants who reported that they did not engage in any exercise before; however, for
104 participants who already engaged in exercise, the frequency of training increased

105 during lockdown. Notably, the percentage of participants that reported engaging in high
106 levels of exercise (at least five times per week) significantly increased from 6% before
107 lockdown to 16% during lockdown. A recent large-scale Australian survey (Phillipou et
108 al., 2020) saw variations in exercise behaviours, with 35% of the general population
109 sample ($n = 5289$) reporting more exercise than before the pandemic, but almost half
110 (43%) reporting less exercise. Therefore, there is clear evidence that lockdown has
111 impacted on perceived changes in eating and exercise behaviours internationally in the
112 general population. However, individual differences in response suggest a more
113 complex picture than that perceived and communicated by the media.

114 There is also preliminary evidence of an increase in disordered eating. In the Australian
115 survey by Phillipou and colleagues (2020), the majority of the general population
116 reported no change in disordered eating during lockdown; however, 27% reported a
117 greater level of food restriction than before COVID-19 and 34% reported increased
118 binge eating behaviours, despite reporting no previous eating disorder history. In a
119 small-scale study from Spain (Fernández-Aranda et al., 2020), one third of individuals
120 with an eating disorder reported a deterioration in eating disorder symptoms. Similarly,
121 a significant proportion of people with an eating disorder ($n=180$) within the Australian
122 study reported an exacerbation of restricting, binge eating, purging and exercise
123 behaviours, relative to before COVID-19 (Phillipou et al., 2020). Therefore, there is some
124 evidence to suggest that eating disorder psychopathology may worsen in people with
125 eating disorders, alongside the potential development of disordered eating behaviours
126 within the general population. Further evidence is required to determine who is at most
127 risk for these changes.

128 The aim of the current study was therefore to explore the perceived impact of the
129 COVID-19 related lockdown in the UK on people's eating, exercise and body image.
130 Specifically, we explored the following research questions (RQ):

- 131 1. To what extent do people perceive changes in being able to regulate eating,
132 preoccupation with food, exercise behaviour, thinking about exercise and
133 appearance concerns during lockdown?

- 134 2. Do these perceived changes vary by gender, age group, living circumstances,
135 and pre-existing mental health conditions and developmental disorders,
136 including eating disorders?
137 3. To what extent are perceived changes in eating, exercise and body image
138 associated with psychological distress?

139 **2. Methods**

140 **2.1 Study design**

141 The current study draws on data collected as part of an ongoing longitudinal survey
142 exploring the impact of COVID-19 on eating, exercise and body image.

143 **2.2 Participants**

144 Adults (18 years or older) living in the UK were invited to take part in a study on the
145 impact of lockdown on body image and eating behaviours. Participants were recruited
146 online between May and June 2020 using advertisements shared on social media by the
147 research team. Additionally, a Facebook targeted advertisement was run for one week
148 (June 15-22) in attempt to increase the number of male participants. A total
149 of 404 unique respondents entered the survey between 11th May and 26th June 2020. Of
150 these, 87 did not consent to take part and four were not living in the UK. From the
151 remaining 313, we only used data from those who had answered the set
152 of questions about how they had been affected by the COVID-19 lockdown. This gave a
153 total of 264 respondents for this study.

154 **2.3 Measures**

155 **2.3.1 Demographic information**

156 Participants were asked to provide a range of demographics including their age, gender
157 (man, woman, other), ethnicity (White; Black, African, Caribbean, Black British; Asian,
158 Asian British; mixed/multiple ethnic groups; other), and education level (secondary
159 school or equivalent, college/vocational training/apprenticeship; undergraduate
160 degree, postgraduate degree, other). For analysis, age was categorised into <30 years vs.
161 30+ years to capture potential differences for participants during the period of
162 emerging adulthood, which is often operationalised as 18 years to mid-late 20s (Arnett,
163 2000).

164 Additionally, in relation to COVID-19 specific circumstances, participants were asked to
165 indicate their current country of residence (England, Scotland, Wales, Northern Ireland,
166 other), and current living arrangements (living alone, living with family, living with
167 friend/s, living with romantic partner/s, living with roommate/s, living with
168 stranger/acquaintances in short-term/temporary housing, other).

169 **2.3.2 Mental health and developmental disorder history**

170 Participants were asked several questions about mental health diagnoses. First, they
171 were asked if they had ever been diagnosed with an eating disorder, another mental
172 health disorder, or developmental disorder (yes, no, I'm not sure). Where participants
173 indicated that they had an eating disorder diagnosis, mental health or developmental
174 disorder diagnosis, they were also asked to specify the diagnosis.

175 **2.3.3 Perceived changes in eating, exercise and body image**

176 As participants' eating attitudes and behaviour, exercise behaviours and body
177 image were unknown before the UK lockdown, we developed a measure to capture
178 perceived changes in behaviour specifically for this study. The measure consisted
179 of nine statements set in the timeframe of 'since the lockdown began'. Five of these
180 items are the focus of the current study: "I have found it more difficult to regulate or
181 control my eating"; "I have become more preoccupied with food/eating"; "I have been
182 exercising more", "I have been thinking about exercise more", and "I've been more
183 concerned about the way that I look".¹ All questions were answered using a 5-point
184 Likert scale, from strongly disagree (1) to strongly agree (5).

185 **2.3.4 Psychological distress**

186 Psychological distress was captured using the 4-item version of the Patient Health
187 Questionnaire (PHQ-4) (Kroenke, Spitzer, Williams, & Löwe, 2009). This measure asks
188 about symptoms of anxiety and depression in the past 2 weeks. The total score is a
189 composite of the 4 items, with a possible range of 0 to 12. The PHQ-4 has demonstrated
190 excellent psychometric properties in both clinical samples and the general population
191 (Kroenke et al., 2009; Löwe et al., 2010).

¹ The remaining four items were excluded from this study as they were only applicable to people who were dieting: "I have found it more difficult to eat according to my rules", "I have found it easier to avoid eating food(s) I shouldn't eat", "I have found it more difficult to resist temptations (avoid "cheating" on my diet)", "I have become more rigid in sticking to rules about what, when, and how much I eat"

192 **2.4 Procedure**

193 The project received ethical approval from the University of Edinburgh (Ref: STAFF181,
194 05/06/20). The survey was hosted online using Qualtrics, to which participants were
195 directed through a link on the study advertisements. After following the link,
196 participants were presented with further information about the study aims, use of their
197 data and their rights. Participants were required to consent to take part before entering
198 the main body of the survey. In this main part of the survey, participants were asked to
199 provide demographic information, to complete a range of standardised measures
200 related to dieting, disordered eating and mood, as well as perceived changes in exercise,
201 eating behaviour and body image since the lockdown began. At the end of the survey,
202 participants were thanked for their time, informed that they would be contacted again
203 for a follow up survey, and provided with the researchers' contact details. As the survey
204 had asked questions about coping with the lockdown and mental health, online
205 resources for support were signposted.

206 **2.5 Data analysis**

207 There were minimal missing data ($n < 3$ for all variables, other than past/present mental
208 health diagnosis, in which $n = 11$ were missing). Given this, we used pairwise deletion
209 meaning n varies slightly between analyses.

210 We used descriptive statistics and histograms to explore the extent to which people
211 reported perceived changes in eating, exercise and body image during lockdown (RQ1).
212 Given the single item ordinal scales, we compared the extent of perceived changes by
213 age (under 30 years vs. 30+ years), gender (male vs. female), living circumstances
214 (living alone vs. not living alone), and current or past diagnosis (dx) of mental health
215 condition or developmental disorder (No dx vs. current/past ED dx vs. current/past
216 other disorder dx) using Kruskal-Wallis tests. In all cases of significant differences, post
217 hoc pairwise comparisons were Bonferroni-adjusted for multiple tests, and the
218 reported p values reflect the adjusted p value (RQ2). Spearman's rank correlation
219 coefficients (with Bonferroni-adjusted p values) were used to explore the association
220 between extent of perceived changes and psychological distress (RQ3). In all analyses,
221 alpha was set to 0.05.

222 **3. Results**

223 **3.1 Sample characteristics**

224 The sample was predominantly women (78.0%, n = 206), of White ethnicity (92.0%, n =
225 243), with an undergraduate degree (81.4%, n = 215). Age ranged from 18 to 79 years,
226 with 42% (n=111) aged 18-29 years, and 58% (n=151) aged 30+ years (2 participants
227 did not provide their age). The majority of the sample were living with other people
228 (friends, family, flatmates) during lockdown (85.23%, n = 225), with only 15% living
229 alone (n = 39). Thirty-five (13.8%) participants reported a current or past diagnosis of
230 an eating disorder, 93 reported a current or past diagnosis of another mental health
231 condition or developmental disorder (n = 128, 36.8%), with half reporting no current or
232 past diagnoses (n = 125, 49.4%) (11 participants either did not provide a response or
233 said they did not know if they had ever received a diagnosis of a mental
234 health/developmental disorder). Based on the PHQ-4 measure, 19% (n = 50) reported
235 psychological distress in the low/mild range, and 11% (n=30) reported distress in the
236 moderate/severe range.

237 **3.2 To what extent do people perceive changes in being able to regulate eating, 238 preoccupation with food, exercise behaviour, thinking about exercise and 239 appearance concerns during lockdown?**

240 Table 1 shows the frequencies with which people agreed with each statement regarding
241 changes in eating, exercise and body image during lockdown. There were clear
242 individual differences across each of the domains, with the sample endorsing the full
243 range of response options. Just over half of the sample reported that it was more
244 difficult to regulate or control their eating, with 60% reporting that they were more
245 preoccupied with food/eating. Half the sample reported exercising more during
246 lockdown, and over two thirds reported thinking more about exercise. Just under half
247 agreed that they had been more concerned about their appearance during lockdown.

248 **3.3 Do these perceived changes vary by gender, age group, living circumstances, 249 and pre-existing mental health conditions?**

250 Table 2 shows the results of the Kruskal-Wallis tests comparing perceived changes by
251 demographic characteristics. In general, women reported greater perceived changes
252 than men, specifically being more likely to report finding it more difficult to control or

253 regulate eating, being more preoccupied with food/eating, exercising more, and having
254 increasing concerns about their appearance.

255 Age was also associated with differential perceived changes, although across fewer
256 domains. Specifically, younger people (i.e. those aged <30 years) were more likely to
257 report thinking more about exercise and also having increasing concerns about their
258 appearance during lockdown. In contrast, there were no differences by age group in
259 perceived changes to eating.

260 Living alone versus living with other people was not associated with differences in rates
261 of perceived changes to eating, exercise or body image.

262 Finally, pre-existing diagnoses of mental health and developmental disorders were
263 associated with differential rates in perceived changes across all domains (illustrated in
264 Figure 1). Specifically, compared to those without a history of mental health problems
265 or developmental disorders, those with a current or past diagnosis of an ED were
266 significantly more likely to report increased difficulties in controlling/regulating eating,
267 increased preoccupation with food, increased exercise thoughts and behaviours, and
268 increased concerns about appearance. In all domains except regulation of eating, those
269 with ED also reported significant increases compared to those with other mental health
270 conditions or developmental disorders.

271 **3.4 To what extent are perceived changes in eating, exercise and body image** 272 **associated with psychological distress?**

273 There was a significant correlation between psychological distress and finding it more
274 difficult to control/regulate one's eating ($r_s = 0.36$, $p < 0.001$, $n = 262$), being more
275 preoccupied with food/eating ($r_s = 0.29$, $p < 0.001$, $n = 262$), thinking more about
276 exercise ($r_s = 0.17$, $p = 0.02$, $n = 262$) and being more concerned about one's appearance
277 ($r_s = 0.41$, $p < 0.001$, $n = 264$). In contrast, there was no significant association between
278 psychological distress and perceived changes in exercise ($r_s = -0.14$, $p = 0.10$, $n = 262$).
279 Note that all reported p values are Bonferroni-adjusted.

280 **4. Discussion**

281 This study explored perceived changes in body image, eating and exercise behaviours
282 within the general population of the UK during the early stages of the COVID-19

283 pandemic-related 'lockdown' measures. Consistent and regular media messages
284 throughout this period have focused on the potential negative impact of increased
285 sedentary lifestyle and dysregulated eating behaviours within the general population.
286 Our study suggests a more complex picture, with large individual differences in
287 perceived impact, and differential rates of perceived change based on demographic
288 characteristics and pre-existing mental health conditions, particularly eating disorders.

289 Firstly, women (and to some extent young people) were disproportionately more likely
290 to report changes in thoughts and behaviours, including finding it more difficult to
291 regulate eating, being more preoccupied with food and having increasing concerns
292 around appearance. This finding mirrors other studies showing a disproportionate
293 negative mental health impact of COVID-19 on women (Banks & Xu, 2020; Pierce et al.,
294 2020). Further work will be needed to understand mechanisms underpinning these
295 changes, but potential explanations could include heightened levels of stress and
296 anxiety (Murray, Byrne, & Rieger, 2011) resulting from increased caregiving
297 responsibilities, exposure to increased weight stigma via public health and social media
298 messaging regarding obesity and COVID-19 (Pearl, 2020), as well as increased saliency
299 of food and eating as a result of shopping restrictions and changes to daily routines.

300 Interestingly, women and younger people also reported exercising more during
301 lockdown. This could represent an improvement in health behaviours, or reflect more
302 compulsive behavioural changes driven by heightened anxiety and weight and shape
303 concerns (Meyer, Taranis, Goodwin, & Haycraft, 2011). Physical activity may also
304 improve mood and mental health (Liao, Shonkoff, & Dunton, 2015; Schuch & Stubbs,
305 2019) and thus might be used as a coping strategy. Interestingly though, in the current
306 study distress was associated only with thinking about exercise more, and not a
307 perceived increase in exercise behaviour. This could signal that exercise-related
308 thoughts were driven more by appearance concerns than physical benefits, or simply
309 that during lockdown it was not possible for people to visit gyms or engage in their
310 usual levels of physical activity.

311 Body dissatisfaction and cognitive biases are important risk and maintenance factors
312 for disordered eating (e.g. Neumark-Sztainer, Story, Faibisch, Ohlson, & Adamiak, 1999;
313 Williamson, White, York-Crowe, & Stewart, 2004). Therefore, these findings may

314 provisionally support concerns that COVID-19 lockdown may be a catalyst for the
315 development of these difficulties (e.g., Rodgers et al., 2020), with women potentially
316 being at greater risk. Following the trajectories of these groups as lockdown measures
317 ease will be vital in determining any longer-term implications of these perceived
318 changes.

319 Second, those with past or current eating disorders showed particularly elevated rates
320 of perceived change in body image, eating and exercise. It has been noted that measures
321 associated with lockdown (e.g., social isolation, restricted food shopping) may present
322 particular challenges to those with eating disorders (Rodgers et al., 2020; Touyz et al.,
323 2020), and this is supported by our findings. Notably, perceived increases in being
324 preoccupied with food, thoughts about exercise and appearance concerns were greater
325 in those with eating disorders, even compared to those with a history of other mental
326 health conditions or developmental disorders. This suggests deterioration in the
327 specific pathology associated with eating disorders that should be considered.

328 These findings indicate that we may see an increase in demand for UK eating disorder
329 services as existing service users may experience more severe symptoms, and there is
330 potential for an increase in new disordered eating presentations. This appears to be
331 provisionally supported by UK-based third sector organisations seeing significant
332 increase in demand for services during lockdown (Turnbridge, 2020). This would have
333 implications for health services at a critical point of COVID-related restructuring and
334 associated social distancing constraints on the delivery of traditional interventions
335 (Davis et al., 2020; Touyz et al., 2020; Weissman et al., 2020), alongside an increase in
336 weight- and diet-orientated media messages, as a result of the launch of Public Health
337 England's Obesity Strategy (Department of Health and Social Care, 2020). Increasing
338 freely available self-help resources, digital delivery and investment in early intervention
339 approaches should be promoted at this time, alongside careful consideration of any
340 risks associated with obesity related public health messages.

341 A third key finding was that greater perceived changes in eating and body image (and to
342 a lesser extent exercise) were significantly associated with elevated psychological
343 distress. Given the cross-sectional nature of these baseline data, it is not possible to
344 determine whether increased distress during lockdown might be driving more

345 disordered eating thoughts and behaviours, or whether those who were already
346 distressed may be using eating as a new coping mechanism when constrained in other
347 coping skills. Given that overall levels of psychological distress in this study were in line
348 with norms reported prior to the pandemic (Löwe et al., 2010), the latter may be more
349 probable. Future longitudinal work will be needed to explore this further, and this may
350 have significant implications for our understanding of the relationship between
351 significant psychosocial stressors and eating behaviours across the population. By
352 understanding underpinning mechanisms associated with these eating behaviours we
353 may begin to develop more targeted, and potentially more effective, public health
354 approaches to weight management.

355 There are some limitations of the current study that should be considered. First, our
356 recruitment strategy relied on people self-selecting to take part, which may mean that
357 our sample is biased towards those interested in health behaviours. Our participants
358 were recruited through social media platforms, and the survey was hosted online.
359 Therefore, our sample is likely to be biased towards individuals with internet access
360 and who actively use social media. For some analyses, we had small and unequal group
361 sample size, especially in the ED group, meaning it was not possible to differentially
362 explore current vs past diagnosis of an ED participants, nor between specific diagnoses
363 in the comparator group (e.g., depression, anxiety). Second, because of the lockdown
364 timing we were unable to obtain a baseline measures of body image, exercise and
365 eating, and therefore were reliant on self-reported changes using an unvalidated
366 measure; this limitation also affects other studies conducted during the lockdown
367 period (e.g. Di Renzo et al., 2020). Although we only required participants to report
368 change rather than actual eating or eating behaviour, we cannot objectively validate the
369 accuracy of these data. Third, the cross-sectional nature of the study means we can only
370 establish relationships between variables, rather than temporality or causality. As the
371 study will involve follow-up rounds, we can examine temporal relationships between
372 variables in more detail and the longer-term impact of changes within groups in later
373 survey sweeps. Finally, our findings do not address the nature of the mechanisms
374 underlying the perceived changes in eating and exercise behaviours. These mechanisms
375 need to be investigated further to identify why some individuals experienced greater
376 changes than others, to inform prevention and intervention strategies.

377 In conclusion, adults in the UK report a wide range of changes to their eating- and
378 exercise-related thoughts and behaviours, as well as their body image, during the
379 lockdown associated with this pandemic. Growing challenges with regulating food
380 consumption, being more preoccupied with food and worsening body image are all
381 linked with psychological distress. Importantly, some groups appear to be more
382 susceptible to these changes, with women, young people and those with pre-existing
383 mental health problems – especially eating disorders – being at heightened risk.
384 Ongoing research to explore the full range of experiences and individual differences in
385 the trajectories of change in eating, exercise and body image as lockdown measures
386 ease will be important for understanding the full psychological impact of this pandemic
387 and improve service and public health planning going forward.

388
389
390

391 **Acknowledgements:** We are very grateful to all participants who volunteered to take
392 part in this study

393 **Author Contributions:** MR, EN and HS conducted data preparation and analysis. All
394 authors conceived of the study and contributed to writing the manuscript. All authors
395 have reviewed and approved the final article.

396 **Funding:** This research did not receive any specific grant from funding agencies in the
397 public, commercial, or not-for-profit sectors.

398 **Figure Captions:** Figure 1. Bar charts showing extent of perceived changes in eating,
399 exercise and body image, by mental health history.

400

401 **References**

- 402 Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens
403 through the twenties. *American Psychologist*, 55(5), 469. doi:10.1037/0003-
404 066X.55.5.469
- 405 Banks, J., & Xu, X. (2020). *The mental health effects of the first two months of lockdown*
406 *and social distancing during the Covid-19 pandemic in the UK. Institute for Fiscal*
407 *Studies Working Paper W20/16*. Retrieved from
408 <https://www.ifs.org.uk/publications/14874>
- 409 Cooper, M., Reilly, E. E., Siegel, J. A., Coniglio, K., Sadeh-Sharvit, S., Pisetsky, E., &
410 Anderson, L. (2020). Eating disorders during the COVID-19 pandemic: An
411 overview of risks and recommendations for treatment and early intervention.
412 *Eating Disorders*. doi:10.1080/10640266.2020.1790271
- 413 Davis, C., Chong, N. K., Oh, J. Y., Baeg, A., Rajasegaran, K., & Chew, C. S. E. (2020). Caring
414 for children and adolescents with eating disorders in the current COVID-19
415 pandemic: A Singapore perspective. *Journal of Adolescent Health*. doi:
416 <https://doi.org/10.1016/j.jadohealth.2020.03.037>
- 417 Department of Health and Social Care. (2020). *Tackling obesity: empowering adults and*
418 *children to live healthier lives*. Retrieved from
419 [https://www.gov.uk/government/publications/tackling-obesity-government-](https://www.gov.uk/government/publications/tackling-obesity-government-strategy)
420 [strategy](https://www.gov.uk/government/publications/tackling-obesity-government-strategy).
- 421 Di Renzo, L., Gualtieri, P., Pivari, F., Soldati, L., Attinà, A., Cinelli, G., . . . Scerbo, F. (2020).
422 Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey.
423 *Journal of Translational Medicine*, 18(1), 1-15.
- 424 Fancourt, D., Bu, F., Mak, H. W., & Steptoe, A. (2020). *Covid-19 Social Study. Results*
425 *Release 22*. Retrieved from [https://b6bdcb03-332c-4ff9-8b9d-](https://b6bdcb03-332c-4ff9-8b9d-28f9c957493a.filesusr.com/ugd/3d9db5_636933e8191d4783866c474fab3ca23c.pdf)
426 [28f9c957493a.filesusr.com/ugd/3d9db5_636933e8191d4783866c474fab3ca23](https://b6bdcb03-332c-4ff9-8b9d-28f9c957493a.filesusr.com/ugd/3d9db5_636933e8191d4783866c474fab3ca23c.pdf)
427 [c.pdf](https://b6bdcb03-332c-4ff9-8b9d-28f9c957493a.filesusr.com/ugd/3d9db5_636933e8191d4783866c474fab3ca23c.pdf)
- 428 Fernández-Aranda, F., Casas, M., Claes, L., Bryan, D. C., Favaro, A., Granero, R., . . . Le
429 Grange, D. (2020). COVID-19 and implications for eating disorders. *European*
430 *Eating Disorders Review*, 28(3), 239. doi: <https://doi.org/10.1002/erv.2738>
- 431 Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., . . .
432 Overall, I. (2020). Multidisciplinary research priorities for the COVID-19

- 433 pandemic: a call for action for mental health science. *The Lancet Psychiatry*. doi:
434 [https://doi.org/10.1016/S2215-0366\(20\)30168-1](https://doi.org/10.1016/S2215-0366(20)30168-1)
- 435 Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2009). An ultra-brief screening
436 scale for anxiety and depression: the PHQ-4. *Psychosomatics*, *50*(6), 613-621.
- 437 Liao, Y., Shonkoff, E. T., & Dunton, G. F. (2015). The acute relationships between affect,
438 physical feeling states, and physical activity in daily life: a review of current
439 evidence. *Frontiers in Psychology*, *6*, 1975.
- 440 Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K., . . . Brähler, E.
441 (2010). A 4-item measure of depression and anxiety: validation and
442 standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general
443 population. *Journal of Affective Disorders*, *122*(1-2), 86-95.
- 444 Meyer, C., Taranis, L., Goodwin, H., & Haycraft, E. (2011). Compulsive exercise and eating
445 disorders. *European Eating Disorders Review*, *19*(3), 174-189.
- 446 Murray, K. M., Byrne, D. G., & Rieger, E. (2011). Investigating adolescent stress and body
447 image. *Journal of Adolescence*, *34*(2), 269-278.
- 448 Naja, F., & Hamadeh, R. (2020). Nutrition amid the COVID-19 pandemic: a multi-level
449 framework for action. *European Journal of Clinical Nutrition*, 1-5.
- 450 Neumark-Sztainer, D., Story, M., Faibisch, L., Ohlson, J., & Adamiak, M. (1999). Issues of
451 self-image among overweight African-American and Caucasian adolescent girls:
452 A qualitative study. *Journal of Nutrition Education*, *31*(6), 311-320.
453 doi:[https://doi.org/10.1016/S0022-3182\(99\)70484-X](https://doi.org/10.1016/S0022-3182(99)70484-X)
- 454 Pascual-Sanchez, A., Nicholls, D., Patalay, P., Crosby, L., McColoud, T., Hudson, L., . . .
455 Viner, R. (2020). *You-COPE. Mental health consequences experienced by young*
456 *people aged 16-24 during first months of the COVID-19 lockdown*. Retrieved from
457 [https://www.ucl.ac.uk/child-health/sites/child-](https://www.ucl.ac.uk/child-health/sites/child-health/files/youcope_briefing_mental_health_impact_final_version.pdf)
458 [health/files/youcope_briefing_mental_health_impact_final_version.pdf](https://www.ucl.ac.uk/child-health/sites/child-health/files/youcope_briefing_mental_health_impact_final_version.pdf)
- 459 Pearl, R. L. (2020). Weight Stigma and the “Quarantine-15”. *Obesity*.
- 460 Phillipou, A., Meyer, D., Neill, E., Tan, E. J., Toh, W. L., Van Rheenen, T. E., & Rossell, S. L.
461 (2020). Eating and exercise behaviors in eating disorders and the general
462 population during the COVID-19 pandemic in Australia: Initial results from the
463 COLLATE project. *International Journal of Eating Disorders*. doi:
464 <https://doi.org/10.1002/eat.23317>

- 465 Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., . . . McManus, S. (2020).
466 Mental health before and during the COVID-19 pandemic: a longitudinal
467 probability sample survey of the UK population. *The Lancet Psychiatry*.
- 468 Rodgers, R. F., Lombardo, C., Cerolini, S., Franko, D. L., Omori, M., Fuller-Tyszkiewicz, M.,
469 . . . Guillaume, S. (2020). The impact of the COVID-19 pandemic on eating
470 disorder risk and symptoms. *International Journal of Eating Disorders*. doi:
471 <https://doi.org/10.1002/eat.23318>
- 472 Schuch, F. B., & Stubbs, B. (2019). The role of exercise in preventing and treating
473 depression. *Current sports medicine reports*, 18(8), 299-304.
- 474 Termorshuizen, J. D., Watson, H. J., Thornton, L. M., Borg, S., Flatt, R. E., MacDermod, C.
475 M., . . . Bulik, C. M. (2020). Early impact of COVID-19 on individuals with self-
476 reported eating disorders: A survey of ~1,000 individuals in the United States
477 and the Netherlands. *International Journal of Eating Disorders*, n/a(n/a).
478 doi:10.1002/eat.23353
- 479 Touyz, S., Lacey, H., & Hay, P. (2020). Eating disorders in the time of COVID-19. *Journal*
480 *of eating disorders*, 8(19). doi:<https://doi.org/10.1186/s40337-020-00295-3>
- 481 Turnbridge, S. (2020). Eating Disorder Charity Sees 70% Increase In Calls For Help
482 During Lockdown. *Huffington Post*. Retrieved from
483 [https://www.huffingtonpost.co.uk/entry/eating-disorder-coronavirus-
484 lockdown-
485 beat_uk_5f0c605ac5b6480493d2fe80?guccounter=1&guce_referrer=aHR0cHM6
486 Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAizPJ0rq2YcAA_IBX5Eu0
487 PawFR39l3KIje7Lbi1ekGLdA3eYYmQNSN6ZdZqHlQiPJ6ZFjQsvMRXG_aft_MUEU
488 8GAR2lvF_NA66zgsSW3uMjBxQ_psrhQrksg28m-
489 pbAQ108RdoBfw0B9pv_6yL9xBJLOkL_sCslgd9ROTEKA0-v](https://www.huffingtonpost.co.uk/entry/eating-disorder-coronavirus-lockdown-beat_uk_5f0c605ac5b6480493d2fe80?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAizPJ0rq2YcAA_IBX5Eu0PawFR39l3KIje7Lbi1ekGLdA3eYYmQNSN6ZdZqHlQiPJ6ZFjQsvMRXG_aft_MUEU8GAR2lvF_NA66zgsSW3uMjBxQ_psrhQrksg28m-pbAQ108RdoBfw0B9pv_6yL9xBJLOkL_sCslgd9ROTEKA0-v)
- 490 Weissman, R. S., Bauer, S., & Thomas, J. J. (2020). Access to evidence-based care for
491 eating disorders during the COVID-19 crisis. *International Journal of Eating*
492 *Disorders*, 53(5), 639-646. doi:<https://doi.org/10.1002/eat.23279>
- 493 Williamson, D. A., White, M. A., York-Crowe, E., & Stewart, T. M. (2004). Cognitive-
494 behavioral theories of eating disorders. *Behavior Modification*, 28(6), 711-738.
495 doi:<https://doi.org/10.1177/0145445503259853>

Table 1 Frequencies of response options for perceived changes in eating, exercise and body image

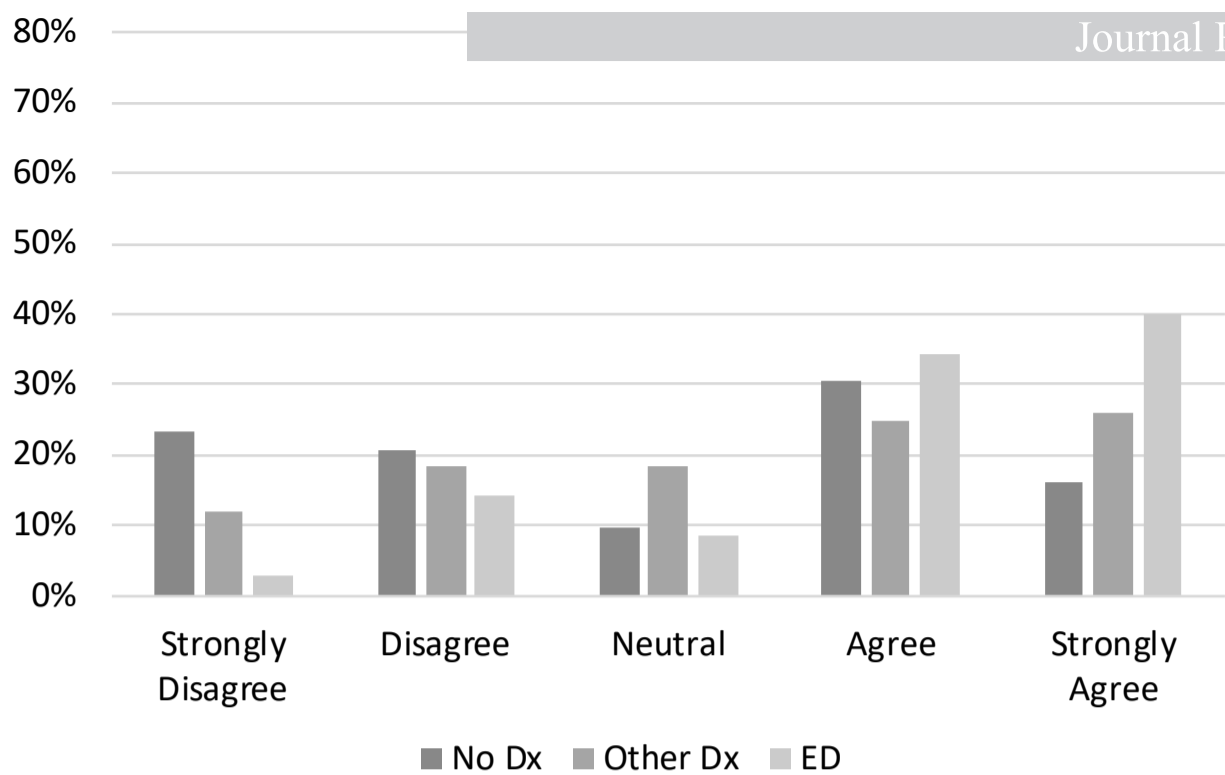
	Strongly Disagree N (%)	Disagree N (%)	Neutral N (%)	Agree N (%)	Strongly Agree N (%)
More difficult to control or regulate eating	42 (16.0%)	49 (18.7%)	32 (12.2%)	77 (29.4%)	62 (23.7%)
More preoccupied with food/eating	25 (9.5%)	37 (14.1%)	44 (16.8%)	99 (37.8%)	57 (21.8%)
Exercising more	45 (17.2%)	51 (19.5%)	34 (13.0%)	66 (25.2%)	66 (25.2%)
Thinking about exercise more	20 (7.6%)	29 (11.0%)	36 (13.7%)	86 (32.7%)	92 (35.0%)
More concerned about the way I look	28 (10.6%)	56 (21.2%)	52 (19.7%)	56 (21.2%)	72 (27.3%)

Table 2. Results of Kruskal-Wallis (KW) tests comparing perceived changes in eating, exercise and body image by demographic characteristics

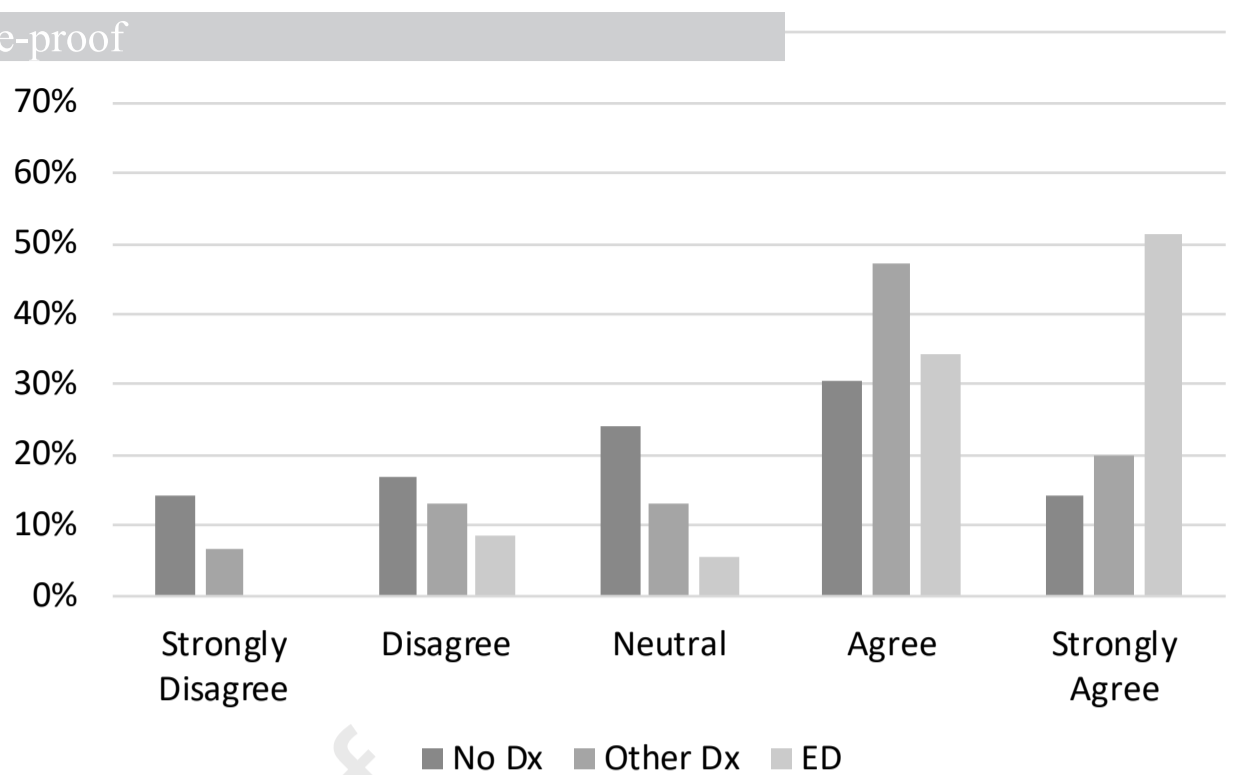
		Gender	Age	Living circumstances	Mental health
More difficult to control or regulate eating	KW Test	$X^2 (1) = 13.93,$ $p < 0.001$	$X^2 (1) = 1.18,$ $p = 0.27$	$X^2 (1) = 0.45,$ $p = 0.50$	$X^2 (2) = 13.75,$ $p = 0.001$
	Post hoc comparisons	Female > Male	N/A	N/A	ED > No Dx
More preoccupied with food/eating	KW Test	$X^2 (1) = 14.00,$ $p < 0.001$	$X^2 (1) = 2.43,$ $p = 0.12$	$X^2 (1) = 0.23,$ $p = 0.63$	$X^2 (2) = 25.78,$ $p < 0.001$
	Post hoc comparisons	Female > Male	N/A	N/A	ED > No Dx ED > Other Dx Other Dx > No Dx
Exercising more	KW Test	$X^2 (1) = 4.21,$ $p < 0.04$	$X^2 (1) = 1.59,$ $p = 0.21$	$X^2 (1) = 0.93,$ $p = 0.34$	$X^2 (2) = 12.30,$ $p = 0.002$
	Post hoc comparisons	Female > Male	N/A	N/A	ED > No Dx ED > Other Dx
Thinking about exercise more	KW Test	$X^2 (1) = 3.01,$ $p = 0.08$	$X^2 (1) = 12.20,$ $p < 0.001$	$X^2 (1) = 0.33,$ $p = 0.57$	$X^2 (2) = 14.34,$ $p < 0.001$
	Post hoc comparisons	N/A	Younger > Older	N/A	ED > No Dx ED > Other Dx

More concerned about the way I look	KW Test	$X^2 (1) = 14.03,$ $p < 0.001$	$X^2 (1) = 12.57,$ $p < 0.001$	$X^2 (1) = 0.02,$ $p = 0.88$	$X^2 (2) = 21.71,$ $p < 0.001$
	Post hoc comparisons	Female > Male	Younger > Older	N/A	ED > No ED > Other Dx

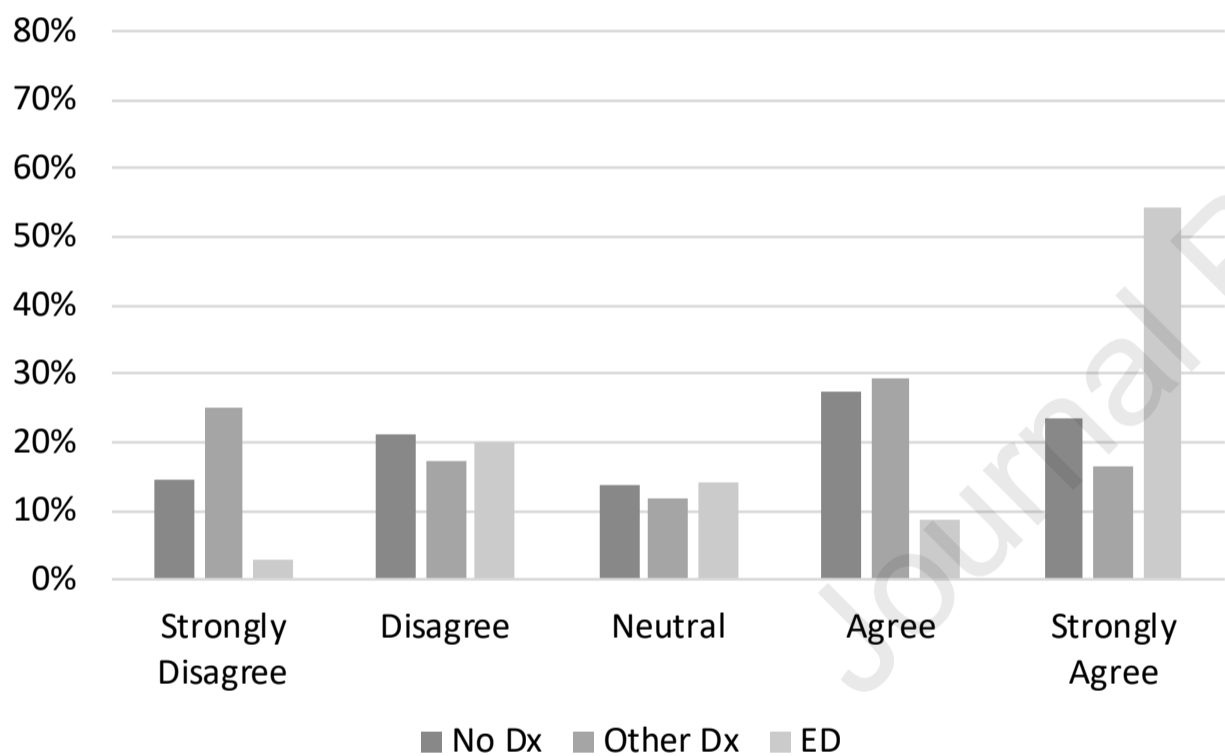
More difficult to regulate/control eating



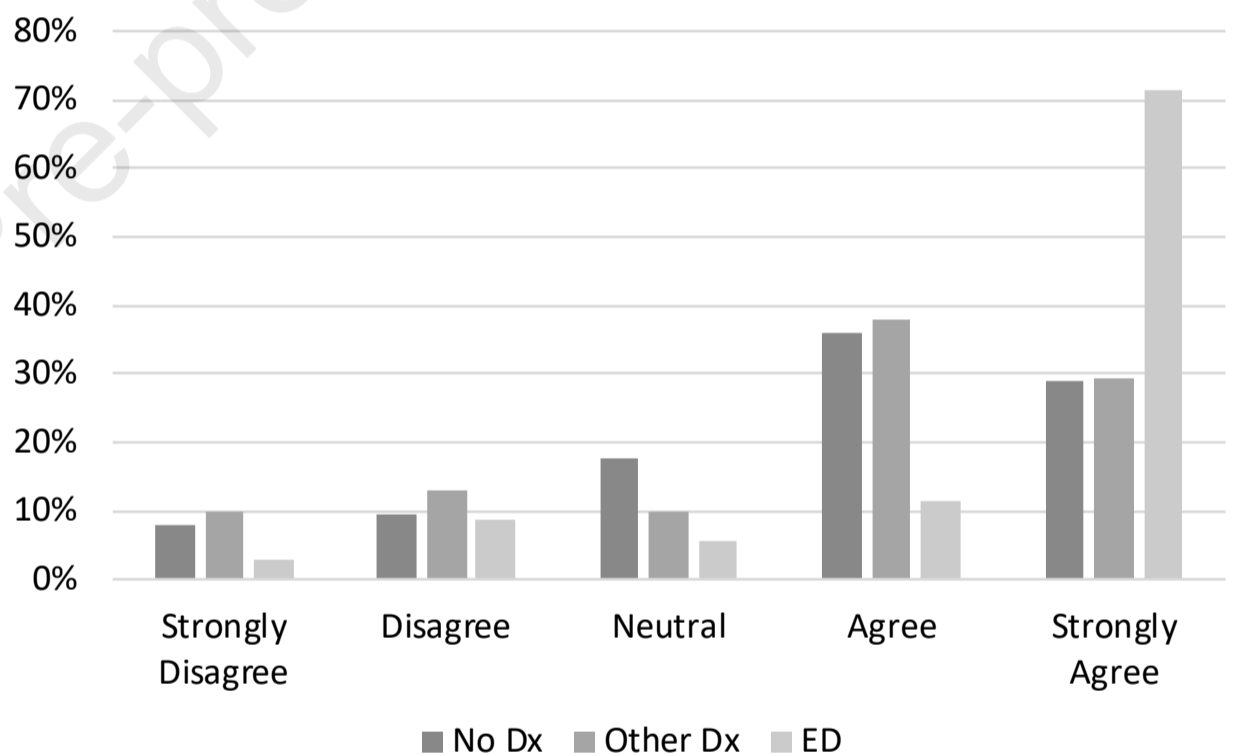
More preoccupied with food/eating



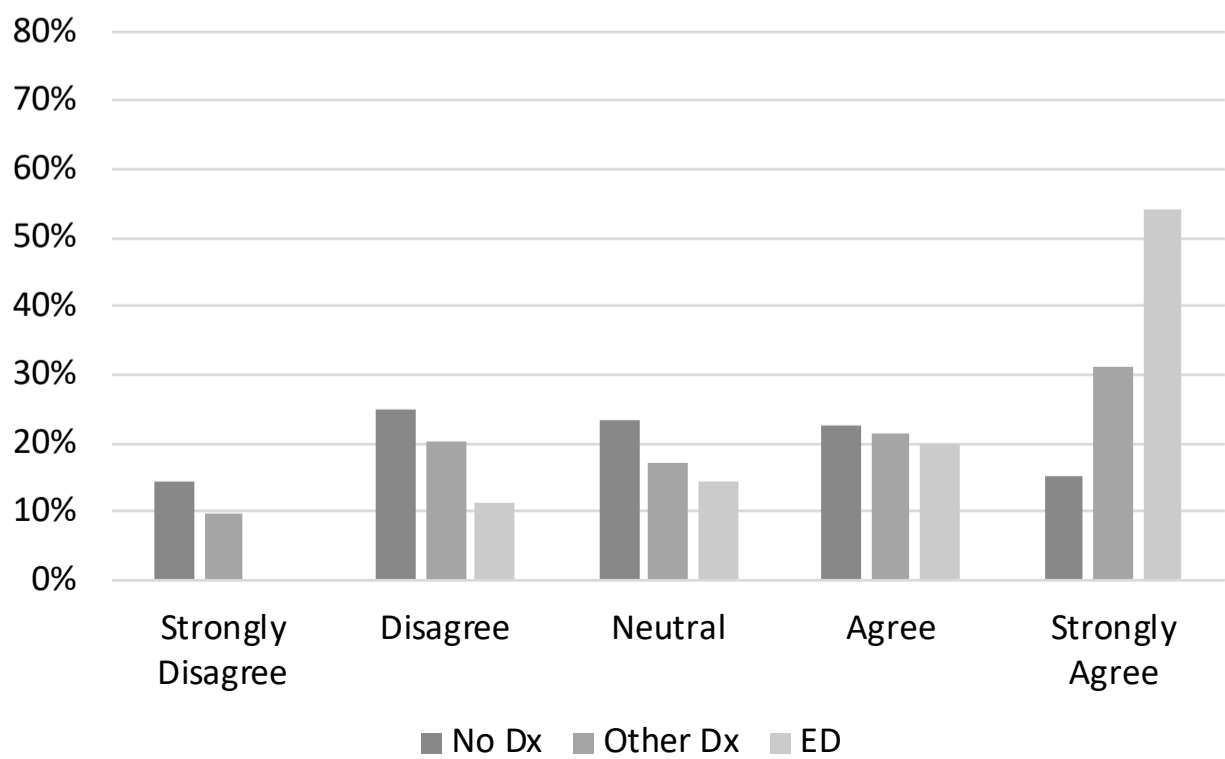
Exercising more



Thinking about exercise more



More concerned about the way I look



**A Qualitative Exploration of the Impact of COVID-19 on Individuals with Eating Disorders in the
UK**

Ethical statement

Ethical approval for this study provided by the University of Edinburgh School of Health in Social Science Research Ethics Committee. (Ref: STAFF181, 05/06/20). All participants provide informed consent prior to taking part in this study.

Journal Pre-proof