

Full title: Eating and Exercise Behaviours in Eating Disorders and the General Population  
During the COVID-19 Pandemic in Australia: Initial Results from the COLLATE Project

Short running title: Eating and Exercise Behaviours, and COVID-19

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## Abstract

**Objective:** Emerging evidence suggests that the coronavirus (COVID-19) pandemic may be negatively impacting mental health. The impact on eating and exercise behaviours is, however, currently unknown. This study aimed to identify changes in eating and exercise behaviours in an Australian sample among individuals with an eating disorder, and the general population, amidst the COVID-19 pandemic outbreak.

**Method:** 5,469 participants, 180 of whom self-reported an eating disorder history, completed questions relating to changes in eating and exercise behaviours since the emergence of the pandemic, as part of the COLLATE (COvid-19 and you: mentaL heaLth in AusTralia now survEy) project; a national survey launched in Australia on April 1<sup>st</sup> 2020.

**Results:** In the eating disorders group, increased restricting, bingeing, purging and exercise behaviours were found. In the general population, both increased restricting and bingeing behaviours were reported, but respondents reported less exercise relative to before the pandemic.

**Discussion:** The findings have important implications for providing greater monitoring and support for eating disorder patients during the COVID-19 pandemic. Additionally, the mental and physical health impacts of changed eating and exercise behaviours in the general population need to be acknowledged and monitored for potential long-term consequences.

Keywords: eating disorder; anorexia nervosa; COVID-19; coronavirus; national survey; pandemic; Australia

The novel coronavirus disease (COVID-19) is an infectious respiratory illness that first affected individuals in late 2019 in Wuhan, China, and was declared a global pandemic by the World Health Organisation (WHO) on March 11<sup>th</sup> 2020 (World Health Organisation, 2020). Since the emergence of the virus, countries around the world have implemented various levels of preventative measures and restrictions to slow or stop its spread, including ‘social distancing’ or ‘physical distancing’, which has resulted in unprecedented impacts on social interactions, employment, and the world economy. The subsequent effects on mental health are beginning to emerge, with increased levels of psychological distress, depression and anxiety reported among the general population (Li, Wang, Xue, Zhao, & Zhu, 2020; Rossell et al., under review; Wang et al., 2020). Additionally, past research has shown that disordered eating behaviours in the general population can be triggered by feelings of boredom and loneliness (Bruce & Agras, 1992), as well as feelings of distress following a disaster (Kuijer & Boyce, 2012).

Relatedly, individuals with an existing eating disorder may be at increased risk of an exacerbation of illness symptoms during the current COVID-19 pandemic, and may be vulnerable to greater levels of anxiety and stress due to increased social isolation as a result of social distancing (Touyz, Lacey, & Hay, 2020). Furthermore, anxieties around access to specific foods and/or medications, and changes to routine, social support and treatment for their illness may be triggering to their symptoms (Abbate-Daga, Amianto, Delsedime, De-Bacco, & Fassino, 2013; Levine, 2012; Schebendach et al., 2011; Steinglass et al., 2018; Tiller et al., 1997; Touyz et al., 2020). It is therefore critical to assess changes to disordered eating behaviours that have arisen following the COVID-19 pandemic.

This paper aimed to characterise changes in eating and exercise behaviours in Australia following the official announcement of the COVID-10 pandemic (i.e. data collected from 1<sup>st</sup>-4<sup>th</sup> April 2020). The specific aims of the paper were twofold: 1) to determine changes in eating

and exercise behaviours among those with a history of an eating disorder; and 2) to identify changes in eating and exercise behaviours among the general population. It was hypothesised that individuals with a self-reported eating disorder would report increased levels of four behaviours compared to before the pandemic: restricting, bingeing, purging and exercising. Increases in these behaviours were also expected in the general population, relative to before the pandemic. Patterns between the different types of eating and exercise behaviours were also examined for each of the groups.

## Method

The study received ethical approval from the Swinburne University Human Research Ethics Committee (SUHREC) and complied with the Declaration of Helsinki.

### *Design and Measures*

Initial findings of the COLLATE (COvid-19 and you: mentaL heaLth in AusTralia now survey) project in relation to changes in eating and exercise behaviours are reported here. These cross-sectional data were collected during the first COLLATE survey in April 2020. Members of the general public residing in Australia, and aged 18 years or older were invited to complete the survey, which is described in detail elsewhere (Rossell et al., under review; Tan et al., under review). Briefly, the project includes a series of anonymous online surveys, open for 72 hours from the 1<sup>st</sup>-4<sup>th</sup> of each month (for 12 months). After the initial 12 monthly surveys, annual surveys will be completed until 2024. Respondents were recruited through social media and other advertisements, participant registries and non-discriminative snowball sampling. All respondents were asked to self-identify whether they had a lived experience of a mental illness. If they responded yes to this question, they were asked to specify the mental illness/es they had

or were recovering from (with free text thereby allowing the participant to specify their mental illness unrestricted).

The first COLLATE survey included a broad range of measures aimed at assessing the mental health impact of the COVID-19 pandemic on the Australian population and will be reported in detail elsewhere (for details, see Rossell et al., under review; Tan et al., under review). Briefly, the survey was composed of a range of quantitative and qualitative questions devised by the researchers regarding the effects of the pandemic (including the eating and exercise behaviours presented here), as well as the inclusion of a battery of standard self-report psychosocial assessments to answer research questions of the broader COLLATE project. The entire survey took approximately 20 minutes to complete.

Only the relevant measures that are the focus of the current paper are described in detail here. Demographic and other relevant information was collected from participants, including whether they currently have or have had COVID-19, and if they are currently in social isolation/quarantine because of potential exposure to the virus through travel or contact with a confirmed case. Current negative mood states (over the past week) were assessed with the Depression Anxiety Stress Scale (DASS-21) which allows categorical characterisation of severity ratings of depression, anxiety and stress ranging from normal, mild, moderate, severe to extremely severe (Lovibond & Lovibond, 1996). Four questions specifically relating to eating and exercise behaviours were also included in the survey, adapted from the Eating Disorders Examination Questionnaire (EDE-Q). Participants responded on a 5-point Likert scale (1=A lot more, 2=A little more, 3=No difference, 4=A little less, and 5=A lot less). The questions were:

- 1- In the past week, have you been deliberately trying to limit the amount of food you eat or exclude any foods from your diet to influence your shape or weight - more so than before the COVID-19 pandemic? [*Restricting*']
- 2- In the past week, have you had episodes of binge eating (eating an unusually large amount of food given the circumstances) - more so than before the COVID-19 pandemic? [*Bingeing*']
- 3- In the past week, have you made yourself sick (vomit) or taken laxatives as a means of controlling your shape or weight - more so than before the COVID-19 pandemic? [*Purging*']
- 4- In the past week, have you experienced any significant changes in your exercise behaviours - more so than before the COVID-19 pandemic? [*Exercising*']

### *Statistical Analysis*

Respondents who self-identified as having an eating disorder were analysed separately to the rest of the sample to address the two aims of the study. As the questions asked about changes in eating and exercise behaviours compared to prior to the COVID-19 pandemic (and the behaviours between groups likely differed before the pandemic), it was deemed most appropriate to conduct within-group rather than between-group comparisons (i.e. to identify *changes* in behaviour for two distinct groups, not changes in behaviour between groups). Therefore, descriptive statistics are presented for the eating disorder group and general population separately. To explore rank correlations between each of the different eating and exercise behaviour variables for each group, Goodman-Kruskal gamma ( $\gamma$ ) was used, with an alpha of  $p=.0008$  ( $p=.05/6$ ) to account for multiple comparisons (i.e. each of the four variables correlated with one another resulted in a total of six correlation analyses).

## Results

A total of 8,014 individuals started the first COLLATE survey. Of this, data from 5,469 respondents who completed the eating and exercise behaviours section of the survey are presented (2,545 participants dropped out by this stage of the survey ( $n=2,542$ ) or chose to not complete this section ( $n=3$ )).

### *Eating Disorder Group*

One hundred and eighty respondents reported that they currently have or have had an eating disorder. Of these respondents, one reported having a current COVID-19 diagnosis and 11 reported being in social-isolation or quarantine because of recent travel or contact with a confirmed COVID-19 case. No respondents reported that they had recovered from COVID-19. The majority self-identified that they had a history of anorexia nervosa ( $n=88$ ), followed by bulimia nervosa ( $n=23$ ), binge eating disorder ( $n=6$ ), eating disorder not otherwise specified or other specified feeding or eating disorder (EDNOS or OSFED;  $n=4$ ); whereas  $n=68$  respondents did not specify the type of eating disorder. Of the eating disorder respondents,  $n=10$  reported that they were recovering or in recovery. 95.6% of the sample were female (1.7% male, 2.8% preferred to self-describe), with a mean age of 30.47 (SD=8.19). Reported comorbidities are presented in Table 1. Over 50% of respondents reported comorbid anxiety and mood disorders. Referring to the DASS-21 severity ratings, over 50% of respondents in the eating disorder group showed moderate to extremely severe levels of depression, anxiety and stress (see Table 2).

[Insert Table 1]

[Insert Table 2]

As seen in Figure 1, the majority of eating disorder respondents (64.5%) reported a little or a lot more food restriction. 35.5% reported increased bingeing behaviours, while 18.9% reported increased purging behaviours. Almost half of all eating disorder respondents (47.3%) reported increased exercising since the COVID-19 pandemic. These percentages have associated standard errors of between 2.9% and 3.7%.

[Insert Figure 1]

Only one significant correlation was observed between the different variables; a relatively strong positive relationship between changes in self-reported bingeing and purging behaviours in the ED group ( $\gamma=.440, p=.004$ ). No other significant correlations were apparent between the different eating or exercise behaviour variables.

#### *Anorexia Nervosa Sub-Group*

Given the high rate of anorexia nervosa reported among the eating disorder sample, further analyses were conducted on these participants separately. Of the 88 respondents reporting a history of anorexia nervosa, none currently had or had recovered from COVID-19, but four were self-isolating. 97.7% of the anorexia nervosa group were female ( $n=1$  male,  $n=1$  preferred to self-describe), and the mean age of the sample was 29.74 (7.25). Similarly to the larger eating disorder group, over 50% of the anorexia nervosa group reported comorbid anxiety or depressive disorders, and over 50% showed moderate to extremely severe levels of depression, anxiety and stress (see Tables 1 and 2).

Changes to eating and exercise behaviours in the anorexia nervosa group are presented in Figure 2. Increased restricting behaviours were observed in 67.1% of this sub-group, whereas 20.5% reported increased bingeing and 18.2% reported increased purging. Almost half of the anorexia nervosa group (48.9%) reported increased exercise. These percentages have associated standard errors of between 4.1% and 5.0%.

[Insert Figure 2]

No significant correlations were found between the different eating or exercise behaviour variables in the anorexia nervosa sub-group.

### *General Population*

5,289 respondents who did not report a history of an eating disorder were included in the general population analyses. 80.0% of this sample were female (17.9% male, 2.1% preferred to self-describe or missing), with a mean age of 40.62 (SD=13.67). Nine respondents reported currently having COVID-19, one reported that they had recovered from the virus, and 119 reported that they were in social isolation or quarantine following recent travel or contact with a confirmed COVID-19 case. Most respondents in the general population sample showed 'normal' levels of depression, anxiety and stress (see Table 2).

The majority of the general population reported no change in the amount of food they restricted, or their bingeing or purging behaviours. However, 27.6% of the general population reported a greater level of food restriction than before COVID-19, and 34.6% reported increased bingeing behaviours. Exercise behaviours varied within the group, with 34.8%

reporting more exercise than before the COVID-19 pandemic, but almost half (43.4%) reporting less exercise (see Figure 3).

[Insert Figure 3]

A number of significant correlations between these behavioural changes were found, including a moderate positive relationship between self-reported bingeing and purging ( $\gamma=.273$ ,  $p<.003$ ), and a weak positive relationship between restricting and exercising ( $\gamma=.136$ ,  $p<.001$ ). There were also weak negative relationships between bingeing and exercising ( $\gamma=-.112$ ,  $p<.001$ ), and restricting and bingeing ( $\gamma=-.086$ ,  $p<.001$ ).

## Discussion

This study aimed to identify changes in eating and exercise behaviours among individuals with and without eating disorders in Australia during the early stages of the COVID-19 pandemic. The study findings have a number of important implications.

A significant proportion of the eating disorder group reported an exacerbation of restricting, bingeing, purging and exercise behaviours relative to before the pandemic, particularly increased restriction and exercising. While self-reported bingeing and purging behaviours were associated with 35.5% and 18.9% increases (and were also the only correlation apparent in this group), 64.5% of the sample reported increased restricting. In addition, exercise behaviours were either increased (47.3%) or decreased (36%) in this sample, with only 17% reporting no change in this behaviour. A similar pattern of results was observed for the anorexia nervosa-specific sub-group (but no significant correlations were found for this sample). These

findings are particularly important as they suggests that even in the early stages of the pandemic (i.e. approximately three weeks after the official announcement by the WHO), people with an existing eating disorder were already reporting changes in eating and exercise behaviours that may be reflective of an exacerbation of disordered eating symptoms. This may be due to a number of factors, including the availability of specific foods, as well as increased stress, anxiety and depressive symptoms as a result of social distancing measures. Although levels of depression, anxiety and stress were high in the eating disorder group, and were comparable to other reported statistics in Australian eating disorder samples (Linardon et al., 2018; Phillipou, Rossell, Castle, Gurvich, & Abel, 2014), because the DASS-21 assesses current negative mood states, it could not be used to determine whether the findings were in relation to worsening of these symptoms (as we did not have pre-pandemic data in this cohort). However, whether these patterns in eating and exercise behaviours continue will be evaluated through the longitudinal component of the COLLATE project, which will allow detailed statistical analyses in relation to changes in depression, stress and anxiety. It is also, however, important to note that a small portion of the sample also reported decreased restricting (8%) and bingeing (8%), and may reflect a different trajectory of symptoms in some individuals with an eating disorder. Similarly, a small number of participants in the general population sample also showed reduced restricting (13%) and bingeing (5%) behaviours.

Although the general population were found to restrict and binge more often than before the pandemic, no changes in purging behaviours were found. Twenty-eight percent of the sample reported increased food restriction to influence their body weight or shape, and 35% of the sample reported increased rates of binge-eating since the COVID-19 pandemic. Changes in bingeing and restricting were negatively correlated, whereas bingeing and purging behaviours were positively correlated, as were changes in restricting and exercising. Changes to exercise varied substantially, with large proportions of the general population reporting

either more or less exercise. However, almost half of respondents reported undertaking less exercise than before the COVID-19 pandemic; though, 36% reported a greater level of exercise which may reflect positive health-related behaviour in these individuals. A negative relationship between changes in self-reported bingeing and exercising was also found, suggesting that individuals who were bingeing more were also more likely to be exercising less. These findings may be related to a number of factors, including government restrictions which have resulted in most individuals working from home, as well as the closure of gyms and sporting clubs. These findings suggest increased rates of disordered eating behaviours and changes to exercise behaviours among the general population in the early stages of the pandemic, which may lead to important negative physical health implications if these behaviours continue through the pandemic.

To our knowledge, this is the first study to assess changes in eating and exercise behaviours in relation to the COVID-19 pandemic, among individuals with eating disorders as well as the general population. Limitations of the study should be noted however, including asking participants to self-report eating disorder history. Given the online nature of this study, diagnoses could not be independently confirmed. Although measures such as the EDE-Q do not provide cut-off scores for an eating disorder diagnosis, future research would benefit from its inclusion to identify probable diagnoses (see Berg et al., 2012). It should also be noted that the general population sample represented respondents without an eating disorder history, and therefore will have included individuals with other mental health or medical conditions. The generalisability of findings in the general population sample is also a potential limitation. Adjusting weightings to the data in terms of age and gender based on population data from the Australian Bureau of Statistics was considered, but was deemed to be inappropriate as it would have resulted in an unrepresentative eating disorder sample which was made up of mostly young females. Furthermore, limitations of the study exist in terms of the self-selective nature

of participation in this cross-sectional online study, the short time period (one week) asking about behaviour changes, as well as the use of self-report and retrospective assessments. In particular, the wording of the questions – i.e. asking participants how their behaviours have changed since before the pandemic – has its limitations as we are not aware of what behaviours were before the pandemic to establish whether they are indeed maladaptive, or perhaps constitute positive health-promoting behaviours, and no specific timeframe was stated for when ‘before’ was. The authors, however, intentionally worded the questions in this way so that participants could reflect on how their behaviours have changed since they perceived the pandemic to have begun. Furthermore, as the question regarding binge eating did not also include a sense of loss of control over eating, the question likely instead enquired about overeating. Finally, future research would benefit from expanding the time period for measuring symptom change (i.e. longer than one week) to more accurately capture the often episodic nature of disordered eating symptoms.

Overall, the findings of this study suggest that there is potential for adverse psychological and health consequences in the general population because of potentially reduced exercising, and increased bingeing and restricting behaviours since the COVID-19 pandemic. Critically, an exacerbation of illness symptoms was reported in individuals with eating disorders within the initial stages of the pandemic. It is therefore crucial that we provide greater psychological support to individuals with eating disorders during this time. Given the uncertainty regarding the length of this pandemic and its rapidly evolving nature, it is essential that we continue to closely monitor these patients and provide greater support to attenuate increasing disordered eating symptoms.

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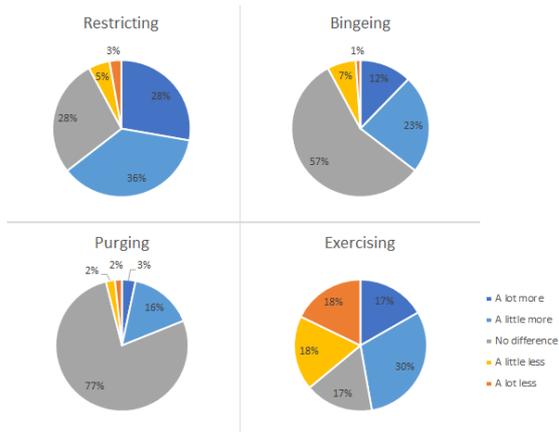


Figure 1: Disordered eating behaviours in the eating disorder group ( $n=180$ ) in the past week compared to before the COVID-19 pandemic

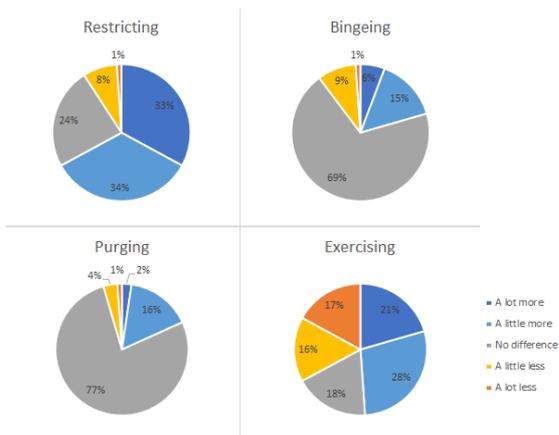


Figure 2: Disordered eating behaviours in the anorexia nervosa sub-group ( $n=88$ ) in the past week compared to before the COVID-19 pandemic

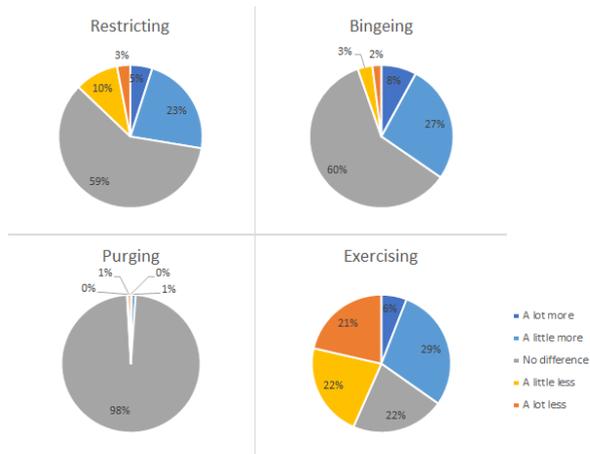


Figure 3: Disordered eating behaviours in the general population ( $n=5,289$ ) in the past week compared to before the COVID-19 pandemic



Table 1. Reported comorbidities in the eating disorder group, and anorexia nervosa sub-group

	Eating Disorder %	Anorexia Nervosa %
Anxiety/Anxiety Disorder	60.0	62.5
Depression/Depressive Disorder	50.6	53.4
Trauma/Post-Traumatic Stress Disorder	15.0	15.9
Obsessive Compulsive Disorder	8.3	12.5
Bipolar Disorder	5.0	4.6
Borderline Personality Disorder	5.0	4.6
Body Dysmorphic Disorder	1.7	1.1
Attention Deficit Hyperactivity Disorder	1.7	1.1
Dissociative Identity Disorder	1.7	1.1
Autism Spectrum Disorder	1.7	0.0
Psychosis	1.1	1.1

Note: The eating disorder group contains all respondents who self-identified as having an eating disorder, including anorexia nervosa

Table 2: Severity Level of Depression Anxiety Stress Scale (DASS-21) Scores

	General Population %			Eating Disorder %			Anorexia Nervosa %		
	Depression	Anxiety	Stress	Depression	Anxiety	Stress	Depression	Anxiety	Stress
Normal	49.9	59.7	57.5	22.2	33.3	34.5	22.1	33.3	31.0
Mild	15.8	8.5	14.7	11.4	9.0	11.3	12.8	4.6	11.5
Moderate	19.8	17.0	13.8	27.8	24.3	18.6	30.2	26.4	23.0
Severe	7.0	6.0	10.1	11.4	8.5	19.8	9.3	6.9	17.2
Extremely Severe	7.4	8.8	4.0	27.3	24.9	15.8	25.6	28.7	17.2
Mean (SD) Score	11.1(9.1)	7.2(7.3)	14.5(8.8)	18.7(11.7)	12.2(9.3)	21.0(10.5)	18.7(11.9)	13.3(10.1)	21.8(10.7)

Note: The eating disorder group contains all respondents who self-identified as having an eating disorder, including anorexia nervosa; Depression Anxiety Stress Scale (DASS-21) severity scores are as follows: Depression: normal (0-9), mild (10-13), moderate (14-20), severe (21-27), extremely severe (28-42); Anxiety: normal (0-7), mild (8-9), moderate (10-14), severe (15-19), extremely severe (20-42); and Stress: normal (0-14), mild (15-18), moderate (19-25), severe (26-33), extremely severe (34-42) (Lovibond & Lovibond, 1996).