

1 **Changes in body dysmorphic disorder, eating disorder, and**
2 **exercise addiction symptomology during the COVID-19**
3 **pandemic: a longitudinal study of 319 health club users.**

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20 **Abstract (96)**

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22 The aim of this longitudinal study was to examine the effect of COVID-19
23 quarantines on morbid exercise, eating, and body image behaviours pre vs
24 post COVID-19 lockdown. Participants ($n=319$; (mean age 36.77 SD=11.75;
25 84% female) were recruited to complete a battery of questions with 14 month
26 follow-up. Exercise addiction scores were significantly lower post-lockdown;
27 eating disorder symptomology scores were significantly higher post-COVID-
28 19 lockdown; and leisure-time exercise significantly increased post-COVID-19
29 lockdown. No differences in body dysmorphic disorder were found. If future
30 lockdowns are enforced, practitioners working with people with suspected
31 morbid eating habits should monitor this closely.

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33 **Key words:** eating disorder; body image; COVID-19

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35 **1. Introduction**

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37 In March 2020, the World Health Organization (WHO) declared the COVID-19
38 outbreak a global pandemic, and as of 16 February 2021, over 108,000,000
39 confirmed cases have been diagnosed in more than 130 countries and areas,
40 resulting in approximately 2,400,000 deaths to date (WHO, 2021).

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42 Exercise addiction is a condition in which exercise becomes obsessive and/or
43 compulsive (Symons Downs et al., 2019), and has been widely reported that it exists
44 in the presence of other disorders: notably body dysmorphic disorder (BDD) and
45 eating disorders (EDs) (Trott et al., 2020b, 2020c). The effects of the COVID-19
46 lockdowns on exercise addiction, BDD, and ED in health club users are currently
47 unknown. The aim of this study, therefore, was to assess differences in exercise
48 addiction, ED symptomology and BDD pre vs post COVID-19 lockdown.

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51 2. Methods

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53 Pre-COVID-19, participants were recruited from 8/4/19 to 31/7/19 (see Trott et al.,
54 2020c for full information). Participants for the follow-up study were recruited from
55 26/8/2020 to 11/9/2020. To be eligible, participants had to be >18 years and be
56 health club users. In both surveys, participants were taken through an online battery
57 of questions including measures of age, sex, exercise addiction, BDD, ED
58 symptomology, body mass index (BMI), and COVID-19 related quarantine status (in
59 the post-COVID survey). Ethical approval was obtained from the Anglia Ruskin
60 University Sport and Exercise Sciences Departmental Ethics Panel (ESPGR-03). All
61 participants provided informed consent before completing both surveys.

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63 Measures

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65 Exercise addiction was measured via the Exercise Addiction Inventory (EAI) (Terry
66 et al., 2004), a six-item questionnaire based on Brown's components of general
67 addiction (Brown, 1993). A score of ≥ 24 is the cut-off to be 'at-risk' of exercise
68 addiction. ED symptomology was measured using the Eating Attitudes Test 26 (EAT-
69 26) (Garner et al., 1982), a 26-item questionnaire. A score of ≥ 20 is the cut-off to be
70 classified as having ED symptomology. BDD was measured using the Body
71 Dysmorphic Disorder Questionnaire (BDDQ) (Phillips, 2005), a questionnaire based
72 on the Diagnostic Statistical Manual for mental disorders-IV (American Psychiatric
73 Association, 2000) diagnostic criteria for BDD. Furthermore, participants were asked
74 if they were currently in some form of lockdown (defined as being 'under restrictions
75 that limit your ability to leave the house'), and how many hours per week they
76 exercised for leisure.

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78 All data were analysed using STATA Version 16 (Stata Corp, 2019). Differences
79 between continuous pre post measures were calculated using a paired samples t-
80 test, and dichotomous variables via McNemar's test, in three groups:

- 81 1. Total sample
- 82 2. Lockdown
- 83 3. No lockdown

84 3. Results

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86 Table 1 shows full study characteristics. In the total sample, total EAT-26 scores
87 were significantly higher post-COVID-19 ($t(318) = 4.02, p < 0.001$); EAI scores
88 significantly lower ($t(318) = -2.13, p = 0.034$); and leisure-time exercise significantly
89 increased ($t(312) = -4.101, p < 0.001$). Regarding participants still in quarantine, total
90 EAT-26 scores were higher post-COVID-19 lockdown, but failed to reach
91 significance ($t(51) = -1.42, p = 0.161$); EAI scores were significantly lower post-
92 lockdown ($t(51) = 2.65, p = 0.011$); and leisure-time exercise yielded no change ($t(50)$
93 $= -1.24, p = 0.222$). Regarding participants not in quarantine, total EAT-26 scores
94 were significantly higher post-COVID-19 lockdown, ($t(266) = -3.78, p < 0.001$); EAI
95 scores yielded no change ($t(266) = 1.143, p = 0.254$); and leisure-time exercise
96 significantly increased ($t(261) = -3.94, p < 0.001$). BDD was unchanged in all
97 samples (Total sample= $\chi^2(1)=0.00, p=1.00$; quarantine= $\chi^2(1)=2.29, p=0.125$; no
98 quarantine= $\chi^2(1) = 2.29, p=0.125$).

99 **Table 1: Descriptive statistics^a**

Variable	Total sample		Currently in lockdown		Not currently in lockdown	
	Pre COVID-19 lockdown	Post COVID-19 lockdown	Pre COVID-19 lockdown	Post COVID-19 lockdown	Pre COVID-19 lockdown	Post COVID-19 lockdown
<i>n</i>	319		52		267	
Sex (female)	84%		90.4%		83.5%	
Age (years)	36.77 (11.75)		33.94 (11.43)		37.31 (11.76)	
BMI (kg/m ²)	23.75 (8.67)	24.02 (8.61)	24.43 (6.08)	24.59 (3.85)	23.11 (3.89)	23.95 (9.25)
EAT-26 Total	13.84 (12.90) ^{***}	15.76 (10.88) ^{***}	15.67 (13.69)	17.54 (11.45)	13.48 (12.74) ^{***}	15.41 (10.75) ^{***}
Indicated ED symptomology	30.72% (98/319)	28.84% (92/319)	38.46% (20/52)	36.54% (19/52)	25.47% (68/267)	27.34% (73/267)
EAI Total	21.49 (4.20) [*]	21.02 (4.25) [*]	22.21 (3.48) [*]	20.73 (4.60) [*]	21.35 (4.31)	21.07 (4.19)
At risk of exercise addiction	31.98% (102/319)	29.15% (93/319)	34.62% (18/52)	25.00% (13/52)	31.46% (84/267)	29.96% (80/267)
BDD status (indicated/not indicated)	33.2% (106/319)	33.5% (107/309)	38.46% (20/52)	48.08% (25/52)	30.71% (82/267)	32.21% (86/267)
Leisure-time exercise (hrs/wk)	6.47 (3.83) ^{***}	7.50 (4.26) ^{***}	6.71 (3.59)	7.49 (4.91)	6.44 (3.89) ^{***}	7.50 (4.14) ^{***}
Quarantine status	NA	16.3% (52/319)	NA			

^aData is presented as mean (standard deviation), unless otherwise stated; Abbreviations: EAT-26 = Eating Attitudes Test 26; ED=eating disorder; EAI=exercise addiction inventory; BDD=body dysmorphic disorder; * = statistically significant difference pre vs post COVID-19 $p<0.05$; **=statistically significant difference pre vs post COVID-19 $p<0.01$ ***=statistically significant difference pre vs post COVID-19 $p<0.001$

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103 4. Discussion

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105 This study of 319 participants measured changes in indicated BDD, ED
106 symptomology and exercise addiction in a sample of health club users pre-COVID-
107 19 vs post-COVID-19 lockdown, as a total sample and stratified according to current
108 lockdown status. The incidence of BDD did not change in all samples. Although this
109 is the first study to our knowledge to examine the effects of COVID-19 lockdowns on
110 BDD, hypotheses have suggested that lockdowns could make BDD worse due to
111 increases in social isolation and depressive feelings (Anxiety and Depression
112 Association of America, 2020). In the total sample and participants not in lockdown,
113 total EAI scores significantly decreased. Furthermore, EAI scores decreased in the
114 sample still under a lockdown, however this failed to reach statistical significance,
115 possibly due to the smaller sample size. These results broadly agree with Lim
116 (2020), who suggested that COVID-19 related lockdowns could reduce exercise
117 addiction symptomology, due to restrictions in areas to exercise. In the total sample
118 and the participants not in lockdown total EAT-26 scores significantly increased,
119 suggesting higher levels of morbid eating behaviours. If future lockdowns or period of
120 enforced quarantines are required, practitioners working with people with suspected
121 morbid eating habits should monitor these behaviours closely. Another finding was
122 that leisure time exercise significantly increased both in the total sample and in the
123 participants who were not currently in lockdown. Increases in exercise levels post-
124 COVID-19 lockdowns are encouraging, especially as authors have reported
125 decreases in exercise during COVID-19 lockdowns (Stockwell et al., 2021). One
126 possible reason for this is because the sample were eager to restart their exercise
127 routine post-lockdown, and 'make up' for time lost by exercising more.

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129 This study should be considered within its limitations. (1) the use of self-report tools
130 carry inherent limitations (Demetriou et al., 2015); (2) the sample had a high
131 proportion of females; (3) our effect sizes were small; and (4) the sample was
132 restricted to health club users, making the generalisation of the findings difficult.

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134 In conclusion, it appears that exercise addiction decreased and eating disorder
135 symptomology increased pre-vs-post COVID-19 lockdown. Furthermore, incidences
136 of BDD appears to have been unchanged.

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