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Short communication

Changes in body dysmorphic disorder, eating disorder, and exercise addiction symptomology during the COVID-19 pandemic: A longitudinal study of 319 health club users

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ABSTRACT

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

1. Introduction

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

Exercise addiction is a condition in which exercise becomes obsessive and/or compulsive (Symons Downs et al., 2019), and has been widely reported that it exists in the presence of other disorders: notably body dysmorphic disorder (BDD) and eating disorders (EDs) (Trott et al., 2020a, 2020b). The effects of the COVID-19 lockdowns on exercise addiction, BDD, and ED in health club users are currently unknown. The aim of this study, therefore, was to assess differences in exercise addiction, ED symptomology and BDD pre vs post the 1st COVID-19 lockdown.

2. Methods

Pre-COVID-19, participants were recruited from 8/4/19 to 31/7/19 (see Trott et al., 2020c for full information). Participants for the follow-up were recruited from 26/8/2020 to 11/9/2020. To be eligible, participants had to be >18 years and be health club users. In both

surveys, participants were taken through an online battery of questions including measures of age, sex, exercise addiction, BDD, ED symptomology, body mass index (BMI), and COVID-19 related quarantine status (in the post-COVID survey). Ethical approval was obtained from the Anglia Ruskin University Sport and Exercise Sciences Departmental Ethics Panel (ESPGR-03). All participants provided informed consent before completing both surveys.

Measures

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

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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			

^a Data 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 $p < 0.001$

week they exercised for leisure.

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

- 1 Total sample
- 2 Lockdown
- 3 No lockdown

3. Results

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

4. Discussion

This study of 319 participants measured changes in indicated BDD, ED symptomology and exercise addiction in a sample of health club users pre-COVID-19 vs post the 1st COVID-19 lockdown, as a total sample and stratified according to current lockdown status. The incidence of BDD did not change in all samples. Although this is the first study to our knowledge to examine the effects of COVID-19 lockdowns on BDD, hypotheses have suggested that lockdowns could make BDD worse due to increases in social isolation and depressive feelings (Anxiety and Depression Association of America, 2020). In the total sample and participants not in lockdown, total EAI scores significantly decreased. Furthermore, EAI scores decreased in the sample still under a lockdown, however this failed to reach statistical significance, possibly due to the smaller sample size. These results broadly agree with Lim (2020), who suggested that COVID-19 related lockdowns could reduce exercise addiction symptomology, due to restrictions in areas to

exercise. In the total sample and the participants not in lockdown total EAT-26 scores significantly increased, suggesting higher levels of morbid eating behaviours. If future lockdowns or period of enforced quarantines are required, practitioners working with people with suspected morbid eating habits should monitor these behaviours closely. Another finding was that leisure time exercise significantly increased both in the total sample and in the participants who were not currently in lockdown. Increases in exercise levels post-COVID-19 lockdowns are encouraging, especially as authors have reported decreases in exercise during COVID-19 lockdowns (Stockwell et al., 2021). One possible reason for this is because the sample were eager to restart their exercise routine post-lockdown, and 'make up' for time lost by exercising more.

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

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

Author statement

MT: conceptualisation; data curation; formal analysis; investigation; methodology; validation; writing-original draft; writing - review and editing. JJ: Conceptualisation; project administration; resources; software; supervision; validation; writing-review and editing. SP: project administration; resources; supervision; writing - review and editing. YB: resources; software; validation; writing - review and editing. LS: conceptualisation; methodology; project administration; resources; supervision; validation; writing - original draft; writing - review and editing.

Final approval of the version to be published (all authors); AND

Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (all authors).

MT and LS verified the underlying data.

All data (excluding email addresses of participants) is available on request from the corresponding author

Declaration of Competing Interest

All authors confirm that they have no conflicts of interest.

References

- American Psychiatric Association, 2000. *Diagnostic and Statistical Manual of Mental Disorders IV*, 4th ed. ed. Washington, DC.
- Anxiety and Depression Association of America, 2020. Body dysmorphic disorder and the impact of COVID-19 and quarantine [WWW Document]. URL <https://adaa.org/learn-from-us/from-the-experts/blog-posts/professional/body-dysmorphic-disorder-and-impact-covid-19> (accessed 9.1.20).
- Brown, R.I.F., 1993. Some contributions of the study of gambling to the study of other addictions. In: Eadington, W., Cornelius, J. (Eds.), *Gambling Behavior and Problem Gambling*. Commercial Gaming. University of Nevada, Nevada, pp. 241–272.
- Demetriou, C., Ozer, B.U., Essau, C.A., 2015. Self-report questionnaires. In: *The Encyclopedia of Clinical Psychology*. American Cancer Society, pp. 1–6. <https://doi.org/10.1002/9781118625392.wbcp507>.
- Garner, D.M., Olmsted, M.P., Bohr, Y., Garfinkel, P.E., 1982. The eating attitudes test: psychometric features and clinical correlates. *Psychol. Med.* 12, 871–878. <https://doi.org/10.1017/S0033291700049163>.
- Lim, M.A., 2020. Exercise addiction and COVID-19-associated restrictions. *J. Mental Health* 1–3. <https://doi.org/10.1080/09638237.2020.1803234>.
- Phillips, K.A., 2005. *The Broken Mirror: Understanding and Treating Body Dysmorphic Disorder*. Oxford University Press, USA.
- Stata Corp, 2019. *Stata Statistical Software: Release 16*. Stata Corp LP, College Station, Texas, USA.
- Stockwell, S., Trott, M., Tully, M., Shin, J., Barnett, Y., Butler, L., McDermott, D., Schuch, F., Smith, L., 2021. Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. *BMJ Open Sport Exercise Med.* 7, e000960.
- Symons Downs, D., MacIntyre, R.I., Heron, K.E., 2019. Exercise addiction and dependence. In: Anshel, M.H., Petruzzello, S.J., Labbe, E.E. (Eds.), *APA Handbook of Sport and Exercise Psychology, Volume 2: Exercise Psychology*, 2. American Psychiatric Association, Washington, pp. 589–604.
- Terry, A., Szabo, A., Griffiths, M., 2004. The exercise addiction inventory: a new brief screening tool. *Addict. Res. Theory* 12, 489–499. <https://doi.org/10.1080/16066350310001637363>.
- Trott, M., Jackson, S.E., Firth, J., Jacob, L., Grabovac, I., Mistry, A., Stubbs, B., Smith, L., 2020a. A comparative meta-analysis of the prevalence of exercise addiction in adults with and without indicated eating disorders. *Eat. Weight Disord. - Stud. Anorexia, Bulimia Obes.* <https://doi.org/10.1007/s40519-019-00842-1>.
- Trott, M., Yang, L., Jackson, S.E., Firth, J., Gillvray, C., Stubbs, B., Smith, L., 2020b. Prevalence and correlates of exercise addiction in the presence vs. absence of indicated eating disorders. *Front. Sports Act. Living* 2, 84. <https://doi.org/10.3389/fspor.2020.00084>.
- World Health Organization, 2021 WHO Coronavirus Disease (COVID-19) Dashboard [WWW Document]. URL <https://covid19.who.int> (accessed 16.2.21).