



A brief report relating physical activity and depressive symptoms in women during the COVID-19 pandemic

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ABSTRACT

Purpose. The purpose of this study was to investigate the association between self-reported physical activity and depressive symptoms in US women during the COVID-19 pandemic.

Methods. A quantitative self-report online survey was administered to adult women ($n > 800$) in the United States during the COVID-19 pandemic in 2020. Physical activity was measured for frequency, intensity, and duration by using Likert scales, along with descriptive measures of types of activity. The Beck Depression Inventory II was applied to assess depressive symptoms.

Results. The Beck Depression Inventory II score of participants not engaging in physical activity ($b = 13.344$, $SE = 0.593$, $p < 0.001$) was greater than that of participants engaging in physical activity. No difference in depression score was found in relation to physical activity intensity or duration, which suggests that these have no meaningful effect on depression symptoms.

Conclusions. All types of self-rated physical activity (low-cost, low-risk activity) taken together are associated with lower depression in women during the COVID-19 pandemic.

Key words: physical activity, depression, Beck Depression Inventory, women's mental health, COVID-19

Introduction

Coronavirus (COVID-19) threatens to increase the toll of depression on women, who are disproportionately impacted by this condition [1]. Data have long suggested that females suffer from depression at a rate of nearly twice that of males, have an earlier onset of depressive symptoms, greater severity, and increased likelihood of recurrent depressive episodes [2–4]. In addition to the pre-existing increased risk, women are also disproportionately affected by some of the negative outcomes related to the COVID-19 pandemic, including lost income, reduced healthcare access, greater caregiver burden, and higher reported levels of stress and burnout, further increasing their vulnerability to the disease of depression [5]. Understanding preventive measures towards the manifestation of depressive symptoms could reduce further burden to women and the healthcare system.

Ettman et al. [6] were among the first to publish findings on the impact of the COVID-19 pandemic on the prevalence of depression in adults. In their study of more than 1441 participants, the prevalence of depressive symptoms was higher in every category (mild, moderate, moderately severe, and severe) during COVID-19 compared with before the pandemic. In fact, the self-report of depressive symptoms in the US has grown more than 3-fold during COVID-19 compared with before the pandemic. Furthermore, the higher risk of depressive symptoms during COVID-19 was associated with receiving lower income, having less than \$5000 in savings, and exposure to more stressors, underlining the importance of treatment being financially accessible to those suffering [6].

Due to the increased, inequitable burden placed on women and other marginalized groups during times of pandemic and concern regarding the potential for increased negative mental health outcomes as

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a result, it is critically important to examine low-cost, easy-access resources that may buffer against the threat of depressive symptoms. Furthermore, necessity dictates that accessible approaches to care for these depressive symptoms be identified that reduce, rather than add to, the burden on women, already struggling under the weight of the pandemic.

Depression treatment in the time of COVID-19

The current gold standard of treatment for depression is antidepressant medication paired with cognitive behavioural psychotherapy [7]. This approach has significant access barriers, including the cost and time for patients and the geographic availability of providers. In the past year, operating under public health mandates due to the COVID-19 virus, accessing this form of treatment became even more challenging. COVID-19 public health precautions have included a significant reduction in in-person appointments with healthcare providers; as a result, patients access services via virtual platforms, requiring a degree of digital competence [8]. Additionally, many individuals suffered job loss and no longer had financial security or healthcare coverage to ensure access to services, regardless of if virtual or in-person.

In such an environment, complementary approaches can support an individual's perception of wellness, offer minor relief of symptoms, and, in some cases, reduce the need for further healthcare services, thus lessening one of the stressors contributing to healthcare worker depression and burnout. The pre-COVID-19 literature had a well-established consensus that exercise could be an effective adjunct or alternative to regular treatment, aiding with mood regulation and mood improvement [9]. It has been noted that symptom relief can be comparable with the antidepressant effects of pharmacotherapy for mild to moderate depression [10]. There is, however, a lack of consensus in the literature on the intensity, frequency, duration, and type of exercise needed to achieve these benefits. Within the confines of the COVID-19 pandemic, 'traditional' exercise options (the gym, fitness classes, swimming pools, etc.) became limited and the scope of these studies expanded beyond traditional and limiting conceptualizations of exercise to a broader concept, of physical activity. More recently, physical activity has been shown to be valuable in preventing and/or managing symptoms of depression [11]. The current study aimed to explore the relationship between physical activity and depression in US women during the COVID-19 pandemic.

Material and methods

Individuals identifying as female, aged 18–55 years and living in the US were recruited on a voluntary basis via popular social media platforms to participate in the study. Upon recruitment, the subjects completed a digital questionnaire which gathered basic demographic information, data regarding the current level of physical activity trends, and responses to a depression inventory identifying the presence of depressive symptoms. Physical activity measures included intensity (self-rated as mild to vigorous), duration (intervals of 10 minutes, 0–60), and frequency (times per week) in Likert scales, as well as type, determined in an open-ended response. The Beck Depression Inventory II (BDI-II), a valid and reliable psychometric instrument, was used to evaluate the number of depressive symptoms [12].

Correlations between the BDI-II depression score and the engagement in physical activity variable for each participant were then examined for the full sample, specifically comparing the mean BDI-II scores for 2 groups: participants who did and did not engage in physical activity. This analysis investigated if a correlation existed between depression score and engagement in physical activity by utilizing the Pearson correlation coefficient [13].

Next, the data were examined to identify the relationship between frequency, intensity, and duration of physical activity bouts and BDI-II depression score across the full data set by using a multiple regression model, after first verifying the bivariate relationship between exercise frequency and depression. Data normality and assumptions of regression were met prior to modelling. Subgroups defined by differing frequency, intensity, and duration of physical activity were inspected. Finally, a *t*-test was performed to determine the difference between groups for those who exercised 6 days vs. those who exercised 7 days per week.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the California Southern University Review Board (October 2020).

Results

In total, 822 adults aged 18–55 years who identified as women participated in this study. The mean depression score of the subjects calculated from their

responses on the BDI-II assessment scale was 9.95 (standard deviation: 8.558). In assessing the relationship between depressive symptom levels and frequency of physical activity in each participant's life, a correlation was identified ($r = -0.240$, $p < 0.001$) which was significant and reflected a small to medium negative relationship (as the frequency of physical activity increased, depression symptoms as assessed by BDI-II decreased).

The regression analysis between exercise frequency and depression as a dependent variable measured by BDI-II demonstrated a significant relationship. It was found that the BDI-II score when a participant did not engage in physical activity, as expected, was $b = 13.344$ (standard error [SE] = 0.593, $p < 0.001$) and that the depression score decreased by 1.522 for each increase in the frequency variable (from rarely to once per week, from once to twice per week, etc.) ($b = -1.522$, $SE = 0.220$, $p < 0.001$). However, the improvement in mental health reached a peak at the physical activity frequency of 6 days a week.

Then, additional covariates were added to the multiple regression model, including factors: frequency of physical activity, duration of physical activity, and intensity of physical activity. Through this analysis, frequency of physical activity engagement was again revealed to be a statistically significant predictor of BDI-II score (r^2 change: 0.057, $p < 0.001$), but the remaining factors assessed in the model were not. These factors were physical activity intensity (r^2 change: 0.003, $p = 0.141$) and physical activity duration (r^2 change 0.819, $p < 0.001$). *T*-test comparisons between the group of participants that reported exercising every day vs. those that reported exercising 6 days a week detected significant differences ($p < 0.001$).

Discussion

Prior to the COVID-19 pandemic, depression was one of the world's leading contributors to disease burden, with a disproportionately negative effect on women. Since March 2020, the impact of the COVID-19 virus on the global economy and related societal systems has furthered gender disparities and exposed women, many of whom are healthcare workers, to greater potential mental distress and vulnerability to this costly disease. While the long-term effect of the pandemic on the nation's mental health is yet to be fully understood, early data have already indicated that the prevalence of depression symptoms has increased rapidly, while healthcare services have become overwhelmed and less available, which generates an even greater need

for widespread tools to fight this disease and reduce the burden on the healthcare system.

The findings of this study present several opportunities for theory-based program planning. The study has confirmed the benefits of a health behaviour that has low barriers to entry and offers opportunities for individuals at all levels of activity to obtain a high degree of self-efficacy in performing physical activity of their choice. We measured physical activity rather than exercise, and we found that any activity that the person did was significant in reducing depressive symptoms. The respondents in this survey undertook a variety of activities, including hobbies, such as gardening, walking for leisure, or exercise. Many theory-based health interventions rely on self-efficacy as a major determinant of behaviour uptake and maintenance [14]. Interventions based upon these observations should rely on the confidence of the population in performing the activity of their choice for a strength-based approach [14].

Research on physical activity as a potential adjunctive treatment for depressive symptoms predates the pandemic. Physical activity is recommended in part because it can reduce some of the access limitations inherent to current existing treatments and has established positive outcomes. Now, under the circumstances of the COVID-19 pandemic, when it is even more challenging to access traditional depression treatments, physical activity has the potential to exert a far-reaching impact and to serve as an accessible tool to combat some of the symptoms of depression.

Conclusions

Women remain most vulnerable to depression during COVID-19 and they can likely achieve symptom relief through maintained or increased physical activity. COVID-19 has demonstrated the need for practical and accessible ways to target depressive symptoms, especially when traditional services are abruptly and unexpectedly altered, reduced, or eliminated. When the immediate healthcare crisis of the COVID-19 pandemic subsides, the longer-term mental health crisis that it contributed to will continue [11]. Physical activity is a low-risk and low-cost measure, requires little interaction with healthcare professionals, and can be done to suit the participant's body comfort, lifestyle, and preferences. Engaging in any form of physical activity may combat the impact of depression during and after COVID-19, though the results of this study do not prove that all types of activities are equivalently beneficial.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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Availability of data and material

The data collected in this study are not publicly available but can be made available upon request to authors.

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