

Exercise as Mental Health Medicine – Have We Had Enough Information?

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Received: August 16, 2022

Accepted: September 9, 2022

Published online: October 31, 2022

Keywords:

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In the Asian Journal of Kinesiology in 2021, more publications on the effects of physical exercises on mental health, including intervention studies, were called [1]. In response to this, we share our view on exercise as mental health medicine based on an overview of the existing review articles and our literature analysis on the effectiveness of exercise on anxiety and depression.

According to the World Health Organization (<https://www.who.int/news-room/fact-sheets/detail/mental-disorders>), one in every eight people was suffering from a mental disorder globally in 2019, with anxiety and depressive disorders being the two most reported, and the number of people living with these mental disorders significantly increased during 2020 due to the COVID-19 pandemic. It has been documented that performing exercise benefits attenuating and treating anxiety and depression (<https://www.beyondblue.org.au/get-support/staying-well/keeping-active>). In addition, various meta-analysis articles and literature reviews have also documented exercise's anxiolytic and anti-depressive effects. For example, Gordon et al. [2] reported that resistance exercise training significantly reduced depressive symptoms among adults, and Stubbs et al. [3] concluded that exercise would improve anxiety symptoms. On the other hand, other review and meta-analysis papers questioned the reported degree of the effects of exercise on anxiety and depressive disorders. For example, Krogh et al. [4] stated that the effects of exercise on depression in the existing literature largely resulted from trial bias including allocation sequence generation, no blinding of participants and personnel, and no blinding of outcome assessors. They concluded that the studies with less bias risk suggested no exercise effects on improving depression.

Similarly, Josefsson et al. [5] showed that the effect size of exercise on depression decreased from large to moderate when re-analysing only high-methodologically valid studies. Their findings highlighted the necessity of more vigorous methodological standards in investigating exercise effects on mental disorders. In addition to the methodological issues, Josefsson et al. [5] added that exercise benefits in people with depression would be limited such that exercise could be recommended to only people with mild to moderate

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depression symptoms who were fit and motivated to perform an exercise. Silveira et al. [6] also stated that while aerobic training improved the response to depression treatments, the effectiveness was affected by age and depression severity. These findings indicate significant gaps in the reliability and validity of the existing studies on exercise effects on anxiety and depression, and a lack of information on how to implement exercise for people with anxiety and depression.

We conducted a literature search and quality assessments on the effectiveness of exercise on anxiety and depression in 2021 as a part of a background search for a grant application. As a result, 41 quantitative study articles were identified through a literature search in CINAHL, MEDLINE, PsychInfo, and SPORTDiscus published in English between 2011-2021. Among the 41 studies, 34 reported a more positive outcome across physical and psychological measures in an exercise intervention than in a control group. For instance, one study in adolescents with obesity who underwent 3 sessions per week of supervised aerobic training on treadmills for 24 weeks showed significant decreases in the points of the Beck Depression Inventory (BDI) and the Spielberger State-Trait Anxiety Inventory (STAI) [7]. Another study found a link between depression reduction and VO_2 max improvements in depression severity [8]. However, our assessments of the 41 studies found various trial biases and methodological weaknesses, as Krogh et al. [4] and Josefsson et al. [5] pointed out, as mentioned previously.

There were 6,270 participants across the 41 studies, but in many studies, the genders were not given or only given to the intervention group but not the control group. Where gender information was included, females accounted for 2,039 participants (75%) and males 683 (25%). Many studies did not have a breakdown of the ages of participants or give a mean age; the age of 3,224 participants, or 52% of the 6,270 participants, was not distinctly reported. Most of the 41 studies were pre- and post-intervention comparison studies; however, most did not clinically classify the baseline anxiety/depression severity. All studies applied psychometrics to compare pre- and post-intervention exercise effects. However, the psychometrics employed in the 41 studies varied widely, even though those articles shared the same study scope

assessing the exercise effects on anxiety or depression. Twelve studies used the BDI, which was used the most, 3 studies each the Patient Health Questionnaire-9 and the General Anxiety Disorder-7. Others used the Anxiety Sensitivity Index, the Beck Anxiety Inventory, the Depression Anxiety Stress Scale, the Hamilton Depression Rating Scale, the Montgomery-Asberg Depression Rating Scale, the STAI, and more. In addition, the study designs and exercise interventions varied in structure, content, duration, and modality. For example, 13 of 41 studies did not have a control group or control condition(s), the shortest intervention program was a one-off yoga session, and the most extended program was a 40-minute resistance-band session three times per week for 12 months. The shortest time of an exercise session was 30 minutes, with the longest being 2 hours, with the modality being moderate to vigorous jogging. One study used a slightly unconventional exercise modality, using exercise video games which encouraged and rewarded movement in participants. The most common exercise intensity was low, with 24 programs utilising low-intensity exercise with 16 studies using yoga-type exercise. One study encouraging a 5-20% increase in steps every week did not specify time frames or intensities, but exercise intensity was progressively increased. However, this study did not specifically report the period during which the participants achieved this.

We also assessed the 41 studies using the Delphi List [9] and the STROBE checklist [10]. Twenty-seven studies were considered an experimental design, the majority being randomised control trials (RCT). The remaining 14 studies were observational designs and evaluated by the STROBE checklist. In the Delphi List criteria, three studies scored 7 out of a maximum of 8, and a further three scored 6. The majority of the studies (13 studies) scored 5, five studies scored 4, and two studies scored 3. The lower scoring studies lost marks most commonly for not concealing treatment allocation (or not discussing it in the study) and for no blinding of the outcome assessor and/or participant. Thirteen studies did not include an intention-to-treat analysis, and two studies did not employ a randomisation method. From the 14 studies assessed using the STROBE checklist, five scored the highest 5, three scored 4, and the remainder scored 2 or 3. Only two

studies randomly selected their participants. Most studies (12 studies) did not include a power calculation. Only three studies reported anthropometric measurements, resulting in lower scores than the RCTs assessed.

Based on the above, we identified some problems in the existing literature on the effects of exercise on anxiety and depression. 1) There are no standardised measurements to evaluate the effects of exercise on anxiety/depression and methodological protocols. 2) The 'acute vs chronic' effects of exercise have not been investigated well. 3) Adverse effects of exercise on anxiety/depression have been paid little attention. 4) The severity of anxiety and depression has been given less attention. 5) Barriers and facilitators to regular exercise engagement in people with anxiety and depression have not been considered. Remarkably, more structured studies on the barriers and facilitators are urgently required to transform exercise to practice as another treatment option for people with anxiety and depression.

Considering many people suffer from anxiety and depression, and the number is increasing rapidly, the role of exercise as mental medicine is rising. However, it does not appear that we have had precise information on what exercise should be recommended to different patients with anxiety and depression because of the lack of studies with standardised tools and methods to clarify the exercise effects. To prescribe exercise as medicine, we need more explicit information on exercise type, duration of the exercise session, intensity, frequency, barriers and facilitators to regular exercise, adverse effects, and more under the standardised methodology and measurement tools. Although statistically significant effects of exercise on mental health parameters were reported, it is unclear how the effects are practically substantial to improve the patient's symptoms in daily life. Moreover, even if an exercise is found to be effective for treating anxiety and/or depression, the biggest challenge is motivating them to perform the exercise regularly to achieve the desired effects. However, to the best of our knowledge, no previous study has investigated this.

As Professor Bik Chu Chow pointed out [1], we need more vigorously investigate the relationship between exercise and mental health with more reliable and valid intervention

trials to promote "Do Exercise and Be Mentally Strong" more confidently. More studies with a more systemised study design are required for us to establish "exercise as mental health medicine."

Conflict of Interest

The authors declare no conflicts of interest.

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