

THE EFFECTS OF REGULAR EXERCISE ON MOOD, ANXIETY LEVELS, AND OVERALL MENTAL WELL-BEING

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Abstract:

Introduction: Regular exercise has garnered recognition for its significant impact on both physical and mental well-being. While its benefits for physical health are well-established, its role in promoting mental health, including reducing stress, anxiety, and depression, is increasingly acknowledged. Mental health disorders, such as anxiety and depression, represent a substantial global burden, necessitating effective and accessible interventions. Exercise emerges as a promising strategy, offering cost-effective and low-risk benefits. Despite evidence supporting its mental health benefits, questions regarding optimal exercise parameters and mechanisms underlying its effects remain. This study aims to explore the effects of regular exercise on mood, anxiety levels, and overall mental well-being, contributing to a deeper understanding of the relationship between exercise and mental health.

Materials and Methods: A randomized controlled trial recruited 100 participants aged > 18 years, randomly assigned to either an exercise intervention group (n=50) or a control group (n=50). Baseline characteristics, mood states, and anxiety levels were assessed using validated instruments. Descriptive statistics, paired t-tests, non-parametric equivalents, and multiple regression analyses were employed for data analysis.

Results: Participants exhibited moderate levels of physical activity and anxiety at baseline. The exercise intervention group showed significant improvements in mood and reductions in anxiety post-intervention, while the control group did not exhibit significant changes. Exercise frequency and duration were significant predictors of mood outcomes, with higher frequency and longer duration associated with greater improvements. Exercise duration demonstrated a significant negative association with anxiety levels.

Conclusion: This study highlights the beneficial effects of regular exercise on mood and anxiety levels, emphasizing the importance of incorporating physical activity into mental health interventions. Further research is warranted to deepen understanding and inform evidence-based interventions for individuals with mood and anxiety disorders.

Introduction:

Regular exercise has long been recognized as a cornerstone of physical health, but its profound impact on mental well-being is increasingly gaining attention. From reducing stress and anxiety to improving mood and overall psychological resilience, the benefits of exercise extend far beyond the confines of the gym.[1] As mental health issues continue to rise globally, understanding the relationship between exercise and mental well-being becomes paramount. This study aims to explore the effects of regular exercise on mood, anxiety levels, and overall mental well-being, shedding light on its potential as a powerful tool in promoting mental health.[2]

Mental health disorders, including anxiety and depression, represent a significant public health concern worldwide. According to the World Health Organization (WHO), depression is the leading cause of disability globally, with over 264 million people affected. Anxiety disorders are also prevalent, affecting approximately 284 million individuals.[1,2] These conditions not only diminish individual quality of life but also pose substantial economic burdens on societies. Despite the availability of various treatments, including pharmacotherapy and psychotherapy, the efficacy of these interventions can be limited, and they may carry undesirable side effects. Furthermore, access to mental health services remains unequal, with many individuals unable to receive adequate care due to various barriers, including cost, stigma, and availability of services.[3,4]

In contrast, exercise presents a promising avenue for enhancing mental well-being that is cost-effective, accessible, and free from adverse side effects. Numerous studies have demonstrated the positive effects of exercise on mental health outcomes, including reductions in symptoms of anxiety and depression and improvements in mood and overall psychological well-being.[5] Exercise is thought to exert its beneficial effects through various mechanisms, including the release of endorphins, neurotransmitter modulation, stress reduction, and enhancement of self-esteem and self-efficacy. Despite the wealth of evidence supporting the mental health benefits of exercise, several questions remain unanswered. For instance, the optimal type, duration, and intensity of exercise for maximizing mental health outcomes have yet to be fully elucidated. Additionally, the mechanisms underlying the observed effects of exercise on mental well-being warrant further investigation.[6]

By systematically examining the effects of regular exercise on mood, anxiety levels, and overall mental well-being, this study aims to contribute to a deeper understanding of the relationship between physical activity and mental health. Findings from this research may inform the development of evidence-based interventions aimed at harnessing the therapeutic potential of exercise for promoting mental well-being and preventing and treating mental health disorders. Ultimately, by elucidating the role of exercise in mental health, this study has the potential to improve the lives of millions worldwide.

Objectives:

- To assess the impact of regular exercise on mood regulation, specifically evaluating changes in mood states such as happiness, sadness, anger, and tension before and after exercise interventions.
- To investigate the effects of regular exercise on anxiety levels, utilizing validated assessment tools to measure anxiety symptoms and comparing pre- and post-exercise anxiety scores.
- To examine the relationship between exercise frequency, duration, and intensity and improvements in overall mental well-being, aiming to identify optimal exercise parameters for maximizing mental health benefits.

Materials and Methods:

Participants: A sample of 100 participants aged > 18 years were recruited through community advertisements, social media platforms, and local fitness centers. Inclusion criteria were individuals who are currently sedentary or engage in irregular physical activity, without any diagnosed mental health disorders. Exclusion criteria were individuals with existing medical conditions that contraindicate exercise or those currently receiving treatment for mental health disorders.

Experimental Design: In this randomized controlled trial (RCT), participants were randomly assigned to either an exercise intervention group (50 participants) or a control group (50 participants). Participants in the exercise intervention group engage in a supervised exercise program, while those in the control group will maintain their usual level of physical activity. Mood states were assessed using validated

instruments such as the Profile of Mood States (POMS) questionnaire before and after the intervention period.

Anxiety levels were measured using standardized assessment tools such as the State-Trait Anxiety Inventory (STAI) before and after the exercise intervention. Participants complete self-report questionnaires to assess both state anxiety (current feelings of anxiety) and trait anxiety (general propensity to experience anxiety). Changes in anxiety scores will be compared between the exercise intervention group and the control group to determine the impact of regular exercise on anxiety levels.

Data Analysis: Descriptive statistics was used to summarize participant demographics and baseline characteristics. Paired t-tests or non-parametric equivalents were used to compare pre- and post-intervention mood and anxiety scores within each group. Independent t-tests or Mann-Whitney U tests were used to compare changes in mood and anxiety scores between the exercise intervention group and the control group. Additional analyses, such as multiple regression, were conducted to explore the relationship between exercise parameters (e.g., frequency, duration) and changes in mood and anxiety levels.

Results:

The average age of the participants was 35.2 years, with a standard deviation of 8.6 years. This indicates that the participants ranged in age from approximately 26.6 to 43.8 years, with most falling within one standard deviation of the mean. The sample consisted of 60% female participants and 40% male participants. This suggests a slight imbalance in gender representation, with a higher proportion of females in the study. 40% of participants reported engaging in moderate physical activity (e.g., brisk walking, cycling) for at least 30 minutes, three times per week. 30% of participants reported engaging in vigorous physical activity (e.g., running, aerobics) for at least 30 minutes, three times per week. 30% of participants reported minimal physical activity or sedentary lifestyles. This indicates that a significant portion of the sample may lead relatively inactive lifestyles. The mean score for vigor/activity on the POMS questionnaire was 15.8, with a standard deviation of 3.2. This suggests that, on average, participants reported moderate levels of vigor and activity. The mean score for tension/anxiety on the POMS questionnaire was 9.4, with a standard deviation of 2.5. This indicates relatively low levels of tension and anxiety among participants at baseline. The mean score for state anxiety on the STAI was 40.7, with a standard deviation of 7.9. This suggests moderate levels of current anxiety symptoms among participants. The mean score for trait anxiety on the STAI was 42.5, with a standard deviation of 8.2. This indicates moderate levels of general propensity to experience anxiety among participants.

Table 1: Baseline characteristics.

Characteristic	Total no of participants n=100 (%)
Age in years (Mean (SD))	35.2 (8.6)
Gender	
- Female	60
- Male	40
Physical Activity	
- Moderate (≥ 30 mins, 3x/wk)	40
- Vigorous (≥ 30 mins, 3x/wk)	30
- Minimal/Sedentary	30
Profile of Mood States (POMS) (Mean (SD))	
- Vigor/Activity	15.8 (3.2)
- Tension/Anxiety	9.4 (2.5)

State-Trait Anxiety Inventory (STAI) (Mean (SD))	
- State Anxiety	40.7 (7.9)
- Trait Anxiety	42.5 (8.2)

The mean mood score significantly increased from 15.2 (SD = 3.0) before the intervention to 18.5 (SD = 2.8) after the intervention ($t(49) = -4.78, p < 0.001$). This indicates that participants in the exercise intervention group experienced a significant improvement in mood following the intervention. The mean anxiety score significantly decreased from 39.6 (SD = 6.5) before the intervention to 35.8 (SD = 5.9) after the intervention ($t(49) = 3.62, p = 0.001$). This suggests that participants in the exercise intervention group experienced a significant reduction in anxiety levels following the intervention. There was no significant difference in mean mood scores between pre- and post-intervention, with scores changing from 14.8 (SD = 2.9) to 14.9 (SD = 3.2) ($t(49) = -0.27, p = 0.790$). This indicates that participants in the control group did not experience a significant change in mood following the intervention. Similarly, there was no significant difference in mean anxiety scores between pre- and post-intervention, with scores changing from 41.2 (SD = 7.2) to 41.5 (SD = 7.5) ($t(49) = -0.54, p = 0.593$). This suggests that participants in the control group did not experience a significant change in anxiety levels following the intervention.

Table 2: Comparison of pre-and post-intervention mood and anxiety scores within each group

Group	Measure	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)	Test Statistic (t)	p-value
Exercise Intervention	Mood Scores	15.2 ± 3.0	18.5 ± 2.8	-4.78	< 0.001
	Anxiety Scores	39.6 ± 6.5	35.8 ± 5.9	3.62	0.001
Control	Mood Scores	14.8 ± 2.9	14.9 ± 3.2	-0.27	0.790
	Anxiety Scores	41.2 ± 7.2	41.5 ± 7.5	-0.54	0.593

The findings from the multiple regression analyses, as presented in Table 3, illuminate the nuanced relationship between exercise parameters and changes in mood and anxiety levels. Specifically, the results reveal that both exercise frequency and duration exert significant effects on mood outcomes. Higher exercise frequency and longer duration are associated with greater improvements in mood, with each unit increase in frequency and duration corresponding to increases of 0.28 and 0.42 points in mood scores, respectively. Conversely, the impact of exercise parameters on anxiety levels appears to be more complex. While exercise duration demonstrates a robust negative association with anxiety, with longer durations linked to greater reductions in anxiety scores, exercise frequency does not exhibit a statistically significant effect on anxiety outcomes. These findings underscore the importance of considering both frequency and duration of exercise when examining its impact on mental health, suggesting that longer bouts of exercise may yield more pronounced benefits for mood and anxiety regulation.

Table 3: Multiple regression to explore the relationship between exercise parameters and changes in mood and anxiety levels

Exercise Parameter	Outcome Variable	Regression Coefficient (β)	p-value
Exercise Frequency	Changes in Mood	0.28	0.012
Exercise Duration		0.42	< 0.001

Exercise Frequency	Changes in Anxiety	-0.15	0.086
Exercise Duration		-0.31	0.004

Discussion:

The study investigated the effects of regular exercise on mood and anxiety levels, as well as the relationship between exercise parameters and changes in mental well-being. The baseline characteristics of the participants revealed a sample with a mean age of 35.2 years, consisting of 60% female and 40% male participants. Physical activity levels varied, with 40% engaging in moderate activity, 30% in vigorous activity, and 30% reporting minimal physical activity or sedentary lifestyles. Baseline mood assessments indicated moderate levels of vigor/activity and low levels of tension/anxiety, with mean scores of 15.8 and 9.4, respectively, on the Profile of Mood States (POMS) questionnaire. Similarly, participants exhibited moderate levels of current (state) and general (trait) anxiety, with mean scores of 40.7 and 42.5, respectively, on the State-Trait Anxiety Inventory (STAI).

The intervention group showed significant improvements in mood, with a mean score increase from 15.2 to 18.5 following the intervention, along with a significant decrease in anxiety levels from 39.6 to 35.8. In contrast, the control group did not exhibit significant changes in mood or anxiety scores post-intervention. These findings suggest that regular exercise can lead to positive changes in mood and anxiety levels, supporting its role in promoting mental well-being. Furthermore, the multiple regression analyses revealed that both exercise frequency and duration were significant predictors of mood outcomes, with higher frequency and longer duration associated with greater improvements in mood. However, only exercise duration showed a significant negative association with anxiety levels, indicating that longer bouts of exercise may be particularly beneficial for reducing anxiety. These results highlight the importance of considering both frequency and duration of exercise when designing interventions aimed at improving mental health, emphasizing the potential for longer exercise sessions to yield more pronounced benefits for mood and anxiety regulation.

The findings of this study are consistent with previous research that has demonstrated the beneficial effects of regular exercise on mood and anxiety levels. Numerous studies have reported similar results, showing that engaging in physical activity can lead to improvements in mood and reductions in anxiety symptoms. For example, a meta-analysis by Stubbs et al. (2017) [6] found that exercise interventions were associated with significant reductions in symptoms of depression and anxiety across various populations, including adults with chronic illnesses and older adults.[7]

Furthermore, our study contributes to existing literature by examining the relationship between exercise parameters and changes in mood and anxiety levels. Consistent with previous research, we found that both exercise frequency and duration were significant predictors of mood outcomes, with higher frequency and longer duration associated with greater improvements in mood. This is in line with a study by Schuch et al. (2019),[5] which found that higher levels of physical activity were associated with a reduced risk of depression, particularly when activity was of longer duration and higher intensity.[8]

Additionally, our findings regarding the relationship between exercise duration and anxiety levels align with previous research suggesting that longer bouts of exercise may be more effective in reducing anxiety symptoms. For example, a study by Asmundson et al. (2013) [3] found that longer durations of exercise were associated with greater reductions in anxiety sensitivity, a risk factor for anxiety disorders.[9]

However, it is important to note that some studies have reported conflicting results regarding the impact of exercise frequency and duration on mental health outcomes. For instance, a study by Hallgren et al. (2016) [4] found that while higher exercise frequency was associated with lower levels of depression, exercise duration did not significantly predict depression severity. These discrepancies may be attributed to differences in study populations, methodologies, and measures of physical activity and mental health outcomes.[10-12]

In summary, our study adds to the growing body of evidence supporting the beneficial effects of regular exercise on mood and anxiety levels. By considering both exercise frequency and duration, our findings provide valuable insights into the optimal exercise parameters for promoting mental well-being. However, further research is needed to better understand the complex relationship between exercise and mental health outcomes and to inform the development of effective interventions for individuals with mood and anxiety disorders.

Conclusion:

This study contributes to the growing body of evidence supporting the beneficial effects of regular exercise on mood and anxiety levels. Our findings highlight the significant improvements in mood and reductions in anxiety experienced by participants in the exercise intervention group following the intervention, compared to those in the control group. Furthermore, our results underscore the importance of considering both exercise frequency and duration in promoting mental well-being, as higher frequency and longer duration were associated with greater improvements in mood. However, the impact of exercise parameters on anxiety levels appears to be more complex, with exercise duration demonstrating a significant negative association with anxiety, while exercise frequency did not exhibit a statistically significant effect. These findings have important implications for public health interventions aimed at improving mental health outcomes, emphasizing the potential benefits of incorporating regular exercise into routine care for individuals with mood and anxiety disorders. Overall, our study highlights the importance of physical activity in enhancing mental well-being and calls for further research to better understand the mechanisms underlying the relationship between exercise and mental health.

References:

1. World Health Organization. Depression and Other Common Mental Disorders: Global Health Estimates [Internet]. 2020 [cited 2020 Mar 6]. Available from: <https://www.who.int/publications/i/item/depression-global-health-estimates>
2. World Health Organization. Depression and Other Common Mental Disorders: Global Health Estimates [Internet]. 2017 [cited 2020 Mar 9]. Available from: https://www.who.int/mental_health/management/depression/prevalence_global_health_estimates/en/
3. Asmundson GJ, Fetzner MG, DeBoer LB, Powers MB, Otto MW, Smits JA. Let's get physical: a contemporary review of the anxiolytic effects of exercise for anxiety and its disorders. *Depress Anxiety*. 2013;30(4):362-73.
4. Hallgren M, Nakitanda OA, Ekblom Ö, Herring MP, Owen N. Associations of objectively measured physical activity and sedentary time with depression: NHANES (2005–2006). *Prev Med*. 2016;90:47-53.
5. Schuch FB, Vancampfort D, Richards J, Rosenbaum S, Ward PB, Stubbs B. Exercise as a treatment for depression: A meta-analysis adjusting for publication bias. *J Psychiatr Res*. 2016;77:42-51.

6. Stubbs B, Vancampfort D, Rosenbaum S, Firth J, Cosco T, Veronese N, et al. An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. *Psychiatry Res.* 2017;249:102-8.
7. Brown HE, Pearson N, Braithwaite RE, Brown WJ, Biddle SJH. Physical activity interventions and depression in children and adolescents: A systematic review and meta-analysis. *Sports Medicine.* 2013;43(3):195-206.
8. Kvam S, Kleppe CL, Nordhus IH, Hovland A. Exercise as a treatment for depression: A meta-analysis. *Journal of Affective Disorders.* 2016;202:67-86.
9. Mammen G, Faulkner G. Physical activity and the prevention of depression: A systematic review of prospective studies. *American Journal of Preventive Medicine.* 2013;45(5):649-57.
10. Stonerock GL, Hoffman BM, Smith PJ, Blumenthal JA. Exercise as treatment for anxiety: Systematic review and analysis. *Annals of Behavioral Medicine.* 2015;49(4):542-56.
11. Gordon BR, McDowell CP, Hallgren M, Meyer JD, Lyons M, Herring MP. Association of efficacy of resistance exercise training with depressive symptoms: Meta-analysis and meta-regression analysis of randomized clinical trials. *JAMA Psychiatry.* 2018;75(6):566-76.
12. Penedo FJ, Dahn JR. Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry.* 2005;18(2):189-93.