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Role of Exercise in Reducing Anxiety and Depression Among Adults

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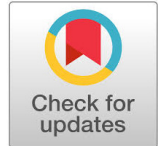
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Abstract

This study investigated the relationship between exercise duration and psychological well-being, with particular focus on symptoms of depression and anxiety among adults. The study aimed to examine whether regular engagement in exercise is associated with lower levels of anxiety and depression, and whether gender differences exist in these psychological outcomes. Adults from various universities participated in the study. Participants were divided into two groups, including regular exercise performers and non-performers. Data were collected using a demographic information form along with standardised measures of anxiety and depression. The findings indicated that individuals who engaged in regular exercise reported lower levels of both anxiety and depression compared to those who did not exercise. Greater time spent exercising was associated with better psychological outcomes. In addition, gender differences were observed, with females reporting comparatively higher levels of anxiety than males. Overall, the results suggest that regular exercise may play a meaningful role in reducing symptoms of anxiety and depression. These findings highlight the potential value of incorporating physical activity into mental health promotion strategies. However, the use of convenience sampling and a cross-sectional research design may limit the generalizability of the results.

Keywords

Anxiety disorders
Depression duration
Gender difference
University adults

INTRODUCTION

Anxiety, according to (Kocsis, 2013), is an emotional behaviour that is marked by tension, anxious thinking pattern, and physiological changes like elevated hypertension. When excessive fear or worry is accompanied by behavioural problems, the conditions are medically referred to as anxiety disorders. According to Kocsis (2013), anxiety involves the expectancy of danger ahead, while fear is an immediate emotion triggered by an actual or perceived present threat. The World Health Organization (WHO) states that anxiety disorders involve continuous and intense feelings of worry and fear. These reactions are significant enough to disrupt normal daily functioning, a key aspect of the diagnostic criteria in the 10th Revision of the International Classification of Diseases (ICD-10), as discussed by Andrade and Galvão (2025). Conditions marked by excessive fear and worry that are relentless and disrupt daily routines are what the National Institute of Mental Health (NIMH) classifies as anxiety disorders (National Institute of Mental Health, 2024).

Depression, a prevalent mental health issue, incorporates persistent sensations of stress and a reluctance to engage in activities, as per the American Psychological Association (APA) (American Psychological Association, 2023). According to the criteria outlined in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a diagnosis of Major Depressive Disorder requires that an individual has experienced a minimum of one major depressive episode at some point in their life, alongside the absence of any history of manic or hypomanic episodes (American Psychiatric Association, 2013). The World Health Organization (WHO) classifies depression as a chronic health issue where individuals endure prolonged periods of sadness, a lack of pleasure in previously enjoyed activities, and an array of associated physical, cognitive, and behavioural difficulties. The National Institute of Mental Health (NIMH) describes this enduring mental disorder as a condition characterized by persistent feelings of sadness, a loss of hope, and disinterest in activities, which is often accompanied by shifts in appetite, sleep schedules, and general energy levels (National Institute of Mental Health, 2024). According to the viewpoint of Cognitive-Behavioural Therapy (CBT), depression is a cognitive disorder marked by negative and distorted thought patterns that result in negative emotions and behaviours (Beck & Alford, 2014).

Given the increasing prevalence of anxiety and depressive symptoms among adults and the growing recognition of lifestyle factors in mental health outcomes, the present study seeks to systematically examine the role of exercise in psychological well-being. The primary objective is to investigate the relationship between regular engagement in physical exercise and levels of anxiety and depression among adult individuals. Additionally, the study aims to determine whether significant differences exist

in psychological well-being specifically anxiety and depressive symptomatology between adults who participate in regular exercise and those who maintain a sedentary lifestyle. Beyond examining lifestyle patterns, the research further intends to explore gender-based variations in exercise duration among adults. Finally, it seeks to assess whether males and females differ significantly in their reported levels of anxiety and depression. Through these objectives, the study aspires to contribute empirical insight into how exercise behaviour and gender-related factors interact in shaping mental health outcomes.

Objectives of the Study

- To explore the relationship between regular exercise and levels of anxiety and depression among adult individuals.
- To assess how psychological well-being, in terms of anxiety and depressive experiences, differs between adults who engage in regular exercise and those who are sedentary.
- To investigate gender differences in the duration of exercise among adults.
- To study gender differences in the levels of depression and anxiety among adults.

LITERATURE REVIEW

Numerous studies have demonstrated that regular exercise can improve health, lessen anxiety and depression, and even be used as an adjunctive treatment for these conditions (Garvey, et al., 2023; Bhatt, et al., 2024; Vancampfort, et al., 2025). The research studies found that anxiety was more common in women than in men. Women experience depression at a higher rate than men do (Farhane-Medina, et al., 2022; Liblik, et al., 2022). Furthermore, physical activity and mental health are strongly correlated. Physical activity and perceived stress, however, did not significantly correlate. This runs counter to the results of another study that discovered a positive correlation between gender and both mental health and physical activity (Hugh-Jones, et al., 2023). Research studies indicate that exercise training is an effective approach for managing symptoms of depression and panic disorder (Machado, et al., 2022). Regular engagement in exercise is associated with reductions in depressive and anxiety symptoms; however, the integration of exercise as a complementary intervention alongside conventional treatments such as medication and general practice care remains limited.

A lack of awareness regarding effective exercise-based interventions often prevents patients from fully benefiting from the therapeutic potential of physical activity in the management of depression and anxiety (Ströhle, 2009; Pasco et al., 2011; Dinas et al., 2011). Evidence also demonstrates that increases in activity levels through regular physical exercise, including walking, cycling, and aerobic activities, are associated with notable reductions in depressive symptoms (Sarbadhikari & Saha, 2006). Individuals experiencing depression have been shown to exhibit lower levels of physical conditioning and reduced participation in physical activity compared to non-depressed individuals (Paluska & Schwenk, 2000). Over time, research examining physical activity has expanded considerably, including within the Brazilian context (Hallal et al., 2012). Several studies have further demonstrated positive associations between physical activity and mood improvement, indicating beneficial psychological outcomes (De Moor et al., 2006; Dunn et al., 2005). Despite well-documented mental and physical health benefits of regular physical activity, a substantial proportion of individuals remain inactive. For instance, a population-based study conducted in São Paulo reported that only 31.3% of surveyed participants engaged in regular physical activity (De Mello et al., 2000).

Limited research has explored the relationship between physical activity and mood status at the population level. Understanding this relationship is essential for developing effective strategies to reduce symptoms of common psychiatric conditions, particularly depression and anxiety (Machado-Vieira, et al., 2007). A substantial body of research has linked physical inactivity with the presence of mood disorders, while evidence indicates that the reintroduction of regular physical activity is associated with improvements in mood (Dinas et al., 2011). Such improvements have been particularly observed when aerobic exercise is performed consistently at a moderate intensity (Sarbadhikari & Saha, 2006).

Individuals experiencing depression tend to demonstrate lower levels of physical activity and reduced physical fitness compared to non-depressed populations (Paluska & Schwenk, 2000). Over time, the volume of research examining physical activity has increased, including studies conducted within Brazil (Hallal et al., 2012). Several investigations have further demonstrated favourable effects of physical activity on mood states, reporting overall positive psychological outcomes (De Moor et al., 2006; Dunn et al., 2005). Despite these well-established benefits, population-level engagement in physical activity remains limited. An epidemiological survey conducted in the city of São Paulo revealed that only 31.3% of participants reported engagement in regular physical activity (De Mello et al., 2000).

Few studies have explored the relationship between habitual physical activity and mood status at the population level. Characterizing populations based on both physical activity patterns and mood-related complaints is essential for informing strategies aimed at reducing the burden of common psychiatric conditions, particularly depressive and anxiety-related symptoms (Machado-Vieira, et al., 2007). In addition, such findings may contribute to the development of evidence-based public health policies. Anxiety disorders represent a class of mental illnesses that are among the most prevalent and serious in terms of functional impairment and distress. In fact, mental health conditions such as depression and anxiety disorders may be comorbid. Moreover, individuals experiencing anxiety disorders are also more likely to present with cardiovascular disease and die prematurely. In both clinical and nonclinical samples, it has been established that physical activity protects against anxiety disorders. In fact, studies have demonstrated that participation in physical activity such as exercise significantly reduces anxiety.

In the context of modern medicine, it is unquestionable that regular exercise exerts a positive effect on health. Physical activity is often the first measure of change in lifestyle in the prevention and treatment of chronic conditions (Kruk, 2007). Beyond its role in reducing mortality risk, regular physical activity has been shown to decrease the prevalence of various chronic health conditions. Evidence suggests that participating in moderate to high intensity exercise for approximately 2 to 2.5 hours per week significantly lowers the likelihood of developing chronic diseases. Epidemiological research further indicates that regular exercise is positively associated with enhanced psychological well-being and higher levels of self-esteem. Individuals who maintain an active lifestyle also tend to experience a slower rate of age-related decline in cognitive functioning and memory when compared to sedentary individuals. Owing to these cognitive benefits, exercise-based interventions have been applied to support memory and cognitive performance in populations with cognitive impairments, including individuals diagnosed with Alzheimer's disease. Additionally, physical activity plays a protective role in mental health, with adults who engage in regular exercise reporting fewer symptoms of depression and anxiety (van Minnen et al., 2012).

According to study conducted by Stanton and Reaburn (2014), regular physical activity positively influences one's mood. In particular, it was found that supervised aerobic exercise at a moderate intensity three times a week for at least nine weeks helped treat depression. In late-life major depression, physical activity can be a safe and effective addition to antidepressant treatment. According to Cooney et al. (2013), despite the fact that exercise is moderately effective in reducing depressive symptoms in comparison to psychological or pharmaceutical treatments, physical exercise does not appear to be more effective. According to Huang and Humphreys (2012), maintenance physical activity has increased the subjective measurement of happiness and quality of life. It may also boost self-control and motivation to achieve goals in life. According to Boecker et al. (2008), euphoria and endorphin release were correlated with long-term running distance among humans. While it is well known that physical activity is beneficial, excessive activity can harm a person physically and psychologically. Research has indicated that individuals who engage in compulsive exercise may experience pronounced withdrawal symptoms when unable to maintain their activity levels.

The present study examines gender variations in the duration of exercise and mental well-being, since existing research has identified that the female gender may experience more anxiety and engage less in physical activity than the male gender (Hallal et al., 2012). To enable efficacious interventions for overcoming obstacles towards exercise, especially for females, it is necessary to understand these

disparities. While the association between higher educational attainment and awareness of the significance of exercise and increased academic-associated stress that can deteriorate mental wellness of anxious and depressed individuals can contribute towards decreasing or deterring beneficial activity and resulting wellness, the impact of education on activity and mental wellness is examined. This study will help present empirical support for the inclusion of exercise interventions for enhanced mental wellness for students in educational institutions and target a study group of 240 students in higher educational institutions. These findings can assist in policy-making for structured activity initiatives for enhanced mental wellness of Pakistani young individuals. This study is especially relevant since there has been an escalating incidence of mental wellness problems that need community-based strategies for lasting interventions.

Hypotheses

- Anxiety and depression are negatively correlated with exercise duration among adults
- Those who do exercise and those who do not have significant differences in their levels of anxiety and depression
- Males do exercise for longer periods of time than females
- Females have higher levels of depression and anxiety than males do

METHODOLOGY

A quantitative research method was used. A total of 240 students made up the study's sample, which was split into two groups. Participants who exercised (N=127) made up one group, while those who did not (N=113) made up the other. There were 136 males and 104 females in the sample of adults, approached at the various departments of the universities in Peshawar, Pakistan.

Instruments

Following instruments were used in the study:

Demographic Information

A demographic information sheet was used in the current research, which included age, gender, education level, marital status and exercise duration of the participants.

Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI), developed by Beck (as discussed by [Kohn, et al., 2008](#)), is a brief self-report tool used to assess anxiety in individuals aged 17 and older. It consists of 21 items that evaluate both physical and cognitive symptoms of anxiety. Each item is scored from 0 to 3, with higher total scores reflecting more severe anxiety. The reliability of the BAI has been previously reported with Cronbach's alpha values ranging from 0.83 to 0.93. In the current study, the BAI demonstrated acceptable internal consistency, with a Cronbach's alpha of 0.863.

Beck Depression Inventory

The Beck Depression Inventory (BDI) is a self-report scale used to gauge how severe depression symptoms are in people 13 years of age and older. Beck created the BDI in 1961 and the updated BDI-II is a 21-item self-report scale, as cited by Jackson-Koku ([2016](#)). Each item has a score between 0 and 3, where higher scores correspond to more severe symptoms. The overall score is between 0 and 63. Aaron T. Beck's scale's reliability ranged from 0.78 to 0.89 across various populations, whereas our study's reliability was alpha 0.88, indicating acceptable internal consistency.

Procedure

Before starting the formal research, heads of several departments at different universities in Peshawar, Pakistan granted official permission to start the study. Potential participants were chosen at convenience

for data collection after giving their consent. Each participant gave their informed consent after being fully informed of the goals and purpose of the study. Subjects received instructions and research questionnaires. They received assurances that the data they submitted would only be utilized for research. Following the establishment of a rapport, the subjects were given the demographic sheet, BDI and BAI, along with some verbal instructions. After completing the questionnaires to the best of their knowledge, the participants were thanked for taking part.

RESULTS & FINDINGS

Table 1 shows the demographic characteristics of the total sample of the participants. Frequencies (N) and Percentage (%) of each level of demographics are shown.

Table 1

Demographics Characteristics of Participants (N=240).

Variables	N	%	
Gender	Male	136	56.7
	Female	104	43.7
Marital Status	Single	164	68.3
	Married	76	31.7
Exercise	Yes	127	52.9
	No	113	47.1

Table 2 shows that all scales used in the current study had high reliability which made them suitable for the study to be used.

Table 2

Psychometric properties of major variables

Variables	N	M	SD	α	Range
BAI	240	18.93	10.30	.86	0-50.00
BDI	240	17.54	11.22	.88	0-52.00

Note: N = Sample Frequency, M = Mean, SD = Standard Deviation, α = Cronbach Alpha

Table 3 shows the Exercise Duration, as a predictor of reducing anxiety among adults. The results show a significant regression equation between duration of exercise and anxiety showed by adults $F(2, 238) = 39.37$, for which $p < .001$ with variance 14.2%. These results reveal that duration of exercise is a significant predictor of reducing anxiety.

Table 3

Regression Analysis for Exercise Duration Predicting Anxiety among Adults

Variable	B	SE
Constant	22.38	.827***
Exercise Duration	-3.33	.531***
R ²	.142	
F	39.37***	

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

Table 4 shows the Exercise Duration, as the predictor of reducing depression among adults. The results show a significant regression equation between duration of exercise and depression showed by adults, $F(2, 238) = 23.39$, for which $p < .001$ with variance 9%. These results reveal that duration of exercise is significant predictor of reducing depression.

Table 4
Regression Analysis for Exercise Duration Predicting Depression among Adults

Variable	B	SE
Constant	20.52	.929***
Exercise Duration	-2.88	.596***
R2	.090	
F	23.39***	

Note: *p<.05. **p<.01. ***p<.001

Table 5 shows that the mean value for female is less than those of male for duration of exercise. These differences are significant at p<.001.

Table 5
Mean Differences between Female and Male for Exercise Duration

Variables	Female		Male		t(238)	P	95% CI		Cohn's d
	M	SD	M	SD			LL	UP	
Exercise Duration	0.81	1.05	1.21	1.22	2.7	0.002	0.11	0.7	1.15

Note: M= Mean, SD= Standard Deviation, CL= Confidence Interval, LL= Lower Limit, UP= Upper Limit

Table 6 shows that the mean value of anxiety for female is greater than those of male, while depression mean is less for female as compared to male.

Table 6
Mean Differences between Female and Male for Anxiety and Depression

Variables	Female		Male		t	P (238)	95% CI		Cohn's d
	Mean	SD	Mean	SD			LL	UL	
Anxiety	20.67	10.82	17.58	9.71	-2.31	.021	-5.70	-.46	10.20
Depression	16.3	11.44	18.22	11.5	1.09	2.77	-1.28	4.47	11.22

Note: M= Mean, SD= Standard Deviation, CL= Confidence Interval, LL= Lower Limit, UL= Upper Limit

Table 7 shows that the mean value of anxiety and depression for those who performed exercise is significantly less than those who don't perform exercise.

Table 7
Mean Differences between Exercise Performers and Non-Performers for Anxiety and Depression

Variables	Exercise Performers		Exercise Non-Performers		t(298)	P	95% CI		Cohn's d
	M	SD	M	SD			LL	UL	
Anxiety	14.88	9.53	23.46	9.21	.815	.001	-10.97	-6.19	9.38
Depression	13.33	9.32	22.25	11.34	.081	.001	-11.54	-6.28	10.32

Note: M= Mean, SD= Standard Deviation, CL= Confidence Interval, LL= Lower Limit, UL=Upper Limit

Discussion

Gender differences in exercise duration, its relation with anxiety, and depression were explored in this study to determine whether exercise can relieve adult patients from depression and anxiety or not. The findings, like previous studies that demonstrated exercise has several psychological advantages, strongly support the hypotheses. Hypothesis assumed that the reduced amount of anxiety and depression is observed with increased exercising participants. The findings of the present study reveal that exercise duration is a significant negative predictor of anxiety and depression. Decreased symptoms of anxiety and depression were observed with increased exercise periods. Along with a previous study demonstrating improved mental health with increased physical activity, it is observed that exercise reduces symptoms

of anxiety and depression. Stanton and Reaburn (2014) completed a meta-analysis that aerobic exercise, monitored thrice a week with moderate intensity for a period of at least nine weeks, reduced symptoms of depression in adults.

The outcomes properly match previous findings that pointed out though exercising intensity is low, yet reduced symptoms of anxiety and depression are found. Ströhle (2009) found a brilliant anxiolytic, by focusing on aerobic exercise, a significant reduction in symptoms of anxiety was found among patients irrespective of whether patients were under treatment for anxiety or were non-clinicals. The finding supports the findings of the present study, as exercise duration is a significant negative predictor for decreased symptoms of depression. Similarly, Craft and Perna (2004) found that regular exercising is a brilliant treatment to improve endorphins and serotonin, thereby decreasing symptoms of anxiety and depression. The result properly supports negative prediction for symptoms of anxiety. The present study has a basis due to the findings that a significant difference between those who perform exercise and those who do not perform exercise.

The second hypothesis is that there are likely to be observable differences between individuals who exercise and those that do not. There are no particular values supported because the findings underscore the importance of exercising and its effect of improving mental health. These results are reinforced by earlier studies that have discovered a relationship between the practice of regular exercise and improved mental well-being. It is likely that there are observable differences between individuals who exercise and those that do not. To affirm the above findings, Dunn et al. (2005) carried out a randomized controlled trial that ascertained that individuals who exercised normally exhibited reduced symptoms of depression when compared with sedentary individuals. Also, like the two above-mentioned studies, a similar finding that physically active individuals had a reduced prevalence of anxiety and depression than those that do not exercise, was observed by Pasco et al. (2011). Moreover, owing to these discrepancies among the two sexes, males are likely than females to exercise extensively. As similar to the present study, the study conducted in Brazil by Hallal et al. (2012) demonstrated that males showed consistently longer periods of physical activity duration in comparison with the female group.

The fourth hypothesis was that females develop anxiety and depression more than males do. The findings partially support the hypothesis that females tend to develop more anxiety than males do but not necessarily more depression. This result agrees with the study by Kessler et al. (2007), where the lifetime prevalence of anxiety disorders in the United States among females was found to be higher than among males. This also supports the current finding of females exhibiting high levels of anxiety. In a Brazilian community sample, Barcelos-Ferreira et al. (2010) found that females had higher rates of anxiety symptoms than males did. This is consistent with the results of the current study.

CONCLUSION

Physical activity or exercise has been found effective for aiding adults with anxiety and depression, and this is evident from the current study. Analysing the results obtained, it is found that longer periods of physical activity are an effective predictor for reducing levels of anxiety and depression. Significant differences were observed between those who physically activity and those who did not. It is very evident that differences exist between the two sexes with regard to the period for which males physically activity and the level of anxiety among females. However, the level of depression is not significant for both males and females. This supports the current literature with the psychological benefits obtained from regular physical activity, including the release of more endorphins and the process by which serotonin is metabolized. Limitations in the current study demonstrate the need for more research even with its contributions. Longitudinal studies and more sampling methods could be adopted for increasing the detection level for physical activity benefits. Moreover, more precise methods for determining the two variables may be necessary. The implications for the current study provide effective means for reducing anxiety and depression within the population through the use of physical activity. This makes the population healthier and more resilient.

Recommendations

- Future research should involve different types of populations in terms of geographic, socioeconomic, and cultural backgrounds so that their results are more generalizable. Some methods of random sampling could increase representativeness.
- Wearable fitness trackers and other objective physical activity measures, such as heart rate monitors, may complement self-reported data and reduce biases. Clinical anxiety and depression tests may also further validate self-reported inventory results.
- Anxiety and depression result from different exercise intensities and modalities, like yoga, strength training, and aerobic exercise, which may allow for the prescription of specific exercise to derive mental health benefits.
- Con-founding variables such as an individual's diet, sleep habits, stress level, and any co-occurring psychiatric disorders will need to be considered in order to separate the specific effect of exercise in subsequent studies on anxiety and depression.
- Our data imply that public health policies should stimulate exercise. For this, the inclusion of exercise promotion in educational facilities is useful. It would also be appropriate to have structured exercise programs at workplaces and universities to stimulate adults to engage in regular physical activity.
- Individually tailored interventions to promote female participation in physical activity and reduce exercise barriers, such as a lack of time or constrictions because of cultural backgrounds, are considered based on the gender differences for exercise duration and anxiety levels observed in this study.
- Health education campaigns on the psychological benefits of exercise can help promote continued physical activity, targeting both the general population and subpopulations, such as females and students.

Limitations

- It is hard to determine the relationship between reduced symptoms of anxiety and depression and the extent of exercise done because of the cross-sectional design of the study. Longitudinal studies can more accurately convey the relationship between these symptoms and their duration.
- The results cannot be generalized to the larger Pakistani or, indeed, any other worldwide populace because they were exclusively selected from an academic environment within the boundaries of Peshawar through convenience sampling. It could be hypothesized that the sample is not fully representative of diversely varied cultural or socioeconomic strata.
- Response biases such as social desirability or errors of recall could be incorporated within the Beck Anxiety Inventory (BAI), the Beck Depression Inventory (BDI), and the demographic survey due to the use of self-report methodology.
- The type, intensity, or exercise frequency was not considered in great detail, although exercise duration is primarily emphasized in this study. The differences in effectiveness of various exercise modes, such as aerobic and resistance exercise, can differ on mental health scores.
- It did not control for factors of diet, sleep, life stressors, or concomitant mental health problems that may have played a role in relationships of exercise and both anxiety and depression.
- Although the study included gender and education, other demographic factors like age, socioeconomic factors, and culture were not explored in the study, and this might have been a limitation to our understanding of the effect of those factors on mental health and exercise.

Competing Interest

The authors declare no conflict of interest.

Authors' Biography

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REFERENCES

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.
- American Psychological Association. (2023). *APA Dictionary of Psychology*. APA Dictionary of Psychology. <https://dictionary.apa.org/>
- Andrade, E. A., & Galvão, M. C. B. (2025). International Statistical Classification of Diseases and Related Health Problems (ICD-11): From its origin to its use in digital systems. *Ciência & Saúde Coletiva*, 30, e01402024. <https://doi.org/10.1590/1413-812320242911.01402024EN>
- Barcelos-Ferreira, R., Izbicki, R., Steffens, D. C., & Bottino, C. M. (2010). Depressive morbidity and gender in community-dwelling Brazilian elderly: Systematic review and meta-analysis. *International Psychogeriatrics*, 22(5), 712-726. <https://doi.org/10.1017/S1041610210000463>
- Beck, A. T., & Alford, B. A. (2014). Depression: Causes and treatment. In *Depression*. University of Pennsylvania Press.
- Bhatt, D., Kashyap, K., Chandravanshi, J., & Kumar, A. (2024). Exercise, Yoga and Meditation Positive Impact on those Suffering from Depression and Anxiety Disorders. *European Journal of Cardiovascular Medicine*, 14(2).
- Boecker, H., Sprenger, T., Spilker, M. E., Henriksen, G., Koppenhoefer, M., Wagner, K. J., ... & Tolle, T. R. (2008). The runner's high: Opioidergic mechanisms in the human brain. *Cerebral Cortex*, 18(11), 2523-2531. <https://doi.org/10.1093/cercor/bhn013>
- Cooney, G. M., Dwan, K., Greig, C. A., Lawlor, D. A., Rimer, J., Waugh, F. R., ... & Mead, G. E. (2013). Exercise for depression. *The Cochrane Database of Systematic Reviews*, 2013(9), CD004366. <https://doi.org/10.1002/14651858.CD004366.pub6>
- Craft, L. L., & Perna, F. M. (2004). The benefits of exercise for the clinically depressed. *Primary care companion to the Journal of Clinical Psychiatry*, 6(3), 104-111. <https://doi.org/10.4088/pcc.v06n0301>
- De Mello, M. T., de Aquino Lemos, V., Antunes, H. K. M., Bittencourt, L., Santos-Silva, R., & Tufik, S. (2013). Relationship between physical activity and depression and anxiety symptoms: A population study. *Journal of Affective Disorders*, 149(1-3), 241-246. <https://doi.org/10.1016/j.jad.2013.01.035>
- De Moor, M. H., Beem, A. L., Stubbe, J. H., Boomsma, D. I., & De Geus, E. J. (2006). Regular exercise, anxiety, depression and personality: A population-based study. *Preventive Medicine*, 42(4), 273-279. <https://doi.org/10.1016/j.ypmed.2005.12.002>
- Dinas, P. C., Koutedakis, Y., & Flouris, A. D. (2011). Effects of exercise and physical activity on depression. *Irish Journal of Medical Science*, 180(2), 319-325. <https://doi.org/10.1007/s11845-010-0633-9>
- Dunn, A. L., Trivedi, M. H., Kampert, J. B., Clark, C. G., & Chambliss, H. O. (2005). Exercise treatment for depression: Efficacy and dose response. *American Journal of Preventive Medicine*, 28(1), 1-8. <https://doi.org/10.1016/j.amepre.2004.09.003>
- Farhane-Medina, N. Z., Luque, B., Taberner, C., & Castillo-Mayén, R. (2022). Factors associated with gender and sex differences in anxiety prevalence and comorbidity: A systematic review. *Science Progress*, 105(4), 00368504221135469. <https://doi.org/10.1177/00368504221135469>
- Garvey, L., Benson, A. C., Bengler, D., Short, T., Banyard, H., & Edward, K. L. (2023). The perceptions of mental health clinicians integrating exercise as an adjunct to routine treatment of depression and anxiety. *International Journal of Mental Health Nursing*, 32(2), 502-512. <https://doi.org/10.1111/inm.13089>
- Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., & Ekelund, U. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *The Lancet*, 380(9838), 247-257. [https://doi.org/10.1016/S0140-6736\(12\)60646-1](https://doi.org/10.1016/S0140-6736(12)60646-1)

- Huang, H., & Humphreys, B. R. (2012). Sports participation and happiness: Evidence from US microdata. *Journal of Economic Psychology*, 33(4), 776-793. <https://doi.org/10.1016/j.joep.2012.02.007>
- Hugh-Jones, S., Wilding, A., Munford, L., & Sutton, M. (2023). Age-gender differences in the relationships between physical and mental health. *Social Science & Medicine*, 339, 116347. <https://doi.org/10.1016/j.socscimed.2023.116347>
- Jackson-Koku, G. (2016). Beck depression inventory. *Occupational Medicine*, 66(2), 174-175. <https://doi.org/10.1093/occmed/kqv087>
- Kessler, R. C., Merikangas, K. R., & Wang, P. S. (2007). Prevalence, comorbidity, and service utilization for mood disorders in the United States at the beginning of the twenty-first century. *Annual Review of Clinical Psychology*, 3, 137-158. <https://doi.org/10.1146/annurev.clinpsy.3.022806.091444>
- Kocsis, R. N. (2013). Book Review: Diagnostic and statistical manual of mental disorders: Fifth Edition (DSM-5). *International Journal of Offender Therapy and Comparative Criminology*, 57(12), 1546-1548. <https://doi.org/10.1177/0306624X13511040>
- Kohn, P. M., Kantor, L., DeCicco, T. L., & Beck, A. T. (2008). The Beck Anxiety Inventory–Trait (BAIT): A measure of dispositional anxiety not contaminated by dispositional depression. *Journal of Personality Assessment*, 90(5), 499-506. <https://doi.org/10.1080/00223890802248844>
- Kruk, J. (2007). Physical activity in the prevention of the most frequent chronic diseases: An analysis of the recent evidence. *Asian Pacific Journal of Cancer Prevention*, 8(3), 325.
- Liblik, K., Mulvagh, S. L., Hindmarch, C. C., Alavi, N., & Johri, A. M. (2022). Depression and anxiety following acute myocardial infarction in women. *Trends in Cardiovascular Medicine*, 32(6), 341-347. <https://doi.org/10.1016/j.tcm.2021.07.005>
- Machado, S., Telles, G., Magalhaes, F., Teixeira, D., Amatriain-Fernandez, S., Budde, H., ... & Sa Filho, A. S. (2022). Can regular physical exercise be a treatment for panic disorder? A systematic review. *Expert Review of Neurotherapeutics*, 22(1), 53-64. <https://doi.org/10.1080/14737175.2021.2005581>
- Machado-Vieira, R., Dietrich, M. O., Leke, R., Cereser, V. H., Zanatto, V., Kapczynski, F., ... & Gentil, V. (2007). Decreased plasma brain derived neurotrophic factor levels in unmedicated bipolar patients during manic episode. *Biological Psychiatry*, 61(2), 142-144. <https://doi.org/10.1016/j.biopsych.2006.03.070>
- National Institute of Mental Health. (2024). *Anxiety disorders*. National Institute of Mental Health. <https://www.nimh.nih.gov/health/topics/anxiety-disorders>
- Paluska, S. A., & Schwenk, T. L. (2000). Physical activity and mental health: current concepts. *Sports Medicine*, 29(3), 167-180. <https://doi.org/10.2165/00007256-200029030-00003>
- Pasco, J. A., Williams, L. J., Jacka, F. N., Henry, M. J., Coulson, C. E., Brennan, S. L., ... & Berk, M. (2011). Habitual physical activity and the risk for depressive and anxiety disorders among older men and women. *International Psychogeriatrics*, 23(2), 292-298. <https://doi.org/10.1017/S1041610210001833>
- Sarbadhikari, S. N., & Saha, A. K. (2006). Moderate exercise and chronic stress produce counteractive effects on different areas of the brain by acting through various neurotransmitter receptor subtypes: A hypothesis. *Theoretical Biology and Medical Modelling*, 3(1), 33. <https://doi.org/10.1186/1742-4682-3-33>
- Stanton, R., & Reaburn, P. (2014). Exercise and the treatment of depression: A review of the exercise program variables. *Journal of Science and Medicine in Sport*, 17(2), 177-182. <https://doi.org/10.1016/j.jsams.2013.03.010>
- Ströhle, A. (2009). Physical activity, exercise, depression and anxiety disorders. *Journal of Neural Transmission*, 116(6), 777-784. <https://doi.org/10.1007/s00702-008-0092-x>
- van Minnen, A., Harned, M. S., Zoellner, L., & Mills, K. (2012). Examining potential contraindications for prolonged exposure therapy for PTSD. *European journal of Psychotraumatology*, 3(1), 18805. <https://doi.org/10.3402/ejpt.v3i0.18805>
- Vancampfort, D., Firth, J., Stubbs, B., Schuch, F., Rosenbaum, S., Hallgren, M., ... & Werneck, A. O. (2025). The efficacy, mechanisms and implementation of physical activity as an adjunctive treatment in mental disorders: A meta-review of outcomes, neurobiology and key determinants. *World Psychiatry*, 24(2), 227-239. <https://doi.org/10.1002/wps.21314>