

THE ROLE OF PHYSICAL EXERCISE IN REDUCING STRESS

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<https://doi.org/10.37602/IJSSMR.2025.8601>

ABSTRACT

Stress is a widespread mental and physical health problem, and this review confirms physical exercise as a safe and effective stress management method, exploring its mechanisms, types, and optimal dosage. Physiologically, regular aerobic exercise modulates the HPA axis to reduce cortisol (the stress hormone) while increasing the release of endorphins and dopamine, thereby boosting resilience and mood. Psychologically, exercise reduces symptoms of anxiety and depression, improves self-esteem, and provides both distraction and social support. The most effective types of exercise are aerobic (like jogging) and mind-body practices (like yoga), with moderate intensity offering the best benefits. The recommended frequency is three to five times a week for 30 to 60 minutes per session. Given the reliance of existing studies on self-reports, future research needs to use longitudinal designs and objective biological markers to better understand long-term effects and differences among populations. Nonetheless, the inclusion of structured exercise interventions in workplaces, schools, and clinical settings is supported as an effective strategy and must be tailored to individual needs to ensure long-term sustainability.

Keywords: Physical Exercise, Stress Reduction, Cortisol, Aerobic Exercise, Moderate Intensity.

1.0 INTRODUCTION

In modern society, stress has become an increasingly common and serious problem, which has adverse effects on the physical and mental health of many different groups of people, such as students, workers, and white-collar workers. Among the many management interventions to reduce stress, physical exercise has become an effective, safe, and convenient method. This review aims to integrate the existing research results on the relationship between physical exercise and stress reduction, explore the relevant physiological and psychological theories and mechanisms involved, and determine the type and intensity of exercise that can produce the most significant stress reduction effect.

Physical exercise is a planned, structured, and repetitive body movement performed with the aim of increasing or maintaining fitness. It is a subset of daily physical activity and involves the expenditure of energy produced by skeletal muscles. In the context of stress management, exercise acts as an effective, safe, and convenient method by helping to shift mental focus and release endorphins, which are brain chemicals that elevate mood. Therefore, the most beneficial exercises for reducing stress are those that combine rhythmic, repetitive elements, and a mind-body focus.

Suitable exercises for this purpose can be divided into three main categories. First, Aerobic Exercise (Endurance), which increases heart rate and is very effective in relieving stress, including brisk walking, jogging, cycling, and swimming. Second, Strength Exercise (Resistance Training), such as weightlifting and bodyweight training (for example, squats and push-ups), which enhances strength and self-confidence. Third, Flexibility and Balance Exercise (Mind-Body), such as Yoga and Tai Chi, which are excellent for relieving muscle tension caused by chronic stress and promoting mental calm through the coordination of breathing and movement.

1.1 Effective Steps for Implementing Aerobic Exercise

To ensure that aerobic activities such as brisk walking, jogging, cycling, and swimming are performed effectively and safely, each session must be divided into three main phases. The first phase is Initial Preparation and Warm-up, lasting 5 to 10 minutes, where you need to prepare the appropriate equipment (like shoes or a helmet) and perform dynamic stretching or low-intensity activities to increase blood flow to the muscles and reduce the risk of injury (ACSM, 2021). The second phase is the Conditioning Phase, which is the main workout lasting 20 to 60 minutes. In this phase, you should maintain a moderate intensity—breathing quickly but still able to speak—with a focus on a stable and rhythmic pace (Herring et al. 2010). The key here is to use mind-body techniques by shifting mental focus away from stress and towards internal breathing and the physical sensations of movement (Pascoe et al. 2017).

The final phase is the Cool-down and Recovery, which also takes 5 to 10 minutes. At this stage, you need to gradually reduce speed to stabilize the heart rate, followed by gentle static stretching of the main muscles to prevent tension and post-exercise muscle soreness (Dupuy, O., et al. 2018). Overall, the optimal stress reduction benefit depends on consistency and frequency, rather than excessive intensity (Chekroud, A. M., et al. 2018). You are also advised to maintain good hydration, take adequate nutrition, and practice cross-training (variety of activities) to ensure motivation is sustained and exercise becomes a lasting routine (Ryan, R. M., & Deci, E. L. 2000).

1.2 Effective Steps for Implementing Strength Exercise (Resistance Training)

Executing Strength Exercise (Resistance Training), such as weightlifting or bodyweight training (like squats and push-ups), effectively requires strict adherence to preparation, technique, and recovery phases. The session must begin with a proper Initial Preparation and Warm-up, involving 5–10 minutes of light cardio and dynamic stretching to activate the joints and muscles and mitigate injury risk (ACSM, 2021). The most critical aspect of the Execution Phase is maintaining correct technique; one must prioritize form over the load used (Schoenfeld, B. J., et al. (2012), beginning with a very light weight or just bodyweight until the movement pattern is fully mastered (Fleck & Kraemer, 2014). Exercises should be performed in a controlled and slow manner, specifically during the lowering phase, while coordinating movement with proper breathing—inhaling during the rest phase and exhaling during the exertion phase -lifting/pushing (De Vries, 1966). Appropriate load selection should allow the performer to complete the target number of repetitions (usually 8–12) while feeling fatigued towards the final set (Krieger, 2010).

Finally, the session concludes with the Cool-down and Recovery Phase. This involves 5–10 minutes of low-intensity activity followed by gentle static stretching of the trained muscle groups, holding each stretch for 20–30 seconds to promote muscle relaxation and reduce soreness. For optimal muscle growth and strength gains, consistent intake of hydration and protein is essential, and adequate rest (48 to 72 hours) must be given to the specific muscle group before training it again. To ensure continued progress and strength improvement, practitioners must employ the principle of Progressive Overload by gradually increasing the challenge over time, whether by adding weight, more repetitions, or reducing rest periods.

1.3 The Physiological Impact of Exercise on Stress

Several studies have investigated the physiological mechanisms by which exercise relieves stress. According to Kandola et al. (2019), regular aerobic exercise can modulate the hypothalamic-pituitary-adrenal (HPA) axis, thereby reducing levels of cortisol, a major stress hormone. In addition, physical activity promotes the release of endorphins and other neurochemicals such as dopamine, which can significantly improve mood and enhance feelings of wellbeing (Luger et al., 2020). These biochemical changes help improve resilience to stressors and accelerate physiological recovery after acute stress episodes (Childs & de Wit, 2014).

1.4 Psychological Benefits of Exercise on Stress

Many studies have shown that from a psychological perspective, exercise has a multi-faceted impact on stress reduction. Craft and Perna demonstrated in their article that regular, long-term physical exercise can effectively reduce the impact of anxiety and depression symptoms, which are often associated with chronic stress. In addition, physical exercise can also improve self-esteem and enhance self-cognition, both of which are protective factors against stress (Chekroud et al., 2018). Collective sports activities can not only promote social connections and enhance personal social status, but also further reduce loneliness and stress (Rebar et al., 2015).

1.5 Types and Intensities of Exercise Effective for Stress Reduction

The stress-reducing effects of exercise seem to be related to the type and intensity of exercise. Aerobic exercise such as jogging, swimming, and hiking have shown significant effects on reducing stress (Herring et al., 2010). In contrast, mind-body exercises such as yoga, meditation, and tai chi provide dual benefits by combining physical movement with mindfulness and controlled breathing, significantly reducing physiological and perceived stress (Pascoe et al., 2017). It is worth noting that moderate-intensity exercise is most beneficial for reducing personal stress, while high-intensity activities may increase stress levels and even have adverse effects in some individuals.

1.6 Mechanisms of Stress Reduction through Exercise

In previous studies, researchers have proposed a variety of mechanisms to explain how exercise reduces stress. From a physiological perspective, exercise-induced changes in human neurochemistry, such as increased levels of endorphins and brain-derived neurotrophic factor (BDNF), can improve mood and cognition. From a psychological perspective, exercise can

distract people from stress and enhance their sense of control over their environment and their sense of achievement. In addition, regular, long-term physical exercise can improve sleep quality and reduce fatigue, which can indirectly help reduce stress levels (Kandola et al., 2019).

2.0 LIMITATIONS AND FUTURE DIRECTIONS

Although most of the current literature and research agree and support the stress-reducing effect of exercise, there are still some limitations. Many current studies rely on self-reported stress and exercise frequency measurements, which are highly subjective, and the measurement of other variables may not be very accurate, which may lead to reporting bias. In addition, most studies focus on short-term effects, and few studies explore the long-term benefits of sustained exercise intervention. Future studies should use more objective stress biomarkers to obtain data more accurately and objectively, and expand the exploration of different populations to enhance the universality of research results.

2.1 Frequency and Duration of Exercise for Optimal Stress Reduction

In addition to the type and intensity of physical activity, the frequency and duration of exercise also play a crucial role in reducing stress. There is evidence that regular, sustained exercise over a long period of time can reduce stress more significantly than occasional or infrequent activity. (Chekroud et al. 2018) analyzed data from more than one million people and concluded that exercising three to five times a week was associated with the lowest number of days with poor mental health, including days related to stress. In addition, the study also showed that 30 to 60 minutes of exercise per day is optimal, and too short or too long a duration will lead to a weakened stress-relief effect or even adverse consequences.

2.2 Practical Applications and Intervention Strategies

The stress-reducing potential of physical activity is increasingly recognized, and researchers and clinicians advocate for the inclusion of exercise interventions in workplace health programs, student health programs, and clinical treatment programs. In occupational settings, companies should encourage the implementation of structured exercise breaks, such as short aerobic exercise or group yoga classes during work hours, which have been shown to reduce perceived stress and improve employee well-being (Rebar et al., 2015). These interventions not only help with stress management, but also improve work productivity and job satisfaction.

In educational settings, incorporating physical activity into daily learning activities can provide students with significant stress relief. Budde et al. (2015) demonstrated that incorporating short bouts of moderate-intensity physical activity into teaching activities can improve adolescent mood. Given the increasing prevalence of academic stress, especially among secondary school students, schools are encouraged to provide campus fitness activities and convenient exercise facilities as part of their mental health support services.

In clinical settings, exercise is increasingly recommended as a complementary therapy for patients with stress-related disorders such as anxiety and depression. (Chekroud et al. 2018) emphasized that exercise prescriptions tailored to personal preferences, individual functional level, and health status can improve treatment outcomes. Additionally, mind-body practices such as Tai Chi, Pilates, and mindfulness-based movement therapy have shown promising

results in clinical populations, providing convenient alternatives for individuals with limited mobility or chronic illnesses (Pascoe et al., 2017). To maximize the effectiveness of these interventions, individual preferences, cultural background, and potential barriers to participation must be considered. Tailoring exercise programs to different needs can ensure wider accessibility and long-term sustainability of stress management strategies.

3.0 SUGGESTIONS

Based on the results of the current literature review, several practical and research recommendations can be made to promote the use of physical exercise in stress management. First, public health departments and medical service departments should actively advocate regular, moderate-intensity physical exercise as a non-pharmacological stress reduction strategy. Specifying relevant policies and regulations will help increase public awareness and accessibility. Second, educational institutions and relevant intelligent departments should develop structured exercise programs based on the needs of their specific groups. For example, organizing short, simple group exercise activities during work or study breaks can be an effective and low-cost intervention to help relieve daily stress (Rebar et al., 2015). To increase participation, such programs should provide a variety of exercise forms, including aerobic exercise and mind-body exercise.

In terms of academic research, future academic workers should give priority to longitudinal research designs to examine the long-term effects of different exercise programs or different types of exercise on stress and related mental health outcomes. In addition, research should be more combined with objective biomarkers, such as salivary cortisol, heart rate variability, and neuroimaging data, which are easily quantifiable data, which will help to more fully reveal the physiological mechanisms of physical exercise in relieving stress (Kandola et al., 2019). Researchers should also pay more attention to the differential effects of physical exercise on different populations, such as the elderly, patients with chronic diseases, and those with mental illnesses, to provide a basis for the development of personalized intervention strategies. Finally, digital and application-oriented exercise interventions are worthy of further exploration, given their growing popularity and potential to reach a wider population. Digital programs that combine exercise guidance, stress management education, and real-time feedback may become an effective and scalable stress reduction solution in modern high-pressure environments.

4.0 CONCLUSION

Based on a comprehensive analysis of the provided text, it can be concluded that physical exercise is a highly effective, safe, and multidimensional stress management intervention, with benefits spanning physiological, psychological, and practical aspects. Physiologically, regular exercise, especially aerobic, is a key modulator of the HPA axis, helping to reduce cortisol levels while stimulating the release of endorphins and neurotransmitters like dopamine, which directly elevate mood and resilience to stress. From a psychological perspective, exercise acts as a healthy mental distraction, boosts self-confidence (especially through strength training), and, when done in a group setting, strengthens social connections and reduces feelings of loneliness.

The effectiveness of exercise depends on optimal execution: moderate intensity is identified as the most beneficial, while activities that are too high in intensity may have adverse effects. The key to long-term benefits lies in consistency, with recommendations to exercise three to five times a week for 30 to 60 minutes per session. Furthermore, a combination of aerobic exercise (for cardiovascular benefits) and mind-body exercise (such as Yoga and Tai Chi, for mental calm) offers the best results. Practically, this evidence supports the integration of exercise into health programs in the workplace, schools, and as a complementary clinical therapy, although intervention designs must be tailored to individual needs. Overall, physical exercise serves as a scientifically proven, holistic stress management strategy, and its consistent and structured integration is vital for enhancing mental and physical well-being in modern society.

Overall, the existing body of research supports that physical exercise reduces stress through physiological and psychological mechanisms. Moderate intensity aerobic exercise and mind-body exercise have the best stress-reducing effects. Given its benefits, such as effectiveness and safety, promoting regular physical exercise is an effective strategy for stress management in both clinical and general populations.

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