



# The Effect of Moderate-Intensity Aerobic Exercise on Psychological Variables Among Different University Freshmen Students in the Tigray Region, Ethiopia

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## Abstract

This study investigated the impact of a 12-week moderate-intensity aerobic exercise program on selected psychological variables among freshman students at Mekelle University and Adigrat University. The region has experienced ongoing crises since 2019, leading to widespread psychological distress. Using a quasi-experimental design with purposive and random sampling, 80 participants were divided into experimental (40) and control groups (40), each comprising 20 students in selected Mekelle University and Adigrat University in the Tigray Region, Ethiopia. Data collected pre- and post-intervention via standardized questionnaires revealed significant improvements in anxiety, stress, depression, self-confidence, arousal, and motivation in the exercise group compared to controls. The findings suggest that moderate-intensity aerobic exercise can be an effective intervention to enhance mental health among university students affected by socio-political crises.

**Keywords:** Exercise, Aerobic, Moderate, Intensity, Anxiety, Stress, Depression, Self-Confidence, Arousal, Motivation

## Introduction

The mental health of university students is increasingly recognized as a critical public health issue, especially in regions facing socio-political crises. In Tigray, since 2019, students have been exposed to COVID-19, ongoing war, and siege, leading to heightened levels of psychological disorders such as anxiety, stress, and depression. Physical activity, particularly aerobic exercise, has been shown to positively influence mental health outcomes. This study aims to evaluate the effect of moderate-intensity aerobic exercise on psychological variables among freshman students in this challenging context. Over 600,000 civilians in Tigray were killed, according to reports from various national and international media outlets, including athletes (Olaran, 2022). More than 2 million people were internally displaced (Reuters, 2021). About 70,000 people fled to Sudan and are still cut off from food, water, and medical assistance (Bearak, 2021). More than 120,000 women experienced sexual violence, both alone and in groups, and 5.2 million people need humanitarian aid (USAID, 2021). This appears especially crucial in light of UN Security Council data emphasizing that 90% of war deaths are civilians, i.e., innocent people who ought to get special protection during hostilities (United Nations, 2022). Universities in Tigray were shuttered during the conflict, forcing students to live with their families, who also suffered at the hands of the enemy. As the target of the enemy was young boys and girls who they are potential to be soldier, they inflicted unthinkable suffering, including threatening their lives. To this end, psychologically, the University students were severely affected by the war, and they have been a vulnerable group to the negative psychological consequences of war, such as stress, anxiety, and depression. However, there was no empirical evidence that showed the impact of war and armed conflicts on the university's mental health and psychological well-being in Tigray.

## Statement of the problem

The Tigrayan society has been heavily impacted by COVID-19, war, siege, and blockades. As part of this society, Mekelle University and Adigrat University freshmen are also affected, appearing inactive, traumatized, depressed, lacking confidence and motivation, and experiencing low arousal. These issues may stem from limited awareness of the mental health benefits of aerobic exercise, compounded by the ongoing conflict and crises in the region and the country at large.

## Objectives of the Study

### General objectives

The general objective of this study was to investigate the effect of moderate intensity aerobic exercise on selected psychological variables among Mekelle University and Adigrat University freshmen students.

### Specific objectives

- Assess the psychological impact of the war in Tigray on freshmen students at Mekelle University and Adigrat University.
- Examine the effect of moderate-intensity aerobic exercise on stress, anxiety, and depression among these students after the intervention.
- Evaluate the impact of aerobic exercise on the motivation, arousal, and self-confidence of students at both universities post-intervention.

### Research hypothesis

1. How does moderate-intensity aerobic exercise influence the psychological health, specifically stress, anxiety, depression, motivation, arousal, and self-confidence of Mekelle and Adigrat University freshmen students

## Literature Review

**Effect of Moderate Intensity Aerobic Exercise on Stress:** The potentially detrimental role of stress highlights the importance of examining and implementing healthcare interventions that control the impact of stress on health. A variety of practical interventions for stress management (to control physiological stress reactivity) have been proposed, including aerobic exercise. Exercise has been proposed to reduce sympathetic responses to stress (Crews and Landers, 1987)

**Effect of Moderate Intensity Aerobic Exercise on Anxiety:** Anxiety disorders are a heterogeneous cluster of common mental health disorders typically characterized by hyperarousal, excessive fear, and worry (Olthuis, 2016). Although anxiety disorders are generally characterized by feelings of anxiety, symptoms can manifest themselves differently depending on the disorder subtype. Subtypes of anxiety disorders include generalized anxiety disorder (GAD), social phobia, panic disorder, specific phobias, agoraphobia, separation anxiety disorder, and selective mutism. Anxiety disorders are highly prevalent, with global estimates ranging from 3.8 to 25% across countries, with estimates of prevalence rates as high as 70% in people with chronic health conditions. (Remes et al., 2016).

**Effect of Moderate Intensity Aerobic Exercise on Depression:** Depression is characterized by low mood, anhedonia, and loss of interest. It has a relatively high incidence affecting both mental and physical health and places a heavy burden on individuals, families, and society. The World Health Organization once showed that ~350 million people were currently suffering from depression, and the disease may last for years. (Smith, 2014).

**Moderate Intensity Aerobic Exercise and Self-Confidence:** Moderate intensity aerobic exercise enhances body self-esteem among Chinese college students more effectively than low intensity exercise. This is likely because it better stimulates muscle growth, fat burning, and physical fitness, leading to a more attractive body and increased self-esteem (Shu and Lu, 2023).

**Moderate Intensity Aerobic Exercise and Arousal:** Arousal levels decrease after high-intensity exercise but approach optimal levels after moderate-intensity exercise. The relationship between exercise intensity and arousal follows an inverted-U shape, indicating that moderate exercise optimally balances arousal levels (Kamijo, 2005).

**Moderate Intensity Aerobic Exercise and Motivation:** Motivation for physical activity and sedentarism are subjective and fluctuate rapidly based on environmental and physical stimuli. After maximal exercise, the desire to move declines significantly, and the desire to rest increases. However, research on how motivation recovers post-exercise is limited (Stults-Kolehmainen, 2021).

## Methodology

**Research Design:** This study employed a quasi-experimental design with a pre-test and post-test control group to evaluate the effects of a 12-week moderate-intensity aerobic exercise program on psychological variables among university freshmen. **Participants:** A total of 80 freshmen were purposively selected from Mekelle University and Adigrat University in the Tigray Region, Ethiopia, based on their exposure to ongoing socio-political crises since 2019. The participants were randomly assigned to two groups: **Experimental Group:** 40 students (20 from Mekelle University and 20 from Adigrat University) who participated in the aerobic exercise program. **Control Group:** 40 students (20 from each university) who did not participate in the exercise program. **Sampling Procedure:** Purposive sampling was used to select universities and students with relevant exposure to the socio-political crisis. Subsequently, simple random sampling was used to allocate participants to the experimental and control groups to minimize selection bias. **Intervention:** The experimental group engaged in supervised moderate-intensity aerobic exercise sessions three times per week for 12 weeks. Each session lasted approximately 45 minutes, including warm-up, main activity, and cool-down phases. The control group did not participate in any structured physical activity during this period. **Data Collection Instruments:** Standardized and validated questionnaires were used to

assess psychological variables, including: Anxiety, Stress, Depression, Self-confidence, Arousal, and Motivation. These instruments were administered before (pre-test) and after (post-test) the intervention period. **Data Analysis:** Data were analyzed using appropriate statistical methods, including paired t-tests to compare pre- and post-intervention scores within groups and independent t-tests to compare differences between the experimental and control groups. A significance level of  $p < 0.05$  was adopted

**Data analysis and interpretation:**

**TABLE 1:** Comparison of Psychological Variables Before and After Intervention in Experimental and Control Groups

Variable	Group	N	Mean (Pre-test)	Mean (Post-test)	t-value	p-value	Interpretation
Anxiety	Experimental	40	2.9000	0.3571	32.051	0.000	Significant reduction post-exercise
	Control	40	2.8857	2.8286	1.116	0.278	No significant change
Depression	Experimental	40	2.3275	0.8050	31.418	0.000	Significant reduction post-exercise
	Control	40	2.3150	2.3175	-0.188	0.851	No significant change
Stress	Experimental	40	2.7500	1.6500	15.475	0.000	Significant reduction post-exercise
	Control	40	2.7600	2.7550	0.224	0.825	No significant change
Self-confidence	Experimental	40	2.6500	4.3929	27.370	0.000	Significant increase post-exercise
	Control	40	2.6750	2.6500	-0.698	0.494	No significant change
Arousal	Experimental	40	1.3286	3.9071	45.069	0.000	Significant increase post-exercise
	Control	40	1.3000	1.3071	-0.087	0.932	No significant change
Motivation	Experimental	40	1.2643	2.7350	21.298	0.041	Significant increase post-exercise
	Control	40	1.2071	1.4500	-1.888	0.074	No significant change

**Interpretation:** The comparison of psychological variables before and after the intervention revealed significant improvements in the experimental group that participated in moderate-intensity aerobic exercise. Specifically, anxiety levels decreased markedly from a mean of 2.90 during pre-test to 0.36 post-test, with a t-value of 32.051 and a p-value of 0.000, indicating a highly significant reduction. Similarly, depression scores dropped from a mean of 2.33 to 0.81 ( $t=31.418$ ,  $p=0.000$ ), and stress levels decreased from 2.75 to 1.65 ( $t=15.475$ ,  $p=0.000$ ). Furthermore,

self-confidence significantly increased from 2.65 to 4.39 ( $t=-27.370$ ,  $p=0.000$ ), arousal improved from 1.33 to 3.91 ( $t=-45.069$ ,  $p=0.000$ ), and motivation rose from 1.26 to 2.73 ( $t=-21.298$ ,  $p=0.041$ ). These results demonstrate that moderate intensity aerobic exercise effectively reduces negative psychological states and enhances positive psychological factors among university students affected by war. In contrast, the control group showed no significant changes in any of the variables, with p-values greater than 0.05, indicating that without engagement in physical activity, their psychological distress remained largely unchanged during the study period.

### **Discussion of Hypothesis:**

The findings support the hypothesis that moderate-intensity aerobic exercise positively influences the psychological health of freshmen students at Mekelle and Adigrat Universities. The data demonstrated significant reductions in stress, anxiety, depression and increases in motivation, arousal, and self-confidence among students who participated in the exercise program. Specifically, students engaging in moderate aerobic activity experienced a notable decrease in stress, anxiety, and depression levels. These outcomes align with existing literature indicating that physical activity stimulates the release of endorphins and other neurochemical changes that alleviate negative emotional states. The reduction in stress and anxiety can be attributed to the physiological effects of aerobic exercise, such as improved cardiovascular health and increased blood flow, which have been shown to promote relaxation and mental well-being. Furthermore, the increase in motivation, arousal, and self-confidence suggests that aerobic exercise enhances positive psychological states that can contribute to better academic performance and social interactions, critical for university freshmen adjusting to new environments. The rise in arousal levels indicates heightened alertness and readiness, which can facilitate learning and engagement in academic activities. These findings are particularly relevant for university students who often face academic pressure, social adjustment challenges, and uncertainties associated with transitioning into higher education. Incorporating moderate aerobic exercise into university wellness programs could serve as an effective strategy to promote mental health and improve overall psychological resilience among students.

### **Discussion on findings:**

The present study aimed to investigate the impact of moderate-intensity aerobic exercise on the psychological health of freshmen students at Mekelle and Adigrat Universities. The results clearly indicate that regular participation in moderate aerobic exercise significantly improved psychological well-being across multiple dimensions, including stress, anxiety, depression, motivation, arousal, and self-confidence.

**Stress, Anxiety, and Depression:** The experimental group showed a substantial decline in stress, anxiety, and depression levels post-intervention. This aligns with existing research highlighting that physical activity stimulates the release of endorphins, serotonin, and other neurotransmitters that promote relaxation and mood stabilization. The reduction in stress and anxiety is particularly important for freshmen who often face academic, social, and environmental adjustments, which can predispose them to heightened psychological distress.

**Motivation, Arousal, and Self-Confidence:** IN addition to alleviating negative emotional states, aerobic exercise contributed to increased motivation, arousal, and self-confidence among participants. Elevated arousal and motivation are conducive to better academic engagement and social interactions, facilitating smoother adaptation to university life. Self-confidence, which significantly improved among exercising students, is crucial for fostering resilience and a positive outlook during stressful transitions.

**Implications for Students and Universities:** These findings underscore the value of incorporating physical activity programs into university health services. Given the mental health challenges faced by students, especially during early university years, aerobic exercise offers a cost-effective, accessible, and sustainable method to enhance psychological resilience. The cultural and environmental contexts of Mekelle and Adigrat make such interventions feasible and potentially impactful.

**Limitations and Considerations:** While the results are promising, it is essential to acknowledge limitations such as the relatively short duration of the intervention and potential variations in individual responses to exercise. Future studies could explore long-term effects and incorporate diverse forms of physical activity.

### **Conclusion**

The study provides compelling evidence that moderate-intensity aerobic exercise significantly benefits the psychological health of university freshmen by reducing stress, anxiety, and depression while enhancing motivation, arousal, and self-confidence. These improvements can contribute to better academic performance, social adjustment, and overall well-being among students. Implementing structured aerobic exercise programs within university settings can serve as an effective strategy to promote mental health and resilience in young adults facing the challenges of higher education. The evidence indicates that moderate-intensity aerobic exercise is a viable and effective intervention for improving various aspects of psychological health among freshmen students in the studied settings. Universities should consider integrating structured physical activity programs to support students' mental well-being and academic success.

### **Recommendation**

- Incorporate regular aerobic exercise programs into university health and wellness services.
- Conduct awareness campaigns to inform students about the mental health benefits of physical activity.
- Create supportive environments with accessible facilities and peer groups to motivate exercise participation.
- Encourage further research on long-term effects and different types of physical activities.
- Develop policies and guidelines that promote physical activity as a tool for mental health promotion in universities.

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