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EFFECT OF AEROBIC EXERCISE ON ANXIETY AND PERFORMANCE OF JAVELIN THROWERS

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Abstract

This study aims to investigate the impact of an 8-week aerobic exercise intervention on the mental health (anxiety) and performance of professional javelin throwers from the Faisalabad National Athletic Club. The inclusion criteria were met by 20 athletes participating in the javelin-throwing events, who took part in the intervention. In the present study, exercise served as an intervention by putting the experimental group (n = 10) while the control group (n=10) served as a benchmark. The study used pre-tests on the mental health variable (anxiety), before 8 weeks of aerobic exercise training for four non-consecutive days a week. The control group practiced as usual. At the end of 8 weeks, a post-test was conducted. Mental health variables were evaluated with standardized questionnaires (Hamilton Anxiety Scale). The demographic factors studied among participants included the level of participation (club, national, international), experience levels at a particular time duration, residency area (urban or rural), and academic qualification & athletic background. The purpose of this study was to develop an in-depth understanding of the various characteristics exhibited by elite javelin throwers that could help to inform how aerobic exercise might affect mental health and ultimately change their performance. In conclusion, it is evidenced that aerobic exercise helps to reduce the anxiety of professional athletes as well as benefits in the javelin throw performance, but this study critically points out the overall effects on mental health. The present findings have relevance for practitioners, coaches, and athletes as they underscore the complex effects of aerobic exercise in training paradigms when considering optimal athletic performance enhancement both physically and mentally in terms of sports satisfaction.

Keywords: Aerobic Exercise; Anxiety; Javelin Throwers; Performance.

Introduction

The sport of javelin throwing combines very high demands on both physical and mental abilities, presenting a special setting where psychological well-being is pivotal for

performance. The javelin throw is a sport that requires physical and mental endurance, strength, and focus (Wang, 2022). Mental health is an essential aspect of overall well-being, and it affects a person's quality of life (Speight et al., 2020). Aerobic exercise is known to have positive effects on physical health, but recent research has shown that it also has a positive impact on mental health (Tous-Espelosín et al., 2020). Furthermore, in a review article (Stubbs et al., 2019) It was revealed that exercise has a positive impact on overall well-being and quality of life, including improvements in mood and self-esteem.

Mental health is an important aspect of human lives, and it matters a lot in every walk of life (Cueto & Agaton, 2021). However, it is inevitable for athletes and could be a potential factor in exhibiting sound and stable performances either in the competitive environment or outside the sporting arena.

Elite athletes, including javelin throwers, are not only physical performers but also individuals who navigate the complex interplay of mental and physical elements in their pursuit of excellence. Aerobic exercise has long been associated with numerous physical health benefits, but its influence on mental well-being and athletic performance, particularly in the context of javelin throwers, is an area that warrants exploration (Cho, 2023).

Exercise is the intentional and purposeful movement of your body, aimed at improving or maintaining physical fitness and overall health (Vani et al., 2021). Aerobic exercise is like a workout for your cardiovascular system. It involves continuous, rhythmic activities that elevate your heart rate and get you breathing a bit harder (Gu et al., 2017). Enter the dynamic world of interval training, a bit like a rollercoaster for your heart rate. In this approach, you alternate between short bursts of high-intensity effort and more relaxed periods of recovery (Huh, 2019).

Mental health refers to our emotional, psychological, and social well-being. It is essentially how we think, feel, and behave. Just like physical health, mental health is an integral part of our overall well-being (Richards et al., 2010). It influences how we handle stress, relate to others, and make choices in our lives. Research consistently demonstrates the positive effects of aerobic exercise on mental health. Javelin throwers, like all athletes, face unique psychological challenges.

Engaging in aerobic activities has been linked to the release of endorphins, which act as natural mood lifters, potentially aiding javelin throwers in managing the stress and anxiety associated with their sport (Thomas, 2019). Numerous studies have consistently highlighted the psychological benefits associated with regular aerobic activities, such as running, cycling, or swimming. Central to these benefits is the release of endorphins, commonly referred to as "feel-good" hormones. This natural mood enhancement has been linked to an improved overall sense of well-being, with individuals reporting reduced levels of stress and anxiety after incorporating aerobic exercise into their routines (Herbert, 2022).

Anxiety, characterized by apprehensive expectation or fear, is one of the most commonly encountered psychiatric symptoms (Kessler et al., 2012). The National Comorbidity Study-Replication data reveals that in the United States, approximately one in three individuals experiences a lifetime prevalence of any anxiety disorder, surpassing other diagnostic categories. Symptoms of anxiety, whether emotional (fear, apprehension) or physiological (racing heart, trembling), are a shared criterion among these disorders. However, diagnostic criteria can vary widely, including the frequency and severity of symptoms and the specificity of triggers.

Anxiety, a prevalent mental health condition, can significantly impact a person's focus, sleep, and daily responsibilities, according to Mikkelsen et al. (2021). The same study indicated that physical inactivity is linked to higher anxiety levels, emphasizing the potential of exercise to reduce anxiety. In a meta-analysis involving 42,264 individuals, exercise was shown to improve anxiety levels, especially benefiting those without pre-existing anxiety (Mikkelsen et al., 2017).

In the quest for holistic well-being, understanding the relationship between aerobic exercise, anxiety, and performance has become a focal point of research. This literature review aims to distill insights from existing studies, exploring how activities like running, cycling, or swimming may influence anxiety levels and performance outcomes (Zhang & Chen, 2019). A consistent thread in the literature reveals the potential of aerobic exercise in mitigating anxiety. Engaging in regular aerobic activities has been associated with a reduction in overall anxiety levels. The release of endorphins, commonly known as the "feel-good" hormones, during aerobic exercise contributes to a sense of relaxation and calmness. This suggests that

incorporating aerobic exercise into daily routines could serve as a practical strategy for managing anxiety (Kandola et al., 2018).

Anxiety often intertwines with cognitive performance. Studies suggest that aerobic exercise not only reduces anxiety but also positively impacts cognitive function. Improved attention, memory, and executive functions have been observed in individuals who engage in regular aerobic activities (Singh et al., 2019). This cognitive boost could play a crucial role in enhancing overall performance, whether in academic, professional, or athletic domains.

The relationship between aerobic exercise, anxiety reduction, and performance improvement is a complex interplay. Physiologically, increased cardiovascular fitness through aerobic training can contribute to better endurance and stamina. Psychologically, the anxiety-alleviating effects may create a conducive mental state for optimal performance. Together, these factors paint a picture of aerobic exercise as a potential catalyst for enhancing overall performance (Amal et al., 2020). Therefore, this research determined the effect of aerobic exercise on selected variables of mental health (anxiety) and performance in elite Pakistani javelin throwers.

Materials and Methods

The methodological approach adopted to study the impact of aerobic exercise on anxiety levels focuses on mental health needs for systematic and integrated action. After passing multiple inclusion/exclusion criteria and undergoing a comprehensive baseline assessment including physical health metrics and standardized mental health surveys, each participant was chosen to cover the range of skill levels. The intervention progress was constantly reviewed by the researcher via periodic appraisals– recording mental and physical parameter variations. The methodological framework aims to identify the links between aerobic exercise, mental well-being and sports performance of javelin throwers (practical outcomes) among them enlighten possible interventions for enhancing psychological resilience as well as empowerment proficiency.

Participants

An 8-week training intervention was administered to twenty participants actively participating in javelin-throwing events. The intervention/experiment group participated in a supervised aerobic exercise program, to examine its effect on mental health and performance.

At the same time, a control group of ten (10) participants was not intervened and served as a reference for comparison. Participants were selected based on a range of skill levels and demographics, providing diversity within the study. The participants' pre-emptions of the throws in both the control and experimental groups, alongside the demographic data, were recorded by the researchers.

Experimental Set-Up and Participant Selection

Twenty (20) professional javelin throwers from Faisalabad National Athletic Club, Faisalabad meeting the selection criteria were selected by the researcher as they volunteered for this study and randomly divided into two groups: an experimental group (n=10) and a control group (n=10). The selected establishing variable of anxiety was measured through a pre-test for both groups before intervention. Aerobic exercise was offered to the experimental group, while continued routine practice served as a control under both conditions. Post-test was performed after completion of 8 weeks of training.

Table 1. Inclusion and Exclusion Criteria for Selection of Participants

Inclusion Criteria	Exclusion Criteria
Javelin Throwers	Non-Athlete
Aged 15-30 years	Age below 15 and above 30
Professional Athletes	Non- Professional/Beginners

Tools/Material for Data Collection

The researchers employed standardized questionnaires, namely the Hamilton Anxiety Scale (HAS) (Hamilton in 1959), to assess anxiety. Performance was measured by providing each participant with three attempts at javelin throwing, and the best attempt was selected as the representative measure.

Demographic Attributes of the Participants

In this study, elite javelin throwers aged between 15 and 30 participated. Javelin throwers of opposition classified, aged between 15 and 30 were as a legal subject in the study. Among these athletes, the researchers analyzed different demographic characteristics like their level of participation such as club, national or international. Also, they were evaluated by their years of experience (1–5, 6–10, 11–15 and 16-20). Among the demographic details, they asked whether athletes were from urban or rural regions, their level of education as well as whether they belonged to sports background i.e., had already been a sportsperson or not.

Together, these variables were central in elucidating the variety of mental traits among elite javelin throwers incorporated within the research that provides an insight into aerobics training efficacy for everyone from a contributor to health and performance.

Ethical Considerations

The Department of Sports Science and Physical Education, University of Haripur provided the informed consent form for this study. The document was approved by both the participants and the administration of Faisalabad National Athletic Club for ease of completion during data collection. This included a comprehensive check of the consent form and addressing any queries or concerns by the participants/club management. The purpose of this procedure is to protect ethical standards and improve compliance with voluntary informed consent for research participation, which should contribute favorably to transparency and cooperation in data collection.

Statistical Analyses

The descriptive and demographic data were explored with frequency and percentage by the concluded study. The distribution of the data was tested with Kolmogorov-Smirnov and Shapiro-Wilk tests for normality. Statistical analyses (e.g., Paired Sample T-test, Independent Sample T-test, and ANOVA) for inferential statistics were performed by Statistical Package for Social Sciences (SPSS) version 26. These techniques were specifically selected to detect differences or trends within the anxiety and performance variables of elite javelin throwers after the 8-week aerobic exercise intervention.

Results and Discussion

This study investigated the effects of aerobic exercise on anxiety and the performance of javelin throwers. It is important to mention that mental health was analyzed from an anxiety perspective. Both pre-test and post-test measurements were taken and analyzed accordingly.

Table 2. Demographic Attributes of the Participants (n=20).

		Level of Participation			
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Clubs	9	45.0	45.0	45.0
	National	7	35.0	35.0	80.0
	International	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

Experience					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	1-5 Years	7	35.0	35.0	35.0
	6-10 Years	6	30.0	30.0	65.0
	11-15 Years	3	15.0	15.0	80.0
	16-20 Years	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

Resident					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Urban Area	11	55.0	55.0	55.0
	Rural Area	9	45.0	45.0	100.0
	Total	20	100.0	100.0	

Academic Qualification					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Matric	5	25.0	25.0	25.0
	FA/FSc	4	20.0	20.0	45.0
	BA/BSc	5	25.0	25.0	70.0
	MA/MSc	6	30.0	30.0	100.0
	Total	20	100.0	100.0	

Demographic attributes were categorized into level of participation, experience in sports, locality, and academic qualification.

Table 3. Difference of Javelin Thrower Measurement of CG and EG before Aerobic Exercise.

Group Statistics					
	Group	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Javelin Thrower Measurement	Experimental	10	49.7000	2.26323	.71570
	Control	10	49.8000	2.39444	.75719

Two sections offer various bits of information: For equality of variance, use Levene's Test (A) and for equality of means, use the t-test (B).

Table 4. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Javelin Thrower Measurement	Equal variances assumed	.025	.877	-.096	18	.925	-.10000	1.04190	-2.28895	2.08895
	Equal variances not assumed			-.096	17.943	.925	-.10000	1.04190	-2.28945	2.08945

The p= .877 is greater than the significant level $\alpha = 0.05$, hence the hypothesis is rejected and concludes that the mean score for EG and CG is not significantly different. Based on the results,

it can be stated that there was no significant difference in the mean score of the javelin thrower between the pre-test of the control group and the experimental group ($t_{.096}$ = 17.943, p > .005).

Table 5. Difference of Javelin Thrower's measurement of CG and EG after Aerobic Exercise

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Javelin Thrower Measurement	Experimental	10	57.9000	3.98469	1.26007
	Control	10	50.1000	2.23358	.70632

According to Table 5, the experimental group showed 57.90 meters of throw in the post-test and the control group showed 50.10 meters of throw in javelin. This means that the experimental group performed more javelin throws after aerobic exercise for 8 weeks (4 days a week).

Table 6. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Javelin Thrower Measurement	Equal variances assumed	1.068	.315	5.400	18	.000	7.80000	1.44453	4.76516	10.83484
	Equal variances not assumed			5.400	14.148	.000	7.80000	1.44453	4.70482	10.89518

The p= .315 is greater than the significant level α = 0.05. Since the p-value is greater than α level, therefore, we should use the middle row of the output (equal variance assumed). Also, the p-value as highlighted was found to be .000, which is less than the critical value of 0.05. Therefore, it can be concluded that there is a statistically significant difference between the mean scores of two different groups i.e., EG and CG with respect to the javelin throw.

Table 7. Differences in Anxiety between CG and EG before Aerobic Exercise

Group Statistics

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Anxiety Control Pre-test	.231	10	.139	.924	10	.432

a. Lilliefors Significance Correction

The p-value of Kolmogorov-Smirnov was found greater than the critical value (p > .05). Similarly, the p-value of the Shapiro-Wilk test was found greater than the critical value (p > .05). Hence, it can be interpreted that the data were normally distributed.

Table 8. Kolmogorov-Smirnova

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	Df	Sig.
Anxiety Experimental Pre-test	.231	10	.139	.924	10	.415

a. Lilliefors Significance Correction

The p-value of Kolmogorov-Smirnov was found greater than the critical value (p > .05). Similarly, the p-value of the Shapiro-Wilk test was found greater than the critical value (p > .05). Hence, it can be interpreted that the data were normally distributed.

Table 9. Differences in Anxiety between CG and EG after Aerobic Exercise

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	Df	Sig.
Anxiety Control Post-test	.230	10	.143	.933	10	.519

a. Lilliefors Significance Correction

To test the data normality measures, Kolmogorov-Smirnov and Shapiro-Wilk tests were applied, and the statistics are shown in Table 4.16. The p-value of Kolmogorov-Smirnov was found greater than the critical value (p > .05). Similarly, the p-value of the Shapiro-Wilk test was found greater than the critical value (p > .05). Hence, it can be interpreted that the data were normally distributed.

Table 10. Difference concerning Anxiety between CG and EG Anxiety Experimental Post-test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	Df	Sig.
Anxiety Experimental Post-test	.230	10	.143	.933	10	.499

a. Lilliefors Significance Correction

The p-value of Kolmogorov-Smirnov was found greater than the critical value (p > .05). Similarly, the p-value of the Shapiro-Wilk test was found greater than the critical value (p > .05). Hence, it can be interpreted that the data were normally distributed.

Discussion

This study examined the effect of aerobic exercise on mental health (anxiety) and the performance of javelin throwers.

The results of the current study are consistent with several studies that show that aerobic exercise significantly affects athletic

performance in relation to javelin throwing and the mental health of athletes. Similarly, the study link to this resonates with the idea that aerobic exercise can act as a natural anxiety-reducing intervention (Baptista et al., 2017). Gilani and Feizabad's (2019) study demonstrated the substantial impact of aerobic exercise training on anxiety sub-scales." The findings suggest that engaging in aerobic exercise training is believed to effectively decrease anxiety levels in individuals. Regular physical activity has been associated with the release of endorphins and other neurotransmitters that contribute to mood improvement and mental well-being (Mahindru et al., 2023; Arsović et al., 2020).

Conclusion

This study investigated the impact of aerobic exercise on anxiety and the performance of professional javelin throwers from the Faisalabad National Athletic Club. This study declared a significant and statistically positive effect on javelin throw performance was demonstrated using the aerobic exercise intervention. The results showed a significant improvement in the conclusion that designed training (aerobic exercise) had a very good influence on improving javelin throwing performance. Nonetheless, the following aerobic exercise intervention was more effective; anxiety levels were significantly lower in the experimental group compared to the control one. The findings reveal a promising application of aerobic exercise in reducing anxiety among elite javelin throwers. In conclusion, though aerobic exercise was found to be an effective tool for enhancing javelin throw performance and reducing the level of anxiety among elite athletes, it is suggested that its psychological consequences also need a full understanding. These findings could help coaches, practitioners, and athletes who will tune their training strategies into holistic health by focusing on the importance of physical & mental benefits derived through undertaking aerobic exercise.

Recommendations & Future Directions

On a positive note, after participating in aerobic exercise, the experimental group experienced a significant reduction in anxiety levels compared to the control group. This suggests that aerobic exercise could play a role in positively influencing anxiety levels among javelin throwers.

Further, investigation should be made to explore the reasons behind the reduction in anxiety levels post-exercise for targeted anxiety management strategies. Include mental health screenings before interventions

to identify and address potential risk factors for anxiety.

Conflict of Interest

No conflict of interest was declared by the authors.

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