ACADEMIA International Journal for Social Sciences
Volume 4, Issue 3, 2025 ISSN-L (Online): 3006-6638

Effect of High-Intensity Aerobic Training on Speed and Muscular Endurance of Non-Athlete Students

Seema Yaqub Saleha
Seemayaqub94@gmail.com
M.Phil. Scholar, Department of Sports Sciences & Physical Education, Faculty of Allied Health Sciences, The University of Lahore, Punjab, Pakistan

Mohibullah Khan Marwat
mohibullah.khan@ed.uol.edu.pk
Professor, Department of Sports Sciences & Physical Education, Faculty of Allied Health Sciences, The University of Lahore, Punjab, Pakistan

Kashif Mehmood
Kashif.mehmood@sports.uol.edu.pk
Lecturer, Department of Sports Sciences & Physical Education, Faculty of Allied Health Sciences, The University of Lahore, Punjab, Pakistan

Corresponding Author: *Seema Yaqub Saleha Seemayaqub94@gmail.com

Received: 12-06-2025 **Revised:** 18-07-2025 **Accepted:** 02-08-2025 **Published:** 24-08-2025

ABSTRACT

*This research study was conducted in Hunza to determine the effect of High-Intensity Aerobic training on speed and muscular endurance of non-Athlete students**.** The study aimed to determine non-athlete students speed and muscular endurance at pre and post-test. Forty non-athlete students participated in this study. Respondents were divided into two groups; 20 respondents in the experimental group (EG) and 20 in the control group (CG). After the completion of eight week of aerobic training again the same tests were conducted to collect the posttest data in respect of the respondents. It was hypothesized that high-intensity aerobic training will significantly improve speed and muscular endurance of non-athlete students. Objective of the research is to determine the effect of high intensity aerobic training on speed and muscular endurance in non-athletes' students. The research has concluded that there is a positive effect of high intensity aerobics training on speed and muscular endurance non-athlete students. Significant difference was observed in the pertest and posttest in the speed and muscular endurance of the respondents. It is recommended that special attention should be paid the improvement of these two basic components of physical fitness as they play vital role in all aspects of life in discharging everyday assignments. Regular participation in high intensity aerobic training should be made as a mandatory part of regular routine of educational institutions.*

Key Words: *High-Intensity, Aerobic Training, Speed, Muscular Endurance, Non-Athlete, Students*

INTRODUCTION

High-intensity aerobic training has positively impacted non-athlete students speed and muscular endurance. Studies show that such training increases performance measures a range of exercises in addition to improving physical well-being.The principal aim was in order to assess the potential benefits of cardiovascular exercise on the muscular endurance, speed of students who were not athletes. Research has indicated that endurance training can enhance overall performance and muscular endurance (Borve et al., 2017). According to some studies, a program for improving muscular endurance that works the muscles more often with lesser weights gives better results. Research indicates that programs focusing on low-load

resistance training with higher frequency can enhance muscular endurance effectively.The muscular and cardiac systems are altered by endurance training, which enhances muscle performance and stamina overall (Schoenfeld et al., 2021). Muscular endurance is unique to each muscle. Squats may give you greater endurance than bicep curls, to put it another way. It is all dependent on the muscles you work out. According to the National Academy of Sports Medicine, exercises including lunges, cable rows, bench presses, and squats to increase muscle endurance (Miller et al., 2011). According to the American Council on Exercise (Alizadeh et al., 2020), muscular endurance may enhance you're Capability to keep the proper posture for extended periods of muscular activity. the capacity to carry out everyday duties, and enhancing capacity to do routine functional tasks, including moving large objects.Making planned modifications to training regimens is necessary to increase muscular endurance. With reference to the role of high intensity aerobic training in the improvement of speed and muscular endurance, Riaz et al. (2024) have concluded that there is significant combined effect of strength and aerobic exercises in the enhancement of speed and muscular endurance. Common strategies include reducing the weight, increasing the number of sets and repetitions, and cutting down on rest times. Muscular endurance refers to the duration of repeated contractions that a muscle area can withstand before experiencing fatigue (Kojima et al., 2020). The intricate process of improving one's health requires a lot of planning because high-intensity aerobic training is more effective than high level of intensity (Helgerud et al., 2001).

High-intensity aerobic training has positively impacted non-athlete students speed and muscular endurance. Studies show that such training increases performance measures a range of exercises in addition to improving physical well-being.The principal aim was in order to assess the potential benefits of cardiovascular exercise on the muscular endurance, speed of students who were not athletes. Research has indicated that endurance training can enhance overall performance and muscular endurance (Borve et al., 2017). According to some studies, a program for improving muscular endurance that works the muscles more often with lesser weights gives better results. Research indicates that programs focusing on low-load resistance training with higher frequency can enhance muscular endurance effectively.The muscular and cardiac systems are altered by endurance training, which enhances muscle performance and stamina overall (Schoenfeld et al., 2021). Muscular endurance is unique to each muscle. Squats may give you greater endurance than bicep curls, to put it another way. It is all dependent on the muscles you work out. According to the National Academy of Sports Medicine, exercises including lunges, cable rows, bench presses, and squats to increase muscle endurance (Miller et al., 2011).

Speed

High-intensity exercises include sprinting in several directions, running, accelerating, and slowing down are the basic way of doing physical activity (Marcelino et al., 2016). Maintaining and enhancing physical fitness levels is mostly dependent on regular exercise, which is a critical component of overall health and well-being. A systematic study summarizing the effects of HIIT on physical performance in the non-athlete population receives far more scientific attention than team sports athletes, but HIIT being a very popular form of training in team sports. An increasing number of researchers have discovered that high-intensity aerobic exercise is a useful way to improve endurance, cardiovascular fitness, and other physical performance factors (Channon et al., 2020). Although high-intensity aerobic exercise has historically been linked to athletes, there is rising interest in investigating the possible advantages of this type of training for non-athlete populations, including students. In this context, Tabassum et al. (2023) have confirmed the role of high intensity aerobic exertion in the improvement of sports related speed and muscular endurance.

A growing body of research indicates that time constraints are a key barrier to exercise, contributing to physical inactivity on a global scale. This is especially important in today's sedentary world since physical inactivity is a major problem that contributes to several health issues (Fletcher et al., 2001).

Problem Statement

This research study was conducted under the title; High-Intensity Aerobic Training Effect on Speed and Muscular Endurance of Non-Athlete Students.

Objectives

The researcher conducted this research study with the following two main objectives:
1. To determine effect of high intensity aerobic training on speed of non-athlete college students.

2. To determine effect of high intensity aerobic training on muscular endurance of non-athlete college students.

Hypotheses

H_1: High intensity Aerobic training has a significant effect on the speed of thenon-athlete college students.

H_0: High intensity Aerobic training has no significant effect on the speed of the non-athlete college students.

H_1: High intensity Aerobic training has a significant effect on muscular endurance of the non-athlete college students.

H_0: High intensity Aerobic training has no significant effect on muscular endurance in non-athlete college students.

LITERATURE REVIEW

College students who are not athletes benefit greatly from high-intensity aerobic training in terms of both speed and muscle strength. According to research, this kind of training increases performance metrics in a variety of physical activities in addition to well-being.Aerobic exercise strengthens the heart muscle and increases heart efficiency. Aerobic exercises involve the major circulatory systems and body parts, including the heart, skeletal muscles, breathing, blood circulation, and oxygen intake, and they increase cardiovascular fitness and oxygen uptake in the body. Aerobic exercise has several benefits and aims to improve health (Moyer et al., 2012). Intensity aerobic exercise helps control obesity and enhances aerobic capacity. Aerobics refers to exercises that increase oxygen uptake in the body and improve cardiovascular fitness by involving major circulatory systems and body parts, including the cardiac system, respiration, skeletal muscles, circulation of blood, and oxygen consumption. There is mounting evidence that physical exercise during the teenage years has future effects on grownup disease and death. Getting regular exercise is one of the most crucial things people can do to enhance their health. Regardless of age, sex, race, ethnicity, or degree of fitness, there are many advantages to moving more and sitting less for everyone (The second edition of the fitness tools). To allow doctors and healthcare organizations to promote the idea that "exercise is medicine," it is necessary that fitness professionals have precise knowledge about the ideal volume and intensity of exercise to safely and successfully prescribe **HIIT:**

There are various subcategories of HIIT, but it is commonly classified as either low-volume HIIT or high-volume HIIT based on whether the duration of active intervals is less than or more than 15 minutes (Atakan et al. 2021). Many studies have been conducted recently to examinethe effects on cardio-metabolic outcomes of high-intensity interval training (HIIT) and sprint interval training (SIT). HIIT techniques have been shown to increase physiological variables linked to both aerobic and anaerobic performance in a number of studies with non-athletes as subjects (Burgomaster et al., 2005; Gibala et al., 2006). The objectives as aerobic exercise are to promote health, and it has several advantages. Heart muscle and heart

efficiency are both enhanced by aerobic exercise. Cardiovascular activity, which lowers the Resting Heart Rate (RHR) a measure of physical fitness helps (Moyer et al., 2012). HIIT is helpful in causing aerobic system changes that help players maintain their game-winning efforts. This suggests that players' endurance and general performance during games can be improved by HIIT. The results of recent studies on HIIT support its effectiveness in enhancing individual strength and encouraging muscle hypertrophy, or the growth of muscles, in athletes (García et al., 2023).

Muscular Endurance

Muscular strength training includes muscular endurance training as well. Resting for 48 to 72 hours before training the same muscle group again is advised (Yang et al., 2019). You can test it, for example, by observing the amount of time you can do pushups or lift weights. The number of repetitions a muscle group can withstand before experiencing fatigue muscular endurance is the longerterm ability of a muscle to exert force (Kojima, 2020).

Muscular endurance is a function of endurance of muscles, strength of muscles, and muscle health (the Unit ed States. Dept. of Wellness and Social Resources). Ability of a muscle to contract repeatedly in the McCall of opposition is known as muscular endurance. The ability of Muscular endurance is the capacity of a muscle group to sustain a specific percentage of maximum voluntary contraction for an extended period of time or to execute repetitive contractions for an extended period of time that results in muscular exhaustion (Charles et al., 2018).

Materials and Methods

This investigation was conceptualized as a quasi-experimental, pre-test/post-test control group study, employing a non-randomized, convenience sampling strategy to select participants. The overarching objective was to systematically assess and compare the pre- and post-intervention variations in muscular endurance and sprint speed within both experimental and control cohorts. Baseline data acquisition was meticulously conducted one week prior to the initiation of the interventional procedure, establishing a robust foundation for subsequent comparative analyses.

ASSESSMENT METHODOLOGY

Push-Up Test: Participants performed as many standard push-ups as possible within a one-minute window, adhering strictly to standardized form—hands positioned slightly wider than shoulder-width, toes in contact with the ground, and a neutral back alignment. Elbows were flexed until the forearms were approximately parallel to the ground, then extended to return to the start position. The total repetitions were meticulously recorded.

Leg Squat Test: Participants executed bodyweight squats, ensuring feet were shoulder-width apart, with arms extended forward to facilitate proper balance. They descended by flexing the knees and hips until the thighs attained a parallel position relative to the floor, maintaining an upright torso, before ascending back to the initial standing posture. The total number of repetitions was documented for each participant.

Meter Sprint Test: Sprint speed was gauged by timing participants running over a 30-meter distance marked by cones, with times recorded to the nearest hundredth of a second using a stopwatch. Multiple trials were conducted to ensure consistency, and the best performance recorded.

Variables of the study

Independent variable
High-intensity aerobic training was the independent variable.

Dependent variable
Speed and Muscular Endurance were the dependent variables.

Methods of data collection

Data were collected in pretest and post-treatment methodology. This method of data collection is used for experimental studies. Before training session, the researcher collected the pretest data in control and experimental groups while training session was given only to the experimental group. After eight weeks of training session again data were collected from both control group and experimental groups.

Sampling technique and procedure

Convenient sampling technique was used for the selection of the population. To measure the speed test the researcher used the pretest and post-test methods for data collection using 30m sprint test. Convenience sampling was used for the selection of 40 respondents for this study who were divided equally into two groups control and experimental groups. Twenty were chosen for the experimental group and twenty for the control group.A sample of 40 respondents was selected for this experimental research study. The sample was equally divided into two groups: twenty experimental and twenty control.

Statistical /test to be used

To measure the first dependent variable e.g. speed, 30-meter speed test was used. Similarly for the evaluation and measurement of the second dependent variable muscular endurance, Leg Squat test and Push Ups were used for upper body and lower body.

Table 1 ***Paired Samples Statistics***

High-intensity aerobic training group & Normal Group			Mean	N	Std. Deviation	Std. Error Mean
High-intensity aerobic training group	Pair 1	30M sprint pre	6.4215	20	.56083	.12541
		30M sprint post	5.8855	20	.63714	.14247
	Pair 2	Push-ups Pre	14.65	20	2.758	.617
		Push-ups Post	21.15	20	3.233	.723
	Pair 3	Squats-Pre	25.75	20	2.511	.561
		Squats-Post	34.65	20	3.100	.693
Normal training group	Pair 1	30Meter Sprint pre	6.5775	20	.59009	.13195
		30Meter Sprint Post	5.9390	20	.62015	.13867
	Pair 2	Push-ups	14.05	20	1.986	.444

	Pre Push-ups Post	14.10	20	2.269	.507
Pair 3	Squats Pre	24.55	20	1.669	.373
	Squats Post	25.80	20	1.908	.427

Table 1 explains that the High-intensity aerobic training group showed a slight decrease in the 30M Sprint, with a significant increase in Push-ups (from 14.65 to 21.15) and Squats (from 25.75 to 34.65). In contrast, the Normal training group had minimal changes, with a small decrease in the 30M Sprint and slight increases in Push-ups (14.05 to 14.10) and Squats (24.55 to 25.80). Overall, the High-intensity aerobic training group showed greater improvements in Push-ups and Squats.

Table 2 ***Paired Samples Correlations***

High-intensity aerobic training group & Normal Group			N	Cor-relation	Sig.
High-intensity aerobic training group	Pair 1	30Meter Sprint pre & 30MeterSprintpost	20	.937	.000
	Pair 2	Pushups Pre & Pushups Post	20	.915	.000
	Pair 3	Squats Pre & Squats Post	20	.678	.001
Normal training group	Pair 1	30 Meter Sprint pre & 30 Meter Sprint post	20	.949	.000
	Pair 2	Pushups Pre & Pushups Post	20	.676	.001
	Pair 3	Squats Pre & Squats Post	20	.928	.000

Note;- The paired samples correlations for the High-intensity aerobic training group and Normal training group show strong positive relationships between the pre-test and post-test scores for all exercises. In the High-intensity aerobic training group, the correlation for the 30M Sprint ($r = 0.937$, $p = 0.000$) indicates a very strong positive relationship between the pre-test and post-test scores. Similarly, the Push-ups showed a strong correlation ($r = 0.915$, $p = 0.000$), and Squats had a moderate correlation ($r = 0.678$, $p = 0.001$).For the Normal training group, the 30M Sprint also showed a very strong correlation ($r = 0.949$, $p = 0.000$), while the Push-ups ($r = 0.676$, $p = 0.001$) and Squats ($r = 0.928$, $p = 0.000$) both showed strong positive correlations. These results suggest that in both groups, there is a significant positive relationship between the pre-test and post-test scores for each exercise, with the 30M Sprint showing the strongest correlations.

Table 3 ***Paired Samples Effect Sizes***

Paired Samples Effect Sizes

High-intensity aerobic training group & Normal Group				Standardizer	Point Estimate	95% Confidence Interval	
						Lower	Upper
High-intensity aerobic training group	Pair 1	30M Sprint pre - 30M Sprint post	Cohen's d	.22500	2.382	1.504	3.244
			Hedges' correction	.22957	2.335	1.474	3.179
	Pair 2	Push-ups Pre – Push-ups Post	Cohen's d	1.318	-4.932	-6.542	-3.311
			Hedges' correction	1.345	-4.834	-6.412	-3.245
	Pair 3	Squats Pre – Squats Post	Cohen's d	2.315	-3.845	-5.128	-2.549
			Hedges' correction	2.362	-3.768	-5.026	-2.499
Normal training group	Pair 1	30M Sprint pre - 30M Sprint post	Cohen's d	.19459	3.281	2.151	4.398
			Hedges' correction	.19854	3.216	2.108	4.310
	Pair 2	Push-ups Pre – Push-ups Post	Cohen's d	1.731	-.029	-.467	.410
			Hedges' correction	1.766	-.028	-.458	.402
	Pair 3	Squats Pre – Squats Post	Cohen's d	.716	-1.745	-2.440	-1.032
			Hedges' correction	.731	-1.710	-2.391	-1.012

a. The denominator used in estimating the effect sizes.

Cohen's d uses the sample standard deviation of the mean difference.

Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Note;- The paired samples effect sizes for the High-intensity aerobic training group and Normal training group show varying levels of improvement in different exercises. For the High-intensity aerobic training group, the effect size for the 30M Sprint pre-to-post change was small (Cohen's d = 0.225, Hedges' correction = 0.229), indicating a moderate effect. In Push-ups, the effect size was large (Cohen's d = 1.318, Hedges' correction = 1.345), suggesting a very strong improvement. For Squats, the effect size was also large (Cohen's d = 2.315, Hedges' correction = 2.362), indicating a substantial improvement in the Normal training group, the 30M Sprint pre-to-post change had a moderate effect size (Cohen's d = 0.19459, Hedges' correction = 0.19854). The Push-ups showed no significant effect, with a small effect size (Cohen's d = 1.731, Hedges' correction = 1.766), suggesting minimal change. For Squats, the effect size was moderate (Cohen's d = 0.716, Hedges' correction = 0.731), indicating a moderate improvement. Overall, the High-intensity aerobic training group showed stronger and more consistent effect sizes across exercises compared to the Normal training group.

DISCUSSION

The focus of this research was to determine the high intensity aerobics training effect of on speed and muscle endurance non-athlete students. The result indicates that there was a difference in both control and experiential groups. as there are no variations in the control group speed test and muscular endurance test while applying eight weeks of tests on experimental groups there was a huge effect that clearer shows the effect on non-athletes' students.in addition to offering an alternative performance metric to tests that include repetitive, high-intensity running attempts (Lockie et al., 2016). There were no significant differences in control groups in 30-m sprint performance.Success in many "sports with several sprints, such hockey, rugby, and soccer, is seen to be largely dependent on one's ability to sprint. According to time-motion analysis, around 20 to 60 sprints, which aregenerally described as "fast movements, maximum effort," occur on average (Bloomfield et al., 2004).A weight-bearing exercise called a "push-up" employs the individual's body weight (BW) as a load to activate the muscles in the chest and upper limbs. Push-up exercises are a very common way to measure muscular endurance, train your upper body, and recover from injuries (Faigenbaum et al., 2015).According to recent studies, training with push-ups enhances maximum dynamic force (Carter et al., 2007).Additionally, it has been demonstrated that push-up training increases upper-body strength and power (Garcia et al., 2011; Hrysomallis et al., 2001).

Additionally, push-ups can be used to evaluate upper body muscular endurance (Fielitz et al.,2016; Mak et al., 2010). The squat is a dynamic exercise that follows both every day and athletic actions (van et al., 2018). When done properly, the squat exercise also strengthens the core, improves posture and balance, boosts metabolism, and helps prevent accidents (Health line).Essential daily actions involving pulling lying down, and numerous other tasks that call for the squat movements. Additionally, a fundamental exercise as part of training regimens meant to enhance endurance and improve against injuries (Miletello et al., 2009). The largest hip muscle is the hamstrings. This muscle stabilizes the lower body and stretches the femur during the squat movement (Schoenfeld et al., 2010).The goal of this exercise is to improve a person's physical and mental health by increasing their overall level of physical fitness (Strohle et al., 2009). the degree of physical well-being is dependent physical load, age, sex, and external factors all affect how often, how hard, how long, and what kind of physical activity is done circumstances (Thum et al., 2017).

Muscular endurance testing data of controlled group

Tests before and after data used to evaluate muscular endurance of Controlled Group, for females significantly remains the same as between the before and after tests. There is no any change in the control group because no any treatments were given to controlled group.

Muscular endurance testing data of experimental group

Tests before and after data used evaluate the muscular endurance of experimental Group, for females significantly changes as from the before to the last test. There is difference in pretest and post-test while collecting 8 weeks of data. In this groups non athletes' students improved in speed and muscular endurance as compare to control groups.

Muscular endurance testing data of controlled group:

Tests before and after data used to evaluate muscular endurance of Controlled Group, for females significantly remains the same as between the before and after tests. There is no any change in the control group because no any treatments were given to controlled group.

Muscular endurance testing data of experimental group

Tests before and after data used evaluate the muscular endurance of experimental Group, for females significantly changes as from the before to the last test. There is difference in pretest and post-test while collecting 8 weeks of data. In this groups non athletes' students improved in speed and muscular endurance as compare to control groups.

CONCLUSION

The study investigated high-intensity aerobic training effect on the speed, muscular endurance of non-athlete students. The results revealed significant improvements in the experimental group, as evidenced by better performance in the 30-meter sprint test for speed, one-minute push-up test for upper body muscular endurance, and one-minute leg squats for lower body muscular endurance. These findings highlight the effectiveness of high-intensity aerobic training in enhancing physical fitness parameters among non-athlete individuals. In contrast, the control group, which did not undergo the high-intensity aerobic training, showed no measurable changes in any of the tested variables. This emphasizes the importance of structured, high-intensity training programs in promoting speed and muscular endurance improvements. The experimental group, which underwent the training regimen, demonstrated significant improvements across all tested parameters. Specifically, their performance in the 30-meter sprint test improved, indicating enhanced speed, while increases in the number of repetitions in the one-minute push-up and one-minute leg squat tests reflected notable gains in upper and lower body muscular endurance. The findings suggest that incorporating high-intensity aerobic training into regular physical activity routines can be an effective strategy for improving physical performance and overall fitness, particularly for non-athlete populations. This study evaluated the impact of high-intensity aerobic activities related speed & muscular endurance among non-athlete students. The findings revealed a clear distinction between the experimental, controlled groups. These results indicate that such training can serve as a valuable tool not only for fitness enhancement but also for promoting long-term health and well-being in non-athlete individuals. Additional investigations might examine the long-term effects sustainability these improvements and the potential benefits of integrating such training into broader physical education programs. Examining how high-intensity aerobic exercise affected non-athlete students' speed and muscular endurance was the goal of the current study.

REFERENCES

Alizadeh S, Rayner M, Mahmoud MMI, Behm DG. (2020). Push-ups vs. Bench press differences in repetitions and muscle activation between sexes. *J Sports Sci Med*.;19(2):289-297.

Atakan M.M., Kosar S.N., Guzel Y., Tin H.T., Yan X. (2021). The Role of Exercise, Diet, and Cytokines in Preventing Obesity and Improving Adipose Tissue. *Nutrients*.; 13:1459. doi: 10.3390/nu13051459.

Bloomfield, J, Polman, R, and O'Donoghue, P. (2004). The *'Bloomfield movement classification*": Motion analysis of individual players in dynamic movement. Int J Perform Anal Sport 4: 20–31.

Borve, Jevne, S.N., Rud, B. and Losnegard, T. (2017). Upper-Body Muscular Endurance Training Improves Performance Following 50 min of Double Poling in Well-Trained Cross-Country Skiers. Frontiers in Physiology 8, 690.

Burgomaster, K. A., Hughes, S. C., Heigenhauser, G. J., Bradwell, S. N., & Gibala, M. J. (2005). Six sessions of sprint interval training increases muscle oxidative potential and cycle endurance capacity in humans. *Journal of Applied Physiology*, 105(3), 1439-1445.

Carter AB, Kaminski TW, Douex AT, Knight CA, Richards JG. (2007). Effects of high-volume upper extremity plyometric training on throwing velocity and functional strength ratios of the shoulder rotators in collegiate baseball players. *J Strength Cond Res* 21: 208–215.

Channon KM. Exercise and cardiovascular health (2020). New routes to reap more rewards. Cardiovascular Res.;116: e56–e58.

Charles LD. (2018) Chapter 4 Health-related physical fitness testing and interpretation. In: Riebe D, Ehrman JK, Liguori G, Magal M, editors. ACSM's guidelines for exercise testing and prescription 10th ed. Philadelphia: Kluwer. pp. 101–2

Faigenbaum AD, Bush JA, McLoone RP, Kreckel MC, Farrell A, Ratamess NA, et al. (2015). Benefits of strength and skill-based training during primary school physical education. *Journal Strength Cond* Res 29: 1255–1262

Fielitz, L., Coelho, J., Horne, T., & Brechue, W. (2016). Inter-rater reliability and intra-rater reliability of assessing the 2-minute push-up test. *Military Medicine*, 181(2), 167-172.

Fletcher G.F., Balady G.J., Amsterdam E.A., Chaitman B., Eckel R., Fleg J., Froelicher V.F., Leon A.S., Piña I.L., Rodney R., et al. (2001). Exercise standards for testing and training: A statement for *healthcare professionals from the American Heart Association.* Circulation.; 104:1694–1740. doi: 10.1161/hc3901.095960

García-Flores I, Hernández-Lepe MA, Aburto-Corona JA, Ortiz-Ortiz M, Naranjo-Orellana J, Gómez-Miranda LM. (2023) Efecto del entrenamiento interválico de alta intensidad sobre el comportamiento del sistema nervioso autóno-mo (*Effect of high intensity Interval training on the autonomic nervous system*). Retos; 47:847–52.

Garcia-Masso X, Colado JC, Gonzalez LM, Salva P, Alves J, Tella V, et al. (2011). Myoelectric activation and kinetics of different plyometric push-up exercises. *J Strength Cond* Res 25: 2040–2047.

Gibala, M. J., Little, J. P., Essen, V. M., Wilkin, G. P., Burgomaster, K. A., Safdar, A., et al. (2006). Short-term sprint interval versus traditional endurance training: similar initial adaptations in human skeletal muscle and exercise performance. *J. Physiol.* 575, 901–911. doi: 10.1113/jphysiol.2006.112094

Helgerud J., Engen L.C., Wisløff U., Hoff J. (2001). Aerobic endurance training improves soccer performance. *Medicine and Science in Sport and Exercise*, 33, 1925-1931

Hrysomallis C, Kidgell D. (2001). Effect of heavy dynamic resistive exercise on acute upper-body power. *J Strength CondRes* 15: 426–430.

Kojima Y, Fukusaki C, Ishii N. (2020). Effects of hyperoxia on dynamic muscular endurance are associated with individual whole-body endurance capacity. Murias JM, ed. PLoS ONE;15(4): e0231643. doi: 10.1371/journal.pone.0231643

Kojima Y, Fukusaki C, Ishii N. (2020). Effects of hyperoxia on dynamic muscular endurance are associated with individual whole-body endurance capacity. Murias JM, ed. PLoS ONE;15(4): e0231643. doi: 10.1371/journal.pone.0231643

Lockie RG, Jalilvand F, Moreno MR, Orjalo AJ, Risso FG, Nimphius S. (2016). Yo-Yo Intermittent Recovery Test Level 2 and its relationship to other typical soccer field tests in female collegiate soccer players. *J Strength Cond* Res. doi: 10.1519/JSC.0000000000001734. Publish Ahead of Print.

Mak, K.-K., Ho, S.-Y., Lo, W.-S., Thomas, G. N., McManus, A. M., Day, J. R., & Lam, T.-H. (2010). Health related physical fitness and weight status in Hong Kong adolescents. BMC Public Health, 10(1), 88.

Marcelino PR, Aoki MS, Arruda AFS, Freitas CG, Mendez-Villanueva A, Moreira A. (2016). Does small-sided-games' court area influence metabolic, perceptual, and physical performance parameters of young elite basketball players? *Biol Sport*;33(1):37.

Miletello WM, Beam JR, Cooper ZC. (2009). A biomechanical analysis of the squat between competitive collegiate, competitive high school, and novice powerlifters. *J Strength Cond* Res.; 23:1611–1617. doi: 10.1519/JSC.0b013e3181a3c6ef.

Miller, J., & Hannon, J. (2011, February). Resistance Circuit Training: Its Application for the Adult Population. *Strength and Conditioning Journal*, 33(1), 16-22.

Moyer VA. 2012. Screening for Cervical Cancer: U.S. Preventive Services Task Force Recommendation Statement. Ann Int Med, 156(12): 880-891

Riaz, J., Ma, K., Sharif, N., & Batool, N. (2024). Effects of Aerobic Strength Training on Physical Fitness and Weight Loss of Female University Students. THE SKY-International Journal of Physical Education and Sports Sciences (IJPESS), 8(2), 63–71. https://doi.org/10.51846/the-sky.v8i2.3881

Schoenfeld BJ, Grgic J, Van Every DW, Plotkin DL. (2021). Loading recommendations for muscle strength, hypertrophy, and local endurance: a re-examination of the repetition continuum. *Sports* (Basel);9(2):32. doi:10.3390/sports9020032

Schoenfeld BJ. Squatting kinematics and kinetics and their application to exercise performance. *J Strength Cond Res*. 2010; 24:3497–3506. doi: 10.1519/JSC.0b013e3181bac2d7.

Strohle, A. (2009). Physical activity, exercise, depression and anxiety disorders. *Journal of Neural Transmission* 116(6), 777-84.

Tabassum, Y., Amjad, S., & Din, B. M. ud. (2023). Investigating the Effects of High Intensity Resistance Training on Physical Fitness of University Male Football Players. *THE SKY-International Journal of Physical Education and Sports Sciences (IJPESS)*, *7*, 27–34. https://doi.org/10.51846/the-sky.v7i0.2546

Thum, J.S., Parsons, G., Whittle, T.& Astorino, T.A. (2017). High-Intensity Interval Training Elicits Higher Enjoyment than Moderate Intensity Continuous Exercise. PloS one. 12 (1), e0166299. DOI: 10.1371/*journal.pone*.0166299.

Van den Tillaar R, Saeterbakken AH. Comparison of core muscle activation between a prone bridge and 6-RM back squats. *Journal of human kinetics*. 2018 Jun; 62:43. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6006542/(accessed 19.2.2022)

Yang J, Christophi CA, Farioli A, et al. (2019) Association between push-up exercise capacity and future cardiovascular events among active adult men. JAMA Netw Open;2(2): e188341. doi:10.1001/jamanetworkopen.2018.8341

Warsi, A. Z., & Shaiq, M. (2025). The Role of Sustainable Planning and Project Team Attitude in Achieving Sustainable Project Success in the Health Sector. THE ASIAN BULLETIN OF GREEN MANAGEMENT AND CIRCULAR ECONOMY, 5(1), 44-64.

Warsi, A., Sibghatullah, A., & Iqbal, A. (2019). Empirics of Agricultural Production: Comparison of Instrumental Variable and Two Stage Least Square Approach