

Effects of 12 weeks of Combined Circuit Training with Yogic Practices, Circuit Training and Yogic Practices on selected Muscular Endurance

Dr. Kamatham Sivananda¹

1 University College of Education, Sri Krishnadevaraya University, Anantapur, Andhra Pradesh

Email – sivananda.sku@gmail.com

Dr. B. Krishna Deepika*

**²Assistant Professor, NTR College of Veterinary Science, Gannavaram.*

Email: deepikasahu777@gmail.com

Abstract: To fulfill the objective of this study, a total of eighty high school-level volleyball players (N=80) who were actively enrolled in schools within the Guntur District of Andhra Pradesh, India, were chosen through a random selection process. Their ages ranged from 13 to 17 years. The selected participants (N=80) were evenly distributed into four groups, each comprising twenty individuals. Group I underwent combined circuit training with integrated yogic practices (CCTYPG), Group II engaged in circuit training (CTG), and Group III practiced yogic exercises (YPG). This training regimen extended over twelve weeks, involving three days per week (Monday, Wednesday, and Thursday) and their standard school curriculum. On the other hand, Group IV (CG) was designated as the control group and did not partake in any specialized training program beyond their routine curriculum-based activities. A significance level of 0.05 was established as the threshold for assessing the obtained F ratio using analysis of covariance, a fitting approach for this study's objectives.

Keywords: *Muscular Endurance, Circuit training, Yogic Practices, Handball*

1. INTRODUCTION

The World Health Organization (WHO) defines physical fitness as "the capacity to perform muscular work satisfactorily." It encompasses an individual's ability to lead a balanced life, involving physical, mental, emotional, and spiritual elements, fostering a wholesome understanding. Circuit training is a conditioning method that integrates resistance training with high-intensity aerobics. Designed for user-friendliness, it focuses on enhancing both strength and muscular endurance. A "circuit" in this context refers to completing a set of prescribed exercises within the program. Circuit training is a significant approach to bolstering mobility, strength, and stamina. Typically consisting of 6 to 10 strength exercises, each is sequentially performed, followed by a predetermined number of repetitions or time duration before proceeding to the subsequent exercise. Brief rest intervals segregate exercises within each circuit, while longer rest intervals separate individual circuits. The total number of circuits executed during a training session may range from two to six, contingent upon factors like training proficiency (beginner, intermediate, or advanced), training phase (preparation or competition), and training objective. The term "Yoga," originating from the Sanskrit root 'yuj,' signifies binding and unifying (Iyengar, 1996). It embodies the true harmony between our will and the divine will. Our ancient traditions have outlined eight stages of yoga to cultivate purity of body, mind, and soul, culminating in a final connection with the divine. This comprehensive system is known as Ashtanga Yoga 8-9.

Muscular endurance stands as a noteworthy aspect of health-related fitness, encompassing the capability of a muscle or muscle group to repeatedly contract or sustain contraction for an extended duration without experiencing fatigue. It signifies the muscular system's aptitude to generate and uphold force or movement over an extended timeframe. Muscular endurance is critical to performing daily activities like carrying groceries, walking up stairs, or playing sports. It also helps reduce the risk of back pain, joint injuries, or muscle strains. One way to enhance muscular endurance is through regular exercises, such as resistance exercises, high-intensity interval training, or aerobic training. When muscles are regularly worked at moderate intensities, they adapt by increasing strength and endurance. Muscular endurance training is appropriate for individuals of all ages, fitness levels, and health status. It has the potential to enhance joint stability, elevate energy levels, and lower susceptibility to chronic conditions such as hypertension, obesity, and diabetes. In summary, muscular endurance is a critical component of health and fitness that promotes physical performance and reduces the risk of injuries and chronic diseases. By adopting a consistent exercise regimen focusing on endurance training, individuals can significantly improve their overall health and quality of life 2-7.

2. DATA ANALYSIS AND STUDY OUTCOMES

The effects of 12 weeks of combined circuit training with yogic practices, circuit training, and yogic practices on selected muscular endurance Variables were statistically analyzed, and the results were presented below. Table 1 displays the analysis of covariance conducted on the data obtained for muscular strength from pre-test, post-test, and adjusted post-test measurements across the groups of combined circuit training with yogic practices, circuit training, yogic practices, and the control group. The statistical examination derived from Table 1 reveals the subsequent pre-test mean values for Muscular Endurance among the groups: combined circuit training with yogic practices (CCTYPG) - 18.60, circuit training group (CTG) - 18.45, yogic practices group (YPG) - 18.50, and control group - 18.55. The calculated F ratio of 1.45 for the pre-test fell below the critical table value of 2.73. Consequently, the pre-test results did not demonstrate significance at the 0.05 confidence level for the degrees of freedom 3 and 76 concerning Muscular Endurance. We were transitioning to the post-test mean values: combined circuit training with yogic practices group - 24.70, circuit training group - 24.40, yogic practices group - 24.55, and control group - 18.65. The computed F ratio of 384.07 for the post-test exceeded the critical table value of 2.73. Hence, the post-test results exhibited significance at the 0.05 confidence level for the degrees of freedom 3 and 76.

Shifting to the adjusted post-test mean values for Muscular Endurance: combined circuit training with yogic practices group - 24.90, circuit training group - 24.45, yogic practices group - 24.57, and control group - 18.70. The obtained F ratio for the adjusted post-test, which amounted to 379.48, also surpassed the table value of 2.73. Thus, the adjusted post-test results proved significant at the 0.05 confidence level for the degrees of freedom 3 and 75.

Table 1: Covariance Analysis for Pre-Test, Post-Test, and Adjusted Post-Test Data on Muscular Endurance in the Groups of Combined Circuit Training with Yogic Practices, Circuit Training, Yogic Practices, and Control.

Tests / Groups		CCTYPG	CTG	YPG	C G	S O V	Sum of Squares	df	Mean Squares	F ratio
Pre Test	\bar{X}	18.60	18.45	18.50	18.55	B	0.250	3	0.083	1.45
	σ	0.680	0.825	0.760	0.759	W	43.70	76	0.575	
Post Test	\bar{X}	24.70	24.40	24.55	18.65	B	523.05	3	174.35	384.07*
	σ	0.732	0.502	0.604	0.812	W	34.50	76	0.454	
Adjusted Post Test	\bar{X}	24.90	24.45	24.57	18.70	B	523.06	3	174.35	379.48*
						W	34045	75	0.459	

Table: F-Ratio at 0.05 Confidence Level for Degrees of Freedom (df) 3 and 76 = 2.73, and Degrees of Freedom (df) 3 and 75 = 2.73.

*Significant

Table 2: Scheffe's Post Hoc Examination of Variations in Adjusted Post-Test Paired Means for Muscular Endurance among the Three Experimental Groups and the Control Group.

Adjusted Post Test Means				Mean Difference	Required CI
CCTYPG (I)	CTG (II)	YPG (III)	CG (IV)		
24.90	24.45			0.45	0.86*
24.90		24.57		0.33	
24.90			18.70	6.2*	
	24.45	24.57		0.12	
	24.45		18.70	5.75*	
		24.57	18.70	5.87*	

*Significant at 0.05 level

The investigation suggests a significant distinction among the adjusted post-test mean values of the four groups, encompassing three experimental groups and a control group. Additionally, to ascertain the substantial disparities among the four paired mean values,

Scheffe's test was employed as a post hoc analysis, and the outcomes are presented in Table 2.

Table 2 illustrates the adjusted post-test mean differences for Muscular Endurance across the various groups: combined circuit training with yogic practices (CCTYPG), circuit training group (CTG), yogic practices group (YPG), and the control group. The calculated differences are CCTYPG and CG - 6.2, CTG and CG - 5.75, and YPG and CG - 5.87. These differences exceed the confidence interval threshold of 0.86 for Muscular Endurance at a 0.05 confidence level, indicating significant disparities between Groups I and IV, II and IV, and III and IV. In contrast, the distinctions between CCTYPG and CTG (0.45), CCTYPG and YPG (0.33), and CTG and YPG (0.12) are lower than the confidence interval threshold of 0.86 for Muscular Endurance at a 0.05 confidence level. As a result, insignificance is observed between Groups I and II, I and III, and II and III.

Furthermore, the mean values for pre-test, post-test, and adjusted post-test Muscular Endurance across the combined circuit training with yogic practices, circuit training, yogic practices, and control groups are visually depicted in Figure 1.

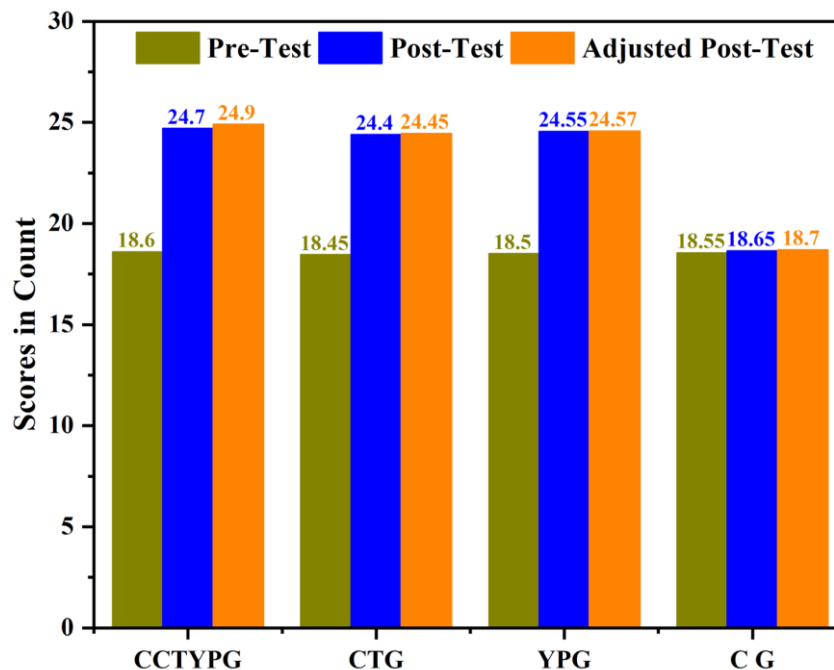


Figure 1: Bar Chart Depicting Pre-Test, Post-Test, and Adjusted Post-Test Mean Values for Muscular Endurance in the Groups of Combined Circuit Training with Yogic Practices, Circuit Training, Yogic Practices, and Control.

3. DISCUSSION AND CONCLUSIONS:

The study's findings demonstrated conclusive evidence that combined circuit training with yogic practices, as well as circuit training and yogic practices independently, led to noteworthy enhancements in specific physical fitness factors, particularly muscular endurance, among school volleyball players. These improvements were notably pronounced when contrasted with other training and control groups. Notably, the circuit training group exhibited superior muscular strength to the yogic practices group. Muscular strength was also superior in the yogic practice group compared to the control group.

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