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EFFECT OF CIRCUIT TRAINING ON SELECTED RESPIRATORY VARIABLES AMONG WOMEN HOCKEY PLAYERS

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Abstract

The purpose of the study was to investigate the effect of circuit training on selected respiratory variables among women hockey players. To achieve the purpose of the study, thirty women hockey players from Pudukkottai District, Tamil Nadu, India, aged between 18 and 25 years, were selected at random. The selected subjects were divided into two equal groups of fifteen each. Group I acted as the experimental group and underwent circuit training, while Group II acted as the control group. Vital capacity and peak expiratory flow rate were selected as the dependent variables. The experimental training programme was conducted for a period of twelve weeks. The pre-test and post-test data were analysed using Analysis of Covariance (ANCOVA) to determine the significant differences between the experimental and control groups. The level of significance was fixed at 0.05. The results revealed that circuit training produced significant improvements in vital capacity and peak expiratory flow rate among women hockey players. The adjusted post-test results also indicated significant differences between the experimental and control groups in both variables. It was concluded that circuit training was effective in improving selected respiratory variables among women hockey players.

Introduction

Hockey is a physically demanding team sport that requires a high level of physical fitness, physiological efficiency and technical ability. Players are required to perform repeated sprinting, running, acceleration, deceleration and rapid changes of direction throughout the match. These activities place considerable demands on the cardiovascular and respiratory systems. Among the important physiological variables contributing to athletic performance are vital capacity and heart rate. Vital capacity refers to the maximum volume of air that an individual can exhale after taking the deepest possible inspiration, reflecting the functional capacity of the respiratory system. Heart rate represents the number of heartbeats per minute and provides an indication of cardiovascular response to physical activity. An effective training programme can improve cardiorespiratory efficiency and help athletes maintain their performance during prolonged competitive activities. According to Wilmore, Costill, and Kenney (2008), regular physical training produces important physiological adaptations that contribute to improved cardiovascular and respiratory functions.

Circuit training is a systematic method of physical conditioning in which a series of exercises are performed at different stations with predetermined work and recovery intervals. It involves a combination of exercises designed to develop muscular strength, muscular endurance and cardiovascular fitness. The continuous movement between exercise stations provides an effective stimulus for improving cardiorespiratory endurance and overall physical fitness. Babu et al. (2026) reported that circuit weight training could improve muscular strength and

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cardiorespiratory fitness. Similarly, circuit-based exercise programmes provide opportunities to develop physiological efficiency through systematic and progressive exercise. In women hockey players, improved respiratory and cardiovascular functions may contribute to better tolerance of physical demands during training and competition. Therefore, the present study was designed to investigate the effect of circuit training on vital capacity and heart rate among women hockey players.

Methodology

The purpose of the study was to find out the effect of circuit training on vital capacity and heart rate among women hockey players. To achieve the purpose of the present study, thirty hockey players from Pudukkottai district, Tamilnadu were selected as subjects at random and their ages ranged from 18 to 25 years. The subjects were divided into two equal groups of fifteen each. Group I acted as Experimental Group I (Circuit training) and Group II acted as Control Group. Analysis of covariance (ANCOVA) was used to test the treatment effect of the training programmes on all the variables used in the study.

Results

TABLE - I

COMPUTATION OF ANALYSIS OF COVARIANCE OF MEAN OF CIRCUIT TRAINING AND CONTROL GROUPS ON VITAL CAPACITY

	Exp	Control	Source of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre-Test Means	2.80	2.47	**BG**	0.82	1	0.82	0.06
			WG	356.53	28	12.73	
Post-Test Means	3.65	2.58	**BG**	8.59	1	8.59	14.32*
			WG	16.80	28	0.60	
Adjusted Post-Test Means	3.64	2.59	**BG**	8.27	1	8.27	14.26*
			WG	15.66	27	0.58	

* Significant at 0.05 level

An examination of table - I indicated that the pretest means of circuit training and control groups were 2.80 and 2.47 respectively. The obtained F-ratio for the pre-test was 0.06 and the table F-ratio was 4.19. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 1 and 28. The post-test means of the circuit training and control groups were 3.65 and 2.58 respectively. The obtained F-ratio for the post-test was 14.32 and the table F-ratio was 4.19. Hence the pre-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 1 and 28. The adjusted post-test means of the circuit training and control groups were 3.64 and 2.59 respectively. The obtained F-ratio for the adjusted post-

test means was 14.26 and the table F-ratio was 4.21. Hence the adjusted post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 1 and 27.

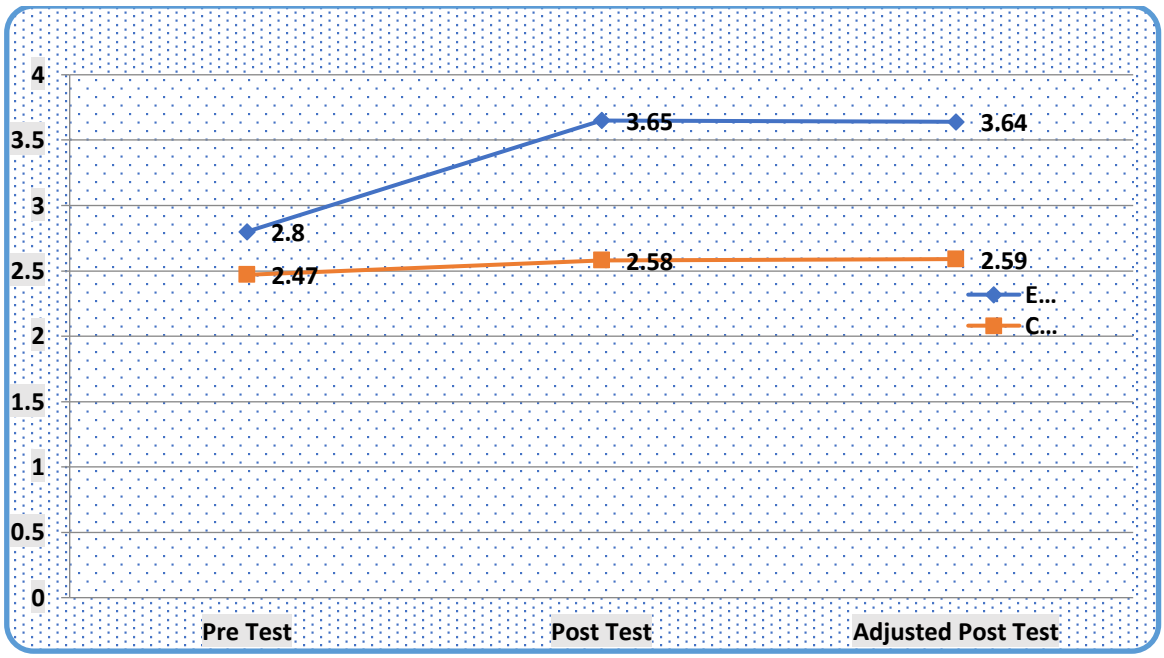


FIGURE - I
PRE AND POST TEST DIFFERENCES ON VITAL CAPACITY

TABLE - II

COMPUTATION OF ANALYSIS OF COVARIANCE OF MEAN OF CIRCUIT TRAINING AND CONTROL GROUPS ON PEAK EXPIRATORY FLOW RATE

	Exp	Control	Source of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre-Test Means	350.00	348.00	**BG**	0.13	1	0.13	0.01
			WG	217.33	28	7.76	
Post-Test Means	405.00	352.00	**BG**	2358.53	1	2358.53	168.92*
			WG	390.93	28	13.96	
Adjusted Post-Test Means	404.50	352.50	**BG**	2353.80	1	2353.80	163.34*
			WG	389.06	27	14.41	

* Significant at 0.05 level

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An examination of table - II indicated that the pretest means of circuit training and control groups were 350.00 and 348.00 respectively. The obtained F-ratio for the pre-test was 0.01 and the table F-ratio was 4.19. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 1 and 28. The post-test means of the circuit training and control groups were 405.00 and 352.00 respectively. The obtained F-ratio for the post-test was 168.92 and the table F-ratio was 4.19. Hence the pre-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 1 and 28. The adjusted post-test means of the circuit training and control groups were 404.50 and 352.50 respectively. The obtained F-ratio for the adjusted post-test means was 163.34 and the table F-ratio was 4.21. Hence the adjusted post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 1 and 27.

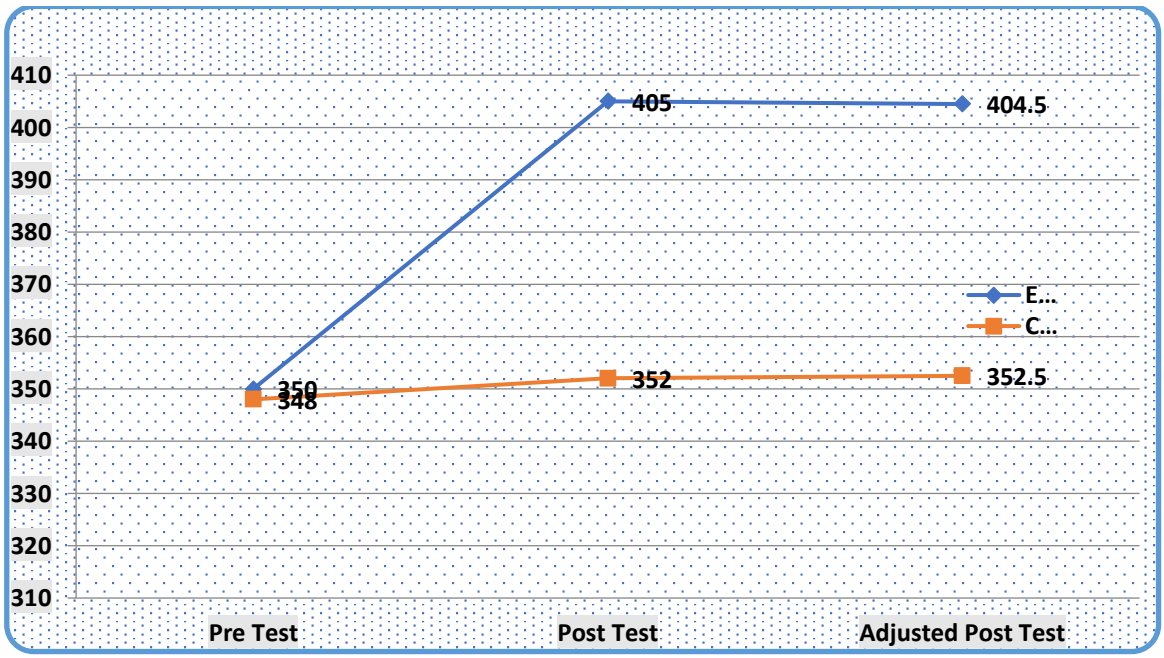


FIGURE - II
PRE AND POST TEST DIFFERENCES OF PEAK EXPIRATORY FLOW RATE

DISCUSSION

The results of the present study revealed that circuit training produced a significant improvement in vital capacity among women hockey players. The pre-test results indicated no significant difference between the experimental and control groups, confirming that both groups were comparable before the commencement of the training programme. However, the post-test and adjusted post-test results showed significant differences in favour of the experimental group. The improvement in vital capacity may be attributed to the systematic nature of circuit exercises, which increase physical activity demands and stimulate the cardiorespiratory system. Wilmore, Costill, and Kenney (2008) explained that regular physical training produces physiological adaptations that contribute to improved cardiovascular and respiratory efficiency. The findings further indicated that circuit training significantly improved peak expiratory flow rate (PEFR) among women hockey players. The experimental group demonstrated greater improvement than the control group, as evidenced by the significant post-test and

adjusted post-test F-ratios. This improvement may be associated with enhanced respiratory muscle performance and physiological adaptations resulting from regular physical conditioning. Peak expiratory flow rate is an important measure of the maximum speed of air expelled during forced expiration and provides information about expiratory airflow. McArdle, Katch and Katch (2010) highlighted that regular exercise training produces beneficial adaptations in the respiratory and cardiovascular systems, contributing to improved exercise capacity. The findings of the present study are supported by Malathy & Alexandar (2016), who reported that circuit weight training improved muscular strength and cardiorespiratory function. Similarly, Wilmore et al. (2008) explained that systematic physical training contributes to improved physiological efficiency and exercise performance. The improvements in vital capacity and peak expiratory flow rate observed in the present study suggest that circuit training can be an effective conditioning method for developing selected respiratory fitness components among women hockey players. Therefore, incorporating circuit training into regular hockey preparation may help improve the physiological fitness required for competitive performance.

Conclusion

It was concluded that twelve weeks of circuit training significantly improved vital capacity and peak expiratory flow rate among women hockey players. The experimental group showed greater improvement in both selected respiratory variables compared to the control group. Therefore, circuit training may be recommended as an effective training method for improving respiratory fitness and physiological efficiency among women hockey players.

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