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WEIGHT TRAINING INDUCED CHANGES ON HAEMATOLOGICAL VARIABLES OF HOCKEY PLAYERS

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ABSTRACT

The purpose of the present study was to determine the effect of weight training on selected haematological variables among hockey players. The study aimed to assess whether a 12-week weight training program would produce significant changes in selected blood parameters compared to a control group that continued with regular activities. Thirty (N = 30) male hockey players from Selvam Educational Institutions, Namakkal, Tamil Nadu, India, were randomly selected as subjects for this study. The age of the participants ranged from 18 to 25 years. The subjects were divided at random into two equal groups of fifteen (n = 15) each. Group I (Experimental Group) Underwent a structured weight training program. Group II (Control Group): Did not participate in any experimental training and continued with their regular routine activities. The study focused on selected haematological variables and blood samples were collected under standardized laboratory conditions both before and after the 12-week experimental period. The study followed a random group design involving a pre-test and post-test with a control group. Blood samples were analyzed using standard hematological laboratory tests. The collected data were statistically analyzed using Analysis of Covariance (ANCOVA) to determine the significance of mean differences between the experimental and control groups. The level of significance was set at 0.05 to test the hypotheses. It was concluded that there was significant improvement on RBC & WDC due to weight training when compared to control group.

KEYWORDS: Weight Training, Hockey, RBC, WBC.

INTRODUCTION

Haematological variables are critical indicators of an athlete's physiological status and play a significant role in determining performance capacity, endurance, and recovery. Regular participation in physical training, particularly strength or resistance exercise, can influence various blood parameters such as red blood cell count, haemoglobin concentration, hematocrit, and white blood cell levels (Singh & Rajput, 2011). These adaptations help improve oxygen transport, metabolic efficiency, and immune function, which are essential for optimal athletic performance. Weight training is a widely used conditioning method in sports to enhance muscular strength, power, and endurance. In addition to its effects on neuromuscular systems, it induces systemic physiological changes that can modify the haematological profile (Jee, Lim, & Kim, 2013). Resistance exercise stimulates erythropoiesis and plasma volume expansion, leading to improved oxygen delivery and metabolic support for working muscles (Mairbaurl, 2013). However, the magnitude and nature of these haematological changes may vary depending on the training intensity, duration, and the athlete's fitness level. Hockey is a physically demanding sport that requires a combination of strength, endurance, and speed. Regular weight training is often incorporated into players' training regimens to enhance performance. Understanding how weight training influences haematological parameters in hockey players can provide valuable insights into optimizing conditioning programs and monitoring training adaptations (Bandyopadhyay, 2007). Hence, the present study aims to investigate the effects of weight training on selected haematological variables among hockey players.

REVIEW OF LITERATURE

Haematological variables such as red blood cell count, haemoglobin concentration, and hematocrit are essential indicators of an athlete's oxygen-carrying capacity and endurance potential. Regular physical training, especially strength or resistance training, can induce favorable haematological adaptations through mechanisms like increased erythropoiesis, plasma volume expansion, and improved oxygen delivery to working muscles (Mairbaurl, 2013). Mairbaurl (2013) noted that both endurance and resistance training improve the functionality of red blood cells and enhance oxygen supply during prolonged physical activity. Montero and Lundby (2017) explained that exercise activates erythropoietin production, stimulating red blood cell formation and improving blood oxygenation efficiency. These physiological responses play a critical role in the performance of athletes who rely on both strength and endurance capacities, such as hockey players. Hockey is a high-intensity, intermittent sport that demands frequent sprints, rapid direction changes, and sustained physical engagement. These requirements place significant stress on the cardiovascular and haematological systems. Hinrichs et al. (2010) observed that elite field hockey players possessed higher total haemoglobin mass and blood volume than sedentary individuals, contributing to superior aerobic performance. Similarly, Brocherie, Millet, and Girard (2015) found that haemoglobin concentration and hematocrit levels were strongly associated with repeated-sprint ability and recovery rate among hockey athletes.

PURPOSE OF THE STUDY

The purpose of the present study was to determine the effect of weight training on selected haematological variables among hockey players. The study aimed to assess whether a 12-week weight training program would produce significant changes in selected blood parameters compared to a control group that continued with regular activities.

SELECTION OF SUBJECTS

Thirty (N = 30) male hockey players from Selvam Educational Institutions, Namakkal, Tamil Nadu, India, were randomly selected as subjects for this study. The age of the participants ranged from 18 to 25 years. The subjects were divided at random into two equal groups of fifteen (n = 15) each.

- Group I (Experimental Group): Underwent a structured weight training program.
- Group II (Control Group): Did not participate in any experimental training and continued with their regular routine activities.

SELECTION OF VARIABLES

The study focused on selected haematological variables, which are important indicators of physiological adaptation and performance capacity. The following variables were measured through standard laboratory testing procedures:

- Red Blood Cell Count (RBC)
- White Blood Cell Count (WBC)

Blood samples were collected under standardized laboratory conditions both before and after the 12-week experimental period.

EXPERIMENTAL DESIGN

The study followed a random group design involving a pre-test and post-test with a control group. Before the commencement of the experimental treatment, all participants were tested on selected hematological variables, which constituted their pre-test scores. The experimental group participated in a 12-week weight training program, while the control group maintained their normal daily schedules

without additional training. After the experimental period, a post-test was conducted on both groups using the same testing procedures as in the pre-test.

TRAINING PROGRAM

The weight training program was designed to progressively develop muscular strength and endurance. The training schedule consisted of various resistance exercises targeting major muscle groups, performed three days per week for twelve weeks. Each session lasted approximately 60–75 minutes, including warm-up and cool-down periods. The training load was adjusted weekly to maintain progressive overload and ensure consistent improvement.

COLLECTION OF DATA

Before the commencement of the experiment, all participants were familiarized with the testing procedures. Blood samples were collected by trained laboratory technicians under medical supervision. The samples were analyzed using standard hematological laboratory tests. Pre-test data were obtained prior to the commencement of the weight training program, and post-test data were collected at the end of the 12-week training period.

STATISTICAL TECHNIQUE

The collected data were statistically analyzed using Analysis of Covariance (ANCOVA) to determine the significance of mean differences between the experimental and control groups. The level of significance was set at 0.05 to test the hypotheses.

RESULTS

TABLE-I
COMPUTATION OF ANALYSIS OF COVARIANCE OF MEAN OF WEIGHT TRAINING AND CONTROL GROUPS ON RBC

	Weight training	*Control Group*	*Source of Variance*	*Sum of Squares*	*df*	*Means Squares*	*F-ratio*
Pre-Test Means	3.38	3.48	**BG**	0.08	1	0.08	1.02
			WG	2.32	28	0.08	
Post-Test Means	4.34	3.40	**BG**	6.53	1	6.53	126.56*
			WG	1.44	28	0.05	
Adjusted Post-Test Means	4.36	3.38	**BG**	6.84	1	6.84	163.25*
			WG	1.13	27	0.04	

(Table Value for 0.05 Level for df 1 & 28 = 4.19) df- Degrees of Freedom
(Table Value for 0.05 Level for df 1 & 27 = 4.21)

An examination of table - I indicated that the pretest means of weight training and control groups were 3.38 and 3.48 respectively. The obtained F-ratio for the pre-test was 1.02 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 weight training and control groups were 4.34 and 3.40 respectively. The obtained F-ratio for the post-test was 126.56 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 weight training and control groups were 4.36 and 3.38 respectively. The obtained F-ratio for the adjusted post-test means was 163.25and 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. The pre, post and adjusted post test mean values of weight training and control groups, on RBC are graphically represented in the figure -I.

FIGURE - I
PRE AND POST TEST DIFFERENCES OF THE WEIGHT TRAINING AND CONTROL GROUPS ON RBC

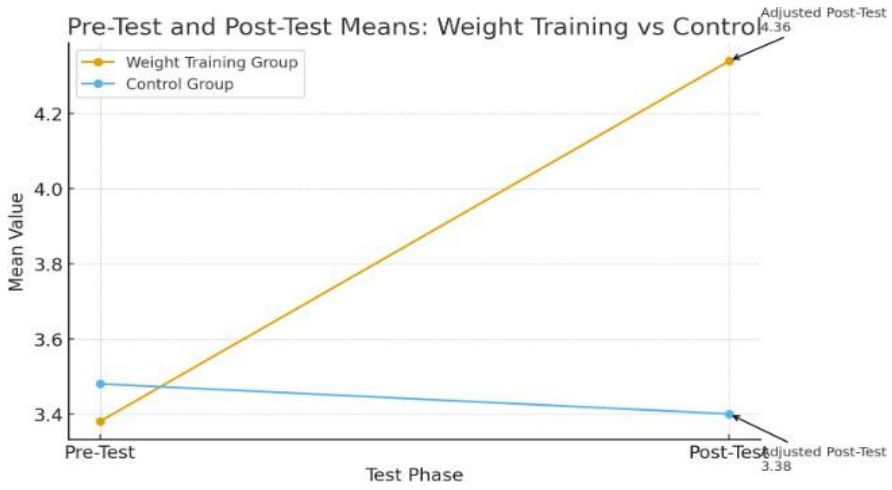


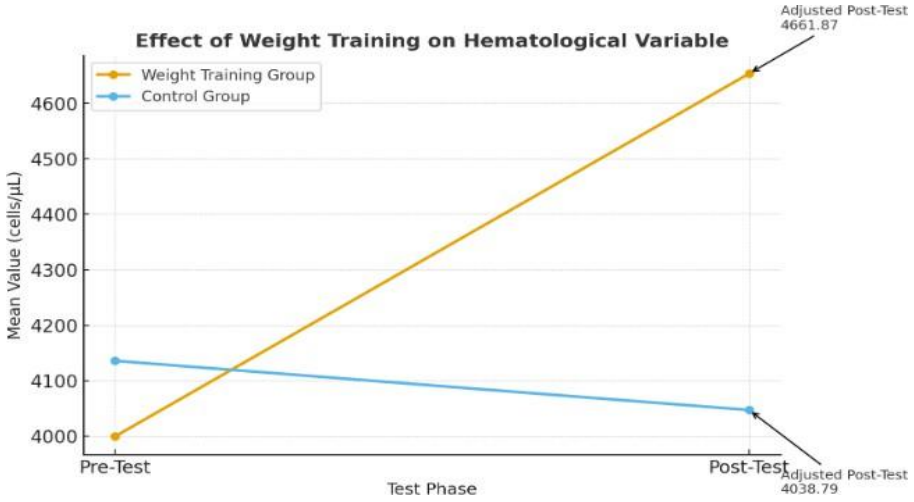
TABLE-II
COMPUTATION OF ANALYSIS OF COVARIANCE OF MEAN OF WEIGHT TRAINING AND CONTROL GROUPS ON WBC

	Weight training	*Control Group*	*Source of Variance*	*Sum of Squares*	*df*	*Means Squares*	*F-ratio*
Pre-Test Means	3999.93	4136.00	**BG**	138856.03	1	138856.03	1.92
			WG	2021168.93	28	72184.60	
Post-Test Means	4653.20	4047.46	**BG**	2751846.53	1	2751846.53	15.37*
			WG	5011782.13	28	178992.21	
Adjusted Post-Test Means	4661.87	4038.79	**BG**	2724513.80	1	2724513.80	14.77*
			WG	4978942.54	27	184405.28	

(Table Value for 0.05 Level for df 1 & 28 = 4.19) df- Degrees of Freedom
(Table Value for 0.05 Level for df 1 & 27 = 4.21)

An examination of table – II indicated that the pretest means of weight training and control groups were 3999.93 and 4136.00 respectively. The obtained F-ratio for the pre-test was 1.92 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 weight training and control groups were 4653.20 and 4047.46 respectively. The obtained F-ratio for the post-test was 15.37 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 weight training and control groups were 4661.87 and 4038.79 respectively. The obtained F-ratio for the adjusted post-test means was 14.77 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. The pre, post and adjusted post test mean values of weight training and control groups, on WBC are graphically represented in the figure -II.

FIGURE - II
PRE AND POST TEST DIFFERENCES OF THE WEIGHT TRAINING AND CONTROL GROUPS ON WBC



DISCUSSION ON FINDINGS

Sellami, Bragazzi, and Abderrahman (2021) conducted a combined sprint and strength training program that produced significant increases in haemoglobin and hematocrit values, along with improved athletic performance. Ozbay (2018) investigated the effects of maximal strength training on haematological and biochemical parameters in elite wrestlers. After 10 weeks, participants showed significant increases in RBC count, haemoglobin, and hematocrit levels. Chupel, de Souza, and de Oliveira (2017) reported that strength training decreases inflammation while increasing beneficial haematological markers, including red blood cell count and haemoglobin concentration. These changes suggest that resistance exercise promotes both circulatory and immune benefits. The results indicated that combined high-intensity training stimulates erythropoiesis and plasma volume adaptation. Montero and Lundby (2017) emphasized that repeated bouts of physical training enhance erythropoietin secretion, supporting sustained red blood cell production. These findings align with Mairbaurl's (2013) conclusion that regular exercise improves oxygen transport capacity and muscular endurance. Bobeuf, Labonté, Khalil, and Dionne (2009) examined the effects of a 12-week resistance training program on haematological blood markers in older men and women. They found significant increases in haemoglobin and red blood cell count, indicating enhanced erythropoiesis. The authors

concluded that resistance training positively affects blood composition even in non-athletes. The study concluded that weight training promotes haematological adaptations beneficial for performance in Hockey. The results of this study clearly show that twelve weeks of weight training significantly affects a few variables, such as RBC and WBC. As a result, the previously established hypothesis was accepted.

CONCLUSION

1. It was concluded that there was significant improvement on RBC & WDC due to weight training when compared to control group.

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