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Effect Of Different Strength Training On Selected Physiological And Hematological Variables Among Engineering College Kabaddi Players

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Abstract:

The purpose of the current study was to investigate the effect of different strength training on selected physiological and hematological variables among engineering college kabaddi players.For the purpose of the study, forty-five men kabaddi players studying bachelor's degree in the different engineering colleges, affiliated to Anna University, Chennai were selected as subject and they were divided into three equal groups of fifteen subjects each at random namely plyometric training group, barbell training group and control group. The age of the selected subjects were ranged from 18 to 22 years. Group I underwent plyometric training and group II underwent barbell training for three days per week for six weeks. Group III acted as control they did not undergo any special training programme apart from their regular activity. The following dependent variables were selected for this study namely Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles. The data were collected on selected dependent variables at prior and immediately after the experimental period as pretest and posttest respectively. The data were analyzed by applying dependent 't' test and analysis of covariance (ANCOVA) was used to find out the significant difference among the groups, if any separately for each dependent variable. Since, three groups were compared, whenever the obtained 'F' ratio for adjusted posttest was found to be significant, the Scheffe's post hoc was used to find out the paired mean differences, if any. The 0.05 level of confidence was fixed to test the level of significance which was considered as an appropriate. The result of the study showed that plyometric and barbell training developed VO2 Max of the engineering college kabaddi players, plyometric training and barbell training group showed normal resting pulse rate, barbell training group showed higher level of hemoglobin and red blood corpuscles

Keywords: Plyometric training, barbell training, Vo2 max, resting pulse rate, hemoglobin and red blood corpuscles

1. INTRODUCTION

Plyometric training is an excellent way to develop both strength and power in the muscles involved in sprinting. It improves the explosive action of leaping from one foot to another because to the stretch shortening cycle. Therefore Plyometric training improves stretch, power speed and jumping ability which has been proved by many researches.

Free weights present a number of different testing conditions compared with weight machines. Free weight require greater motor coordination than do machines, primarily because the individual must control free weights through all spatial dimensions, whereas machines generally involve control through only one plane of movement (Fleck S Jand Kraemer W J, 1996). This attribute can be an advantage or a disadvantage, depending on the motor function (e.g., frail elderly, those with neuromuscular disease, people with arthritis, and so on) may require machine-based testing initially until sufficient improvement in physical function occurs. Another more practical reason for using free weights is their low cost and availability.

Blood volume decreased significantly during bed rest (from 5.0 to 4.7 L inthe five subjects, i.e., a 7% reduction). The decrease in plasma volume wasslightly more pronounced

than in the red cell mass. During training, the plasmavolume and red cell mass increased again, in most subjects above the controlvalues. Endurance training increases both the blood volume and the totalhemoglobin (Hb) so that the Hb concentration usually is maintained constant.Plasma volume increases after a few days of training, whereas the expansion oferythrocyte volume takes longer. Cross-sectional studies show that there is a close relationship between VO2max on one hand and blood volume and total amount ofHb on the other (Harrison M H,1985).

Langford GA et al., (2007) The findings of this study showed thatall three training groups significantly improved in strength during short – timetraining on the machine (MB), Barbell (BB) and leg bench press (LB) These datatend evidence that improved strength after training on the MB, BB and LB equallytransfers to strength gains on any of the four model of testing. These results should be considered when including similar exercises varying in stability into thetraining program to improve strength.

Methods and Materials

To achieve the purpose, forty five men kabaddi players studying bachelor's degree in the different engineering colleges, affiliated to Anna University, Chennai were selected as subject and they were divided into three equal groups of fifteen subjects each at random namely plyometric training group, barbell training group and control group. The age of the selected subjects were ranged from 18 to 22 years. Group I underwent plyometric training and group II underwent barbell training for three days per week for six weeks. Group III acted as control they did not undergo any special training programme apart from their regular activity. The following dependent variables were selected for this study namely Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles. The experimental design selected for this study was pre and posttest randomized design. The data were collected form each subject before and after the training period and statistically analyzed by using dependent 't' test and analysis of covariance (ANCOVA).

Table IDescription Of Training Schedule For Plyometrics Group

Week	**1-2 Week**			**3-4 Week**			**5-6 Week**		
Load	**Set**	**Reps**	**Volume**	**Set**	**Reps**	**Volume**	**Set**	**Reps**	**Volume**
Squat Jump	2	10	20	2	12	24	3	12	36
Split Squat Jump	2	10	20	2	12	24	3	12	36
2 foot ankle hop	2	10	20	2	12	24	3	12	36
Box Jump	2	10	20	2	12	24	3	12	36

Table II Description Of Training Schedule For Barbell Group

Week	**1-2 Week**			**3-4 Week**			**5-6 Week**		
Load	**Set**	**Reps**	**Intensity**	**Set**	**Reps**	**Intensity**	**Set**	**Reps**	**Intensity**
Clean	3	6-8	40-50 %	3	6-8	50-60 %	3	6-8	60-70 %
Snatch	3	6-8	40-50 %	3	6-8	50-60 %	3	6-8	60-70 %
Bench Press	3	6-8	40-50 %	3	6-8	50-60 %	3	6-8	60-70 %
Step up	3	6-8	40-50 %	3	6-8	50-60 %	3	6-8	60-70 %

Table III Tests Selection

Variable	**Tests/ Equipment**	**Unit of measurement**
VO2 Max	Multi Stage Shuttle Run Test	Ml/kg/min
Resting Pulse Rate	By taking radial pulse	Beats/minute
Hemoglobin	Blood Sampling Analysis	Gram percentage
Red blood corpuscles	Blood Sampling Analysis	Millions per cubic millilitre

The data pertaining to the variables in this study were examined by using dependent 't' test to find out the significant improvement and analysis of covariance (ANCOVA) for each variables separately in order to determine the difference and tested at 0.05 level of significance. The analysis of dependent 't' test on data obtained for Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles of the pretest and posttest means of experimental and control group have been analyzed and presented in Table IV.

Results and Discussions

Table IVMean and Dependent 't' Test of Experimental and Control Groups on Selected Physiological and Hematological Variables

Variables	Mean	Plyometric	Barbell	Control Group
Vo2 Max	Pre Test	41.17	41.29	41.66
	Post Test	41.43	43.45	41.05
	't' test	3.29*	14.89*	1.18
Resting Pulse Rate	Pre Test	76.40	78.40	74.47
	Post Test	72.87	72.67	74.00
	't' test	5.35*	7.82*	0.55
Hemoglobin	Pre Test	15.02	15.21	14.98
	Post Test	15.08	15.28	15.00
	't' test	3.63*	3.21*	1.38
Red blood corpuscles	Pre Test	5.45	5.37	5.30
	Post Test	5.49	5.43	5.31
	't' test	3.06*	3.57*	1.00

*Significant at 0.05 level of confidence (14) is 2.145

The obtained 't' ratio value on Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles of experimental group was higher than the table value, it was understood that the plyometric training and barbell training had made significant improvement on Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles. However, the control group has not made significant changes as the obtained 't' value is less than the table value, because it was not subjected to any specific training. The analysis of covariance on the data obtained on Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles due to the effect of plyometric training, barbell training and control groups have been analyzed and presented in Table V.

Table VAnalysis of Covariance of Experimental and Control Groups on Physiological and Hematological Variables

Variables	Adjusted Post Test Means			Source of variance	SS	df	Mean squares	F ratio
	Plyometric training	Barbell training	Control Group					
Vo2 Max	42.44	42.55	42.01	Between	49.826	2	24.913	9.502*
				Within	107.488	41	2.622	
Resting Pulse Rate	72.6	72.4	74	Between	321.600	2	160.800	13.422*
				Within	491.200	41	11.980	
Hemoglobin	15.42	15.68	15.27	Between	0.031	2	0.016	3.587*
				Within	0.179	41	0.004	
Red blood corpuscles	5.52	5.66	5.43	Between	0.025	2	0.012	3.778*
				Within	0.134	41	0.003	

*Significant Table F-ratio at 0.05 level of confidence for 2 and 41 (df) =3.23

Table V showed that the obtained 'F' ratio value of 9.502, 13.422, 3.587 and 3.778 which were higher than the table value of 3.23 with df 2 and 41 required to be significant at 0.05 level. Since the obtained value of 'F' ratio was higher than the table value, it indicated that there was significant difference among the adjusted posttest means of plyometric training, barbell training and control group on Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles.

The plyometric training and barbell training showed the significant difference than control group on Vo2 max, Resting pulse rate, Hemoglobin and Red blood corpuscles. Since significant differences were obtained, as suggested by Thirumalaisamy (1997), the Scheffe"s post hoc test was used to find out the paired means significant difference. The obtained results are presented in Table VI.

Table VIScheffe's Post Hoc Paired Means Comparisons of PlyometricBarbell and Control Group among Engineering College Kabaddi Players

Variables	Groups	Mean differences			Req. CI
		Plyometric	Barbell	Control	
Vo2 Max	Plyometric	---	0.11	----	0.36
	Barbell	---	----	0.54*	
	Control	0.43*	----	----	
Resting Pulse Rate	Plyometric	---	0.20	----	0.78
	Barbell	---	----	1.60*	
	Control	1.40*	----	----	
Hemoglobin	Plyometric	---	0.26*	----	0.01
	Barbell	---	----	0.41*	
	Control	0.15*	----	----	
Red blood corpuscles	Plyometric	---	0.14*	----	0.01
	Barbell	---	----	0.23*	
	Control	0.09*	----	----	

*****Significant at 0.05 level.

Table VI showed that the mean differences of Vo2 max between barbell and control were 0.54, plyometric and control was 0.43. The mean differences of resting pulse rate between barbell and control were 1.60, plyometric and control was 1.40. The mean differences of hemoglobin between plyometric and control were 0.15, barbell and plyometric were 0.26, barbell and control was 0.41 The mean differences of red blood corpuscles between plyometric and control were 0.09, barbell and control were 0.23, barbell and plyometric was 0.14. which were greater than the required Scheffe's confidence interval value of 0.36 (Vo2 Max), 0.78 (Resting pulse rate), 0.01 (Hemoglobin) and 0.01 (Red blood corpuscles). Hence, the difference between the groups was significant at 0.05 level of confidence. Hence the null hypothesis was rejected at 0.05 level of confidence.

The mean differences of Vo2 max between barbell and plyometric were 0.11. The mean differences of resting pulse rate between plyometric and barbell were 0.20. which were lesser than required Scheffe's confidence interval value of 0.36 (Vo2 Max), 0.78 (Resting pulse rate). Hence, there was no evidence to reject the null hypothesis.

To understand better about the findings of the study, the obtained mean values of all the four groups were presented through bar diagram in Figure-A & B

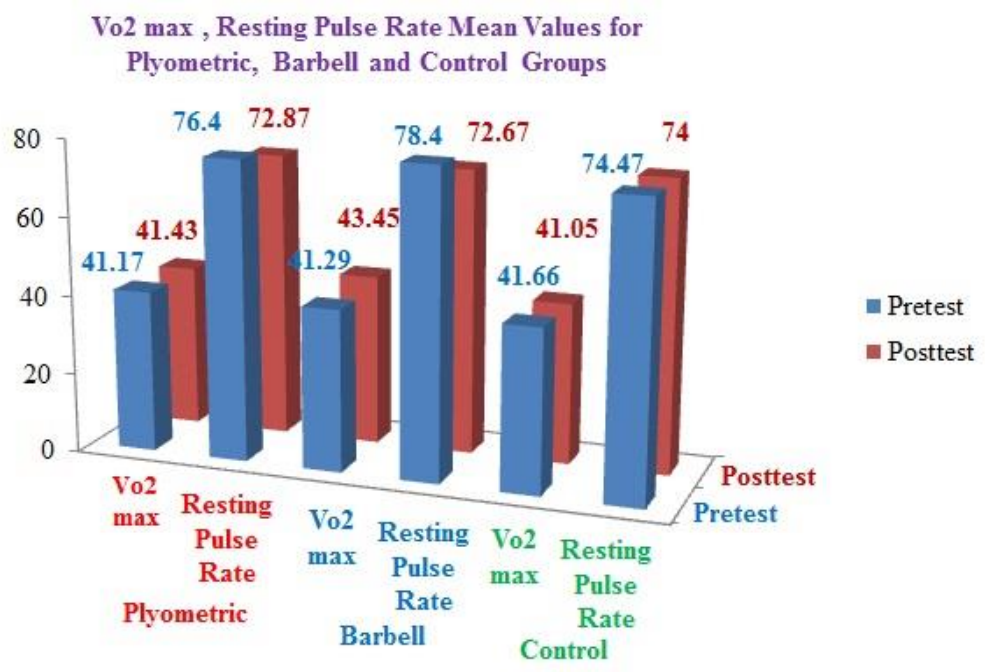

Figure (A) Showing the mean values of Vo2 max, Resting pulse rate for Plyometric, Barbell and Control Groups among Engineering College Kabaddi Players

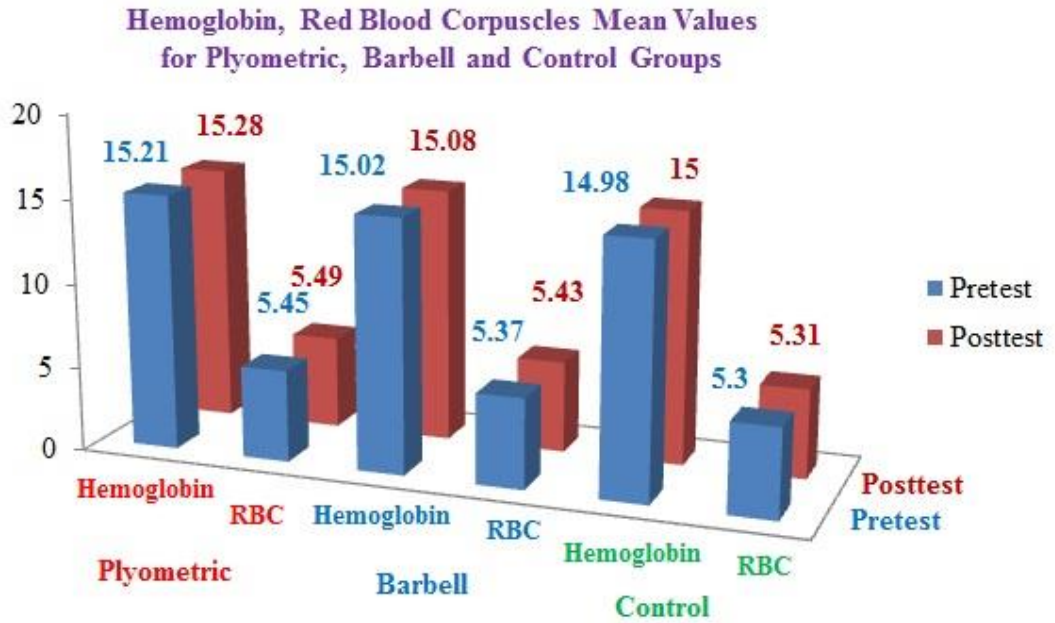

Figure (B) Showing the mean values of Hemoglobin, Red blood corpuscles for Plyometric, Barbell and Control Groups among Engineering College Kabaddi Players

Discussion on Physiological Variables

VO2 Max

Significant difference existed among PMTG (plyometric training), BBTG (barbell training), UHTG (uphill training) and CNG (control group) on VO2 max. The adjusted post test values of VO2 max on UHTG (uphill training) was higher than the (plyometric training),

BBTG (barbell training), and CNG (control group).

The findings of the research was in line with the result of Ferley DD et. al., (2013)that uphill training expanded ventricular wall thickness and chamber size causes cardiac output and VO2 max, improved oxygen conveyance to working muscle and lessened hormonal reactions to work out, decline the pace of use of muscle glycogen and blood glucose and abatement the pace of gathering of lactate during sub maximal work out. There is a nearby coupling between the capacity of the cardiovascular framework to convey oxygen and the capacity of the muscles to utilize the oxygen that is provided, it is not really astonishing that both cardiovascular capacity and muscle oxidative limit are firmly connected to performance. (Ron Maughan, Michael Gleeson, 2004).

Resting Pulse Rate

Significant difference on resting pulse rate was observed between the adjusted means of PMTG (plyometric training), BBTG (barbell training), UHTG (uphill training) and CNG (control group). Uphill training group had showed better resting pulse rate than other groups.

Results of the present investigation was in association with the findings of Nigatuworku and AschenakiTaddese(2013) that well planned hill training program can significantly improve VO2 max, resting heart rate and resting pulse rate. Uphill training strengthened the walls of the lungs and respiratory muscles. Strengthened respiratory system increased the inhaling oxygen amount and ends in higher level of cardiovascular function. Significant effect on the resting pulse rate may be due to the efficient functioning of cardio-respiratory system.

Discussion on Hematological Variables
Hemoglobin

Significant difference on hemoglobin level was observed between the experimental groups and control groups. Three experimental groups PMTG (plyometric training), BBTG (barbell training) and UHTG (uphill training) showed improved hemoglobin level than the CNG (control group).

The findings of the present investigation was in accordance with the findings of Min Hu and Wentao Lin (2012) that effects of physical training like plyometric, barbell and uphill on red blood cell production stimulates erythropoiesis and elevates total haemoglobin and red blood cell mass, which results in the improvement of oxygen-carrying capacity.

Red Blood Corpuscles

Red blood corpuscles showed significant difference between experimental groups and control groups. Three experimental groups PMTG (plyometric training), BBTG (barbell training) and UHTG (uphill training) showed improved red blood corpuscles value than CNG (control group).

The present research findings was in agreement with the findings of Laughlin et al., (2012) that during exercise the increased O_2 demand of skeletal muscle is mainly matched by increasing muscle blood flow by increasing cardiac output, by modulating blood flow matched by the increased red blood cell production. Increased red blood cell may be due to the increased life span of red blood cells due to the plyometric, barbell and uphill training for a period of twelve weeks.

2. CONCLUSIONS

It was concluded that

1. VO2 max were improved due to the effect of plyometric training, barbell training among engineering college men kabaddiplayers .

2. Normal resting pulse rate were observed due to the effect of plyometric training, barbell training among engineering college men kabaddi players.

3. Hemoglobin and red blood corpuscles were increased due to the effect of plyometric and barbell training among engineering college men kabaddi players than the control group.

4. REFERENCES

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