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Training and Detraining Impact on Biomotor Abilities - An Overview

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ABSTRACT

The aim of this research work is to inspect the influence of training and detraining impact on selected bio-motor abilities. To attain the study purpose, forty male inter-collegiate level players were considered as participants. The chosen player's age, was ranged from 18 to 23 years. The chosen inter-collegiate players were randomly allocated into two equivalent groups of 20 players in both. Group-I performed concurrent resistance and aerobic training whereas group-II were acted as control. After the completion of twelve-weeks training period the subjects of group-I and II were physically detrained for thirty days. The data collected pre, post experimentation and during detraining were statistically analyzed by using two way (2 x 5) factorial ANOVA with last factor repeated measures. Statistical analysis found significant improving in muscular strength and Cardio respiratory endurance performance due to concurrent resistance and aerobic training and significant decline during detraining period.

Keywords: *Concurrent training, Detraining, Muscular strength, Cardio respiratory endurance and inter-collegiate players.*

INTRODUCTION

Athletes in predominately strength and endurance sports are frequently given training programs designed to induce positive changes in both endurance and strength attributes, particularly during the off-season. Strength and conditioning professionals prescribing aerobic exercise for their strength and endurance athletes often cite the benefit of enhanced recovery during the limited rest periods which intersperse the supramaximal work efforts. Recovery from anaerobic exercise is highly dependent upon aerobic metabolism. Thus, aerobic endurance training may help athletes recover more quickly between anaerobic work intervals, such as multiple sets in resistance training or repeated sprints. Strength and endurance athletes may perform endurance exercise in order to maintain an optimal body weight or to reduce body fat levels.

Working on strength and endurance at the same time, whether be in the same session, alternative days, alternative sessions, etc. Countless numbers of recreational workout enthusiasts complete their strength and endurance training workouts during the same training session, or within hours of one another. Many people, athletes and non-athletes, take part in a combination of resistance and aerobic training. These people are expecting to experience the

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benefits that these two different types of training have to offer. A number of studies have shown that performing these two types of training simultaneously can be detrimental to the gains that might be made in performing one type of training alone (Bell et al., 2000). Concurrent training can also yield benefits to those individuals who want to improve their endurance as athletes. The benefits aren't quite as drastic as those seen by untrained individuals, but if we have primarily focused on aerobic training, adding resistance training can yield some great benefits. Primarily, individuals would be able to put on some lean muscle mass and increase strength. And athletes are able to do this without much of a loss in endurance capacity and often an increase. The researcher is felt that there is a need to confirm the beneficial effects of concurrent resistance and aerobic training on selected bio-motor abilities of inter-collegiate level players. Moreover, very little research had been done in this area especially among inter-collegiate level players, which motivated the investigator to take up the study.

Detraining is also equally important but that has been given considerably less attention by the players and the coaches and practically ignored by the research scholars in exercise and sports sciences. Detraining induces a partial or complete loss of training induced adaptations in response to insufficient training stimuli. The influence of detraining on muscular strength and Cardio respiratory endurance has received little attention and not completely understood. The aim of the present study was to assess the effectiveness of Concurrent resistance and aerobic training and detraining impact on muscular strength and cardio respiratory endurance of inter-collegiate level players.

METHODOLOGY

Subjects and Variables

To attain the study purpose, forty male inter-collegiate level players were considered as participants. The chosen inter-collegiate level player's age, was ranged from 18 to 23 years. The chosen inter-collegiate level players were randomly allocated into two equivalent groups of 20 players in both. Further, the researcher was interested in finding out the detraining impact on muscular strength and cardio respiratory endurance. The data on muscular strength and cardio respiratory endurance was collected by administering leg press and Cooper's 12minutes run/walk test.

Training Protocol

Training programme was administered for twelve weeks with three training units per week. The experimental group performed concurrent resistance and aerobic training. The resistance training program was a total body workout consisting of 3 sets of 6-10 repetitions on 8 exercises that trained all the major muscle groups. A percentage of each subject's one-repetition maximum for each exercise was used to determine the intensity of each week. The intensity and number of repetitions performed for each exercise was progressively increased. The aerobic training consists of continuous running with 65- 80% HRR. The running intensity was determined by a percentage of heart rate reserve (HRR). The intensity was increased as training progressed. Concurrent resistance and aerobic training group performed every odd

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numbered week resistance training in the morning session and aerobic training in the evening session. Every even numbered week they performed aerobic training in the morning session and resistance training in the evening session.

Collection of the Data

Pretest data were collected prior to the training programme and posttest data were collected immediately after the twelve-weeks of training programme from both the experimental and control groups. During the detraining period the data were collected once in ten days for 30 days from both experimental and control groups.

Statistical Technique

The data collected from the two groups prior to and post experimentation and during detraining were statistically analyzed by using two way (2 x 5) factorial ANOVA with last factor repeated measures. The simple effect and the Scheffe's test were used as follow up and post hoc test. The level of confidence is fixed at 0.05 for significance. The analysis of data on muscular strength and cardio respiratory endurance is presented in table-I to III.

RESULT

The descriptive analysis of the data on muscular strength and cardio respiratory endurance of experimental and control groups are presented in table-I.

Table – I: **Descriptive Analysis of the Data on Muscular Strength and Cardio Respiratory Endurance of Experimental and Control Groups**

Variable	Group	Test	Mean	SD	MD	't' ratio	Percentage of Changes
Muscular Strength	Concurrent	Pre	62.19	5.32	4.12	13.11*	6.62%
		Post	66.31	4.83			
	Control	Pre	61.19	4.65	0.50	0.85	0.82%
		Post	60.69	3.40			
Cardio Respiratory Endurance	Concurrent Training	Pre	2126.90	135.34	251.20	16.79*	11.81%
		Post	2378.10	114.79			
	Control Group	Pre	2046.90	190.78	23.80	0.99	1.16%
		Post	2023.10	146.41			

*Table t-ratio at 0.05 level of confidence for 19 (df) =2.09*Significant*

The obtained 't' values on muscular strength and cardio respiratory endurance of concurrent training group are 13.11 and 11.81 respectively which are greater than the required table value of 2.09 for significance at 0.05 level for 15 degrees of freedom. It revealed that due to the effect of resistance training and concurrent training the muscular strength and cardio respiratory endurance of the players were significantly improved. The result of the study produced 6.62% of improvement on muscular strength and 11.81% of improvement on cardio respiratory endurance due to concurrent training.

Figure: **Diagram Showing the Mean Values on Muscular Strength and Cardio Respiratory Endurance of Experimental and Control Groups**

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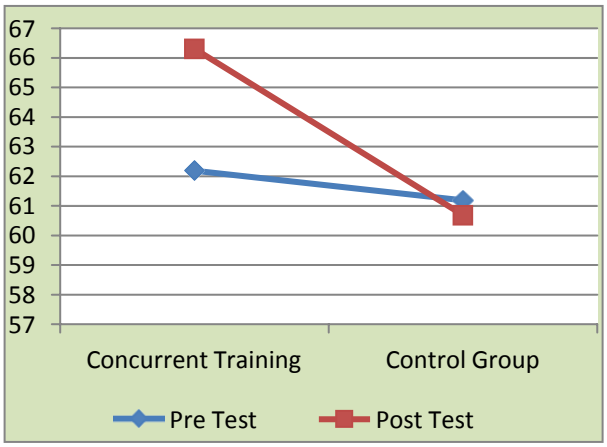
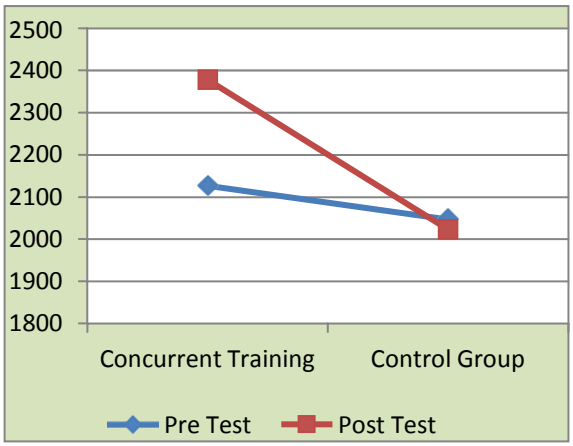
Muscular Strength **Cardio Respiratory Endurance**





In order to verify the impact of detraining, all the two preferred group's muscular strength and cardio respiratory endurance data during five various testing periods were further calculated by two way factorial (2x5) ANOVA as in table- II.

Table –II: Two Factor ANOVA on Muscular Strength and Cardio Respiratory Endurance

Variable	SoV	SS	df	MS	"F" ratio
Muscular Strength	**Groups**	36.60	1	36.60	15.99*
	Group Error	86.93	38	2.28	
	Tests	770.92	4	192.73	95.41*
	Groups &Tests	848.88	4	212.22	105.06*
	Error	383.80	190	2.02	
Cardio Respiratory Endurance	**Groups**	17226.56	1	17226.56	3.58
	Group Error	182496.87	38	4802.54	
	Tests	1164366.75	4	291091.68	105.41*
	Groups &Tests	921538.25	4	230384.56	83.43*
	Error	524675.00	190	2761.45	

[Table values for df 1&38, 4&190 are 4.10 & 2.37 (.05level)]

The 'F' value (105.06 & 83.43) acquired for Interaction effect [Groups x Tests] on muscular strength and cardio respiratory endurance is also better than the table value required [df4&190=2.37(.05level)]. This result (Interaction effect) on muscular strength and cardio respiratory endurance confirm that, major deviation subsist between each tests of both groups (concurrent &control) and also among tests (pre, post & 3 detraining data) of within every group(concurrent &control). Then the simple effect (follow-up) test was applied and the outcomes are accessible in table-III.

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Table – III: Simple Effect Test Results of Groups at Different Tests on Muscular Strength and Cardio Respiratory Endurance

Variable	Source of Variance	SS	df	MS	"F" ratio
Muscular Strength	Groups at Pretest	3.60	1	3.60	1.78
	Groups at Posttest	1464.10	1	1464.10	724.80*
	Groups at 1st detraining	1188.10	1	1188.10	588.17*
	Groups at 2nd detraining	893.02	1	893.02	442.09*
	Groups at 3rd detraining	396.90	1	396.90	196.49*
	Tests of Group- I	1613.66	4	403.41	199.71*
	Tests of Group-II	6.14	4	1.53	0.76
	Error	383.80	190	2.02	
Cardio Respiratory Endurance	Groups at Pretest	1000.00	1	1000.00	0.36
	Groups at Posttest	1112222.50	1	1112222.50	402.77*
	Groups at 1st detraining	996980.62	1	996980.62	361.04*
	Groups at 2nd detraining	307125.62	1	307125.62	111.22*
	Groups at 3rd detraining	37210.00	1	37210.00	13.47*
	Tests of Group- I	2067599.00	4	516899.75	187.18*
	Tests of Group-II	18306.00	4	4744.19	1.72
	Error	524675.00	190	2761.45	

[Table values for df 1&190, 4&190 are 3.84 & 2.37 (.05level)]

The derived simple effect test result ('F' ratio) proved that muscular strength and cardio respiratory endurance scores of both (concurrent & control) group be different during the post and detraining (three) periods. However, the derived simple effect test result ('F' ratio) for pre test of two groups (1.78 & 0.36) did not differ during the pre test period. While comparing all five tests within each groups on muscular strength and cardio respiratory endurance, the calculated 'F' value (199.71 & 187.18) for tests within concurrent training group is superior but, all five tests within control group 'F' (0.76 & 1.72) is lesser than the needed table value [df4&190=2.37(0.05 level)] for significant. Consequently, all five tests within concurrent training group vary noticeably while; all five tests within control group didn't be different on muscular strength and cardio respiratory endurance.

As the derived 'F' ratio (simple effect) outcome is much greater, the post hoc (Scheffe'S) test statistical procedure was applied. It proved that the improved muscular strength due to concurrent training were sustained during the first two detraining periods (20days) afterwards it was started decline towards pre test value from the 3rd (30days) detraining stage. Whereas, the enhanced cardio respiratory endurance due to concurrent training were sustained during the first 10days of detraining period afterwards it was started decline towards pre test value from the 2nd (20days) detraining stage onwards.

DISCUSSION

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The findings proved that the muscular strength and cardio respiratory endurance of the players improved significantly by twelve weeks of concurrent training. These results are conformity with the following findings. Concurrent training group did make gains in maximum (bench press) strength. The improvements seen in 1 RM bench press by the concurrent training group in our investigation are similar to or greater than those reported by earlier investigations that used either the same test or a very similar test, i.e. 1 RM squat (Hunter *et al*., 1987; Gravelle & Blessing, 2000; McCarthy *et al*., 1995) Concurrent training improves endurance performance, both with trained cyclists (Paton & Hopkins, 2005) and other trained athletes (Hoff et al., 1999; Johnston et al., 1997; Millet et al., 2002; Paavolainen et al., 1999). Paton and Hopkins (2005) found that 1- and 4-km time trial performance increased could have also been a result of high intensity interval training being employed in addition to resistance training. It has been well documented by Senthil et al., (2011) that the effects of concurrent strength and endurance training significantly improved the Cardio-respiratory endurance when compared with control group. Hence, in order to maintain optimal training levels and take advantage of the potential benefits, it is suggested that concurrent resistance and aerobic training sessions not be missed by the players.

The results of the study also indicated that the improved muscular strength and cardio respiratory endurance performance due to concurrent strength and endurance training was decreased significantly due to detraining. The evidence for this conclusion comes from Mikel et al., (2007), who found that detraining for 4 weeks after 16 weeks of periodized, intense, and explosive resistance training causes significant drops in bench press 1RM, parallel squat 1RM, and muscular power output of the upper and lower body. These study's findings are also in consistent with Nageswaran's (1997) conclusion. According to Nugroho (2005), detraining causes higher losses to cardio respiratory endurance than it does to muscular strength, power, and endurance.

CONCLUSION

As a result of concurrent resistance and aerobic training the selected bio-motor abilities such as muscular strength and cardio respiratory endurance of the inter-collegiate players were significantly improved. The result of the study produced 6.62% of improvement in muscular strength whereas, 11.81% of improvements in cardio respiratory endurance due to concurrent training. During the detraining period the improved muscular strength due to concurrent training were sustained during the first two detraining periods (20days) afterwards it was started decline towards pre test value from the 3rd (30days) detraining stage. Whereas, the enhanced cardio respiratory endurance due to concurrent training were sustained during the first 10days of detraining period afterwards it was started decline towards pre test value from the 2nd (20days) detraining stage onwards. Therefore, athletes and gamers who are concerned about muscular strength and cardio respiratory endurance shouldn't engage in prolonged inactivity state.

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