



Isolated and Combined Effect of Theraband Resistance Exercise and Medicine Ball Exercise on Selected Physical Fitness and Biochemical Variables of School Boys

Dr. Deepak.S.S

Assistant Professor, Department of Physical Education, NSS College, Nemmara, Palakkad, Kerala, India.

Received 15th September 2015, Accepted 1st December 2015

Abstract

The purpose of the study was to find the effect of isolated and combined effect of Theraband resistance exercise and Medicine ball exercise on selected physical fitness and bio chemical variables of school boys. To facilitate the study 80 boys from Army Public School, Trivandrum District were randomly selected as subjects and their age was between 14 and 15 years. They were assigned into four groups of which one group served as Theraband Resistance exercise groups, second group served as Medicine Ball exercise group, third group served as combined Theraband Resistance exercise and Medicine Ball exercise group and the fourth group served as control group. The study was formulated as a true random group design, consisting of a pre test mid test and post test. The subjects (n=80) were randomly assigned to four equal groups of twenty each. The groups were assigned as Experimental Groups I, II, III and control group respectively. Pre tests were conducted for all the subjects on selected physical fitness, and biochemical variables such as abdominal strength, leg explosive strength, RBC and hemoglobin content. The experimental groups participated in their respective theraband practices, medicine ball practice and combined theraband exercises and medicine ball practices for a period of eight weeks. The midtest tests and post tests were conducted on the above said dependent variables after a period of theraband resistance practice, medicine ball practice and combined theraband resistance and medicine ball practices. The training programme was scheduled at 6.30 to 7.30 a.m. on 3 to 4 days in a week. The criterion measures such as abdominal strength was measured by bent knee sit ups, Leg explosive strength was measured by standing broad jump. Blood sample was collected for RBC count, hemoglobin test. To find out the difference between the pre test, mid test and post test, repeated measures ANOVA was used. When ever it found significant, the Newman kuels post-hoc test was administer. Analysis of covariance (ANCOVA) was applied and when ever the adjusted post-test means were found significant, the scheffe's post-hoc test was administer to find out the paired means difference. To test the obtained results on variables, level of significance 0.05 was chosen and considered as sufficient for the study. The result reveals that the combined group (Theraband resistance exercise and Medicine ball exercise) have shown increased level of abdominal strength, leg explosive strength, hemoglobin content and RBC than the Theraband resistance exercise, Medicine ball exercise and control group.

Keywords: Theraband resistance exercise, Medicine ball exercise, Abdominal strength, Leg explosive strength, RBC, Hemoglobin.

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Introduction

Theraband resistance bands are widely used for rehabilitation from muscle and joint injuries and for aerobics and general conditioning. Proper use of these bands for resistive exercise provides both positive and negative force on the muscles, improving strength, range of motion and cooperation of muscle groups. Color-coded progressive resistance gives at-a-glance documentation of progress from one level to the next. Medicine ball exercises have their place in an overall strength program. That doesn't mean to say they should replace all forms of strength training however. Rather

than following a medicine ball 'routine' as such, a more appropriate approach is to select a few exercises and incorporate them into a circuit or session designed to increase power and/or strength endurance.

Review of literature

Frank A. Treiber. et al (1998) conducted a study on the Effect of Theraband and Light weight Dumbbell Training on Shoulder Rotation Torque and Serve Performance in college tennis players. The purpose of the study was to determine whether a 4 week isotonic resistance training program using theraband elastic tubing and light weight dumbbells would significantly increase concentric shoulder rotator strength or velocity of serve or both in a group of elite level tennis players. Twenty two male and female varsity college tennis players were randomly assigned to control

Correspondence

Dr. Deepak.S.S

E-mail: sasikumar.deepak@gmail.com Ph: +9194463 76347

or 4 week training groups. Subjects were pre and post tested in concentric internal and external rotation torque using an isokinetic dynamometer. Functional performance was assessed before and after training by recording the peak and average velocities of eight maximal serves. The experimental group exhibited significant gains in internal rotation torque at both slow (120 deg/sec) and fast speeds (300 deg/sec) for total work and in the peak torque to body weight ratio and torque acceleration energy at the fast speed. This group also exhibited significant gains in external rotation torque for the same parameters at fast speed. Regarding speed of serve, the experimental group exhibited significantly greater increase in peak speed (+6.0% compared with -1.8%) and average speed (+7.9% compared with -2.3%) compared with control group. Men exhibited greater internal and external rotation torque on all parameters and in peak mean speed of serve on both evaluations. Men also exhibited greater imbalance in external to internal rotation torque ratios. In conclusion, resistance training using theraband tubing and light weight dumbbells may have beneficial effects on strength and functional performance in college level tennis players.

Faigenbaum, Avery D. et.al (2006) conducted a study on the Effects of Medicine Ball Training on Fitness Performance of High-School Physical Education Students. The purpose of this study was to examine the effects of medicine ball training on the fitness performance of high-school physical education students. Sixty-nine high-school students participated in a 6-week medicine training program during the first 10 to 15 minutes of each physical education class. A group of 49 students who participated in physical education lessons but not medicine ball training served as controls. Performance on the shuttle run, long jump, sit and reach flexibility, abdominal curl, medicine ball push-up, and medicine ball seated toss was assessed at baseline and post-training. Students who participated in the medicine ball training program made significantly greater gains on all fitness tests as compared to the control group. These data suggest that medicine ball training can enhance

selected measures of speed, agility, power and muscular endurance when incorporated into a high school physical education class.

Methodology

Selection of Subjects

Purpose of the Study

The purpose of the study was to compare the effect of Theraband resistance exercise and medicine ball exercise and combined effect of Theraband resistance exercise and Medicine ball exercise on selected physical fitness and biochemical variables. To facilitate the study 80 boys students from Army Public School, Trivandrum District were randomly selected as subjects and their age was between 14 and 15 years. They were assigned into four groups of which one group served as Theraband Resistance exercise groups, second group served as Medicine Ball exercise group, third group served as combined Theraband Resistance exercise and Medicine Ball exercise group and the fourth group served as control group.

Selection of Variables

The research scholar reviewed the various scientific literatures pertaining to the Theraband Resistance exercise and Medicine ball exercises on selected physical fitness, and biochemical variables from books, journals, periodicals, magazines and research papers. Taking into consideration of feasibility criteria, availability of instruments and the relevance of the variables of the present study, the following variables were selected.

Physical Fitness Variables

1. Abdominal strength
2. Leg explosive strength

Biochemical Variables

1. Hemoglobin content
2. RBC

Results and Discussions

Table I. One Way Repeated Measures ANOVA on Selected Variables of Pre, Mid and Post Tests of Theraband Training Group

Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F'-ratio
Abdominal Strength	Between	116.13	2	58.06	35.28*
	Error	62.53	38	1.64	
Leg Explosive	Between	139.03	2	69.51	36.87*
	Error	71.63	38	1.88	
RBC	Between	0.60	2	0.30	173.89*
	Error	0.06	38	0.002	
Haemoglobin	Between	1.64	2	0.82	117.02*
	Error	0.26	38	0.007	

* Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 38 is 3.24.

Table II. One Way Repeated Measures ANOVA on Selected Variables of Pre, Mid And Post Tests of Medicine Ball Exercises Group

Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F'-ratio
Abdominal Strength	Between	208.90	2	104.45	406.39*
	Error	9.76	38	0.25	
Leg Explosive	Between	221.23	2	110.61	26.92*
	Error	156.10	38	4.10	
RBC	Between	2.45	2	1.22	346.85*
	Error	0.13	38	0.004	
Haemoglobin	Between	8.65	2	4.32	941.15*
	Error	0.17	38	0.005	

* Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 38 is 3.24.

Table III. One Way Repeated Measures ANOVA on Selected Variables of Pre, Mid and Post Tests of Combined Exercises Group

Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F'-ratio
Abdominal Strength	Between	438.30	2	219.15	607.86*
	Error	13.70	38	0.36	
Leg Explosive	Between	552.53	2	276.26	31.29*
	Error	335.46	38	8.82	
RBC	Between	5.29	2	2.64	165.67*
	Error	0.60	38	0.01	
Haemoglobin	Between	23.88	2	11.94	648.48*
	Error	0.70	38	0.01	

* Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 38 is 3.24.

Table IV. One Way Repeated Measures ANOVA on Selected Variables of Pre, Mid and Post Tests of Control Group

Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F'-ratio
Abdominal Strength	Between	0.90	2	0.45	0.74
	Error	23.10	38	0.60	
Leg Explosive	Between	30.10	2	150.05	2.16
	Error	263.90	38	6.94	
RBC	Between	0.006	2	0.003	0.08
	Error	1.50	38	0.03	
Haemoglobin	Between	0.001	2	0.001	1.00
	Error	0.02	38	0.001	

* Significant at 0.05 level. The table value required for significance at 0.05 level with df 2 and 38 is 3.24.

Table V. Newman keuls test for the differences between treatment means on physical fitness and biochemical variables of theraband exercises group

	Means		Order Means			Range (r)	Critical value
			Post	Mid	Pre		
Abdominal Strength			32.7	30.80	29.30		
	Post	32.70	-	1.90*	3.40*	3	1.44
	Mid	30.80	-		1.50*	2	1.26
	Pre	29.30	-	-	-	-	-
Leg Explosive strength			Post	Mid	Pre		
			186.25	184.00	182.55		
	Post	186.25	-	2.25*	3.70*	3	1.55
	Mid	184.00	-		1.45*	2	1.35
	Pre	182.55	-	-	-	-	-
RBC			Post	Mid	Pre		
			4.79	4.67	4.54		
	Post	4.79	-	0.12*	0.25*	3	0.05
	Mid	4.67	-		0.13*	2	0.04
	Pre	4.54	-	-	-	-	-
Hemoglobin			Post	Mid	Pre		
			13.34	13.14	12.94		
	Post	13.34	-	0.20*	0.40*	3	0.09
	Mid	13.14	-		0.20*	2	0.08
	Pre	12.94	-	-	-	-	-

*Significant at 0.05 level.

Table VI. Newman keuls test for the differences between treatment means on physical fitness and biochemical variables of medicine exercises group

	Means		Order Means			Range (r)	Critical value
			Post	Mid	Pre		
Abdominal Strength			30.90	28.25	26.35		
	Post	30.90	-	2.65*	4.55*	3	0.56
	Mid	28.25	-		1.90*	2	0.49
	Pre	26.35	-	-	-	-	-
Leg Explosive strength			Post	Mid	Pre		
			188.20	185.05	183.60		
	Post	188.20	-	3.15*	4.60*	3	2.28
	Mid	185.05	-		1.45	2	2.00
	Pre	183.60	-	-	-	-	-
RBC			Post	Mid	Pre		
			4.93	4.67	4.44		
	Post	4.93	-	0.26*	0.49*	3	0.07
	Mid	4.67	-		0.23*	2	0.06
	Pre	4.44	-	-	-	-	-
Hemoglobin			Post	Mid	Pre		
			13.88	13.43	12.95		
	Post	13.88	-	0.45*	0.93*	3	0.07
	Mid	13.43	-		0.48*	2	0.06
	Pre	12.95	-	-	-	-	-

*Significant at 0.05 level.

Table VII. Newman keuls test for the differences between treatment means on physical fitness and biochemical variables of combined group

	Means		Order Means			Range (r)	Critical value
			Post	Mid	Pre		
Abdominal Strength			36.10	32.35	29.50		
	Post	36.10	-	3.75*	6.60*	3	0.67
	Mid	32.35	-		2.85*	2	0.59
	Pre	29.50	-	-	-	-	-
Leg Explosive strength			Post	Mid	Pre		
			191.30	186.10	184.10		
	Post	191.30	-	5.20*	7.20*	3	3.35
	Mid	186.10	-		2.00	2	2.93
	Pre	184.10	-	-	-	-	-
RBC			Post	Mid	Pre		
			5.20	4.78	4.47		
	Post	5.20	-	0.42*	0.73*	3	0.11
	Mid	4.78	-		0.31*	2	0.09
	Pre	4.47	-	-	-	-	-
Hemoglobin			Post	Mid	Pre		
			14.40	13.69	12.89		
	Post	14.40	-	0.71*	1.51*	3	0.11
	Mid	13.69	-		0.80*	2	0.09
	Pre	12.89	-	-	-	-	-

*Significant at 0.05 level.

Computation of Analysis of co variance

The subjects were selected random, but the groups were not equated in relation to the factors to be examined, Hence the difference between means of the four groups in the pre-test had to be taken into account during the analysis of the post-test differences between the means. This was achieved by the application of the analysis of covariance, where the final means were adjusted for differences in the initial means, and the adjusted means were tested for significance. When ever

the adjusted post-test means were found significant, the scheffe’s post-hoc test was administer to find out the paired means significant difference. The significance of the means of the obtained test results was tested at 0.05 level of confidence. It was considered as sufficient for the present study. The following tables illustrate the statistical results of the effect of isolated and combined effect of Theraband resistance exercise and Medicine ball exercise on selected physical fitness and bio chemical variables of school boys.

Table VIII. Summary of analysis of variance for the initial means on selected variables of theraband, medicine ball, combined theraband and medicine ball and control groups

Sl. No	Variables	Source of variation	Sum of Squares	DF	Mean Squares	F-value
1	Abdominal Strength	Between Sets	146.63	3	48.87	1.04
		Within Sets	3540.55	76	46.58	
2	Leg Explosive	Between Sets	35.45	3	11.81	0.24
		Within Sets	3605.30	76	47.43	
3	RBC	Between Sets	0.16	3	0.05	0.68
		Within Sets	6.10	76	0.08	
4	Haemoglobin	Between Sets	1.31	3	0.43	1.26
		Within Sets	26.20	76	0.34	

Table value for df 3 and 76 was 2.72

Results of initial mean

The F-value obtained from testing the initial means among the four groups on the criterion measures were shown in Table VIII, the corresponding ‘F’ values needed for significance at 0.05 level of confidence was 2.72. The calculated ‘F’ values are abdominal strength (1.04), leg explosive (0.24), RBC (0.68) and

Haemoglobin (1.26). Since the observed F-values of these were found lesser than the required table value of 2.72 at 0.05 level of confidence, the observed mean difference among the groups on criterion measures was statistically not significant. Thus the obtained results confirm the random assignment of subjects to four groups was successful.

Table IX. Summary of analysis of variance for the final means on selected variables of theraband, medicine ball, combined theraband and medicine ball and control groups

Sl. No	Variables	Source of variation	Sum of Squares	DF	Mean Squares	F-value
1	Abdominal Strength	Between Sets	493.63	3	164.54	3.81*
		Within Sets	3278.75	76	43.14	
2	Leg Explosive	Between Sets	554.25	3	184.75	4.47*
		Within Sets	3135.70	76	41.25	
3	RBC	Between Sets	4.18	3	1.39	20.08*
		Within Sets	5.28	76	0.07	
4	Hemoglobin	Between Sets	18.89	3	6.29	18.57*
		Within Sets	25.76	76	0.33	

Table value for df 3 and 76 was 2.72

Results of Final mean

The F-value obtained from testing the initial means among the three groups on the criterion measures were shown in Table IX, the corresponding ‘F’ values needed for significance at 0.05 level of confidence was 2.72. The calculated ‘F’ values are abdominal strength

(3.81), leg explosive (4.47), RBC (20.08) and Hemoglobin (18.57) since the observed F-values of these were found greater than the required table value of 2.72 at 0.05 level of confidence, the observed mean difference among the groups on criterion measures was statistically significant.

Table X. Summary of analysis of variance for the adjusted means on selected variables of theraband, medicine ball, combined theraband and medicine ball and control groups

Sl. No	Variables	Source of variation	Sum of Squares	DF	Mean Squares	F-value
1	Abdominal Strength	Between Sets	472.02	3	157.34	88.45*
		Within Sets	133.40	75	1.77	
2	Leg Explosive	Between Sets	543.84	3	181.28	17.36*
		Within Sets	782.87	75	10.43	
3	RBC	Between Sets	4.91	3	1.63	42.36*
		Within Sets	2.89	75	0.03	
4	Hemoglobin	Between Sets	25.92	3	8.64	369.99*
		Within Sets	1.75	75	0.02	

Table value for df 3 and 76 was 2.72

Results of Adjusted mean

The F-value obtained from testing the initial means among the three groups on the criterion measures were shown in Table X, the corresponding ‘F’ values needed for significance at 0.05 level of confidence was 2.72. The calculated ‘F’ values are abdominal strength (88.45), leg explosive (17.36), RBC (42.36) and Hemoglobin (369.99). Since the observed F-values of these were found greater than the required table value of 2.72 at 0.05 level of confidence, the observed mean

difference among the groups on criterion measures was statistically significant. It is evident that the criterion measures are influenced by interventions used in the study. Since the observed mean difference among the four groups was statistically significant. In order to find out which of the pairs of group grown up for the significant difference the Scheffe post-hoc test was applied. The results of the same were given in Table XI & XII.

Table XI. Scheffe’s test of significance between paired final adjusted means for physical fitness variables

Sl.No	Physical Variables	Adjusted Means				Mean Differences	CI Value
		TEG	MBEG	TMBEG	CG		
1	Abdominal Strength	32.12	33.10	---	---	0.98	1.38
		32.12	---	35.33	---	3.21*	
		32.12	---	---	28.59	3.53*	
		---	33.1	35.33	---	2.23*	
		---	33.1	---	28.59	4.51*	
		---	---	35.33	28.59	6.74*	
3	Leg Explosive	187.11	188.22	---	---	1.11	3.36
		187.11	---	190.91	---	3.80*	
		187.11	---	---	183.64	3.47*	
		---	188.22	190.91	---	2.69	
		---	188.22	---	183.64	4.58*	
		---	---	190.91	183.64	7.27*	

The mean difference for abdominal strength between TEG and TMBEG, TEG and CG, MBEG and TMBEG, MBEG and CG, TMBEG and CG were 3.21, 3.53, 2.23, 4.51 and 6.74 respectively was greater than the CI value 1.38. Hence there exists significant difference between the groups. In case of mean difference between TEG and MBEG was 0.98 lesser than the CI value 1.38 and exists insignificant differences.

The mean difference for leg explosive power between TEG and TMBEG, TEG and CG, MBEG and CG, TMBEG and CG were 3.80, 3.47, 4.58 and 7.27 respectively was greater than the CI value 3.36. Hence there exists significant difference between the groups. In case of mean difference between TEG and MBEG, MBEG and TMBEG were 1.11 and 1.69 lesser than the CI value 3.36 and exists insignificant differences.

Table XII. Scheffe’s test of significance between paired final adjusted means for biochemical variables

Sl.No	Physical Variables	Adjusted Means				Mean Differences	CI Value
		TEG	MBEG	TMBEG	CG		
1	RBC	4.76	4.97	---	---	0.21*	0.18
		4.76	---	5.21	---	0.45*	
		4.76	---	---	4.54	0.22*	
		---	4.97	5.21	---	0.24*	
		---	4.97	---	4.54	0.43*	
		---	---	5.21	4.54	0.67*	
2	Hemoglobin	13.40	13.92	---	---	0.52*	0.14
		13.40	---	14.54	---	1.14*	
		13.40	---	---	13.00	0.40*	
		---	13.92	14.54	---	0.62*	
		---	13.92	---	13.00	0.92*	
		---	---	14.54	13.00	1.54*	

The mean difference for RBC between TEG and MBEG, TEG and TMBEG, TEG and CG, MBEG and TMBEG, MBEG and CG, TMBEG and CG were 0.21, 0.45, 0.22, 0.24, 0.43 and 0.67 respectively was greater than the CI value 0.18. Hence there exists significant difference between the groups. The mean difference for hemoglobin between TEG and MBEG, TEG and TMBEG, TEG and CG, MBEG and TMBEG, MBEG and CG, TMBEG and CG were 0.52, 1.14, 0.40, 0.62, 0.92 and 1.54 respectively was greater than the CI value 0.14. Hence there exists significant difference between the groups.

Discussion on Findings

The Theraband resistance exercises group have shown increased level of abdominal strength, leg explosive strength, blood haemoglobin content and RBC. Theraband resistance bands are widely used for rehabilitation from muscle and joint injuries and for aerobics and general conditioning. Proper use of these bands for resistive exercise provides both positive and negative force on the muscles, improving strength, range of motion and cooperation of muscle groups. The medicine ball exercises group have shown increased level of abdominal strength, leg explosive strength, blood haemoglobin content and RBC. Medicine ball

exercises have their place in an overall strength program. Medicine ball exercises used to develop explosive power will be more effective if they are performed after a phase of maximal strength training. The combined group (Theraband resistance exercise and Medicine ball exercise) have shown increased level of abdominal strength, leg explosive strength, hemoglobin content and RBC than the Theraband resistance exercise, Medicine ball exercise and control group. This may due to the combined effect of both theraband and medicine ball exercises.

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