Effects of Resistance Training and Detraining Programme on Upper Body Strength and Leg Explosive Power of University Men Handball Players

[a]K.Murugavel and, [b]E.Balaji

[a]Dean- Faculty of Education, Professor & Head and Director, Department of Physical Education, Bharathiar University, Coimbatore, Tamilnadu, India.
[b]Director of Physical Education, CBM College, Sakethapuri, Kovaipudur, Coimbatore, Tamilnadu, India.

Corresponding Author: E.Balaji,

Abstract

The study was designed to investigate the "Effects of resistance training and detraining programme on upper body strength and leg explosive power of University men handball players". To achieve this purpose 15 college level male handball players were randomly selected from Coimbatore district as subjects. Their age ranged between 18 and 28 years. The subjects were given resistance training for three days a week, for a period of 12 weeks and detraining for 12 weeks. Following the 12 weeks of resistance training programme, the training ceased followed by 12 weeks in reduce to provide for model form which the effects of detaining would be evaluated. The criterion variables were chosen namely leg explosive power and upper body strength. All the dependent variables were assessed before and after the resistance training period of 12 weeks and after 12 weeks of detraining. The collected data on upper body strength and leg explosive power due to the effect of resistance training followed by detraining was statistically analyzed with't' test to find out the significant improvement between pre & post test and post & test after detraining if any. In order to find out the significant difference between the pre, post and test after detraining repeated measures ANOVA was used. In all cases 0.05 level of confidence was fixed to test the level of significance.

KEYWORDS: Resistance training, Detraining, Upper body strength, Leg explosive power

INTRODUCTION

Resistance training has become a primary component of athletic conditioning, rehabilitation and general fitness programs. **(ACSM, 1990; Fleck** *et al.,* **1987; Pollock** *et al.,* **1990)**. The prescription of a resistance training program requires a consideration of several factors including the intensity, frequency and the volume of exercises **(Fleck** *et al.,* **1987).** For the adult interested in developing the general fitness, a training regimen that requires the minimum of a single set of 8-12 repetitions performed to volitional fatigue is widely recommended **(Westcott** *et al.,* **1993)**. The effects of resistive type exercise (strength training) on health status have been largely overlooked. Traditionally, strength training has been seen as a means of improving muscular strength and endurance (muscle mass) and power, but not as a means for improving health. There is increasing evidence that strength training plays a significant role in many health factors. The **ACSM**

(1990, 1995), AHA (1995), and the Surgeon General's Report on Physical Activity and Health (1996) all have recognized the importance of strength training as an important component of health. These organizations have recommended performing 1 set of 8–12 repetitions of 8–10 exercises 2–3 times per week for persons under 50 years of age and the same regimen using 10–15 repetitions for persons over 50 years of age. The research and rationale for this exercise prescription have been reviewed **(ACSM, 1990; Pollock** *et al.,* **1994; Feigenbaum & Pollock, 1997)**.

Competitive team handball requires muscular strength, speed, and endurance. To date, it has not been very clear how these parameters change during the season in elite team handball players. Thus, only two studies **(Gorostiaga** *et al.,* **1999 and Hoff & Almasbakk, 1995)** have so far attempted to evaluate the effects of heavy resistance training (RT) programs on different physical parameters in competitive team handball players.

Athletes often experience interruptions in training sessions and competition programs because of illness, injury, postseason break, or other factors, which may result in a reduction or cessation of their normal physical activity level **(Hortobagyi** *et al.,* **1983, Kraemer** *et al.,* **2002, and Zatsiorsky 1995)**. The magnitude of this reduction may depend upon the length of the detraining period **(Hakkinen and Komi, 1985)** in addition to training levels attained by the subject . Since, moreover, there exists only one previous study **(Skoufas** *et al.,* **2003)** investigating the effects of detraining (DT, or RT cessation) on team handball players, the current investigation sought additional information on the effect of this upon upper body strength and leg explosive power.

The hypothesis argued in this paper is that University team handball players can significantly increase the motor fitness parameters of upper body strength and leg explosive power by combining normal technical and tactical sessions with a resistance training program over a consecutive 12 weeks period. Additionally, a 12 weeks detraining (DT) period may produce significant decreases in the upper body strength and leg explosive power. Therefore, the object of this study was to investigate the changes in the parameters produced during 12 weeks of RT and DT in 15 University level team handball players.

METHODS

Experimental Approach to the Problem

In order to address the hypothesis presented herein, we selected 15 University level men team handball players. Their age ranged between 18 and 28 years. The subjects were given resistance training for three days a week, for a period of 12 weeks and detraining for 12 weeks. Following the 12 weeks of resistance training programme, the training ceased followed by 12 weeks in reduce to provide for model form which the effects of detaining would be evaluated.

The inclusion of a control group in the study of top athletes is unethical. This is because the withholding of potentially important training would be detrimental for the development of the players so selected **(Kraemer 2005)**. To overcome this fact, the stability of the dependent variables was established with test-retest reliability measures (intraclass correlation coefficient [ICC]).

DESIGN

The evaluated parameters were upper body strength (1 RM Bench Press) and leg explosive power (vertical jump).The parameters were measured at baseline after 12 weeks of resistance training and 12 weeks of detraining and the effects of the training and detraining were examined.

TRAINING PROTOCOL

The training programme was lasted for 45 minutes per session in a day, 3 days in a week for a period of 12 weeks duration. These 45 minutes included 5 minutes warm up and 5 minutes warm up down remaining 35 minutes allotted for training programme. Every three weeks of training 5 % of intensity of load was increased from 65% to 80% of work load. Following the 12 weeks of resistance training programme, the resistance training group ceased the training for 12 weeks to provide for model form which the effects of detraining would be evaluated. During Detraining, Resistance training was totally discontinued but the team handball players maintained normal team handball practices and competitions.

STATISTICAL ANALYSIS

The collected data on above said variables due to the effect of resistance training followed by detraining was statistically analyzed with 't' test to find out the significant improvement between pre & post test and post & test after detraining if any. In order to find out the significant difference between the pre, post and test after detraining repeated measures ANOVA was used. Whenever 'F' ratio was found to be significant, scheffee's test was used as post-hoc test to determine which of the paired means differed significantly. In all cases the criterion for statistical significance was set at 0.05 level of confidence. ($P < 0.05$)

TABLE - I

Computation of 't' ratio between pre and post test means on upper body strength and leg explosive power of experimental group

S.No	Variables	Pretest	Post test	SD	't' ratio
1.	Upper body strength	.799	.876	0.03	11.63*
2.	Leg Explosive Power	43.33	47.8	0.99	17.47*

*Significant at 0.05 level (2.14)

Table I reveals the computation of mean, standard deviation and 't' ratio on upper body strength and leg explosive power of resistance training group. The obtained 't' ratios on upper body strength and leg explosive power were 11.63 and 17.47 respectively. The required table value was 2.14 for the degrees of freedom 14 at the 0.05 level of

significance. Since the obtained 't' values were greater than the table value it was found statistically significant. It implies that the resistance training for a period of 12 weeks significantly improved the upper body strength and leg explosive power of men team handball players.

TABLE - II

Computation of't' ratio between post test means between resistance training and detraining of experimental group

S.No	Variables	Posttest	Detraining	SD	't' ratio
1.	Upper body strength	.876	.841	.02	7.43*
2.	Leg Explosive Power	47.8	45.07	1.22	8.66*

*Significant at 0.05 level (2.14)

Table II indicates the computation of mean, standard deviation and 't' ratios on upper body strength and leg explosive power between resistance training and detraining. The obtained 't' ratios on upper body strength and leg explosive power were 7.43 and 8.66 respectively. The required table value was 2.14 for the degrees of freedom 14 at the 0.05 level of significance. Since the obtained 't' values were greater than the table value it was found statistically significant. It implies that there was significant difference in upper body strength and leg explosive power of men team handball players between resistance training and detraining.

Table - III

Repeated measure analysis of variance of pre, post, detraining post test means of resistance training group on upper body strength and leg explosive power

Variables	Source of variance	Sum of square	DF	Mean square	F ratio
UPPER BODY STRENGTH	Between group	0.09	14	0.01	78.72*
	Within group	0.1	30	0.002	
	Treatment	019	2	0.02	
	Residual	0.01	28		

LEG EXPLOSIVE POWER	Between group	441.47	14	31.53	84.52*
	Within group	466.67	30	11.11	
	Treatment	152.13	2	76.07	
	Residual	25.2	28	0.9	

*Significant at 0.05 level of confidence 2,28 (3.34)

Table III indicates that the obtained F values on pre, post, detraining means of upper body strength and leg explosive strength were 78.72 and 84.52 respectively. The critical value for 2, 28 degrees of freedom was 3.34 at 0.05 level of significance.

Since, the obtained F values were greater than, that of table value of 3.34, it was statistically significant at 0.05 level of confidence. From the inspection of results, it was inferred that there was significant difference in upper body strength and leg explosive power of handball players among pre, post, and detraining of resistance training.

Table – IV

Scheffe's post hoc test for the differences between the paired adjusted Post-test means of upper body strength and leg explosive power

Variables	Pre test	Post test	Detraining	MD	CI
UPPER BODY STRENGTH	.799	.876	….	0.08	0.03
	.799	….	.839	0.04	
	….	.876	.839	0.04	
LEG EXPLOSIVE POWER	43.33	47.8	….	4.47	2.44
	43.33	….	41.2	2.13	
	….	47.8	41.2	6.60	

*Significant at 0.05 level

Table IV reveals that the mean differences between the paired adjusted post means of all tests.

The upper body strength mean difference between pre test and post test, pre test and detraining and post test and detraining were 0.08, 0.04 and 0.04 respectively. The values of mean differences are greater than the confidence interval value of 0.03; it was found to be statistically significant at 0.05 level of confidence.

The leg explosive power mean difference between pre test and post test, pre test and detraining were 4.47, 2.13 and 6.60 respectively. The values of mean differences are greater than the confidence interval value of 2.44; it was found to be statistically significant at 0.05 level of confidence. Further, the mean difference of pretest and detraining was 2.13. This value was less than the CI value. It was found to be statistically not significant.

BAR DIAGRAM SHOWING PRE, POST AND DETRAINING POST MEANS OF RESISTANCE TRAINING GROUP ON UPPER BODY STRENGTH (Fig., 1) AND LEG EXPLOSIVE POWER (Fig., 2)

Figure 1

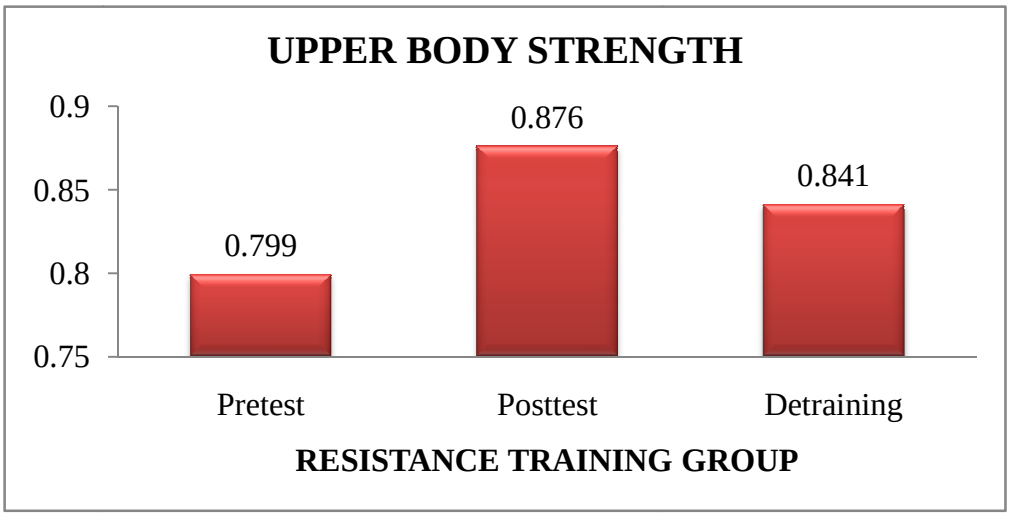
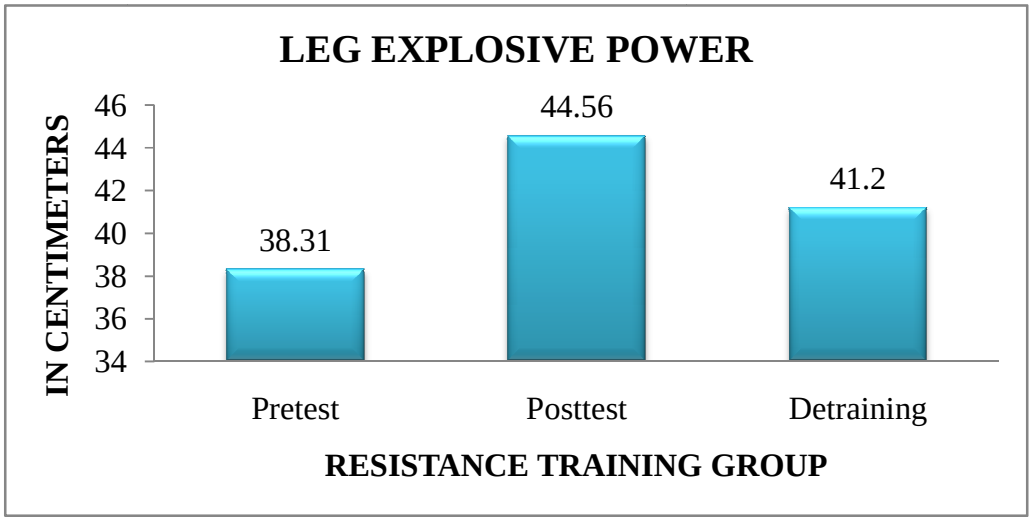


Figure 2



DISCUSSION ON FINDINGS

Speed, leg explosive power and anaerobic power were significantly improved due to the influence of two modes of resistance training **(Muktamath, 2010)**. **Lo (2011)** expressed that 24 weeks of resistance training significantly increased Vo_2 max, upper body strength and lower body strength. **Faigenbaum (2001)** reported that eight weeks of resistance training protocol improved upper body strength in children. **Chtara (2008)** revealed that circuit resistance training significantly improved explosive strength and power of physical education students.

Lo (2011) observed that 24 weeks of detraining after resistance training significantly decreased Vo_2 max, upper body strength and lower body strength. Muscle strength and hypertrophy levels of older adults decrease after a detraining period of 12 weeks who had previously participated in a 12 weeks resistance training programme **(Tokmakidis, 2009)**. Eight weeks of detraining after eight weeks of strength training resulted in a significant loss of upper and lower body strength in children **(Faigenbaum, 1996)**.

CONCLUSIONS

It was concluded that twelve weeks of resistance training programme produced significant changes in upper body strength and leg explosive power of men team handball players.

Further, it was concluded that twelve weeks of detraining programme produced significant changes in upper body strength and leg explosive power of men team handball players.

RECOMMENDATIONS

The proposed training programme can be a part of physical preparation of handball players, to improve their fitness and playing ability.

It is necessary to raise awareness of the trainers with the importance of the specific exercises in the direction of the fitness.

Studies may be conducted in the same area on different samples in terms of age and gender.

There is a need to undertake more researches in this area.

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