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Assessment of circuit training impact on back strength and strength endurance among handball players

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Abstract

This study was designed to examine the effect of circuit training on back strength and strength endurance among handball players. To achieve this purpose of the study, thirty men handball players in the age of 18 to 22 years from Annamalai University, Chidambaram were randomly selected as subjects. They were divided into two equal groups. Each group consisted of the fifteen subjects. Group-I underwent circuit training for three days per week for twelve weeks. Group-II acted as control they didn't undergo any special training apart from their regular program. The following strength parameters namely back strength and strength endurance were selected as dependent variables and were assessed by using dynamometer and bent knee sit-ups. The circuit training was selected as independent variable. The selected subjects were tested on selected dependent variables at prior to and immediately after the training program and were statistically examined for significant differences, if any, by applying analysis of covariance (ANCOVA). The results of the study indicated that due to the effect of circuit training the back strength and strength endurance of handball players were significantly improved.

Keywords: Circuit training, back strength, strength endurance and handball players

Introduction

Handball has become one of the most popular team sports at both the national and international level (Clanton & Dwight, 1997; Marczinka, 1993) [2, 6]. To develop effective training programmes for handball players ranging from amateur to elite, team handball coaches, strength and conditioning coaches, athletic trainers, and sport physicians should be familiar with the physical characteristics, physiological attributes, throwing velocity and accuracy, and on-court performance of handball players. Coaches and trainers can effectively use the relevant information to develop more effective conditioning programmes for handball players. This information is also essential for coaches to help their players to develop a repertoire of defensive and offensive drills required for achievement in team handball.

Team handball is in fact a fast paced game that requires high-intensity movements to be repeated over time based upon the technical and tactical situations. Physical conditioning in team handball should then be characterized by acyclic activities and intermittent-like drills for maximizing specific improvements. A fit handball player is not the one who is able to run 1000 meters on the track faster than anybody else. A fit handball player is the one who is able to play fast paced handball (in defensive and/or attacking positions) for the whole duration of the game. A fit handball player is capable of performing good tactical decisions at fast pace for the whole duration of the game. The above mentioned characteristics can only be improved by careful planning and periodization of game-like drills in which decision-making is also a major component.

Circuit training is an excellent choice for developing general, all round physical and cardiovascular fitness. Generally, a good circuit training programme will involve each muscle group getting worked by several different exercises. The number of exercises per muscle group depends on the training effect to be achieved, the desired volume of work to be completed during a training session, the desired intensity of effort and the structure of the programme. To improve or maintain a desired level of physical fitness, there is a need to constantly administer an adequate training intensity while exercising. Hence, to maximize handball training sessions the clear understanding of the fitness demands of the game circuit training throughout the competitive season is necessary.

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Methodology

Selection of Subjects

The purpose of the study was designed to examine the effect of circuit training on back strength and strength endurance among handball players. To achieve this purpose of the study, thirty men handball players in the age of 18 to 22 years from Annamalai University, Chidambaram were randomly selected as subjects. They were divided into two equal groups. Each group consisted of the fifteen subjects. Group-I underwent circuit training for three days per week for twelve weeks. Group-II acted as control they did not undergo any special training program apart from their regular program.

Selection of Variables

The following strength parameters namely back strength and strength endurance were selected as dependent variables and were assessed by using back lift with dynamometer and bent knee sit-ups. The circuit training was selected as independent variable.

Training Programme

During the training period, the experimental group (Group I) underwent circuit training for three days per week (alternative days) for twelve weeks. Every day the workout lasted for 45 to 60 minutes approximately including warming up and warming down periods. The participants performed the following exercises namely squat jumps, burpees, dumbbell squat and swings, tuck jumps, squat thrusts, fast feet on box,

jumping jacks, alternating split squat respectively. The subjects underwent the training program as per the schedules under the supervision of the researcher in the morning time.

Collection of the Data

The data on back strength and strength endurance were collected by using back lift with dynamometer and bent knee sit-ups respectively. The data were collected at prior to and immediately after the training program for each dependent variable separately.

Experimental Design and Statistical Technique

The random group design was used as experimental design. Thirty men handball players were selected as subjects at random. They were divided at random into two equal groups and each group consisted of fifteen subjects. The selected subjects were tested on selected dependent variables at prior to and immediately after the training program and were statistically examined for significant differences, if any, by applying analysis of covariance (ANCOVA). In all the cases, .05 level of confidence was used to test the significance, which was considered as an appropriate.

Result

The analysis of covariance on back strength of circuit training and control groups have been analyzed and presented in Table-1.

Table 1: Analysis of Covariance on Back Strength of Circuit Training and Control Groups

| Test | Circuit Training Group | Control Group | Source of Variance | Sum of Squares | Df | Mean Squares | Obtained 'F' Ratio |
|-------------------------|------------------------|---------------|--------------------|----------------|----|--------------|--------------------|
| Pre-test Mean | 94.53 | 94.54 | Between | 0.004 | 1 | 0.004 | 0.03 |
| S.D | 0.35 | 0.33 | Within | 3.52 | 28 | 0.125 | |
| Pre-test Mean | 98.53 | 94.54 | Between | 119.56 | 1 | 119.58 | 52.67* |
| S.D | 0.35 | 0.33 | Within | 63.56 | 28 | 2.27 | |
| Adjusted Post Test Mean | 98.18 | 94.51 | Between | 117.69 | 1 | 119.69 | 37.48* |
| | | | Within | 84.72 | 27 | 0.54 | |

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 1 and 28 and 1 and 27 are 3.34 and 3.35 respectively).

The table-1 shows that the pre-test mean values on back strength of circuit training and control groups are 94.53 and 94.54 respectively. The obtained "F" ratio of 0.03 for pre-test scores is less than the table value of 3.34 for df 1 and 28 required for significance at .05 level of confidence on back strength. The post-test mean values on back strength of circuit training group and control group are 98.53 and 94.54 respectively. The obtained "F" ratio of 52.67 for post test scores is more than the table value of 3.34 for df 1 and 28 required for significance at .05 level of confidence on back strength.

The adjusted post-test means of circuit training group and control group are 98.18 and 94.51 respectively. The obtained "F" ratio of 37.48 for adjusted post-test means is more than the table value of 3.35 for df 1 and 27 required for significance at .05 level of confidence on back strength. The results of the study indicated that due to the effect of circuit training the back strength of handball players were significantly improved.

The adjusted post-test mean values of circuit training and control groups on back strength were graphically represented in figure 1.

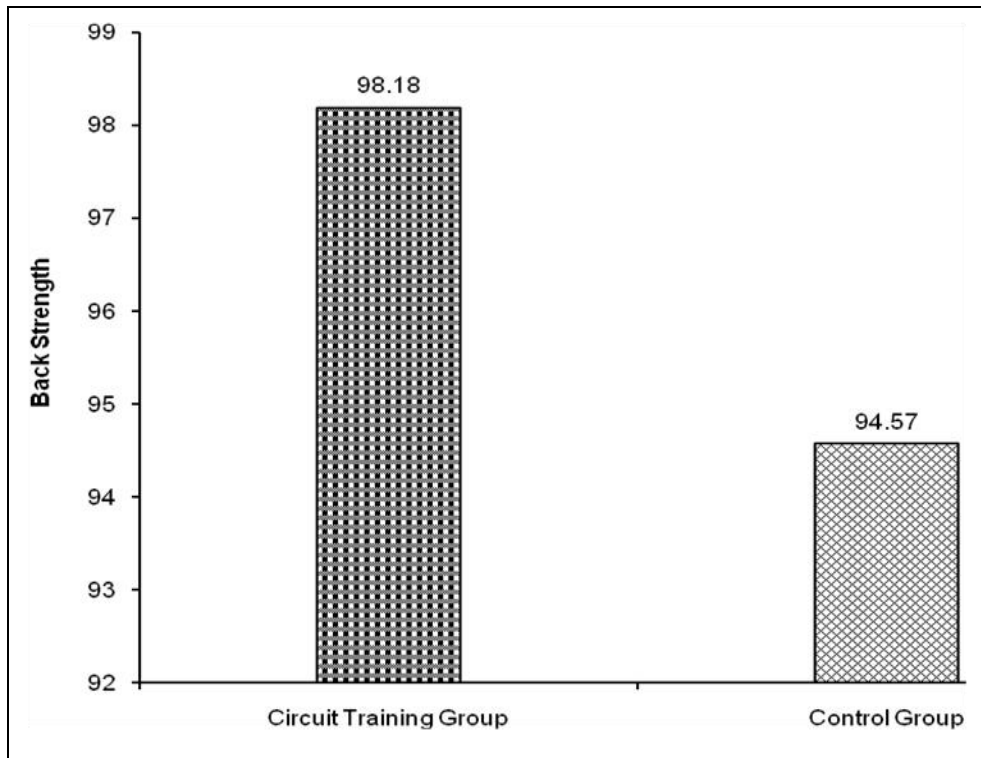


Fig 1: The Adjusted Post-Test Mean Values of Circuit Training and Control Groups on Back Strength

The analysis of covariance on strength endurance of circuit training and control groups have been analyzed and presented in Table 2.

Table 2: Analysis of Covariance on Strength Endurance of Circuit Training and Control Groups

| Test | Circuit Training Group | Control Group | Source of Variance | Sum of Squares | Df | Mean Squares | Obtained 'F' Ratio |
|-------------------------|------------------------|---------------|--------------------|----------------|----|--------------|--------------------|
| Pre-test Mean | 37.60 | 37.27 | Between | 0.85 | 1 | 0.85 | 0.63 |
| S.D | 0.80 | 0.998 | Within | 38.13 | 28 | 1.36 | |
| Pre-test Mean | 40.73 | 37.40 | Between | 282.84 | 1 | 282.84 | 196.42* |
| S.D | 0.77 | 0.88 | Within | 40.27 | 28 | 1.44 | |
| Adjusted Post Test Mean | 40.42 | 37.39 | Between | 274.62 | 1 | 274.62 | 188.10* |
| | | | Within | 39.31 | 27 | 1.46 | |

* Significant at.05 level of confidence.

(The table values required for significance at.05 level of confidence for 1 and 28 and 1 and 27 are 3.34 and 3.35 respectively).

The table shows that the pre-test mean values on strength endurance of circuit training and control groups are 37.60 and 37.27 respectively. the obtained “F” ratio of 0.63 for pre-test scores is less than the table value of 3.34 for df 1 and 28 required for significance at.05 level of confidence on strength endurance. The post-test mean values on strength endurance of circuit training group and control group are 40.73 and 37.40 respectively. the obtained “F” ratio of 196.42 for post test scores is more than the table value of 3.34 for df 1 and 28 required for significance at.05 level of confidence on strength endurance.

The adjusted post-test means of circuit training and control groups are 40.42 and 37.39 respectively. the obtained “F” ratio of 188.10 for adjusted post-test means is more than the table value of 3.35 for df 1 and 27 required for significance at.05 level of confidence on strength endurance.

The results of the study indicated that there was a significant difference between the adjusted post-test means of circuit training group and control group on strength endurance.

The adjusted post-test mean values of circuit training group and control group on strength endurance is graphically represented in figure 2.

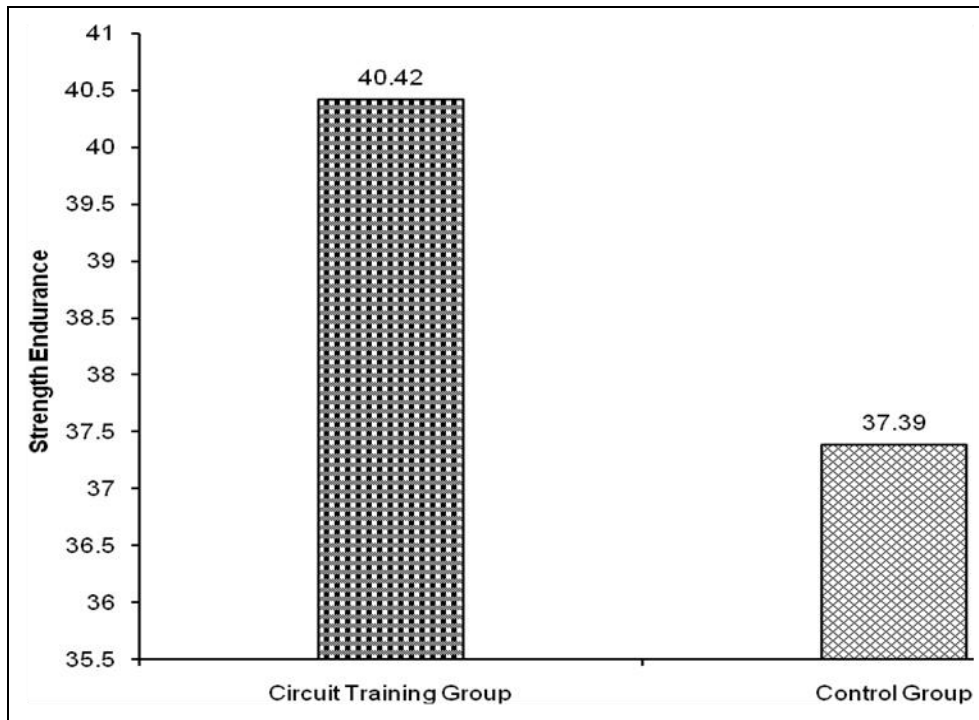


Fig 2: The Adjusted Post-Test Mean Values of Circuit Training Group and Control Group on Strength Endurance

Discussion

The literature thoroughly supports the evidence that a higher dose of circuit training produces greater increases in strength and endurance parameters. Studies have shown improvement in aerobic capacity from participation in circuit training (Kass & Castriotta, 1994; Peterson, Miller, Quinney, & Wenger, 1988) [5, 7]. Kaikkonen *et al.*, (2000) [4] observed significant improvement on cardiovascular and muscular fitness due to the effect of a 12-week low resistance circuit weight training. Alcaraz *et al.*, (2008) [1] that heavy-resistance circuit training may be an effective training strategy for the promotion of both strength and cardiovascular adaptations. Dorgo *et al.*, (2009) observed significant improvements in muscular strength and muscular endurance of the manual resistance training and weight resistance training groups.

Gettman *et al.*, (1978) [3] conducted a study to determine the changes elicited by circuit weight training and running (RN) programs conducted 3 days per week for 20 weeks. According to the American Council on Exercise, athletes involved in various sports and games can improve performance with circuit training (Zatsiorsky & Kraemer, 2006) [8].

Conclusion

The result of the study reveals that due to the effect of circuit training the back strength and strength endurance of the handball players were significantly improved. Since, circuit training program was most specific in improving strength and endurance this types of training may be given due importance in order to improve handball players fitness level.

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