ASSESSMENT OF CIRCUIT TRAINING IMPACT ON BACK STRENGTH AND STRENGTH EDURANCE AMONG HANDBALL PLAYERS

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ABSTRACT

The purpose of this research was to find out how handball players' back strength and endurance were affected by circuit training. Thirty male handball players from Annamalai University, Chidambaram, ranging in age from eighteen to twenty-two, were chosen at random to participate in the research. They were split along the middle. The fifteen participants were divided into two groups. For twelve weeks, members of Group-I did circuit training three times a week. As a control group, Group II did not get any additional instruction above what was required by their standard curriculum. The dynamometer and bent-knee sit-ups were used to measure the dependent variables, which were strength endurance and back strength. The independent variable chosen was the circuit training. Using analysis of covariance (ANCOVA), we looked for statistically significant changes between the pre- and post-training assessments of the chosen participants on a set of dependent variables. Researchers found that handball players' strength endurance and back strength were both enhanced by circuit training.

Key words: *Circuit training, Back strength, Strength endurance and Handball players*

INTRODUCTION

According to two sources (Clanton & Dwight, 1997; Marczinka, 1993), handball has surpassed all other team sports in terms of popularity on a global scale. Team handball coaches, strength and conditioning coaches, athletic trainers, and sport physicians should be well-versed in the physical traits, physiological traits, throwing speed and accuracy, and on-court performance of handball players in order to design effective training programmes for players at all levels of the sport. With this newfound knowledge, handball trainers and coaches may create more efficient training regimens for their players. Additionally, coaches must have this knowledge in order to assist their players in building the offensive and defensive drill repertoire necessary for team handball success. As a matter of fact, team handball is a lightning-fast game that calls for repetitive, high-intensity motions tailored to certain tactical and technical contexts. Acyclic actions and drills similar to intermittent training should thus characterise team handball physical conditioning in order to maximise targeted benefits. Being able to sprint the 1000 metres quicker than everyone else is not a sign of a fit handball player. A physically fit handball player can keep up a high tempo game throughout, whether they're on defence or offence. A healthy handball player can keep up a high level of tactical decision-making throughout the game. The aforementioned traits are limited to being

enhance performance via strategically scheduled game-like workouts that heavily involve decision-making. A great way to improve your cardiovascular fitness and overall health is to do circuit training. A decent circuit training routine would often include many exercises that target various muscle groups. How many exercises are needed to train each muscle group is dependent on the training effect, the amount of work to be done in a session, the intensity level to be obtained, and the program's structure. In order to achieve or maintain a certain degree of physical fitness, it is essential to exercise consistently at an appropriate intensity. If you want to get the most out of your handball training sessions, you need to know what the game requires in terms of fitness and stick to a circuit training regimen over the season.

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

For twelve weeks, the experimental group (Group I) trained with circuit training three times a week (on alternate days). The workouts, which included warmups and cooldowns, clocked in at 45 to 60 minutes daily. Squat jumps, burpees, dumbbell squats and swings, tuck leaps, squat thrusts, rapid feet on box, jumping jacks, and alternating split squats were the workouts that the participants did. Mornings were spent under the watchful eye of the researcher while the participants went through the training programme according to schedule.

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 experimental design used was the random group design. A random sample of thirty male handball players were used for the study. There were fifteen participants in each of the two groups that were randomly assigned. Using analysis of covariance (ANCOVA), we looked for statistically significant changes between the pre- and post-training assessments of the chosen participants on a set of dependent variables. The significance was tested in all instances using a.05 level of confidence, which was deemed suitable.

RESULT

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

Table – I: **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 S.D	94.53 0.35	94.54 0.33	Between Within	0.004 3.52	1 28	0.004 0.125	0.03
Pre-test Mean S.D	98.53 0.35	94.54 0.33	Between Within	119.56 63.56	1 28	119.58 2.27	52.67*
Adjusted Post Test Mean	98.18	94.51	Between Within	117.69 84.72	1 27	119.69 0.54	37.48*

** 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).

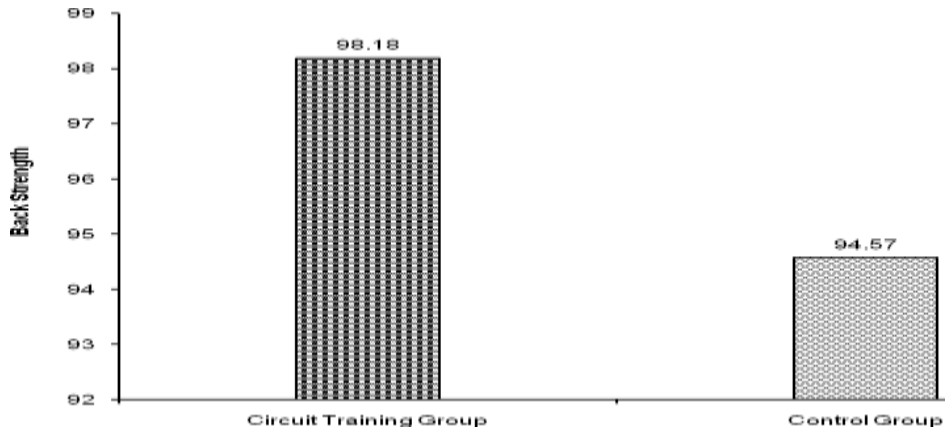
The table-I shows that the pre-test mean values on back strength of circuit training and control groups are 94.53 and 94.54 respectively. The obtained "F" ratio of 0.03 for pre- test scores is less than the table value of 3.34 for df 1 and 28 required for significance at .05 level of confidence on back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

Figure – I: **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 II.

Table – II: **Analysis of Covariance on Strength Endurance of Circuit Training and Control Groups**

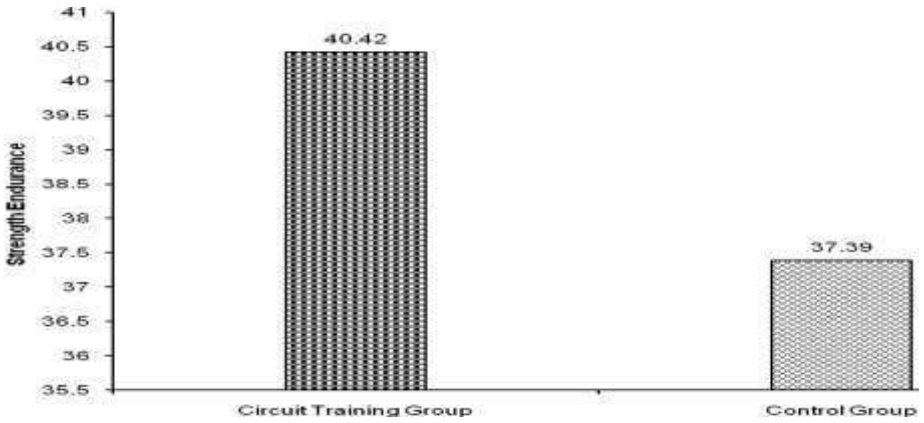
Test	Circuit Training Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Squares	Obtained 'F' Ratio
Pre-test Mean S.D	37.60 0.80	37.27 0.998	Between Within	0.85 38.13	1 28	0.85 1.36	0.63
Pre-test Mean S.D	40.73 0.77	37.40 0.88	Between Within	282.84 40.27	1 28	282.84 1.44	196.42*
Adjusted Post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

** 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).

According to the data in the table, the control group had a strength endurance pre-test mean of 37.27 and the circuit training group had a mean of 37.60. For strength endurance, the calculated "F" ratio of 0.63 for pre-test scores is lower than the 3.34 for df 1 and 28 needed for significant at the.05 level of confidence. The control group had a post-test mean of 37.40 on the strength endurance scale, whereas the circuit training group had a score of 40.73. An "F" ratio of 196.42 for strength endurance post-test scores exceeds the 3.34 table value for df 1 and 28 needed for significant at the.05 level of confidence.
Both the circuit training and control groups achieved adjusted post-test averages of 40.42 and 37.39, respectively. For strength endurance, the calculated "F" ratio of 188.10 for adjusted post-test means is more than the 3.35 table value for df 1 and 27 needed for significant at the.05 level of confidence.

The research found that the control group and the circuit training group had significantly different adjusted post-test means when it came to strength endurance. Figure II shows a graphical representation of the modified post-test mean values on strength endurance for the control group and the circuit training group.

Figure – II: **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). Kaikkonen et al., (2000) 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) 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) 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). Muthuraj (2018) analyzed the effect of concurrent training on back strength of college men. The result stated that the concurrent training group had significant increase on back strength when comparing to the control group.

CONCLUSION

Circuit training had a notable impact on the handball players' back strength and strength endurance, according to the study's results. It is reasonable to put handball players more emphasis on circuit training as it was the most effective programme for increasing strength and endurance.

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