

## SIX WEEKS OF CIRCUIT RESISTANCE TRAINING MODE ON STRENGTH ENDURANCE AMONG THE STUDENTS OF PHYSICAL EDUCATION & SPORTS SCIENCES



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### ABSTRACT

The purpose of this study was to examine the eight weeks of circuit resistance training mode on strength endurance among education students. Forty B.P.Ed. Male students (n=40) were randomly selected as subjects and their age ranged between 20 and 25 years. The selected subjects were randomly assigned into two equal groups such as experimental group (EG) and control group (CG) with twenty subjects each (n=20). The experimental groups underwent their respective experimental treatment for six weeks three days per week and a session on each day. Control group was not taken as variable for this investigation. The pre and post test were conducted one day before and after the experimental treatment. Analysis of covariance (ANCOVA) was (EG) produced significant improvement ( $p \leq 0.05$ ) due to resistance training on strength endurance when compared to control group (CG).

**Keywords:** Circuit resistance training, strength training, and strength endurance.

### INTRODUCTION

Circuit training is a form of conditioning combining resistance training and high-intensity aerobics. It is designed to be easy to follow and target strength building as well as muscular endurance. It is an interval-training technique that minimizes rest between sets and exercises. It can consist of only weight training or alternating intervals

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Page 1

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of weight training and brief, high-intensity cardiovascular exercise. Circuit resistance training is the practice of doing exercise with resistance and moving simultaneously from one to the next with no real break in between exercises. It is a combination of circuit training and resistance training. Typically, it involves working at 40-60% of maximum strength for 30 second with a 15-second recovery period. Circuit resistance training improves strength, muscular endurance and flexibility (McCarthy et al, 1995). It can also increase muscle mass and decrease body fat content. This training plays a key role in conditioning athletes for the specific strength and conditioning demands of different sports. It has been become the most widely accepted method for improving muscular strength and power (Kraemer & Ratamess, 2004). The increases in muscular strength during the initial periods of a resistance training program are not associated with changes in cross-sectional area of the muscle (Sale, 1988). Changes in strength evidenced in the first few weeks of resistance training are more associated with neural adaptations (Moritani & deVries, 1979), which encompass the development of more efficient neural pathways along the route to the muscle. Youth sports have become more popular and in many ways, more competitive. Many young athletes and parents are seeking way to achieve a competitive edge. Many precious studies have explored the effect of different resistance training frequencies on developing muscle strength and size of adolescents (American college of sports medicine, 2000). While the literature supports the efficiency of resistance training (Ramsay et al., 1990 and Sewall & Mischeli, 1986) two or three times per week.

Strength endurance is one of the essential factors of sports activities (Uppal & Alifereti, 1984). It is a conditional ability which depends largely on the energy liberation process in the muscles. Any exercises to build muscular endurance by using high repetitions and light loads. Muscular strength endurance is the ability to lift an amount of weight that is sub maximal as many times as possible. Long-term changes in strength are more likely attributable to hypertrophy of the muscle fibers or muscle group (Sale, 1988). The range of increase of strength is quite variable to the individual and may range from

7% to 45% (Kraemer, 1994). It should be noted that strength results appear to be velocity specific. Velocity specificity best characterizes the profanity that the greatest increases in strength occur at or near the velocity of the training exercise (Behm & Sale, 1993).

Therefore, slow-speed training will results in greater gains at slow movement speeds, while fast-speed training will realize the improvements in strength at faster movement speeds. All movements in sports are caused by muscle contractions and therefore, strength is an integral part of all motor abilities. Strength endurance is the ability of muscle or group of muscles to overcome resistance or to act against resistance for longer duration under condition of fatigue or tiredness (Singh,91).

#### **PURPOSE OF THE STUDY**

The purpose of this study was to examine the six weeks of circuit resistance training mode on strength endurance among the students of physical Education.

#### **DESIGN OF THE STUDY**

Forty (n=40) students from Institute of Physical Education & Sports Sciences, Dr. R.M.L. Avadh University, Ayodhya, were selected as subjects and the age of students were between 20 and 25 years. The selected subjects were randomly divided into two equal groups of twenty subjects each (n=20). The groups were one experimental group (EG) and one control (CG). During the training period, the experimental group underwent their respective training programme for six weeks 3 days per week and a session on each day apart from their regular activities. Control group (CG), who did not participate in any specific training. Strength endurance was selected as dependent variable for this study, it was measured by using bent knee sit ups. These are the exercise used as a circuit resistance, clean and press (full body), front squat (legs), arm curl (arms), leg press (legs) upright row (shoulder), calf raise (lower leg), dips (chest, triceps), renegade rows (abs), closed grip bench press (triceps, chest).

Total 8-10 exercises and 2-3 times with one minute rest between circuits with moderate intensity and velocity (50-60% of maximum). The pre and post test were conducted one day before and after the experimental treatment.

## DATA ANALYSIS

Mean and standard deviation were calculated for strength endurance for each training group. And the data were analyzed by using analysis of covariance (ANCOVA). All analysis was carried out using SPSS version (Field, 2000) and statistical significance was fixed at 0.05.

**Table No: I**  
**Analysis of covariance on strength endurance of experimental group and the control group**

Test		Experimental Group	Control Group	SOV	SS	Df	MS	F ratio
Pretest	Mean	9.50	9.45	B	0.025	1	0.025	0.003
	SD	2.8	2.68	W	285.95	38	7.53	
Post test	Mean	13.45	9.60	B	148.23	1	148.23	19.18*
	SD	2.98	2.56	W	293.75	38	7.73	
Adjusted Post test	Mean	13.43	9.62	B	144.7	1	144.7	100.06*
		13.43	9.62	W	53.51	37	1.45	

\*Significant,  $F = (df 1,38) (0.05) = 4.10$ ;  $(P \leq 0.05)$ ,  $F = (df 1,37) (0.05) = 4.11$ ;  $(P \leq 0.05)$

Table I shows that the pre test mean of experimental and control groups are 9.50 and 9.45 respectively. The obtained F ratio of 0.003 for pre test mean is less than the table value 4.10 for df 1 and 38 required for significance at 0.05 level. The post tests mean of experimental and control groups are 13.45 and 9.60 respectively. The obtained F ratio of 19.18 for post test mean is higher than the table value 4.10 for df 1 and 38 required for significance at 0.05 level. The adjusted post test mean of experimental and control groups are 13.43 and 9.62 respectively. The obtained F ratio of 100.06 for adjusted post test mean is higher than the required table value 4.11 for df 1 and 37 required for significant at 0.05 level.

The results of the study indicated that there was significant differences between the adjusted post tests mean of resistance training group and control group on strength endurance at 0.05 levels.

## DISCUSSION

Circuit training group was improved in abdominal strength endurance. Strength endurance is considered as one of the determinants of sports performance. The

improvement of muscle power and successful performance in emergencies need a high level of fitness of respiratory system, system, cardio-vascular system and physiological components. Mark et al. (2001), Pollack et al. (1993) and Collin & Snow (1993) pointed out that circuit resistance training is the best method to improve strength endurance. Many research studies revealed that the use of different training loads elicits different training adaptations and further it indicated that it also includes the volume specific adaptations in strength variable (Christou, 2006) Teixeira et al. (2001) pointed out that resistance training three times per week is as effective as five times per week. Waller et al. (2011) and Tanaka & Swensen (1998) concluded that the improvement of strength endurance depends on the modalities of resistance training and circuit weight training is helps to improve strength endurance. Resistance exercises are one of the best methods for improving upper body strength endurance, many studies supported to this statement (Hickson et al., 1980, Chtara et al, 2008 & Faigenbaum et al., 1999) . the various training components (E.g. sets, repetitions, rest, intervals) could be manipulated the training loads used from the most important factor that determine the training stimuli and the consequent training adaptations (Myer et al., 2006 & Jones et al., 2001). From the results of the present study and literature it is conclude that the dependent variable such as abdominal strength endurance was significantly improved due to the influence circuit resistance training.

## **CONCLUSION**

In summary the strength endurance can be improved during the age between 20 and 25 years of female students and favour the prescription of circuit resistance training programme during the initial adaptation period. It is evident from a number of the adaptations that occur with resistance training that there are several health-related benefits. Circuit resistance training has been shown to improve factors associated with strength and endurance. It is concluded that there was a significant improvement on strength endurance due to circuit resistance training programme as compared to control group.

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