



EFFECT OF CIRCUIT TRAINING ON LOWER LIMB POWER OF ADOLESCENTS STUDENTS

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Abstract

This study aimed to examine the effect of a circuit training programme on Leg explosive strength of school students Meerut, Uttar Pradesh. To achieve the purpose of the study, the sixty (60) male students were selected who served as subjects and their age group was between 9 to 14 years. The selected subjects were divided into two groups i.e., experimental and control group. 30 male students were selected for each group as research subjects. The experimental group underwent through circuit training exercise consisted 8 station for 12 weeks. The control group was not given any training apart from their regular activities. The physiological variable which was examined during the study was Leg explosive strength. All the data which was collected before the training and after applied the training programme were examined by using dependent “t” test to find out the significant difference between the means of pre and post test score of experimental group after applied 12 weeks of circuit training. The level of confidence was fixed at 0.05. The obtained ‘t’ score of Leg Explosive strength was found higher than the required table value 1.67 to be significant at 0.05 level of confidence at df 58. It shows that Post data score of school students of experimental group is found better than the Post data of control group of school students.

Keywords: Circuit Training, Leg Explosive Strength, School Students.

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INTRODUCTION:

In recent years, there has been a growing concern regarding the physical fitness and overall health of school students. With the prevalence of sedentary lifestyles and the rise of technology-driven entertainment, physical activity levels among students have witnessed a decline. This trend raises concerns about the long-term implications for their health and well-being. One area of particular interest is explosive strength, which plays a vital role in various physical activities, including sports, athletics, and general functional movements. Explosive strength refers to the ability to generate a maximal force in a short period. It encompasses rapid muscle contractions and the efficient recruitment of muscle fibers, contributing to movements such as jumping, sprinting, and throwing. Developing explosive strength during adolescence is crucial, as it lays the foundation for athletic performance and can have a lasting impact on physical abilities throughout one's life.

To address the decline in physical fitness and enhance the explosive strength of school students, educators, coaches, and researchers have been exploring various training methodologies. One such approach gaining traction is circuit training, a form of exercise that combines resistance training and cardiovascular activities in a structured and time-efficient manner. Circuit training involves performing a series of exercises consecutively, targeting different muscle groups and energy systems. Participants move from one station to another, performing each exercise for a prescribed duration or number of repetitions. This dynamic and comprehensive workout stimulates various physiological adaptations, including muscular strength, endurance, cardiovascular fitness, and even coordination.

The circuit training program was developed by **R.E. Morgan and G.T. Anderson in 1953** at the University of Leeds, England. Since then, this exercise has become one of the exercises that improve the physical fitness of athletes. Circuit training is an exercise routine that combines cardiovascular fitness and resistance training. The initial routines were established by performing different sets of exercises in a circular fashion, alternating with each other, and thus called circuit training. By allowing only a short 30-90 second rest between poses, cardiovascular fitness is achieved along with other training effects. Different exercises for different positions are determined by the training room, age and the need

to improve physical condition and physiological characteristics of the trainees.

Explosive Strength: It is the ability to overcome resistance with high speed. It is used in take-off jumping events like long jump, high jump, and triple jump, jumping in volleyball for smashing or spiking jumping for rebound in basketball. Explosive power is important for athletes because it can help them improve their performance in sports that require quick bursts of speed or strength, such as sprinting, jumping, or throwing a ball. It's a major factor in both speed and jumping ability.

Explosive strength is the speed at which you can use your strength! It involves heavy loading in shorter high speed movements for a few repetitions with long rest periods between. Think one rep max vertical leap or one rep max snatch/clean and jerk. In non-workout terms, think a punch. It is an excellent way to improve cardiovascular fitness and muscular strength endurance. Circuit training will elevate your heart rate and keep it high through the entire circuit due to the short rest periods, large muscles being worked together and a combination of upper, lower and whole body exercises.

Circuit training provides many benefits, such as increased strength and muscular endurance, and better heart health and mood. It may also promote weight loss, and its very time efficient and versatile, increasing the odds that you'll stick with it long-term. It is an event that provides physical fitness through joyful activities. The modern civilization gives immense recognition to sports and physical fitness which leads to the good establishments of the organization of sports. **(Guttman. A 2004).[1]** The regular exercise a significant role in contemporary society in terms of awareness about health and fitness, entertainment, profession etc. **(Maguire JS.2008)[2]** the present scenario of physical exercise is being portrayed by professionalism at the different levels of competitions. The desires of the athletes for earning fame and wealth are the contributing factor of the professionalism. **(Duda JL.1989)[3]** Scientific preparations of the sportspersons for the competitions play a vital role in the enhancement of the performances. To display the upper hand against the opponent the researchers and coaches develop their techniques and strategies. **(Kapp KM.2012)[4]** Circuit training is a method of physical rehabilitation where you move from one exercise to another, usually in several different positions or

equipment. Regular circuit training simultaneously improves muscle strength, endurance, cardiovascular fitness and flexibility. "Circuit training is a method of fitness designed to develop general, versatile physical and cardiovascular fitness" (Scholich, 1990)[5] It is an excellent exercise program to improve different physical skills based on a program of different positions. In sports training, coaches use various tools and methods to get their athletes to run faster, jump higher and move faster to achieve higher performance. The purpose of this study is to determine the effect of certain circuit training on certain physical fitness variables. Circuit training has gained popularity as a training strategy due to the improvement of various physical fitness indicators. (Sudhakar Babu and Paul Kumar 2013)[6]

In the early stages of strength training, especially with entry-level athletes, almost all strength training methods or the program leads to some degree of strength development. But when an athlete develops a strong base, a coach a specific periodic strength training program should be created to maximize the natural abilities of the athlete. Equally important coaches must remember that each athlete has a unique rate of response, reaction and adaptation to a particular method and hence the different rate of improvement. Strength training is a long-term proposition. Athletes do not reach their highest level four to six weeks after starting the weight training program, but preferably during the competition phase, which is one month away from the phase of anatomical adaptation. (Bompa, 2005)[7] Knowing the explosiveness of players of different ages is direct link to training effects and facilitates the trainer's choice of methods, design process and a program for gamers. In most cases, explosive power depends on the number of engine units; genetic predisposition is 80%. This is defined as the ability of the athlete to produce the greatest possible force in the shortest possible time (Zatsiorsky and Kraemer, 2009) [8]

EXPERIMENTAL DESIGN & METHODOLOGY:

The subjects were selected from Panchwati Public School, Meerut. Total 60 students were selected For the purpose of the study and before selecting the final subjects of the research, cooper's 12 minute run/walk test will be conducted to assess the performance of population. The age level of the subject was taken between 9-14 years. The physical variable that was taken into account was Leg Explosive Strength.

COLLECTION OF DATA:

Before performing the data collection tests, the subjects were familiarized with the tests and the test procedure. They were also given practice so that they could give the best result at the end of the test. Although the study did not use a motivational technique, subjects were encouraged to do their best while completing the tests. To ensure uniform conditions for all subjects, the tests were performed in the afternoon. The duration of the tests was adjusted so that fatigue might not occur. Sufficient time was allocated between tests to allow subjects to perform at their best. Subjects completed all tests in their appropriate sports kit.

ADMINISTRATION OF TESTS:

The pre and post tests were administered before and after the twelve weeks training periods. The test administered was physical fitness variable of Leg Explosive Strength (Standing Broad Jump). Test was administered through standardized testing procedure.

CIRCUIT TRAINING PROCEDURE:

The group received an experimental treatment. The eight circuit stations were linked to a specific exercise, a specific distance or a specific number of repetitions for each exercise; each exercise was performed with prescribed repetitions for 3 rounds. Rest intervals were 10 seconds between each exercise and 2 minutes between sets for 45 minutes. The above circuit training was practiced five times a week from Monday to Friday for twelve weeks.

1. Jump Rope-1x3 minutes
2. High Knees-20x3 Times
3. Jumping jack -20x3 reps
4. Body weight Squats -15x3 reps
5. Plank-30 sec.x3
6. Push-ups -5x3 reps
7. Hill Climber 20x3 reps
8. Sit ups- 15x3 reps

STATISTICAL TECHNIQUE: Find out the effect of circuit training on selected leg explosive strength of school students. Two paired samples were used for the t-test dependent on the mean.

ANALYSIS OF DATA: The data were analyzed using the following statistics techniques:

- Calculating the average value
- Calculation of Standard Deviation
- Calculation of 't' ratio
- The chosen significance level was 0.05 confidence level.

DATA ANALYSIS & RESULTS

Table I: Analysis of t-ratio for the Pre and Post Tests of Experimental and Control Group on Leg Explosive Strength (Scores counts in number)

Variable	Group	Mean		SD		't' ratio
		Pre	Post	Pre	Post	
Leg Explosive Strength	Control	1.3183	1.3260	.20132	.20431	0.93
	Experimental	1.4040	1.4423	.40889	.40014	6.04*

*Significance at 0.05 level of confidence $df(58) = 1.67$

The Table-I shows that the mean values of pre-test and post-test of the control group on leg explosive strength were 1.3183 and 1.3260 respectively. The obtained 't' ratio was 0.93, since the obtained 't' ratio was less than the required table value of 1.67 for the significant at 0.05 level with 58 degrees of freedom it was found to be statistically insignificant. The mean values of pre-test and post-test of the experimental group on explosive strength were 1.4040 and 1.4423 respectively. The obtained 't' ratio was 6.04* since the obtained 't'

ratio was greater than the required table value of 1.67 for significance at 0.05 level with 29 degrees of freedom it was found to be statistically significant. The result of the study showed that there was a significant difference between control group and experimental group in explosive strength. It may be concluded from the result of the study that experimental group improved in leg explosive strength due to twelve weeks of circuit training.

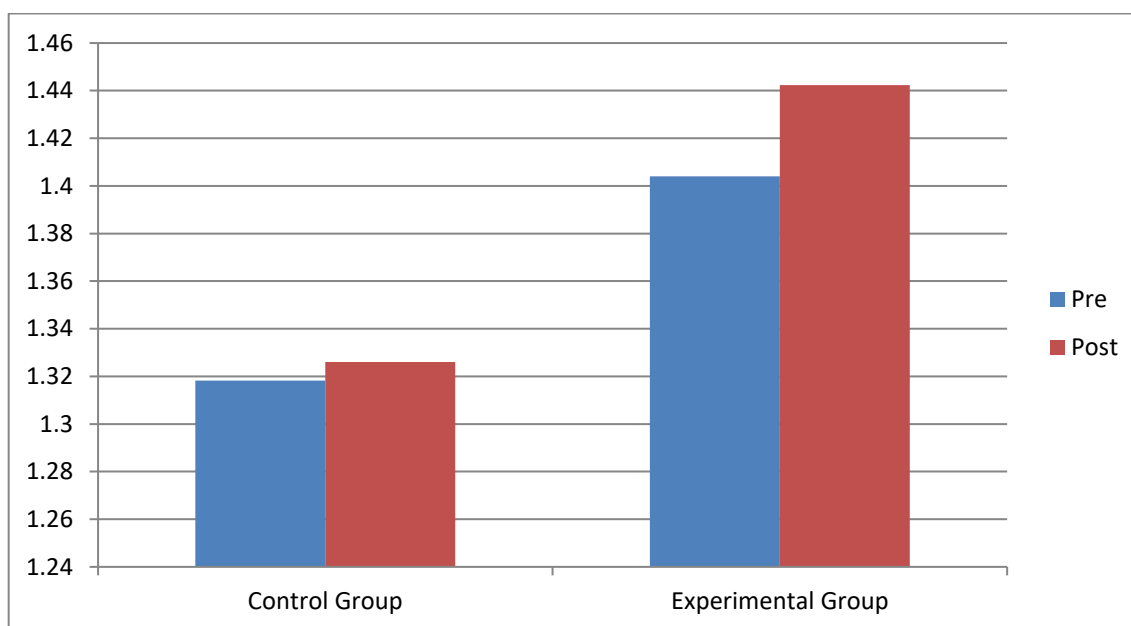


Fig 1: Bar Diagram Showing the Pre and Post Mean Values of Control and Experimental Group on Leg Explosive Strength.

Discussions on Findings

The result of the study indicates that the experimental group, namely circuit training group had significantly improved the selected dependent variable, namely Leg Explosive Strength, when compared to the control group. It is also found that the improvement caused by circuit training when compared to the control group. The result of this study on Leg Explosive Strength has in line with the study conducted by (Shireesha Kastur, 2017), (Dr. P Gopinathan 2018), (Dr.K.S. Sridhar 2018).

Conclusion:

In conclusion, the study on the effect of circuit training on explosive strength in school students has provided valuable insights into the benefits of this training method. Through a comprehensive analysis of the data collected, it is evident that circuit training positively influences explosive strength in school students. The results of this study have shown a significant improvement in explosive strength among the participants who underwent the circuit training program. This improvement can be attributed to the combination of various exercises targeting different muscle groups and energy systems, as well as the high-

intensity nature of circuit training. Furthermore, the findings indicate that circuit training is a time-efficient and effective method for improving explosive strength in school students. The structured nature of circuit training allows for a wide range of exercises to be incorporated, providing a holistic approach to strength development.

It is worth noting that this study focused specifically on school students, highlighting the potential benefits of incorporating circuit training into physical education programs. By introducing circuit training as part of the curriculum, schools can contribute to the overall physical development of their students, enhancing their explosive strength and athletic abilities. However, it is important to recognize that individual variances may exist in terms of response to circuit training. Factors such as initial fitness levels, training intensity, and adherence to the program may influence the outcomes. Therefore, personalized training plans and supervision by qualified professionals are recommended to optimize the results. In summary, this study emphasizes the positive impact of circuit training on explosive strength in school students. By implementing circuit training programs within educational settings, schools can foster physical development and enhance the overall well-being of their students. Further research in this field can explore additional variables and long-term effects to deepen our understanding of the relationship between circuit training and explosive strength.

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