Impact of a Circuit Training Protocol on the Motor Fitness Components of College Students

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Abstract

Purpose: This research aimed to investigate the impact of a circuit training regimen on specific motor fitness characteristics among students enrolled in a postgraduate college.

Methods: This research included forty college students participating in various intercollegiate games in 2015. The age group spanning from 18 to 28 years. This research examined specific motor components among college students, including muscular endurance, speed, agility, and explosive strength. The research was confined to a four-week experimental period during which participants engaged in a six-day-per-week circuit training plan, except for holidays. The data were gathered before and after the four-week training regimen. A t-test was conducted to determine the impact of a circuit training program on specific motor fitness characteristics among college students. The t-ratio values of the pre-test and post-test were statistically significant at a significance level of 0.05.

Result: A notable disparity was seen between the pre-test and post-test results for particular motor fitness indicators, such as the 50-meter sprint. The physical fitness activities performed by students at Shri Agrasen PG College include the run, shuttle run, standing broad jump, and sit-ups. The hypothesis of this experiment has been deemed valid.

Conclusion:. The findings of this study support the conclusion that a four-week circuit training exercise program successfully enhanced the motor fitness characteristics of college students.

Key words: motor fitness & circuit training

I. INTRODUCTION

The evolution of society is a significant influence on many aspects of life, including physical education, just as it is on all other aspects and activities of life. Throughout human history, society has undergone various shifts and transformations; during some eras, these shifts and transformations have been extensive, while in other eras, society has essentially stayed the same. The first three decades of this century have seen more significant societal shifts than any other comparable period in the history of the globe. This is the case when comparing decades from other centuries. The occurrences preceding these shifts have resulted in a great deal of difficulty and prompted a great deal of inquiry.[1]

The concept of motor fitness gained prominence during World War II when assessments that could be administered efficiently to a large number of individuals with little equipment were developed for use by several parts of the military and educational institutions. Motor fitness is often seen as a restricted aspect of overall motor ability, explicitly focusing on the fundamental component of intense physical exercise. However, it does not include the neuromuscular coordination required for motor abilities.[2]

An athlete engages in a formal form of training known as circuit training. During this training, the athlete participates in a series of predetermined exercises or activities carried out in succession or in a circuit. It is possible to set up circuits indoors (in gymnasiums or exercise rooms) or outdoors (on courts or fields). In a typical circuit, there are anywhere from six to ten stations. The athlete will perform a particular exercise at each station before moving on to the next station. The objective is to move as quickly as possible through the circuit, with the goal being to improve one's performance in one of two ways: either by reducing the total amount of time it takes to complete the circuit or by increasing the amount of work done at each station, or both. The stations are located all over the space that has been designated for circuit training. As a result of the individual's need to run from one station to the next, the individual will experience a higher level of cardiovascular conditioning the further apart the stations are. This higher level of cardiovascular conditioning is due to the increased distance covered during the circuit training. Additionally, the varying locations of the stations also provide a more dynamic and engaging workout experience as individuals have to navigate different areas of the designated space[3].).

The capacity to engage in locomotion, such as running, walking, and swimming, as well as perform manual dexterity tasks like throwing, bending, manipulating the fingers, and swinging a stick, has significantly contributed to the evolutionary development of humankind. Additionally, the ability to turn the head and partake in activities such as climbing mountains or dancing has also played a prominent role in shaping the human experience. Furthermore, its

position has included more than just physical aspects. The concept of movement is fundamental to the progress achieved by humanity. Whether it pertains to the field of communication. The movement has been crucial in facilitating or enabling the advancement of expressive arts, exploration, and the expansion of intellectual or perceptual frontiers.[4,5,6]

II. METHODOLOGY

The primary aim of the current study was to examine the impact of a circuit training protocol on specific motor fitness components among college students. The research was confined to a sample of 40 male college students, aged 18 to 28 years, who were enrolled in various colleges affiliated with A.P.S. University in Rewa, Madhya Pradesh. The study focused on a particular circuit training plan implemented over four weeks. The participants were directed toward the assessment of motor fitness factors. The participants were chosen for each trial and underwent assessments consisting of a 50-meter run, shuttle run, standing broad jump, and sit-ups. The tests above were selected based on the literature sources "Test and Measurement" by Devendra Kansal[7] and "A Practical Approach to Measurement in Physical Education" by Harold M. Barrow.[8] The numerical value provided by the user is 6. This study aims to investigate the impact of a circuit training plan on specific motor fitness characteristics among college students. Descriptive statistics and a t-test were computed. The letter "t" is a symbol in the English alphabet. The ratio value between the pre-test and post-test was statistically significant at the 0.05 level. The record of readings for several test items of motor fitness components includes the following criteria measurements.

An individual's abdominal muscular strength is measured by their performance on the Bend Knee Sit-Ups Test. The score was quantified as the cumulative count of accurately executed sit-ups within sixty seconds. The assessment of lower limb strength was conducted using the Standing Broad Jump Test, with the results being quantified in meters. The measurement of coordinative ability was conducted using the Shuttle Run test, with the results recorded in units of seconds. Speed running was measured over a distance of 50 meters, with the obtained scores being expressed in seconds. Each of the individuals provided an appropriate answer throughout the exam. The mean values of the pre-test and post-test measurements for four fitness variables were computed. The standard deviation of the pre-test and post-test fitness variables was also computed using SPSS version 16—the participants' performance in the 50-meter sprint. The research used the 50-meter Run, Shuttle Run, Standing Broad Jump, and Sit-Up tests as performance measures before and after the experimental period. These tests were used to determine the scores for the study's objectives. In order to assess the disparity between the Pre-test and Post-test, a significance threshold of 0.05 was established.

50-Meter Dash Run

i. **Objective:** To measure the speed.
ii. **Facilities & Equipment:** 200m Track, starting line and finish line, stopwatches, clapper.
iii. **Procedure:** Following a brief warm-up period, the participants were instructed to assume their positions behind the starting line. The participants were instructed to engage in paired running to enhance the outcomes' quality. In commencing the race, the individual responsible for initiating the event utilizes the verbal cues "Ready Go" or "Clap," which may be accompanied by a downward motion of the arm, serving as a visual indication to the timekeeper. The individual completes the race by reaching the finish line with the utmost speed. A single trial was authorized.
iv. **Score**: The scoring system measured the elapsed time, rounded to the closest tenth of a second, between the starting signal and the moment the participants crossed the finish line.

Sit And Reach Test

i. **Objective:** To measure the flexibility of back and leg (hamstring) muscle.
ii. **Equipment:** Sit and Reach Testing Box.
iii. **Procedure:** Participants were instructed to remove their shoes and position their feet against the testing box, ensuring their knees remained unbent. The participants were, after that, instructed to align their hands by placing one hand on top of the other, ensuring that the middle finger of each hand met at an equal distance. The experimenter maintained manual contact with the subject's knees to ensure the maintenance of knee extension, preventing any flexion of the knees. Simultaneously, participants were directed to incline their bodies forward and position their hands atop the measuring scales on the box's surface. Subsequently, participants were instructed to smoothly glide their hands along the measuring scale to reach the maximum extent without any abrupt movements. They were further instructed to maintain this furthest position for a minimum duration of one second.
iv. **Score**: Three trials were conducted for each participant, and the highest or best score, closest to one inch, was recorded to determine the flexibility score.

Standing Broad Jump

Objective: To measure the explosive leg strength.

Equipment: Measuring Tap & Playground.

Procedure: The participant was instructed to position themselves below the designated line, adopting a hand swing motion and a slight flexion of the knees. They were explicitly instructed not to do a double jump. Subsequently, the participant was directed to execute a forward leap. Three trials were authorized, and the highest leap was documented out of the three attempts.

Score: The score was measured by identifying the most optimal trial regarding distance, expressed in meters.

4x10 Meter Shuttle Run

Objective: To measure Agility

Equipment: Blocks of wood (2"x2"x4"), stopwatches and marking powder.

Procedure: Two parallel lines were delineated on the floor, with a separation distance of 10 meters. Four wooden blocks were configured near one of the demarcated lines. Participants were instructed to begin the task from a different line than the one they started from the initial point. The timers were activated upon initiating the signal "go," and the subjects moved swiftly toward the designated blocks. They then got a single block and promptly returned to the starting line. Subsequently, the subjects positioned the block behind the starting line and proceeded to retrieve a second block, which they brought back across the beginning line. Upon placing the second block on the ground, the timers ceased the operation of their watches and proceeded to document the recorded time.

Scoring: Each individual was permitted to undergo two trials, with a period of rest in between. The more accurate trial time was measured and rounded to the closest tenth of a second, serving as the reported score for the test item.[9,10]

TABLE: 1 Circuit Training Variables

Circuit Training Variable	Test
1. Bent knee sit-ups	30 sec.
2. Pull ups	30 sec.
3. Half Squad	30 sec.
4. Skipping	30 sec.
5. High Knee action	30 sec.
6. Huddle Jump	30 sec.
7. Plyometric exercise	30 sec.
8. Back Sit ups	30 sec.

III. RESULTS AND DISCUSSION

TABLE: 2 Comparison of Means of Selected motor fitness components of pre test and post test of 50 meter dash Run

Test	Mean	Standard Deviation	Mean Difference	Standard Error	't' Ratio
Pre-test	7.60	.67	-.38	.148	4.47*
Post-test	7.98	1.04			

*****Significant at 0.05 level.

t.05 (38) =2.04

The average value of the Pre-test and Post-test measurements for the 50m run are 7.60 and 7.98, respectively. The standard deviation values for the pre-test and post-test are 0.67 and 1.04, respectively. The calculated value of the t-ratio is 4.47, indicating that the 50-meter run had a significant effect at the 0.05 level. In order to achieve statistical significance at a significance level of 0.05, the value of the 't' ratio must be equal to or higher than 2.04.

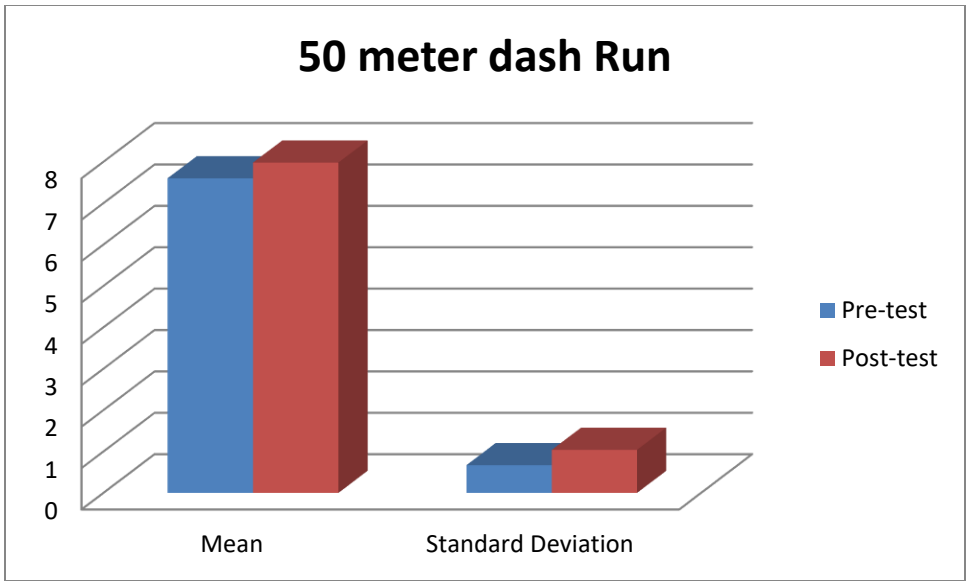

Fig1: pre-test and post-test mean of 50-meter dash run

TABLE: 3 Comparison of Means of Selected motor fitness components of pre test and post test of Shuttle run

Test	Mean	Standard Deviation	Mean Difference	Standard Error	't' Ratio
Pre-test	11.22	.81			
Post-test	11.25	.80	-.03	.13	3.83*

***Significant at 0.05 level.**
t.05 (38) =2.04

The average values of the Pre-test and Post-test scores for the Shuttle Run activity are 11.22 and 11.25, respectively. The standard deviation values for the pre-test and post-test are 0.81 and 0.80, respectively. The calculated value of the 't' ratio is 3.83, indicating that the observed value for the Shuttle Run is not statistically significant at the 0.05 level. In order to achieve statistical significance at a significance level of 0.05, the value of the 't' ratio must be equal to or higher than 2.04.

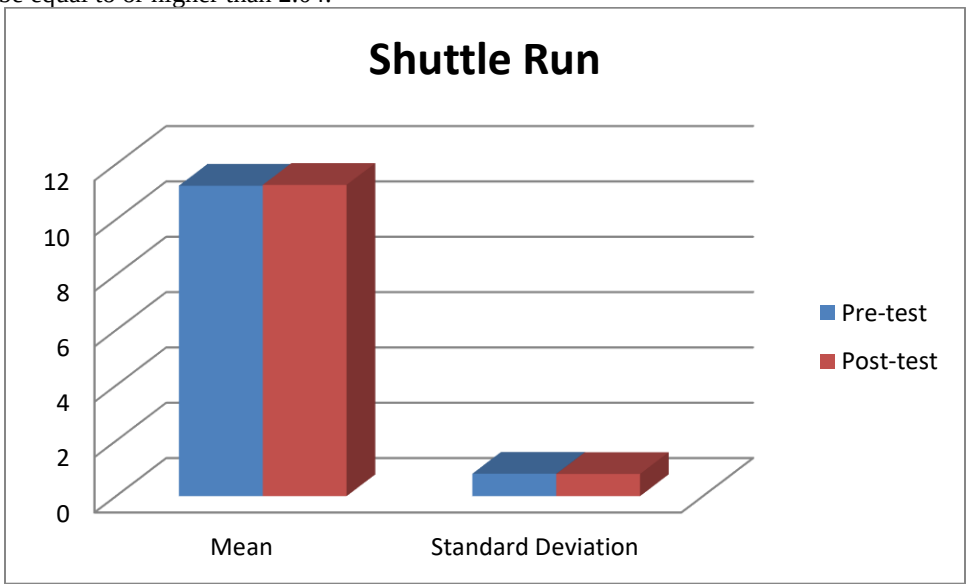

Fig2: pre-test and post-test mean of shuttle run

TABLE: 4 Comparison of means of selected motor fitness components of pretest and posttest of standing broad jump

Test	Mean	Standard Deviation	Mean Difference	Standard Error	't' Ratio
Pre-test	1.77	.24	-.19	.042	2.24*
Post-test	1.96	.26			

*****Significant at 0.05 level.

t.05 (38) =2.04

The average values of the Pre-test and Post-test measurements for the Standing Broad Jump are 1.77 and 1.96, respectively. The standard deviation values for the pre-test and post-test are 0.24 and 0.26, respectively. The calculated value of the 't' ratio is 2.24, deemed statistically insignificant at the 0.05 significance level. In order to achieve statistical significance at a significance level of 0.05, the value of the 't' ratio must be equal to or higher than 2.04

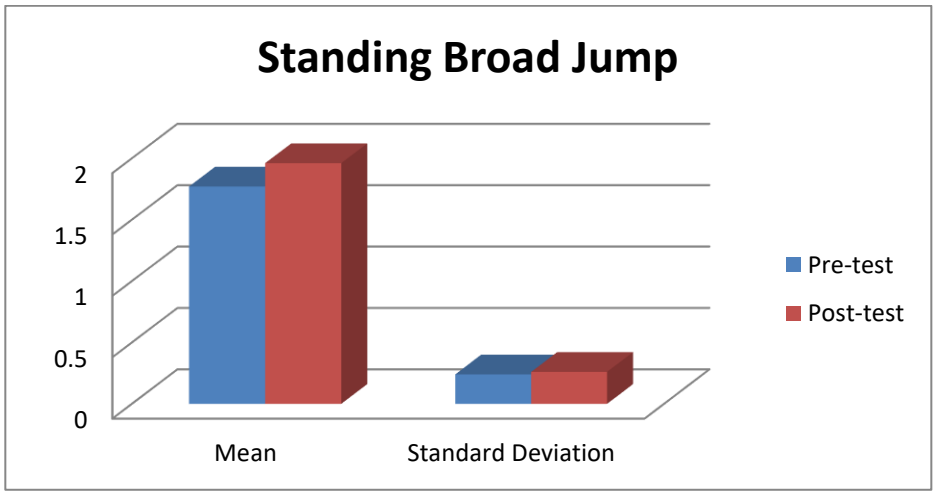

Fig3: pre-test and post-test mean of standing broad jump

TABLE: 5 Comparison of means of selected motor fitness components of pretest and posttest of sit ups

Test	Mean	Standard Deviation	Mean Difference	Standard Error	't' Ratio
Pre-test	26.04	8.33	-.26	1.49	2.72*
Post-test	26.31	9.34			

*****Significant at 0.05 level.

t.05 (38) =2.04

The average values of the Pre-test and Post-test measurements for the The average value of Pre-test and Post-test measurements for Sit-ups are 26.04 and 26.31, respectively. The standard deviation values for the pre-test and post-test are 8.33 and 9.34, respectively. The calculated value of the t-ratio is 2.72, indicating that the observed value of Sit-ups is statistically significant at the 0.05 significance level. In order to achieve statistical significance at a significance level of 0.05, the value of the 't' ratio must be equal to or higher than 2.04.

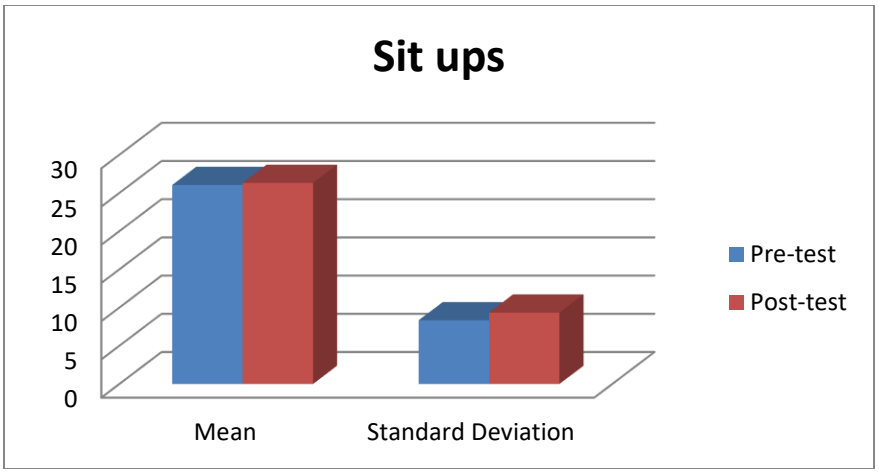

Fig4: pre-test and post-test mean of sit-ups

Based on the data analysis, there was a noticeable improvement in the mean of the Post-test. This finding suggests that the motor fitness of the students is influenced by various factors such as heredity, sex, diet, and age. Additionally, the study revealed that a four-week circuit training program is adequate for enhancing the motor fitness of students at Shri Agrasen PG College. The previously stated hypothesis, which posited that a circuit training plan would significantly influence the motor fitness components of college students, was supported.

Conclusions

A notable disparity was seen between the pre-test and post-test results for particular motor fitness indicators, such as the 50-meter sprint. The physical fitness activities PG College students perform include running, shuttle running, standing broad jump, and sit-ups. The findings above support the conclusion that a four-week circuit training exercise program helped enhance the motor fitness characteristics of college students.

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