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The Effect of Circuit Training and Plyometric Exercise on Agility and Core Strength in Karate Players

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ABSTRACT

BACKGROUND: Since karate is one of the most well-known martial arts and the word"karate" means "empty hand" (kara = empty, te = hand), it refers to the practice of punches,kicks, and blocking moves without the use of weapons.

So the purpose of the study to find dose agility and core strength can can change by after undergoing the certain exercise which are plyometric exercise and circuit training in the maleand female plyers

AIM: To see the effect of Circuit training and plyometric exercise on agility and corestrength in karate players.

METHODOLOGY: Subjects will be selected by using simple random sampling. For inclusion criteria the subject are aging from 12 to 16 years and must be playing 1-2 sessionsper week and willing to consent for the same.

OUTCOME MESURES:

- **T DRILL TEST**
- **CURL UP TEST**

RESULTS:

Based on the results the study have shown that there is significant effect in agility and corestrength of karate plyers who underwent with certain treatment protocol.

KEYWORDS: Plyometric exercise, Circuit training, Agility, Core Strength , Karate players , Curl up test , T Drill test.

INTRODUCTION

Since karate is one of the most well-known martial arts and the word "karate" means "empty hand" (kara = empty, te = hand), it refers to the practice of punches, kicks, and blocking moves without the use of weapons.Although it had its origins on the Japanese. There are two major types of Karate as following·

"Kihon" is a type of fundamental exercise that focuses on repeating and paying attention to particular movements or a blend of motions. "Kumite" workouts involve working out with a partner; the idea is to train intandem rather than against them. The word "kumite" refers to sparring with an opponent; for novices, it involves predetermined moves; for experienced practitioners, it involves "free fighting," which is employed in competitions. [1]

The physical attribute known as agility allows a person to quickly and precisely alter their body position

and direction. It is the capacity to swiftly change direction through a sequence of motions while maintaining and controlling proper body positions. A key element of fitness for success in a wide range of sports is agility. It takes on a significant role in determining an individual's success in sports and physical activities. The capacity to change direction swiftly and precisely is known as agility. Agility in the kumite category refers to the capacity to go forward, backward, and precisely. [2]

Agility in athletes is characterized by a mix of rapid direction changes, good body control, and movement speed. In sports like basketball, cricket, and football, adequate agility is crucial. Martial disciplines like taekwondo, judo, and karate also demand agility. The capacity of the body to move quickly in different directions is known as agility, and it is used in sports like basketball, rugby, and martial arts. [2]

Since every technique made during a match requires physical agility, agility is crucial for karate kumite athletes. Increased balance and reaction time might result from having good agility.

The capacity to change direction swiftly and precisely is referred to as agility.[1]

A karate athlete necessitates changing direction, speed and position in response to the movements of theopponent and must be of a dominant agility to an opponent.

Benefits from improved agility include:

- Increased body control during fast movements.
- Increased intramuscular coordination.

When it comes to human movement, the core is the most crucial part of the body. Since the majority of the body's functional motions start at the core, the majority of movements involving the ankle and lower leg also start there. All of the body's peripheral joints, including the ankle mortise, may function at their peak levels if the core is effective. It is said that the limbo makes up the core. It is where the body's movements start and where our center of gravity is situated. During functional exercise, an effective core enables the best acceleration, deceleration, and stabilization of the complete kinetic chain. In order to effectively distribute weight, absorb force, and convey ground reaction, the core needs to be trained properly.[9]

The "local" and "global" muscular systems are said to regulate the musculature of the core in classical literature. Except for the psoas muscles, which flex the hip joints, the entire group of muscles that begin and end at the vertebrae is referred to as the "local" system. The "local" system's functions include lumbar spine curvature management, assistance with segmental coordination and control, and provisionof sagittal and lateral stiffness to preserve mechanical spinal stability. However, forces from the pelvis and thoracic cage are transferred to the extremities by the "global" system. The "global" system's muscles have longer moment arms of force and bigger larger cross-sectional areas compared to the "local" system's muscles, which makes them perfect for producing force.

Circuit training is a term that is frequently associated with strength training, yet the same concepts that apply tostrength training also apply to honing karate skills. When a player engages in circuit training, he or she visits numerous stations that are set up so that during the practice session, they can work on a variety of talents. The term "circuit training" describes a series of carefully chosen exercises done in order. According to the circuit's architecture, the circuit's original format called for 9–12 stations to make up the circuit. Each circuit training participant performs a 15 to 45 second work session of 8 to 20 repetitions at each station utilizing a resistance of approximately while moving from one station to the next with little (15-30 seconds) orno rest. [9]

Karate player demands can be trained for very well with plyometrics. Training regimens should incorporate periods of recuperation work that mimic the specific karate-related duties that are followed by

repeated high-intensity work. Depth jump, box jump, and jump training are additional terminology that are used in conjunction with plyometric exercise. karate training programs have shown success with plyometric exercise as a means for enhancing motor skills. Plyometric workouts are primarily usedto improve jumping ability and maximal power output. It contains intervals between sets of exercises and drills as well as training weights with several rebounds. Athletes practice abrupt stopping, starting, and direction changes during plyometric training, which helps to increase agility. One of the most powerful methods of sports.[2]

METHODOLOGY

1. Type of study – Experimental Study
2. Study design – Pre and post experimental study
3. Study duration – 6 Months
4. Type of sampling – Simple random sampling
5. Sample size – 68
6. Study setting - Karate Sports Clubs in Miraj and Sangali city

MATERIALS

1. Consent form
2. Plyometric box
3. Cones
4. Measuring tapes
5. Stopwatch
6. Skipping rope

INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA

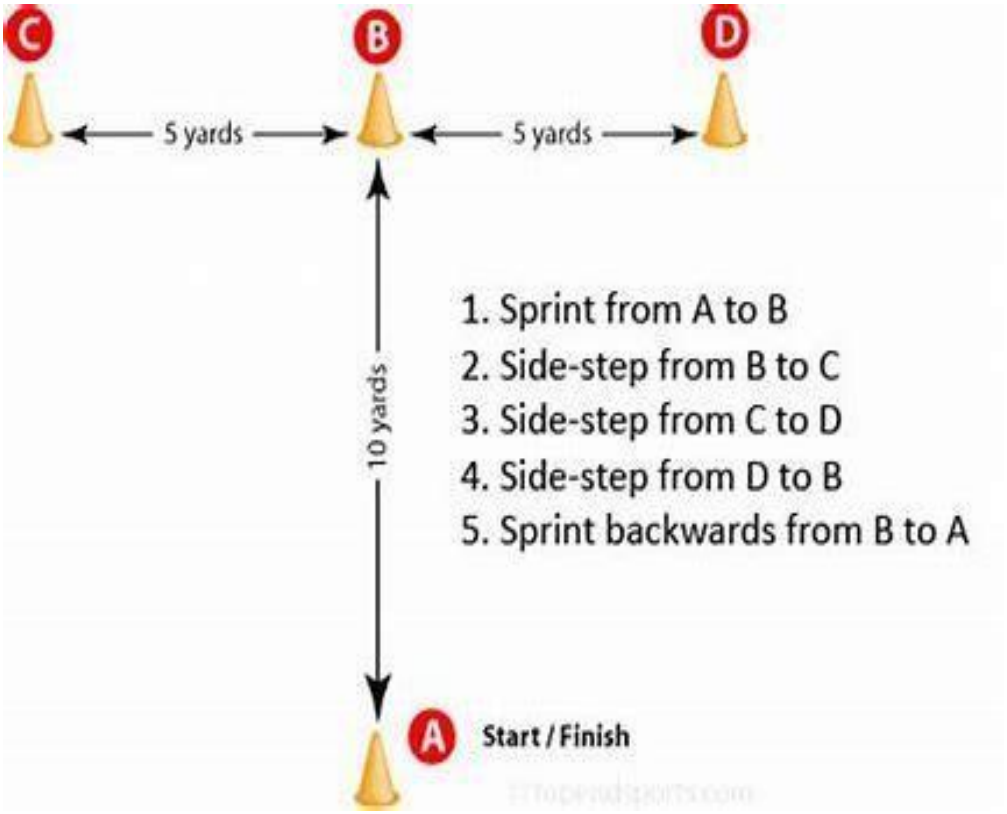
1. Age 12 to 16 years
2. Male and female karate players
3. Must play between 1-2 sessions per week

EXCLUSION CRITERIA

1. Newly practicing players. (For 1 month)
2. Player with any type of injury to muscle or joint.
3. History on any recent musculoskeletal surgery. (Past 6 months)
4. Players with any cardiorespiratory problems.

Players with Neuromuscular problems

OUTCOME MEASURES



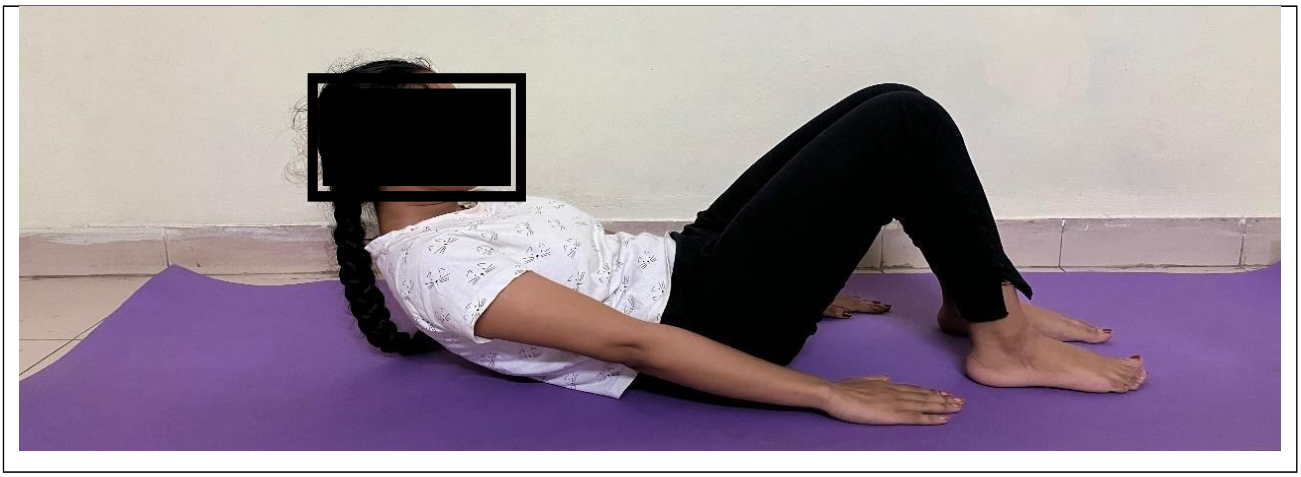
Interpretation of T- Drill test

Category	Males (sec)	Females (sec)
Excellent	< 9.5	<10.5
Good	9.5-10.5	10.5-11.5
Average	10.5-11.5	11.5-12.5
Poor	>11.5	>12.5

Curl – up Test

- Curl-up tests are an evaluation tool for the Fitness program that gauge the strength and endurance of thecore muscles.
- Using a mat with a 12 cm measurement strip, participants tried to perform up to 75 curl-ups at a set rate(1 curl every 3 s, 20 repeats per minute). With their feet flat on the ground and their knees bent 90 degrees, they lay flat on their backs. Weapons were their palms on the mat, extended and parallel to thetrunk. The measurement strip was positioned beneath the knees with the purpose of assisting participants in determining how far to curl up the fingers positioned closest to the edge. Individuals moved their digits from one end of the measurement strip to the opposite side, coiled downward once more.

The total number of curl-ups performed determined the final score.



PROCEDURE

Ethical clearance will be obtained from institutional ethical committee

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Screening will be done

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Subjects will be selected according to inclusion and exclusion criteria

↓

Written consent will be taken

↓

participants will be explained about the study in their vernacular language.

Pre –interventional assessment (Check T Drill test & Curl-up Test and record time of the players)

Plyometric exercises on Monday, Wednesday, Friday and **Circuit training**

On Tuesday, Thursday and Saturday (For six weeks

↓

Post –interventional assessment (Check T Drill test & Curl-up Test and record the time of players)

↓

Statistical analysis

↓

Result

High Jump

High Knees

Squats

1) Circuit Training

	Week 1 & Week 2		Week 3 & Week 4		Week 5 & Week 6	
	Duration(sec)	Sets	D (sec)	Sets	D (sec)	Sets
Tuesday, Thursday, Saturday						
Jumping Jacks	20	3	30	3	45	3
Kicking back	20	3	30	3	45	3
High knee strides	20	3	30	3	45	3
Side hopes	20	3	30	3	45	3
Squat	20	3	30	3	45	3
Flutter kick	20	3	30	3	45	3
Pilates Leg Pulls	20	3	30	3	45	3
Pilates Leg Pulls	20	3	30	3	45	3

2) PLYOMETRIC EXERCISES

	Week 1 & Week 2		Week 3		Week 4 & Week 5		Week 6	
	Repetition	Sets	Rep	Sets	Rep	Sets	Rep	Sets
MONDAY								
Jump Squat	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Jump	15	2	20	2	20	3	20	4
Strides	15	2	20	2	20	3	20	4
Skipping	15	2	20	2	20	3	20	4
WEDNESDAY								
Side way box jump	15	2	20	2	20	3	20	4
Jump over to tuck jump	15	2	20	2	20	3	20	4
Sumo Jump	15	2	20	2	20	3	20	4
Hamstring curl fast	15	2	20	2	20	3	20	4
Jumping on Toes	15	2	20	2	20	3	20	4
FRIDAY								
One Leg Hop jump	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Way Jump	15	2	20	2	20	3	20	4
Depth jump	15	2	20	2	20	3	20	4
Scissor Jump	15	2	20	2	20	3	20	4

RESULTS

DESCRIPTIVE STASTICS

Table no 1 Normality test using Shapiro-Wilk

Variable	Time Frame	z-value	p-value
T-DRILL	Pre	0.952	0.051
	Post	0.962	0.053

CURL-UP	Pre	0.966	0.058
	Post	0.954	0.051

Table no 2 Shows age distribution:

Gender	Frequency	Percent
Male	**42**	**62**
Female	**26**	**38**
Total	**68**	**100**

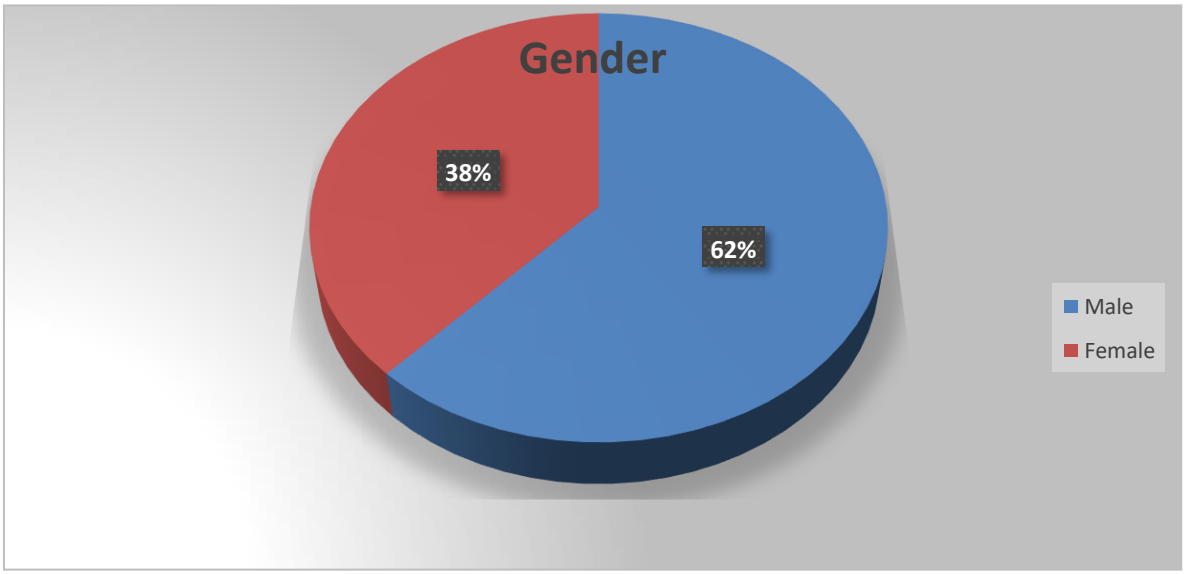
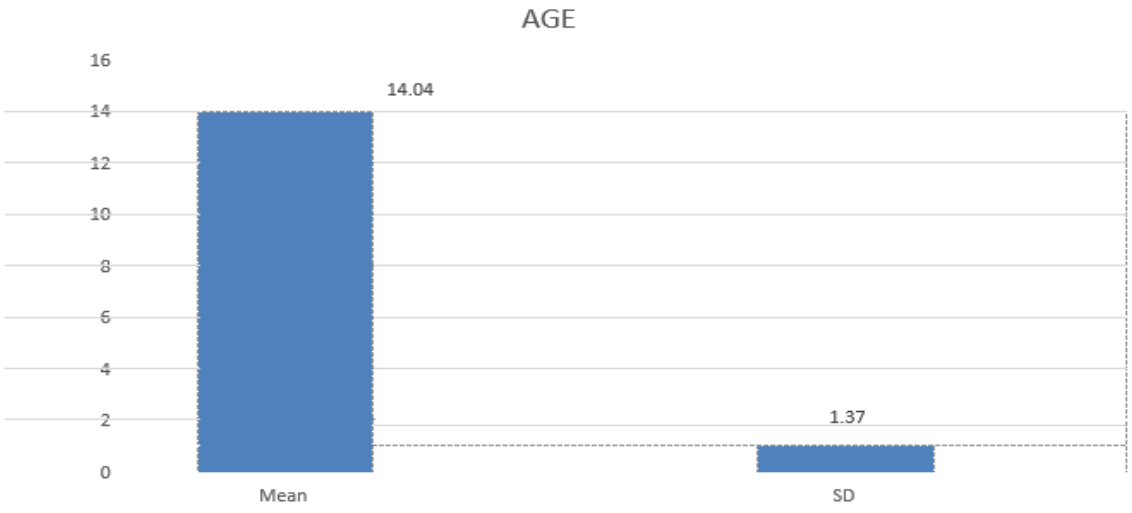


Table no 3
SHOWS DISCRIPTIVE STATISTICS

Variable	Minimum	Maximum	Mean	SD
AGE	12.00	16.00	14.04	1.37

Graph 2



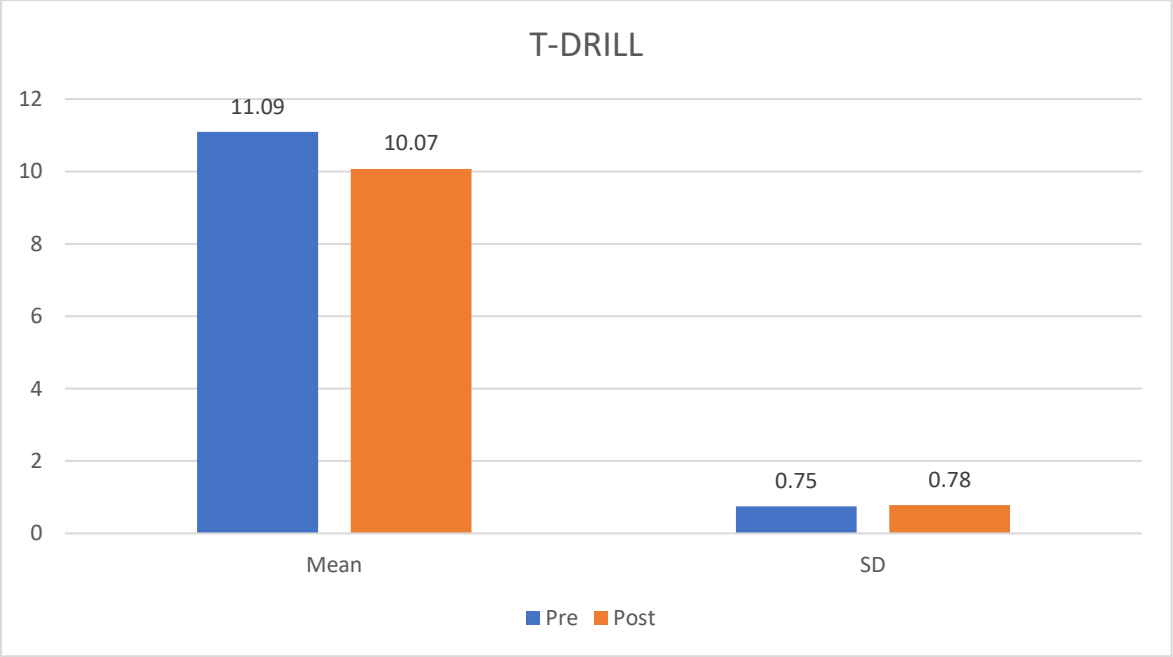
Within group Pre and post test

Comparison of pre-test and post-test scores of T-DRILL by paired sample t test

Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	t-value	p-value	MCID
Pre	11.09	0.75	1.02	0.40	2.52	20.755	0.001*	0.09
Post	10.07	0.78						

MCID was derived by multiplying the SD Diff. by the square root of 0.05 (5% significance level)

The mean value indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the limited consistency with post treatment value which is more than pre value. The effect size or Cohen's D indicates 2.52 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention. MCID represents the smallest amount of change in an outcome that might be considered important by the patient or clinician. The MCID value is 0.09 which is less than 0.50 so it validates the outcome as significant. In the above table it is observed that pre-post treatment mean difference value is greater than the minimal Clinically Important Difference and hence it validates the medical outcome from both the statistical and medical perspective since the difference values are greater than the minimum required values as defined by the standards

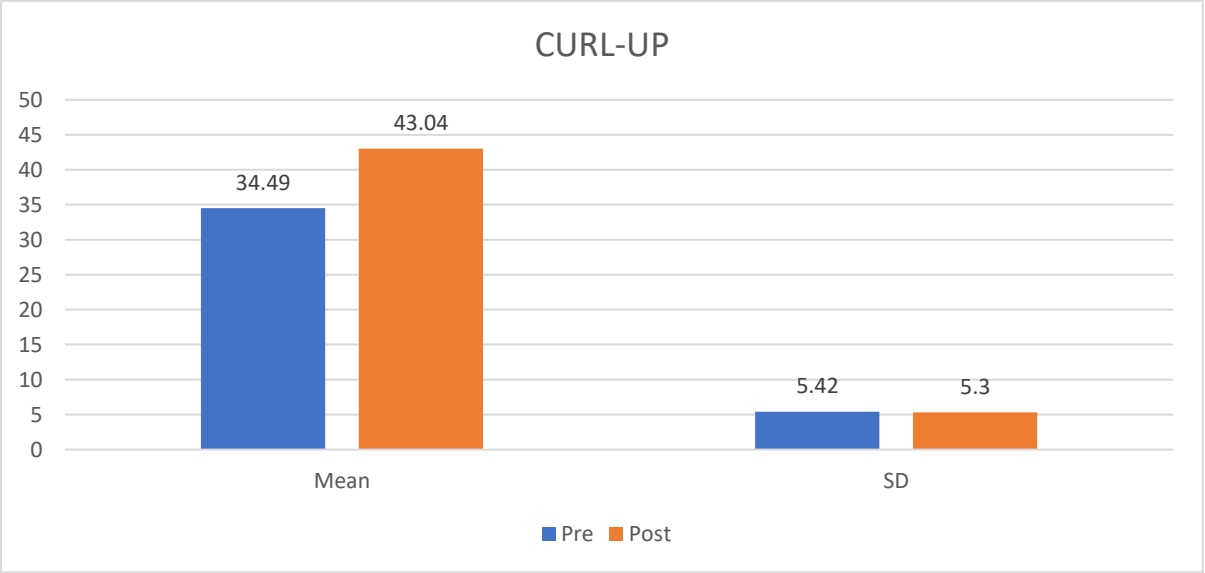


Within group Pre and post test

Comparison of pre-test and post-test scores of CURL-UP by paired sample t test

Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	t-value	p-value	MCID
Pre	34.49	5.42	8.56	1.99	4.31	35.504	0.001*	0.44
Post	43.04	5.30						

MCID was derived by multiplying the SD Diff. by the square root of 0.05 (5% significance level) The mean value indicated changes post treatment and higher values are recorded for post treatment outcome and also the standard deviation shows the limited consistency with post treatment value which is more than pre value. The effect size or Cohen's D indicates 4.31 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention. MCID represents the smallest amount of change in an outcome that might be considered important by the patient or clinician. The MCID value is 0.44 which is less than 0.50 so it validates the outcome as significant. In the above table it is observed that pre-post treatment mean difference value is greater than the minimal Clinically Important Difference and hence it validates the medical outcome from both the statistical and medical perspective since the difference values are greater than the minimum required values as defined by the standards.



DISCUSSION

The purpose of the study is to identify effectiveness of plyometric and circuit training to improve agility and core strength in karate players. one of the combat sports that is most widely practiced worldwide is karate, which is distinguished by high intensity activity that includes explosive and sporadic movements In Karate, cardiovascular endurance is crucial, and with it, agility and core strength. [1]

Basketball training programs have included plyometric training as a helpful technique for enhancing motor execution. The primary purpose of plyometric exercise is to raise the maximal output of power and capacity for jumping. Although the phrase "circuit training" is typically associated with strength training, basketball skill improvement is also impacted by the same concepts. Circuit training is typically responsible to improve cardiacendurance, core strength agility and balance in an individual and hence it is important to a karate player with this all-key element. [2]

An athlete with agility may readily and swiftly alter the position of his body. The term "agility" describes a person's capacity for maneuverability, or their quickness in changing directions while maintaining their equilibrium and spatial awareness.

The effect of an in-season 8-week plyometric training program shows Over the past 25 years, core workouts have received a lot of attention. In sports, fitness, and rehabilitation, the function of the core muscles and a variety of training techniques have been studied to learn how trunk conditioning may impact health and performance. Plyometric training and core stability exercises are now staples of training regimens for athletes aiming to compete. Maximal force translation to the extremities ismade possible by core stability, which stabilizes the body's trunk and spine.

Prior research has examined the impact of core exercises on the physical fitness and performance of male football players at varying levels. The length and frequency of the training routine typically ranged from two to four times per week to twelve weeks. week, in that order Lately, a meta-analysis and systematic review proved the effectiveness of brief CT sessions (less than 300 seconds) conducted twice a week for a minimum of 18 meetings. The CT duration in the present investigation varied between 21 and 28 minutes, and the overall There were sixteen sessions, which is rather close to the recommendation made above. In terms of duration, a two-time-weekly, eight-week integrated training regimen showed an improvement in trunk, upper body strength, and neuromuscular control and agility when in contrast to training in isolation [19]

In our study circuit training including jumping jacks, squats, Pilates leg pull etc. showing Increased muscle endurance which is responsible to enhances the muscle's ability to sustain contractions over time, Enhancing muscular hypertrophy leading to increased protein synthesis and muscle growth. In this way it is improving the ability to perform more curl ups in given time and hence we are checking for agility of karate player as it is directly co relating with abdominal muscle strength which leads to hold the balance of individual as compare to change the direction and position to show next move to opponent in karate.

Role of plyometrics and core rehabilitation in competitive sport showing that Plyometric training is a specialized kind of exercise that involves stretching the active muscles before shortening them; this sort of training typically calls for training in explosive strength. It has been found that this kind of training elicits particular neurological changes, such as greater motor unit activation, while causing less muscular growth than is usually seen following intense static resistance strength training. Plyometric workouts can be performed with or without an external load. Plyometric exercises and heavy strength training are often combined in research, and some studies have indicated that the combination of the two improves power and power-related skills more than either modality alone. [18]

In our study Plyometric exercises like Jump squats, jumping on toes, side jump etc. exercises showing explosive force development, enhanced neuromuscular coordination and greater motor unit activation with increased power output.

Karate is one of the most widely practiced martial arts in the world and a high-intensity combat sport. In karate training, cardiovascular endurance is directly related to technique execution and the level of competence needed to execute it. Due to its potential to postpone weariness and quicken the healing process, it is regarded as a crucial factor in a player's performance. This would lead to a quicker recovery between fights and in between intense exchanges between rounds. [3]

As circuit training is high intensity interval training it will improve cardiac endurance and so agility also hence our study is showing improvement in agility of player after intervention of circuit training.

The effects of a 6-week plyometric training program on agility. **shows result further Subjects improved by more than 10% on the force plate,** 2.93% on the Illinois Agility Test, and 4.86% on the T-test. Our results show that plyometric training increased timings in the agility test measures due to either superior motor recruitment or neural changes, as seen by the significant differences we found for all three tests.

Improvements may have resulted from improved motor unit recruitment patterns, according to the authors of a prior study on plyometrictraining (Potteiger et al., 1999). Athletes typically experience neural changes when their proprioceptive feedback and CNS signal coordination improve and they react or respond (Craig, 2004). Nevertheless, we wereunable to ascertain whether neuronal changes resulted from better facilitation of neural adaptations. [14]

Our study is also fulfilling the same components as previous study showing after intervention of plyometric exercises like increased speed with improvement in neural factors of every individual

Fabio C. Function training for sports. Human Kinetics: Champaign IL, England. 2004. rather than just the harmony between strength and flexibility or between working and non-working muscles—is the essential component of karate training. However, it might also think that the methods employed—like standing on one foot and being able to move without the other body parts falling—are significant for interactive training careers. [15]

The present study is showing that the circuit training and plyometric exercises having very significant changes in the Agility and Core strength of each and every karate player who underwent with certain treatment, and it can suggest that improved agility and core strength will help a player to give a good performance and a easy chance to overcome on the opponent player with less chance of any injury to himself or herself due to improved body mechanism as mentioned above. Further study can also evaluate for the improvement of balance and co ordination in karate player for better performance.

CONCLUSION

The study has shown that plyometric exercise and circuit training have significant effect on Agility and Core Strength of Karate players.