

A Cross Sectional Study to Assess Agility Skills of Kumite Karate Players Aged 15-20 Years in Mumbai Suburban Area

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ABSTRACT

Background: Karate is one of the most popular martial arts, and it describes the fact that it involves the use of kicks, punches, and blocking techniques. Kumite is the term used for sparring with an opponent. Agility is defined as combination of speed of the movements with quick changes in the directions along with good body control. Agility tests are best used for diagnostic purpose to determine which karate athlete is the most agile, and which one requires more additional practice to perform better. Hence, the aim of this study was to evaluate agility in kumite karate players using Illinois Agility Test and T-drill test.

Objective: To evaluate speed of movement, zigzag crossing of kumite karate players, speed, lateral movement and coordination using Illinois agility test and T-drill test respectively.

Materials and Methods: 100 kumite karate players (60 males; 40 females) were selected on the basis of inclusion and exclusion criteria and consent was taken. Subjective details and demographic data were obtained prior to the agility testing. Illinois agility test and T-drill test were performed. The data was obtained and statistically analysed.

Result: Data was collected and then mean and standard deviation was analysed for demographic data such as age (17.43 ± 1.74 years), height (1.65 ± 5.46 cm), weight (53.91 ± 6.04 kg), BMI (19.80 ± 1.36 kg/m²), IAT score (17.58 ± 1.44 seconds) and T-drill test score (10.50 ± 0.92 seconds). Correlation values of BMI and IAT is 0.866 & that of BMI and T-drill is 0.904.

Conclusion: Agility was better in male players than females because male players have more strength, power, more muscle mass and less body fat.

Keywords: Agility, Karate, Kumite, Illinois agility test, T-drill test

INTRODUCTION

Karate is one among the foremost popular martial arts and therefore the word "karate", meaning empty hand (kara = empty, te = hand), describes the very fact that karate involves the practice of kicks, punches, and blocking techniques without the use of weapons.⁽¹⁾

Shotokan karate is one of the oldest styles of karate and was first publicly demonstrated in Japan in 1922 by its modern-day founder Funakoshi Gichin,

though it had originated from the Japanese island of Okinawa in 16th century.⁽¹⁾

The training of karate comprises of three parts:

- "Kihon", basic exercise, which is mainly characterized by the attention to and repetition of specific movements or a combination of movements.
- "Kumite", exercises with the partner; the main goal is to train together with and not against the partner.

- “Katas”, where sequences of different moves are combined.⁽²⁾

Kumite is that term used for sparring with an opponent and ranges from prearranged moves for beginners to “free fighting” for knowledgeable practitioners and for use in competitions.⁽²⁾ Agility is the physical ability that enables an individual to rapidly change the body position and direction in a precise manner.⁽³⁾ It is the ability to maintain and control correct body positions while quickly changing direction through a series of movements.⁽⁴⁾ Agility is an important component of fitness for success in a wide variety of sports. It assumes an important role in predicting the success of people in sport and physical activity. Agility is defined as a person’s ability to change the direction quickly and accurately. In kumite category agility means ability to move forward, backward and sideways and change of direction quickly. Athletes’ agility is defined as combination of speed of the movements with quick changes in the directions along with good body control. Adequate agility is essential in sports like football, cricket and basketball. Agility is also required in martial arts like karate, judo and taekwondo. Agility is the motor ability of the body to make rapid movements in various directions in sports like rugby, basketball and martial arts. Agility is extremely essential in karate kumite athletes because all the movements made during the match require physical agility.⁽⁵⁾ Good agility can lead to increased balance and reaction time.

The tests used to assess agility are:

- Illinois agility test.
- T-drill test.

There are studies showing that it is important to have good agility that would allow karate athlete to strike the opponent with speed and power at any directions. Agility is a multi-factorial physical ability which is affected by explosive strength, speed, balance, muscular coordination, and flexibility. It is extremely important to possess good agility in kumite during which

athletes should be ready to move or change the body position quickly.

Benefits from improved agility include:

- Increased body control during fast movements,
- Increased intramuscular coordination, and
- Decreased risk of injury or re-injury.

A karate athlete necessitates changing direction, speed and position in response to the movements of the opponent and must be of a dominant agility to an opponent. Agility tests are best used for analytical purpose to work out which karate athlete is most agile, and which one requires additional practice to perform well.

However, there is not much research done to assess agility skills in kumite karate players. Illinois agility test and T-drill test are easy and reliable and have been used in many studies to assess agility. Hence, the present study is undertaken to assess agility skills in kumite karate players using Illinois Agility Test and T-drill test.

MATERIALS AND METHODOLOGY

MATERIALS USED:

- Pen
- Paper
- Stopwatch
- Sticking tape
- Cones
- Measuring tape

METHODOLOGY

STUDY DESIGN:

- **Type of study:** Cross-sectional Observation
- **Duration of study:** 1 year
- **Location of study:** Mumbai suburban areas

SAMPLE DESIGN:

- **Type of sampling:** Convenient sampling
- **Sample size:** 100
- **Sample population:** Competitive kumite karate players

SELECTION CRITERIA
INCLUSION CRITERIA:

- Competitive kumite karate players.
- Age group of 15-20 years.
- Experience for more than 2 years.
- Training for 3 days per week for 2 hours or more.
- Participants willing to participate.

EXCLUSION CRITERIA:

- Participants with any recent MSK injury.
- Congenital abnormalities.
- Non-cooperative participants.
- Non-competitive karate players.
- Age greater than 20 years.
- Underwent any recent surgery.

PROCEDURE

Institutional ethical clearance was obtained. Subjects were selected according to inclusion and exclusion criteria. Procedure was explained to participants. A written informed consent was taken from the participants willing to participate in the study. Subjective details and demographic data were obtained prior to the agility testing. Illinois agility test and T-drill test were performed.

Illinois agility test

The length of the course is 10 metres and width (distance between start and finish point) is 5 metres. The start, finish and two turning points are marked by 4 cones. In addition, 4 cones in the centre are placed 3.3 metre apart.

Table 1. Normative values of Illinois Agility Test (IAT)

Category	Males (seconds)	Females (seconds)
Excellent	<15.2	<17.0
Good	15.2-16.1	17.0-17.9
Average	16.2-18.1	18.0-21.7
Fair	18.2-18.3	21.8-23.0
Poor	>18.3	>23.0

The subject warms up for 10 mins. The athlete starts by lying face down on the floor at the Start cone. The therapist then gives the command “GO” and starts the stopwatch. The athlete then quickly jumps to his/her feet and traverses the course around the cones to finish. When the athlete

passes the Finish cone, the therapist then stops the watch and records the time.

T-drill test

The athlete warms up for 10 mins. The therapist places 3 cones 5 metre apart from straight line. The 4th cone is placed 10 metres from middle cone so that 4 cones form a T shape.

The athlete stands at starting point at the base of T facing T. The therapist gives the signal “GO” and starts the stopwatch and the athlete commences the test. The athlete runs to and touches the middle cone, sidesteps to left cone and touches it, sidesteps to far right cone and touches it, sidesteps again to middle cone and touches it and then runs backwards to the base of T and touches the cone and finishes the test.

The therapist stops the stopwatch and records the time when athlete touches the cone at the base of T.

Table 2. Normative values of Agility T-drill Test

Category	Males (seconds)	Females (seconds)
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

RESULTS AND ANALYSIS

Data was collected from the subjects that were selected according to inclusion and exclusion criteria. Data consists of 100 subjects out of which 60 were males and 40 were females. Mean and standard deviation was analysed using SPSS software version 16.0 for all the demographic variables such as age, height, weight, BMI and Illinois agility test and T-drill test.

Normality test was done using Shapiro Wilk’s Test. Correlation was found using Spearman’s correlation coefficient between agility tests and BMI (IAT with BMI) (T-drill test with BMI).

Descriptive Statistics of Karate Kumite Players

	N	Mean	Std. Deviation
Age	100	17.4300	1.73645
Height	100	1.6474	5.46360
Weight	100	53.9110	6.04094
BMI	100	19.8040	1.35653
IAT	100	17.5817	1.43753
T-drill	100	10.5000	.92128

Table no. 1 depicts the descriptive statistics of 100 subjects (60 males, 40 females) having mean age (17.43±1.74 years), mean height (1.65±5.46 cm), mean weight (53.91±6.04 kg), mean BMI (19.80±1.36 kg/m²), mean IAT score (17.58±1.44 seconds) and mean T-drill score (10.50±0.92 seconds).

Table no. 3: Normality Test (Shapiro Wilk Test)

	Shapiro-Wilk		
	Statistic	df	Sig.
Age	.902	100	.000
Height	.980	100	.126
Weight	.986	100	.383
BMI	.965	100	.010
IAT	.900	100	.000
T-drill	.987	100	.436

Table no. 4: Correlation of BMI and Illinois Agility Test Scores

Correlations				
		BMI	IAT	
Spearman's rho	BMI	1.000	.866**	
			.000	
	N	100	100	
IAT	BMI	.866**	1.000	
		.000		
	N	100	100	

** . Correlation is significant at the 0.01 level (2-tailed).

As our data didn't cross normality so accepted null hypothesis and used non parametric tests for calculating correlation (Spearman's)

Table No.5 Regression between BMI and Illinois Agility Test scores

Regressions				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.710	.503	.498	.96076

a. Predictors: (Constant), IAT
b. Dependent Variable: BMI

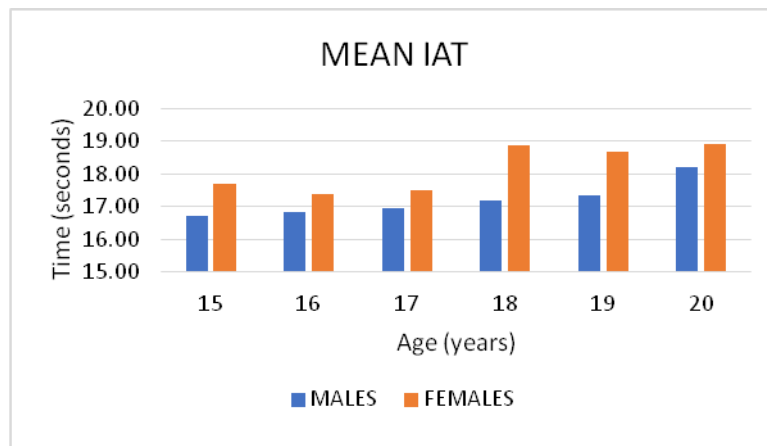
Table no. 6: Correlation of BMI and T-drill Test Scores

Correlations				
		BMI	TDRILL	
Spearman's rho	BMI	1.000	.904	
			.000	
	N	100	100	
TDRILL	BMI	.904	1.000	
		.000		
	N	100	100	

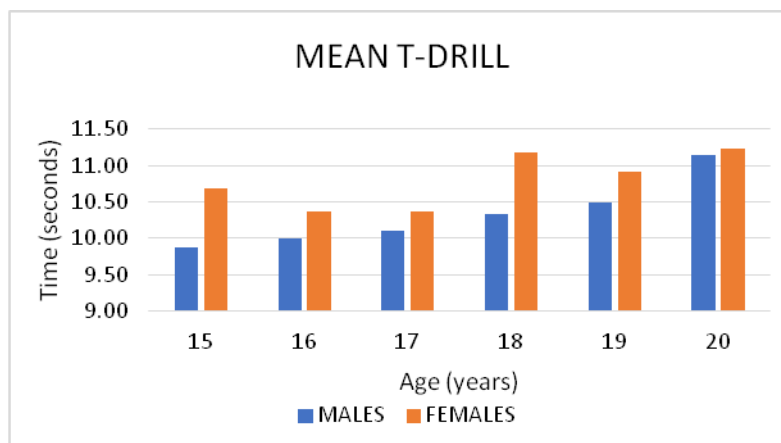
Table no. 7 Regressions between BMI and T-drill test scores

Regressions				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.779	.608	.603	.85419

Predictors: (Constant), T- drill
Dependent Variable: BMI



Graph 1. Mean IAT scores in males and females in the age group of 15-20 years
X-axis shows age group of males and females from 15-20 years. Y-axis shows Mean IAT timing in seconds.



Graph 2. Mean T-drill test scores in males and females in the age group of 15-20 years
X-axis shows age group of males and females from 15-20 years. Y-axis shows Mean T-drill test timing in seconds.

DISCUSSION

Kumite is characterised by quick attacks and it requires several strategies and tactics. Kata athletes need to concentrate on the power and physical strength whereas kumite athletes require physical agility which is a combination of several biomotor components. Therefore, a karate coach should approach differently in assessing and training the kata and kumite athletes to improve the results of the tournaments.⁽⁵⁾

Physical agility is one of the most important requirements for karate athletes to achieve best performance. Only inborn talent cannot bring success but structured and programmed training is also required.⁽⁵⁾ Kumite athletes who have sufficient agility will find it easier to move, avoid opponents attack and counterattack quickly. Kumite athletes can perform better in competitions and can defend and attack quickly and accurately if they have good physical agility. Improvement in agility is made through proper training. The progress made in agility should be measured, observed and recorded. There are no agility tests in kumite category which will exactly match movement patterns in actual kumite competition. For this reason, kumite category requires to have a specific test to decide the athlete's performance improvement. Many researchers hardly found specific agility test for karate kumite category that matched movement patterns, tactics and techniques in real competition.⁽⁵⁾

In karate, agility is indispensable for fast movements in performing various techniques and tactics in various directions by maintaining balance and body co-ordination. Agility is extremely needed in karate because great agility can help the athlete to perform difficult movements and advanced technical skills accurately. The main aim of this study was to assess agility skills in kumite karate players using Illinois agility test and T-drill test. These test results can be used to motivate the athlete's self-improvement and plan their fitness goals.

The study shows that there is a difference of 0.93 sec in the mean score of

Illinois agility test of males and females. But as far as T-drill test is concerned the difference is 0.46 sec. The standard deviation values of IAT test shows that there is a difference of 0.62 sec in the values of male and female players. The difference in standard deviation values of T-drill test in males and females is 0.09 sec. In the present study the agility tests like IAT and T-drill tests are highly reliable and give us comprehensive assessment of high-level mobility.

Training program for the adolescent athletes should be focused on multilateral training with co-ordinating movements of legs and hands in order to prepare the athletes to have perfect range of movements. Agility training is important for improving posture, balance and reaction time. It also improves cognitive functions like perception, memory and executive functions to be effective.

According to Robin Vealey and Melissa Chase, males and females differ on several physical characteristics that influence the agility. Male athletes have larger skeletal muscles and less body fat than female athletes. Male athletes have more strength, power, speed and height than female athletes.

Factors that affect agility in karate kumite athletes are strength, power, neuromuscular control, deceleration, core, technique & flexibility.

IAT & T-drill test were found to be dependable measures of agility in karate kumite athletes between age group of 15-20 years. T-drill test and IAT are reliable and valid measure of agility in athletes involved in sports like football, basketball and martial arts like karate, taekwondo and judo. Coaches may benefit from assessing the movement skills and potential of athletes by using IAT & T-drill tests. These tests may also be of value to conditioning specialists who wish to assess improvement in sports specific fitness as a result of participating in training program. Selection of an appropriate test for a sport should centre on

specificity principle and demands of sports to be evaluated.⁽¹¹⁾

Dewangga Yudhistira, Tomolius, concluded that the construction of karate agility test for the kumite category has high validity. With the documents of test instruments for the construction of karate agility test for the kumite category, the test has high content validity so it can help ensure the construct validity and giving trust to all regarding this instrument.

Younes Hachana et al. found that IAT is a reliable and valid protocol which can be routinely included by sports institutes and coaches within an assessment battery for athletes to evaluate their ability to speed and to change directions. According to him performance is significantly related to speed rather than legs' power.

Yassine Negra et al. strongly recommended IAT and T-test to evaluate agility within young competitive level team sports athletes. These tests could be strongly recommended to evaluate agility within young competitive-level sports athletes. In addition, it seems that agility, speed time, and jumping ability assess the same physical characteristics in young competitive-level team sports athletes.

Perry Stewart et al. found that change of direction speed (CODS) is often considered a main determinant of successful performance in many team sports and is routinely measured using field-based tests. He concluded that Illinois agility test and T-drill test are effective in assessing a general ability to change direction means these tests are highly reliable and valid measures of CODS.

Agility skills of kumite karate players were assessed in our study using IAT and T-drill test. It showed lesser timings of male players than female players. The difference between the male and female players are due to more strength, power, speed, flexibility, more muscle mass & less body fat in male players.⁽¹²⁾

These assessments can be utilised to improve the performance of karate players and to narrow down the difference between

the male and female karate kumite players agility scores.

According to, Dr. Mahesh Singh Dapola and Dr. Bharat Verma et. al, there is significant inverse correlation between BMI and agility of male and female karate kumite players.⁽¹³⁾ In our study we found a significant correlation between BMI and agility, but it was not inversely correlated so there could be various reasons which could have affected the relationship between the two variables. One possible reason could be due to reduction in practice and weight gain during the pandemic period. So, to investigate we did a regression analysis.

CONCLUSION

Agility skills in kumite karate players were found to vary from average to good in male athletes. In female kumite karate players agility skills varied from average to excellent. The factors affecting the agility skills are age, height, weight, BMI, power, strength and endurance. Agility of the male players was better than the female players because the male players have more strength, power, more muscle mass and less body fat.

As the correlation value is (0.87, 0.90) so we did a linear regression analysis to find out the causal relationship which turned out to be (R squared value) 0.5 which shows 50% relationship. That means only 50% of values were able to fit under criteria. So this R squared value which is low but it has statistically significant predictors as these values are associated with changes in response value. So we cannot say precisely that BMI and agility are perfectly correlated. Still further more research needs to be done. The above given results which show high correlation values between BMI and agility can be due to various limitations listed down. One possible reason can be the candidates may have increase in weight due to reduced practice seeing the current scenario of pandemic. Second possible reason could be reduction in number of days of practice.

Due to Covid-19 pandemic there were limitations like availability of participants of age group 15-20 years and wide spaces to conduct the study.

Further studies can be conducted to study the effects of various above-mentioned factors like height, weight, BMI etc. on the agility skills of the kumite karate players.

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