

Kinematic Inferential Indicators of the Front Round Kick Skill (Kisame Mawashi Jerry)

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Nowaday, the world is witnessing a great development in various areas of life, as many phenomena have subjected to general research as the best way to solve many problems and there is no doubt that one of the most important of these areas that are subject to scientific research is the sports field, as this development was clearly reflected on it, which led to increased competition between countries to achieve a head start in the sports field, so that the world championships became a theater in which the heroes and athletes showcased their prowess by showing what they reached from new innovations and kinetic creativity.

Mazen Marwa (2015) stated that human progress in

improving his movements is due to its association with various sciences such as kinetic science, sports training, exercise or physical education through its influence of natural laws and bio-physical theories, and this helps to develop physical and kinetic performance, and improve achievements in sporting events and international championships on various types of sports. (Mazen Marwa 2015, p. 11)

"Adel Abdel-Basir" (1998) indicated that biomechanics plays an important role in the field of skillful learning for beginners, on the basis that biomechanics helps to find and model sports technique and its learning, whether in training programs, or physical education lessons, and based

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on this concept the most important purposes of biomechanics have been defined, through studying sports movement, and based on the use of the foundations of biomechanics to find the most appropriate mechanical solutions for sports performance. (Adel Abdel-Basir, 1998. p. 13.14)

Sareeh al-Fadli (2015) indicated that dynamic mechanics is the science that provides the correct basis for the coach and teacher when teaching and training sports skills, by finding solutions to questions about performance and athletic achievement for the various movements that include push and pull, and the results of kinetic performance, whether quantitative or qualitative, are one of the important necessities that address the problems of kinetic performance and the application of various sports skills which pave the way for making scientific solutions that are concerned with developing training or educational programs by relying on what is measured through the biomechanical values that are extracted through scientific observation and the results of

the use of mechanical laws. (Sareeh Fadli. 2015 p. 18, 19)

Carr (1997 AD) indicated that finding the perfect technical performance in light of the biomechanical characteristics of the human system's motor system, technical requirements and competition laws is a solution to the proposed motor problem and the basis for the first evaluation and reference process for a successful training process (Car.1977. p. 4) Carl (1992) believes that the codified diagnosis of the kinetic abilities of the various sports is linked to the direction and guidance of the training process, as an important relationship appears between them in achieving the necessary goals, as the guidance of training works to select the exercises that are difficult with the skillful performance to cause changes in the level of sports achievement to achieve higher levels.(Carl. 1992 p. 527)

Ahmed Ibrahim (2010) stated that the results of the last world championships and Egypt's obtaining advanced medals in both kata and kumite are the best testimony to the development, and to maintain the global level of our

nullification we must keep pace with science and exploit the capabilities and tools that allow to maintain this level and use modern scientific foundations that aim to prepare well in terms of physical, skill and planning in order to save time and effort. The main goal of karate training is to try to reach the individual to the highest possible level of sports in various championships. (Ahmed Ibrahim 2010, p. 45) "Ahmed Ibrahim" (2002 AD) confirmed that karate is a sport that is characterized by rapid movement performance and sudden and rapid change, which requires the ability to respond quickly to the changing circumstances and conditions of playing throughout the game. The kumite player is fully aware of various offensive, defensive or opposite offensive methods and countermeasures, but during the match, the player does not study any of these methods the opponent will use at any moment of the match, therefore the player is paying close attention to the opponent's moves, in case he is ready to quickly respond to the opponent's sudden methods and respond quickly and

accurately (Ahmed Ibrahim. 2002 P. 137)

Also, "Ahmed Ibrahim" (2005 AD) explained that the sports planning of the karate player (actual combat Kumite) achieves the highest achievement rates during the championship and competition by achieving a balance between the multiple requirements of actual fighting (Kumite) and the levels of the structural structure components of the player's training status. It is clear that the development of the physical and skill state through his promotion of the components of the structural structure of the player's training condition as a whole (Ahmad Ibrahim. 2005 p. 476,475)

Beep (1987) believes that they can be used easily with all basic skills and helping in all directions and times of attack as the kinetic groups of kicks play an important and essential role in the attack because of the advantage of large muscle groups that are characterized by the legs to produce a large power and speed of effectiveness that can be employed in the technical performance of the attack, as it is characterized by the length

of the leg which plays a vital role in exploiting the distance between the player and the opponent (Beep. 1987 p. 95)

Amr Helwish (1997 AD) stated that despite the multiplicity of offensive methods of Kumite, these methods in which the two legs are used, whether in the form of foot moves or kicks, occupy a primary place in weighting the player during the matches, especially after the new amendments in the match Law, which give the player three points if he succeeds in directing one of the kicks in a proper way to the opponent's head and two points when directing the torso, so the player can finish the match in his favor by using one or some kicks successfully between three to four times during the match that lasts three minutes, and thus the game can be decided early for who gets eight points or not, which leads to the possibility of winning during the shortest time and with minimal effort. (Amr Helwish, 1997. p. 52)

Through the researcher's pursuit of tournaments at the local and international levels, he has found that most of the players of kumite games tend to use some punches and kicks

in the matches, especially the front round kick, as it is one of the most common kicks that players use, because of the following advantages:

- Where the player gets three points when performing in the head part.

- The player gets two points when performing it in the trunk area (abdomen, sides, back).

- The preliminary stage is the preliminary stage for most kicks.

- The player wins the match if he performs it three times in the head correctly.

- One of its advantages is that the competitor cannot defend well in the event of an element of speed and accuracy.

- The near distance between the player and the opponent when the skill is performed, because it is performed with the front leg close to the opponent.

The stages of the skill of the front round kick are divided into:

The introductory stage : It includes (combat readiness position- back pivot – rotation

The main stage: It includes (kicking)

- The final stage:** It includes (drag - drop - return to the initial position).

Through the previous presentation and the reference survey of studies and scientific research related to karate sport such as Ahmed Bakr (2010), Ahmed Ibrahim (2002), Muhammad Bureka (1991), Ahmed Al-Dali (2001), Ahmed

Abdel Rahman (2007), Ashraf Al-Shafei (2009), which shows the scarcity of research related to biomechanical indicators.

The researcher also has conducted an exploratory study of some matches to analyze the front round kick.

Table (1)
The result of analyzing kumite matches in the final rounds of 2016/2017 season (n = 20)

Percentage not achieved	Achieved percentage	Percentage of use during the match	Skill
80%	%20	%50	(Kisame Mawashi Jerry) Front Round Kick
%96	4%	%10	Mawashi Jerry
100%	0%	%7	Ura Mawashi Jerry
90%	10%	17%	Kiago Zuki Godan
92%	8%	%13	Kisame Zuki

One of the most important results of this analysis of (20) games was that the kumite players perform this skill continuously, but they did not achieve wining by using it, especially when using it in the head and trunk area and losing three or two points, and thus the player's effort is wasted in these failed attempts during the game, even if they exploit this skill is the optimal use towards its correct kinematic path, as this is done through the proper kinematic property between the body parts, and this achieves the speed, accuracy and

balance of the player, enabling to score (3) points each time the skill is used in the head area, i.e. the match ends in a short time.

The researcher recommends the necessity of taking into account the biomechanical factors accompanying performance in the sports field, and studying the biomechanical variables of the skill, to identify the amount of movement produced by the body parts, as well as its relationship to the index of accuracy of directing performance and its speed

towards the correct kinetic path of the skill, where it is possible through that determining the ideal technique for performing and correct direction to achieve the goal of kinetic performance of the skill in the game.

This prompted the researcher to conduct the research to identify some of the biomechanical indicators and relationship to the skill of the front round kick of the kumite players as a scientific method to solve this problem and achieve the most points in karate sport.

The importance of research and the need for it:

Scientific importance:

-This research constitutes one of the scientific foundations that increase the development of achievements and performance in karate, especially kumite.

-This study highlights the importance of the scientific method to perceive knowledge and information related to some biomechanical indicators of the skill of the front round kick of karate athletes.

Applied importance: It is considered one of the scientific attempts to raise the level of skill performance of the kumite players, through the use of mechanical analysis of performance.

-This research is considered a guide for coaches of karate sport in general and kumite in

particular as it draws the attention of coaches to assess the level of skill performance and overcome the competitor as one of the important solutions to win the match and achieve the highest level of performance.

The Aim of the Research:

The aim of the research is to study of some biomechanical indicators of the skill of the front round kick for the kumite players by identifying:

-The level of technical performance of the player of the sample of research.

-Biomechanical indicators of the skill of the front round kick of the research sample

Questions of the Research:

-The first question: What is the level of technical performance of the model player (the research sample)?

-The second question: What are the biomechanical indicators of the skill of the front round kick of the research sample?

Plan and Procedures of the Research

Research Methodology:

The researcher has used the descriptive method (case study) using the kinematical analysis to suit the nature and purpose of the research in order to identify the biomechanical variables of the skill of the front round kick using simi motion analysis program.

Research fields:

The Human Field:

The research sample was chosen in an intentional way, represented in the model player from the first-class Kumite players, who holds the Republic Championship and distinguished in performing the skill of the front round kick.

Time field :

Filming took place on Wednesday 5/7/2019 at 12.00 pm, under the supervision of specialists at the laboratory of biomechanics, College of Physical Education, Assiut University.

Community and Sample of the Research

Research Community:

The research community represents karate players registered in the Egyptian Karate Federation under (20) years.

The Research Sample:

The research sample was chosen in the intentional way, represented in the model player, who is a karate player and registered in the Egyptian Karate Federation for the year (2020), and gets the Republic Championship and distinguished in performing the skill of the front round kick in karate (kumite).

**Table (2)
Description of the research sample**

Training age	Age	weight	Mass gram	length	No.
12	19	470.88	48	168	1

Table (2) shows, the basic data (length - mass / kg - weight / newton - age - training age) for the analytical sample that performed the skill under research (at the left side)

Presentation and Discussion of the Results of the First Question

The technical performance level was evaluated by photographing the skill performance with a video camera and the video was shown to five arbitrators, where the researcher used a

committee composed of five accredited arbitrators registered in of the Egyptian Karate Federation, from the first-class referees. (Attachment 1), they evaluated the performance in terms of technical performance, where each arbitrator gave a score of (10) degrees, and the highest and lowest score were omitted, so that the player's score is the average of the three average scores, and the following table shows the skill performance evaluation:

**Table (3)
Evaluating the skillful level of the sample under research**

standard deviation	average	Name of the skill
0.32	9.47	Front Round Kick Skill (Kisame Mawashi Jerry)

Table (3) shows the average and the standard deviation for the level of performance of the skill of the front round kick, where the average of the score of performance was (9.47) and the standard deviation was (0.32).

Presentation and Discussion of the Results of the Second Question:

The averages of the biochemical variables

"displacements, total speeds, total wheels, angles, angular speeds and angular wheels" during the selected time moments, and the averages of the biochemical variables "exerted power and amount of movement" during the chosen moments of the chosen anatomical points of the skill of the front round kick of the player are displayed:

Presentation and discussion of the results of the elements of the temporal composition of the skill of Kisame Mawashi Jerry:

**Table (4)
Chronology of the Front Round Kick Skill (Kisame Mawashi Jerry)**

percentage	Time	Technical stages
% 14	0.23	The beginning of the movement
% 11	0.18	Stability mode
% 17	0.27	Leave the ground
% 12	0.20	Lift the leg parallel to the floor
% 6	0.10	Hitting
% 7	0.11	Lower the leg parallel to the floor
% 17	0.27	Stability mode
% 14	0.22	Return to the standby mode
% 100	1.59	Total

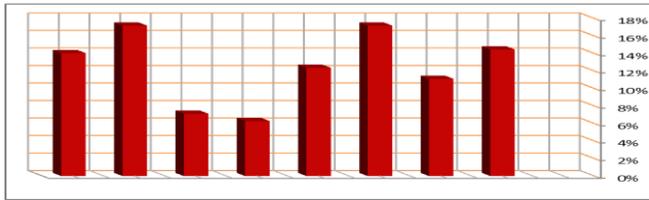


Figure (1) Chronogram Calculation of Technical Stages of Front Round Kick Skill (Kisame Mawashi Jerry)

By reviewing the times of successive skill stages, it becomes clear that the stage of establishing stability and leaving the ground was the longest compared to the different performance stages:

This is due to the fact that leaving and re-balancing require the player a period of time to focus on performance and help to achieve better for the same parameters (time) compared to the rest of the stages as performed as preparation for later stages.

It is also clear that the stage of hitting or kicking took a time

of (0,10 seconds), which is the main part of the skill under discussion in which the kinetic duty is accomplished, because the basic kicking stage (hitting) requires speed as it requires the element of surprise and the speed of the reaction from the counter

attack.4/1/2Presentation and discussion of the results of the biomechanical indicators (kinematic and kinetic) of the upper part of the skill of the front round kick skill (Kisame Mawashi Jerry):

Table (5)

Linear kinematic and kinetic variables of the upper part of the skill of the front round kick (center of body weight)

center of body weight						position
Total power	Total power	Total of the amount of movement	Total wheel	Total speed	Total Displacement	
Newton	Second ² *kg meter/	meter/Second*kg	Second ² meter/	/second meter	meter	
4685.88	477.66	28.01	9.95	0.58	1.25	The beginning of the movement
4454.50	454.08	27.89	9.46	0.58	1.24	Stability mode
2723.00	277.57	11.51	5.78	0.24	1.32	Leaving the ground
903.28	92.08	12.47	1.92	0.26	1.37	Lift the leg parallel to the floor
10214.03	1041.19	14.26	21.69	0.30	1.38	Hitting
3121.11	318.16	6.92	6.63	0.14	1.36	Lower the leg parallel to the floor
4469.58	455.62	16.35	9.49	0.34	1.36	Stability mode
2207.06	224.98	25.88	4.69	0.54	1.25	Return to the standby mode

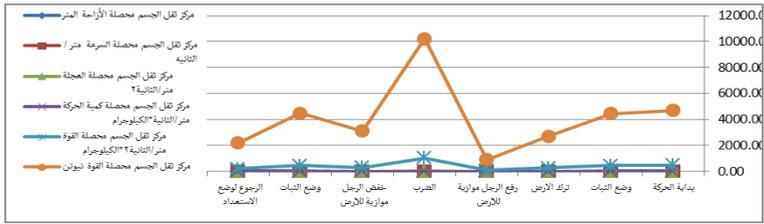


Figure (2)

Linear kinematic and kinetic variables of the skill of front round kick (center of body weight

It is clear from the table (5) and Figure (2) the variables of the center of the body weight for the front round kick during the different stages of performance, where the values

of each kinematic variable of the (displacement - speed - wheel) and the kinetic variable (the amount of movement - power)

Table (6)

Linear kinematic and kinetic variables of the upper part of the skill of the front round kick (Center of head weight)

center of head weight						position
Total power	Total power	Total of the amount of movement	Total wheel	Total speed	Total Displacement	
Newton	Second ² * meter/kg	/Second*kg meter	Secon /d ² meter	secon /d meter	Meter	
93.69	9.55	0.93	2.73	0.27	1.75	The beginning of the movement
113.49	11.57	1.04	3.30	0.30	1.74	Stability mode
204.33	20.83	1.84	5.94	0.52	1.72	Leaving the ground
139.66	14.24	1.71	4.06	0.49	1.63	Lift the leg parallel to the floor
200.09	20.40	1.21	5.82	0.35	1.60	Hitting
262.66	26.78	1.38	7.64	0.39	1.60	Lower the leg parallel to the floor
412.92	42.09	2.16	12.01	0.62	1.80	Stability mode
84.67	8.63	1.00	2.46	0.28	1.76	Return to the standby mode

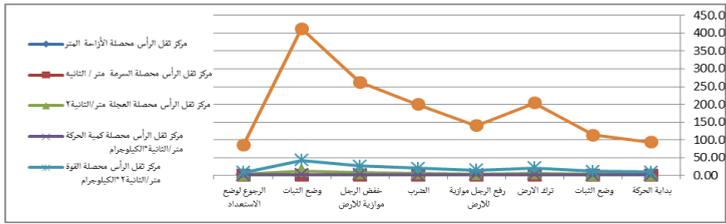


Figure (3)

Linear kinematic and kinetic variables of the skill of front round kick (center of body weight

Table (6) and Figure (3) show the variables of the center of the body weight for the front round kick during the different stages of performance, where the values of each kinematic

variable of the (displacement - speed - wheel) and the kinetic variable (the amount of movement - power) have been shown

Table (7)

Linear kinematic and kinetic variables of the upper part of the skill of the front round kick (Center of trunk weight)

center of trunk weight						position
Total power	Total power	Total of the amount of movement	Total wheel	Total speed	Total Displacement	
Newton	Second ² *k meter/g	/Second*kg meter	Second ² meter/	second meter/	meter	
2989.72	304.76	15.85	12.52	0.65	1.35	The beginning of the movement
3100.63	316.07	14.70	12.99	0.60	1.34	Stability mode
2507.96	255.65	6.48	10.51	0.27	1.39	Leaving the ground
799.52	81.50	8.13	3.35	0.33	1.36	Lift the leg parallel to the floor
6806.43	693.83	9.57	28.51	0.39	1.35	hitting
1271.47	129.61	5.24	5.33	0.22	1.34	Lower the leg parallel to the floor
3430.93	349.74	8.95	14.37	0.37	1.45	Stability mode
1172.12	119.48	14.15	4.91	0.58	1.35	Return to the standby mode

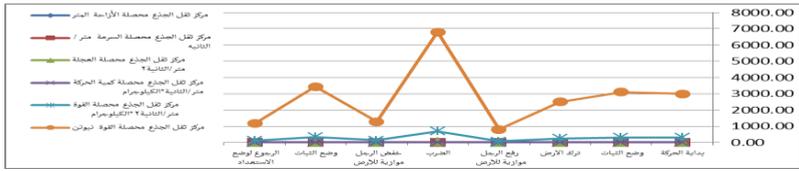


Figure (4) Linear kinematic and kinetic variables of the skill of front round kick (center of trunk weight)

Table (7) and Figure (4) show, the variables of the center of trunk weight of the skill of the front round kick during the different stages of performance, where the values

of each variable of the kinematic (displacement - speed - wheel) and kinetic (the amount of movement - strength) are clear.

Table (8) Linear kinematic and kinetic variables of the upper part of the skill of the front round kick (Center of right humerus)

right humerus						position
Total power	Total power	Total of the amount of movement	Total wheel	Total speed	Total Displacement	
Newton	Second*k/meter/g	/Second*kg/meter	Second/meter ²	second/meter/	meter	
43.03	4.39	0.68	3.51	0.54	1.29	The beginning of the movement
61.41	6.26	0.66	5.02	0.53	1.26	Stability mode
134.78	13.74	1.11	11.01	0.89	1.24	Leaving the ground
114.85	11.71	0.95	9.38	0.76	1.25	Lift the leg parallel to the floor
62.25	6.35	0.75	5.08	0.60	1.22	hitting
126.21	12.87	0.46	10.31	0.37	1.20	Lower the leg parallel to the floor
123.57	12.60	0.61	10.09	0.49	1.36	Stability mode
45.13	4.60	0.63	3.69	0.50	1.30	Return to the standby mode

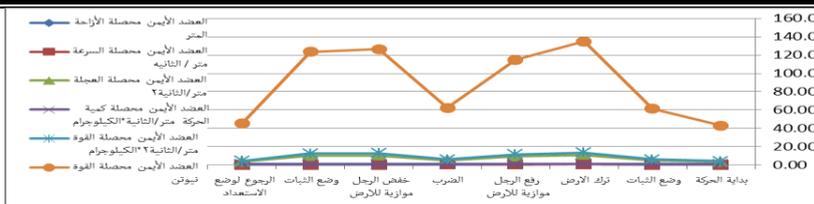


Figure (5) Linear kinematic and kinetic variables of the skill of front round kick (center of right arm weight)

Table (8) and Figure (5) show the variables of the center of right humerus weight for the skill of the front round kick during the different stages of

performance, where the values of each kinematic variable (displacement- speed- wheel) and kinetic (amount of movement - strength).

Table (9)

Linear kinematic and kinetic variables of the upper part of the skill of the front round kick (Center of left humerus weight)

left humerus						position
Total power	Total power	Total of the amount of movement	Total wheel	Total speed	Total Displacement	
Newton	Second ² *k meter/g	/Second*kg meter	Second ² meter/	second meter/	meter	
57.19	5.83	0.89	4.67	0.71	1.52	The beginning of the movement
91.04	9.28	0.83	7.44	0.67	1.53	Stability mode
104.05	10.61	1.07	8.50	0.86	1.58	Leaving the ground
114.55	11.68	0.43	9.36	0.34	1.45	Lift the leg parallel to the floor
74.89	7.63	0.35	6.12	0.28	1.46	hitting
57.90	5.90	0.58	4.73	0.46	1.47	Lower the leg parallel to the floor
164.39	16.76	0.68	13.43	0.55	1.62	Stability mode
56.77	5.79	0.77	4.64	0.62	1.52	Return to the standby mode

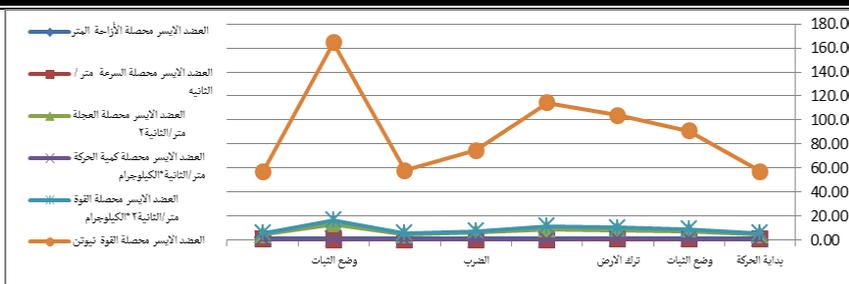


Figure (6)

Linear kinematic and kinetic variables of the skill of front round kick (center of left humerus weight)

Table (9) and Figure (6) show the variables of the center of humerus weight for the skill of the front round kick during the different stages of

performance, where the values of each kinematic variable (displacement - speed - wheel) and kinetic (movement amount - strength) are shown.

Table (10)
Linear kinematic and kinetic variables of the upper end of the skill of the front round kick (Center of right forearm weight)

Center of right forearm weight						position
Total power	Total power	Total of the amount of movement	Total wheel	Total speed	Total Displacement	
Newton	Second ² *k meter/g	/Second*k meter	Second ² meter/	second meter/	meter	
51.60	5.26	0.44	4.21	0.57	1.24	
76.40	7.79	0.51	6.24	0.67	1.19	Stability mode
211.83	21.59	1.00	17.30	1.30	1.17	Leaving the ground
182.58	18.61	0.71	14.91	0.92	1.33	Lift the leg parallel to the floor
71.91	7.33	0.65	5.87	0.85	1.31	hitting
107.92	11.00	0.39	8.81	0.51	1.28	Lower the leg parallel to the floor
122.72	12.51	0.40	10.02	0.52	1.36	Stability mode
42.92	4.37	0.45	3.51	0.58	1.27	Return to the standby mode

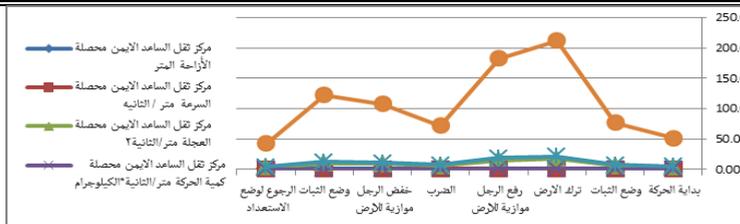


Figure (7)

Linear kinematic and kinetic variables of the skill of front round kick (center of right forearm weight)

Table (10) and Figure (7), show the variables of the center right forearm weight for the skill of the front round kick during the different stages of performance, where the values of each kinematic variable (displacement - speed - wheel) and kinetic (the amount of movement - strength) are clear.

Through the previous presentation of biomechanical indicators of the biochemical

variables averages, “displacements, total velocities, total wheels, angular velocities and angular wheels” during the chosen moments, and the averages of the biochemical variables “the power exerted and the amount of movement (the amount of kinetic congestion) during the chosen moments of the chosen anatomical points of the skill of the front round kick of the

kumite players in the Arab Republic of Egypt.

By reviewing the times of successive skill stages from Table (4/1), it becomes clear that the stage of establishing stability and leaving the ground was the longest compared to the different performance stages, due to the fact that leaving and re-balancing require from the player a period of time to focus on performance and also help to achieve better dynamic performance compared to the rest of the stages. It is also performed as a preparation for subsequent stages as the leg-raising stage parallel to the ground and the hitting stage.

Table (4/1) also shows that the hitting or kicking stage took a time of (0.1 w), which is the main part of the skill under study in which the kinetic duty is accomplished, because the basic kicking stage (hitting) requires speed as it requires the element of surprise and the speed of response from the act of counterattack.

It also presented that the stage of leaving the ground and returning to the position of stability is the longest time within the stages of performance, where the total

time of the stage was (0.27 s) each reached (17%) of the total time of skill, and the researcher contributes this to the movement shift of the striking leg through a period of focus attention to create kinetic accuracy of the skill. Also, returning to the stability position requires the player to maintain balance during performance, especially in the match (kumite)

The foot movements between preparing and moving for hitting and then returning to the position of stability again play a very important role in karate and kumite competition, and in this regard Sharif Al-Awadi (1994) (171) asserts that the movements of the feet in kumite are great basis and as a base that can be used to perform and develop many skills and different values. (Sharif Al-Awadi. 1994. p. 171 (Reviewing the results of the tables (4/2) (4/3) (4/4) (4/5) (4/6) (4/7) (4/8) (4/9) (4/10) (4/11) (4/12) (4/13) (4/14) (4/15)

Biomechanical indicators (kinematic and kinetic) for the skill of the front round kick, it is clear to us that the variables of the center of the body parts weight of the skill of the front round kick

during the different stages of performance where the values of each of the kinematic variables (displacement - speed - wheel) and kinematic (amount of movement - force) have been shown.

Kumite skills are characterized by high speed in performance and require a high degree of balance and moving by more than one part of the body at the same time with a very small base during the performance of some skills and also require a certain degree of strength and agility performed through a group of kicks and the researcher believes that the front round kick is one of the most important offensive skills of karate and due to the following: Spatial and temporal displacement of kicks make the attacker safer than exposure to counterattack by the opponent, the strength of the two muscles of the legs makes the kicks stronger and more influencing the opponent, especially at the moment of hitting.

This is consistent with what Wajih Shamandi (1993 AD) mentioned (214), that the kinetic kicks groups play an important and essential role in the attack because of their advantage in employing large

muscle groups that the two legs characterized by to produce a large power and effective speed to employ them in the skillful performance of the attack and on the other hand, they are characterized by the length of the leg, this plays a crucial role in the distance between the attacker and the defender (Wajih Shamandi. 1993. p. 214)

It is noted from the results of the tables that the largest sum of the speed of the trunk during the final stage (returning to the position of preparation) as this stage requires the player to return to the position of balance very quickly as a result of maintaining the body position from the counter attack after the moment of hitting, while the largest sum of power for the body is during the moment of hitting and as a result of the strength exerted by the player during the performance for trunk and swing the striking leg.

The researcher also believes that the highest values of the outcomes of displacement, speed, wheel, quantity, kinetic momentum and the power of effort exerted during performance of the hitting

stage, as a result of the spatial shift acquired during performance and that the angular change rates during this stage were the most and the highest amount of analogues in other technical stages.

This is consistent with what was stated by "Adel Abdel-Basir" (1998 AD) (22) that the mechanical properties of the kinetic system for humans enjoy working as a mechanical series and if there is a large quantitative displacement in a less time for the body parts, the achieved mechanical rates are the largest and highest in the kinematic values and if compared with the body mass will have the highest values in kinetic rates. (Adel Abdel-Basir. 1998. p. 22)

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