



P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIIF): 5.38
IJPESH 2023; 10(6): 182-187
© 2023 IJPESH
www.kheljournal.com
Received: 05-07-2023
Accepted: 06-08-2023

Dr. Waleed Abdul-Ameer Almani
College of Literature, Wasit
University, Iraq

Biomechanical determinants of sweeping (Uchibarai) and straight fist (Uraken) fighting for some exercises simulating karate

Dr. Waleed Abdul-Ameer Almani

DOI: <https://doi.org/10.22271/kheljournal.2023.v10.i6c.3154>

Abstract

The purpose of this paper is to identifying the biomechanical determinants as a function of developing some simulation exercises for the combined attack of imbalance by sweeping (Uchibarai) and striking with the back of the fist (Uraken) in karate. The descriptive “case study” approach was used with motor analysis at the first level to identify the technical aspects of the performance due to its suitability and the nature of the research. First-class karate players, and the sample was tested intentionally from among the distinguished players in performing the combined attack, “Unbalancing by sweeping (Uchibarai) and striking with the back of the fist (Uraken)” with an open weight, and the player performed 5 attempts, the fourth attempt was analyzed for obtaining the highest estimated score. One of the most important results reached by the researcher is that: When performing the combined attack performance, imbalance by sweeping (Uchibarai) or striking with the back of the fist (Uraken), the average values of the instantaneous values of the biomechanical variables of the body’s general center of gravity vary during the three stages of the performance (preliminary - main - final), and when performing the first part of the main stage (Sweeping - Uchibarai), the leg parts work in different directions, with varying strength horizontally and vertically, increasing horizontally and vertically heavier. One of the most important recommendations recommended by the researchers is that: Paying attention to the combined sweeping attack with striking with the back of the fist as part of the kumite attack methods and not limiting it to strikes, and using the suggested exercises during the special physical preparation period for open weight karate players.

Keywords: Performance, imbalance, preliminary

Introduction

The development of skills individually or in combination in a manner different from what is used in performing the specific sporting activity may lead to the brunt of the actual performance falling on the weaker side of the participating muscles, and thus the development process becomes in a direction other than the purpose for which it was used, i.e. the necessity of performing the movements can be confirmed. And the exercises used with the aim of improving the level of physical fitness or any of its elements in a way that is as close as possible to the content of the original movement in the required job or work (Al-Bashihi, 2000) [1].

Biomechanics has an important role in the field of education and training. Exercise is the main means of analyzing the symptoms of physical culture, and it cannot be practiced properly unless it has been well researched, relying on biomechanics to find the correct technique.

As the primary goal of most types of sporting activities is to achieve what is faster, higher, and stronger, and this means from the point of view of mechanics, doing mechanical work as much as possible in directions contrary to external conditions. This means exploiting mechanical energies to create movement of the highest degree for it, and on this basis, the general objectives of it is possible to formulate general principles and foundations for the art of optimal performance for many types of mathematics.

Ignoring attention to this does not stop at deducting the player’s grades, but rather causes injuries to the players.

Corresponding Author:
Dr. Waleed Abdul-Ameer Almani
College of Literature, Wasit
University, Iraq

One of the most common causes of common injuries to the players of the Egyptian national karate team is performing the technical aspects incorrectly, and this causes injuries to the ankle, knee, and the calf and front thigh muscles.

This type of attack scores a full point when it is executed. Rather, the matter goes beyond this and gives the player a full point when he succeeds in simply throwing the opponent off balance, even if he does not fall to the ground. The referee must not rush to stop the match with the word "okra" because this often leads to nullifying the effect. Sweeping or throwing methods, and the referee must give the player at least two seconds after sweeping to allow him to show his follow-up to this method during this period (Abdel Qader. 2022) [4].

(Wajba Ahmed Shamandi. 2002) [8] also emphasizes that the transfer takes place when performing the method from the torso to the limbs, and it is classified within the complex motor structure, which is the most difficult sports classification, as it aims to achieve more than one basic mechanical goal, and therefore it is considered a system of individual movements that take a specific format and with special requirements for each. From these words (Mukhtar Salem. 1999) [7].

It is also noted that this method is included in the educational fight when a player is promoted. Although this combined method is performed in one direction, which is the competitor, the different parts of the body work in opposite directions. When the entire leg is separated from the longitudinal axis forward, the striking fist comes closer to the longitudinal axis. When the sweeping leg touches the opponent's leg, the opposite happens, in addition to the fact that this method requires the balance of the player performing it, so that it does not reflect on him, as well as the general shape taken by the toes of the sweeping leg and the pulling force (Mohamed Saeed Abu Al-Nour. 2010) [9].

One of the combined attack methods is disrupting the balance by sweeping, Uchi striking sweep braai, followed by striking with the fist (Uraken). This method includes performing a skill with the upper extremity and a skill with the lower extremity and is known as (Uchibarai Uraken).

Open-weight players are among the players who need this style most because they do not have an opportunity to perform kicks due to their high weight. Despite the ease of moving the front leg during the attack by tightening the blows with the hand, the sweeping style is not widely used (Brain Ariel. 2004) [11].

Based on what the International Federation of Karate has pointed out, it becomes clear the importance of this method: imbalance with a striking sweep, followed by a strike with the back of the fist, and the grades it achieves for the player. Looking at studies related to the same field, it was noted that they focus on separate skills, usually for the lower extremity. Of the body without being exposed to this method, despite its importance in actual or educational combat, so the researcher turned to studying the biomechanical determinants as a function of developing some simulation exercises for the combined attack of imbalance by sweeping (Uchi brai) and

striking with the back of the fist (Uraken) in karate.

Research objective

The current research aims to identify the biomechanical determinants as a function of developing some simulation exercises for the combined attack of imbalance by sweeping (Uchibarai) and striking with the back of the fist (Uraken) in karate. This is achieved by answering the following questions:

1. What are the biomechanical changes in the combination attack (unbalancing by sweeping (Uchibarai) or striking with the back of the fist (Uraken)?
2. What is the relationship between biomechanical variables in performing the Uchibarai sweeping technique followed by striking with the back of the fist (Uraken). Back fist?
3. What is the contribution rate of biomechanical variables in performing the striking sweep (Uchibarai) style of imbalance followed by striking with the back of the fist (Uraken). Back fist?
4. What are the simulation exercises for the combined attack, imbalance by sweeping (Uchibarai) and striking with the back of the fist (Uraken).

Search terms

Combined attack in the current research (procedural definition).

Disrupting balance by striking sweep (Uchi braa) followed by back fist strike. This method includes performing a skill with the upper extremity and a skill with the lower extremity and is known as ((Uchibarai- Uraken) (Stefane, oyns 2003) [10].

Research methodology and field procedures

Research Methodology

The descriptive "case study" approach was used with motor analysis at the first level to identify the technical aspects of the performance due to its suitability and the nature of the research.

Community and sample research

First-class karate players, and the sample was tested intentionally from among the distinguished players in performing the combined attack, "Unbalancing by sweeping (Uchibarai) and striking with the back of the fist (Uraken)" with an open weight, and the player performed 5 attempts, the fourth attempt was analyzed for obtaining the highest estimated score.

Data collection tools

Arbitrators' method

Kinetic analysis

Because the complex attack under study belongs to the two-dimensional spatial division, video and a computer equipped with a video card were used, and following the analytical method to find the body's center of gravity the following was done:?

Table (1) shows the estimated score and percentage of the opinions of some karate referees regarding the level of attempt performance

Attempts	High level performance (5)	Medium level performance (3)	Low level performance (1)	Estimated score	Percentage %	Ranking
1	45	3	0	48	96	2
2	35	9	0	44	88	4
3	40	6	0	46	92	3
4	50	0	0	50	100	1
5	40	6	0	46	92	3m

Thus, the fourth attempt became the attempt under analysis

First: Preparing the filming location and tools

This site includes a set of tools

- 330 digital zoom video camera. It has an internal lighting feature.
- Camera tripod with water level and measuring tape.
- Battery as a power source to operate the camera, video tape recorder
- Computer, peripheral connections, to connect it to the camera to clearly see the performance for the judges
- Beams whose lengths are known accurately to determine the scale of the drawing upon analysis. Their number reached (6) beams with a length of (90 cm) for each of them.
- The error in measurement accuracy was calculated as the length of the beams used was 30 mm on the images with an average of 30 mm and a standard deviation of zero. The researcher attributes this to the presence of a water

balance in the holder and its use with the camera as well.

- The drawing scale is 30:1.

Second: Preparing the player

The player wore shorts and was physically prepared, followed by drying his body and placing guide marks on the joint points.

Third: Extracting data to obtain some biomechanical variables**First stage**

By printing the pictures, the stages of the performance were divided into (a preliminary stage), (A main stage, the first part of which is balancing by sweeping (Uchibarai), the second part of which includes striking with the back of the fist (Uraken) (The final stage is returning the first, then bouncing back).

Table 2: shows the Calculating the chronogram of the complex attack by sweeping imbalance

Period name	Cadres number	The number of time periods separating the cadres	Time in seconds
Introductory stage	Zero-28	28	1, 17
Main stage (Sweeping then beating)	28-32	Sweeping 28-30	2
		Beating 30-33	3
Final stage	33-119	86	0, 2 0, 12 3, 58

It is clear from Table (2) that the images amounted to 120 images with an interspace distance of 119, and by dividing them by the camera frequency of 24 fps/s, the time taken for the overall performance reached (4.9516 T) The time per cadres became 0.04 seconds.

Second stage: Using the steps of the analytical method to find the body's center of gravity

- The length of each of the longitudinal axes for each part of the body was determined, and using the ratios of the radii (Fisher), the position of the center of gravity of each member was determined separately, and it was considered that the longitudinal axis of the torso is the line connecting the middle of each of the horizontal axis connecting the shoulder joints. And the middle of the horizontal axis of the thigh joints.
- The center of gravity of each member was determined on the longitudinal (Y), horizontal and (X) axis.
- -The distance of the member's center of gravity from the vertical axis (Y) was multiplied by the member's relative weight using ratios (Fisher and Brown) and was summed and divided by the player's weight, as well as the horizontal dimension (X) and was summed and divided by the player's weight for the right and left sides.
- Thus, vertical and horizontal coordinates of the center of gravity of masses of body parts (CG) were determined.

Statistical methods

Use Excel to calculate the estimated score for the player's attempts, and to compensate in the previous equations. Use the statistical program SPSS to extract the relationship between the study variables and calculate the contribution percentages of the variables to the resultant propulsion and speed of the limbs of the kinematic chains of the fist and foot.

Results and Discussion

It is clear from Table (3) that the total time for the method

reached 4.96 seconds, and the main stage was the fastest stage of performance with a time of 0.21 seconds, at a rate of 4.2%, followed by the preliminary stage with a time of 1.17 seconds, at a rate of 23.53%, and the final stage included the return of the fist. The retracement is 27.72%, with a time of 3.58.

Table 3: Shows Initial measurements of the stages of performing a complex attack Disruption of balance by sweeping (Uchibarai) and striking with the back of the fist (Uraken)

Stage	Introductory	Main	Final	Total time
Time	1, 17	0, 21	3, 58	4, 96
Percentage	23, 53	4, 20	72, 27	100, 00

The researcher attributes this arrangement to the fact that the main phase is composed of two parts, the first with the foot and the second with the fist, and this composition makes the complex attack need speed of execution and the speed of the main phase, and this is what made it come late in the ranking of attacking skills among high-level players, and this is based on pointed out. (Yasser Al-Sayyid Ashour. 2004) [6].

The researcher reduces the increase in the height of the variables in the main stage, the moment of sweeping for force, and the momentum remains vertical only, and the propulsion increases vertically, horizontally, and as a result. This is due to the decrease in the momentum remaining to positive absorption after achieving the mechanical goal of the movement, so that the skill gradually transforms from movement to stability. As for the increase in values, it is considered consistent. With the basis of the starting force and the most appropriate position to extract the maximum force (Ahmed Saeed Al-Dali. 2001) [5], this is because the integral of the (force-time) function between two moments represents the amount of force influence or push (force push), which is required to transform from one position to another (Egyptian Karate Federation, Karate Competition Law, 2001) [3], and this is clear from the figure the next.

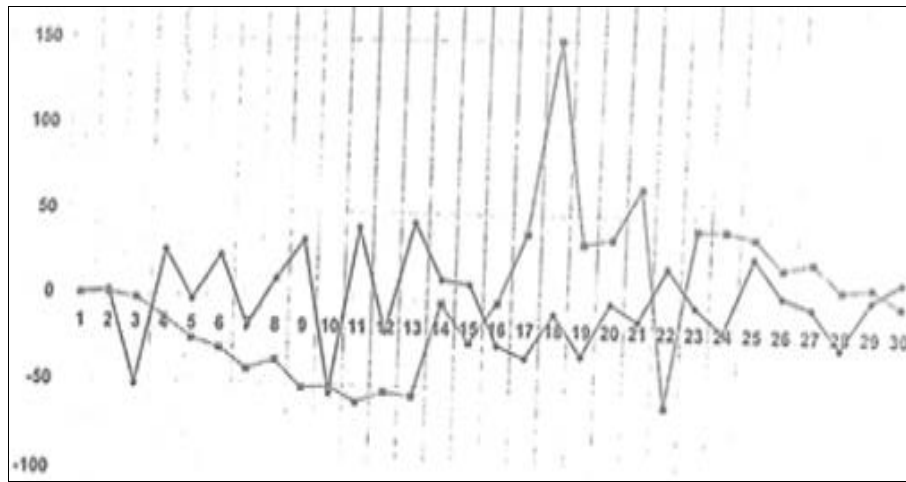


Fig 1: The geometric path of the wheel from the preliminary stage to the final return of the fist during the performance of the compound attack, sweeping imbalance (Uchibarai) Striking with the back of the fist (Uraken)

The path of the newly created wheel to the center of transporting the body is considered an appropriate path expressing the principle of the wheel’s path, as it agreed with what was indicated by (Al-Khalidi. 2019) [2], where the mechanical basis indicates the necessity of the path of the wheel to be permanently straight or curved, and this is noted from the value. The instantaneous value (1) in the preliminary stage until the instantaneous value (13), passing through the

main stage and until the return of the fist in the final stage. The shape appeared to be wavy from the instantaneous value (14) to (23) and this is due to the beginning of the moments of rebound occurring at those moments, and it began again on the curved path without undulations starting from the instantaneous values (24) to (03) the end of the performance and rest.

Table 4: shows the Linear instantaneous values of the biomechanical variables (foot) of the imbalanced leg during the performance of the combination attack, imbalance by sweeping (Uchibarai), striking with the back of the fist (Uraken)

Performance stages		Image	Force (N)		Resultant force	Pushing (n/s)		Resultant Pushing	
			Y	X		Y	X		
Preliminary stage		0-4	0.0	0.0	0.0	0.00	0.00	0.00	
		4-8	0.0	0.0	0.0	0.00	0.00	0.00	
		8-12	1.2	0.0	1.2	0.19	0.00	0.19	
		12-16	-8.6	0.0	8.6	-1.28	0.00	1.38	
		16-20	8.6	1.2	8.7	1.38	0.19	1.39	
		20-24	5.1	2.1	5.5	-0.81	0.33	0.87	
Main stage		Clash	28-32	-33.6	-22.2	126.8	-5.38	-19.55	20.28
			sweep	32-36	-18.7	58.6	61.5	-3.00	9.37
		strike	36-40	-33.0	65.1	73.0	-5.28	10.42	11.68
			40-44	61.0	-73.4	95.5	9.75	-11.75	15.27
			44-48	37.2	-49.7	62.0	5.95	-7.95	9.92
Final stage		48-52	0.0	-16.1	16.1	0.00	-2.57	2.57	
		52-56	0.0	7.4	7.4	0.00	1.19	1.19	
		56-60	0.0	1.2	1.2	0.00	0.19	0.19	
		60-64	0.0	-7.4	7.4	0.00	-1.19	1.19	
		64-68	1.2	-19.0	19.1	0.19	-3.05	3.05	
		68-72	-7.4	108.2	108.5	-1.19	17.32	17.36	
		72-76	2.4	66.9	66.9	0.38	10.71	10.71	
		76-80	-17.2	-1.2	17.3	-2.76	-0.19	2.77	
		80-84	13.7	8.6	16.2	2.19	1.38	2.59	
		84-88	8.6	-8.6	12.2	1.38	-1.38	1.95	
		88-92	-7.4	7.4	10.5	-1.19	1.19	1.68	
		92-96	0.0	-1.2	1.2	0.00	-0.19	0.19	
		96-100	-1.2	9.8	9.9	-0.19	1.57	1.58	
		100-104	8.6	-17.2	19.3	1.38	-2.76	3.09	
		104-108	-8.6	16.1	18.2	-1.38	2.57	2.92	
108-112	8.6	-7.4	11.4	1.38	-1.19	1.82			
112-116	-8.6	0.0	8.6	-1.38	0.00	1.38			
116-120	7.4	0.0	7.4	1.19	0.00	1.19			

It is clear from Table (4) that the net force of the foot increases at the moment of impact and decreases at the moment of sweeping. The thrust increases at the moment of impact and decreases at the moment of sweeping. The

horizontal force is greater than the vertical force. Likewise, the vertical thrust is greater than the horizontal. At the moment of sweeping the force decreases horizontally and increases vertically and the resultant decreases. As for the

thrust, it is lower horizontally and vertically than before, but the horizontal values are less than the vertical ones.

Table 5: Contribution percentage of variables (Force- Conservation of momentum - push) by the leg is the resultant force of the foot performing the sweeping

Variables	Partial regression coefficient	Standard error	Degrees of freedom	Calculated T value	Contribution percentage%
Fixed amount	9, 471		5	0, 542	-
FGGY	0, 315	0, 023		-0, 127	0, 1
FGGX	0, 172	-169, 0		-0, 821	0
MGGY	7, 228	-180, 0		-0, 014	0, 06
MGGX	2450, 94	-312, 0		-0, 246	0, 84
IMGGr	9	0, 601		3, 092	0

It is clear from Table (5) that the highest percentage of contribution to the variable of the resultant force of the foot was due to the MGGX, 84%, MGGY, 0.06%, FGGY, 0.01%. Thus, the variables (force vertically, momentum remaining

vertically and horizontally) depend on the center of gravity. The arm affects 100%, but in a different way than the contribution of the center of gravity variables of the body as a whole.

Table 6: shows the percentage of variables (force- Conservation of momentum - push) in the arm in the resultant speed of the fist

Variables	Partial regression coefficient	Standard error	Degrees of freedom	Calculated T value	Contribution percentage%
Fixed amount	0, 063		5	3, 472	-
FGGY	0, 002	0, 13		0, 786	0, 09
FGGX	0, 017	-0, 379		-2, 264	0, 06
MGGY	0, 016	0, 455		2, 566	0, 02
MGGX	0, 011	-0, 303		-1, 666	0, 01
IMGGr	0, 01	-0, 175		1, 072	0, 82

It is clear from Table (6) that the highest percentage of contribution to the variable of the resultant velocity of the fist was for the variable of the resultant of the propulsion at a rate of 82%, followed by force vertically, then force horizontally, then momentum remaining horizontally, and finally horizontal thrust, and that the variables (Vertical force, momentum remaining and horizontally, propulsion. The horizontal and its resultant effect is 100%. Here, the variables that affect the arm on the fist are (vertical force, the momentum of movement remaining vertically and horizontally, the horizontal thrust and its resultant) differ from the variables that affect the leg on the foot, which are (Force is vertical, momentum remains vertical and horizontal), the

resultant thrust of the arm is important for the resultant speed of the fist, and the amount of movement remaining horizontal for the leg is important for the resultant force of the foot. The researcher attributes this to control of the arm at the moment of impact, so as not to cause injuries, and decreases in the amount of movement are a requirement for controlling performance and also an appropriate application of the sports law regarding the prohibited actions section, Article The eighth category is the second, which concerns preventing methods that cannot be controlled by their nature and expose the opponent to danger. Methods are dangerous and uncontrollable, regardless of whether they reach the goal or not).

Table 7: shows the qualitative and quantitative description of the combined attack and the proposed exercises according to the results of the analysis of biomechanical variables

Description of performance stages			
Preliminary	Performance over instantaneous values Instantaneous values of (28:0) Approach with the back leg and move the front leg towards the opponent. The arms are in a ready position; the torso has a slight bend, looking at the opponent.	In-stage performance characteristics There were variations in the instantaneous values used for the speed of movement of the body as a whole, especially the legs. The time reached 1.17 seconds, representing 23.53% of the total time.	Exercises 1-Speed and agility A- (Preparedness pause): Performing the combined attack, sweeping and striking with the back of the fist in advance. 2- (Body weight resistance) Standby with the rubber rope attached to the middle Performing a combination attack by sweeping and striking with the back of the fist.

Table 8: shows the qualitative and quantitative description of the combined attack and the proposed exercises in light of the results of the analysis of biomechanical variables

Description of performance stages	First stage Second stage		
	Main	Performance over instantaneous values The first part is the momentary values from (30:28) Raise the thigh and leg, then extend the knee to sweep the opponent with the foot upward, while leaning on the successor's leg and torso in good manner.	Performance over instantaneous values The instantaneous values of the force vertically are higher than the horizontal ones at the moment of collision, but they reflect the moment of sweep, so they increase horizontally and decrease vertically, and the time is 0.08 seconds, at a rate of 01.61%.

	The second part is the instantaneous values from (33:30). Before the foot hits the ground after sweeping, extend the arm to strike with the fist	At the moment of striking, the resultant force and momentum decrease, the resultant velocity increases, increases vertically and decreases horizontally with a time of 12 seconds and a rate of 2.42%.	1-Arm speed (Standing ready with the rubber rope attached to the wrist) Performing the strike with the back of the fist 2-(Standing ready to carry weight) bend and extend in the direction of striking.
--	--	--	--

Conclusions and Recommendations

Conclusions

1. When performing the combined attack performance, imbalance by sweeping (Uchibarai) or striking with the back of the fist (Uraken), the average values of the instantaneous values of the biomechanical variables of the body's general center of gravity vary during the three stages of the performance (preliminary - main - final).
2. When performing the first part of the main stage (Sweeping - Uchibarai), the leg parts work in different directions, with varying strength horizontally and vertically, increasing horizontally and vertically heavier.
3. When performing the second part of the main stage (striking with the back of the fist - Uraken), the parts of the arm work in different directions, varying due to the resultant speed, force, propulsion, and the momentum remaining horizontal and vertical, and the resultant strike is done before the foot hits the ground.
4. The resultant push to the center of gravity of the body as a whole has the largest role in the contribution rate to the resultant grip speed and the resultant foot force.
5. The resultant thrust of the arm has the largest role in the percentage of contribution to the resultant speed of the fist, while the momentum remains the largest role in the resultant force of the foot.
6. The proposed simulation exercises vary depending on the biomechanical characteristics of each stage of performing a complex attack.

Recommendations

1. Paying attention to the combined sweeping attack with striking with the back of the fist as part of the kumite attack methods and not limiting it to strikes.
2. Using the suggested exercises during the special physical preparation period for open weight karate players
3. Motivation to perform imaginary combat sentences (kata) that include changing directions, for example (Ansu-Kunkudai - ambi).
4. Performing other studies similar to the current study of a combination attack that contains the skills of two legs and arms.

References

1. Al-Bashihi MR. Effects of elastic ropes on muscular ability and performance level in karate, unpublished master's thesis, Faculty of Physical Education, Helwan University; c2000.
2. Al-Khalidi MJM. Sports Biomechanics, University of Kufa, Najaf; c2019.
3. Egyptian Karate Federation, Karate Competition Law; c2001.
4. Qader RA. Biomechanical determinants as indicators for training in the Tkatchev skill on crossbars of different heights, Scientific Journal of Sports Sciences and Arts. 2022, 3.
5. Al-Dali AS. Biomechanical determinants of some offensive lower limb skills for choosing specific exercises in karate, Master's thesis, Faculty of Physical

Education for Boys, Helwan University; c2001.

6. Al-Sayyid Ashour Y. Biomechanical characteristics of preparatory skills as a basis for developing specific exercises for selected motor endpoints on the horizontal bar, doctoral dissertation, Faculty of Physical Education, Helwan University; c2004.
7. Salem M. Karate is an art, strength and skills, 1st edition, Al Maaref Printing and Publishing Establishment, Beirut; c1999.
8. Shamandi WA. Preparing the karate player for the Theory and Practice championship, Khattab Press, Cairo; c2002.
9. Abu Al-Nour MS. The effect of developing some visual abilities on the effectiveness of the counterattack among beginners of kumite in the sport of karate, Journal of Sports Sciences and Arts, Faculty of Sports Education for Girls, Al-Jaziza, Helwan University. 2010, 26.
10. Stefane, Oyns. sport technology and the improvement of performance of athletes, Department sport science University stullenosch, south Africa; c2003. p. 19.
11. Ariel B. Action in sport, by E& FN Sport, an imprint of Routledge ll New Fetterlane, London EG4p 4EE; c2004.
12. Hassan BB. Sports injuries and modern rehabilitation techniques. Al-Mizan Press, Al-Najaf Al-Ashraf; c2019.