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Comparison some of Biomechanics Variables to Jump Shot from a 45° Angle from the Area of the Three Points in Front of the Defender or without for the Player and Ball in Basketball. Analytical Research

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ABSTRACT

Present study aimed to comparison some of biomechanics variables to jump shot from a 45° angle from the area of the three points in front of the defender for the player and ball in basketball. Descriptive research design method with two styles such as analytical and comparison was used to conduct current study because it is suitable to the nature of the study.5 players of advanced category represented a Serwan Noy club at Sulaimaniah City. Jump shot from a 45° angle in front of the defender or without. Researcher analyzed the attempt in which the ball goes in of ring directly without touch the ring after back from board. Mean, standard deviation, and independent T-test were used to analyze the results of present study. Study concluded a significant difference in angle of the shoulder joint variable at the moment the ball left the hand and in favor of shot in front of defender but no significant difference in ball and body angles variables between two cases in front of defender or without. In addition, no significant difference was shown in kinematic variables of the player and ball between two cases the shot in front of defender and without but in favor of shot without defender. There was a deficiency in subjects in a variable of maximum height of the body mass gravity center in shooting in front of the defender, who is supposed to be higher than the case of the shooting without a defender.

Keywords: Biomechanics variables, Jump, Area of the three points, Defender, Basketball.

1. Introduction

Number of studies have been started to analyze the stable shoot especially the free-shoot because it needs to balance and control of the movements of the player through the stages of performance, and then studies have developed to include jumping shoot from different angles and distances (Diyar,2009),these studies were without a defender, and these studies are important because they identify wrong reservoirs and strengths points in performance in order to place the solutions to correct the error and investment of positive advantages to improve the performance.

The nature of play and its different activities are witnessing continuous conflict between the attacker and the defender in all play areas and increasing concentration of defense against cases of shoot of various forms and rarely we find cases of shoot without jumping unless shoot the ball without control of defender. So defend player can face shooter by using movements permitted under international law of basketball. However, continuing conflict between the attacking team and the defending team until the player will be had the safest opportunity to shoot.

Shoot jumping performance requires many things from shooter such as an automatic performance including high jump and shoot angle of the ball and the ideal force that lead to the speed required to achieve an appropriate height to the ball in order to achieve a perfect entry angle to the basket as well as the balance during the flight and maintain the right track of the ball and taking into account external factors which affecting the shoot of which the skill of the defender and right timing to acquire a ball or legal obstruction to prevent the player from shooting freely. However, a good and an excellent control in basic skills is one of the main things on which depends the success of the match, and to determine the outcome of the match depending on the points recorded between the two teams, which in turn depends on the move strategy and fast performance and accuracy of the acquired basic skills to be undertaken in a manner distinct and sophisticated with a degree of speed and accuracy (Hanks, 1988).

To increase the interest of the team in which players are characterized by the highly skill in the shoot, given that the International Federation of Basketball has been added an arc which is its border end of the arc of free throw circle and give a concession to the team by making the value of the successful throw which perform from behind of the three points arc, nevertheless, jumping shoot accuracy has been developed significantly from nearby areas of the basket and even distant ones which perform from outside of the three points arc, so the International Federation of Basketball was decided to do amendment to the three points area through deport arc of the three points to back (6.75 m) (International Federation of Basketball, 2013) in order to make scoring process being more difficult and reduce the high rates for the success of the far shoot.

The main concern for the coach and the player is to develop physical, movement, skill, psychological abilities in order to play a required role in matches. Shoot accuracy is the most important thing which results of the match depend on. Furthermore, to identify the most important mechanical variables for jumping shoot from a corner (45) degrees from outside the three-point arc in front of the defender and without and also knowing the differences between the cases of shoot in front of defender or without. So no study has investigated the comparison some of biomechanics variables to jump shot from a 45° angle from the area of the three points in front of the defender for the player and ball in basketball.

2. Methodology

2.1 Participates

Descriptive research design method with two styles such as analytical and comparison was used to conduct current study because it is suitable to the nature of the study. 5 players of advanced category represented a Serwan Noy club at Sulaimaniah City, and table (1) showed subject characteristics.

Table (1)
Shows subject characteristics

Variables	Mean	SD	Coefficient of variation	Low and high limits	Rang
High. M	1.814	0.059	3.25	1.74-1.92	0.18
Mass. Kg	72	8.51	11.82	60-84	24
Weight. Kg	706.3	83.5	11.82	588.6-824.0	235.4
Age. year	22.2	1.72	7.75	20-25	5

Table (1) showed that subject was homogeneity at all variables of study where coefficient of variation was of 3.25 – 11.82 which is a high coefficient of homogeneity. Al-Tekrity & Al-Aubedy (2012) said that normal homogeneity placing between Zero-30% but homogeneity is high if it is closer to zero (Wadeea & Mohammed, 2012).

2.2 Tests

Testing of jumping shoot from angle of 45° against the basketball defender was conducted after receiving the ball from another player and be a defender under the basket and as soon as the coach handing the ball to the shooting player, defender goes toward him to start the defense (Rojas *et al*., 2000). We also have achieved the same test without defender and given five attempts for each player with defender and without. Researcher analyzed the attempt in which the ball goes in of ring directly without touch the ring after back from board, process of shot has been done from outside of the three-point arc.

2.3 Scientific observation technique

Scientific observation technique was conducted by using camera which its speed is 25 photo per second where placed vertically on the player with a distance of (10m) and the height of the camera lens (1.50 m) angle (90) degree. Whereas camera that covers the basket was a 10-meter rise (3.05 m) angle (90) degree, either third camera was on distance of (10 m) and rise (2) meters an angle of 90 degrees. Researcher filmed draw scale horizontally and vertically at three locations, the player, midway between the player and the basket, and near the basket. Figure (1) showed positions of the cameras.

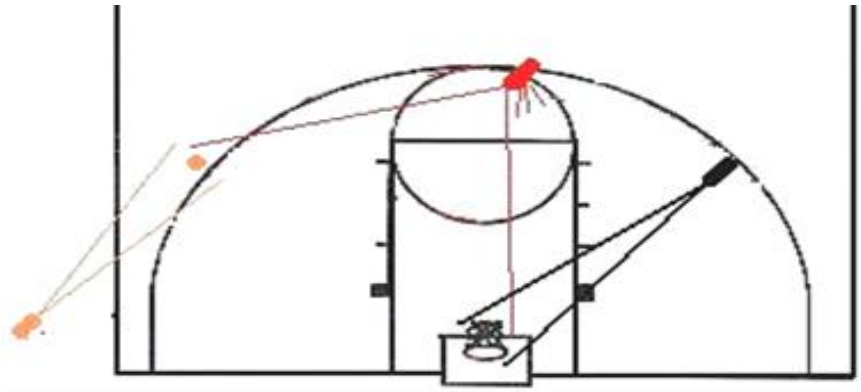

Figure (1) showed positions of the cameras

2.4 Study variables

We analyzed the continent of references and similar studies to select the angles changes geometry, kinematic and Kinetic which included variables indexed in tables (2) and (4) (Tabord et *al*., 2007; Diyar, 2009; Abidullah, 1997).

2.5 Statistical analysis

Researcher used SPSS to analyze the data of present study and we used mean, standard deviation, and independent T test.

3. Results and Discussion

Table (2)
Shows variables of body joints angles and ball by jumping shot from an angle 45°which is against defender of basketball/ degree

N	Angles	Players					Mean	SD
		1	2	3	4	5		
1	Knee angle at the end of absorption stage (flexion)	104	120	109	106	110	109.8	6.18
2	Knee angle at the end of push stage (full extension)	167	177	179	165	177	173	6.48
3	The angular difference of the knee joint at the push stage	63	57	70	59	76	65	7.91
4	Angle of shooting arm shoulder joint at the end of the preparatory phase	55	88	84	98	115	88	21.99
5	Shoulder angle towards the end of the pushing in flight	157	162	165	144	168	159.2	9.42
6	Angular difference of the arm in push stage	102	74	81	46	53	71.2	22.47
7	Leaving of hand ball angle	56	55	50	47	56	52.8	4.09
8	Entry of Basketball angle	43	41	41	36	48	41.8	4.33
9	Angle starting player for the moment to leave the ground	75	85	84	79	79	80.4	4.10

Table (3)
Shows variables of body joints angles and ball by jumping shot from an angle 45° without basketball defender /degree

N	Angles	Players					Mean	SD
		1	2	3	4	5		
1	Knee angle at the end of absorption stage (flexion)	106	121	111	111	114	112.6	5.50
2	Knee angle at the end of push stage (full extension)	165	176	177	167	176	172.2	5.72
3	The angular difference of the knee joint at the push stage	59	55	66	56	62	59.6	4.51
4	Angle of shooting arm shoulder joint at the end of the preparatory phase	64	85	86	86	119	88	19.71
5	Shoulder angle towards the end of the pushing in flight	153	152	166	152	157	156	5.96
6	Angular difference of the arm in push stage	89	67	80	66	38	68	19.30
7	Leaving of hand ball angle	52	57	53	50	57	53.8	3.11
8	Entry of Basketball angle	40	45	46	41	50	44.4	4.04
9	Angle starting player for the moment to leave the ground	73	87	86	72	86	80.8	7.60

Table (4)
Shows kinematic variables of body joints angles and ball by jumping shot from an angle 45°which is against defender of basketball

N	kinematic variables	Players					Mean	SD
		1	2	3	4	5		
1	Push time (stage of jump)/ S	0.20	0.20	0.20	0.24	0.28	0.22	0.04
2	Angular speed for joint knee at the push stage. Degree/S	315	285	350	246	271	293.4	40.28
3	Ball push time/ S	0.16	0.16	0.16	0.16	0.28	0.18	0.05
4	Moment speed of a starting player. M/ S	2.00	2.4	2.37	2.4	2.65	2.36	0.23
5	High point for play starting. M	0.96	1.10	1.08	1.16	1.12	1.08	0.08
6	The maximum height of the center of gravity of the body mass. M	1.18	1.32	1.26	1.35	1.42	1.31	0.09
7	M vertical displacement M S K G.M	0.22	0.22	0.18	0.19	0.30	0. 20	0.05
8	Flight time for player .S	0.44	0.44	0.48	0.44	0.40	0.44	0.03
9	High shooting ball .M	2.37	2.67	2.57	2.56	2.53	2.54	0.11
10	Maximum high ball .M	4.02	4.12	4.20	4.21	4.44	4.20	0.16
11	The vertical displacement of the ball after launch. M	1.56	1.45	1.63	1.65	1.91	1.40	0.17
12	A moment speed for ball launch. M/S	6.8	5.76	6.54	6.32	6.34	6.35	0.38

Table (5)
Shows kinetic variables of body joints angles and ball by jumping shot from an angle 45°which is against defender of basketball

N	Variables kinetic	Players					Mean	SD
		1	2	3	4	5		
1	Kinetic energy of the player when starting. Gul	120	276	183	222	295	219.2	63.45
2	The potential energy of the player. Gul	695.71	985.3	804.5	995.4	1172.8	935.8	164.9
3	Mechanical work of the player. Gul	129.5	207.2	114.8	143.5	247.2	168.4	50.44
4	Mechanical ability of the player. Watt	647.5	1036	574	597.9	882.9	747.6	181.1
5	Kinetic energy of the ball when starting. Gul	15.03	10.78	13.90	12.98	13.06	13.1	1.40
6	The potential energy of the ball at the top of her height. Gul	25.63	26.27	26.78	26.85	28.31	26.7	0.89
7	Mechanical ability of the ball. Watt	4.42	3.74	4.25	4.10	4.12	4.13	0.22

Table (6)
Shows kinematic variables of body joints angles and ball by jumping shot from an angle 45°without basketball defender

N	kinematic variables	Players					Mean	SD
		1	2	3	4	5		
1	Push time (stage of jump)/ S	0.20	0.24	0.16	0.20	0.24	0.21	0.03
2	Angular speed for joint knee at the push stage. degree/S	295	299	413	280	258	309	60.32
3	Ball push time/ S	0.16	0.20	0.20	0.16	0.24	0.19	0.03
4	Moment speed of a starting player. M/ S	1.90	2.2	2.40	2.1	2.79	2.28	0.34
5	High point for play starting. M	0.97	1.15	1.10	1.09	1.17	1.10	0.08
6	The maximum height of the center of gravity of the body mass. M	1.17	1.34	1.28	1.31	1.47	1.31	0.11
7	M vertical displacement M S K G.M	0.20	0.19	0.18	0.22	0.30	0.22	0.05
8	Flight time for player .S	0.48	0.44	0.52	0.44	0.40	0.46	0.05
9	High shooting ball .M	2.46	2.60	2.60	2.54	2.59	2.56	0.06
10	Maximum high ball .M	4.00	4.25	4.25	4.25	4.50	4.25	0.18
11	The vertical displacement of the ball after launch. M	1.54	1.65	1.65	1.96	1.91	1.48	0.18
12	A moment speed for ball launch. M/S	7.2	6.2	6.44	6.78	6.67	6.66	0.34

Table (7)
Shows kinetic variables of body joints angles and ball by jumping shot from an angle 45°withoutbasketball defender

N	Variables kinetic	Players					Mean	SD
		1	2	3	4	5		
1	Kinetic energy of the player when starting. Gul	108	232	187	170	327	204.8	72.90
2	The potential energy of the player. Gul	688.7	999.05	816.19	963.83	1211.3	935.81	176.69
3	Mechanical work of the player. Gul	117.7	178.9	114.8	166.2	247.2	164.96	48.39
4	Mechanical ability of the player. Watt	588.5	745.4	717.5	831	1030	782.48	146.18
5	Kinetic energy of the ball when starting. Gul	16.85	12.49	13.48	14.94	14.46	14.44	1.47
6	The potential energy of the ball at the top of her height. Gul	25.51	27.10	27.10	27.10	28.69	27.1	1.01
7	Mechanical ability of the ball. Watt	4.68	4.03	4.19	4.41	4.34	4.33	0.22

Table (8)
Shows differences on some of angles variables and the body joints and ball between the cases of jumping shoot from an angle 45°against the basketball defender and without. Degrees

N	Angles	Against defender		Without		Calculated T	Error Ratio
		Mean	SD	Mean	SD		
1	Knee angle at the end of absorption stage (flexion)	109.8	6.18	112.6	5.50	0.7568	N.S 0.576
2	Knee angle at the end of push stage (full extension)	173	6.48	172.2	5.72	0.2070	N.S 0.206
3	The angular difference of the knee joint at the push stage	65	7.91	59.6	4.51	1.2361	N.S 0.685
4	Angle of shooting arm shoulder joint at the end of the preparatory phase	88	21.99	88	19.71	Zero	N.S------
5	Shoulder angle towards the end of the pushing in flight	159.2	9.42	156	5.96	4.9217*	S 0.001
6	Angular difference of the arm in push stage	71.2	22.47	68	19.30	0.2416	N.S 0.190
7	ball leaving angle of the hand	52.8	4.09	53.8	3.11	0.4352	N.S 0.254
8	Entry of Basketball angle	41.8	4.33	44.4	4.04	1.2102	N.S 0.679
9	Angle starting player for the moment to leave the ground	80.4	4.10	80.8	7.60	0.1948	N.S 0.902

S= Significant, N.S=No Significant

Table (9)
Shows differences in some of kinematic variables between jumping shot from an angle 45°againstbasketball defender and without

N	Angles	Against defender		Without		Calculated T	Error Ratio
		Mean	SD	Mean	SD		
1	Push time (stage of jump)/ S	0.22	0.04	0.21	0.03	0.7207	N.S 0.546
2	Angular speed for the knee joint at the push stage. Degree/S	0.18	0.05	0.19	0.03	0.3065	N.S 0.235
3	Ball push time/ S	293.4	40.2	309	60.3	0.4081	N.S 0.242
4	Moment speed of a starting player. M/ S	2.36	0.23	2.28	0.34	0.1836	N.S 0.137
5	High point for play starting. M	1.08	0.08	1.10	0.08	0.3952	N.S 0.254
6	The maximum height of the center of gravity of the body mass. M	1.31	0.09	1.31	0.11	Zero	N.S --- --
7	M vertical displacement M S K G.M	22.2	4.71	21.8	4.82	0.6324	N.S 0.504
8	Flight time for player .S	0.44	0.03	0.46	0.05	0.7668	N.S 0.526
9	High shooting ball .M	2.54	0.11	2.56	0.06	0.0357	N.S 0.911
10	Maximum high ball .M	4.20	0.16	4.25	0.18	0.958	N.S 0.564
11	The vertical displacement of the ball after launch. M	1.40	0.17	1.48	0.18	0.1828	N.S 0.140
12	A moment speed for ball launch. M/S	6.35	0.38	6.66	0.34	2.533	N.S 0.055

Table (10)
Shows differences in some of kinetic variables between jumping shot from an angle 45°againstbasketball defender and without

N	Angles	Against defender		Without		Calculated T	Error Ratio
		Mean	SD	Mean	SD		
1	Kinetic energy of the player when starting. Gul	219.20	63.45	204.8	72.90	0.3332	N.S 0.260
2	The potential energy of the player. Gul	935.81	164.97	935.81	176.69	0.00	----N.S
3	Mechanical work of the player. Gul	168.44	50.44	164.96	48.39	0.1110	0.160 N.S
4	Mechanical ability of the player. Watt	747.66	181.13	782.48	146.18	0.0463	0.931 N.S
5	Kinetic energy of the ball when starting. Gul	13.15	1.40	14.44	1.47	1.4209	0.750 N.S
6	The potential energy of the ball at the top of her height. Gul	26.77	0.89	27.10	1.01	0.5482	0.270 N.S
7	Mechanical ability of the ball. Watt	4.13	0.22	4.33	0.22	1.8182	0.090 N.S

The results of the body joints angles variables and ball showed that no significant differences except angle of shot arm shoulder joint at the end of the push, but there were calculation differences (random) between the cases of shoot in front of the defender and without. No significant changes were showed on Knee angle at the end of absorption stage (flexion) where angle without defender is largest than with defender because of the needing from the player to jump highly to pass block wall and this requires a bigger flexion during jumping (Nassaif & Mazer, 1979). No significant differences were appeared in variable of Knee angle at the end of push stage (full extension), an angle when defender is presented largest than without defender due to jumping process needs full extension for body joints through leave the ground.

However, no significant changes were seemed in the angular contrast for the knee joint at the push stage but angular contrast during being of defender was larger than without because angular contrast connects with angular value in the maximum flexion and extension, more flexion leads to increase angular contrast because the differences in the maximum angular of thee extensions in the nature of the performance of the process of jumping and this agreement with Rojas *et a*l., 2000 that angles of knees during jumping shot in front of defender was the biggest. No significant result in angle of shooting arm shoulder joint at the end of the preparatory phase was showed due to the player is used to lap the ball near his chest with full flexion of the elbow joint, which is equal to the angle shoulder joint in both cases presence the defender or without.

However, significant result was appeared in shoulder angle towards the end of the pushing in flight in favor of shot in front of defender, where an angle during present the defender is larger than without defender because defensive player that performs a jump fronting the shooter players the shooter player trying to raise his arms aloft to get rid of the block wall of the defender player so shot arm angle increases through present defense. This result is consistent with the findings of the Rojas *et a*l., 2000. Moreover, no significant result in angular difference of the arm in push stagehand ball leaving angle of the hand were seemed because of large angular different centre event of a defender and this result is consistent with the findings of the Krause *et al*., (2008). In addition, no significant results in entry of Basketball angle and angle starting player for the moment to leave the ground were showed because many factors for example ball shot angle and speed of shot (Ali, 1998).

In general, no significant differences were see final variables of the body joints angles and the ball except the angle of the shot arm's shoulder jointed-push stage during flying in spite of random differences as an indicator of stability of performance in both cases, despite what we have referred to shortcomings in the angles of the starting body. The results of the differences of the kinematic and kinetic variables between jumping shoot from 45° against basketball defender and without were showed that no significant in all variables except a moment speed for ball launch in favor of during present of defender which researcher attributed that shot without defender gives the full freedom to the player to shot fast and accurately and one of factors which help to success the scoring is speed of ball, it is what happened in the mechanical variables for the successful scoring as time performance was less than the time of the failed throws which reflected positively on the kinetic energy of the body which represents the onetime variables equations (Samir., 1991).

In addition, no significant results were appeared in kinetic variables between jumping shot from an angle 45°againstbasketball defender and without.

4. Conclusion

Study concluded a significant difference in angle of the shoulder joint variable at the moment the ball left the hand and in favor of shot in front of defender but no significant difference in ball and body angles variables between two cases in front of defender or without. In addition, no significant difference was shown in kinematic variables of the player and ball between two cases the shot in front of defender and without but in favor of shot without defender. There was a deficiency in subjects in a variable of maximum height of the body mass gravity center in shooting in front of the defender, who is supposed to be higher than the case of the shooting without a defender.

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