AN ANALYTICAL STUDY OF SOME KENMATICAL VARIABLES AND SUMMIT OF ELECTRICAL ACTIVITY OF THE STRIKING ARM MUSCLES OF THE STRAIGHT TRANSMISSION IN TENNIS

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Abstract

Because of the skill tennis transmission is a fundamental skill begins with it the game and implements after each point reflected negatively on the level of performance and achievement and therefore the researchers felt to make a comparison between successful and failed transmissions. This study aimed to The differences between the values of some kenmatical variables of the successful and failed straights transmissions in the tennis and differences between the summit of the electrical activity of the muscles of the striking arm (deltoid muscle and the triceps muscle and brachial biceps muscle and flexor carpi radialis) of the successful and failed straights transmissions in tennis. Speed of ball was targeted and filmed so as the EMG for activated muscles was recorded during Tennis transmissions. Current study put much of conclusions like; The high electrical activity of the deltoid muscle had an effect clearly in the speed of lifting movement of the upper arm to the top in the striking arm as was significant and in favor of the successful attempts.The high electrical activity of the flexor carpi radialis muscle has an effect clearly in the installation of the wrist at the moment of the collision between the ball and the racket as it was of significance and in favor of the successful attempts.

KEYWORDS: Biomechanic. Electrical. Muscles. Tennis.

1. INTRODUCTION

The world has been seen for the present time a large advance scientifically and technically in the application of modern scientific and technological foundations in the field of sports that contributed in the progress of the sporting level dramatically and clearly in a lot of sporting games and events including Tennis, the importance of the research lies in the identification of some kenmatical variables and the summit of electric activity of the striking arm muscles and the differences between them in the successful and failed skills of tennis sending attempts and because of the study of physiology and biomechanic science linked in most of their laws and measurements with using the devices and laboratory or field requirements to achieve accurate measurements therefore require the adoption of devices which will be compatible and objective to lead the target of the study .

Research problem:

Through continuous observation noted that there are successful transmissions and another failed dramatically which have an effect on the outcome of the game in tennis because the transmission plays a big role in getting the points directly or poses a great difficulty in retaining it and because of the skill tennis transmission is a fundamental skill begins with it the game and implements after each point reflected negatively on the level of performance and achievement and therefore the researchers felt to make a comparison between successful and failed transmissions for the same player through the identification of differences in the kenmatical variables and the electrical activity values of the striking arm muscles between successful and failed attempts.

Research Aim

1. Values of some kenmatical variables of successful and failed transmissions in the tennis.

2. The summit of the electrical activity of the muscles of the striking arm (deltoid muscle and triceps and brachial biceps muscle and flexor carpi radialis muscle) of the successful and failed straights transmissions in the tennis.

3. The differences between the values of some kenmatical variables of the successful and failed straights transmissions in the tennis.

4. Differences between the summit of the electrical activity of the muscles of the striking arm (deltoid muscle and the triceps muscle and brachial biceps muscle and flexor carpi radialis) of the successful and failed straights transmissions in tennis.

2. MATERIAL AND METHODS

Descriptive approach was adopted by the two methods of connectivity relations for being one of the most curricula suited to the nature of the research problem and the research sample included on the number of views (attempts) for the first seeded player of the tournament of Iraq's universities. The transmissions was filmed by using digital Camera (2 in number), the first one with speed of1000 pic/sec to portray the speed of transmission of the ball and the second at 30 p / s to extract the biomechanical variables. The electrical activity of the muscles of the arm was registered by using a recording device type (Myo Trace 400) Canadian in origin with four poles. The recorded video was analyzed with extraction of biomechanical variables by (Kinovea) application. The target is (deltoid muscle, and the triceps muscle, and brachial biceps muscle, and flexor carpi radialis muscle) for the study. The biomechanical variables are (the ball height at the striking moment, angle of starting the ball, angle of trunk tilting, shoulder angle, height of body mass center at the striking moment, the peripheral speed of the striking arm, the speed of ball starting). The researchers used the following statistical methods:

1. Arithmetic mean.
2. The standard deviation.
3. Test (Wilksin for the correlated samples)

3. RESULTS AND DISCUSSION

Table 1: Shows the results of the tests biokenmatical variables of the successful and failed straights transmissions in tennis.

Rank	1		2		3		4		5		6		7		8	
	Ball height at the striking moment		Angle of ball starting		Angle of trunk tilting		Shoulder angle		Height of body mass center		Peripheral speed of the arm		Speed of ball starting		accuracy	
	Successful	failed	Successful	failed	Successful	failed	Successful	failed	Successful	failed	Successful	failed	Successful	failed	Successful	failed
1	3.30	3.10	5	3	16	8	168	158	0.26	0.27	8.44	9.07	39	39	6	0
2	3.36	3.26	5	8	13	13	159	157	0.32	0.30	7.89	9.23	36	33	5	0
3	3.13	2.99	3	2	12	11	165	164	0.33	0.19	9.03	9.75	37	32	6	0
4	3.41	2.96	6	5	10	10	156	162	0.31	0.16	9.03	8.91	39	33	6	0
5	3.39	3.48	5	12	9	20	154	169	0.25	0.23	8.01	7.57	40	41	6	0
6	3.15	3.16	4	9	8	10	145	160	0.26	0.23	8.15	7.57	38	32	4	0
7	3.18	3.07	4	9	7	24	148	157	0.29	0.28	8.42	9.71	37	36	6	0
8	3.33	3.02	4	9	6	12	156	162	0.30	0.31	8.07	7.72	37	35	4	0
9	3.42	3.18	4	8	11	18	155	167	0.31	0.25	8.30	8.38	38	37	4	0
10	3.24	3.05	6	8	10	14	155	164	0.31	0.22	9.06	7.90	38	36	6	0

Table 2: Shows the results of the tests of the summit of the electrical activity of the deltoid muscle and triceps muscle and brachial biceps muscle and flexor carpi radialis muscle of the successful and failed straights transmissions in tennis.

Rank	1		2		3		4	
	Deltoid muscle		Triceps muscle		The biceps muscle		flexor carpi radialis muscle	
	Successful	failed	Successful	failed	Successful	failed	Successful	failed
1	391.30	422.26	2439.43	2171.08	2011.89	2542.08	1279.15	910.94
2	371.46	190.51	1859.64	1830.73	1927.57	2782.29	1083.32	1383.92
3	364.23	234.64	2384.59	2074.68	2026.59	2071.07	2135.59	1316.31
4	324.17	162.51	2254.69	2539.16	2592.48	2464.72	2238.71	1725.48
5	428.53	413.49	2618.65	2037.87	2137.48	2471.82	1482.49	1036.74
6	357.73	269.82	2683.72	2186.19	1849.39	2618.67	1521.93	1472.48
7	390.70	302.46	2730.33	2372.53	2057.97	2812.62	1251.76	1078.01
8	297.86	297.72	1983.48	2068.72	2737.70	1624.19	2356.76	1500.57
9	329.98	365.94	2124.47	1510.19	2834.76	1340.69	1405.05	1532.00
10	474.63	363.46	2280.78	2298.95	2137.87	2325.29	2089.35	1487.84

Table 3: Shows the arithmetic means and standard deviations of the biokenmatical variables of the successful straight transmissions in the tennis

Rank	Variables	Unit of measurement	M	S.D
1	The ball height at the striking moment	Meter	3.29	0.104
2	Angle of ball starting	degree	4.6	0.917
3	Angle of trunk tilting	degree	10	2.821
4	Angle of shoulder	degree	156	6.518
5	Height of body mass center at the striking moment	cm	0.29	0.027
6	The peripheral speed of the arm	Metr/sec	8.44	0.425
7	Speed of ball starting	Meter/sec	38	1.136

Table 4: Shows arithmetic means and standard deviations of the deltoid muscle and triceps muscle and brachial biceps muscle and flexor carpi radialis muscle of the successful straight transmissions in tennis.

Rank	Variables	Unit of measurement	M	S.D
1	Deltoid muscle	microvolt	373.06	49.248
2	Triceps muscle	microvolt	2335.98	278.379
3	Biceps muscle	microvolt	2231.37	335.676
4	flexor carpi radialis muscle	Microvolt	1684.41	445.510

Table 5:Shows arithmetic means and standard deviations of the biokenmatical variables of the failed straight transmissions in tennis.

Rank	Variables	Unit of measurement	M	S.D
1	Ball height at the striking moment	Meter	3.13	0.146
2	Angle of the ball starting	degree	7.3	2.900
3	Angle of trunk tilting	degree	14	4.837
4	Shoulder angle	degree	162	3.899
5	Height of the body mass center at the striking moment	Cm	0.24	0.045
6	The peripheral speed of the arm	Meter/ sec	8.78	0.787
7	Speed of ball starting	Meter/ sec	35	2.871

Table 6:Shows arithmetic means and standard deviations of the deltoid muscle and triceps muscle and brachial biceps muscle and flexor carpi radialis muscle of the failed straight transmissions in tennis.

Rank	Variables	Unit of measurement	M	S.D
1	Deltoid muscle	microvolt	302.28	84.993
2	Triceps muscle	microvolt	2109.01	272.809
3	Biceps muscle	microvolt	2305.34	462.612
4	flexor carpi radialis muscle	microvolt	1344.43	244.467

Table 7: Shows the statistical parameters of the arithmetic means and the significance of the differences of the biokenmatical variables in successful and failed ground straight transmissions in tennis.

Rank	Variables	Successful transmissions	Failed transmissions	Unit of measurement	T	The tabulated value	Sig.
		M	M				
1	Height of body mass center at the moment of strike	0.29	0.24	Cm	4	8	Significant
2	Ball height at the strike moment	3.29	3.13	Meter	3	8	Significant
3	Speed of ball starting	38	35	Meter/ sec	3	8	Significant
4	Angle of trunk tilting	10	14	degree	14	8	Not significant
5	Shoulder angle	156	162	degree	13	8	Not significant
6	Angle of ball starting	4.6	7.3	degree	11.5	8	Not significant
7	The peripheral speed of the arm	8.44	8.78	Meter / sec	13	8	Not significant

*** The significant level of the two parts at ratio of 0.05 for a sample of (10) as the value of (t) of the Wilksin test amounts to (8)**

Researchers attribute the presence of significant difference in variable of the height of body mass center at the moment of ball strike between successful and failed attempts and in favor of the successful attempts that the balls that are in a higher level have falling angle more spacious than those of low-lying.

As well as researchers attribute the presence of significant difference in the variable of ball starting speed between the successful and failed attempts and in favor of the successful attempts to the summit of electrical activity of the deltoid muscle which works directly in the amount of speed of the associated part and thus lead to increase the peripheral speed of the member,[Noehren, B., Davis, I.M., Hamill, J., 2007:951-956] and that can be seen through the arithmetic mean of the successful attempts which amounted to (38 m / s) while the arithmetic mean of the failed attempts amounted to (35 m / s). The electrical activity values of the deltoid muscle can be observed in the table (2), as whenever the summit of the electrical activity rose, the work of the deltoid muscle was faster in the dimensions of the upper arm from the body as well as to the summit of the electrical activity values of the flexor carpi radialis muscle which plays a major role in the moment of collision tennis with the ball as whenever were of high-speed signal, the starting speed of the ball was higher.

The results indicated the presence of significant differences which are not significant in the variables (angle of the trunk tilting, shoulder angle, the angle of the ball starting, and the peripheral speed of the arm)

Researchers attribute the existence of differences which are not significant in a variable of trunk tilting angle between the successful and failed attempts to that the form of performance may have some technical errors that require review in that the change in the values of variables caused by the performance due to one model and may overlap the associated factors with the same sample and not every increase in the peripheral speed offset by an increase in accuracy. [Carter, A.M., SJ. Kinzey, L.P 2000, 269-278]

Table 8: Shows the statistical parameters of the arithmetic means and the significance of the differences of the summit of the electrical activity of the deltoid muscle and flexor carpi radialis muscle and brachial biceps muscle and triceps muscle in the successful and failed straight transmissions in tennis.

Rank	variables	The successful transmissions	The failed transmissions	Unit of measurement	T	The tabulated value	Sig.
		M	M				
1	Deltoid muscle	373.06	302.28	Microvolt	7	8	Significant
2	flexor carpi radialis muscle	1684.41	1344.43	Microvolt	6	8	Significant
3	Triceps muscle	2335.98	2109.01	Microvolt	9	8	Not significant
4	Biceps muscle	2231.37	2305.34	Microvolt	15	8	Not significant

*** The significant level of the two parties at ratio of 0.05 for a sample of (10) as the value of (t) of Wilksin test amounts to (8)**

The summit of the electrical activity resulting from the four muscles work is matched in the successful and failed attempts as their goal is to transmit the movement between parts of the joints of the striking arm but influenced by variables like ball height at the moment of strike and the height of body mass center and the angle of the trunk tilting as disparity between the summit of the activity values of the four muscles was evident in table (1.2), note down the ball from the required level at moment of strike leads to reduced activity in the deltoid muscle which means failure to raise the upper arm to the top at high speed with the survival of the summit of the electrical activity high for the two biceps muscles which is responsible for rotating the forearm and annexation arm at the shoulder joint and annexation the forearm on the upper arm at the elbow. So be clear through peripheral speed of the arm as note that the speed of ball starting in the failed attempts is less than the speed of successful attempts with the presence of peripheral speed higher in the failed attempts and this case can be explained by the increase in the speed would be an outsider factor in reducing the accuracy[Trzaskoma Z., Buśko K., Gajewski J. 2004:663-679] In order to avoid losing the transmission , reduce the electrical activity of the flexor carpi radialis muscle which is responsible for wrist bending at the moment of collision with a tennis ball which leads to a reduction in the speed of the ball starting and the falling the ball within the allocated accuracy areas in the test.

Researchers attribute the presence of significant difference at the summit of electrical activity of flexor carpi radialis muscle between successful and failed attempts and in favor of the successful attempts to the higher contraction in the performance of the flexor carpi radialis muscle in the successful attempts in order to make the movement of the wrist in a fixed position and non-relaxant at the moment collision of the racket with the ball to secure high starting speed of the ball, and from a table (1.2) can be observed differences between the speed of starting the ball in the successful and failed attempts and compared with the activity of the flexor carpi radialis muscle as by decreasing the electrical activity before the moment of the collision led to a decline in the speed of starting the ball and if the activity is increased in this muscle note increase the speed of starting the ball.

4. CONCLUSION

1. The height of body mass center values and the height of the ball at the moment of strike have a major role in obtaining high accuracy and thus the success of the straight transmission in the tennis as was of significance in favor of the successful attempts.

2. The angle of trunk tilting and the angle of the shoulder and the angle of ball starting have a great and small degrees that have an effect on the accuracy of straight transmission in tennis as was not significant.

3. The high electrical activity of the deltoid muscle had an effect clearly in the speed of lifting movement of the upper arm to the top in the striking arm as was significant and in favor of the successful attempts.

4. The high electrical activity of the flexor carpi radialis muscle has an effect clearly in the installation of the wrist at the moment of the collision between the ball and the racket as it was of significance and in favor of the successful attempts.

5. The speed peripheral values converge between successful and failed attempts with convergence of summit values of the electrical activity of the two muscles; biceps and triceps as was not significant.

6. The starting ball speed increases with the increase in the electrical activity of the Flexor carpi radialis muscle and the ball starting speed decreases with the decline in its electrical activity as was significant and in the favor of the successful attempts

5. REFERENCES

1. Noehren, B., Davis, I.M., Hamill, J., 2007. Prospective study of the biomechanical factors associated with iliotibial band syndrome. Clin. Biomech. 22, 951–956.
2. Carter, A.M., SJ. Kinzey, L.P. Chitwood, and J.L. Cole. 2000. Proprioceptive neuromuscular facilitation decreases muscle activity during the stretch reflex in selected posterior thigh muscles. .1 Sport Rehabil 9(4): 269-278.
3. Trzaskoma Z., Buśko K., Gajewski J.(2004) Evaluation of the training statusin athletes based on the selected biomechanical indices. Evaluation of the training status in athletes based on biomechanical measurements. In: M. Nałęcz (red.) Biocybernetics and Biomedical Engineering. 2000. Biomechanics and Rehabilitation Engineering. Akademicka Oficyna Wydawnicza EXIT, Warszawa, v. 5, pp. 663-679 (in Polish).

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