RELATIONSHIP OF SELECTED BIOMECHANICAL VARIABLES WITH THE PERFORMANCE OF FOREHAND DRIVE IN SQUASH RACKET


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ABSTRACT
The purpose of the study was to find the relationship of selected biomechanical variables with the performance of Squash Racket Player. For the purpose of the study, five Squash Racquet Players were selected as a subject from Lakshmibai National University of Physical Education Gwalior. There are different Angular Kinematic variables i.e. Angle of Ankle joint, Angle of Knee joint, Angle of Hip joint, Angle of Shoulder joint, Angle of Elbow joint, Angle of Wrist joint and Center of Gravity (C.G) during the execution of forehand drive in squash racket were selected for achieving the purpose of this study. For this study Biokin Kinematics Analyzer (2D Motion) was used as motion analyser instrumentation for biomechanical analysis of forehand drive in squash racket. A Sony handicam 3.0 mega pixel was used to obtain sequence of selected movements during the forehand drive and the Squash Racquet performance was evaluated and graded by a panel of experts on the basis of their skills, techniques and match result. Pearson's product moment correlation statistical technique was used to compute the correlation between Squash Racquet Performance with the selected variables at 0.05 level of significance.The results have exhibits that the obtained value of coefficient of correlation of the angle of shoulder joint at moment stance and C.G at the moment of execution have shown the significant relationship with the performance of subjects in forehand drive in squash. On the basis of the finding of the study, the following conclusion drawn that the shoulder joint and C.G of the subjects were important variable for better performance in Squash Racquet game.
Keywords: Angular Kinematics, Center of Gravity and Wrist.

INTRODUCTION
Man's physical activity and movement is as old as human existence. It played numerous roles from struggle as existence to struggle for excellence. In this role, playing fundamental motor skills have developed into various movement patterns. But at every stage of human history physical activity provides an existing out let for human expression often creative in nature. Human being normally run, jumps, throw, catch, kick, strike and perform a multitude of basic skills. They have learned these first as general skills and later on as specific sports skills. They combine the skills into pattern of unceasingly greater specific and complexity. Biomechanics is an applied from of mechanics, and methods used to investigate it must be derived from those of mechanics. However, biomechanics have not developed in the wake of mechanics, but as a boarding science in other scientific discipline such as Anatomy Physiology, and the technique of sport. One of the area of modern sport science is biomechanics and it is an applied form of mechanics and consequently the methods used to investigate it must be derived from those of mechanics however biomechanics and it is an applied from of mechanics and consequently the method used to investigate. It is be derived from those of mechanics, however, biomechanics have not developed in the work of mechanics, but as a boarding science in other scientific discipline such as anatomy, physiology and the technique of sports. The role that sport biomechanics can play is becoming more widely understood in sport community and the demand for service increasing, researcher in sport biomechanics will have to consider carefully how much time they can devote to the provision of science service without impairing their performance as scholar researcher. To avoid the problems inherent in this situation, it may be necessary to developed programs of the training of technique in the sports biomechanics, technique that can provide the kind of service sought by sporting bodies.

There are two methods, by which motor skills can be analyzed the quantitative method and the qualitative method. With the quantitative method, the performance is recorded technique and then evaluated objectively. This method is used only by researcher and is quite expensive, on the other hand coaches and physical education teacher are using qualitative method by which the performance is evaluated subjectively on the basis of direct, visual observation and this method is widely used, as it is less expensive. To conduct qualitative analysis, requires some prior knowledge of the sports or quality concerned and, in particular, if the motor skills to be analyzed. At least the very least, one must know what the performer is trying to achieve and what restriction the governing the event imposes. The qualitative analysis system includes the development of theoretical model as a basis for identifying faults and serves to supplement whatever experience the physical education teachers or coach might have and to channel as direct the analysis in a logical and systematic fashion. The concept of optimum skill development is broad and has implications for the approach used by everyone who deals with movements, i.e. the parents, the teacher, the coaches,

physical education and researcher in the field. Each of these adults has a different role to play in the total skill development among them the researcher gives me concepts ideas and scientific model of facts through researcher, which serves as a guideline for others. So, people who are working in this field should have a basic knowledge about how a body moves, what are the major group of muscles, joints and in what proportion and degree they are to be used to get an optimum output. This approach can provide their dependent factors, which in turn, can build into an awareness of the larger scheme of economic movement.

Objectives of the study

The purpose of the study was to find the relationship of selected biomechanical variables with the performance of forehand drive in Squash Racquet Player.

METHODOLOGY

Five male players from Lakshmibai National Institute of Physical Education squash racket between the age group of 16 to 25 years, who had participated in all India inter-university was selected as subject for this study. Since these players have been trained for a considerable period, they were considered skilful and there technique was established. The biokin kinematics analyzer (2D Motion) was used as a technique for biomechanical analysis of forehand drive in squash racket. A Sony handicam 3.0-mega pixel was used to obtain sequence of selected movements during the forehand drive.The camera was mounted on a tripod at a height of 1.21 m from the ground. The camera was placed perpendicular to the initial line and parallel to the horizontal plane at of 5.70 m from the midpoint of initial line. The forehand drive of different subject was filmed at Lakshmibai national institute of physical education, Gwalior. The videography was taken under controlled condition. The subjects performed skill thrice. The photographs as obtain by the use of videography were analyzed by standard analysis method. Only selected moments were analyzed. Selected variables were as under. The scholar developed stick figure by biokin kinematics analyzer (2D Motion) from which selected angular biomechanical (kinematics) variables were calculated.

STATISTICAL METHOD

The relationship of selected biomechanical variables with performance of forehand drive was calculated by using Pearson's product moment correlation. The hypothesis was tested at 0.05 level of significance. The score of each kinematics variables were calculated with the performance of subjects in forehand drive. The value of coefficient of correlation of selected angular biomechanical (kinematics) variables i.e. angle of selected joints at selected moment with the performance of subjects in forehand drive are presented in table-1.

Table 1

RELATIONSHIP OF SELECTED BIOMECHANICAL VARIABLES WITH THE PERFORMANCE OF SQUASH RACKET PLAYER IN FOREHAND DRIVE

S. No	Variables	Coefficient of Correlation at the Moment Stance	Coefficient of Correlation at the Moment Execution
1.	Ankle Joint	0.65	0.68
2.	Knee Joint	0.58	-0.31
3.	Hip Joint	-0.14	0.62
4.	Shoulder Joint	-0.88*	-0.30
5.	Elbow Joint	0.44	-0.12
6.	Wrist Joint	0.01	-0.69
7.	Center of Gravity	0.76	-0.89*

Significant at 0.05 level Required value of **'r'** for 3 degree of freedom is **0.87**

As shown in table 1 the obtain value of correlation (r = -0.88, -089) for 3 degree of freedom, only angle of shoulder joint at the moment stance and C.G at the moment of execution of subjects were greater than the required value of 0.87 at 0.05 level of significance. However, the obtain value of Coefficient of correlation in other variables were less than the required value at selected level of significance, therefore, these selected moment have shown insignificant relationship with the performance of subjects.

FINDING

As shown in table 1 as that the only two variables i.e. the angle of shoulder joint at the moment stance and C.G at the execution of the subjects, which has exhibited a significant relationship at the level of 0.05. This means in the

stance position, the angle of shoulder joint might have provided best possible position for gaining a maximum range, because in technique of forehand drive, the shoulder joint plays very important role. In stance position the shoulder flexed then it followed by the extension of arm, which provide the required amount of force, to create more speed of ball. However, the C.G is also play a dominant role in executing of the forehand drive in squash and contributing very much to the performance as selected stroke a rotation type of activity which requires smooth and easy execution of technique. On the other hand angular kinematics variables ankle joint (stance), ankle joint (execution), knee joint (stance), knee joint (execution), hip joint (stance), hip joint (execution), shoulder joint (execution), elbow joint (stance), elbow joint (execution), wrist joint (stance) and wrist joint (execution) and C.G (stance) did not show significant relationship.

DISCUSSION

In case of coefficient correlation of selected angular kinematics at moment stance were: ankle joint (0.65), knee joint (0.58), hip joint (-0.14), shoulder joint (-0.88), elbow joint (0.44), wrist joint (0.01) and C.G (0.76). At moment execution: ankle joint (0.68), knee joint (-0.31), hip joint (0.62), shoulder joint (-0.30), elbow joint (-0.12), wrist joint (-0.69) and C.G (-0.89).

The results have exhibits that the obtained value of coefficient of correlation in case of the angle of shoulder joint at moment stance and C.G at the moment of execution have shown the significant relationship with the performance of subjects in forehand drive in squash. In case of other selected biomechanical variables the results have shown the insignificant relationship. Technical complexities of squash stroke production it can be valuable to search for some kind of uniformity in the way that good players execute their shots. If identify some common feature then try to explain qualitatively the biomechanical reason for their use. That might suggest to better ways in which to coach stroke production in particular to young children and beginners.

In squash racket, to minimize the diversion of C.G. it is very much required to maintain the momentum and develop the economy of movement. There are basically two reasons for diversion of C.G. The inadequate and improper arm movement of shoulder and too much up and down of shoulder might have reason for significant relationship between forehand drive and performance in squash racket.

CONCLUSION

None of the biomechanical variables such as angles of ankle joint (stance and execution), knee joint (stance and execution), shoulder joint (execution), elbow joint (stance and execution), wrist joint (stance and execution) and C.G (stance), have exhibited significant relationship to the performance with the subjects in forehand drive in squash except angle of shoulder joint at the moment stance and C.G at the moment of execution.

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