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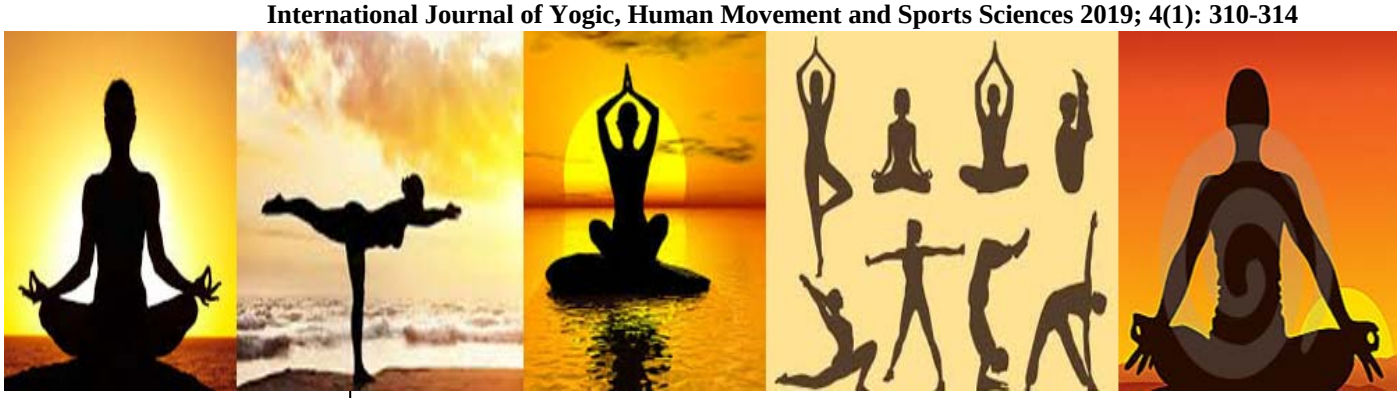

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Kinemetical analysis of angle of elbow joint at the time of short spiking skill in volleyball

Gurpreet Singh and Dr. Nishan Singh Deol

Abstract
The purpose of the present study was to investigate the relationships between the kinematic analysis of angle of elbow joint and performance of volleyball players. Inter-University levels, volleyball players were randomly selected from Punjabi university Patiala as subjects for the study. The age of all the subjects were ranged above 18 years. The kinematic variable was Angle of elbow joint at the time of short spiking and performance of volleyball players. The Kinematic Analysis of volleyball players mean, standard deviation and Karl Pearson's product moment coefficient correlation was employed with the help of statistical package of SPSS. The level of significance was set at 0.05.

Keywords: Kinematic, short spiking, Angle of elbow joint

Introduction
Volleyball is a team sport in which two teams of six players are separated by a net. Each team tries to score points by grounding a ball on the other team's court under organized rules. It has been a part of the official program of the Summer Olympic Games since 1964.The complete rules are extensive, but simply, play proceeds as follows: a player on one of the teams begins a 'rally' by serving the ball (tossing or releasing it and then hitting it with a hand or arm), from behind the back boundary line of the court, over the net, and into the receiving team's court. The receiving team must not let the ball be grounded within their court. The team may touch the ball up to 3 times but individual players may not touch the ball twice consecutively. Typically, the first two touches are used to set up for an attack, an attempt to direct the ball back over the net in such a way that the serving team is unable to prevent it from being grounded in their court. The rally continues, with each team allowed as many as three consecutive touches, until either (1): a team makes a kill, grounding the ball on the opponent's court and winning the rally; or (2): a team commits a fault and loses the rally. The team that wins the rally is awarded a point, and serves the ball to start the next rally. A few of the most common faults include:

- causing the ball to touch the ground or floor outside the opponents' court or without first passing over the net;
- catching and throwing the ball;
- double hit: two consecutive contacts with the ball made by the same player;
- four consecutive contacts with the ball made by the same team;
- net foul: touching the net during play;
- Foot fault: the foot crosses over the boundary line when serving.

The ball is usually played with the hands or arms, but players can legally strike or push (short contact) the ball with any part of the body. A number of consistent techniques have evolved in volleyball, including spiking and blocking (because these plays are made above the top of the net, the vertical jump is an athletic skill emphasized in the sport) as well as passing, setting, and specialized player positions and offensive and defensive structures. (Wikipedia; the Free Encyclopaedia, 2018).
Biomechanics is the study of motion and its causes in living things. Biomechanics provides key information on the most effective and safest movement patterns, equipment, and relevant exercises to improve human movement. In a sense, kinesiology professionals solve human movement problems every day, and one of their most important tools is biomechanics.

This chapter outlines the field of biomechanics, why biomechanics is such an important area to the kinesiology professional, and where biomechanics information can be found. Mechanics is a branch of physics that is concerned with the description of motion and how forces create motion. Forces acting on living things can create motion, be a healthy stimulus for growth and development, or overload tissues, causing injury. Biomechanics provides conceptual and mathematical tools that are necessary for understanding how living things move and how kinesiology professionals might improve movement or make movement safer. (Knudson Duane 2007).

Statement of problem

The problem is entitled as "Kinematical analysis of angle of elbow joint at the time of Short Spiking in volleyball".

Methodology and procedure

In this chapter the sources of data, criterion measure, filming protocol, administration of test, analysis of film and collection of data, reliability of data and statistical procedure for analysis have been described.

Selection of subjects

Two Inter-University levels, volleyball players were randomly selected from Punjabi university Patiala as subjects for the study.

Criterion measure

The criterion measure for this study was the performance of the Spikers. Total ten attempts were given to each subject and the successful shots were marked as single score out of ten.

Filming protocol

Motion captures technique was used in this study. To recorded the video of the volleyball short spiker, while they performing the technique, digital video camera (50 fps) was used by a professional photographer. After obtaining the recorded video, the video was analyzed through Quintic coaching v-17 software approved by Human kinetics. First video was digitized through Quintic coaching v-17 software. After the procedure of digitizing, the video was calibrated. The calibrated video gave us the results through makers, stroboscopic effect technique, stick figures, stopwatch programming, angle manual (horizontal, vertical, and draw angles), linear and angular analysis manual etc. With the of "Quintic coaching v-17 software."

Motion capture technique/Digital videography was used to analysis the kinematic variables of male volleyball short spiker. Digital video camera Casio EX-FH 100 (50 fps) was used for videography of volleyball short spiker performance. The performance of the subject was recorded with stroboscopic effect from approach to landing. Digital video camera was placed 6 meter away at the side of the spikers (lateral axis).

Administration of test

Two Inter-university levels, volleyball players were randomly selected from Punjabi university Patiala as subjects for the study. The separate data was collected as for all short spikers. The subject's undergone training for a considerable period. Therefore it was ascertained that subjects possess reasonable level of technique. The subjects were explained about the objective of the study. As per the game situation various zones were marked with the consultancy of qualified coaches as these are the zones where spiker has maximum chances of scoring the point during game so each subject were asked to spike ten shots and as per the marking in field they were given a score on basis each shot. A shot hitted in zone number 1, 2, and 3 were get one score and shot hitted out of zone was recorded as zero score.

Analysis of film and collection of data

Motion capture technique was used in this study. The films were analyzed by using standard "Quintic coaching v-17 software" approved by Human kinetics. Videos analyzed through strobed photo sequence / stroboscopic effect, stick figure analysis, Quick snap shots with the help of software for analyse of selected variable is presented below:-

Measurement of body angles

Angle was measured through videography technique. The videos of the short spiking were traced with the help of "Quintic coaching v-17 software" by using auto tracking markers on the selected body joints of spikers. Using auto tracking markers in "Quintic coaching v-17 software" we analyse the video of short a spikes. In order to receive the complete segmental diagram 'angle finding' option was selected in the software and marks of demanded joints were connected. After completing the marking by joining different highlighted marks on the selected body joints software automatically present the measurements of required angles. e.g. The angle of elbow joint at time of spiking.

The angle of elbow joint

Fig 1: The angle of Elbow joint at time of short spiking through "Quintic coaching v-17 software."

Strobed photo sequenc/stroboscopic effect

The stroboscopic effect is a visual phenomenon that occurs when continuous motion is represented by a series of shot and pictures. It is very helpful to understand the fastest motion of any object or body. Visual characteristics such as reaction time, tracking, and hand-eye coordination are recognized as important components of sports vision, but equally important is the component of dynamic visual acuity. Dynamic visual acuity can be described as the ability of an individual to track a moving object, while his/her head is moving at the same time. More specifically, dynamic visual acuity is the ability of the visual system to resolve detail and to discriminate the fine parts of a moving object when there is relative movement between the object and the observer.

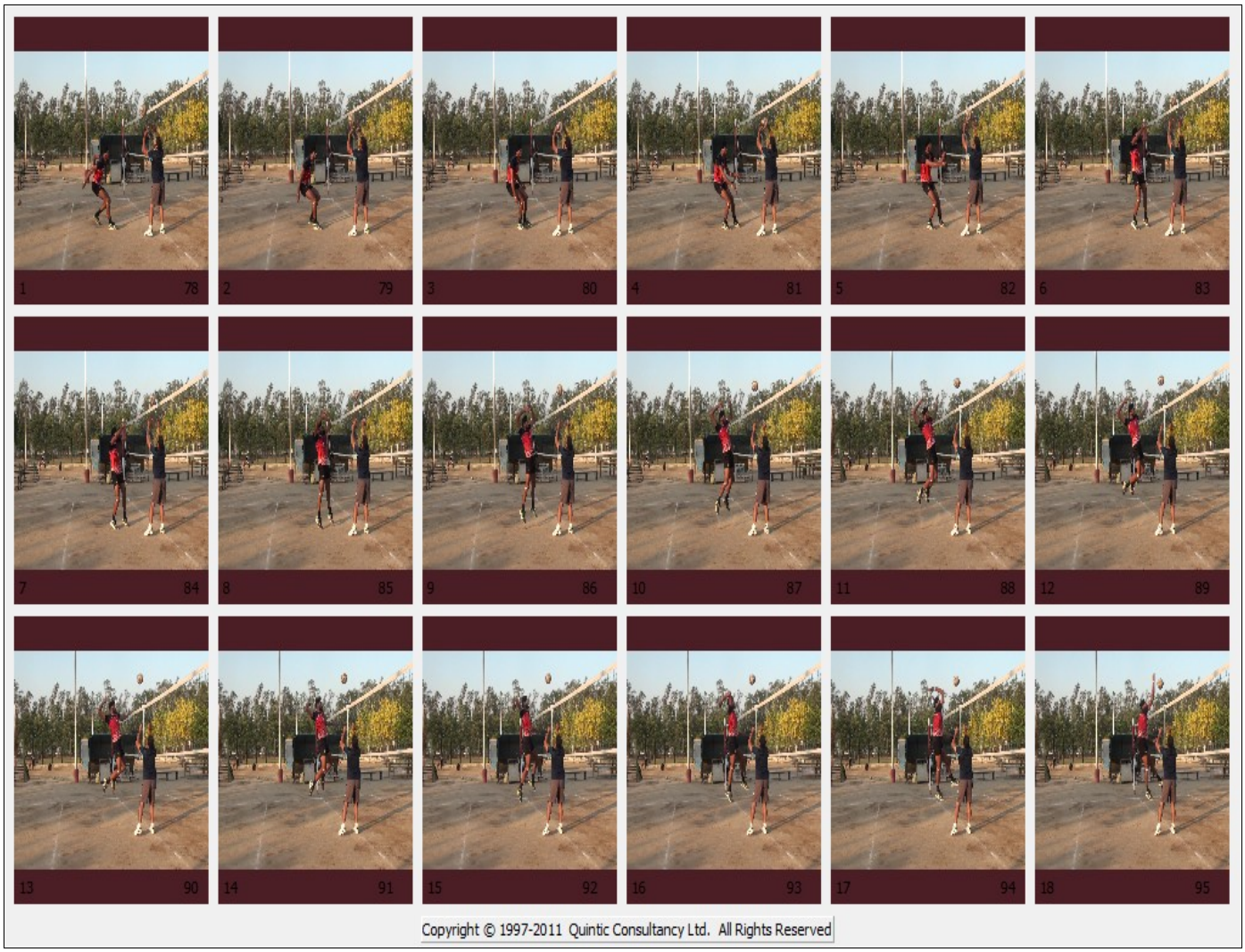

Fig 2: Stroboscopic effect of a short spike technique through "Quintic coaching v-17 software."

Stick figure analysis

The simplest drawing of a human being, one where the torso, arms and legs are just lines while the head is a circle. It's the greatest creation of humankind which helps to understand the different body segments during very movements. A fundamental challenge that arises during analysis to visual sequences is the problem of describing the motion of non-rigid objects. The ordinary approach while dealing with human motion is to fit the data with an articulated kinematic model, or "stick-figure", composed of a number of rigid parts connected by flexible joints. The structure of a stick-figure the shape of each body part or "stick" and the connectivity between them remains fixed across time, while motion is encoded as a sequence of pose parameters the joint angles between connected sticks permitted to vary at each time step. The joint angles derived from a stick-figure provide a more-parsimonious representation of the data, suitable for higher level modelling of human motions. For example, stick-figure models are used to convert feature positions obtained from optical motion-capture to joint angles, which can be used to animate computer generated characters.

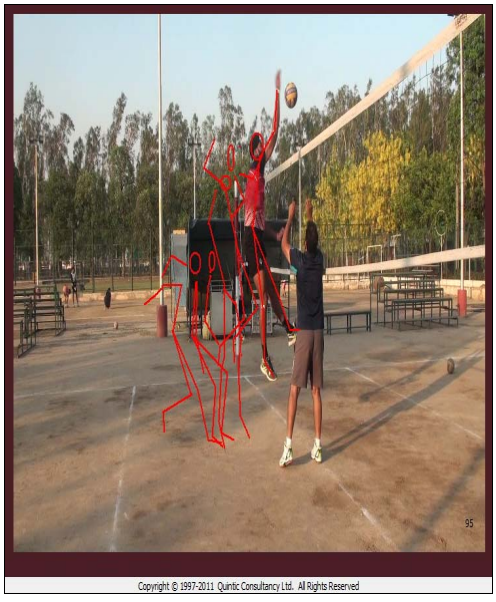

Fig 3: Stick figure analysis of a short spike technique through "Quintic coaching v-17 software."

Reliability of the data

To obtain variable measurements, standard and calibrated equipments like Digital Video Camera {Casio EX-FH 100 (50 fps)}, measurement tape and specialized motion analyzing software (Quintic coaching v-17 software) approved by: human kinetic were used, all the equipments and software were supplied by standard agencies and companies and their accuracy was ensured by the experts and suppliers, all the measurements pertaining to the kinematical variables were taken by the researcher under the guidance of expert. Digital Video Camera {casio EX-FH 100 (50 fps)} were operated by expert professional videographer. So the data collected by using these instruments and software were considered reliable for the purpose of this study.

Statistical Procedure

With regard to purpose of the study karl Pearson`s product moment coefficient correlation statistical technique was calculated between selected kinematical variables with performance of male short spiker in volleyball. In order to check the significance, level of significance was set at 0.05.

Results

Table 1: Relationship between Angle of Elbow joint with performance of short spiker in volleyball

Trials	Variables	Mean	Standard deviation	Correlation (r) Values
20	Angle of Elbow joint	170.93	3.88	0.36*
20	Performance	0.65	0.48	

'r'$_{0.05}$ =0.36

Table & figure no. 4.2 represents that the mean value of angle of elbow joint of short spiker in volleyball players was 170.93, whereas the standard deviation (SD) of angle of elbow joint of short spiker in volleyball players was 3.88 respectively. At the time of calculation of relationship between angle of elbow joint with performance of short spiker in volleyball players the r value was 0.36. The data does suggest that there is significant relationship between angle of elbow joint of short spiker in volleyball players with performance.

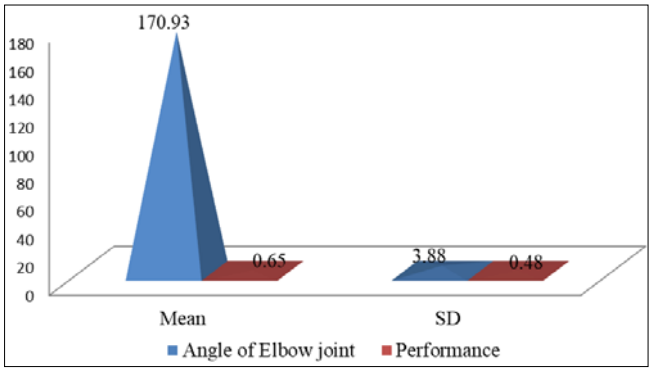

Fig 4: Mean and standard deviation values of short spiker in volleyball players angle of elbow joint and performance

Discussion of the findings

Based on the statistical analysis of data following finding was drawn by the researcher:

The result of the study revealed that there was significant relationship between Angle of elbow joint of short spiker in volleyball players with their performance.

Discussion of hypotheses

It was hypothesized that there was a significant difference between the Angle of wrist joint at the time of spiking with the performance of volleyball player. This hypothesis is accepted because significant differences were measured between the Angle of wrist joint at time of spiking with the performance of volleyball player.

Conclusion

On the basis of findings of present study, the following conclusions were drawn:

The result of the study revealed that there was significant relationship between Angle of elbow joint of short spiker in volleyball players with their performance

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