

KINEMATIC ANALYSIS OF THE JUMP THROW IN BASKETBALL

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The aim of this study was to analyze kinematically the jump throw movements of adult category players. The sample of this study was done by ten players. For the kinematic analysis, it was used a bidimensional video graph system and the Jump Test system to analyze the vertical jump. Within the analyzed variables, the angle of elbow extension in the moment of ball release was a value of $126,67 \pm 9,42^\circ$, which was not verified a significant difference related to other studies. In the variable projected angle of the ball it was observed an average value of $54,75 \pm 2,48^\circ$, with a significant difference related to other studies. The jump throws has a low technique rate, because only 40% of realized throws had success.

KEY WORDS: kinematic, basketball, jump throw.

INTRODUCTION:

The biomechanics is a subject, among other sciences from the natural sciences, which studies the physical analysis of biological systems, consequently, physical analysis of body movement. These movements are studied through laws and mechanic patterns in function of specific characteristics of the human biological system. (Amadio et al, 1996)

The biomechanics, due to its investigation area linked to mechanic, has subdivisions of study the kinematic and kinetic. The kinematic describes a movement realized by body segments which correspond to the coordination degree demonstrated by an individual realizing natural movements of different sports. (Hall 2000)

Among them there is basketball, which according to Daiuto (1991), it is a succession of intensive and brief efforts, realized in several rhythms, and it is a group of run, jump and throws. Practicing this sport modality, all the muscles are in action, the lower-limbs are more demanded and accomplish a higher effort with more intensity and the upper-limbs accomplish a less rude effort, more precise and more adjusted.

The throw is a fundamental attack, realized with a ball, and its aim is to reach the basket. This throw might be executed in several ways, depending on the court position, of the opponent position and of the displacement speed, among these parameters, there are some types of throws, the tray up, the Jump, the slam-dunk and others. (Ferreira et al 1987)

According to Daiuto (1991), the Jump is a kind of throw realized during the jump (except the tray up) and it can be realized with one or both hands, this throw is very hard, because demands a good coordination of asymmetric movements, good impulse to the jump and great balance in the air.

The study has as aim to analyze kinematically the movement of jump throw of adult category players.

METHODS:

The research is characterized by being descriptive according to Gay (1987), inasmuch as it was analyzed and compared the behavior of space kinematic variables of jump throw in adult category players.

The sample of this study was constituted by ten adult category players, with an average of $21,6 \pm 3,78$ years old, an $189,50 \pm 9,42$ cm average height, and $87,26 \pm 12,83$ kg average body mass.

To make a measurement related to the players height it was used a estadiometro – Cardiomed, with resolution of 1 mm and to measure the body mass, it was used a digital scale – Mars, with resolution of 0,1 kg.

In the kinematic analysis, it was used a kinematic system of bidimensional video graph with an image acquisition frequency of 60 Hz. To obtain the images it was used a mini camera DV

– Panasonic, and the data analysis it was realized through a Simi Twinner Pro system. To realize the system calibration it was used one meter of dimension ruler. It was also used the Jump Test system which is a vertical impulse rug, that consists of a digital chronometer, and it is displayed in the moment in which the individual's feet lose the contact with the rug and it is turned off in the moment in which the feet reach the contact again, after the jump suspension phase. It was registered the time of the flight during the jump, to measure the vertical jump height which the player got in each executed throw.

The data collection was realized during a training section, previously scheduled with a team coach and players. This section occurred in the sport gymnasium in Cascavel city, Paraná state, Brazil.

This day, firstly, the anthropometric variables were measured relate to the height and body mass. After this measurement demarcations from articulate centers (ankle, knee, hip, shoulder and distal phalanges beside the execution throw) were realized in order to become the digitalizing of images more accurate. To the execution of the movement the training court itself was used, where the camera to acquire the images was placed in the sagittal plan of the throw. (Fig 1). This camera captured the jump throw movements from the beginning of the ball way to the basket direction. The calipers was placed close and centralized to the throw place. The throw was executed on the jump test rug.

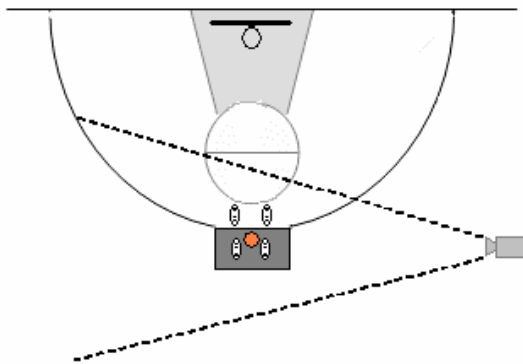


Figure 1: Camera position related to the throw.

The players were informed to do their usual warm-up. Each player accomplished three throws in sequence, they were also oriented to realize the throw as they were in a game in order to simulate this situation, it was placed a marker (defender) in front of the athlete who executed the throw, in other words, high concentration was demanded.

The analyzed variables in the throw execution phase were height of vertical jump, in the players impulsion during the jump throw (air phase of the throw), and the angle of the extension movement to the flexion, from fist in the moment of the ball release (the marked points of the articular centers were in the distal phalanges of the medial fingers, fist articulation and elbow articulation), the elbow extension angle in the moment of the ball release (the marked points of the articular centers were the fist, elbow and shoulder articulations), the shoulder flexion angle in the moment of the ball release (the marked points in the articular centers were the elbow, shoulder and hip articulations), the knee maximum flexion angle during the throw (the marked points of the articular centers were the ankle, knee and hip articulations) and the ball release angle (two first tables after the ball release).

To the analysis of the variables, afterwards the record was realized the digitalizing of images through the Simi Twinner Pro system. To the data analysis was realized a descriptive statistics through the measurement of central tendency (average) and variability measure (standard deviation) and to compare the variables it was used Student t-test to compare two paired samples. T-test: to a sample and linear correlation of Pearson.

RESULTS

In the angle of the extension movement to the flexion, elbow extension angle, shoulder flexion angle, and projected angle variables were analyzed only the throws which obtained success, and these were 40% (12 throws) of the executed. These throws were analyzed according to the given form in the method topic, that are shown on the table.

Table 1 Average values and standard deviation of the fist angle, elbow extension angle, shoulder flexion angle, projected angle variables.

Variables	Medium	Standard Deviation
Movement extension angle to the flexion of fist (°)	204,76	12,36
Elbow extension angle (°)	126,67	9,42
Shoulder flexion angle (°)	129,84	9,24
projected angle (°)	54,75	2,48

In the angle of the maximum flexure knee and height of vertical jump were analyzed and correlated the athletes' throws in which their attempts had successes and mistakes, the found value in the knee maximum flexion angle variable to the throws non converted was $52,10 \pm 9,84^\circ$, and to the throws converted was $52,78 \pm 9,53^\circ$. In height of vertical jump variable the obtained values were $18,11 \pm 6,60$ cm to the throws non converted, and $17,30 \pm 6,80$ cm to the converted throws.

DISCUSSION:

The successes in the analyzed movement extension angle to the flexion, from fist have an average of $204,76 \pm 12,36^\circ$, when compared with Rodacki et al (2005), who realized a study with adults of an academic team, they presented an 180° value to this variable, with this it was verified a significant difference to the level of the 5%. The high angle on the present study can be credited to the motive that all the converted throws were analyzed, if they reach the table and hoop or they fall directly in the basket, which was the study realized by Rodacki et al (2005).

In the elbow extension angle variable obtained a value of $126,67 \pm 9,24^\circ$, being close when compared to Rodacki et al (2005), who presented in his study a value of 131° , therefore, it was not verified a significant difference to the level of 5%.

The elbow extension angle has an important role in the throw technique, according to Button et al (2003, apud Okazaki, 2007), who points his variable as the most important point in the throw, inferring a higher impulse impelled to the ball through this articulation.

To the shoulder flexion angle variable, the present study obtained a value $129,84 \pm 9,24^\circ$, compared to Rodacki et al (2005) who presents a value of 122° to the same, it was verified a significant difference to the level of 5%.

Related to the projected angle it was verified in the present study an average value of $54,75 \pm 2,48^\circ$, compared to Hall (2000), who presents to this variable a value of 50° it was checked a significant difference to the level of 5%. However, it is worth to point out that the projected angle is not the only responsible variable for of ball way. The shoulder flexion angle variable presented an average value higher than the found in the reading, consequently, the projected angle was also higher.

In the correlation between the knee maximum flexion angle and height of vertical jump variables, comparing the converted and non converted throws, it was checked that it does not occurred a significant correlation to a $p. <0,05$, this allows us infer that the success in throws is a related technique, mainly, to the movement of the superior members to this category.

CONCLUSION:

The jump throw in basketball has particularities due to the position in the court and individuality in each player. But the mechanic and technique of throw are considered equal to everyone to get its goals helping its development and getting better results in throws.

The jump throws, which were analyzed in this adult, have a low technique rate, because only 40% of realized throws from the sample obtained success. From the analyzed throws which were converted, the obtained values to the movement extension angle to the flexion, from fist, shoulder flexion angle, and ball projected angle variables presented significant difference related to other studies.

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