MASARYK UNIVERSITY
FACULTY OF SPORTS STUDIES

Erasmus 2013

2D and 3D Motion Analysis

Teacher: Martin Sebera

Student: Inês Faria

Number: 429708

Analysis attempts handball in suspension

Introduction:

The purpose of this theme was to perform a quantitative assessment of a shot handball in suspension with a support and a goal in suspension the feet together, based on biomechanical knowledge.

Conditions of Evaluation:

For the realization of Goal attempts used two handball athletes, Dinis (The Athlete) with 68kg of body mass and height of 1.75m, and Clara (Athlete B) with 61kg of body mass and height 1.63m. The two athletes affected two suspension shots, one with support and the second with the feet together.

The filming was make at on 2.5m of distance of Goal attempts handball and perpendicular to the movement of players and the ball. Used in the motion analysis software: Utilius EasyInspect. A calibration system (2x1m) was filmed, to calibrate the images of the Goal attempts in suspension.

Figure1: Calibration System

On the next chart are the coordination's the calibration system.

Ponto	X (m)	Y (m)
1	0.0	0.0
2	1.0	0.0
3	0.0	1.0
4	1.0	1.0
5	0.0	2.0

Results:

In 2nd Figure we analyze the angle maximum that the Athlete A performed with the best leg with a support (Panel A) and feet together (Panel B). With support he made an angle of 44.1 ° and 63.7 ° with feet together, so with the feet together the angle increased by 44.1%.

A **B**

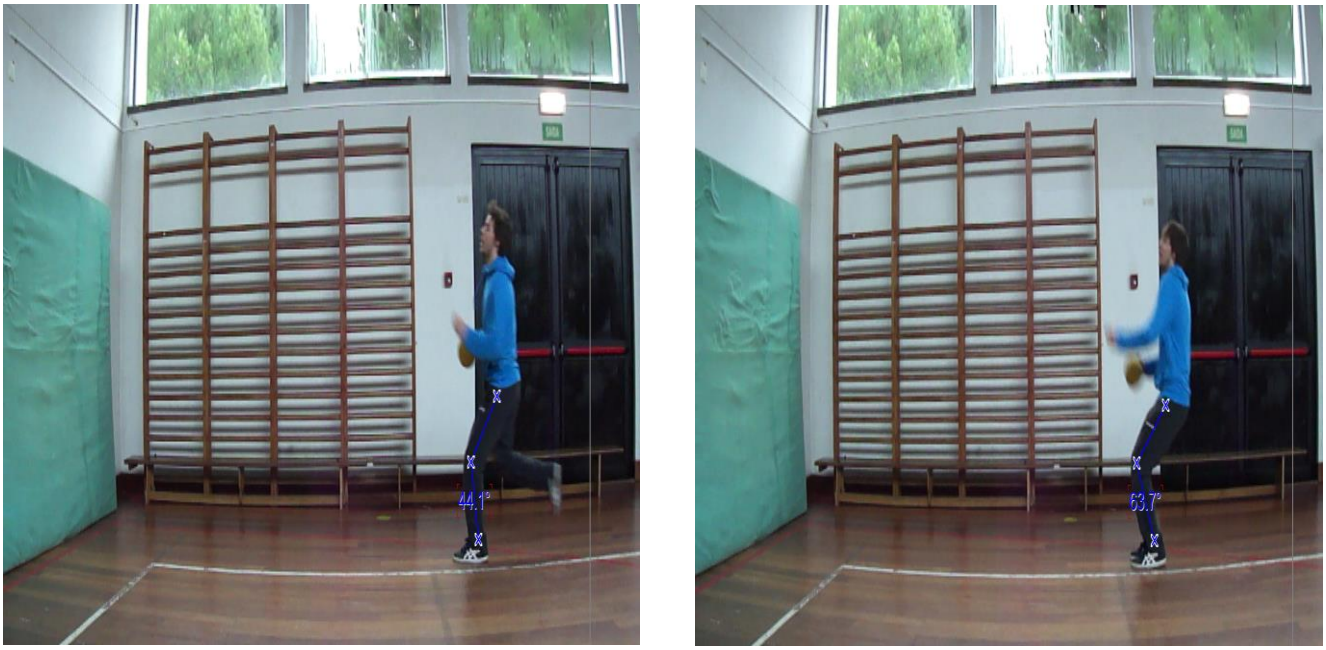


Figura 2. The angle of the shot athlete with a support and feet together.

Then I analyzed the Goal attempts athlete B (Figure 3) with the support (Panel C) and its angle was 48.4 ° and the shot to two feet together (Panel D) was 60.7 º. With the feet together the angle increased by 25.4% less difference than was found with the athlete A.

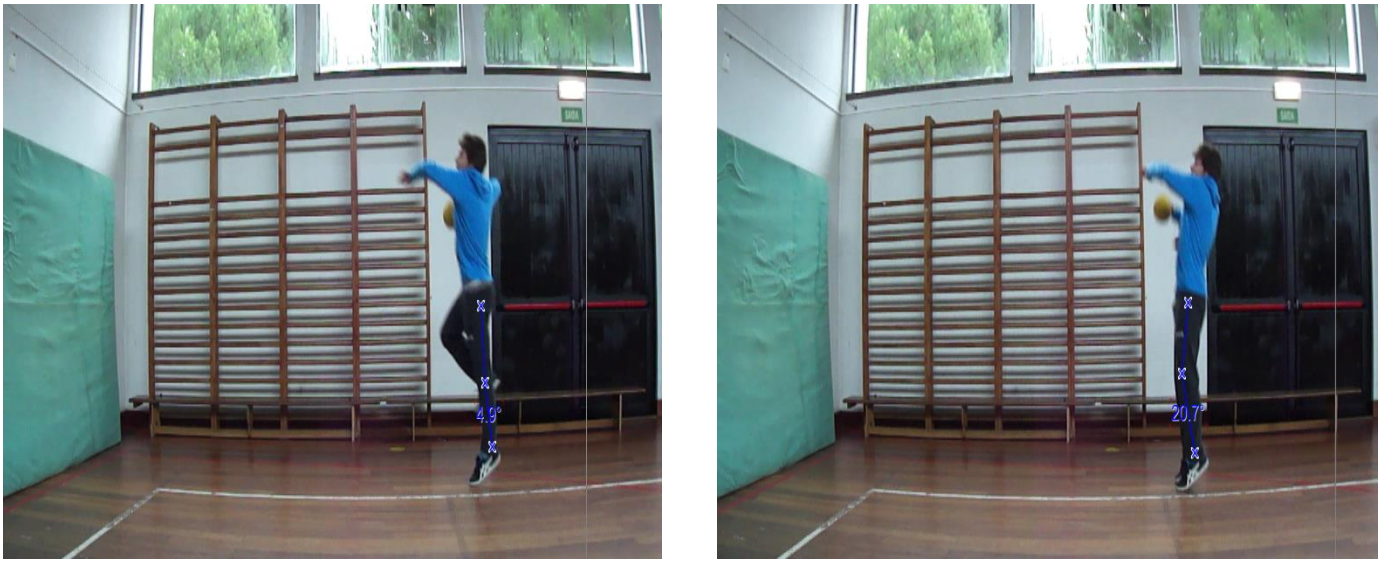
C **D**

Figura 3. Angle B athlete in the shot with a support and feet together.

In Figure 4 are the angles of A athlete when it leaves the ground and could thus realize the speed and acceleration angle that this makes when he jumps. A athlete in the shot to a support when out of the ground (Panel E) has an angle of 4.9 ° which had a time (τ) of 0.13s from the first recorded angle (Figure 2). The distance (Δθ) between the angles of 39.2 ° (44.1 ° -4.9 ° = 39.2 °) in 0.13s so the angular velocity (ω) is 301.5 ° / s (ω = Δθ / τ ⇔ ω = 39.2 / 0:13 = 301.5 ° / s) and its angular acceleration (α) is 2319.2 º / s2 (α = Δω / τ ⇔ α = 301.5/0.13 = 2319.2 ° / s2).

In shot to two feet (Panel F) the angle is 20.7 ° and the angular distance is 43 (63.7-20.7 = 43) in 0.10s , so its angular speed is 430 ° / s (ω = Δθ / τ ⇔ ω = 43/0.10 = 430 ° / s) and its angular acceleration is 4300 ° / s2 (α = Δω / τ ⇔ α = 430/0.10 = 4300 ° / s2).

With these data we can say that the jump with two feet have greater variation and respective angular velocity and angular acceleration greater.



E **F**

Figura 4. The angle of the athlete when it leaves the ground.

In figure 5 we have the angle of athlete B when the athlete leaves the ground and thus we can calculate the angular distance of the athlete as well as the speed and angular acceleration. In the shooting support (Panel G) is the angle of 11.7 ° with its angular distance of 36.7 ° (48.4-11.7 = 36.7 °) 0.10s. The angular velocity is 367 ° / s (ω = Δθ / τ ⇔ ω = 36.7 / 0:10 = 367 ° / s), and the angular acceleration is 3670 ° / s2 (α = Δω / τ ⇔ α = 367/0, 10 = 3670 ° / s2).

In the shot to two feet (Panel H) angle of 16.3 °, with an angular distance of 44.4 ° (44.4 ° = 60.7-16.3) 0.13 s. Thus we can calculate the angular distance is 341.5 ° / s (ω = Δθ / τ ⇔ ω = 44.4 / 0.13 = 341.5 ° / s), its angular acceleration is 2626.9 ° / s2 (α = Δω / τ ⇔ α = 341.5 / 2626.9 = 0.13 ° / s2).

We can say after reviewing the results that the angular variation is greater in the shot to two feet but the speed and angular acceleration was higher in the shot with a support.

G **H**

FIGURA 5. The angle of the athlete when it leaves the ground.

Then we calculate the maximum distance that the athlete A jumped upright and which the vertical distance that the knee of the free leg rises in the shot to a foot (Panel I) and kick the feet together (Panel J), as in Figure 6. The athlete's jump in to support jumped 0.30 m and 0.48 m feet together, with two feet jumped over 60%. The maximum height of the knee of the free leg rose 0.93m to 0.96m and support the feet together, with the feet together soared 3.2%.

In Figure 7 we calculate the maximum height and maximum knee of the free leg of the athlete B of the jump with a support (Panel K) and jump two feet (Panel G). Jump in support had a maximum height of 0.46 m and two feet was 0.16 m, and with one support soared 187.5%. The maximum height of a knee support was 0.85 m and two feet support was 0.71 m, thus soared to a 19.7% support.

K **L**

Figura 7. Maximum height of the athlete B and knee of the free leg.

The athlete A had the speed to climb the knee of the free leg of 3.3 m/s in the shot with a support (Panel M) and 1.5 m/s in shot to two feet (Panel C) as can be seen in Figure 8. Jump in support was 120% faster than the jump feet together.

Athlete B got one speed knee of 3.1 m/s hits in a support (the Panel) and 1.5 m/s shot in the feet together (Panel D) as can be seen in Figure 9. His shot was a support 106.6% faster than the shot to two feet.

M **N**

Figura 8. Speed of the free leg knee of the athlete A.

O **P**

Figura 9. Speed of the free leg knee of athlete B.

CONCLUSION:

This work was enriching the level of research and was very useful for a better understanding of the implementation of hits in suspension throughout the analysis. The absence of a very specific goal for participants in the execution of the work (which in this case was to achieve goal with the existence of a difficulty that was the goalkeeper) can have inhibited some movement by the performers.