191 - SPEED-ACCURACY RELATIONSHIP IN BASKETBALL SHOOT

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INTRODUCTION

Jump shoot is the most important technique in basketball (OKAZAKI et al., 2004a). Three variables determine the efficacy of this motor ability: height, angle and speed of release (MILLER & BARTLETT, 1996, 1993). Great height of release has been suggested to decrease release angle and speed (KNUDSON, 1993). Because, greater release angles causes increase in the generation of speed to propel the ball (BRANCAZIO, 1981). As speed is proportional to movement variability (DARLING & COOKE, 1987; SCHMIDT et al., 1979), minor generation of speed is recommended (KNUDSON, 1993). Thus, the inverse relationship between speed and accuracy has been established.

Fitts' Law (1954) has been used to explain and express this inverse relationship between speed and accuracy. However, Fitts' findings had support in laboratories tasks. Thus, the ecological validation of Fitts' findings is diminished, once it does not handle with complex motor tasks such those find in sports (like the jump shoot in basketball). Therefore, the present study aimed to analyze the speed-accuracy relationship in the basketball shooting.

The analysis of speed-accuracy relationship in basketball shoot may provide subsides in the understanding of this ability. This analysis will also permit to comprehend better the relationship between speed and accuracy in complex motor tasks.

METHODOLOGY

Sample

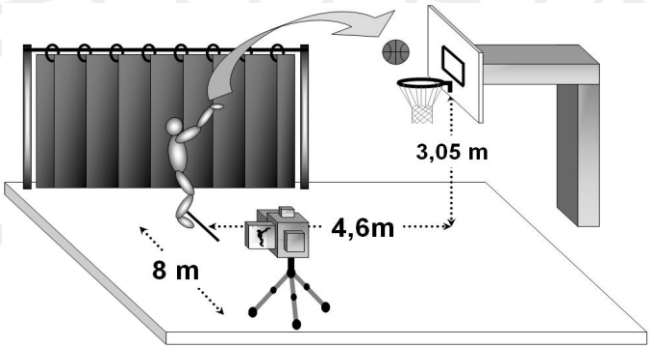
Sample was constituted by 15 basketball players from man adult category (24,0 ± 5,1 years; 88,2 ± 17,8 kg; 1,86 ± 0,1 m) with 11,3 ± 5,7 years of experience. None subject reported any kind of previous injury or incapacity that could interfere in the shoots tests performed. Before the beginning of the evaluation the subjects were informed about the research procedures and assigned a term of consentient.

Experimental Procedures

Before the beginning of the film a general and specific warm up was performed (15-20 min). The warm up was not controlled and each subject was free to choose his own series of exercises to avoid any fatigue effects. The specific warm up was performed through shoots in the basket in a front position (4.6m from the basket) during a 10 minutes period.

The resultant linear speed of balls release was obtained through a cinematic analysis (2 D, saggital plane, 100 Hz, Shutter-Speed 1/250). A digital recorder (JVC GR-DVL 9500E, Japan) was positioned perpendicular to the subject's saggital plane (right side) from a distance of 8 meters (figure 01). The images were stored in video tape and than transferred to a microcomputer. The images were digitalized manually by only one researcher through specific movement analysis software (*SIMI Motion*®). A 4th order recursive Butterworth filter was used to attenuate the signal noise (cutoff rate 10Hz) (OKAZAKI et al., 2004b). This procedure was performed through the Biomechanics Toolbox software (*Manchester Metropolitan University, UK*) (OKAZAKI e RODACKI, 2005).

Figure 01 - Film Setup.



Accuracy Test of Balls Displacement

The accuracy test of balls displacement provided a score to the balls displacement in the shoots performed. This test was used to analyze the three shoots performed and recorded from each subject. The average of the three shoots was calculated to provide an average score. Table 01 express how the performed shoots were scored.

Table 01 - Score of Accuracy Test of Balls Displacement

Score	Description
02	Ball touches first the board or does not touch the ring.
04	Ball touches once or more times the ring, but does not pass through the basket.
06	Ball touches more then once the ring and passes through the basket.
08	Ball touches once the ring and passes through the basket.
10	Ball passes through the basket without before touches the ring or board.

Statistical Analysis

Data was analyzed through descriptive statistics procedures of mean and standard-deviations. The Kolmogorov-Smirnov test was applied to confirm the data normality. Pearson correlation test was used to verify the association between the balls release speed and the shoots' accuracy test. The significance level was fixed at 0.05. The statistical analysis was performed through the software *STATISTICA*® (*STATSOFT Inc.,* versão 6.0).

RESULTS

Table 02 showed the results from the accuracy test and the release speed performed in the shoots.

Table 02 - Score of Accuracy test and the balls release speed.

Subject	Accuracy Test (pts)	Balls Release Speed (m/s)
01	7.40	5.27
02	5.80	5.26
03	6.60	5.72
04	8.20	5.70
05	5.80	5.53
06	6.00	6.23
07	6.60	5.97
08	7.20	5.62
09	6.00	5.44
10	6.80	5.83
11	6.80	6.13
12	8.80	5.58
13	5.20	4.72
14	7.20	6.32
15	5.40	5.89

Pearson correlation test showed a low association between the accuracy test and the balls release speed ($r = 0.22$; $p < 0.05$).

DISCUSSION

The basketball jump shoot is an ability that requires the performance of movement with both, speed and accuracy (ELLIOTT, 1992). This relationship has been expressed inversely in research with laboratorial motor tasks (FITTS, 1954; FITTS e PETTERSON, 1964). Thus, as shoot speed is increased the movement precision should decrease. However, the results showed that in the basketball shoots performed with great speed of release were not less accurate. It is possible that, this tradeoff in speed-accuracy was not verified in basketball shoot in function of other variables that influence the performance of this ability, such as the release angle and height. Therefore, even that the increase in speed generation results in greater variability and, consequently, decrease in accuracy, subjects appeared to have the capacity to manipulate the release angle and height to allow a satisfactory performance. For example, increase the release angle allows a greater area to ball pass through the basket, but requires more generation of release speed. While increasing release height allows minor generation of speed and movement variability.

CONCLUSION

It was not verified a linear relationship between accuracy and speed in the basketball jump shoot as that predicted by Fitts (1954). Therefore, release speed did not seem to be the determinant factor in the accuracy of the basketball shoot. Basketball players seemed to manipulate other variables (such as the release angle and height) to compensate the great generation of speed.

It is recommended the analysis of the speed-accuracy tradeoff in other complexes motor abilities as: kick in soccer, baseball throw, dart throwing, etc.

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SPEED-ACCURACY TRADEOFF IN BASKETBALL SHOOT

ABSTRACT

The aim of the study was to analyze the speed-accuracy relationship in basketball shoot. Fifteen male players (24,47 ± 5,40 years old; experience 11,47 ± 6,10 years) were analyzed performing freethrow shoots. A kinematics analyze (2D, saggital plane, 100 Hz) provided ball's release speed on each shoot. Shoot accuracy was performed through the ball's trajectory analysis. Pearson's correlation test was used to analyze the relationship between speed and shoot accuracy. The relationship between ball's release speed and accuracy test was small (r = 0,22; p>0,05). Therefore, release speed did not seem to be the factor that most determines on shoots accuracy. Players were able to manipulate other variables (such as release angle and height) to compensate release speed. Thus, faster movement may be compensated through greater release angles, this allows a greater area of ball's entry through the basket and decrease the shoot's margin of error. In another way, minor speeds ensure less movement variability.

Key-Words: Speed-Accuracy, Basketball Shoot, Basketball.

LE COMPROMIS DE VéLOCITé-PRéCISION DANS LE LANCEMENT DE BASKETBALL

RESUME

Le dessein de l'étude était d'analyser la relation de vélocité-précision dans le lancement de basketball. Quinze joueurs mâles (24.47 ± 5.40 années; éprouver 11.47 ± 6.10 années) ont été analysé exécutant freethrow lancement de basketball. Une cinématiques analysent (2D, saggital, 100 Hz) a fourni la vélocité de propulsion de la balle sur chaque lancement. Tirer la précision a été exécutée par l'analyse de trajectoire de la balle. Le test de corrélation de Pearson a été utilisé pour analyser la relation entre la vélocité et tire la précision. La relation entre la vélocité de propulsion de la balle et le test de précision était petite (r = 0.22 ; p>0,05). Donc, la vélocité de propulsion n'a pas semblé être le facteur qui la plupart de détermine sur tire la précision. Les joueurs pouvaient manipuler d'autres variables (angle tel que de propulsion et la hauteur) compenser la vélocité de propulsion. Ainsi, le mouvement plus rapide pourrait être compensé par les plus grands angles de propulsion, ceci permet le plus grand secteur d'entrée de la balle par le panier et diminue la marge d'erreur de la fusillade. Dans une autre façon, les vitesses mineures assurent la variabilité de moins de mouvement.

Mot-réserve: Vélocité-Précision, Lancement de Basketball, Basketball.

El INTERCAMBIO VELOCIDAD-PRECISIÓN EN LANZAMIENTO DEL BALONCESTO

RESUMO

El objetivo del estudio fue de analizar la relación de la velocidad-certeza en el renuevo del baloncesto. Quince jugadores masculinos (24.47 ± de 5.40 años de edad; experimente 11.47 ± 6.10 años) fueron analizados los renuevos de lanzamiento que realizan. Una cinética analiza (2D, plano saggital, 100 Hz) proporcionó la velocidad de la liberación de pelota en cada lanzamiento. La eficacia del lanzamiento fue realizada por el análisis de la trayectoria de pelota. El teste de la correlación de Pearson fue utilizado para analizar la relación entre la certeza de la velocidad y el lanzamiento. La relación entre la velocidad de la liberación de pelota y el teste de eficacia fue pequeña (R = 0.22; p>0,05). Los jugadores pudieron manipular otras variables (tal como el ángulo y altura de la liberación) para compensar la velocidad de la liberación. Así, los movimientos más rápidos pueden ser compensados por ángulos más grandes de liberación, esto permite un área más grande de la entrada de la pelota por la cesta y disminuye el margen del lanzamiento del error. En otra manera, las velocidades secundarias aseguran menos variabilidad de movimiento.

Palabra-Clave: Velocidad-Precisión, Lanzamiento del Baloncesto, Baloncesto.

RELAçãO VELOCIDADE-PRECISãO NO ARREMESSO DO BASQUETEBOL

RESUMO

O objetivo do estudo foi analisar a relação velocidade-precisão no arremesso de basquetebol. Quinze atletas masculinos (24,47 ± 5,40 anos; experiência 11,47 ± 6,10 anos) foram analisados realizando arremessos de lance livre. Uma análise cinemática (2D, plano sagital, 100 Hz) forneceu a velocidade de lançamento da bola em cada arremesso. A precisão do arremesso foi realizada através da análise da trajetória da bola. O teste de correlação de *Pearson* foi utilizado para analisar a relação entre a velocidade e precisão. A relação entre a velocidade de lançamento da bola e o teste de precisão demonstrou ser pequena (r = 0,22; p>0,05). Desta forma, a velocidade de lançamento não pareceu ser o fator mais determinante na precisão dos arremessos. Os atletas parecem conseguir manipular outras variáveis (como o ângulo e altura de lançamento) para compensar a velocidade de lançamento. Assim, movimentos mais rápidos podem ser compensados por maiores ângulos de lançamento, o que permite maior área de entrada da bola na cesta e reduz a margem de erro no arremesso. Por outro lado, menores velocidades garantem menor variabilidade de movimento.

Palavras-Chave: Relação velocidade-precisão, Arremesso, Basquetebol.