Portuguese Journal of Sport Sciences
11 (Suppl. 2), 2011

COMPARISON OF THE HAND-DRIBBLING MOTION BETWEEN SKILLED AND UNSKILLED SUBJECTS

Kai Hirata[1], Masatoshi Sawamura[1], Michiyoshi Ae[2] and Yasuto Kobayashi[1]

Graduate School of Comprehensive Human Sciences, University of Tsukuba, Japan[1]
Institute of Health and Sport Sciences, University of Tsukuba, Japan[2]

The purpose of this study was to investigate the differences in the kinematics of skilled and unskilled between the skilled and unskilled dribblers. Ten male university basketball players as the skilled subjects and thirty males as the unskilled ones participated in this study. The three-dimensional coordinate data of reflective markers on the body and a ball were captured with a VICON system operating at 250Hz. The skilled players employed the external-internal rotation and adduction-abduction of the shoulder and the forearm supination-pronation to achieve longer contact time and lower catch and release heights.

KEY WORDS: hand-dribbling kinematics, 3D motion analysis.

INTRODUCTION: The task of the hand-dribbling motion in basketball is to carry a ball in the court without being taken by the opponents. Some coaches point out factors of a good dribbling technique as a longer contact of the hand with the ball and a lower height of the range of motion of the ball and hand. As for scientific point of view, Katsuhara et al. (2010) reported that the contact time in a stationary dribbling was longer in the skilled subjects. Fujii et al. (2010) indicated that the skilled subjects in 20m hand-dribbling, greatly rotated the upper arm to maintain running velocity. However, there is no information of the kinematics of the hand-dribbling motion to coach and teach effectively. Therefore, the purpose of this study was to investigate the differences in the kinematics between the skilled and unskilled dribblers.

METHODS: Ten male university basketball players as the skilled subjects and thirty males as the unskilled ones participated in this study. The three-dimensional coordinates data of reflective markers on the body and a ball were captured with a VICON system (VICON MOTION SYSTEMS, Ltd) operating at 250Hz. The subjects were asked to perform 10m hand-dribbling as fast as possible. The parameters measured were contact time of the hand with the ball, catch and release heights, height and horizontal velocity of the centre of gravity and angular kinematics of the dribbling arm. To test the difference between two groups Mann-Whitney U test was used with significant level set at 5%.

RESULTS AND DISCUSSION: Figure 1 shows the averaged dribbling motion of the skilled players and a typical example from the unskilled subjects. The dribbling motion of the skilled players was characterized by a great range of lateral motion of the ball in the frontal plane and a lower catch and release heights, as coaches pointed out. The skilled players showed a significantly longer contact time and lower catch and release heights (Table 1). Katsuhara et al. (2010) inferred that the long contact time of skilled players in a stationary dribbling played an important role for the stable control of bouncing position. We speculate that in the 10m hand-dribbling, the longer contact time plays a similar role. A negative correlation was found between the heights of catch and release and the contact time, indicating that the lower heights of catch and release of the ball helped players keep the ball longer in the hand. Figure 2 shows the averaged and a typical pattern of change in the CG height and figure 3 shows the CG horizontal velocity for skilled and unskilled players. The skilled players caught the ball in the phase where their CG was lower than the average height in running, and were able to accelerate the ball with their CG because their CG was accelerate after the instant of its lowest point. Kinematic analysis of the arm and ball indicated that the skilled players were manipulating the inward-outward movement of the ball with the external-internal and

adduction-abduction of the shoulder joint, and the lower catch and release heights of the ball resulted from the combined motion of the elbow flexion-extension and the forearm supination-pronation, which were likely to be important motion for the excellent dribblers.

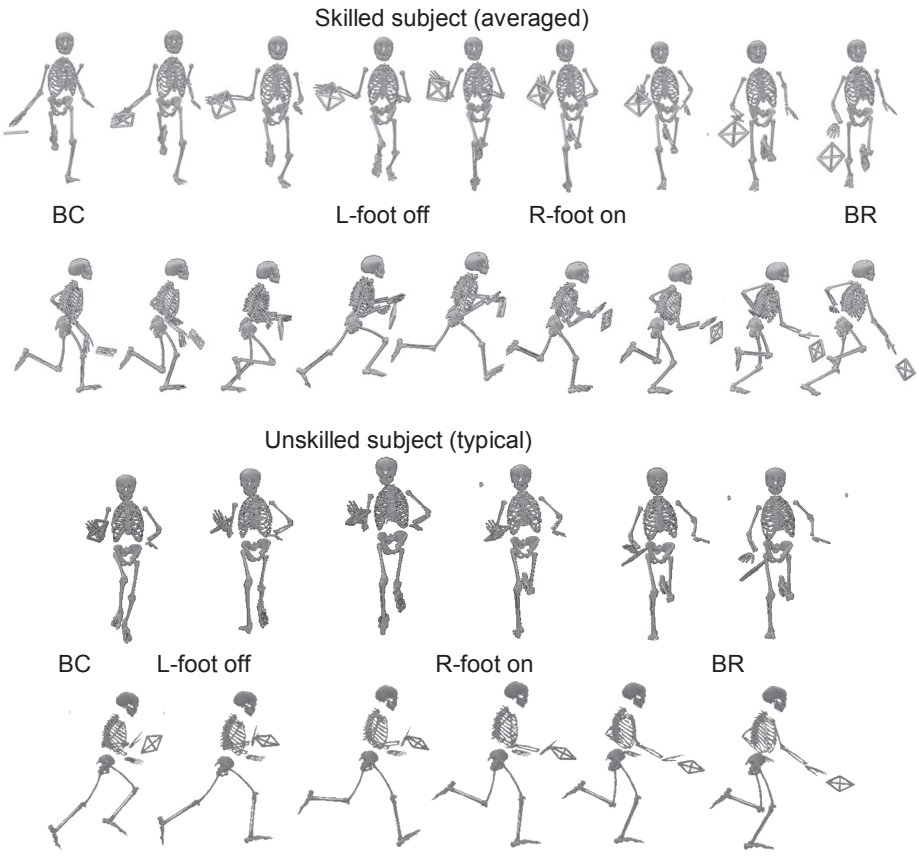

Figure 1. The hand-dribbling motion of the skilled and unskilled subjects.

Table 1
Catch and release height and contact time of the skilled and unskilled dribblers. Values expressed as Mean ± S.D.

	Skilled	Unskilled	Sig. Diff.
Catch height (%)	40.3 ± 2.88	56.0 ± 7.44	$p < 0.001$
Release height (%)	32.5 ± 2.24	42.3 ± 6.38	$p < 0.001$
Contact time (s)	0.39 ± 0.02	0.28 ± 0.07	$p < 0.001$

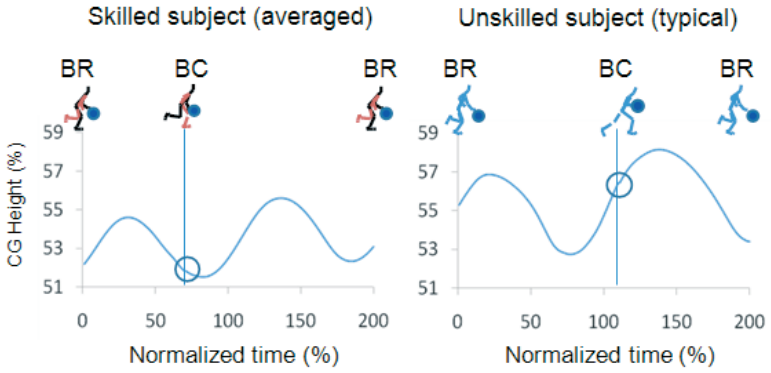

Figure 2: The averaged and a typical pattern of change in the CG height for skilled and unskilled players.

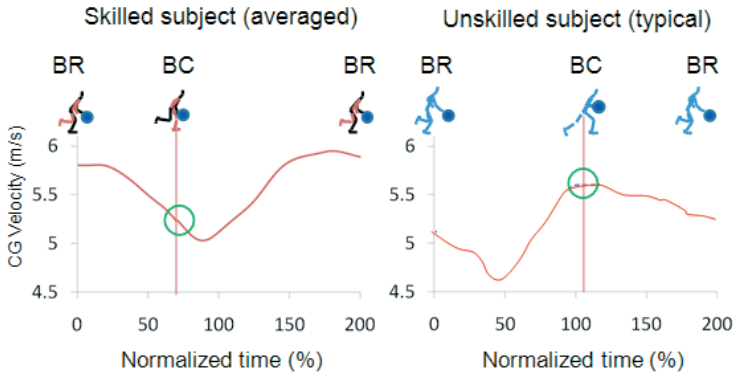

Figure 3: The averaged and a typical pattern of change in the CG horizontal velocity for skilled and unskilled players.

CONCLUSION:

The skilled players employed the external-internal rotation and adduction-abduction of the shoulder, and the forearm supination-pronation to manipulate the ball in a lower position and with a longer contact time.

REFERENCES:

Fujii S., Yamada Y., and Oda S. (2010) Skilled Basketball players rotate their shoulders more during running while dribbling. Perceptual and Motor skills 110: 983-994

Hay, J.G. (1993) The Biomechanics of Sports Techniques, 4th ed. Benjamin Cummings, 231-232.

Katsuhara Y., Fujii S., Kametani R., and Oda S. (2010) Spatiotemporal characteristics of Rhythmic,stationary basketball bouncing in skilled and unskilled players. Perceptual and Motor skills 110: 469-478