ESTIMATION OF TAKEOFF-ANGLE IN THE LONG JUMP BY USING WiMAS

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INTRODUCTION: There have been many studies on the biomechanics of the long jump, and the typical method has been video analysis. These studies provided a lot of new angles about movement of jumping (Jaitner et al, 2001). However, video analysis has a flaw in that it takes a long time for the analysis. We produced a motion analysis system by using telemeter and micro sensor IC. We named this system WiMAS. WiMAS stands for Wireless Motion Analysis System. WiMAS has two merits. One of them is that it doesn't restrain the subject's motion, and the other is real-time feedback. In previous studies, we had measured the height of vertical jumps, and have recently developed a method for estimating a takeoff-angle in the standing long jump by using WiMAS. The purpose of this study was to develop a method for estimating the takeoff-angle in the long jump.

METHODS: The subjects were track and field athletes of college age (4 males and 1 female). The acceleration during the long jump motion was measured by using WiMAS with two bi-axes acceleration sensor ICs (Analog Devices Inc., ADXL250). The sensor was fixed on the Iliac crest, and the direction of the measurement was made downward for perpendicular. This method could obtain the acceleration-time curves similar to the vertical ground reaction force. The takeoff-angle was measured by jump height and flight distance from takeoff to landing. The Jump height was calculated from the flight time. It was evaluated from the lowest center of gravity on takeoff and landing. The long jump motion was taken by digital video camera (30 fps) at the same time. In every case, the takeoff-angle of the center of gravity of the body was calculated by both video analysis and WiMAS.

RESULT AND DISCUSSION: The flight angle was 14.56 ± 3.28 (sec) by WiMAS and 14.04± 3.27 (sec) by video analysis. There was no significant difference between WiMAS and video analysis. The absolute error margin of flight angle between WiMAS and video analysis was 1.16 ± 1.11 (deg). The Takeoff-angles which were measured by WiMAS and video analysis had high correlations ($r = 0.89$, $p < 0.01$). These results suggested that the flight angles which were evaluated using WiMAS coincided with those which were calculated using video analysis. WiMAS has a merit which is real-time feedback. The results indicated that WiMAS could show feedback data to athletes and coaches more instantaneously than other analytic devices during training.
Therefore, we consider that estimation of takeoff-angle on the long jump using WiMAS is useful for training.

REFERENCES:
Jaitner, T. (2001). Analysis of the Long Jump Technique in the Transition From Approach to Takeoff Based on Time-Continuous Kinematic Data, *European Journal of Sport Science,* vol.1, issue 5.