A CASE STUDY OF APPLYING CAI TO UKEMI PRACTICE IN JUDO

Naotoshi Minamitani, Hokuriku University,
Hiro Yamamoto, Kanazawa University, Komatsu. Japan

KEY WORDS: cai, judo, ukemi practice, video

INTRODUCTION: In university Judo classes, students are often thrown or fall as part of the training. As a part of being thrown or falling, *ukemi* is an important technique. Ukemi is the technique used to soften the shock to one's body when being thrown or falling and is a method by which injuries can be avoided. As ukemi is native to Judo, it is one of the most basic and important movements. Consequently, students who learn Judo must completely master the art of ukemi, rather than the art of throwing. In Japanese universities, students who learn Judo must completely master ukemi. However, students often voice complains about the conventional method of ukemi practice, mainly complaining that the process is long and tedious. In the end, most of them have no choice but to learn to cope with the process.

Research has suggested that utilization of personal computers and video equipment (Computer Aided Instruction - CAI) may improve performance and skills in junior gymnastics classes in Japan (Watanabe & Yamamoto, 1997). Further, qualitative investigations of the biomechanical properties of Judo throwing techniques have been conducted by Minamitani et al. (1988, 1992, 1993), and the importance of positioning the center of gravity in throwing movements has been recognized. This information was thought to be of use to Judo teachers and coaches. However, quantitative data of ukemi movements were not obtained in these studies.

This study was conducted using a personal computer during ukemi practice. The purpose of this study was to present materials which can be applied to illustrate the utilization of computer assisted instruction (CAI) for ukemi practice, and included various ways of teaching kinesiology and biomechanics.

METHODS: Subjects consisted of ten male students and three female students at Hokuriku University, located in Japan. Physical characteristics of the males were as follows: Height; 1.69 ± 0.07m, weight 65.40 ± 11.40 kg, and age, 19.47 ±1.31 yrs. For the females: Height; 1.68 ±0.03m, weight 58.33 ±6.24 kg, and age, 20.0 ±0 yrs. Each subject participated by engaging in a fundamental ukemi practice program for three weeks (twice a week). In this study, instead of a paper textbook, newly developed software for use with a personal computer was applied to the teaching of ukemi skills. The ukemi skills learned were: 1) Ushiro-ukemi (back fall), 2) Yoko-ukemi (side fall), 3) Mae-ukemi (straight forward fall), 4) Maemawari-ukemi (forward fall forward roll), respectively (Kodokan, 1986). All movements of each student's ukemi performance were taken by video camera and then analyzed. Moreover, a questionnaire related to knowledge of the classifications of ukemi was administered pre- and post experiment for comparison.

The second part of this study investigated the differences in the Maemawari-ukemi motions between a trained Judo player and beginning male university students,

using three-dimensional (3D) motion analysis. All trials of the right side Maemawari-ukemi were videotaped with two video cameras, and 3D coordinates of points on body landmarks were obtained using Direct Linear Transformation (DLT).

RESULTS AND DISCUSSION: Pre-test understanding of the forms and classifications of ukemi among the male sample showed the following (numbers indicate correct responses). 1) Ushiro-ukemi 30%, 2) Yoko-ukemi 20%, 3) Mae-ukemi 30%, 4) Maemawari-ukemi 50%, and total 33%. Post-test results showed the following (numbers indicate correct responses). 1) Ushiro-ukemi 100%, 2) Yoko-ukemi 100%, 3) Mae-ukemi 100%, 4) Maemawari-ukemi 100%, and total 100%.

Pre-test understanding of the forms and classifications of ukemi among the female sample showed the following (numbers indicate correct responses) 1) Ushiro-ukemi 0%, 2) Yoko-ukemi 0%, 3) Mae-ukemi 0%, 4)Maemawari-ukemi 0%, and total 0%, respectively. On the other hand, post-test results showed the following (numbers indicate correct responses). 1) Ushiro-ukemi 100%, 2) Yoko-ukemi 67%, 3) Mae-ukemi 100%, 4) Maemawari-ukemi 100%, and total 92%. Among all students, pre-test comprehension of the forms showed the following. 1) Ushiro-ukemi 23%, 2) Yoko-ukemi 15%, 3) Mae-ukemi 23%, 4) Maemawari-ukemi 38%, and total 25%. Post test results among all students was as follows. 1) Ushiro-ukemi 100%, 2) Yoko-ukemi 92%, 3) Mae-ukemi 100%, 4) Maemawari-ukemi 100%, and total 98%. As for the qualitative aspect of the new technique, students reported that they enjoyed ukemi practice and were able to fully understand the classifications of ukemi.

The use of the personal computer makes the image of ukemi skills very clear and easy to understand. On video, students can see not only their mistakes, but also monitor their progress. Students gained confidence gradually, but the video method was unable to show them the timing and the amount of the strength needed to execute various ukemi.

As for the 3D motion analysis during Maemawari-ukemi practice, the range of motion of the left elbow joint angle when slapping the tatami (Japanese straw mat) ranged from 105 degrees to 175 degrees. For beginners however, the range of motion of the left elbow joint angle when slapping the tatami ranged from 110 degrees to 165 degrees. The results suggested that it was important to use not only the hand alone, but rather the entire length of the arm when slapping the tatami. Results also suggest that efficiency of motion for the left arm of a beginner was lower than that of an accomplished Judo player.

CONCLUSIONS: This study has shown evidence that the utilization of the personal computer and video equipment could improve performance and help perfect the skills and understanding of various types of ukemi, and that the CAI has the capability to increase students' desire to improve their Judo skills.

REFERENCES:

Kodokan. (1986). Kodokan Judo (p. 45-54). Tokyo: Kodansha.

Minamitani, N., Fukushima, M., Yamamoto, H., Suganami, M., Hirose, N. (1988). Biomechanical Properties of Judo Throwing Technique, uchimata, Especially for Newly Developed Flamingo Technique. In *Proceedings of the 6th International Symposium on Biomechanics in Sports* (pp. 245-251).

Minamitani, N., Iura, Y., Yamamoto, H. (1992). Kinematic and Temporal Characteristics of osotogari Performed by High School Judoists. *Bulletin of Hokuriku University* **16**, 77-90.
Minamitani, N., Kitano, Y., Iura, Y., Yamamoto, H. (1993). Kinetic Characteristics of osotogari Performed by High School Judoists. *Bulletin of Hokuriku University* **17**, 63-70.
Watanabe, Y., Yamamoto, H. (in press). A Case of CAI to Junior Gymnastics Class in Japan. In *Proceedings of the 15th International Symposium on Biomechanics in Sports*.