THE STEREOSCOPIC EFFECT OF A SPINNING BATON FLIGHT

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INTRODUCTION: In baton twirling, catching a spinning baton is one of fundamental skills. For successful baton-catching, baton twirlers acquire the efficient visual search behavior setting their gaze not only to parabolic flight but spin of baton (Takahashi et al., 2007). Mazyn et al. (2007) reported that the learning to catch a ball is affected by stereo vision providing accurate depth perception of the ball's movement. We consider a CAVE Automatic Virtual Environment system, 3D virtual reality display with stereoscopic effect, may be used as a training tool for baton-catching. This preliminary study aimed to examine the stereoscopic effect on the virtual reality simulation of baton-catching in a CAVE system. We reconstructed stereo- and monoscopic stimuli of spinning baton flight simulated by 3D motion capture data and assessed observer's impression of them.

METHOD: One expert baton twirler threw a baton with a spin to a target point (distance = 2.5 m) in her sagittal plane. Four retroreflective markers were attached to tips, the center and a quarter point of the baton length, respectively. The baton flight was measured by using 3D auto motion analysis system (Motion Analysis Inc., Santa Rosa, CA) with six cameras at 200 Hz. By referring to the 3D motion data, stereo- and monoscopic stimuli that a spinning baton flew toward the viewpoint of observers were constructed. A questionnaire to scale observer's impression of each stimulus, using 100-point slider bar on PC screen, contained five items as follows: the sense of stereoscopic effect, speed, distance, dynamics, and reality of the stimuli. Three volunteer subjects answered the questionnaire of their impression of both a stereoscopic stimulus in a CAVE system with stereo glasses and monoscopic stimulus on 2D screen with no glass.

RESULTS & DISCUSSION: The results of biomechanical parameters showed that the frequency of the baton's spin was 2.0 Hz and the maximum height of baton's flight trajectory was 1.35 m. The results of the questionnaire showed that, in the sense of stereoscopic effect, dynamics and the reality of the stimulus, the all mean scores (79.3 ± 14.4, 74.3 ± 3.8 and 81.0 ± 7.8) for stereoscopic stimulus were higher than those (57.3 ± 19.4, 60.0 ± 17.8 and 51.7 ± 17.0) for monoscopic one, respectively. These results suggest that the stereoscopoic stimulus of the spinning baton flight works positively to provide the sense of reality as well as the stereoscopic effect on subjects. The further study will reveal more details of the learning effect of the simulation in a CAVE system.

CONCLUSION: Our findings provide that the stereoscopic effect in a CAVE system enhance the presence of the simulated spinning baton flight. It suggests that a CAVE system has a potentiality for the training use in baton-catching.

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