Whole-body coordination skill for dynamic balancing on a slackline

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The purpose of the present study is to reveal the skills for slacklining. A slackline is a flat belt tightly spanned between two anchor points. Because it bounces and swings in all directions, keeping balanced on it is difficult. Since slacklining started as a balance sport in 2007 in Europe, it has spread over the world, and international contests have been held wherein competitors demonstrate various acrobatic skills such as jumping on a line.

Although slacklining has progressively spread as both a balance sport and balance training, research on it is relatively sparse. Most existing studies have focused on the effects of slackline training on balance ability, and very few studies have focused on slacklining skills (a case study). In the practical field of slackline training, instructors share their skills based on personal experience. In a basic slackline course, they begin by teaching a fundamental skill, such as single-leg standing on a slackline, by explaining how they do it. However, such first-person perspectives on slacklining skills have not been scientifically investigated.

According to the instructors' knowledge based on personal experience, we hypothesize the following skills for single-leg standing on the slackline: To maintain whole-body balance in a horizontal direction, one should raise both hands high and coordinate them in parallel; in the vertical direction, one should flexibly bend to reduce the line's fluctuations; in the anteroposterior direction, one should maintain a straight back to keep the center of gravity vertically balanced over the heel of the standing leg and the line.

As a first step toward understanding the slacklining skill, the present study will examine these hypotheses to reveal the skill of single-leg standing on the slackline by comparing the performances of novice and expert groups. A three-dimensional motion capture system will capture whole-body motion, and kinematic data will be analyzed in terms of the hypotheses presented above (parallel bimanual coordination, flexible knee coordination, and stable positioning of center of gravity).

The pilot study comparing performances between novice and experienced players is in progress. In the current workshop, our hypotheses, experimental design, and pilot data will be presented and discussed. We plan to not only describe the skill based on kinematic data analysis from a third-person perspective, but also describe it by interviewing top-level players from a first-person perspective. In future, we aim to suggest safer and more effective training methods based on the knowledge obtained by the present study.