Effect of simulation-based coach training in acrobatic sports

Aerial acrobatics performed in acrobatic sports are the subject of scientific studies but are not accessible to coaches. Their understanding is often partial and they sometimes have difficulties in remedying learning problems. Numerical simulation is proving to be an alternative to scientific writings for the study and improvement of sports performance. The objective of this project was to develop an acrobatics simulator for coaches and to set up training around this tool in order to address the main notions of the biomechanics of twisting somersaults.

A first step was to develop a biomechanical model that (1) respects the laws of motion in the aerial phase, (2) allows for the simulation of movements quickly for inclusion in training, and (3) has enough articular movements that the user can control to test realistic movements. Subsequently, a graphical user interface had to be built for the user and a set of motions had to be generated. Finally, it was necessary to generate training material for two sessions in the heart was exercises with the simulator and three questionnaires based on acrobatic movement videos to evaluate the relevance of the training. Three groups for a total of 14 trainers attended the two training sessions. An evaluation before and after the training highlighted an improvement in the trainers' knowledge. The training highlighted other criteria such as the interest of the coaches, their ability to use the tool independently and to answer their own technical questions.

This project continued with a master's thesis (Ariane Crépeau-Rousseau) where the objective was to validate the simulation model through experimentation. In addition to customizing the simulation model for a national-level diver, the athlete's movement was recorded using 17 cameras and reconstructed in three dimensions for 16 dives from the 5 m platform. This experimental part is complex and achievable by few teams in the world. The comparison between the real movement and the simulated movement highlighted the realism of the simulator.

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