

Ecological Ice Hockey Butterfly Motion Assessment Using Inertial Measurement Unit Capture System

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Abstract : To date, no study on goaltending butterfly motion has been completed in real conditions, during an ice hockey game or training practice, to the author's best knowledge. This motion, performed to save score, is unnatural, intense, and repeated. The target of this research activity is to identify representative biomechanical criteria for this goaltender-specific movement pattern. Determining specific physical parameters may allow to will identify the risk of hip and groin injuries sustained by goaltenders. Four professional or academic goalies were instrumented during ice hockey training practices with five inertial measurement units. These devices were inserted in dedicated pockets located on each thigh and shank, and the fifth on the lumbar spine. A camera was also installed close to the ice to observe and record the goaltenders' activities, especially the butterfly motions, in order to synchronize the captured data and the behavior of the goaltender. Each data recorded began with a calibration of the inertial units and a calibration of the fully equipped goaltender on the ice. Three butterfly motions were recorded out of the training practice to define referential individual butterfly motions. Then, a data processing algorithm based on the Madgwick filter computed hip and knee joints joint range of motion as well as angular specific angular velocities. The developed algorithm software automatically identified and analyzed all the butterfly motions executed by the four different goaltenders. To date, it is still too early to show that the analyzed criteria are representative of the trauma generated by the butterfly motion as the research is only at its beginning. However, this descriptive research activity is promising in its ecological assessment, and once the criteria are found, the tools and protocols defined will allow the prevention of as many injuries as possible. It will thus be possible to build a specific training program for each goalie.

Keywords : biomechanics, butterfly motion, human motion analysis, ice hockey, inertial measurement unit

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