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Ground-Based Preparatory Activities (11)
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Author: Mrs. Tatiana Volkova
Space Innovation, Swiss Federal Institute of Technology in Lausanne, Switzerland, tatiana.volkova@epfl.ch

Prof. Claude Nicollier
Space Innovation, Swiss Federal Institute of Technology in Lausanne, Switzerland, claude.nicollier@epfl.ch
Dr. Volker Gass
Space Innovation, Swiss Federal Institute of Technology in Lausanne, Switzerland, volker.gass@epfl.ch

MARKER LESS MOTION CAPTURE METHOD APPLICATION FOR INVESTIGATION OF JOINT PROFILES IN THE WORKPLACE UNDER SIMULATED HYPOGRAVITY

Abstract

According to biomedical research, hypogravity (HG) defined as gravity conditions between ($0 < g < 1$) as experienced on Mars (1/3G) and the Moon (1/6G) – can lead to health problems for human crews if the effect of gravity is not properly taken into account in the workplace design. The loss of loading and stimulation on the human body, which on Earth is naturally provided by gravitational forces, are the primary risks especially for upper body joints (wrists, elbows, shoulders and hip). Currently, however, the ergonomics of astronauts' movements in HG conditions have not been extensively studied and relevant data are necessary.

Within this context, this paper intends to introduce an innovative marker less motion capture data collection method and demonstrate its successful application on a HG workplace ergonomics experiment, focused on the sitting posture, thus laying out a promising approach for future research.

The experiment involved 7 healthy males and 7 healthy females, without chronic problems of the musculoskeletal system (35±years). The seated subjects were performing a task involving various objects and tools in hydro-laboratory simulated HG environment.

The marker less motion capture enabled to successfully calculate the joint profiles of subjects in a sitting posture under HG without any invasive sensor. As a consequence, the overall productivity of subjects in HG can be estimated based on the collected data. This method can help speed up the data collection related to human motions in such specific environments us hydro-laboratory.

We conclude that the implemented method of marker less motion capture technique enables the collection of representative data for the statistical analyses and optimizations involved in truly understanding the ergonomics of astronauts' movements obtained in HG conditions. The proposed method requires further validation using parabolic flights.