MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Interactive Presentations (IP)

Author: Dr. Irene Lia Schlacht
Politecnico di Milano, Italy, irene.schlacht@mail.polimi.it

Prof. Jörn Rittweger
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Joern.Rittweger@dlr.de
Mr. Mouzzam Mehmood Mukadam
Karlsruhe Institute of Technology, Germany, mouzzam.mehmood@gmail.com
Mr. Raùl Feuillard
Karlsruhe Institute of Technology, Germany, raul.feuillard@gadz.org
Dr. Martin Daumer
SLCMSR e.V. - The Human Motion Institute, Germany, martindaumer@gmail.com
Prof. Melchiorre Masali
Università degli Studi di Torino, Italy, Melchiorre.Masali@gmail.com
Prof. Walter Kuehnegger
Germany, prof.dr.walter-kuehnegger@t-online.de
Prof. Bernard Foing
ESA/ESTEC, ILEWG & VU Amsterdam, The Netherlands, Bernard.Foing@esa.int

MOON GAIT: INVESTIGATING WALK PATTERNS IN REDUCED GRAVITY

Abstract

During the Apollo missions, we discovered that people on the Moon have a completely different way of moving and walking. Prof. Dr. Walter Kuehnegger (also known as Prof. Moon), for example, discovered what he calls the Kangaroo Walk.

What happens if we need to plan habitats that account for different walking behaviors like the Kangaroo Walk? And what happens if we walk on Mars? Will we still have this typology of walks?

In the context of Moon and Mars missions, the difference in gravity strongly affects human posture, the Ohr-Augen-Ebene (OAE), movement, and physical interaction. In light of current plans for Moon and Mars missions, human interaction needs to be integrated starting from the earliest phases of mission design. Many studies have been done in simulated conditions, starting from the Lunar Gravity Simulation performed at NASA in 1966 by the same Prof. Moon, or the Gantry experiment in 1964, also at NASA. Today we still lack detailed biomechanical data in order to completely understand the interactive behavior on the Moon and Mars. Currently the DLR (German Aerospace Center) is running a study to investigate human-machine system interaction in hypogravity in order to design interfaces that will support the user in these extreme conditions.

This paper presents a methodology for measuring the differences in OAE and walking altitude, starting from the video realized by DLR on a normal treadmill in comparison with a vertical treadmill. On the vertical treadmill developed by Prof. Jörn Rittweger (head of the 'Space Physiology' division at the DLR institute), the subject is able to walk vertically. In this position, gravity no longer has any influence on the subject's vertical axes and hypogravity can be reproduced using a special type of software that calculates the tightness of the string where the subject is belted. The methodology included video analysis via Tracker software measuring the variation in the height given by the oscillation of the top of the head while walking and the tracking of AOE. The goal of this work is to test the methodology to verify

the feasibility of human-factors and human-machine interaction studies on hypogravity on the vertical treadmill as well to motivate the need for collaboration between different fields such as physiological research and human-machine interaction in order to realize successful space exploration.