View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by DIAL UCLouvain

DIAL Digital access to libraries

"The effect of simulated microgravity on the motor control of landing from ajump"

Gambelli, Clément ; Theisen, Daniel ; Willems, Patrick ; Schepens, Bénédicte

Abstract

The pre-programmed muscular activity is thought to play a key role in preparing the human body to the forthcoming impact forces in landing movements (Santello, 2005). The aim of this study was to assess the adaptability of the motor control of landing from a jump in simulated microgravity conditions. Experiments were carried out in the A300 0g during ESA parabolic flight campaigns. Participants were equipped with a loading system (Gosseye et al., 2010) creating 4 simulated gravity conditions (1g, 0.6g, 0.4g and 0.2g) during the 0g phases. Eight subjects were instructed to perform several consecutive counter-movement jumps (CMJs) and to land without rebounding. Kinetics, kinematics, and muscular activity of the lower limbs were recorded. The first 3 trials per gravity condition were rejected to avoid a learning effect. Subjects were able to perform CMJs in 0g and to land without re-bounding in the 4 gravity conditions. In the 1g condition, aerial time was 267 ± 35 ms (n=184); at land...

Document type : *Communication à un colloque (Conference Paper)*

Référence bibliographique

Gambelli, Clément ; Theisen, Daniel ; Willems, Patrick ; Schepens, Bénédicte. *The effect of simulated microgravity on the motor control of landing from ajump.*44th annual meeting of Society for Neuroscience (Washington (USA), du 15/11/2014 au 19/11/2014).

Available at:
http://hdl.handle.net/2078.1/157135

[Downloaded 2019/04/19 at 07:25:12]

Print this Page

Presentation Abstract

Program#/Poster#:	830.04/MM22
Presentation Title:	The effect of simulated microgravity on the motor control of landing from a jump
Location:	WCC Hall A-C
Presentation time:	Wednesday, Nov 19, 2014, 1:00 PM - 5:00 PM
Presenter at Poster:	Wed, Nov. 19, 2014, 4:00 PM - 5:00 PM
Topic:	++D.16.a. Posture and gait: Kinematics, muscle activity, exercise and fatigue, and biomechanics
Authors:	**C. N. GAMBELLI**[1], D. THEISEN[2], P. A. WILLEMS[1], *B. SCHEPENS[1]; [1]IoNS/LOCO, Univ. catholique de Louvain/ Inst. of Neurosci. / LOCO, Louvain-La-Neuve, Belgium; [2]Lab. de Recherche en Médecine du Sport, Ctr. de Recherche Publ. de la Santé, Luxembourg, Luxembourg
Abstract:	The pre-programmed muscular activity is thought to play a key role in preparing the human body to the forthcoming impact forces in landing movements (Santello, 2005). The aim of this study was to assess the adaptability of the motor control of landing from a jump in simulated microgravity conditions. Experiments were carried out in the A300 0g during ESA parabolic flight campaigns. Participants were equipped with a loading system (Gosseye et al., 2010) creating 4 simulated gravity conditions (1g, 0.6g, 0.4g and 0.2g) during the 0g phases. Eight subjects were instructed to perform several consecutive counter-movement jumps (CMJs) and to land without re-bounding. Kinetics, kinematics, and muscular activity of the lower limbs were recorded. The first 3 trials per gravity condition were rejected to avoid a learning effect. Subjects were able to perform CMJs in 0g and to land without re-bounding in the 4 gravity conditions. In the 1g condition, aerial time was 267 ± 35 ms (n=184); at landing, the peak vertical ground reaction force was 3.0 ± 0.9 times body weight with a whole body stiffness of 429 ± 386 s^{-2}. Muscular activity was present before touchdown for most of the recordings in the 1g condition. With decreased gravity conditions, jump height and aerial

time increased. Peak vertical ground reaction force decreased proportionally to the gravity condition, and whole body stiffness and amplitude of pre-landing muscular activity were reduced. These results suggest that the human body adapts whole body compliance and muscular activity with respect to the gravity condition. The presence of a pre-landing muscular activation suggests that the instant of touchdown can be predicted in different simulated gravity conditions. The fact that pre-landing muscular activity tends to disappear in 0.2g condition could be part of the specific landing control. Indeed, whole body stiffness has to be sufficiently low to avoid re-bounding on the ground in 0.2g condition.

Disclosures: **C.N. Gambelli:** None. **D. Theisen:** None. **P.A. Willems:** None. **B. Schepens:** None.

Keyword (s): MOTOR CONTROL

HUMAN

MICROGRAVITY

Support: European Space Agency-Prodex n° 4000103291, Belgium

Government of Luxembourg (Ministry of Higher Education and Research) through an ESA Contract in the Luxembourg Third Party Programme. The view expressed herein can in no way be taken to reflect the official opinion of the European Space Agency