

## Kinematic and kinetic comparisons of arm and hand reaching movements with mild and moderate gravity-supported, computer-enhanced armeo®spring: A case study

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New and novel robotic device has been used to facilitate Stroke rehabilitation of the paretic arm. The purpose of this study was to examine the role of Armeo®Spring (Hocoma, Inc.), a gravity-supported, computer-enhanced robotic device, on reaching movements while using two different gravity-support levels (mild and moderate weight support) on individuals with stroke. One stroke subject and one gender-matched healthy control performed a computer-based reaching task under two gravity weight-support conditions (mild and moderate) provided by the Armeo®Spring device. Reaching cycle was divided into five phases (initiation, reaching, grasping, transporting, and releasing). We assessed joint angles for the glenohumeral and elbow joints throughout the reaching cycle, three kinematic parameters (completion time, moving velocity, acceleration), one kinetic parameter (vertical force acting on the forearm) for various instances and phases of the reaching motion. In addition, we examined seven muscle activation patterns and the mean magnitude of the electromyography (EMG) signal was presented as a percentage of the subject's maximum voluntary contraction (MVC). Within the healthy control subject, results demonstrated no significant differences in many parameters between mild to moderate gravity-support levels. However, with higher weight-support of the paretic arm, the stroke subject results revealed a significant decrease in the cycle mean completion time ( $p=0.042$ ), specifically in mean completion time of the grasping phase, and significant decrease in the average EMG magnitude. The significant differences in movement performance between mild and moderate physical weight support suggested a preliminary result that the gravity-supported mechanism provides a mean to facilitate functional upper limb motor performance in individuals with stroke.

### Biography

Ying-Chih Wang, OTR/L, Ph.D., is an Assistant Professor at the Department of Occupational Science & Technology, University of Wisconsin-Milwaukee. Her current research interests are to develop quantitative functional outcome measures and to perform comparative effectiveness research with new rehabilitation technologies. She has published 39 papers in reputed journals and has been serving as an editorial board member of AJOT and BioMed Research International. The presented work was done by Qussai M. Obiedat, OT, MS, (currently an instructor at the Faculty of applied medical sciences, Jordan University of Science and Technology) under her supervision.

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