

Stability of reaching movement of the paretic arm is enhanced with participation of the contralateral arm in individuals with hemiparesis

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The paretic arm of individuals with hemiparesis has a diminished ability to resist sudden perturbations and to preserve stable movement patterns compared to healthy subjects. The goal of this study was to investigate how different types of participation of the contralateral arm may influence the stability of reaching movement of the paretic arm in individuals with post-stroke hemiparesis. While sitting, non-disabled subjects and patients with hemiparesis on the dominant side performed a task in which they reached forward, grasped and removed a lid from a jar placed in the sagittal midline on a height-adjustable table. The task was performed in three conditions: bilaterally with both arms starting to move simultaneously; unilaterally while the contralateral arm held the jar; and unilaterally with the jar attached to the table. During some reaches, the arm removing the lid was suddenly and transiently stopped by an electromechanical device. Kinematic data from markers placed on the hands, arms and trunk were recorded. Among the kinematics analyzed was the deviation of reaching trajectory of the perturbed arm in frontal plane from trajectory recorded during non-perturbed movement compared to that of the non-perturbed arm and the movement time. Temporal coupling (for bilateral movement only) was defined as a time difference in movement onset and offset between arms. Results showed that the movement of the paretic arm was more stable when the contralateral arm was involved in holding the jar, compared to the unilateral movement. The results of this study may be used in the development of new rehabilitation approaches that include bimanual movements to improve functional recovery of the paretic arm in patients with hemiparesis due to stroke.

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