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<http://dx.doi.org/10.1016/j.rehab.2015.07.237>

C031-003-e

Assessment of upper limb stiffness using REA plan in stroke patients

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Objective To quantify the stiffness of the flexor muscles of the elbow in spastic patients using REA plan, a robotic device used in rehabilitation that can mobilize the patient's upper limb in a horizontal plane.

Patients Twelve chronic stroke patients with hemiplegia were recruited. Spasticity of the elbow flexor muscles was assessed with Modified Ashworth Scale (MAS). Their scores were greater than 1.

Methods Patients received an anaesthetic block of the musculocutaneous nerve, to reduce the spasticity of the elbow flexor muscles. Each patient was assessed before and after the injection of the anaesthetic block and a third time the next day. During each session, stiffness was measured with the REA plan. The robot passively mobilized the patient's upper limb at various speeds (10, 20, 30, 40 and 50 cm/s) in a back-and-forth trajectory (30 cm). For each speed condition, ten movements were performed. We recorded the force required to passively mobilize the patient's upper limb. For the ten extension movements, the strength peaks (SP) were computed and averaged.

Results The results showed that the SP was significantly higher in the impaired upper limb than in the unaffected arm ($p < 0,001$), and increased proportionally with the speed condition ($p < 0,001$). For the anaesthetic effect, the results showed that the SP decreased just after the injection at 40 and 50 cm/s and increased until the initial values the next day ($p < 0,05$). Finally, the SP results showed an excellent correlation with the MAS, for each speed condition greater than 20 cm/s ($r > 0,6$). These last results suggested that the SP reflected the spasticity of the elbow flexor muscles.

Conclusion This study develops and validates a protocol to quantify the stiffness of the flexor muscles of the elbow, using the robot REA plan. This protocol, integrated to the REAplan, must be compared to other quantitative measures of spasticity in the future, and could be used to assess the effect of spasticity treatments (e.g. botulinum toxin).

Keywords Assessment; Stiffness; Robotic; Upper limb; Stroke

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

<http://dx.doi.org/10.1016/j.rehab.2015.07.238>

C031-004-e

Effects and impacts of a robotic arm used by individuals with upper limb motor impairment: A scoping review

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Introduction Individuals with motor impairments may be limited in the realization of their activities of daily living, their leisure activities or their work activities. To overcome these limitations, the involvement of a caregiver and/or the acquisition of assistive devices are often necessary. In the last few years, more and more assistance robots have been developed and the interest they generate is growing. Among these, there are robotic arms aiming to improve the functional autonomy of people living with upper limb motor impairment.

Objective Since the effects and impacts of the use of a robotic arm by these individuals are not well documented, this study aims at obtaining an overview of what has been reported until now in the scientific literature.

Methods To achieve this, we undertook a scoping review. Four databases were searched: PubMed, Embase, Compendex and Scopus. Following a selection process involving different steps, 36 papers were retained. Relevant data, the same for each paper, were recorded. The quality of the selected papers was evaluated using the Critical Review Form for Quantitative Studies (McMaster University). The papers were also classified according to the Canadian Model of Occupational Performance and Engagement (CMOP-E). The CMOP-E allowed us to identify the occupational domains addressed in the retained studies.

Results Twenty-four papers presented results related to basic activities of daily living, 18 to instrumental activities of daily living, 9 to work activities, 8 to leisure activities, 2 to school and 2 to games. The quality assessment revealed a mean score of 8.8/15, demonstrating that the effects and impacts of robotic arms have to establish in a more rigorous way. The utilisation of a robotic arm has more positive than negative effects and impacts on the various occupational domains.

Conclusion These assistive devices have the potential to be successfully integrated into the users' life, but some improvements are desirable to increase the satisfaction related to their utilization.

Keywords Assistive technology; Assistive device; Robotic arm; Motor impairments; Upper limb; Scoping review

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

<http://dx.doi.org/10.1016/j.rehab.2015.07.239>

C031-005-e

Potential of motor recovery in upper limb after a 3-month robot assisted therapy in subacute stroke patients

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Introduction Following stroke, the use of robotic in rehabilitation program leads to increase the number of movement performed on each session. The present study aimed to investigate predictive factors of upper limb motor recovery after

