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Title	Effect of motor imagery on upper limb motor performance using surface
	electromyography: A case study
Туре	Article
URL	https://clok.uclan.ac.uk/id/eprint/43960/
DOI	https://doi.org/10.1016/j.gaitpost.2022.07.018
Date	2022
Citation	Jasenská, M., Haltmar, M., Kovářová, M., Kolářová, B., Kolář, P. and Richards, James (2022) Effect of motor imagery on upper limb motor performance using surface electromyography: A case study. Gait & Posture, 97. S15-S16. ISSN 09666362
Creators	Jasenská, M., Haltmar, M., Kovářová, M., Kolářová, B., Kolář, P. and Richards, James

It is advisable to refer to the publisher's version if you intend to cite from the work. https://doi.org/10.1016/j.gaitpost.2022.07.018

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## Effect of motor imagery on upper limb motor performance using surface electromyography: A case study.

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**Introduction:** The use of motor imagery (MI) is a relatively new therapeutic approach which has been shown to offer significant improvements in movement performance and can be applied in rehabilitation [1]. This case study explores the immediate effect of MI on a reaching task in a subacute stroke survivor.

**Research Question:** Can any immediate changes in upper limb motor performance during a reaching task be seen using surface electromyography (sEMG) and inertial measurement unit data as a result of MI in a subacute stroke survivor?

**Methods:** The reaching task consisted of the following: reaching for a cup placed at a distance of 30 cm from the tip of the middle finger, grasping the cup and moving the cup towards oneself and then returning it back to its original position. This movement was performed ten times before and after MI [1]. The effect of a single session of MI on the performance of the reaching task was assessed in a female subacute stroke survivor (72 years of age). Muscle activity from deltoid and triceps brachii were collected using sEMG (Delsys, inc.) and upper arm angular velocity data was recorded from an Inertial Measurement Unit sensor (Delsys, inc.). The EMG signals were processed using, remove mean, a 20 Hz high pass filter, and root mean square (RMS) [2]. The mean values and maximal values of the sEMG and angular velocity data were found before and after motor imagery and the difference expressed as a percentage.

**Results:** A decrease of 11% was seen for the biceps and triceps brachii muscles, and a 10% increase in angular velocity in the anterior-posterior direction was seen after the MI intervention. In addition, there was a decrease in the standard deviation.

**Discussion:** This study demonstrated an immediate decrease in upper limb muscle activity with an increase in extension angular velocity during the performance of a reaching task after MI training, and also showed greater consistency in the movement and muscle activity post MI training. These results suggest a learning effect during the execution of the movement and improved quality of movement as an effect of motor learning. This data would support the hypothesis that MI has an immediate effect on control and performance, however the longer-term changes in a larger cohort of stroke survivors is required to confirm these findings.

**Acknowledgement:** This study was supported by grant DSGC-2021-0175 "Evaluation of the Immediate Motor Imagery Effect on the Performance of a Upper Limb Motor Task in Stroke

Survivors" and funded through the OP RDE project "Improving schematics of Doctoral student grant competition and their pilot implementation", Reg. No. CZ.02.2.69/0.0/0.0/19\_073/0016713.

## **References:**

[1] Kolářová, B., Richards, J., Haltmar, H., Lippertová, K., Connell, L., & Chohan, A. (2022). The effect of motor imagery on quality of movement when performing reaching tasks in healthy subjects: A proof of concept. *Journal of bodywork and movement therapies*, *29*, 161–166.

[2] Stegeman, D.F., Hermens, H.J. (1998). Standards for surface electromyography: the European project (SENIAM). In: Hermens, H.J., Rau, G., Disselhorst-Klug, C., Freriks, B. Surface Electromyography Application Areas and Parameters. Proceedings of the Third General SENIAM Workshop on Surface Electromyography. (pp. 108-112). Aachen, Germany.