

THE EUROPEAN ACADEMY OF REHABILITATION MEDICINE SCIENTIFIC PRIZE 2016

sponsored by Journal of Rehabilitation Medicine

WINNER 2016: KRISTINE OOSTRA

Summary of the thesis Mental Practice through motor imagery in gait rehabilitation following acquired brain injury. This thesis was awarded the European Academy of Rehabilitation Medicine prize 2016. Dr Oostra received her prize during the congress of Baltic and North Sea Forum on PRM in Maastricht, The Netherlands, October 2017.

Mental practice (MP) using motor imagery (MI) is considered to be a promising rehabilitation technique in patients following acquired brain injury. During MP a motor task is repeatedly mentally rehearsed without any overt movement. Since MI and overt movement share many common behavioural characteristics and activate common neural pathways, mental practice using motor imagery can potentially be used to prevent learned non-use and maladaptive cortical reorganization.

The first objective of this research was to examine if MI ability is preserved in patients with an acquired brain injury. We found that patients with a traumatic brain injury showed an impaired MI ability with imagined movements being performed slower and less accurate than executed movements.

In our stroke cohort on the other hand, MI vividness was shown to be reduced, but we demonstrated a preserved temporal coupling between real and imagined movements.

Our second study aim was to examine if MI ability can be trained. MI is a skill and like any skill, we expect that it can be rehearsed and thus brought to a higher level of performance. Therefore, we examined MI ability in patients with a first-ever stroke and included these patients in a 6 weeks MI training program. MI vividness responded well to MI training with a normalization of kinesthetic motor imagery vividness scores after training. This finding highlights the need to familiarize patients with the mental practice technique before applying it in rehabilitation practice.

Recovering independent gait is considered one of the most important rehabilitation goals by stroke patients and given its clinical importance, developing rehabilitation techniques that help gait recovery seem highly relevant. Therefore our third study objective was

to examine the effect of a gait rehabilitation program based on mental practice. Our study results support the evidence that MP has an additional benefit in gait rehabilitation post stroke. Moreover, we did not find a relationship between initial low MI ability and gait velocity improvement after MP, indicating that people with initial low MI ability scores can equally benefit from MP.

Finally our fourth study aim was to clarify if MI ability after stroke is related to a specific brain lesion localization. Voxel-lesion symptom mapping results identified the importance of an intact functional fronto-parietal network for a preserved MI ability.

We further elucidated the crucial role of the basal ganglia, more specifically the left putamen, when performing motor imagery tasks.

In conclusion, this work has aimed to further clarify MI ability in patients with an acquired brain injury. Results have revealed that both patients with stroke and a traumatic brain injury have an (at least) partially preserved MI ability and are potential candidates for MP in neurorehabilitation. Moreover MP was shown to have an additional task specific benefit in gait rehabilitation in a sub-acute phase after stroke.



Joao Pinheiro hands over the symbolic cheque to Kristine Oostra of the EARM award (sponsored by JRM)

Finally voxel lesion-symptom mapping indicated a left hemisphere dominance for MI, emphasizing the importance of the need for an intact fronto-parietal network and subcortical structures for preserved MI ability.

Dr Kristine Oostra work at the Ghent University, Ghent, Belgium. Promotor: Prof. Dr. G. Vingerhoets. Co-promotor: Prof. Dr. G. Vanderstraeten. E-mail: kristine.oostra@uzgent.be.

REFERENCES

1. Oostra KM, Vereecke A, Jones K, Vanderstraeten G, Vingerhoets G. Motor imagery ability in patients with traumatic brain injury. *Arch Phys Med Rehabil* 2012;93: 828-833.
2. Oostra KM, Oomen A, Vanderstraeten G, Vingerhoets G. Influence of motor imagery training on gait rehabilitation in sub-acute stroke: a randomized controlled trial. *J Rehab Med* 2015; 47: 204-209.
3. Oostra KM, Van Bladel A, Vanhoonacker A, Vingerhoets G. Neural correlates of motor imagery ability after stroke: a voxel-based lesion-symptom mapping study. *Front Behav Neurosci* 03/2016. Doi: 10.3389/fnbeh.2016.00005.



Dr Kristine Oostra is congratulated to the EARM award at the congress of Baltic and North Sea Forum on PRM in Maastricht, The Netherlands, October 2017. From left: Henk Stam, Guy Vanderstraeten, Kristine Oostra, Joao Pinheiro and M. Anne Chamberlain.