Using Mental Imagery to Control Action

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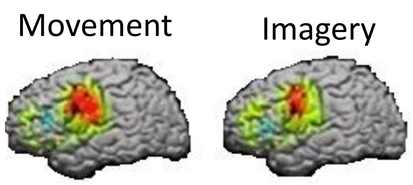
Introduction

Many areas of the brain are activated during mental imagery. Importantly, motor imagery and actual performance of a motor skill show overlapping activity in motor areas (Miller et al., 2010).

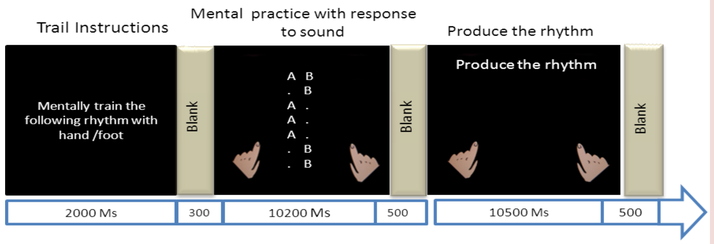


This is the first behavioural study to investigate whether imagery of a motor skill relies on the same mechanisms as the actual performance of the motor skill, using a behavioural task.

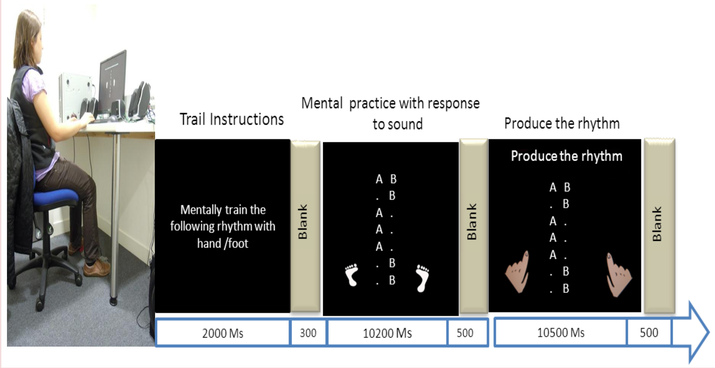
If this is the case, then there should be a difference when people have to use the same body parts for mentally practicing the rhythms and responding to the sounds compared to when they have to use different body parts.

Method

Experiment 1. Participants saw a symbolic description of a complex rhythm that they had to memorize for later performance with either hand or feet. While memorizing the rhythm, we played low or high beeps, that participants had to respond to with hands or feet. Afterwards, they had to perform the rhythm from memory.

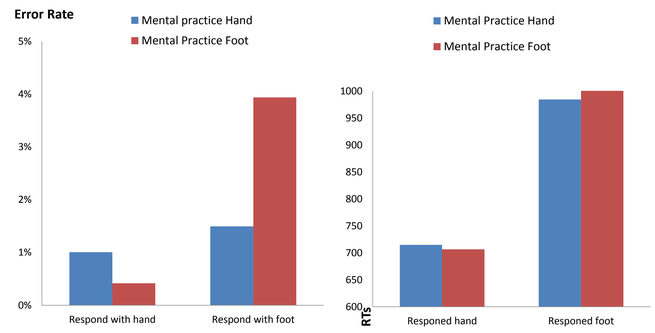


Experiment 2. Participants saw easy rhythms and they had to mentally practice them to perform them as fast as possible later. They were not required to fully memorize the rhythms, because participants now also saw the symbolic description of the rhythm in the production interval.

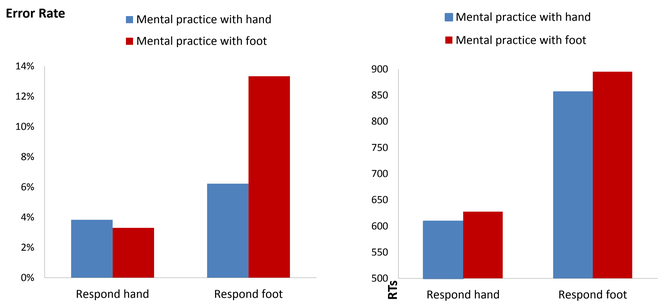


Results

Experiment 1: The analysis revealed a significant interaction of mental practice (hands/feet) and response (hands/feet) for error rates, $F(1, 20) = 4.59$, $p = 0.045$), but not for RTs, $F(1, 20) = 0.255$, $p = 0.619$.



Experiment 2: Again, there was a significant interaction of mental practice (hands & feet) and response (hands & feet) in the error rates, F (1, 19) = 9.96 , p = 0.005, but not in the RTs,
F (1, 19) = 1.61, p = 0.220.



Discussion

The findings of the second experiment support the findings of the first experiment. In both experiments, the participants made fewer errors when using the same body parts for responding to the beeps and for mental practice.

These data show that mental practice of a motor skill affected the responses to the sounds. This suggests that mental practice of a motor skill is embodied. A body part engaged in the brain can not be used for another task.

Reference

Miller, K. J., Schalk, G., Fetz, E. E., Nijs, M. den, Ojemann, J. G., & Rao, R. P. N. (2010). Cortical activity during motor execution, motor imagery, and imagery-based online feedback. *Proceedings of the National Academy of Sciences of the United States of America*, *107*(9),4430-5.