



# PERFORMING ARTS

SPECIAL INTEREST GROUP



**ORTHOPAEDIC SECTION**  
AMERICAN PHYSICAL THERAPY ASSOCIATION



## **Motor Imagery for Enhanced Movement Execution – CITATION SUMMARY**

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Students often are interested in conducting research on the effectiveness of imagery to change motor control. I question them on what they know about imagery, what they think may be the neural correlates of imagined practice v. motor practice. It turns out that they aren't very familiar with the imaging literature related to this topic. I thought this might be of general interest to the performing arts community because imagery is often used in dance and other performance pedagogy. Mental rehearsal has long been familiar to athletes and musicians as a partial substitute for physical practice. Behavioral improvements such as improved speed, strength, and performance accuracy have been reported when physical practice is augmented with mental rehearsal. Motor imagery most commonly has two modes: visual motor imagery (VMI) and kinesthetic motor imagery (KMI). VMI involves imagining seeing yourself performing a movement. KMI involves imagining the feeling of performing a certain movement.

If motor imagery and motor performance are related phenomena, then they should share the same neural mechanisms. Is imagery the same as the physical movement itself? The answer is maybe.

Experiments with implanted electrodes into the motor cortex of the brain to activate a robotic or paralyzed limb demonstrate the potential of imagery. Advances in non-invasive techniques for studying brain activity, including EEG, PET, and MRI during physical and mental practice, show some interesting similarities and differences between the two. Areas in the frontal lobes that support planning, and the parietal lobes that support spatial representations and working memory, tend to be active equally during physical and mental practice. The evidence is more mixed about primary motor cortex (M1), which exerts direct control over voluntary muscle movement. Some studies find no involvement of M1 during mental rehearsal, while others reported activation. Other studies found activation of the cerebellum with physical practice but none with

mental practice. Recent application of near-infrared spectroscopy (NIRS), which is temporally more accurate than fMRI, found temporal differences between imagined and physical movement.

Finally, imaging ability differs among individuals. Several rating scales have been developed to assess this ability, including the Movement Imagery Questionnaire, Vividness of Motor Imagery Questionnaire, and Kinesthetic and Visual Imagery Questionnaire. The level of training also seems to affect how imagery is used: skilled performers, with well-established motor representations of an activity, seem to activate motor areas, while novices activate visual areas.

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