

The role of motor imagery in learning a totally novel movement
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Since mental practice is found to be effective in optimizing the execution of movements, motor imagery may be a useful tool in rehabilitation. Several studies have shown that similar neural structures are involved both in motor imagery and in the planning, programming and execution of actual movements. The results suggest that the effects of mental practice can be explained by a central or top-down mechanism. A central explanation, however, may restrict the use of mental practice to movements we are familiar with.

We performed two experiments. In the first experiment we examined whether a totally novel movement can be learned by mental practice. Healthy young adults had to physically or mentally practice the abduction of the right big toe without moving the other toes. These subjects were absolutely unable to move the toe outward and were termed absolute zero's. The results showed that these subjects did not profit from mental practice, whereas subjects who physically practiced the movement, indeed, improved after training.

In the second experiment we observed whether an existing skill may be improved by mental practice. This experiment had exactly the same design, but was carried out with subjects who already were able to abduct the right big toe to some extent. These subjects improved in abducting the toe after both physical and mental practice.

The results of these experiments suggest that during motor imagery stored representations of action are used. We can mentally practice only movements that we have performed before. The results underscore the role central mechanisms may play in motor imagery.

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