The Effects of Mental Imagery Rehearsal on Performance of Mazes

Alison Painter & Dr. Laird Edman

Psychology Department, Northwestern College

Introduction

What is Mental Imagery? Mental imagery is a way to practice or rehearse a skill in the absence of physical movement or ability (Driskell et al., 1994).

This form of practice is important to enhancing the skill of various types of performance. Some research has touched on mental imagery's effect on motor skills, while others focus on high cognitive skilled performance.

Why is this important:

In a clinical setting- mental imagery is something that patients can do without supervision of a practitioner. It is a safe and secure way to enhance skills, that would normally go dormant without practice. Furthermore, using mental imagery stimulates the motor cortex as if the patient is performing the task; the nervous system is still being triggered without any actual movement occurring (Jars and Ratzon, 2000; Jennerod 2001). With these in mind, one can avoid what is called a "practice gap" in recovery. A "practice gap" occurs when there is a time of no practice between session and the patient may lose momentum in recover or fall behind in their pace of recovery. Mental imagery is a way to practice without the supervision of physical movement and allows for a shorted "gap" between sessions (Nilsen, et al., 2010).

Previous Literature:

The previous literature on this topic has conflicting conclusions. Some say that Mental imagery is successful only in motor performance while others say that it is successful in cognitive performance. Literature arguing for the success of mental imagery in motor performance argue that mental imagery can be a foundation for physical performance (Kohl & Roenker, 1983). A clinical example for this is found in stroke rehabilitation. In stroke rehabilitation there is a focus on the regaining of movement on the hand or arm (something essential to everyday actions), and mental imagery can be used to imagine the movement of their arm, how it would look and feel.

Literature arguing for the success of mental imagery in cognitive performance argue that mental imagery is found only in skills that have a large component of cognition involved (Driskell et. al., 1994). Mental imagery for cognitive performance can also enhance attention, memory, and focus of a given task.

Like mentioned before there are many instances where mental imagery is needed in replacement of physical practice. Recent literature has focused on just how well mental imagery enhances performance in comparison to physical practice itself. Some indicate that mental imagery produces the same effect as physical practice (ASA, 2014). Others indicate that physical practice skill exceeds mental imagery for performance enhancement (Toth, 2020).

Need for this study:

There is a pull between just how well mental imagery affects performance of skills. Hence the need for further research to determine the effects of mental imagery. There is importance to mental imagery and the ways it can assist in daily living, however just how well and in what context does this form of practice work?

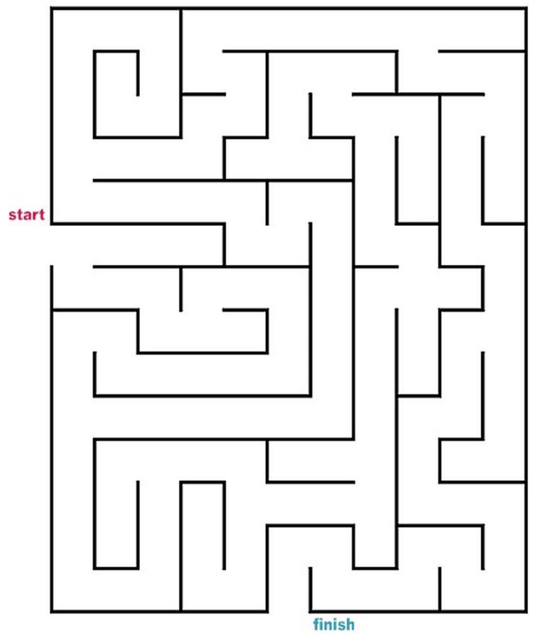
Hypotheses

The purpose of this study is to examine the influence that mental imagery rehearsal plays in cognitive symbolic tasks. Previous literature has revealed that mental imagery rehearsal can enhance skills; however, the literature conflicts regarding what type of skill (cognitive or motor) is best enhanced by mental imagery and in what context does it work.

1) Mental imagery practice improves performance of a cognitive symbolic skill, then participants in the mental rehearsal only groups would achieve a significant positive effect on the performance of a skill compared to participants in no practice groups

2) Within the mental rehearsal only group, those who received the same maze each day will achieve a higher level of performance than those who practice different mazes each day

3) Participants in the mental rehearsal only groups will achieve a similar performance on the maze task compared to those in the physical practice only group.



Material & Methods

The participants were pulled from Northwestern College. The sample includes 92 adults (females = 69, males = 23) between the ages of 19 and 25 (M = 19.86, SD = 2.337). Of the total participants 71 completed the entire experiment. After the signing of an informed consent, participants were involved in two trials 7 days in between. In Trial 1 participants were given a maze to complete. Completion was determined by the participant running their finger from start to finish two times. For each trial, the participant's time and errors were measured.

Each participant was given an intervention which included a variety of tasks to complete over the 7 days via email.

Intervention Groups:

1. Group 1→ Mental Imagery Rehearsal who received the same maze each day
2. Group 2 → Mental imagery Rehearsal who received different mazes each day
3. Group 3 → Physical Practice Rehearsal
4. Group 4→ No rehearsal (control group)

After the intervention, participants came back and completed a maze once more. Once the whole experiment was completed, they received a debriefing form and their incentive.

Results

Purpose: To Determine if different groupings of practice (mental practice, physical practice, or no practice) would influence improvement of trial time.

A Two by Four Mixed- Design ANOVA found no significant differences in the interaction of trial time and groupings

$$F(1,67)=1.324,\ p=.274,\ \eta_p^2 = .056$$

Individual comparisons were tested using an Independent Samples T-Test.

The results still demonstrate no differences just as the ANOVA output; however, the effect sizes indicate something may be there

Individual Comparisons:

- Mental practice with same maze and no practice
  $t(32) = 1.122,\ p = .270,\ d = .385$
- Mental practice with different mazes and no practice
  $t(33) = 1.869,\ p = .71,\ d = .632$
- Physical practice and no practice
  $t(34) = 1.829,\ p = .076,\ d = .610$
- Mental practice with same maze and physical practice
  $t(34) = -.231,\ p = .819,\ d = -.077$
- Mental practice with different mazes and physical practice
  $t(35) = .255,\ p = .800,\ d = .084$

Discussion

For Mental Practice:

The effect size for mental imagery using the same maze had a small effect compared to no practice, but mental imagery using different mazes had a higher than moderate effect compared to no practice. The size of effect demonstrates that mental imagery may work in comparison to no practice, but there were not enough participants to achieve statistical significance in this current study. Furthermore, those using the same maze to practice each day had a smaller effect than those using different mazes each day. This leads to indication that more research should be done on the generalizability that mental imagery can have on performance.

For Physical Practice:

The effect size for physical practice in comparison to no practice also had a higher than moderate size. Demonstrating again that physical practice has an effect in comparison to no practice. The lack of statistical significance can be understood from a power issue.

The hypotheses of this current study were not supported by statistical analysis; however, the effect sizes are in the expected direction and indicate that there may indeed be an effect of mental practice and physical practice in performance of skill between trial one and trial two. This current study leans towards the direction of previous laid research that mental imagery does improve performance, and even to a similar performance as physical practice when given a cognitive symbolic task.

Further Research

The primary limitation for this study was sample size. Only 71 participants completed the study. A larger sample size may have an effect on the significance of the findings in this study, and future studies with a larger participant pool may find statistically significant results. To apply this research to a wider population, future research may also utilize a larger and more diverse sample. The participants in this study were of similar age, because involvement was only recruited from a small, liberal arts college in the Midwest. As the sample size was the primary limitation, future research may gain more from a larger sample size.

Another limitation to this study is the intervention between trial one and trial two. Previous studies regarding mental imagery performance had a stronger intervention with more time and more practice. Studies ranged in intervention time from 2 weeks (Sackett) to 3 months (wohldmann). In comparison to the one-week intervention of the current study the time interval could not have been long or strong enough to have a lasting effect and enhancement of performance. Another aspect of intervention strength is the number of times each day participants were to practice. In the current study participants only had to practice five times once a day. The significance of the intervention could have changed if participants were asked to practice more each day, for instance three times a day rather than once. Future research should utilize a stronger intervention with either longer testing interval or more practice intervals between trials

Future research should also take note of the differences between mental imagery using the same maze and mental imagery using different mazes. In the current study mental imagery using different mazes had a much higher effect size than those using the same maze each day. This would lead to a question regarding the generalizability of mental imagery practice on performance. Does mental imagery that forces development of the skill work better than repetitive practice of the same skill?

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