Theory of Mental Imagery

During the 60's and 70's, the studies conducted on mental imagery were rather inconsistent due to different confounds such as lack of subjects and reliable controls. In addition, researchers used a variety of skills because they were not exactly sure what the subjects should do when they engage in mental practice. Hence, some were more likely than others to work with mental practice which varied the results.

However, now there is sufficient reliable evidence that suggests imagery rehearsal can sometimes improve motor performance in a variety of sports. Feltz and Landers conducted a meta-analytic to examine 60 studies in which mental practice was compared to control conditions. Their analysis yielded 146 effect sizes with the overall average effect size of 48 positing that mental imagery practice "influences performance more than no practice," but consistently less effective than physical practice. On average, the effect sizes were larger with the studies which used cognitive tasks. Overall, the cognitive rehearsal conditions showed a better performance, about 1/2 of a standard deviation unit (Paivio, 22-29).

In 1992, Anne Isaac conducted a study which examined the influence of mental practice on sports skills. While most of the previous studies on this topic showed positive effects of mental rehearsal, they were not performed in actual field context using subjects who learned actual sport skills rather than just novel motor tasks. Isaac eliminated this problem in her experiment. She also tested the hypothesis of whether people who have better images and control over their images result in better performances. Isaac tested 78 subjects and classified them as novice or experienced trampolinists. Then she further divided the two groups into an experimental and control group. She also classified the subjects as either high or low imagers based on initial skill level. Both groups were trained in three skills over a six week period.

In order to prevent confounds, the imagery group was unknown to the experimenter until afterwards. The experimental group physically practiced the skill for 2-1/2 minutes, which was then followed by 5 minutes of mental practice. Lastly, an additional 2-1/2 minutes of physical practice followed the mental practice. Meanwhile, the control group physically worked on the skill for 2-1/2 minutes, which was then followed by 5 minutes of a session trying a mental task of an abstract nature, such as math problems, puzzles, and deleting vowels. Then, 2-1/2 more minutes were spent physically working on the skill again.

The outcome of the experiment was as followed: There existed a significant difference in the improvement of the high and low imagers. In both novice and experimental groups where the initial skill ability was similar, the high imagery groups showed significantly more improvement than the low imagery group. Furthermore, there was a significant difference between the experimenter and control groups. Not surprisingly, the experimental group had significantly more improvement than the control group. This study posits that despite the level of skill (beginner or experienced) visual imagery proves effective (Isaac, 192-198).

In a recent experiment conducted by Roure et al, they found six specific autonomic nervous system (ANS) responses that correlated with mental rehearsal, thereby improving sports performance. The subjects were placed into an imagery group and a control group. The task measured in each group was based on their ability to pass an opponent's serve to a given teammate, in the sport of volleyball. The experimenters measured the variations of the ANS during the motor skill and during the mental rehearsing sessions. The ANS parameters tested included: skin potential and resistance, skin temperature and heat clearance, instantaneous heart rate, and respiratory frequency.

The results of the test revealed a strong correlation between the response in the actual physical tasks (both pre- and post-test volleyball) and during the mental imagery sessions.

There existed a difference in the skills between the imagery and the control group, the former being the better. In addition, no clear difference was present between the pre- and post- tests in the control group. This study showed that mental imagery induces a specific pattern of autonomic response. These include: decreased amplitude, shorter duration and negative skin potentials when compared to the control group. As a consequence of the ANS, the imagery group was associated with better performance. In light of this experiment, Roure suggested that metal imagery may help in the construction of schema which can be reproduced, without thinking, in actual practice (Roure, 99-108).

Not only does mental imagery seem to enhance athletic performance, but it has been shown to enhance intrinsic motivation as well. A study in 1995 tested who would spend more time practicing a golf putting task and who would result in having higher self efficacy. Thirty nine beginner golfers were grouped into an imagery or control group. For 3 sessions, both groups were taught how to hit golf balls. The imagery group practiced in an imagery training session designed for this specific golf skill. As a result, the imagery group spent significantly more time practicing the golf putting task than the control group. In addition, the subjects in the imagery group had more realistic self-expectation, set higher goals to achieve, and adhered more to their training programs outside the experimental setting (Martin, 54-69).

Since all of the studies mentioned have focused on adult subjects, I wanted to see if mental imagery had the same effect on children. I found a study which examined the effects of mental imagery on performance enhancement with 7-10 year old children. In this experiment, table tennis players were divided into three groups. The results indicated that the children who used mental imagery had significant improvement in the accuracy and quality of their shots compared with the control group. This study shows that mental imagery training for children can be beneficial. This could be a perfect opportunity to learn mental skills at an early age which can ultimately give them greater control over their own destiny. However, this is only one particular study, and more studies on children do need to be conducted (Orlick, 230-241).

How Mental Imagery Works

The reason visual imagery works lies in the fact that when you imagine yourself perform to perfection and doing precisely what you want, you are in turn physiologically creating neural patterns in your brain, just as if you had physical performed the action. These patterns are similar to small tracks engraved in the brain cells which can ultimately enable an athlete to perform physical feats by simply mentally practicing the move. Hence, mental imagery is intended to train our minds and create the neural patterns in our brain to teach our muscles to do exactly what we want them to do (Porter, 17).

Theories of Imagery Rehearsal Mechanisms

Sports psychologists have attempted to understand the exact mechanisms that cause mental imagery to work. Numerous theories exist, but sports psychology lacks a single theory which completely explains the effectiveness of mental imagery. The earliest theory was proposed by Carpenter in 1894 called the psycho-neuromuscular theory. This theory maintains that imagery rehearsal duplicates the actual motor pattern that is being rehearsed. His view is that the motor patterns which are generated during imagery practice are the same as those used for physical practice.

Another prominent theory is the symbolic learning theory. This differs from the previous theory that instead of imagery working due to muscle activation, mental imagery works from the opportunity to practice the symbolic elements of a motor task. Therefore, it is assumed that the learning obtained from imagery relates to cognitive learning.

A third theory, called the arousal/activation theory, connotes that by practicing imagery, one will obtain a level of arousal that is optimal for the specific performance. The arousal functions as a way of "priming" the muscles which result in a lowering of the sensory threshold of the performer to facilitate performance.

Peter Lang came up with an information-processing model of imagery which presumes that an image is a functionally organized, definite set of propositions stored by the brain. It is not simply a stimulus in a person's head to which one responds. This image has two main types of statements: response propositions and stimulus propositions. The latter describes the content of the scenario to be imagined. Response propositions, on the other hand, describe the imager's response to that scenario. Lang further states that an image contains a motor program which holds instructions for the imager on how to respond to the image. Hence, the image is a template for overt responding. So modifying either overt behavior or vivid imagery will result in a change in the other (Suinn, 492-506).

Another popular theory is Suinn's visual motor behavior rehearsal (VMBR) model which posits that imagery should be a holistic process that includes a compete reintegration of experience. This includes visual, auditory, tactile, emotional, and kinesthetic cues. He has demonstrated that physiological responses can result from athlete's usage of mental imagery. Suinn's method is one of the few which has solid evidence to support its effectiveness.

A more recent model, which also places importance on psychophysiology, goes even further by including a specific meaning for an image. This model is known as Ahsen's Triple Code Model of imagery (ISM). According to Ahsen there are three fundamental parts to an image. The first part is that the image itself must be a centrally arousing sensation so it is more like the real world. It has all the attributions of a sensation and the only difference is that it is internal. This image provides the imager with so much realism that it can enable him or her to interact with the image as if it were the real world. Secondly, there exists a somatic response. Therefore, the very act of imaging results in psycho-physiological changes in the body. Finally, the third part of the image is the actual meaning of the image. Every image has a significant meaning and that specific meaning can imply something different to each individual. Since every person has a unique background and upbringing, the actual internal image can be quite different for each individual, even though the set of imagery instructions are the same (Murphy, 153-172).

Conclusion

After reading through numerous studies, visual imagery seems somewhat promising and beneficial. Although it is not as beneficial as physical practice, visual imagery fairs better than no practice at all. Hence, a program with physical practice combined with mental training seems to be the best method. Virtually all of the studies show that mental training improves motor skills. More recently a lot of studies go even further and prove that visual imagery can improve various skills related to sports in actual field contexts.

Visual imagery seems to be beneficial to anyone who wants to improve at their sport. Whether you are a recreational athlete or a professional does not matter. The benefits of mental imagery have proved successful at any level. So if you are a professional looking to break into the top, or a club player who simply wishes to defeat his/her friend, I recommend incorporated mental imagery along with physical practice. Not only can mental imagery improve specific motor skills but it also seems to enhance motivation, mental toughness and confidence, all which will help elevate your level of play.

However, even though most of the studies demonstrate that mental imagery results in significant sports improvement, I am skeptical to the extent of the external validity of these experiments. If one can return a serve more precisely in volleyball, does that mean that it will work under real pressure situations? In addition, does this mean that improvements will be made in other areas of the game besides the serve? Will this work in other sports not yet tested such as football? It seems rather naive to generalize these finding to real world, intense pressure situations of all sports. There also lies a shortage of evidence regarding exactly how mental imagery works to enhance performance. More studies need to be done to determine when and why imagery techniques are and are not effective. If this problem can be addressed, then more effective techniques can be created and will in turn further increase the effects of mental imagery. In addition, it might also help solidify the validity of the previous experiments.

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