

## Mental Practice

While reading the article in the provided packet of resources, “Why is Dancing so Good for Your Brain,” by Christopher Bergland, I began researching things under the general category of sports psychology. The various dances, especially ballet, referenced throughout the article intrigued me because of my dance history and background. I have been a ballerina for thirteen years, and Bergland’s summation of Neuroadaptation in dancers’ brains because of the frequency of turning interested me. I began looking into how other types of sports psychology principles such as skill acquisition and mental practice can influence performance. Fundamentally, there are two types of performance, cognitive and physical. Cognitive performance includes various types of learning, such as recovery after an injury. Physical performance includes sports and other types of physical activity, but is not limited to competitive sports. I began to wonder if there was a connection between improved performances physically and cognitively, after use of mental practice as the improvement tool.

Mental practice is the use of visualization and imagery techniques to improve one’s performance in the desired field. Many sports psychologists have used mental practice as a technique for improving skill acquisition, as well as a form of therapy for injured players. In professional sports and other high-level competitions, including The Olympics, many athletes use mental practice. For beginners or intermediate-level athletes, mental practice is difficult to get used to, encouraging some athletes to shy away from using it, and therefore not gain any benefits from using mental practice. There is some debate about mental practice effectively and positively impacting physical performance, or if the results of studies finding a link are misattributing improved performance from physical training. The newly explored link between cognitive performance and mental practice is beginning as a form of therapy for patients with

degenerative cases, mostly for those suffering from Alzheimer's disease. How can mental practice through visualization and imagery improve performance, both physically and cognitively?

### Physical Performance

For some athletes, training does not begin in the locker room, or in the weight room. It begins in a quiet and secluded place, void of any distractions. Under these conditions, athletes can begin visualization techniques by imagining some type of action. There are two types of visualization or imagery; external and internal. External imagery is imagining one's body moving through the actions of a complex task as if from a third-person perspective. Internal imagery however, is moving through the actions for oneself, imagining the event as an actual occurrence. As Christopher Clarey reported in *The New York Times* (2014), athletes require total concentration while using mental imagery sometimes feeling physical symptoms (par 47).

Clarey reported some of the practice techniques of the Olympians that competed in the 2014 Sochi Winter Games. He also explained the rise of sports psychologists that travel with the United States Team (par 1, 2, 17). The use of sports psychologists in high-level sports competitions like the Olympics has increased over time, as techniques become more adaptable for sports, and with evolving uses for mental practice. Critics of mental imagery point out the circumstances of these athletes, and compare them with athletes at a lower level. As Buriak, Creasy, Rearick, and Wright write in the *Virginia Association for Health, Physical Education and Dance Journal* (VAHPED) (2009), of the twenty-two National Collegiate Athletic Association (NCAA) coaches surveyed, only two taught mental skills and techniques to players (par 12). The survey sample included coaches from all three NCAA divisions therefore

eliminating potential bias between coaches from the competitive Division I, and the less competitive Division III.

The coaches that were not teaching mental practice to players stated reasons such as time constraints in a busy season, or feeling uncomfortable with teaching their players mental imagery skills (par 14). For some coaches, these techniques were not yet refined during their own college sports experience, thus proving difficult to teach. Similarly, players that have never been exposed to mental imagery will have difficulty understanding the concepts, such as differing preferences between external and internal imagery. Due to the limited percentage of coaches that provide players with mental imagery training, improved physical performance in sports where the opponent's actions are not controlled has been disputed. Sports that do not involve an opponent, but rely on points earned as the qualifications for winning, such as diving, skiing, and snowboarding show higher improvements in performance. One such example of an opponent-sport is basketball; with several possibilities of movements, plays, and options for passing, training to play the opponent is difficult for coaches and players (par 5). In one play, an opponent can have unlimited possibilities of movements and defensive maneuvers for the mental practice player to account for, thus complicating training both for the athlete, and for the inexperienced coach.

Additionally, as Collet, Guillot, and Nadrowska write in *The Journal of Sport Behavior* (2009), athletes that had never used the techniques of mental imagery found it difficult to master (par 46). However, athletes that trained with mental imagery experienced greater transfer between training with mental imagery and physical practice. Though many coaches are lacking in teaching mental imagery to their players, the successful attempts at coaching provide

examples of how to combine physical practice with mental imagery to improve the most during any given season.

In a study by Cornelia Frank, William M. Land, Carmen Popp, and Thomas Shack in the *Public Library of Science Journal (PLOS ONE)*, a peer-reviewed and open-access journal; the effects of skill acquisition were studied. One group used both mental practice via mental imagery and physical practice, another used physical practice, and one group did not practice. Combined practice proved the most effective at skill acquisition, proving the benefits of mental imagery are worth the added measures for coaching players (par 6). When comparing novices to veteran athletes, those who have used mental practice have an excess of stored information about the sport in their long term memory. For experienced athletes the completion of a complex task found within their sport is routine, and requires the use of information retrieval from long-term memory. Skills acquired over a long period of time are similar to skills that are learned with mental practice and imagery because of their connection to long-term memory. These efforts continue the existing learning process, as well as improving the frameworks for skill-based memory in long term memory (par 4, 5).

Similar to skill-based memory, another type of learning that is applicable to athletes is a type of sensory learning, as Christopher Bergland discussed in, “Why is dancing so good for your brain?” This type of learning is called Habituation, which can be defined as the decrease of biologic reactions to stimuli that have been repeatedly presented to an individual (Mikulas, n.d., par 38). For dancers the repeated sensory information to the cerebellum regarding balance has been habituated, because of the frequency of turning in ballet (Bergland, par 10). This can be regarded as another kind of skill acquisition which is taught through performance and practice of a given sport, particularly dance.

The skill of marking, learned by dancers at a young age to facilitate in learning complex movements, is influential in promoting mental practice. When dancers “mark,” they are rehearsing the movements in their working memory, therefore making them more readily available when performance time comes. The benefits of marking are described by Bergland as making dancers more fluid and connected, which shows the benefits of marking as a type of mental practice on performance (par 21).

### Cognitive Performance

Another type of mental practice is knowledge visualization, where mental imagery is used to show an individual’s understanding of higher-level thinking, as well as showing connections between abstract thought and new insights (Jacobson & Wang, 2011, par 1). This is becoming a more widely used teaching method, due to the potential for acquiring knowledge, similar to how mental imagery can help athletes with skill acquisition (par 3). Knowledge visualization is taught by various methods including cognitive maps and other similar mental structures to facilitate learning. Cognitive maps, a type of hierarchically sorted teaching tool takes topics from generalized to most specific, as Calvo and Villalon wrote in *The Journal of Educational Technology & Society* (2011) (par 2). By working hierarchically, these maps allow the individual to place information in an order that demonstrates their understanding; through these tools cognitive processing becoming more accessible to teachers. Using cognitive mapping as a teaching tool, teachers can begin to instruct students on higher-level thinking, including abstract topics like analysis and synthesis (par 1).

After these concepts have been mastered, there is always the chance of additional improvement. Mental imagery has been used as a form of therapy for both psychological and physiological conditions and injuries. For Olympians and other injured athletes the process of

imagery scripts, a step-by-step instruction of actions completed during a complex task can be useful in the recovery process. For athletes like gymnasts or snowboarders, one such complex task could be flipping through the air, a nearly impossible motion when injured (Clarey, 2014). Many athletes use this technique as a method of mental training, but without any physical exercise; instead, by imagining and using a script of the exact process, athletes are reviewing the motions.

In a combined study psychological and physiological treatment were provided to stroke patients with damaged hands, as Liu, Song, and Zhang showed in *Neural Regeneration Research*, a peer-reviewed journal for neuroregeneration and stem-cell research (2014). Patients that received both mental and physical practice recovered the most, both cognitively and physically. With combined practice, neural restructuring and reorganization took place, allowing for new cognitive processes to occur (par 39). This demonstrates the therapeutic qualities of mental imagery and mental practice when recovering from cognitive disabilities, such as those that may have occurred after a stroke. With success coming from combined practice in treating a type of degenerative event, there is hope for future treatment of Parkinson's Disease (par 39). This type of combined treatment can be extended to other types of neurological degenerative disorders, in which brain functions deteriorate or are impaired, spreading the benefits of mental imagery beyond Parkinson's and Alzheimer's disease.

Even before the use of combined practice in treatment of stroke patients, Hossman and Pulvino showed in *The School Counselor* (1976), a journal dedicated to publishing studies conducted by counselors, that there was potential for the extension of mental practice to include psychological therapy, such as a method of discussing problems within the school setting. Though this journal was published in 1976, the beginnings of mental imagery as a therapy tool

began with counseling students. The case described used two students, one of whom was having trouble with dropping grades in school. After attending sessions with the counselor, the use of mental imagery began problem-solving the varied issues for the students, including both personal and environmental (par 6-8). For the effective reasons, mental imagery can be used to help with problem-solving by providing individuals with the skills they need to imagine the solution that they want. Additionally, through the use of mental imagery as a therapy tool, patients were able to embark on a mission of self-discovery, which allowed them to further the use of mental imagery in problem-solving (par 11).

### Summation

Mental imagery is effectively being used to improve performance. In Cognitive performance, mental imagery is being used as a form of therapy: psychologically as a way of imagining possible outcomes to an unknown and anxiety-arousing situation; and physiologically to continue training through an injury without further injury, and as a substitute for over-training. Mental imagery is also being used cognitively as a teaching tool for higher-level thinking, beginning teaching the abstract ideas of analysis and synthesis to students. For those that have suffered from a stroke, or other kind of neurodegenerative event, a combined practice of mental imagery and physical exercise can effectively promote reorganization, therefore helping patients return to everyday life. In order to continue the advancements of mental practice, there needs to be better understanding of policies and tools, as well as better education for coaches and mental health professionals about the possible benefits of mental practice. With added measures more education can lead to less over-training, more balanced training, and the inclusion of mental imagery to existing practicing schedules.

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