

Introduction to Psychological Skills

- Imagery

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Aims of the Session

- Provide a definition of Imagery.
- Consider anecdotal and empirical evidence for the effectiveness of Imagery.
- Consider theories of why imagery works and empirical evidence for these theories.
- Consider the 4 W's of Imagery (Munroe et al 2000)
- Consider strategies in developing an imagery program.

Defining Imagery

- Golf Legend Jack Nicklaus (1974, p79)
- “I never hit a shot, not even in practice, without having a very sharp, in focus picture of it in my head. It’s like a color movie. First I “see” the ball where I want to finish.... Then the scene quickly changes and I “see” the ball going there.... Then there is a sort of fade-out, and the next scene show me making the kind of swing that will turn the images into reality”



Defining Imagery

- Paul Hamm 2004 Olympic Gold Medallist Gymnastics
- “and then it happened, just as they’d pictured it. Fully stretched out with his one-arm sequences. Flipping high and free above the bar. The crowd noise building, all eyes riveted, and the final tumbling release that ended with him sticking his landing as firmly as a plug into a socket. Another flawless routine (Swift, 2004, p7).



Defining Imagery

- Using our senses to create or re-create an experience or visual image in the mind that may seem to be as real as seeing the imagine with our eyes (Vealey and Greenleaf, 2010).

Defining Imagery

- Vealey and Greenleaf (2010) expand on this definition by stating that:-
 - A) Imagery can be created even in the absence of external stimuli.
 - B) An image may involve one or more physical senses (indeed all five senses could be used)
 - C) Image is created from information stored in memory.

Other terms

- Imagery is often used interchangeably with other terms such as:
- Cognitive Rehearsal
- Symbolic Rehearsal
- Mental Rehearsal
- Visualisation
- Mental Practice.

Does Imagery Work?

- Many studies have provided empirical evidence of the efficacy of imagery relating to sports in a number of ways – including.
 - A) Enhancing thoughts and emotions of the athlete (e.g. changing interpretations of symptoms of anxiety)
 - B) Facilitating cognition and motivation
 - C) Use by successful athletes compared to non-successful athletes.

Empirical Evidence

- Bell, Skinner and Fisher (2009).
- Examined the effectiveness of a solution focused guided imagery (SFGI) intervention on putting yips in three experienced golfers.
 - Yips = jerks in the putting stroke.
- Multiple baseline design was utilised – to assess how often the golfers would demonstrate yips prior to intervention.
- Five SFGI sessions.
 - create vivid images of thinking, feeling, and behaving in ways devoid of the problem (i.e., putting with a smooth continuous stroke).
- Data Collected over regular scheduled weekly golf sessions.
- Immediate and sustained decrease in yips.
- Maintenance demonstrated after last sessions (3 weeks after).

Empirical Evidence

- Malouff et al 2008 – Effects of positive imagery on serving accuracy in tennis.
- Sample – 115 adult tennis players randomly assigned to 3 conditions.
 - 1) Positive imagery about serving group, 2) Self-instructions relating to serving, 3) Serve as usual control group.
- Both Positive Imagery and Self-Instructions group demonstrated significant improvements in serving during competition compared to control condition.
- Conclusion – Due to both imagery and self-instructions group focused the thoughts of the player relating to completing the serve and service accuracy.



Does Imagery Work?

- It is not just Athletes, Coaches and Applied Sport Psychologists who have cited the effectiveness of imagery relating to sport and exercise.
- Physiotherapists employ imagery in relation to Sports Injury Rehabilitation Adherence (Arvinen-Barrow et al, 2010).
- Exercisers employ imagery to increase motivation to continue to exercise (Milne et al, 2005; Gammage et al, 2000; Hausenblas et al, 1999).

Why does imagery work?

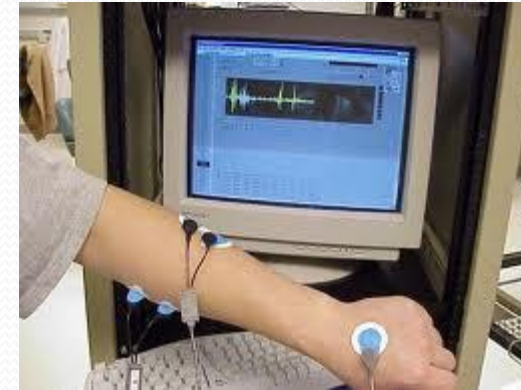
- Whilst a large number of anecdotal and empirical evidence provides support for the efficacy of imagery in improving sports performance – less is known why or how it works.
- A number of theories have been put forward – including.
 - Psychoneuromuscular Theory
 - Symbolic Learning Theory
 - Functional Equivalent Hypothesis.

How Imagery Works

- Theory 1: Psychoneuromuscular theory
 - Imagery programs muscles for action.
 - Imagery facilitates the learning of motor skills because imagined events innervate the muscles as physical practice of the movement does; they strengthen neural pathways (Weinberg and Gould, 2010).

Psychoneuromuscular Theory

- Jowdy and Harris (1990) – Electromyography Experiment.
- 35 Male Jugglers (23 = High Skilled, 12 = Low Skilled).
- Imagined themselves juggling for 8 x 15 second trials, measured muscle activity via Electromyography.
- Significant increase at $p < .001$ level in muscular activity during mental imagery across all participants.
- No significant difference between high and low level participants.



However....

- Slade et al (2002) –
- Compared passive (imagery non-movements) and active movements of biceps and tricep curls.
- 60 Undergraduate – 30 aware of the predictions of imagery effects, 30 = non-aware.
- Used Electromyography (EMG).
- For both bicep and tricep curls, activation was greater in imagery compared to baseline.
- However – Pattern analysis showed that activation during the active movement DIFFERED from imagery (passive) movement.
- Therefore did not support the mirroring hypothesis of the psychoneuromuscular theory.

Nevertheless

- Despite studies such as Slade et al rejecting a muscular mirroring of imagined vs real movements. There is still widespread belief amongst Sport Psychologists that imagery assists the brain in developing a schema for executing a motor pattern (Cox, 2012).
- Don't forget, Slade's study did report EMG activation in the imagery condition.

Imagery – Mirror Neurons.

- Original research on Monkey (Di Pellegrino et al, 1992; Gallese et al, 1996; Rizzolatti, Fadiga, Gallese, & Fogassi, 1996)
- Noted through Neuron activity recording (cell recording) that specific neurons and neural pathways were activated when Monkeys performed a specific movement.
- Same neural activity when Monkeys observed the same movements, but not carrying them out.

Imagery – Mirror Neurons

- Recent studies (Calmels et al, 2006; Grèzes et al, 2003) have suggested that Mirror neurons also exist in Humans.
- Could this help explain the impact of imagery in relation to sport performance improvements?
- Does imagery help facilitate the appropriate neural pathways associated with the movement?

Imagery – Mirror Neurons

- Perani et al 2001 – Activation in Neural pathways greater (and more accurate to executed movement) when watching a grasping action performed by a human compared to non-animal being (e.g. machine).
- Activation is minimal if observed action is biomechanically impossible to execute (Stevens et al, 2000)
- Activation is also minimal if the observed action is not in the persons repertoire (Buccino et al., 2004)

Imagery – Mirror Neurons.

- Calvo-Merino et al (2005; 2006) reported that expertise and familiarity of observed movements plays an important role in the Mirror neuron theory.
- They found that a closer “mirroring” activation of relevant motor areas were observed with expert dancers viewing familiar dance moves compared to non-expert dancers.
 - However in less familiar dance moves, the mirror activation was not as strong for the expert dancers (even though they were capable of performing that routine).

Imagery – Mirror Neurons

- Important to note, that most of the Sports Specific Neuroscience studies observing Mirror Neurons have focused on participants OBSVERING a movement.
- Very little on **imagery** of a movement.
- However, Holmes (2008) suggested that the principle might be applicable to imagery.
 - Indeed many Language orientated fMRI studies requires the participant to say the word in their head or think the word.

Important to note....

- That the Mirror neuron explanation is not the same or part of the Psychoneuromuscular Theory –YET!
- However, research would suggest the links and similarities are there and Mirror neurons might (in future years) be used to provide a further explanation and support for the Psychoneuromuscular theory.

Symbolic Learning Theory

- Quite different from Psychoneuromuscular theory – No electrical measurements of muscles needed.
- Janseen and Sheikh (1994) – Motor sequences, task goals and alternative solutions are cognitively considered BEFORE a response is required.

Symbolic Learning Theory

- Athletes (both recreational and elite level) and Exercisers are continually evaluating and reviewing their actions, goals and alternative solution.
- Mental rehearsal or imagery is used as coding system (or blueprint) to help people acquire and understand the appropriate movement patterns to meet their goals.

Example - Bullseye

- 1980's-1990's British Television Show.
- The final part is where the winning pair had to throw a total of 101 or more in six darts.
 - First three darts – Non dart player
 - Final three darts – Expert player.



Bullseye Scenario

- If first dart player scored 83 – leaving you with 18 (in three darts) to win the speed boat – how would you approach it?



Functional Equivalence Hypothesis.

- Actually linked closely to Psychoneuromuscular theory.
- Agrees that mental images share same neurophysiological process as physical executions of same actions.
- However, the role of learning important to “why” imagery works is where this hypothesis differs.
 - In later stages of learning – functional equivalence greater than in earlier stages of learning – could explain psychoneurophysiological findings relating to familiarity and ability level.
 - At earlier stages of learning – should use imagery in a different way
 - Functional Equivalence.

Functional Equivalence Hypothesis

- Holmes and Collins (2001) proposed a 7 point functional equivalence checklist to facilitate appropriate imagery use.
- Mental image of executing a physical skill should be identical to physical execution in terms of the following practical components
 - **Physical, Environment, Task, Timing, Learning, Emotion and Perspective.**
 - PETTLEP BASED IMAGERY INTERVENTIONS.

PETTLEP

- Physical component – Imagery most effective when it includes all physical sensations experienced during actual performance.
- Environmental component – The imagined environment in which the skill is executed should be the same as when performing the skill physically.
- Task component – Imagined motor task must be carried out with same thoughts, feelings and actions as during physical execution.

PETTLEP

- Timing component – Imagine execution of a motor task must be carried out with same emphasis of speed and pace as actual task
- Learning component – As skill level increases, correct emphasis must be placed on appropriate actions associated with stages of learning
- Emotion component – Must experience the same emotions as during physical execution.
- Perspective component – A situational specific individualised approach to imagery should be considered.

The 4 W's of Imagery

- Classic, Ground-breaking paper of Munroe et al (2000) – placed on moodle!
 - Very much an applied sport psychology paper.
- The 4 W's of Imagery
 - Where
 - When
 - What
 - Why

Where and When Imagery Occurs

- According to Munroe et al (2000) – imagery takes place either during training or during competition.
 - Most (even training ones) associated with competition.
- Within training – most takes place during practice
 - But some away from practice.

Where and When Imagery Occurs

- At the period of competition.
 - Can take place before, during or directly after competition.
 - Most before competition (mental rehearsal).
- Off season and in season use of imagery?
 - High level athletes use imagery the most in both situations (Cumming and Hall, 2002; Hall et al, 2009).

Where and When Imagery Occurs

- The role of the coach.
- Jedlic et al (2007) – Coaches encouragement of the use of imagery = critical for athletes to use it.
- These authors also suggest that some coaches actively use imagery as part of their training routine more than they are actually aware.

Where and When Imagery Occurs

- Jedlic et al (2007) – Coaches revealed that they encourage their athletes to use imagery both on and off season.
 - Most often “on” season – just prior to competition or during competition (e.g. half time team talks etc).
 - Visual imagery and mental rehearsal were the do most common types of imagery adopted.
- Jedlic et al (2007) – Also noted that higher level competitive coaches **ACTIVELY** encourage imagery more than at lower level.
 - Do these have greater knowledge due to possibly having an applied sport psychologist as part of their team make them more aware of the impact of imagery?

What is being imagined? (Munroe et al, 2000)

