

THEORETICAL AND PRACTICAL DIMENSIONS OF MOTOR IMAGERY APPLIED FOR HURDLES, POLE VAULT AND THROWING EVENTS

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Abstract: *This study aims to describe the applicability of imagery in hurdlers, vaults and throwing races based on literature analysing. Researchers have developed over time a theoretical optimum approach for coaches who want to create an imagery script for athletes during warm-up routine, training and before competitions. In addition, the athlete's ability to view the range of movements in hurdlers races and accuracy in pole vault involves imagery models while neuromuscular psychological theory can be seen as the engine of connection between nerve cells and musculature. PETTLEP model incorporates components (physical, environmental, task, time, learning, emotion, perspective) to highlight the psychomotor adaptation of athletes. Studies on motor imagery associated to recovery after muscle injuries revealed that athletes must have a positive attitude to overcome injuries. Coaches can create imagery scripts that can develop athlete's ability to acquire new motor skills.*

Key words: *psycho – neuromuscular, PETTLEP model, imagery training, athletic events.*

1. Introduction

Athletic events involve a high degree of cognitive side and connection between the mental and the physical performance when athletes use motor imagery. This can be improved by using mental imagery which is described as “the ability to generate, maintain, modulate an image” [4].

Imagery is a process of psychomotor self-education, which “improves motor learning, neuromuscular rehabilitation, motor behaviour and self-confidence” [18]. Motor imagery cultivates self-confidence leaving aside the failure, the athlete

focusing on success. Motor imagery is divided into the following types of imagery: “visual, kinesthetic, olfactory, auditory, tactile” [5].

With regard to “visualization and imagery are often considered synonymous but visualization has some restrictions whereas imagery involves all the senses plus and the actions view” [1].

With motor imagery skills, athletes can reflect on their movements. It seems that “70-90% of athletes use motor imagery to improve their performance” [10].

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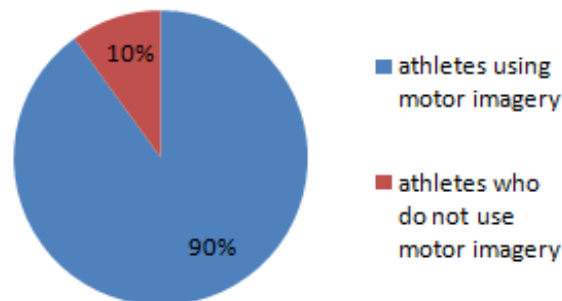


Fig.1. *Estimated percentage between athletes using the motor imagery and those who do not use it [10]*

According to Krista J. Munroe-Chandler and Michelle D. Guerrero (2017) the applicability of the imagery can be determined by the variables shown in the figure below (Fig.1) [24].

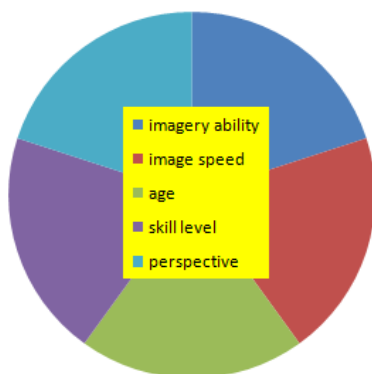


Fig.2. *Factors affecting imagery [24]*

Over time studies have been conducted on various factors that can influence the imagery process, here referring to age. With age, it has been found that “visual and kinesthetic imagery skills can improve” Isaac Marks, (1994) quoted by Thelma S. Horn (2008) [8]. Also, the author Ed Jacoby (2009) states that “with the passage of the pubertal period

kinesthetic imagery makes its appearance” [9].

In athletic events kinesthetic imagery plays an important role “implying a feeling of executing the action including strength and exertion perceived during movement and balance” (Callow and Waters 2005) quoted by Aymeric Guillot, Christian Collet (2010) [5]. From kinesthetic imagery perspective, athletes can imagine “what he/she feels while performing the running movement, position of the legs in moving, tactile information (contact of the foot with the ground), physiological response (heart rate, pain and fatigue) and emotions (anxiety)” [16]. In the performance sport, Ed Jacoby (2009) states that kinesthetic imagery is more prevalent than the visual one [9].

2. Examples of Situations in which Athletes Use Motor Imagery Training as a Form of Mental Rehearsal

Russian scientists stated that using more motor imagery during training sessions this aspect can improve sports performance (Fig.3).

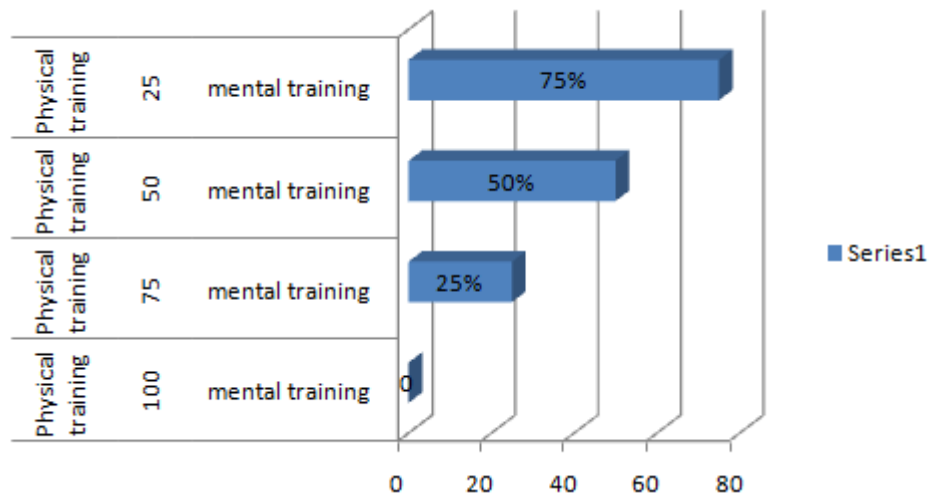


Fig.3. *Motor imagery percentage used during training comparing with physical training* [25]

Before using motor imagery, athlete must have a clear picture of their technique to be able to make a correlation between internal and external imagery. The study by Vincent Parnabas, Julina Mary Parnabas and Mary Antoinette Parnabas applied to the imagery effect among athletes "showed a positive correlation between internal and external imagery" [11]. Mental training during pre-competitive and competitive periods must be adapted to the real demands of sport having as a starting point "situations less stressful and then moving to circumstances involving mental pressure" [6]. Mental rehearsal session duration of motor load may differ from one sport to another so Driskell, Copper and Moran (1994) quoted by Jim Taylor, Gregory Scott Wilson (2005) suggested that "the type of load may vary during execution and a jumper in height must imagine the elevation, the detachment and the landing of the vault which requires more mental rehearsal than other sports" [13].

In vault events "when the number of vaults is limited (pole vault) it is recommended to use imagery during

breaks as a means to supplement vaults" [7]. This recommendation is useful for efficient correction of some technical errors during vaults performance by viewing them. Also, it is important that the "imagery to be as much as real possible including colours, public, sounds and image of the athlete successfully passing the bar" [12]. A clear case of using of imagery "is the high jumper who imagines successfully crossing over the bar before starting to make the jump itself" [6]. A study by Olsson CJ, Jonsson B, Nyberg L examined the changes made by using internal imagery on high jumpers. They concluded that "internal imagery training can be used to improve a component of a complex motor skill" [24].

Throwing may also benefit from the use of imagery training. For example "before throwing the javelin, the athlete should imagine something like: raising the javelin, running forward, moving the arm backward, throwing the arm forward, releasing the javelin, making a step forward, viewing the javelin flight and for sticking it into the ground. In other words, the javelin throwers actually mentally

repeat what they do when throwing the javelin”[9].

To maximize imagery effectiveness “a javelin thrower who images himself throwing a personal best while holding a javelin and standing in the stance he would adopt before his run-up would likely prompt certain feelings and sensations associated with the situation thus creating a more vivid and realistic image”[17].

3. Psycho-neuromuscular Theory

In Oxford Dictionary of Sports Science & Medicine Psycho, neuromuscular theory is described to be part of sports and recent research on this field discovered that by using “electromyography patterns of the muscle activity of skiers who imagine they are performing a downhill run, are similar to the electrical patterns of the skiers muscles when they have actually been skiing” [23]. This type of imagery presents the possibility that when “imagining the

own motion, the brain subconsciously sends electrical signals to the musculature in the same order as when executing the physical movement” [1].

Meanwhile “coordination and organization of the movement is carried to the brain and when imagine the movement, these processes occur automatically” [1]

3. Example of PETTLEP Model Applied to Athletic Events

PETTLEP model is a mental construction that involves seven elements: physical, environment, time, task, learning, emotion and perspective. By applying PETTLEP model it is suggested that “if there is a similarity between image and physical time this can help to add more details to the image improving the vividness of the image” [20]. PETTLEP Model is used in sports that require fine motor coordination (high vault, pole vault 110 meter hurdles and throwing. PETTLEP model can be adapted to all the sports.

Table 1

PETTLEP Model applicability for athletic events [21]

1.	Physical - the athlete will be dressed in sports equipment like in competitions and will be in its original position: hurdler (before the start), vault (preparing for starting the vault on elevation), throws (preparing the position of grabbing the object thrown).
2.	Environment - The best place to perform imagery program is the running track (throws, vaults sector).
3.	Time - The duration of each race varies from one event to another.
4.	Task - Each race is divided into moments focused on appropriate segments movements per time – space unit.
5.	Learning - by learning athletes can focus more on the technical aspects.
6.	Emotion - This step can cultivate positive feelings that can improve the general approach to competitions.
7.	Perspective - Using video images may indirectly contribute to the mechanical representation of the movement.

4. Efficacy of Imagery Training in Muscles Injury

With the help of mental training on muscle “it has been proven that using vision before maximum efforts can actually activate multiple motor units” [15]. Regarding the effectiveness of imagery and relaxation on injuries, the author Davis (1991) quoted by Comfort, P., Abrahamson, E found that after applying “relaxation and imagery, the injuries decreased by 52% “[3]. One aspect to be taken into account when a muscle is injured is pain management. The authors Law, Priediger, Hall and Forwell (2006) quoted by Paul Comfort, Earle Abrahamson found that “athletes who use imagery to cope with pain are more satisfied of the recovery [10]”. This is due to the awareness of the risk factors that lead to injuries triggering. During the recovery period after injury “there are three effective techniques of mental imagery that positively promote the healing process of injured athletes: visual imagery, emotional imagery and healing imagery” [22]. Another aspect that the athlete must take into account for healing of injuries by using imagery to be more effective is that “the recovery should include daily life events including the vision and experience with which the athlete performs certain skills to not forget them during injury”[10].

A concrete example of success by using mental training through the imagery is that of “a pole jumper that during the process of recovery from injury of lower back muscle has managed that once returned to competition circuit untrained to win the first competition in which he participated” [10].

5. Conclusions

In conclusion Bruce Hale, Penny Crisfield [6] suggest that mental rehearsal of the image should be a routine in training and for the successful implementation of motor imagery, a program of mental imagery rehearsal should be considered [1]. Steven Ungerleider [14] concluded that “field athletes (pole vault, discus throwers, high jumpers were more likely to use mental practice and had stronger physical sensations associated with imagery than track competitors (sprinters)” [11]. Besides technical, physical and tactical training, coaches can introduce motor imagery script adapted to the athlete needs and according to the: “sports situation, imagery types, outcomes and imagery ability” [19].

Motor imagery has an important role in developing the athlete motor behaviour and in conclusion using motor imagery during training can improve performance.

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