Chapter 20
Get Your Head in the Game: Examining the Use of Psychological Skills in Sport

Amanda M. Rymal[1], Christopher R. Hill[1], and Jenny O[2]

[1]California State University, San Bernardino, USA
[2]Cal State East Bay, USA

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Chapter Overview

Psychological skills training (also known as mental skills training) is used at all levels of sport, worldwide. There are many psychological skills that are theorized to impact sport performance. In this chapter, we will introduce four psychological skills that are crucial for high level sport performance. These skills are focus, self-talk, imagery, and observation. All of these skills have been used to improve sports performance, and research evidence would suggest that if used appropriately, they can be harnessed to help athletes at all levels. Each section will provide a theoretical background of the skill, the research evidence that supports the assertions made, and ways in which the skill can be applied in the sporting context.

For correspondence: arymal@csusb.edu

Focus

It is common to hear coaches before a big moment exclaim, "Focus!" However, coaches rarely provide guidance about how to focus, or what to focus on. One of the key factors in peak performance in sport is the ability to focus and refocus during a game (Krane & Williams, 2015). This section of the chapter will briefly cover the applied sport psychology literature that has examined the ability to focus and concentrate.

What is the Ability to Focus?

Effective concentration involves two main components; the ability to attend to the correct things at the correct moment and the ability to attend to the information in the correct way (e.g., are you focused on the right thing at the right time). At face value this might seem quite simple, but it can actually be a challenge. For example, JR, an American football quarterback, is trying to hear the play call from his coach so that he can relay the play to his teammates. The home crowd is loud, making it difficult to know if he is relaying the correct information to his teammates. He tells his teammates the play, and then heads to the line of scrimmage. The coach gave him the option to audible (i.e., change the play if he deems it appropriate) if the safety (i.e., one of the defensive players) is close to the line of scrimmage. His focus jumps to the movement of the safety, but of course, the safety is moving all over the field before the play begins. He is having difficulty reading what the safety will do, but he must make a decision. He decides to keep the original play call, which is a four-man passing play (he must look at four different routes to know where to throw the ball). He calls for the ball to be snapped. Immediately one of his offensive linemen misses a block and he has to scramble to avoid being tackled. He avoids the first defender but knows more are coming. While avoiding rushing defenders, he must scan the field for who is open and what coverage the defense is playing. He notices that they are playing zone and notices that there is a hole in the coverage. He steps up and throws to what he thinks is an open receiver. However, there was a safety just out of his line of sight. His receiver makes a great catch over the safety's outstretched arms. He throws a touchdown!

Before we move on, consider all of the things that JR had to concentrate on in the example provided above. You will see for a play that might have lasted six seconds, there were many different components to focus on for the play to be successful. The ability to focus on the correct information, at the correct time is vital for sporting success. It is also necessary that athletes are able to shift their focus throughout the game (Williams et al., 2015). In the example above, we excluded any information about past or future events. Both past and future events can be a distractor to athletes during play. Scholars believe the best form of concentration is the ability to stay in the here and now (Hermansson & Hodge, 2012), meaning an athlete maximizes their concentration whenever they have complete focus on the task at hand. In the next section, we will lay the groundwork that focuses on conceptualizing the different types of attention that athletes have during sports participation.

Conceptualizing Attention Control

In the 1970s, Robert Nideffer proposed a model of attention control training that suggests that people have four unique dimensions of attention in a 2x2 model. The first component is the direction of the athlete's attention, which is conceptualized as either being internal (within oneself) or external (outside of oneself). When attention is internal, an athlete could be focused on feeling their muscular tension or rehearsing strategy within their own thoughts. When attention is external, an athlete could focus on the movement of the other players on the field or finding the open teammate to pass to: that is, focusing on anything outside of one's body.

The other key component from Nideffer's model is width of attention focus. Width of attentional focus is thought of as being either broad or narrow. Broad attentional focus is being able to attend to a lot of different pieces of information at the same time. For example, a basketball player surveying the court to see where her teammates and opponents are in order to decide to pass (and who to pass to) or shoot. The basketball athlete needs to see as many of her teammates and opponents as possible to make the decision. Otherwise, she might pass to a teammate who is being covered by someone who she did not see and lose possession of the ball. However, if her attention is too broad, she might become indecisive, leading to her turn the ball over. An example of a narrow attentional focus would be a golfer right before trying to make a short putt (we will assume the golfer has already picked the line of the putt using broad information). The golfer knows that they have to make clean contact with the ball with their putter. In this situation, you will likely see the golfer with their head down, staring at the ball. This is very narrow because the golfer is no longer looking at their surroundings, they have already chosen the shot and now they have to execute it.

Taken together, Nideffer's model proposes that at any time an athlete will be focused at some width and in some direction. This creates four unique dimensions that include broad-external, broad-internal, narrow-external, and narrow-internal (See Figure 20.1). The importance of an athletes' ability to shift their attention to where they need it in critical moments of a game is well documented but like most psychological skills, there is a high amount of individual variance in an athlete's ability to shift focus (Ziegler, 1994). Also, athletes seem to have a high amount of variability in their ability to attend to many or a few cues at a time (Williams et al., 2015). Some athletes can inherently attend to more cues in the environment than others. That is not to say that focus (or shifting focus) cannot be trained, but there seems to be some level of focus that is innate for each athlete.

Figure 20.1

The Dimensions of Attention as Proposed by Nideffer (1976) with Examples

Broad-External: Scanning the field to see where teammates and opponents are located.	**Narrow-External:** Seeing a pass coming from a teammate to your foot in a soccer game.
Broad-Internal: Forming a game plan for an upcoming match.	**Narrow-Internal:** Using imagery to practice a skill.

Stevinson and Biddle (1998) proposed a slightly different model of attentional focus. Within the Stevinson and Biddle model there are still two focal dimensions, but they are divided by task-relevance and direction. For task relevance, the researchers hypothesized there are two dimensions of either task association or task dissociation. Similar to Nideffer's (1976) model, it also incorporates the direction component.

There have also been other classifications of focus in sport that are newer and have less empirical support to date. Brick and colleagues (2014) created two categories that focus solely on internal association named internal sensory monitoring and active self-regulation. Some hypothesize that this model works well when focused on endurance sports due to the high internal focus that often happens during events that last for many hours (Neuman, 2019). There is also recent theorizing that proposes that an external focus is optimal for skill learning and development of most motor skills (Wulf & Lewthwaite, 2016).

Each of these alternative views of focus in skill learning and performance is worth considering because the demands of focus are incredibly varied across the sport domain. What information a gymnast needs to focus on is likely quite different from what a soccer player must focus on for optimal sport performance. Although the Nideffer model has been most cited, these other models are well conceptualized and have empirical support (Williams et al., 2015, Wulf & Lewthwaite, 2016). Therefore, when considering a model that might be most useful for your specific sport needs, examine each of the proposed models in detail to see if they fit the sport-specific needs of the domain.

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Application

Like all mental skills, in order to be able to optimally focused, athletes must train to focus on the correct cues at the correct times (Ziegler, 1994). Interestingly though, athletes rarely get explicit training on what to focus on during a sporting event. Athletes that have sport demands that are somewhat static (i.e., sports where the object is stationary before the play begins, like archery) probably have thought more about their ability to focus compared to athletes who play invasive sports (like basketball or soccer). However, for all sports, there are ways to train focus that should be considered when working with athletes.

Athletes often struggle with shifting their focus from one object to another (Ziegler, 1994). Shifting focus can be trained during normal practice situations. It would be useful for a coach to explicitly tell and athlete what they should focus on in a situation and when their focus should shift (Williams et al., 2015). After a simple explanation, the coach could repeatedly run an athlete through a situation where they have to shift their focus from one cue to another. The coach could give the athlete the space to fail and let them work through the process in a way that allows them to self-correct and self-regulate their behavior. If the athlete continues to struggle, the coach could work to simplify the decision, and then add complexity later on in the practice session. When an athlete successfully completes the task and clearly shifts focus, the coach could verbally encourage that behavior and the shifting of focus. After the athlete has developed the skill set to focus on the task in a practice scenario, the coach could make the scenario more difficult by making the situation more complex in a simulated competition.

Another important, but often overlooked detail, is talking with an athlete about what they are seeing or focusing on after a play. What a coach or mental performance consultant thinks an athlete is seeing compared to what they are actually seeing might be quite different (Williams et al., 2015). Talking with an athlete might help them filter the cues they are seeing. The athlete might be having too broad of a focus during a time when they need to be much narrower in their focus. These conversations should be commonplace for athletes who are struggling with focus during games. Knowing what someone is focusing on is the first step in either enhancing that focus, or altering that focus. Consultants or coaches could also focus on incorporating a pre-performance routine with their athletes. This routine should be developed with focus in mind. At the end of the routine, a coach would want the athlete to be completely focused on the task at hand.

Moving back to the motor learning literature, there has been some interesting theoretical work by Wulf and Lewthwaite (2016) who created the OPTIMAL model of motor learning. Part of their model focuses on the type of focus that most athletes or skill learners should have to optimize for skill learning and development. In basic motor learning tasks, they find that an external focus of attention is far superior to an internal focus of attention (Wulf & Lewthwaite, 2016). They posit that an external focus of attention likely decreases self-focus which allows for increased focus on the task goal. This increase focus on the task goal will lead to increases in motor performance and motor learning. The increase in external focus has beneficial effects on efficiency and accuracy in lab and field-based tests (Lewthwaite & Wulf, 2017).

Being able to focus on the right object at the right time is crucial for most sport performances. Understanding the key components of focus are crucial for understanding how and why performers make mistakes on well-learned tasks. The ability to train focus is increasing with different biofeedback and neurofeedback tools that are available on the market today. Moving forward, sport psychology researchers should continue to develop strong theoretical arguments about how focus is structured in specific sport settings and how it can be best measured.

Self-Talk

Self-talk is thought to have strong ties to our cognitions and affect in the sporting domain (Williams et al., 2015; for more discussion on affect, see Chapter 4 [Brand & Ekkekakis, 2021], Chapter 11 [Jones & Zenko, 2021], and Chapter 12 [Zenko & Ladwig, 2021]). In fact, self-talk has been highlighted in previous studies of Olympic level athletes as a tool that they use to achieve sporting success (Gould et al., 1993). Self-talk is often defined as our internal dialogue that is almost constant throughout the day for many people (Hardy, 2006). Self-talk has been proposed as a tool that athletes can harness to perform at their best. However, simply having an internal dialogue does not necessary lead to success; as such we will cover the foundations of research in the self-talk literature and then provide some suggestions for how to maximize self-talk as a useful tool in an athlete's psychological tool chest.

What is Self-Talk?

Self-talk has many synonyms including inner dialogue, intrapersonal speech, inner voice, or internal monologue. By definition, self-talk is dynamic, multidimensional, and serves both instructional and motivational functions (Hardy, 2006). Self-talk has many purposes and uses for athletes (Hardy, 2006). One athlete might use more motivational components of self-talk, compared to another athlete who might use self-talk to induce the appropriate amount of arousal before a competition.

Conceptualizing Self-talk

Only a few self-talk models have been proposed in the sport psychology literature over the years. However, one of the few models that has been circulated comes from Hardy and colleagues (2009). The self-talk model that was proposed highlights there are both antecedents and consequences of self-talk for most athletes. Specifically, there are personal factors and situational factors that are antecedents to athletes' self-talk. The personal factors can include how athletes prefer to process cognitive information, how much an athlete believes self-talk will impact their performance, and personality traits that might make athletes more amenable to self-talk (Hardy et al., 2009). Situational factors that influence self-talk include (a) how difficult the task is, (b) the competitive setting the athlete is in (along with other social pressures), and (c) the coaching behaviors interpreted from the athlete. The model proposes that self-talk can directly influence performance in sport and that self-talk can also have other cognitive and behavioral consequences. Some of the other consequences that are highlighted by Hardy and colleague's (2009) are cognitive mechanisms (such as concentration), motivational mechanisms (self-motivation and confidence), behavioral mechanisms (skill technique), and affect mechanisms (general affect and sport-related anxiety). Like most psychological skills models, the Hardy and colleagues (2009) model places self-talk at the center of the model.

A more recent model of self-talk outlined by Latinjak et al. (2019) breaks self-talk into two categories; organic self-talk and strategic self-talk. Organic self-talk is defined as self-spoken statements that reflect what is currently happening cognitively with the athlete (Latinjak et al., 2019). Within the organic self-talk category, Latinjak and colleagues propose separate subcategories of spontaneous self-talk, goal-directed self-talk, and self-talk that occurs in reflexive interventions (i.e. reflecting on past events and analyzing the self-talk that occurred). Strategic self-talk is defined as cue works used specifically for strategic purposes (Latinjak et al., 2019). Strategic self-talk is planned and practiced before competition to help athletes manage their arousal, anxiety, motivation, to keep them focused on the task at hand. Understanding how self-talk occurs both through organic (more natural processes) and strategic (more trained processes) provides insight into what the purposes of self-talk are for athletes and might elucidate a better understanding from consultants when trying to work with athletes.

Despite some differences in the models of self-talk, each model suggests that self-talk can be used to benefit sport performance. The next section of this chapter will be devoted to understand the benefits of self-talk and how to use self-talk for sporting success.

Why is Self-Talk Important?

Tod and colleagues (2011) noted in a review of 47 self-talk studies that self-talk can be beneficial for sports performance whenever it is *positive, instructional, and motivational in nature*. This study also concluded that negative self-talk did not have detrimental effects on performance, but is also unlikely to provide beneficial effects. Overall, it appears that self-talk can be used as a tool to enhance sport performance, perhaps though cognitive and behavioral mediators or mechanisms (Hardy et al., 2009).

Self-talk might be a more useful tool in sports that are self-paced (e.g., golf, tennis) compared to sports that are externally paced (e.g., soccer or basketball; Williams et al., 2015). Sports that are self-paced allow for more time and control over the process of starting the action. This means that there is more time available for athletes to have a pre-programmed plan that can be quickly put into action.

There is evidence that self-talk can be beneficial for athletes. Looking at the Hardy and colleagues' model (2009), the next few paragraphs will outline the ways in which self-talk can benefit the cognitive, motivational, behavioral, and affective mechanisms in sports.

The cognitive mechanism of self-talk is directed at any process in sport that involves the processing of information, concentration, or attention (Hardy et al., 2009). In fact, one of the most common reasons that athletes use self-talk is to help them focus or concentrate on the task at hand (Hardy et al., 2001). Self-talk can help direct the processing of information to the most relevant parts of the skill. When working with athletes, it is important to correctly identify the parts of the skill performance where the cognitive processing needs to be present. Once the athletes and coaches have identified they key parts of the performance where the attention should be focused, the next step would be to identify key words or phrases that the athlete could say to themselves to keep their focus on the relevant details. Using a key word or phrase can direct an athlete's attention to the most relevant part of the performance, hopefully leading to improvements in skill performance. If a basketball player is about to take a free throw they might need to think “smooth and follow through” right before taking their shot to ensure that they are focused on the parts of the shot that will lead to optimal outcomes.

Some athletes use self-talk to motivate themselves to perform their best during challenging circumstances. Hardy and colleagues (2009) further break down the motivational component of their model into self-efficacy and persistence. According to self-efficacy theory (Bandura, 1997) verbal persuasion, which can come from oneself, is a way to build perceptions of self-efficacy. Therefore, if an athlete uses self-talk that reflects on their high ability level, they will likely see increases in confidence. Motivational self-talk might also keep people going during difficult tasks and keep them driven to achieve success. Although proposed in the Hardy and colleagues’ model, this has little support in the sport psychology literature with very few studies examining the topic (Hardy et al., 2009)

The behavioral mechanisms of self-talk are highly intertwined with other aspects of kinesiology like biomechanics, motor learning, and motor behavior. Hardy and colleagues note that movement patterns are hypothesized be tied to the self-talk of an individual. However, to-date there is little evidence that supports this mechanism.

Hardy and colleagues (2009) use the affective mechanisms label as an umbrella term to capture all things affect, mood, and emotion (for further discussion on the distinctions between affect, mood, and emotion, see Chapter 12; Zenko & Ladwig, 2021). Using self-talk that manages feelings of anxiety and arousal can be beneficial for athletes who have performance decrements due to arousal issues. Using language that is calming or relaxing could create an affective state that would benefit the athlete. On the contrary, if an athlete is having a difficult time getting appropriately aroused and ready to go for a game or match, the athlete could benefit from self-talk that is energizing and stimulating. However, more research is necessary to understand the ties between self-talk and affect in sport.

Application

At first, athletes might struggle to even know what they say to themselves during a performance. Athletes might also struggle with the awareness of self-talk. One of the first things to have them do would be to create a self-talk journal that documents the things that they said during practice or game situations. This will make the athlete more aware and help them see that their self-talk patterns might not be helping them perform at high levels (and for many athletes they will recognize that their self-talk patterns could be improved).

Another useful tool is having athletes reflect to their previous best performances and attempt to remember the types of self-talk that they were engaged in during that performance. For this exercise, the athlete can try to remember as many details as possible of their best performance (this will also impact some self-efficacy perceptions). To make this relevant to self-talk, have them reflect on the things that they said to themselves and jot down the things that are relevant to future performances. If the self-talk worked then, regardless of the purpose, it might be beneficial for future performances. Furthermore, the understanding the type of self-talk that is beneficial for performance can guide a self-talk intervention for future performances.

Lastly, a common technique used by practitioners to change self-talk is thought-reframing, also known as cognitive reappraisal. In this technique, someone would work with an athlete to take the negative self-talk and have the athlete reframe the thought with the purpose of using the reframed phrases whenever the athlete is in a similar situation in the future. For example, if a tennis player hits a shot out, they could say, “I am terrible, I can’t believe I missed that.” An athlete could instead say, “I missed that shot, but I know that shot does not define me. Next point matters the most.” Thought-reframing is a very common technique use by sport psychology professionals for athletes who struggle with negative self-talk during performances.

Imagery

Most people do not realize how often they use imagery. When you are driving to a restaurant you've been to a few times but don't quite remember exactly when that last turn is, you might picture that parking structure that comes up immediately before that turn. This not only helps you remember when to turn, but also, in what direction. This brief "mental movie" you've created is imagery. In sport, a volleyball player might *imagine* what the hitter's hand and wrist look likes when they are going to dump (versus hit) the ball so they can then mentally practice how to move in response. Imagery is a cheap, adaptable, and learnable psychological skill widely used by athletes at all competitive levels.

What is Imagery?

Imagery is any sort of detailed mental experience you *purposefully* create in your mind using some combination of your memories, senses, thoughts, and emotions. By "purposefully", we mean you are generating the image with the expectation that it is going to help you in some way, much like the examples in the previous paragraph (e.g., Morris et al., 2005). Because imagery doesn't require any external equipment or specific training space, imagery can be done almost any time and anywhere.

Conceptualizing Imagery

It is widely-known that objective performance improvements are achievable through regular and structured imagery use (for a review, see Munroe-Chandler & Guerrero, 2017). Meta-analyses conducted on the efficacy of imagery use on motor learning and performance by Driskell and colleagues (1994) and Feltz and Landers (1983) revealed small-to-moderate effect sizes of 0.53 and 0.48, respectively. Many years later, Simonsmeier et al. (2020) conducted a meta-analysis on the effects of imagery interventions in sport, and reported similar findings (i.e., overall effect size of 0.43). Furthermore, Simonsmeier and colleagues found that imagery intervention could positively and significantly influence not only physical outcomes of performance, but also motivational and affective outcomes (e.g., feelings, emotions).

We are less clear, however, as to exactly *why* imagery use is beneficial. Nevertheless, there are a few theories that do help us understand imagery's influence on our learning and performance. Two such theories are the bio-informational theory (Lang, 1979) and the triple code theory (Ahsen, 1984).

Lang's (1979) bio-informational theory suggests that mental images contain two main parts: *stimulus propositions* and *response propositions*. Stimulus propositions are the characteristics of the skill or scenario to be imaged (i.e., what you're doing and what your surroundings are), while response propositions are the physiological (i.e., physical sensations) and affective responses that the individual experiences when imaging that particular skill or scenario. For example, a baseball player may imagine the fans, the opposing team's pitcher and defense, the score and the count, and themselves in the batter's box waiting for the pitch (stimulus propositions). However, they may also incorporate into this image the physical sensation of their heart beating faster, hands feeling sweaty, and general feelings of excitement and optimism (response propositions). The bio-informational theory posits that imaging a skill or scenario with the particular associated response propositions – even if they are considered debilitative or negative responses – can help an individual improve their performance as they are mentally simulating the actual task, including the affective responses. In doing so, the individual is more closely simulating the task as it would occur in real life.

One of the more comprehensive theories of imagery to-date is Ahsen's (1984) triple code theory (ISM). This theory is similar to Lang's (1979) bio-informational theory, however, Ahsen's theory offers a third element to its operational definition. The image (I) is similar to Lang's stimulus propositions in which effective images are vivid and realistic, closely replicating the physical/environmental elements present in the real-world experience. The second source of information involves the individual's somatic responses (S; similar to Lang's response propositions) in which imaging a task results in psychophysiological changes to an individual such as an increase in heart rate, sweaty palms, or other somatic responses to anxiety or arousal. The third source of information is the meaning of the image (M) to the imager; this is highly related to the intended purpose of generating the image (e.g., the image being created means that the individual is ready to perform and optimally focused). Triple code theory states that the most effective images are vivid and realistic, evoke psychophysiological response, and impart meaning to the individual.

Why is Imagery Important?

One direction of imagery research has been to advance explanations of the relevance of imagery use in sport and physical activity (e.g., Hall et al., 1998). In a landmark sport imagery publication, Paivio (1985) proposed an analytic framework which explained that imagery could serve both cognitive and motivational functions (*function* refers to the intended purpose of the image). He added that each function operates on either a "specific" or a "general" level. A number of years later, Hall and his colleagues (1998) added further delineation to the functions of imagery, resulting in five functions. Specifically, the purpose of one's images could be: cognitive general (CG: assist in learning, development or mastery of strategies, game planes, or routines); cognitive specific (CS; assist in the learning, development or mastery of specific sport skills); motivational specific (MS; regulate effort and affect relating to achieving one's goal); motivational general arousal (MG-A; regulate arousal and stress); and, motivational general mastery (MG-M; increase mental toughness, perceptions of control, or self-confidence). It is important to note that individuals can choose to employ multiple functions of imagery at the same time, for a single image (e.g., Cumming & Williams, 2013). For example, a high jumper using an image of themselves executing a jump in competition may be choosing to employ imagery to help practice the skill (i.e., CS imagery), but, at the same time, may also intend to use that image to increase their confidence in their ability to execute the jump successfully (i.e., MG-M imagery).

Application

One of the most important variables impacting imagery effectiveness relates to the learner's ability to create vivid and controllable images (Munroe-Chandler & Guerrero, 2017). This is known as imagery ability. Simply put, if you can create a mental movie in your mind that plays from start to finish and that "looks" and "feels" real to you, wherein you can precisely control exactly what is happening in the movie, then your imagery will be highly effective. Imagery is a psychological *skill*, and thus, is learnable (i.e., you can get better at it with training and practice; e.g., Wright et al., 2015). Those who are not proficient at imagery should not be discouraged from using the skill if they are willing to devote time and energy to develop it. For example, Rodgers and colleagues (1991) reported that the ability to image basic movements improved in figure skaters following a 16-week figure skating imagery training program. More recently, an eight-week intervention conducted by Wright and colleagues (2015) demonstrated that imagery training improved imagery ability in a sample of female golfers. Researchers have suggested at least a moderate level of imagery ability prior to beginning an imagery practice routine or program for sport is important (e.g., Cumming & Ste-Marie, 2001). Below are two possible avenues in which coaches or sport psychology consultants can train imagery and thus enhance its effectives with sport participants.

Layered Stimulus Response Training (LSRT)

Layered Stimulus Response Training (LSRT) is an imagery training method based on the bio-informational theory (Lang, 1979). Cumming and her colleagues have developed and employed this training method in previous studies (e.g., Cumming et al., 2007; Williams et al., 2013) and have found it effective in improving imagery ability as well as actual motor performance. This training method consists of helping an individual learn how to construct vivid and controllable images by starting with generation of the most salient stimulus proposition(s) (relative to the imager's perceptions) such as the immediate environment of the scenario being imaged, any equipment they may use, and/or others around. Following practice of this base "layer", the imager would then be instructed to add another layer—essentially, more nuance to their images—by incorporating other stimulus propositions to their current image layer. These nuances typically involve senses other than vision (e.g., the smell of fresh cut grass, the sound of a ball hitting the sweet spot of the tennis racket, feeling dirt moving under one's shoes, etc.). Following practice of the first and second layers, the last layer involves incorporating response propositions by having the imager try to feel the emotions they want associated with their image and/or any particular moods, thoughts, or beliefs they believe will be facilitative of the scenario being imaged. Initial research examining the effectiveness of LSRT has been promising (e.g., Marshall & Wright, 2016) and thus LSRT should be considered for any novice imager.

PETTLEP Approach to Imagery

Holmes and Collins (2001) proposed the PETTLEP approach (also known as the PETTLEP model) to motor imagery to guide precisely how one structures their images and their imagery practice. PETTLEP is an acronym that stands for physical, environmental, task, timing, learning, emotional, and perspective. This approach is based on the notion that mentally imaged actions and actual physical execution of actions are "functionally equivalent". Neuroimaging techniques, such as functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) allow neuroscientists to examine the areas of the brain that are activated when mentally imaging versus when physically performing actions (for a review, see Ruffino et al., 2017). Holmes and Collins (2001) have suggested that, "if physical and mental practice are [functionally] equivalent, then many of the procedures shown to be efficacious in physical practice should also be applied in mental [imagery] practice as well" (p. 62). The PETTLEP model was intended to highlight several of these key efficacious procedures, or elements, which should be considered when preparing to use imagery. These include physical, environmental, task, timing, learning, emotional, and perspective (PETTLEP) elements:

1. Physical: Athletes should try to best approximate the physical state required when they are performing the situation to be imaged in real life, successfully. Holmes and Collins suggest that athletes become *actively* involved during their imagery session, perhaps employing sporting implements, wearing competition clothing, and even making physical movements, when appropriate.
2. Environment: Accurate and vivid mental recreation of the training or competition environment using all relevant senses can enhance imagery. Holmes and Collins suggest using aids, such as photo, video, or verbal accounts of the actual training or performance environment to ensure a realistic recreation of the surroundings.
3. Task: Careful consideration of how the individual personally experiences the task to determine the appropriate content and focus of their image. Holmes and Collins suggest that athletes may differ with regards to the specific elements of the task they focus on when physically performing (e.g., a novice might focus internally on feeling balanced while a more skilled individual might focus externally on the basket during a free throw shot). In addition, different athletes may prefer different visual perspectives when imaging (i.e., first- versus third-person perspectives, or, a combination).
4. Timing: Generally, it is recommended that images should unfold in real-time speed (the speed at which actual physical execution occurs). However, more recent research suggests that, indeed,

real-time image speed is critical when athletes are working on learning/mastering sport skill/strategy timing or tempo, but interestingly, that slow- and fast-motion speed images are also being used deliberately by athletes, and that their use can produce positive effects on learning and performance (e.g., O & Hall, 2009, 2013; O et al., 2020).

5. Learning: Images should be adapted as an athlete's focus and/or execution quality changes. As an athlete becomes more skilled, Holmes and Collins suggest that image content should be reviewed and updated (if necessary), to ensure functional equivalence.
6. Emotion: Encourage athletes, when imaging, to experience any emotions they have when physically performing successfully. These emotions should ideally be experienced at the same level of intensity as they are experienced in real life.
7. Perspective: This element refers to the primary sense used to experience the image (e.g., sight, kinaesthetic and/or tactile feel, sound, smell, and/or taste). Holmes and Collins suggest that a kinaesthetic focus (e.g., feeling the movements) will result in the greatest physiological response to the imagery session, thus leading to more effective learning and performance outcomes.

The PETTLEP approach to motor imagery (Holmes & Collins, 2001) is a theoretically driven and evidence-based checklist intended to maximize the effectiveness of athletes' imagery use. The model has received significant support via testing of various PETTLEP elements (e.g., for a review, see Wakefield et al., 2012). Incorporating every single element of the PETTLEP model is not currently noted as a "requirement" to achieve positive effects of applying the model. Thus, although incorporating all seven PETTLEP elements may, perhaps, elicit the *greatest* effects on imagery practice outcomes, athletes can also feel confident in the benefits of incorporating only a few of these elements if time, motivation, and/or resources prohibit full PETTLEP alignment of one's imagery practice.

Observation

Technology is constantly at our fingertips. Therefore, it is not shocking to witness an athlete pulling out their phone in the middle of training to watch a video of themselves, or someone else, performing a skill. If asked why they did this, a typical response relates to using the video to help them get better. For example, a baseball player may be seen reviewing their recent up to bat during practice in order to gain information on how to perfect the technique of the swing. Or an aspiring dancer may watch a YouTube video of a professional dancer performing a pirouette in hopes that they will be just like the professional dancer when they grow up. This is known as observational learning or modeling.

What is Observation Learning/Modeling?

Observational learning is the process by which individuals view a demonstration of either them self or someone else performing an action and, from this, is able to gain the ability to produce that same action (Cumming et al., 2005). There are many forms in which one can observe (for more detailed definitions see Ste-Marie et al., 2012); one can view the self or someone else and either of these techniques can be live or on video. Viewing the self is known as a self-as-a-model technique. Here, one can view themselves at their current skill level which could potentially include errors (i.e., self-observation) or at their best with little to no errors (i.e., self-modeling). The self-modeling technique can be broken down into two categories. The positive self-review technique is an edited video of the learner performing a skill to show the individuals best ever performance, such as those featured in highlight videos of athletes. The feedforward self-modeling technique uses footage of prior attempts which are then edited and spliced together to create a video of a behavior not quite achieved (Dowrick, 1999). For example, a gymnast may be struggling with certain skills in their floor routine. Their coach may decide to create a feedforward self-modeling video in which clips of each of their skills performed independently, but correctly, are spliced together to create an optimal full routine. In this situation, the gymnasts would see themselves performing their entire routine at the best they have every performed each skill independently: A snapshot into their future perhaps!

When viewing someone else, one can choose from either a skilled, unskilled, learning, mastery, or coping model. The most common forms used in sport are either the skilled or unskilled models. Thus, we will elaborate on these two types but direct readers to Ste-Marie et al. (2012) for further information on other modeling types if interested. A skilled model would demonstrate the skill with proper technique whereas an unskilled model would demonstrate that same skill but there would be obvious errors viewed as the individual has not yet acquired the proper technique. For example, a beginner volleyball player could watch a skilled player serving the volleyball in order to gain the accurate information on how the timing and proper technique of the overhand serve are carried out in hopes to be able to transfer that information into their own attempts. No matter what modeling technique one chooses, the consensus is that observing a demonstration works (Ste-Marie et al., 2020).

Conceptualizing Observation/Modeling

The two most prominent perspectives regarding the effectiveness of observing a demonstration stems from Bandura's social-cognitive theory and Gibson's direct perception perspective (for more on social-cognitive theory, see Chapter 5; Delli Paoli, 2021). Albert Bandura's (1986) view relates to observation and social learning. This view suggests that we learn through observation by symbolically coding the observed behavior and translating that information into a cognitive representation. The cognitive representation is stored in our memory which then serves as a guide to later perform that skill. There are four subprocesses necessary for the individual to learn through observation: attention, retention, behavior reproduction, and motivation. Therefore, an individual must attend to the observed behavior in order to pick up the relevant information presented to them by the demonstration. From here, the information picked up would be retained in the form of a cognitive representation that can later be used to guide their own behavior when attempting to reproduce that same action. Motivation plays a key role as well. As such, if an individual is motivated to reproduce the behavior, they will selectively attend to the information presented to them via the demonstration and as a result are more likely to produce an accurate cognitive representation that would guide subsequent attempts to a desired reproduction of that movement. Past research has aligned with this perspective and has supported the notion of a cognitive representation in fact influencing subsequent actions (e.g., Frank et al., 2018).

Scully and Newell's (1985) view aligns with Gibson's (1950) direct perception perspective and suggests that we are able to simply "pick up" the information from a demonstration in which our visual system automatically processes the information without the need to create a symbolic representation. That is, we are able to directly perceive in a way that constrains our motor control system to act in accordance to what we see and produce a movement. Specifically, the individual viewing the demonstration directly perceives the relative timing of the joints and uses these motions and coordination patterns to develop their own movement patterns. An example of early related research was conducted by Johanson (1973), where light reflector markers were placed on the joints of a model while walking and running and individuals viewing the lighted dots in motion were able to distinguish the difference between movement patterns (i.e., walking vs. running). Within this perspective, point light displays (PLD) are typically used when models have light reflectors on their joints and it is the movement of the light reflectors that the learner observes on video. From these movements, the observer is able to gain information regarding the timing of the skill to be learned. Research conducted from this perspective suggests that PLD provide the relative motion information needed to learn a motor skill and that these displays are beneficial for highly complex skills (i.e., skills with multiple limbs involved) as well as less complex skills (i.e., skills with single limb movements; e.g., Kordi & Ghamary, 2014).

Photo by Budgeron Bach from Pexels

Why is Modeling Important?

No matter which perspective one is taking, there is ample evidence that support the notion that observation provides the necessary information to the learner and as a result the learner is better able to acquire or perfect the motor skill, create strategies, and assist in mental states (see Ste-Marie et al., 2020). As examples, observation techniques could highlight how to properly execute a free throw in basketball, help develop game strategies and routines when understanding power play formations in hockey, and help an athlete learn how to reach an optimal state of arousal before competing in their figure skating long program. The next section examines experimental results regarding the effectiveness of observation within these three functions.

In regard to evidence relating skill acquisition, the majority of research on the effects of using a skilled model has been promising. For example, the use of skilled models has been shown to increase the motor execution in areas as a power lifting (Sakadijanet et al., 2014), golf putting (Kim et al., 2017), badminton serving (Kamanga et al., 2013), throwing (e.g., Ghaehroudhani et al., 2016), and basketball shooting (e.g., Kordi & Ghamary, 2014). Another common model type is viewing the self. Research has shown positive effects in both the skill acquisition (e.g., Ste-Marie et al., 2011) and competitive enhancement (e.g., Rymal & Ste-Marie 2017). In Ste-Marie et al.'s (2011) work with competitive gymnasts, beam performance was significantly higher at competitions in which the gymnasts viewed a feedforward self-modeling video compared to competitions where no video was viewed. Recently, research has ventured into the exploration of combining models. This research has shown positive effects when learning how to perform sport skills such as hurdles (Amara et al., 2015), volleyball passing (Barzouka et al., 2007), gymnastic sequences (e.g., Robertson et al., 2018), as well as balancing tasks (Karlinsky & Hodges, 2018). In Robertson and colleagues' (2018) research, participants either viewed the self or a combination of the self and a skilled model when attempting to learn a gymnastics sequence. The results indicated that both groups increased in performance however the group that received the combo model intervention outperformed the self-model group only for both skill learning and error recognition.

Cumming et al. (2005) reported developing strategies as the second most frequent use of observation, following the skill function. That is, the reason for which individuals use observation can also be tied to developing strategies/game plans to help achieve the motor skill. The use of observation as an actual intervention to influence strategies is sparse, but the few studies that have investigated this have shown promising results. For example, gymnasts in Rymal & Ste-Marie's (2018) research used their self-modeling video as a means to strategically plan motor execution, create adaptive inferences, and analyze tasks specific to their bar routine. Frank and colleagues (2018) were interested in the effects of observation on physical performance and mental representations of the mechanics of the golf swing. Participants were assigned to one of two groups; an observational group and a combined observational and physical practice group. Despite both groups increasing physical performance and acquiring the mental representation of the golf swing (i.e., identifying correct mechanics of the swing when presented with a video), only the observation plus physical practice group was able to transfer that strategy into motor output. Thus, physically practicing alongside of an observation intervention helped identify skill mechanics which then lead to the use of those mechanics in future attempts.

Research investigating the performance function typically coincides with research investigating skill learning as the main outcome. Self-efficacy seems to be the most commonly measured psychological construct in such research. Increases in self-efficacy have been found in areas such as swimming (Clark & Ste-Marie, 2007), gymnastics (Robertson et al., 2018), as well as hockey (Feltz et al., 2008). Extending beyond self-efficacy measures, much of Rymal and colleagues' work with divers and gymnasts (2010, 2017, 2019; Ste-Marie et al, 2011) investigated the relationship of self-modeling and self-regulatory processes during a competition. The results of both divers and gymnasts suggest that the observation technique promoted performance characteristics such as self-efficacy, motivation, satisfaction, and arousal control during a competitive event.

Application

As noted by Ste-Marie and colleagues (2012; 2020) there are many things to consider prior to determining an observation intervention; however, it is not our goal to review the entire Applied Model for the Use of Observation (i.e., AMUO). We will instead give some avenues and suggestions as to potential applications. Specifically, we will discuss some options with respect to the type of model to use (i.e., "who" should be observed), as well as when and how to implement observation with athletes (for a full review of the AMUO see Ste-Marie et al., 2012; 2020).

Who Should be Observed?

Should the learner observe someone else? Would it be more beneficial if it were a skilled model or an unskilled model? Or perhaps the self should be viewed, but should it be at their current skill level, at their best, or at a level that is slightly better than their current state? These are all worthwhile questions that have some evidence from the research literature to answer them! Overall, existing research demonstrates that no matter who one chooses, all models seem to be effective to some degree (Ste-Marie et al., 2012; 2020). If looking to increase skill, a skilled model would be appropriate as a skilled model provides the correct information regarding the timing of joint movements. A skilled model can also assist in the cognitive representation, providing information to guide the learner when attempting to perform skill (e.g., Frank et al., 2018). An unskilled model would also be appropriate, as an unskilled model is thought to increase the problem-solving process and thought to help with error detection and correction of mechanisms. A key feature to consider is model similarity. If an athlete perceives they are similar to a model then it is more likely they will pay attention, associate to similar timing of the joints, and thus have a greater effect on skill learning (McCullagh, et al., 2012).

However, no one is more similar to you than yourself. Previous research suggests that there is a greater advantage to viewing the self, as compared to viewing other models. Noteworthy is that Ste-Marie et al.'s (2020) re-examination of the AMUO suggest that it is the combination of different model types that are giving the most promising results for motor outcomes and psychological aspects (e.g., Robertson et al., 2018). Furthermore, Karlinsky & Hodges (2018) examined dyads practicing a balancing task and despite no differences between those who were paired to those whom were not, paired practice might help coaches that have limited time due to the fact that dyads practicing together can both concurrently learn a new skill by examining their teammate as a model. As such, we will not suggest one model type over the other when working with individuals acquiring a new skill, but we do suggest to use more than one model type (e.g., skilled and self-model) as a means to enhance skill acquisition and performance.

When and How to Implement Observation Techniques?

According to Ste-Marie et al., (2012; 2020) the majority of research is still unclear as to whether one should show a demonstration before, during, after, or combinations thereof. However, most research that implements the observation intervention before and during has shown positive results. To date, very few research studies have compared the scheduling in order to determine which is actually more beneficial. Outside of the sport environment, research has suggested that viewing either before or during physical practice seems to be advantageous to the motor task outcome (e.g., Herbert, 2018). Furthermore, researchers are exploring the use of a self-control protocol when using observation to enhance motor skills. Here, the learner chooses how much and when they would like to view the demonstration. For the most part, evidence is still unclear as to which is best for skill acquisition: self-controlled viewings or other-controlled viewings. There is, however, a trend moving towards self-controlled viewings over experimenter-controlled viewings (e.g., Marques & Corrêa, 2016). What is interesting however, is that much of the research in this area has shown consistent findings regarding how much a learner actually needs to view a demonstration in order produce a change in behavior. Specifically, if self-controlling the frequency of viewings, the learner still benefits from the observation technique but these benefits arise from fewer viewings than compared to experimenter-controlled viewings (e.g., St. Germain et al., 2019). From a practical standpoint, coaches and practitioners are not able to be with one learner at all times to ensure they do their viewings. However, by allowing athletes to be in control of their own viewings, they may get just as much of a performance improvement in a much shorter time.

Conclusion

This chapter has covered four main psychological skills that are commonly used by athletes at all levels. If used appropriately, these skills can lead to greater sports performance. This chapter is meant as an introduction to four of the most common skills used by athletes today that are supported by research evidence. Many mental skills programs will work on many of these skills together. We believe that this is an optimal way to approach mental skills training, as long as the athlete is not overwhelmed by the amount of information being presented. Overall, mental skills training can improve performance and these straightforward skills presented in this chapter are a great place to start.

Learning Exercises

1. Explain the 2x2 model for attention control. What are the four unique components of the model?

2. How would you help an athlete whose attention is too narrow?

3. How would you help an athlete who is attending to the wrong cues in practice and game situations?

4. What are some of the functions of self-talk?

5. What is thought reframing? How might you use this technique to change someone's self-talk?

6. How does self-talk influence performance in sport?

7. Briefly define the five functions of imagery. Provide an example of each function framed within your favorite sport or physical activity.

8. Using a sport or physical activity you are familiar with, give examples of stimulus and response propositions (bio-informational theory; Lang, 1979).

9. Pick a specific skill or strategy in a sport or physical activity that you have done in real life many times. Come up with an LSRT outline, specifically noting what you would include in the first, second, and third "layers" of the LSRT.

10. Explain the three functions of observation and provide an example of how you, as a movement instructor, would implement an observation technique as a means to influence each of these functions.

11. Using either Bandura's (1986) social cognitive theory or Gibson's (1950) direct perception perspective, explain how observation is thought to benefit skill learning and performance for a specific sport of physical activity.

12. Pretend you are a movement instructor of your favorite sport or activity. Think of a scenario in which you are required to teach an individual a skill or strategy. Using the guidelines put forth by the AMUO (Ste-Marie et al., 2012), determine who should be observed as well as when and how the observation technique should be implemented.

Further Readings

Cumming, J, & Williams, S. E. (2013). Introducing the revised applied model of deliberate imagery use for sport, dance, exercise, and rehabilitation. *Movement & Sport Sciences*, *82*, 69–81. https://doi.org/10.1051/sm/2013098

Hodges, N. J., & Ste-Marie, D. M. (2013). Observation as an instructional method. In D. Farrow, C. MacMahon, & J. Baker (Eds*.), Developing sport expertise: Researchers and coaches put theory into practice* (2nd ed., pp. 115–131). Taylor & Francis.

Lindsay, R, Spittle, M, & Larkin, P. (2019). The effect of mental imagery on skill performance in sport: A systematic review. *Journal of Science and Medicine in Sport, 22,* S92. https://doi.org/10.1016/j.jsams.2019.08.111

Rymal, A.M. (2018). Let's make it real: A commentary on observation research. *Journal of Motor Learning and Development, 6,* 73–80.

Simonsmeier, B. A., Androniea, M., Buecker, S., & Frank, C. (2020). The effects of imagery interventions in sports: A meta-analysis, *International Review of Sport and Exercise Psychology*. Advance online publication. https://doi.org/10.1080/1750984X.2020.1780627

Ste-Marie, D. M., Lelievre, N., & St. Germain, L. (2020). Revisiting the applied model for the use of observation: A review of articles spanning 2011-2018. *Research Quarterly for Exercise and Sport*, *91*(4), 594–617. https://doi.org/10.1080/02701367.2019.1693489

Wakefield, Caroline, & Smith, Dave. (2012). Perfecting practice: Applying the PETTLEP model of motor imagery. *Journal of Sport Psychology in Action, 3*(1), 1–11. https://doi.org/10.1080/21520704.2011.639853

Williams, J. M., Nideffer, R. M., Wilson, V. E., & Sagal, M. (2015). Concentration and strategies for controlling it. In J. M. Williams & V. Krane (Eds.), *Applied sport psychology: Personal growth to peak performance* (pp. 304–325). McGraw Hill.

Williams, J. M., Zinsser, N., & Bunker, L. (2015). Cognitive techniques for building confidence and enhancing performance. In J. M. Williams & V. Krane (Eds.), *Applied sport psychology: Personal growth to peak performance* (pp. 274–303). McGraw Hill.

References

Amara, S., Mkaouer, B., Nassib, S. H., Chaaben, H., Hachana, Y., & Salah, F. Z. (2015). Effect of video modeling process on teaching/learning hurdle clearance situations on physical education students*. Advances in Physical Education, 5,* 225–233. https://doi.org/10.4236/ape.2015.54027

Ahsen, A. (1984). The triple code model for imagery and psychophysiology. *Journal of Mental Imagery, 8,* 15–42.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* Freeman and Company.

Barzouka, K., Bergeles, N., & Hatziharistos, D. (2007). Effect of simultaneous model observation and self-modeling of volleyball skill acquisition. *Perceptual & Motor Skills, 104,* 32–42. https://doi.org/10.2466/pms.104.1.32-34

Brand, R., & Ekkekakis, P. (2021). Exercise behavior change revisited: Affective-reflective theory. In Z. Zenko & L. Jones (Eds.), *Essentials of exercise and sport psychology: An open access textbook* (pp. 62–92). Society for Transparency, Openness, and Replication in Kinesiology. https://doi.org/10.51224/B1004

Brick, N., MacIntrye, T., & Campbell, M. (2014). Attentional focus in endurance activity: New paradigms and future directions. *International Review of Sport and Exercise Psychology, 7,* 106–134. https://doi.org/10.1080/1750984X.2014.885554

Clark, S. E., & Ste-Marie, D. M. (2007). The impact of self-as-a-model interventions on children's self-regulation of learning and swimming performance. *Journal of Sports Sciences, 25(5),* 577–586. https://doi.org/10.1080/02640410600947090

Cumming, J., Clark, S. E., Ste-Marie, D. M., McCullagh, P., & Hall, C. (2005). The functions of observational learning questionnaire (FOLQ). *Psychology of Sport and Exercise, 6*(5), 517–537. https://doi.org/10.1016/j.psychsport.2004.03.006

Cumming, J., Olphin, T., & Law, M. (2007). Self-reported psychological states and physiological responses to different types of motivational general imagery. *Journal of Sport and Exercise Psychology*, 29, 629–644. https://doi.org/10.1123/jsep.29.5.629

Cumming, J. L., & Ste-Marie, D. M. (2001). The cognitive and motivational effects of imagery training: A matter of perspective. *The Sport Psychologist, 15,* 276–288. https://doi.org/10.1123/tsp.15.3.276

Cumming, J., & Williams, S. E. (2013). Introducing the revised applied model of deliberate imagery use for sport, dance, exercise, and rehabilitation. *Movement & Sport Sciences, 4,* 69–81. https://doi.org/10.1051/sm/2013098

Gould, D., Finch, L. M., & Jackson, S. A. (1993). Coping strategies used by national champion figure skaters. *Research Quarterly for Exercise and Sport, 64*, 453–468. https://doi.org/10.1080/02701367.1993.10607599

Delli Paoli, A. G. (2021). Predictors and correlates of physical activity and sedentary behavior. In Z. Zenko & L. Jones (Eds.), *Essentials of exercise and sport psychology: An open access textbook* (pp. 93–113). Society for Transparency, Openness, and Replication in Kinesiology. https://doi.org/10.51224/B1005

Dowrick, P. W. (1999). A review of self modeling and related interventions. Applied and Preventive Psychology, 8(1), 23–39. https://doi.org/10.1016/S0962-1849(99)80009-2

Feltz, D. L., Short, S. E., & Singleton, D. A. (2008). The effect of self-modeling on shooting performance and self-efficacy with intercollegiate hockey players. In M. P. Simmons & L. A. Foster (Eds.), *Sport and exercise psychology research advances* (pp. 9–18). Nova Science Publishers.

Frank, C., Kim, T., & Schack, T. (2018). Observational practice promotes action-related order-formation in long-term memory: Investigating action observation and the development of cognitive representation in complex motor action. *Journal of Motor Learning and Development, 6*(1), 53–72**.** https://doi.org/10.1123/jmld.2017-0007

Gibson, J. J. (1950). *The perception of the visual world.* Houghton Mifflin.

Hall, C. R. (2001). Imagery in sport and exercise. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (2nd ed, pp. 529-549). Wiley.

Hall, C. R., Mack, D., Paivio, A., & Hausenblas, H. A. (1998). Imagery use by athletes: Development of the Sport Imagery Questionnaire. *International Journal of Sport Psychology, 29*, 73–89.

Hall, C. R., & Martin, K. A. (1997). Measuring movement imagery abilities: A revision of the Movement Imagery Questionnaire. *Journal of Mental Imagery, 21*, 143–154.

Hardy, J. (2006). Speaking clearly: A critical review of the self-talk literature. *Psychology of Sport And Exercise, 7,* 81–97. https://doi.org/10.1016/j.psychsport.2005.04.002

Hardy, J., Gammage, K., & Hall, C. (2001). A descriptive study on athlete self-talk. *The Sport Psychologist, 15,* 306–318. https://doi.org/10.1123/tsp.15.3.306

Hardy, Oliver, E., & Tod, D. (2009). A framework for the study and application of self-talk within sport. In S. D. Mellalieu & S. Hanton (Eds.), *Advances in applied sport psychology: A review* (pp. 37–74). Routledge.

Hebert, E. (2018). The effects of observing a learning model (or two) on motor skill acquisition. *Journal of Motor Learning and Development, 6(1)*, 4–17. https://doi.org/10.1123/jmld.2016-0037

Hermansson, G., & Hodge, K. (2012). Uncontrollable outcomes: Managing expectations at the Olympics. *Journal of Sport Psychology in Action, 3,* 127–138. https://doi.org/10.1080/21520704.2012.683086

Holmes, P. S., & Collins, D. J. (2001). The PETTLEP approach to motor imagery: A functional equivalence model for sport psychologists. *Journal of Applied Sport Psychology, 13*, 60–83. https://doi.org/10.1080/10413200109339004

Johansson, G. (1973). Visual perception of biological motion and a model for its analysis. *Perception and Psychophysics,* 14, 201–211.

Jones. L., & Zenko, Z. (2021). Strategies to facilitate more pleasant exercise experiences. In Z. Zenko & L. Jones (Eds.), *Essentials of exercise and sport psychology: An open access textbook* (pp. 242–270). Society for Transparency, Openness, and Replication in Kinesiology. https://doi.org/10.51224/B1011

Kamangar, A., Miri, H., Mahdiloo, M., Moghadam, R. H., Baraty, A. H., & Mirzai, R. M. (2013). Comparison of efficacy the three different practice methods on acquisition and learning a motor skill. *International Journal of Sport Studies, 3*(6), 649–658. Retrieved from http://ijssjournal.com/fulltext/paper-06012016094813.pdf

Karlinsky, A., & Hodges, N. (2018). Dyad practice impacts self-directed practice behaviors and motor learning outcomes in a contextual interference paradigm. *Journal of Motor Behavior, 50(5),* 579–589. https://doi.org/10.1080/00222895.2017.1378996

Kim, T., Frank, C., & Schack, T. (2017). A systematic investigation of the effect of action observation training and motor imagery training on the development of mental representation structure and skill performance. *Frontiers in Human Neuroscience, 11,* 1–13. https://doi.org/10.3389/fnhum.2017.00499

Kordi, H., & Ghamary, A. (2014). The effect of video and point-light demonstration on motor learning and performance. *Kinesiologia Slovenica, 20(2),* 26–34.

Krane, V., & Williams, J. M. (2015). Psychological characteristics of peak performance. In J. M. Williams & V. Krane (Eds.), *Applied sport psychology: Personal growth to peak performance* (pp. 159–175). McGraw Hill.

Lang, P.J. (1979). A Bio-informational Theory of emotional imagery. *Psychophysiology*, 16, 495–512.

Latinjak, A. T., Hatzigeorgiadis, A., Comoutos, N., & Hardy, J. (2019). Speaking clearly…10 years on: The case for an integrative perspective of self-talk in sport. *Sport, Exercise, and Performance Psychology, 8*(4), 353–367. https://doi.org/10.1037/spy0000160

Lewthwaite, R., & Wulf, G. (2017). Optimizing motivation and attention for motor performance and learning. *Current Option in Psychology, 16*, 38–42. https://doi.org/10.1016/j.copsyc.2017.04.005

Marques, P. G., & Corrêa, U. C. (2016). The effect of learner's control of self-observation strategies on learning of front crawl. Acta Psychologica, 164, 151–156. https://doi.org/10.1016/j.actpsy.2016.01.006

Marshall, B., & Wright, D. J. (2016). Layered stimulus response training versus combined action observation and imagery: Effects on golf putting performance and imagery ability characteristics. *Journal of Imagery Research in Sport and Physical Activity*, 11(1), 35–46. https://doi.org/10.1515/jirspa-2016-0007

Martin, K. A., Moritz, S. E., & Hall, C. R. (1999). Imagery use in sport: A literature review and applied model. *The Sport Psychologist, 13*, 245–268. https://doi.org/10.1123/tsp.13.3.245

McCullagh, P., Law, B., & Ste-Marie, D. M. (2012). Modeling and performance. In S. M. Murphy (Ed.), *The Oxford handbook of sport and performance psychology* (pp. 250–272). Oxford University Press.

Millard, M., Mahoney, C., & Wardop, J. (2001). A preliminary study of mental and physical practice on the kayak wet exit skill. *Perceptual and Motor Skills, 92*, 977–984. https://doi.org/10.2466/pms.2001.92.3c.977

Moritz, S. E., Hall, C. R., Martin, K. A., & Vadocz, E. (1996). What are confident athletes imaging?: An examination of image content. *The Sport Psychologist, 10*, 171–179. https://doi.org/10.1123/tsp.10.2.171

Morris, T., Spittle, M., & Watt, A. P. (2005). *Imagery in sport.* Human Kinetics.

Munroe, K.J., Giacobbi, P.R., Hall, C., & Weinberg, R. (2000). The four Ws of imagery use: Where, when, why, and what. *The Sport Psychologist, 14*, 119–37. https://doi.org/10.1123.tsp.14.2.119

Munroe-Chandler, K. J., & Guerrero, M. D. (online publication 2017). *Psychological imagery in sport and performance*. In E. Acevedo (Ed.), *Oxford research encyclopedia of psychology.* https://doi.org/10.1093/acrefore/9780190236557.013.228

Nideffer, R. M. (1976). Test of attentional and interpersonal style. *Journal of Personality and Social Psychology, 34*, 394–404. https://doi.org/10.1037/0022-3514.34.3.394

Neumann, D. L. (2019). A systematic review of attentional focus strategies in weightlifting. *Frontiers in Sports and Active Living.* https://doi.org/10.3389/fspor.2019.00007

O, J., & Hall, C. (2009). A quantitative analysis of athletes' voluntary use of slow motion, real-time, and fast motion images. *Journal of Applied Sport Psychology*, *21*(1), 15–30. https://doi.org/10.1080/10413200802541892

O, J., & Hall, C. (2013). Does speed matter? A qualitative analysis of the 'why' of athletes' voluntary image speed use. *Journal of Imagery Research in Sport and Physical Activity*, *8*(1), 1–12. https://doi.org/10.1515/jirspa-2012-0004

O, J., Ely, F. O., & Magalas, S. (2020). It's all about timing: An imagery intervention examining multiple image speed combinations, *Journal of Applied Sport Psychology, 32(3)*, 256–276. https://doi.org/10.1080/10413200.2019.1570391

O, J., Munroe-Chandler, K. J., Hall, N. D., & Hall, C. R. (2014). The effect of an MG-M imagery intervention with youth squash players. *Journal of Applied Sport Psychology, 26(1)*, 66–81. https://doi.org/10.1080/10413200.2013.778914

Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Science*, *10*, 22–28.

Robertson, R., St. Germain, L., & Ste-Marie, D. M. (2018). The effects of self-observation when combined with a skilled model on the learning of gymnastics skills. *Journal of Motor Learning and Development, 6(1),* 18–34. https://doi.org/10.1123/jmld.2016-0027

Robin, N., Dominique, L., Toussaint, L., Blandin, Y., Guillot, A., & Le Her, M. (2007). Effects of motor imagery training on service return accuracy in tennis: The role of imagery ability. *International Journal of Sport and Exercise Psychology, 2,* 177–188. https://doi.org/10.1080/1612197X.2007.9671818

Rodgers, W., Hall, C., & Buckolz, E. (1991). The effect of an imagery training program on imagery ability, imagery use, and figure skating performance. *Journal of Applied Sport Psychology, 3*, 109–125. https://doi.org/10.1080/10413209108406438

Ruffino, C., Papaxanthis, C., & Lebon, F. (2017). Neural plasticity during motor learning with motor imagery practice: Review and perspectives. *Neuroscience*, 34, 61–78. https://doi.org/10.1016/j.neuroscience.2016.11.023

Rymal, A. M., Martini, R., & Ste-Marie, D. M. (2010). Self-regulatory processes employed during self-modeling: A qualitative analysis. *The Sport Psychologist*, 24(1), 1–15. https://doi.org/10.1123/tsp.24.1.1

Rymal, A. M., & Ste-Marie, D. M. (2017). Imagery ability moderates the effectiveness of video self modeling on gymnastics performance. *Journal of Applied Sport Psychology, 29*(3), 304–322. https://doi.org/10.1080/10413200

Rymal, A.M., & Ste-Marie, D.M. (2019). Feedforward self-modeling and self-regulated learning: It's not just for learning. *Research Quarterly for Exercise and Sport, 90,* 276–286. https://doi.org/10.1080/02701367.2019.1593923

Sakadjian, A., Panchuk, D., & Pearce, A. J. (2014). Kinematic and kinetic improvements associated with action observation facilitated learning of the power clean in Australian footballers. *Journal of Strength and Conditioning Research, 28*(6), 1613–1625. https://doi.org/10.1519/JSC.0000000000000290

Scully, D., & Newell, K. (1985). Observational learning and the acquisition of motor skills: Toward a visual perception perspective. *Journal of Human Movement Studies, 11,* 169–186.

Simones, L., Rodger, M., & Schroeder, F. (2017). Seeing how it sounds: Observation, imitation, and improved learning in piano playing. *Cognition and Instruction, 35(2),* 125–140. https://doi.org/10.1080/07370008.2017.1282483

Simonsmeier, B. A., Androniea, M., Buecker, S., & Frank, C. (2020). The effects of imagery interventions in sports: A meta-analysis. *International Review of Sport and Exercise Psychology*. Advance online publication. https://doi.org/10.1080/1750984X.2020.1780627

St. Germain, L., Lelievre, N., & Ste-Marie, D. M. (2019). Variations in observation frequency in a self-controlled learning environment do not modulate learning of a pirouette en dehors. *Journal of Sports Sciences, 37,* 2106–2113. https://doi.org/10.1080/02640414.2019.1621477

Ste-Marie, D. M., Law, B., Rymal, A. M., O, J., Hall, C., & McCullagh, P. (2012). Observation interventions for motor skill learning and performance: An applied model for the use of observation. *International Review of Sport and Exercise Psychology, 5*(2), 145–176. https://doi.org/10.1080/1750984X.2012.665076

Ste-Marie, D. M., Lelievre, N., & St. Germain, L. (2020). Revisiting the applied model for the use of observation: A review of articles spanning 2011-2018. *Research Quarterly for Exercise and Sport*, *91*(4), 594–617. https://doi.org/10.1080/02701367.2019.1693489

Ste-Marie, D. M., Rymal, A. M., Vertes, K., & Martini, R. (2011). Self modeling and competitive beam performance enhancement examined within a self-regulation perspective. *Journal of Applied Sport Psychology, 23*, 292–307. https://doi.org/10.1080/10413200.2011.558049

Ste-Marie, D.M., Vertes K., Rymal, A.M., & Martini R. (2011). Feedforward self-modeling enhances skill acquisition in children learning trampoline skills. *Frontiers in Movement Science and Sport Psychology, 2*, 1–7. https://doi.org/10.3389/fpsyg.2011.00155

Stevinson, C. D., & Biddle, S. T. (1998). Cognitive orientations in marathon running and "hitting the wall". *British Journal of Sports Medicine, 32*, 229-234. https://doi.org/10.1136/bjsm.32.3.229

Tod, D., Hardy, J., & Oliver, E. (2011). Effects of self-talk: A systematic review. *Journal of Sport and Exercise Psychology, 33*, 666–687. https://doi.org/10.1123/jsep.33.5.666

Vadocz, E.A., Hall, C.R., & Moritz, S.E. (1997). The relationship between competitive anxiety and imagery use. *Journal of Applied Sport Psychology, 9*, 241–253. https://doi.org/10.1080/10413209708406485

Weinberg, R.S., & Gould, D. (2003). *Foundations of sport and exercise psychology* (3rd ed.). Human Kinetics Publishers.

WIlliams, S.E., Cooley, S.J., & Cumming, J. (2013). Layered stimulus response training improves motor imagery ability and movement execution. *Journal of Sport and Exercise Psychology, 35*, 60–71. https://doi.org/10.1123/jsep.35.1.60

Williams, J. M., Nideffer, R. M., Wilson, V. E., & Sagal, M. S. (2015). Concentration and strategies for controlling it. In J. M. Williams & V. Krane (Eds.), *Applied sport psychology: Personal growth to peak performance* (pp. 304–325). McGraw Hill.

Williams, J. M., Zinsser, N., & Bunker, L. (2015). Cognitive techniques for building confidence and enhancing performance. In J. M. Williams & V. Krane (Eds.), *Applied sport psychology: Personal growth to peak performance* (pp. 274–303). McGraw Hill.

Wulf, G., & Lewthwaite, R. (2016). Optimizing performance through intrinsic motivation and attention for learning: The OPTIMAL theory of motor learning. *Psychonomic Bulletin & Review, 23*, 1382–1414. https://doi.org/10.3758/s13423-015-0999-9

Wright, D. J., McCormick, S. A., Birks, S., Loporto, M., & Holmes, P. S. (2015). Action Observation and imagery training improve the ease with which athletes can generate imagery. *Journal of Applied Sport Psychology, 27*(2), 156–170, https://doi.org/10.1080/10413200.2014.968294

Zenko, Z., & Ladwig, M. A. (2021). Affective responses to exercise: Measurement considerations for practicing professionals. In Z. Zenko & L. Jones (Eds.), *Essentials of exercise and sport psychology: An open access textbook* (pp. 271–293). Society for Transparency, Openness, and Replication in Kinesiology. https://doi.org/10.51224/B1012

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