Imagery Use in Sport: A Literature Review and Applied Model

Kathleen A. Martin
McMaster University

Sandra E. Moritz
University of Rhode Island

Craig R. Hall
University of Western Ontario

Research examining imagery use by athletes is reviewed within the context of an applied model for sport. The model conceptualizes the sport situation, the type of imagery used, and imagery ability as factors that influence how imagery use can affect an athlete. Three broad categories of imagery effects are examined: (a) skill and strategy learning and performance, (b) cognitive modification, and (c) arousal and anxiety regulation. Recommendations are offered for the operationalization and measurement of constructs within the model, and suggestions are provided for how the model may guide future research and application.

Mental imagery is defined as "those quasi-sensory and quasi-perceptual experiences of which we are self-consciously aware and which exist for us in the absence of those stimulus conditions that are known to produce their genuine sensory or perceptual counterparts" (Richardson, 1969, pp. 2–3). Over 200 published studies have examined the relationship between mental imagery and sport performance. Considered collectively, these studies have shown that imagery of a particular sports skill can improve physical performance of that skill (for meta-analytic reviews, see Driskell, Copper, & Moran, 1994; Feltz & Landers, 1983). Hence, mental imagery is frequently included in mental training packages for athletes as a strategy for improving skill acquisition and performance (e.g., Beauchamp, Halliwell, Fournier, & Koestner, 1996).

Kathleen A. Martin is with the Department of Kinesiology at McMaster University, Hamilton, ON, Canada, L8S 4K1. Sandra E. Moritz is with the Department of Physical Education & Exercise Science at the University of Rhode Island, Kingston, RI 02881-0810. Craig R. Hall is with the School of Kinesiology at the University of Western Ontario, London, ON, Canada N6A 3K7.
In addition, sport psychologists frequently encourage athletes to use imagery to influence their performance in a variety of other ways, such as enhancing motivation and self-confidence (e.g., Rushall, 1988), coping with injury and pain (e.g., Rotella, 1984), regulating arousal (e.g., Harris & Harris, 1984), and managing stress and anxiety (e.g., Orlick, 1990). Although mental imagery is often used for these purposes in applied settings, very little research attention has been devoted to studying the effectiveness of these imagery interventions (for a review, see Jones & Stuth, 1997). Rather, most of the sport imagery research has examined imagery’s effectiveness for enhancing the learning and performance of motor skills.1 Murphy (1990) has blamed the narrow focus of existing sport imagery theories for the lack of research on a broader range of imagery uses.

A number of theories have been advanced to explain imagery’s effects on various aspects of cognition, affect, and behavior. Some of these theories were developed to explain imagery’s effects in general, whereas other theories were developed to explain imagery’s effects within a particular domain. Within the motor domain, two major theoretical approaches have been generated explicitly for the purpose of explaining why imagery may benefit motor performance.2 First, psychoneuromuscular theory (Jacobson, 1930) posits that vivid imagined events produce innervation in muscles similar to that produced by the actual physical execution of the movement. Imagery may strengthen “muscle memory” (Vealey & Walter, 1993) for a task by having the muscles fire in the correct sequence for a movement, without actually physically executing the movement. Second, symbolic learning theory (Sackett, 1934) proposes that imagery functions as a cognitive coding system to help athletes acquire or understand the “mental blueprints” (Vealey & Walter, 1993) for movement patterns. Imagery strengthens the mental blueprint, enabling movements to become more familiar and possibly automatic.

These two theories suggest that imagery enhances motor skill learning by mimicking physical practice of a skill. However, imagery use in sport psychology encompasses a much wider range of applications than just the acquisition of motor skills and as a substitute for physical practice. Psychoneuromuscular and symbolic learning theory fall short in accounting for the effectiveness of the variety of imagery interventions frequently used by sport psychologists (Murphy, 1990; Perry & Morris, 1995).

One approach that does attempt to account for various imagery applications is Paivio’s (1985) analytic framework for imagery effects. According to Paivio, imagery influences motor behavior through its impact on both cognitive and motivational response systems. Specifically, behavior can be affected by the imagery of motor skill components and general game or performance strategies (cognitive functions of imagery). In addition, imagery of goals, the activities related to goal achievement, and the physiological arousal and affect that may accompany imaged successes and failures can influence performance vis-à-vis motivation. Paivio’s framework has been used to explain imagery’s effects on self-confidence, anxiety, and intrinsic motivation (Martin & Hall, 1995; Moritz, Hall, Martin, & Vadocz, 1996; Vadocz, Hall, & Moritz, 1997).

Although Paivio’s (1985) framework is more encompassing than symbolic learning theory and psychoneuromuscular theory, it has at least three significant limitations. First, some research (Hall, Mack, Paivio, & Hausenblas, 1998; White & Hardy, 1998) suggests that athletes use more types of imagery than those accounted for by Paivio’s framework. Second, it does not include situational or
personal factors—such as the sport context or the athlete’s imagery ability—that can determine the type of imagery used by an athlete and the effects of the imagery (Salmon, Hall, & Haslam, 1994). Third, it provides few predictions about the specific types of images that lead to specific cognitive and motivational changes in athletes. Because of these limitations, the framework is restricted in its ability to predict the best imagery strategy for attaining a particular outcome (e.g., skill acquisition, increased confidence, decreased arousal) in a particular sport situation (e.g., training, competition). The purpose of this article is to provide a guiding framework that describes how an athlete can use imagery to achieve a variety of cognitive, affective, and behavioral changes across different sport situations.

Considerations for a New Model

Sport psychologists have frequently borrowed from the parent discipline of psychology to facilitate the development of models and theories (Brawley & Martin, 1995). In support of this interdisciplinary approach, Murphy (1990) has suggested that when researchers are developing new imagery models for the sport domain, they should borrow and incorporate elements from imagery models developed outside of sport. Following Murphy’s recommendations, we have looked to cognitive psychology and identified aspects of the triple-code model (Ahsen, 1984) and bioinformational theory (Lang, 1977, 1979) that relate to athletes’ use of imagery. These aspects have been incorporated into our model.

From Ahsen’s (1984) triple-code model of imagery, we have borrowed a concept that is missing from the imagery models that are frequently used in sport—the meaning of the image to the individual. According to Ahsen, every image imparts a definite significance or meaning to the individual and can have different effects on different people. Indeed, the same image can be interpreted very differently across athletes (Murphy, 1990; Orlick, 1990), and different interpretations of imaged events can elicit different individual reactions (Bandura, 1986). For example, soccer players have been shown to experience less cognitive anxiety and greater self-confidence when they interpret images of crucial game situations (e.g., taking a potentially game-winning penalty kick) as a challenge rather than as a pressure (Hale & Whitehouse, 1998).

In addition to eliciting cognitive reactions, imagery also elicits physiological and emotional reactions (Bandura, 1986). This is a central concept of Lang’s (1977, 1979) bioinformational theory and one that we have adopted into our model. Lang posited that vivid imagery involves activation of information about (a) the stimulus characteristics (i.e., descriptive qualities) of the imaged situation, and (b) response propositions, or the physiological and overt behavioral responses to the imaged situation. Because response propositions are modifiable and represent how an athlete may react in a real-life sport situation, imaged response propositions can have a powerful impact on subsequent overt behavior (Lang, Melamed, & Hart, 1970). For example, a basketball player can include response propositions—such as feelings of anxiety, anger, and elation or physical symptoms of fatigue and tension—in her imagery of free throws during crucial game situations. According to bioinformational theory, imaging perfect control and execution of the free throw despite potentially interfering feelings and symptoms can facilitate overt performance of the skill. With the exception of a couple of studies (Bakker, Boschker, & Chung, 1996; Hecker & Kaczor, 1988; Murphy, Woolfolk, & Budney, 1988), very
little research has examined the effects of including response propositions in athletes’ imagery scripts. Yet for decades, sport psychologists have been incorporating physiological and emotional reactions into athletes’ imagery and reporting the benefits (e.g., Orlick, 1986; Rushall, 1988; Suinn, 1972, 1986).

To summarize, our model has adopted aspects of both the triple-code model and bioinformational theory. These aspects reflect the concept that different images have different meanings to athletes, which in turn are associated with different cognitive, affective, and behavioral reactions. Thus, the model has the breadth to describe athletes’ use of imagery to achieve a variety of intrapersonal changes. In subsequent sections, we discuss imagery-related factors that are associated with these changes.

Overview of the Model

When developing the model, our primary objective was to reduce the myriad of imagery-related variables that have been studied in applied sport contexts to the smallest possible set of theoretically meaningful factors. Four key factors were identified based on a thorough literature review of studies examining imagery use and sport (using PsychINFO, Sport Discus, and MedLine computer searches): (a) the sport situation, (b) the type of imagery used, (c) imagery ability, and (d) outcomes associated with imagery use. These four factors represent the key constructs in our model, which is illustrated in Figure 1. By organizing what is known about mental imagery use within a conceptual model, researchers can begin to see what questions have been answered about imagery use and what questions need to be answered.

We also wish to emphasize that we are proposing a model rather than a theory of imagery use. According to accepted definitions, a theory is a systematic arrangement of fundamental principles that provides a basis for explaining a phenomenon. Unlike theories, models do not attempt to explain the processes underlying a phenomenon; they only represent them (Chaplin & Krawiec, 1979). Because our goal is to represent how athletes use imagery—not to explain the processes underlying the effects of imagery use—the framework presented in this paper is best considered a model.

![Figure 1 — An applied model of mental imagery use in sport.](image-url)
In the remainder of this article, we elaborate on our applied model of mental imagery and review the scientific literature within the framework that the model provides. Due to space limitations, it was impossible to write a comprehensive review of all sport imagery studies to date. Instead, we elected to highlight studies that are representative of key research findings and research weaknesses within a given area. That is, we “fleshed out” the bare bones of our model with studies that best reflect the current state of knowledge regarding athletes’ use of imagery. The conclusions drawn in this article, however, are based on our review of all published studies in each imagery subtopic (e.g., effects of imagery on arousal, effects of imagery ability on outcomes), including narrative and meta-analytic reviews. We have also made some suggestions for the operationalization and measurement of variables in the model, given that the imagery research area is often criticized for inconsistent and poor operationalization of constructs (Goginsky & Collins, 1996; Moran, 1993).

Components of the Model

Type of Imagery Used

Our model centers on the type of imagery used by the athlete (i.e., the function or purpose that imagery is serving) as a determinant of cognitive, affective, and behavioral outcomes. This perspective is consistent with reports from theorists and clinicians that have linked different types of images with different types of outcomes. For example, according to Paivio (1985), what the athlete images determines whether imagery will have an effect on cognitive or motivational response systems. Likewise, Suinn (1996) has emphasized that “the content of the imagery is determined by which goals the clinician seeks to achieve: coping, skill acquisition, error analysis, error correction and self-efficacy strengthening . . . altering personal self-image, self-schemas, or self-perceptions” (p. 31).

Despite the theoretical and clinical relevance attached to imagery type or content, this topic has received very little research attention. Until recently, the only studies of imagery type were those that compared the effects of positive and negative performance imagery (e.g., Woolfolk, Murphy, Gottesfeld, & Aiken, 1985; Woolfolk, Parrish, & Murphy, 1985). These studies showed that imagery of a successful performance outcome produces better performance than imagery of an unsuccessful outcome. Only during the past decade have researchers begun to identify and describe other types (i.e., functions) of imagery (Hall et al., 1998; Hall, Rodgers, & Barr, 1990; MacIntyre & Moran, 1996; White & Hardy, 1998) and their potential effects on the athlete (e.g., increased confidence, Moritz et al., 1996; decreased anxiety, Vadocz et al., 1997). The results of these studies, combined with reports from professional practice (Murphy, 1990; Suinn, 1996; Vealey & Walter, 1993), confirm that athletes do indeed use different types of imagery to achieve different types of outcomes.

Recently, Hall and his colleagues developed a taxonomy for classifying the different types of images used by athletes. Paivio’s (1985) model of imagery effects provided the conceptual basis for this taxonomy, which was subsequently verified in a series of empirical studies (Hall et al., 1998). Within the sport domain, the following five types of imagery have been identified:
- Motivational-Specific (MS): Imagery that represents specific goals and goal-oriented behaviors, such as imagining oneself winning an event, standing on a podium receiving a medal, and being congratulated by other athletes for a good performance.
- Motivational General-Mastery (MG-M): Imagery that represents effective coping and mastery of challenging situations, such as imagining being mentally tough, confident, and focused during sport competition.
- Motivational General-Arousal (MG-A): Imagery that represents feelings of relaxation, stress, arousal, and anxiety in conjunction with sport competition.
- Cognitive Specific (CS): Imagery of specific sport skills such as penalty shots in hockey or double axels in figure skating.
- Cognitive General (CG): Imagery of the strategies related to a competitive event, such as imaging the use of full-court pressure in basketball or a baseline game in tennis.

The five types of imagery are considered to be functionally orthogonal. Therefore, it is conceivable, for instance, to imagine coping with a difficult situation (MG-M imagery) without imagining behavioral goals (MS imagery) or to imagine strategic behaviors (CG imagery) independent of imaging specific skills (CS imagery). Yet it is also possible for athletes to experience two or more types of imagery simultaneously.

In addition to categorizing sport imagery, Hall et al. (1998) developed the Sport Imagery Questionnaire (SIQ) to measure the extent to which the five imagery types are used. Exploratory and confirmatory factor analyses have supported the five-factor structure of the SIQ, and interscale correlations have been low to moderate (−.45 to .32), indicating that the various types of imagery use are related yet independent (Hall et al., 1998). In addition, the SIQ has demonstrated adequate internal consistency (alpha coefficients were all >.70). Its construct validity has also been supported by studies that have shown meaningful relationships between the SIQ subscales and various outcome measures including performance (Hall et al., 1998, Study 3), confidence (Callow, Hardy, & Hall, 1998), and anxiety (Vadocz et al., 1997). Given the favorable psychometric properties of the SIQ, it seems that imagery use can be operationalized in terms of SIQ subscale scores.

Outcomes of Imagery Use

In this section we review literature examining the use of imagery for (a) facilitating skill and strategy learning and performance, (b) modifying cognitions, and (c) regulating arousal and competitive anxiety. This review includes research examining the effects of specific types of imagery (i.e., MS, MG-M, MG-A, CS, and CG), as well as the effects of imagery use in general.

Skill and Strategy Learning and Performance. The bulk of imagery studies have examined the use of cognitive-specific (i.e., imagery of skills) imagery as a technique for enhancing the learning and performance of motor skills. Considering the results of these studies collectively, it is generally accepted that imagery of motor skills facilitates the learning, acquisition, and performance of those skills (Driskell et al., 1994; Feltz & Landers, 1983). This is a robust finding across a wide variety of sport skills, ranging from fine motor tasks such as dart throwing (Straub, 1989) to gross motor tasks such as basketball free throws (Wrisberg & Anshel, 1989).
A few experiments have compared the effects of different types of imagery on the learning and performance of motor skills (Burhans, Richman, & Bergey, 1988; Lee, 1990; Murphy et al., 1988). All of these studies demonstrated the superiority of CS imagery. For example, in the early stages of a training program for beginner runners, participants who used CS imagery (imaging perfect performance of all the movements associated with running) showed greater performance improvements than participants who used MS imagery (imaging "crossing the finish line ahead of all the competitors ... receiving awards, newspaper interviews and being cheered by spectators"; Burhans et al., 1988, p. 30).

In another study, the effects of imagery on sit-up performance were examined (Lee, 1990). Participants who used an MG-M imagery strategy (i.e., imaged a situation associated with feelings of confidence and happiness) did not perform any better than a no-imagery control group. However, participants who used a CS imagery strategy (i.e., imaged themselves doing sit-ups) significantly improved their performance over baseline measures, and they performed significantly better than the MG-M and control groups. Similarly, Murphy and colleagues (1988) found that an MG-A strategy was ineffective for improving performance on a strength task. They suggested that arousal imagery may not facilitate performance unless it is accompanied by CS imagery (i.e., imagery of task performance). Taken together, these findings suggest that compared with other types of imagery, CS imagery may be the most effective imagery strategy for promoting athletes' acquisition and performance of individual motor skills.

In addition to using imagery to rehearse individual motor skills, athletes also report using imagery to rehearse entire game plans (e.g., the 2-min drill in football), strategies (e.g., waiting for a breaking pitch, hitting the ball into left field, running past first and sliding into second), and routines (e.g., a figure skater's long program; Madigan, Frey, & Matlock, 1992). Imagery for these purposes represents the cognitive general (imagery of strategies) function of imagery. We are not aware of any controlled studies that have examined the effects of CG imagery on the learning or performance of game plans, strategies, or entire routines and races. However, case-study reports have documented the performance benefits of CG imagery for rehearsing football plays (Fenker & Lambiote, 1987), wrestling strategies (Rushall, 1988), pommel-horse routines in gymnastics (Mace, Eastman, & Carroll, 1987), artistic gymnastic routines (White & Hardy, 1998), and entire canoe slalom races (MacIntyre & Moran, 1996). Based on these reports, CG imagery can have a significant effect on athletic performance.

**Modifying Cognitions.** Sport psychologists have noted imagery's effectiveness for changing an athlete's thoughts and beliefs (Murphy, 1994; Perna, Neyer, Murphy, Ogilvie, & Murphy, 1995; Rushall, 1988; Suinn, 1996). These changes depend on the athlete's interpretation of the imagery (cf. Ahsen's triple-code theory, 1984), which is determined by a combination of personal, behavioral, and environmental factors that are unique to the individual (cf. social cognitive theory, Bandura, 1986). For example, if an image is interpreted positively, it can have corresponding positive effects on self-efficacy, motivation, and anxiety. If an image is interpreted negatively, it can have a negative effect on these same cognitions.

Self-efficacy and self-confidence are two important sport-related cognitions that may be affected by imagery use. Bandura (1997) has suggested that positive visualizations enhance self-efficacy by preventing negative visualizations in situations where athletes may begin to question their own abilities. In testing Bandura's
claim, some sport researchers have failed to find any relationship between CS imagery and self-efficacy (Martin & Hall, 1995; Woolfolk, Murphy, et al., 1985). Other researchers have found that imagery of task performance (i.e., CS imagery) is sometimes associated with increased task self-efficacy (i.e., for certain participants or for certain task elements) in sports such as figure skating (Garza & Feltz, 1998) and soccer (Callery & Morris, 1996) and for tasks such as dart throwing (McKenzie & Howe, 1997). What could account for the failure to find a reliable association between CS imagery use and self-efficacy?

One explanation may be related to the type of imagery employed in these studies. Researchers may have failed to find a consistent relationship between imagery use and self-efficacy because study participants did not always use an imagery strategy conducive to enhancing self-efficacy. Denis (1985) contends that for imagery to have beneficial effects, the content of the imagery must accurately reflect the intended outcome. In other words, imagery will enhance self-efficacy only when it includes images associated with success and competence (i.e., when motivational general-mastery [MG-M] imagery is used; Moritz et al., 1996). Results from a well-controlled experiment (Feltz & Riessinger, 1990) support Denis's position. Study participants who used MG-M imagery (i.e., imaged themselves feeling competent and being successful) on a muscular endurance task had higher and stronger efficacy expectations for their performance on the task than participants who did not use imagery. Contrary to the null and weak effects observed in previous studies that did not include explicit instructions to use MG-M imagery, Feltz and Riessinger's (1990) experiment demonstrated that MG-M imagery had a medium- to large-sized effect (Cohen, 1992) on self-efficacy.

MG-M imagery also seems to be most effective for enhancing an athlete's self-confidence. A recent intervention study examined the effects of an MG-M imagery intervention on the sport confidence of 3 elite badminton players (Callow et al., 1998). A single-subject multiple-baseline design was used. Once a week for 20 weeks, players completed Vealey's (1986) State Sport Confidence Inventory prior to a match. A baseline for sport confidence was established, and the imagery intervention was implemented for Players 1, 2, and 3 at Weeks 5, 7, and 9, respectively. The 2-week, six-session intervention consisted of imagery associated with confidence, control, and successful management of challenging situations. The intervention increased sport confidence for two of the players and stabilized the other player's level of confidence. It was concluded that an MG-M imagery intervention can improve sport confidence.

In a similar vein, two correlational studies demonstrated that immediately prior to sport competition, self-confidence was positively related to the use of MG-M imagery (Moritz et al., 1996; Vadocz et al., 1997). There was no relationship between self-confidence and the use of CS imagery. These results suggest that MG-M imagery is more likely to enhance an athlete's self-confidence than CS imagery.

The confidence-enhancing benefits of MG-M types of images have also been noted in professional practice with athletes (Orlick, 1990; Rushall, 1988; Suinn, 1996). For instance, Suinn (1996) recommended that to increase confidence, "the content of the imagery focuses on seeing oneself winning, or repeated scenes of performing in a confident manner" (p. 30). Similarly, Orlick (1990) suggested that an athlete's self-confidence can be enhanced through imagery of oneself overcoming critical obstacles during competitions, staying focused, and feeling in control. These reports buttress the idea that if one wishes to develop, maintain, or regain
sport confidence and self-efficacy, one should imagine being confident and efficacious (Moritz et al., 1996).

In addition to confidence and efficacy, imagery can affect other cognitions associated with effort and motivation (Bandura, 1997). For example, in a study of beginner golfers, participants assigned to a six-session imagery intervention spent more time practicing a golf-putting task, set higher goals for themselves, and were more adherent to their training regimen than participants in an attentional control condition (Martin & Hall, 1995). Moreover, participants who imaged a successful performance outcome (i.e., sinking the putt) set higher goals for themselves and were more adherent to their training regimen than participants who imaged only successful task performance (i.e., a perfect stroke). These results suggest that MS imagery (i.e., imaging one’s goal) may have a stronger effect on cognitions related to effort and motivation than CS imagery (i.e., imaging one’s technique).

**Regulating Arousal and Competitive Anxiety.** According to Lang’s bioinformational theory (1977, 1979), certain images elicit changes in one’s physiological arousal. In support of Lang’s position, one study of competitive swimmers found that breathing and cardiac frequency significantly increased across the following images: (a) imagery of the pool, bleachers, and spectators; (b) imagery of oneself in the lane behind the starting block, awaiting the next race; and (c) imagery of oneself competing in the race (Gallego, Denot-Ledunois, Vardon, & Perruchet, 1996). The physiological changes that occurred during imagery of the three situations paralleled the increased reactivity that occurs among swimmers in similar real-life events. Hence, athletes’ imagery of a certain situation (e.g., preparing to race) may elicit a set of physiological responses (e.g., increased cardiac and respiratory frequency) that typically occur in that real-life situation.

The results of the swimming study, coupled with the predictions of bioinformational theory, suggest that athletes should use images associated with stress, anxiety, and excitement (i.e., MG-A imagery) to increase their levels of arousal. Anecdotal reports and studies of athletes’ favorite “psyching-up” strategies indicate that this is, in fact, what athletes do (Caudill, Weinberg, & Jackson, 1983; White & Hardy, 1998). Moreover, there is empirical support for the use of MG-A imagery to increase arousal. For example, in one study (Hecker & Kaczor, 1988), athletes’ heart rates significantly increased above baseline levels when they used an MG-A imagery strategy (i.e., imagery of sport scenes that included response propositions such as “you feel your heart begin to pound” and “you feel butterflies in your stomach”).

In contrast, other experiments found that imagery had no effect on arousal when a CS imagery strategy was used (Anshel & Wrisberg, 1993; Weinberg, Seabourne, & Jackson, 1981). In these studies, the preperformance heart rates of participants who imaged successful task performance were no different than the heart rates of participants in a no-imagery control condition. Presumably, unlike MG-A imagery, CS imagery lacks the stimulus characteristics and response propositions required to increase arousal (cf. bioinformational theory).

In addition to using imagery to psych themselves up, athletes also report using certain types of images to bring themselves down (Cancio, 1991; Hall et al., 1998; Orlick, 1990; White & Hardy, 1998). Arousal-reducing images may include imagining oneself in a favorite, relaxing place away from the sport environment, picturing muscular tension seeping out of the body and into the air (Orlick, 1990), or imagining oneself feeling relaxed and at ease during sport competition (Vadocz
According to bioinformational theory, all of these images should lower arousal. However, this prediction has not yet been tested empirically. Clearly, there is a need for research to further examine conceptually meaningful relationships between certain types of imagery and arousal, such as the relationship between arousal and the use of imagery that includes arousal-enhancing or arousal-reducing response propositions.

Sport competition anxiety can also be influenced by the use of mental imagery (Gould & Udry, 1994; Orlick, 1990; Perna et al., 1995). Although this tenet has been generally accepted among clinical practitioners, we found little empirical support for it when we reviewed the imagery literature. Three experiments showed no significant difference in preperformance state anxiety levels between control participants and those instructed to use a CS (Terry, Coakley, & Karageorghis, 1995; Weinberg et al., 1981) or an MG-M imagery strategy (Carter & Kelly, 1997). Similarly, in another study, CS and MG-M imagery did not predict precompetition state anxiety in a linear regression model (Vadocz et al., 1997). However, one study showed that, consistent with the predictions of bioinformational theory, MG-A imagery use (imagery of the stress, anxiety, and arousal associated with sport competition) did account for significant variance in athletes’ self-reported anxiety (Vadocz et al., 1997).

Within the imagery literature, the strongest empirical evidence for imagery’s anxiolytic effects emerged when imagery was combined with other cognitive behavioral strategies. For example, studies have shown stress inoculation training (SIT; Meichenbaum, 1985) to be an effective strategy for controlling anxiety levels prior to athletic performance (Kerr & Leith, 1993; Mace & Carroll, 1985; Mace et al., 1987). SIT is a treatment package that teaches skills for coping with stress and anxiety, and it provides an opportunity for rehearsing these skills in imagery and in vivo situations that approximate sport competition. During SIT, athletes are instructed to image the stress and anxiety associated with sport competition and to see themselves dealing with it effectively. Interestingly, the SIT images of stress, anxiety, and coping are very similar to MG-A imagery—the one type of imagery that Vadocz et al. (1997) found predictive of athletes’ sport competition anxiety. The fairly reliable effects of SIT on anxiety, coupled with evidence of a relationship between anxiety and a type of imagery that is similar to that used in SIT (i.e., MG-A), bolster the notion that changes in sport competition anxiety levels are related to the use of a particular type of imagery strategy.

In addition to studies that examined SIT, other research showed decreases in precompetition anxiety when imagery was combined with relaxation training (Cogan & Petrie, 1995; VanDenberg & Smith, 1993). Consistent with bioinformational theory (Lang, 1977, 1979), it is possible that when athletes pair imagery of their skills with a relaxation response, this response carries over to real-life competitive situations (Lang et al., 1970). In other words, athletes are less anxious in competitive situations because they have learned, through imaginal rehearsal, to feel calm and relaxed in competitive situations (cf. Orlick, 1990).

The significant changes in anxiety following SIT and combined imagery-relaxation interventions suggest that imagery rehearsal that includes feelings of relaxation, anxiety, stress, and excitement can have an effect on an athlete’s level of competitive anxiety. However, further research is needed to tease apart the effects of imagery per se from the effects of other aspects of multicomponent interventions.
(e.g., aspects such as self-talk in SIT and progressive muscle relaxation in the imagery-relaxation interventions). Because one drawback of multicomponent interventions is their length, it would be valuable to know the role that imagery plays in producing treatment effects. The interventions could then be streamlined to include only the most effective treatment components. It is likely that athletes would adhere more to abbreviated versions of interventions than they would to lengthy, full-blown versions.

In summary, clinical insights and the extant research suggest that imagery use can influence athletes in a variety of ways. Moreover, there is accumulating research to suggest that specific types of imagery are associated with specific cognitive, affective, and behavioral outcomes. We now examine how the sport situation can influence imagery use.

The Sport Situation

Athletes use mental imagery (a) in training periods between competitive events, (b) immediately prior to and during a competitive event, and (c) when they are rehabilitating an injury (for a review, see Jones & Stuth, 1997). Across these sport situations, certain types of imagery use may be more prevalent than others (Hall, 1995; Murphy, 1994; Vealey & Walter, 1993). Each of the three sport situations is discussed in turn.

First, during training phases, the type of imagery used by an athlete depends on the focus of the training program and the athlete’s level of skill acquisition (Hall et al., 1998; MacIntyre & Moran, 1996; Perry & Morris, 1995; Salmon et al., 1994). Specifically, novice athletes tend to use imagery primarily for its cognitive functions, because novices are generally focused on learning sport skills and strategies and analyzing and correcting performance errors.

Once novices have acquired the requisite sport skills, the emphasis of their training turns to preparation of these skills for performance under competitive pressure. During this training phase, athletes make greater use of motivational types of imagery. For example, MG-M imagery is used to help athletes perform already-learned skills with more confidence and assertiveness (Suinn, 1996; White & Hardy, 1998). MS imagery can be used to help athletes set performance goals and to maintain their level of motivation in the time period leading up to a competitive event (Hall, 1995; Martin & Hall, 1995; Munroe, Hall, Simms, & Weinberg, 1998; Orlick, 1990). Interestingly, even though their skills are well developed, advanced athletes still report using a substantial amount of CS imagery (Hall et al., 1998; Moritz et al., 1996). Advanced athletes probably employ cognitive imagery during phases when their training program involves the learning of new skills and strategies. They may also use it to enhance the performance of well-learned skills and strategies and to help them stay focused (Munroe et al., 1998).

Second, as part of their competition preparation, athletes report using imagery for varied purposes such as regulating their level of arousal, focusing their attention on the upcoming performance, and keeping themselves feeling positive and confident (Murphy, 1990; Murphy & Martin, in press; Orlick, 1990). It has been suggested that immediately before competition, motivational types of imagery use may be more prevalent and may have a greater effect on performance than cognitive types (Hall, 1995; Murphy, 1994; Vealey & Walter, 1993; White & Hardy, 1998). However, few studies have examined imagery use among athletes in actual
competitive situations (for a review, see Greenspan & Feltz, 1989), and these few investigations lacked the controls needed for conclusions to be drawn regarding imagery’s effectiveness as a precompetition preparation strategy.

For instance, studies have shown that athletes who are trained to use mental imagery as a precompetition strategy perform better than athletes in a control group (Cogan & Petrie, 1995; Kerr & Leith, 1993; Lee & Hewitt, 1987). These studies provide tentative support for the use of imagery to facilitate competitive performance. However, because the studies did not include manipulation checks, it is not known how much imagery or what types of imagery were used by study participants immediately prior to competing. We also don’t know the mechanisms by which imagery facilitated performance (e.g., through imagery’s effects on self-confidence, anxiety, arousal, etc.). Additional research is needed to address these issues.

The third sport situation when athletes may use different types of imagery is during the injury rehabilitation and prevention process (Durso-Cupal, 1998; Gordon, Potter, & Ford, 1998). For example, athletes can use imagery for relaxation as a strategy to lessen the impact of life- or sport-specific athletic stressors, thus decreasing muscular tension and the potential for sport injury (Green, 1992). Indeed, one study found that gymnasts assigned to a 6-week imagery and relaxation program reported fewer athletic injuries and physical symptoms than gymnasts in a control group (Lee & Hewitt, 1987).

Injured athletes may also use motivational imagery to facilitate adherence to rehabilitation programs, to maintain a positive attitude, and to manage anxiety and tension during their recovery (Kerr & Goss, 1996; Wiese, Weiss, & Yukelson, 1991). Cognitive imagery could be used to replace physical practice while recuperating. Some practitioners have suggested that mental imagery can also help injured athletes deal with pain (Murphy & Jowdy, 1992) and that the use of healing imagery may speed recovery (Gordon et al., 1998; Ievleva & Orlick, 1991). Although the extant research suggests that mental imagery is useful for rehabilitating injured athletes, additional research is needed to identify the imagery types most conducive to meeting the needs of injured athletes. For example, White and Hardy (1998) reported that an injured gymnast used imagery to enhance her self-confidence upon returning to training. However, it is unknown whether her confidence was enhanced by the use of CS imagery, MG-M imagery, or a combination of the two. Research that teases apart the effects of various types of imagery can spur the development of better psychological interventions for injured athletes.

**Imagery Ability**

The fourth component of our model is imagery ability. Virtually everyone has the ability to generate and to use imagery, but not to the same degree (Paivio, 1986). Among athletes, research to date has generally shown that the ability to visually and kinesthetically image physical movements is associated with better sports performance (Highlen & Bennett, 1979; Meyers, Cooke, Cullen, & Liles, 1979; Orlick & Partington, 1988; Vadocz et al., 1997). Also, individuals with high imagery ability have demonstrated greater performance improvements than individuals with low imagery ability, following the use of cognitive-specific imagery strategies (Goss, Hall, Buckolz, & Fishburne, 1986; Isaac, 1992; Ryan & Simons, 1981). Based on these findings, our model shows imagery ability moderating the effects of imagery use on outcomes.
Our conceptualization of imagery ability as a moderator variable is based on correlational and ANOVA-type analyses that have shown a relationship between imagery ability and various motor performance outcomes. This rationale is consistent with Baron and Kenny's (1986) statistical and conceptual definitions of a moderator variable. That is, a moderator is a variable "that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable" (p. 1174). Within a correlation framework, a moderator is a third variable that affects the zero-order correlation between two other variables. Within an analysis of variance (ANOVA) framework, a moderator effect can be represented as an interaction between an independent variable (e.g., use of CS imagery) and a factor that specifies the conditions (e.g., when imagery ability is high) in which effects (e.g., improved performance) for the independent variable will emerge.

Unfortunately, there has not been any research examining the moderating effects of imagery ability on (a) types of imagery use other than CS, and (b) outcomes other than performance. It would be useful for practitioners to know whether imagery ability moderates the effects of other types of imagery. It seems plausible, for example, that when using MG-A imagery, an athlete who is a good imager will experience more physiological arousal than an athlete who is a poor imager. Thus, an athlete's imagery ability could affect how the sport psychologist instructs the athlete to use imagery immediately prior to competing.

How should an athlete's imagery ability be assessed? Most research to date has operationalized imagery ability as a score on self-report measures such as the Movement Imagery Questionnaire (MIQ, Hall & Pongrac, 1983; MIQ-Revised, Hall & Martin, 1997) and the Vividness of Movement Imagery Questionnaire (VMIQ; Isaac, Marks, & Russell, 1986). These instruments were developed and validated to measure visual and kinesthetic imagery ability for specific movements (cognitive specific imagery). It is possible that they also indirectly assess imagery ability for other types of imagery. (For example, some motivational functions of imagery may draw on the same kinesthetic and visual imagery abilities that are related to the cognitive functions of imagery.) However, the MIQ, MIQ-R, and the VMIQ were not designed for this purpose. Although these inventories have proven reliable, we encourage the development and validation of additional tests that measure the ability to image other types of sport-related experiences such as goal achievement (MS imagery) and game strategies (CG imagery).

Future Directions and Conclusions

The purpose of this article is to present an applied model of mental imagery use for sport psychology that has utility for both researchers and practitioners. The development of conceptual frameworks and models is crucial to the growth of sport psychology (Brawley & Martin, 1995) and has been particularly lacking in the area of mental imagery (Murphy, 1990). We have attempted to assimilate research from several areas in the sport imagery literature and to provide an organizational model to guide future research and application.

Research

The model has helped us focus and clarify our thinking regarding imagery use by athletes. It has also prompted us to think about what we know about imagery and
what questions need to be answered. One value of a model is that it can be used to
develop specific, testable hypotheses. Various hypotheses stem from our model,
and these are outlined in Table 1. The testing of all of these predictions will take
considerable time and effort and will likely spawn suggestions for modifying and
improving the model. In the following section we offer researchers some initial
direction for testing the model.

Table 1  Some Predictions of the Model: Effects of Imagery Type Across
Various Sport Situations

<table>
<thead>
<tr>
<th>Sport situation</th>
<th>Type of imagery used</th>
<th>Predicted effects/outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>CS</td>
<td>Facilitate learning\textsuperscript{a} and performance\textsuperscript{a} of skills</td>
</tr>
<tr>
<td>Training</td>
<td>CG</td>
<td>Facilitate learning and performance of strategies</td>
</tr>
<tr>
<td>Training</td>
<td>MS</td>
<td>Facilitate the setting of process, performance, and outcome goals</td>
</tr>
<tr>
<td>Training</td>
<td>MG-M</td>
<td>Increase self-confidence and self-efficacy\textsuperscript{a}; help athlete maintain a positive attitude; facilitate mental toughness</td>
</tr>
<tr>
<td>Training</td>
<td>MG-A</td>
<td>Regulate arousal and anxiety levels\textsuperscript{a}</td>
</tr>
<tr>
<td>Competition</td>
<td>CS</td>
<td>Enhance performance of skills\textsuperscript{a}; facilitate mental focus</td>
</tr>
<tr>
<td>Competition</td>
<td>CG</td>
<td>Enhance performance of strategies; facilitate mental focus</td>
</tr>
<tr>
<td>Competition</td>
<td>MS</td>
<td>Facilitate the setting of process, performance, and outcome goals</td>
</tr>
<tr>
<td>Competition</td>
<td>MG-M</td>
<td>Increase self-confidence and self-efficacy\textsuperscript{a}; help athlete maintain a positive attitude; facilitate mental toughness</td>
</tr>
<tr>
<td>Competition</td>
<td>MG-A</td>
<td>Regulate arousal and anxiety levels\textsuperscript{a}</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>CS</td>
<td>Facilitate learning of rehabilitation exercises; maintain sport skills; promote healing</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>CG</td>
<td>Facilitate rehabilitation planning and strategies; maintain sport strategies</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>MS</td>
<td>Facilitate setting of rehabilitation goals and adherence to rehabilitation program</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>MG-M</td>
<td>Increase self-confidence and self-efficacy for recovery; help athlete maintain a positive attitude and manage pain; facilitate mental toughness and adherence to rehabilitation</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>MG-A</td>
<td>Regulate arousal and anxiety levels</td>
</tr>
</tbody>
</table>

\textit{Note.} Imagery ability may moderate each predicted outcome.

\textsuperscript{a}There is some empirical support for this prediction.
**Research Questions.** Our model, along with supporting research and case reports, highlights the importance of using different types of images to achieve different outcomes. Inquiry in this area is in its infancy; investigators are encouraged to further explore the situations and applications that are associated with each type of imagery (see Table 1). At the descriptive level of research, season-long examinations of athletes’ physical and mental training regimens are needed to identify factors (e.g., changes in the emphasis of training programs, temporal proximity of competitions) that influence the use of cognitive and motivational imagery. Longitudinal studies could also be used to identify cognitive, affective, and behavioral changes (e.g., increased self-confidence and motivation) that are associated with different types of imagery. For example, a longitudinal design was recently used in a study that found dramatic variation in hockey players’ efficacy beliefs over the course of a season (Feltz & Lirgg, 1998). It would be interesting to replicate the study, but to administer the SIQ along with the efficacy measures. Researchers could then examine whether efficacy changes were associated with changes in the types of imagery used throughout the hockey season. The study could also examine the temporal sequencing of imagery use and efficacy changes. That is, do changes in efficacy precipitate a change in the type of imagery used? Or do changes in imagery type precipitate changes in efficacy?

In addition to these general questions about the types of imagery used by athletes, there are many specific questions about imagery use that need to be answered. For example, of the five types of imagery captured by the SIQ (Hall et al., 1998) and discussed in this article, CG imagery has received the least research attention. When do athletes use this type of imagery? What effects does it have? Does imagery of entire routines and strategies have a greater impact on performance than imagery of discrete skills (i.e., CS imagery)? Furthermore, although CS imagery has been well studied, we only know about its effects in the context of training. The exact role that CS imagery plays at competitions—perhaps priming the motor system to perform, or as a strategy for keeping the athlete focused on the task—awaits further investigation. Additional research is also needed in training contexts to examine the effects of motivational imagery. Practitioners would benefit from research examining whether this type of imagery facilitates motivation and persistence, particularly during those difficult training periods when athletes perceive their progress to be slow or nonexistent.

When testing the model, we encourage researchers to design controlled experiments that examine several of the model’s components concurrently. For example, an experimental design that included athletes with both high and low imagery ability could examine whether imagery ability moderates the effects of different types of imagery on several measured outcomes (i.e., cognitive, emotional, and physiological variables). Another experiment could manipulate the nature of the sport situation (competition versus training) and examine whether the situation influences the type of imagery used by athletes and the effects of imagery on the athlete. By conducting experiments that examine multiple constructs within the model, researchers can begin to probe the causal mechanisms that operate during imagery use. It is crucial, however, that researchers use proper methodologies and terminologies for testing and describing relationships within the model (cf. Baron & Kenny, 1986).

Finally, we encourage researchers to explore theoretically and conceptually meaningful relationships between specific types of imagery and specific cognitive,
affective, and behavioral outcomes. For example, does a greater use of MS imagery result in greater goal commitment? Do injured athletes experience less anxiety about their recovery if they use more MG-A imagery? For many years, clinicians and theorists have declared that certain outcomes can only be achieved by the use of certain images (e.g., Denis, 1985; Murphy, 1990; Paivio, 1985; Suinn, 1996). Researchers must heed this advice when selecting the type of imagery to be used in their experiments. Our model and our literature review provide some guidance for this task.

**Elaboration of the Model.** The list of SIQ imagery types is not exhaustive. As researchers continue to explore athletes’ imagery content, and as athletes, coaches, and sport psychologists develop new uses for imagery, it is likely that other types of imagery will be identified and incorporated into the model. Moreover, we will continue to build and modify the model as we increase our understanding of variables related to athletes’ use of imagery.

Imagery modality (visual, kinesthetic) and sport type (e.g., open vs. closed; team vs. individual) are two variables that may be associated with different types of images, and they may ultimately find a place in the model. For instance, football players may find that visual imagery is most useful for rehearsing game plans and picturing entire offensive and defensive lines. Kinesthetic imagery might be more useful for the rehearsal of discrete football skills such as handling, throwing, and catching the ball. With respect to sport type, preliminary evidence suggests that use of the five SIQ imagery types varies significantly across sports (Munroe et al., 1998). At this time, however, there is insufficient evidence to warrant inclusion of modality and sport type in the model.

There is an imagery-related variable that has received considerable study but is conspicuously absent from our model: imagery perspective. Hardy (1997) recently demonstrated that most research examining the effects of imagery perspective on performance has confounded perspective (external vs. internal) with modality (visual vs. kinesthetic). Moreover, researchers (Hardy, 1997; Murphy & Martin, in press) have questioned the merit of experiments that simply compare the performance effects of internal versus external imagery, because both perspectives may affect performance but through different intermediary processes. For example, external imagery may be superior to internal imagery when the performance objective is to improve errors in form (Hardy, 1997). However, internal imagery may be better than external imagery for improving performance vis-à-vis increased self-efficacy and self-confidence. The effects of different perspectives on different imagery functions is a topic worthy of further investigation (White & Hardy, 1995).

**Application**

In addition to guiding future research, the model offers some direction in consulting with athletes, given that different types of imagery seem to be associated with different outcomes. As consultants, we pay particular attention to the types of images that we prescribe to athletes. To paraphrase Botterill and Orllick (1988), we believe that what you see really is what you get. Accordingly, we use imagery content that corresponds with our consulting and treatment goals. In the following sections we provide examples of how we apply the model to match treatment goals.
with imagery content. Most of these examples are fairly general, however, because many of the model’s specific predictions await testing.

**Imagery for Sport Training.** In our own work, we encourage athletes and teams to use all functions of imagery in both training and competition. In training, athletes are told to image their daily and weekly training goals (MS imagery) and the activities associated with achieving those goals (CS and CG imagery). CG imagery is often encouraged, particularly among team-sport athletes, because they tend to overlook this valuable function of imagery use. Consider, for example, a goaltender in ice hockey who has difficulty stopping the puck on rebounds. In situations such as these, there are generally a number of people approaching the crease, or already in or near the crease. Thus, one of the goaltender’s objectives may be to increase her save percentage on shots when teammates or the opposition are surrounding her. The athlete would be instructed to use MS imagery—to image making the save under these circumstances, as well as the adulation that would result from stopping the shot. The athlete could also be instructed to use CS imagery to rehearse making the save with her glove, pads, stick, and so on. She could also vary the context of the images with CG imagery. That is, she could change the number of people around the crease area and the type of shot taken (i.e., forehands, backhands, wrap-arounds, etc.).

MG-M and MG-A imagery are also encouraged in training. MG-M imagery can be employed to help maintain or regain a positive, confident attitude and to help athletes handle the setbacks and plateaus that are often a part of sports training (Orlick, 1990). For example, athletes can imagine performing an especially difficult and exhausting drill at the end of practice and image themselves pushing through that drill, maintaining proper technique and a positive “stick with it” attitude. In addition, they may use MG-A imagery to imagine themselves getting psyched up for a 6:00 a.m. outdoor practice on a wet, cold morning. They can imagine being enthusiastic, even at that early time, and encouraging their teammates. MG-A imagery can also be used to control arousal and anxiety levels during stressful training situations such as try-out camps and simulations.

**Imagery for Sport Competition.** During consultations, we teach athletes to use imagery for competitions long before they actually compete. This has been a successful approach for preparing athletes for optimal performance under competition pressure. Athletes are encouraged to imagine their competition goals and themselves achieving those goals (MS imagery). Athletes are also told to imagine themselves in difficult competitive situations (e.g., behind in a game, last attempt at a jump) and handling those situations in a confident, positive manner (MG-M imagery). Furthermore, they are told to imagine coping with stressful competitive situations, staying calm and poised (MG-A imagery). For example, they may imagine standing coolly at the free throw line in basketball, with 1 s on the clock and the outcome of the game in their hands. With respect to CS and CG imagery, we direct athletes to imagine themselves in competition situations, performing perfectly and working through problems that they might encounter.

Once athletes are at the competition site, we encourage them to continue to use imagery as needed. For example, they can imagine being confident, in control, performing exactly the way they need to, and accomplishing their goals. CS imagery can be used to help athletes stay focused (Orlick, 1990), and CG imagery may be
employed to remind athletes of what strategies to use in various situations. The amount and nature of the imagery used depends on such variables as the athlete’s skill level, the task, and the athlete’s use of other mental preparation techniques (e.g., self-talk). Generally, getting athletes to use imagery at a competition is not a problem. However, our goal is to show them how to use it most effectively.

Conclusions

In this article we have presented an applied model of imagery use by athletes, and we have outlined ways in which the model may guide future research and application. However, as with any conceptual framework, there are limitations to the model. One limitation is that apart from imagery ability, the model does not specify individual differences that can influence the relationships among the constructs.

Differences in preferred cognitive style, for instance, might mediate the effects of imagery use. Individuals who prefer imaginal thinking may benefit more from an imagery intervention than individuals who prefer verbal thinking (e.g., O’Halloran & Gauvin, 1994). Also, differences in the amount of time or effort spent on imagery could influence the effects of imagery use. For example, one study showed that participants who imaged for 1 or 3 min showed greater improvement on a basketball-shooting task than subjects who imaged for 5 or 7 min (Etnier & Landers, 1996). Because additional research is needed to determine whether cognitive style and duration of imagery rehearsal reliably influence imagery’s effectiveness, these variables have not been included in the model. Nonetheless, we wish to draw attention to these factors and encourage researchers and practitioners to beware of individual differences that can affect relationships among the model’s constructs.

Another limitation of the present model is that no predictions are made about the use of more than one type of imagery at a time. There is no doubt, for example, that a gymnast can learn a new skill while bolstering her confidence for that skill by using CS and MG-M imagery simultaneously (e.g., White & Hardy, 1998). What is unclear is whether using only one type of imagery at a time is more or less effective than using two or more types of imagery at a time. Specific predictions concerning the combined effects of various types of imagery await future examination.

Despite its shortcomings, there are also important advantages to using the model. First, it provides researchers with a clear theoretical background for designing imagery-use experiments, and it guides the selection of variables to be included and measured in experiments. Second, the model provides practitioners with a conceptual framework that can aid the development of imagery interventions to achieve specific treatment goals. Third, to the extent that the model identifies the variables that are relevant to athletes’ use of imagery, the model furthers our understanding of imagery per se. A greater understanding of how imagery is used may ultimately lead to a greater understanding of how imagery works. Clearly, the advantages of the model outweigh its limitations.

In conclusion, we urge researchers and practitioners to use the model as a guiding framework for designing imagery studies and interventions. We also hope that investigators will be compelled to test the model’s predictions. Research that tests the predictions can only help athletes by spurring the development of more effective imagery interventions.
References


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Notes

1The term sport imagery refers collectively to the variety of imagery applications used within the sport domain (cf. Murphy & Martin, in press).

2Schmidt’s (1982) attentional-arousal set hypothesis predicts that imagery enhances performance by helping the athlete set the optimal arousal level and focus...
attention on the task. As Schmidt’s (1982) hypothesis has never been fully developed as a formal theory or validated by empirical research, we have not included it here. In addition, it should be noted that although not advancing a particular theory, others (e.g., Weinberg & Gould, 1995) have suggested that imagery works via the enhancement of psychological skills.

We have substituted the terms learning and performance—which are typically used in the mental imagery literature—with training and competition. There is probably little conceptual difference between these terms. However, since we are proposing a model of imagery that is specific to sport, it is important to use terminology that is appropriate for our domain (the learning/performance distinction was borrowed from the motor learning literature; see Magill, 1993). The term competition represents an event where the athlete’s skills are evaluated by a panel of judges, or tested in head-to-head competition, and a particular outcome is at stake (e.g., winning a medal, being selected for a team). Training refers to all other practice and coaching situations. We acknowledge that not all imagery takes place at the rink, field, court, etc. Indeed, many athletes report engaging in imagery rehearsal when they are in bed at night, during the bus ride to a game, or even during school. Our training/competition distinction does not exclude these scenarios.

Some practitioners (e.g., Murphy, 1990; Whelan, Mahoney, & Meyers, 1991) have suggested that imagery ability functions as a mediator. However, these suggestions are not based on statistical tests for mediation (cf. Baron & Kenny, 1986).

Although the MIQ-R and VMIQ only measure visual and kinesthetic imagery ability, they are the only measures currently available.

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