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## **Onwards with the Evolution of Imagery Research in Sport Psychology**

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Mental imagery refers to all those quasi-sensory or 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, and which may be expected to have different consequences from their sensory or perceptual counterparts (Richardson, 1969, p. 2-3).

The topic of imagery has fascinated many people in sport and physical activity settings for years. It is considered to be one of the most popular performance enhancement techniques or psychological skills because of its versatility in effecting several different outcomes. Imagery has been referred to by a number of names – visualization, mental rehearsal, mental practice, and cognitive enactment to name a few. Sometimes researchers use one term over another based on slight differences in meaning. For example, using “visualization” implies modality; that the images are visual in nature (i.e., “seeing” yourself do something). However, imagery can (and should) involve all the senses (i.e., seeing, feeling, touching, hearing, and tasting; Vealey & Greenleaf, 2001). The terms mental rehearsal and mental practice are from motor learning and are most often used when the images involve specific physical skills and skill learning. However, the content of images used and the functions of imagery are more varied than this. For example, according to Bandura (1997), “cognitive enactment” or visualization can focus on cognitive (i.e., plans, strategies), motor (i.e., regulation of action patterns and accompanying sensations) or emotive (i.e., stress management and reduction of tension) facets of athletic skills.

A brief overview shows that imagery research is diverse and can include descriptive and experimental studies using qualitative and quantitative methods. At the most basic level, researchers have conducted descriptive studies and have shown things like who uses imagery, what people image, why people image, and/or where and when people image. Often “individual difference variables” such as skill or competitive level and gender are included as independent variables. How to assess imagery is also an important part of imagery research and instrument development and measurement validation studies have been completed on imagery characteristics ranging from use to vividness. Other researchers are more interested in discovering how imagery works (there have been several different models or theories advanced; for reviews see Morris, Spittle, & Watt, 2005; Murphy, Nordin, & Cumming, 2006). Some researchers incorporate their study of imagery into existing theoretical models like social cognitive theory (Bandura, 1997) where imagery is considered to be a source of self-efficacy. Researchers are also interested in uncovering what makes people good imagers; variables like imagery ability and imagery perspective have been studied. Another line of research concerns the strategies for applying imagery – how can imagery interventions be designed to help people achieve their desired outcomes? Questions posed in this area consider the optimal length for imagery programs, the delivery of the imagery intervention, the content of the images, etc. As with any other applied field, imagery researchers in sport psychology strive toward the ultimate goal of understanding of how imagery can be used to change behavior.

At this time a reader may be thinking that there has been lot of research conducted on imagery. In fact, searches of popular academic databases reveal that over 200 studies have been conducted investigating the role of imagery in just sport settings alone (for meta-analytic reviews see Driskell, Copper, & Moran, 1994; Feltz & Landers, 1983). Overall, the amount of literature on imagery in sport has grown rapidly over the past 20 years. Recently, Morris et al. (2005) published a book called “*Imagery in Sport.*” Theirs was the second book published on imagery in sport (the first, by Sheikh and Korn, was published in 1994). A journal devoted strictly to imagery research in sport and physical activity settings has also been created ([www.bepress.com/jirspa](http://www.bepress.com/jirspa)). It is clear that “researchers are generating information on imagery faster than ever” (Morris et al., 2005; p. x).

The underlying thesis of the current article is to present evidence supporting the need for the evolution of imagery research. Evolution refers the gradual process in which something changes into a different and usually more complex or better form. It differs from revolution which refers to a sudden or momentous change in a situation. The focus of this article is on the sport imagery research that has been grounded in Paivio’s (1985) framework and Martin et al.’s (1999) applied model of imagery use, and has used the Sport Imagery Questionnaire (SIQ: Hall, Mack, Paivio, & Hausenblas, 1998; Hall, Stevens, & Paivio, 2005). The paper is divided into three sections that include an overview of SIQ research, limitations and criticisms, and a summary/conclusion.

## Overview

The conceptualization of imagery use forwarded by Paivio (1985) was that imagery mediates behavior through either cognitive or motivational mechanisms, which affect specific or general response systems. Cognitive Specific imagery (abbreviated as CS) was proposed to consist primarily of images of skills. Most of the mental practice literature deals with imagery of this type. Cognitive General (CG) referred to the use of imagery to develop cognitive plans for athletic events; for example, the strategies that could be used. Images classified as Motivation Specific (MS) were thought to serve a motivational role when reinforcers are rare. Thus, MS imagery 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 (MG) included images associated with affect and arousal.

Based on Paivio's (1985) framework, Hall and colleagues developed the SIQ to assess the frequency with which athletes use images representative of these imagery categories. While the SIQ is clearly a measurement tool to assess the frequency with which athletes use specific images, there is a practical utility to the questionnaire as well. That is, it contains a compilation of images representative of each imagery type which may be beneficial to practitioners, coaches and ultimately, athletes. Although it was expected that the factor structure of the SIQ would cluster into the same four cells of Paivio's model, factor analysis procedures divided the MG into two factors that were subsequently named Motivation General-Mastery (MG-M: which represented effective coping and mastery of challenging situations, such as imagining being mentally tough, confident, and focused during sport competition), and MG-Arousal (MG-A: which focused upon emotional and somatic experiences in sport like feelings of relaxation, stress, arousal, and anxiety). Recently, Hall, Stevens, and Paivio (2005) published a new version of the SIQ. More specifically, changes were made in the wording of several items, one MS item was removed because it loaded on the MG-A factor, and an additional CS item was added (the psychometric properties of this revised SIQ were not reported).

Using the SIQ as its driving force, Martin et al. (1999) proposed an applied model of imagery use for sport. The model highlighted that the different types of imagery (CS, CG, MS, MG-M, and MG-A) could be used for different outcomes. That is, the imagery content was proposed to systematically determine outcomes. In other words, the main predictions of the model were best summed up as "what you see is what you get." For example, skill-based imagery was thought to enhance the execution of skills, and mastery-based imagery was thought to enhance, for example, self-confidence.

Taken together, the development of the SIQ and proposal of the applied model revolutionized imagery research. The SIQ was used with great zeal in subsequent imagery studies. For example, it was used to investigate the relationship between imagery and psychological constructs such as sport confidence/self efficacy (e.g., Abma, Fry, Li, & Relyea, 2002; Callow, Hardy, & Hall, 2001; Callow & Hardy, 2002; Moritz, Hall, Martin & Vadocz, 1996; Ross-Stewart & Short, 2006, White & Hardy, 1998), anxiety

(e.g., Monsma & Overby, 2004; Vadocz, Hall, & Moritz, 1997), motivational orientations (e.g., Cumming, Hall, Harwood, & Gammage, 2002), and goal orientations (e.g., Harwood, Cumming & Hall, 2003). The SIQ was also used in studies investigating potential moderators of the imagery - outcome relationship. For example, the following variables were considered: imagery perspective (e.g., Cumming, & Ste-Marie, 2001), imagery ability (e.g., Gregg, Hall, & Nederhof, 2005), type of sport (e.g., Munroe, Hall, Simms, & Weinberg, 1998), and time of season (e.g., Munroe et al., 1998). Furthermore, the SIQ was used to assess the effectiveness of imagery workshops and interventions (e.g., Cumming, Hall, & Shambrook, 2004; Evans, Jones, & Mullen, 2004). It was also used as a dependent variable when one was interested in looking at differences in imagery according to age, gender, imagery ability, level of participation, years of experience and encouragement to play (for a review of the research on individual differences see Murphy et al., 2006). Several researchers made modifications to the original SIQ to suit their specific research questions (e.g., Beauchamp, Bray, & Albinson, 2002; Boyd & Munroe, 2003; Cumming & Hall, 2002; Short & Fischer, 2006; Short, Monsma, & Short, 2004, 2006; Short & Short, 2005; Short, Tenute, & Feltz, 2005; Ross-Stewart & Short, 2006; Weinberg Butt, Knight, Burke, & Jackson, 2003).

The SIQ was used with athletes' at all competitive levels and ages – from amateurs and children to college, professional and elites. In addition, it was administered to athletes competing in both individual and team sports. For example, athletic activities include badminton, ballet, baseball, basketball, climbing, fencing, field hockey, football, goalball, golf, ice hockey, lacrosse, netball, precision skating, racquetball, roller skating, rowing, rugby, soccer, softball, swimming/diving, tennis, track and field/cross country, volleyball, and wrestling (Abma et al., 2002; Barr & Hall, 1992; Beauchamp et al., 2002; Boyd & Munroe, 2005; Callow & Hardy, 2001; Callow et al., 2001; Cumming & Hall, 2002; Cumming et al., 2002; Cumming, Hall & Shambrook, 2004; Evans et al., 2004; Gregg et al., 2005; Harwood et al., 2003; Monsma & Overby, 2004; Moritz et al., 1996; Munroe et al., 1998; Ross-Stewart & Short, 2006; Short et al., 2004, 2006; Short & Fischer, 2006; Short & Short, 2005; Vadocz et al., 1997; Weinberg et al., 2003).

There is no doubt that the SIQ and the applied model of imagery use have played an integral part in the current understanding of imagery use in sport. Now, around 10 years after the SIQ was first developed and the applied model of imagery use was published, we are at a stage where a significant amount of research has amassed to be able to evaluate the usefulness of the SIQ and to what extent the predictions of the model have held up. The results obtained so far are mixed; some are supportive and others not (Murphy et al., 2006). The bottom line seems to be that both the SIQ and the applied model of imagery use have severe limitations and have been justly criticized.

### **Limitations and Criticisms**

The most likely explanation for the inconsistent and non-supportive findings regarding imagery content, type, function, and outcome is the conceptual confusion pertaining to these terms. In the first published paper using the SIQ, Moritz et al. (1996) referred to the SIQ subscales as image “content” (i.e., “*What are confident athletes*

*imaging?: An examination of image content*”). They concluded that if one wishes to develop, maintain, or regain sport confidence (i.e., the function), then one should image being confident (i.e., the content). Their conclusion was based on the finding that the image content comprising the MG-M SIQ subscale was associated with sport confidence and the finding that high and low confident athletes could be differentiated by the content of the images they used (as assessed by the SIQ). However, there was not a claim made that the MG-M images served a motivational function, just that these images were associated with sport confidence. Since then, some researchers assumed that the items on each of the SIQ subscales actually served the functions specified by Paivio’s (1985) model. For instance, imagining being interviewed as a champion (a MS item on the SIQ) was thought to serve a motivational function.

There is no doubt that over time the line between image content, type and function has blurred. *For example*, quoting from Martin et al.’s (1999) paper, they stated that “our model centers on the type of imagery used by the athlete (i.e., the function or purpose that imagery is serving)” (p. 249). Hall et al. (2005) consistently use the word “function” to refer to the SIQ subscales; for example, they wrote that “the SIQ consists of items that refer to imagery experiences related to each of these functions” (p. 6); when describing the structure of the SIQ they noted that “all the items are self-report questions about how often the athlete uses the five different functions of imagery” (p. 12); and they concluded that the SIQ “is currently the only measure assessing both cognitive and motivational functions of imagery use by athletes” (p. 30). These quotes are simply examples to illustrate the shift of the meaning of the SIQ. They highlight that the SIQ subscales, originally referred to as imagery content by Moritz et al. (1996), and subsequently considered synonymous with imagery “type,” evolved to be representative of imagery functions.

This “content,” “types,” and “functions” distinction is of utmost importance because the terms differ in meaning. Interestingly, from a theoretical perspective, it has been known for years that any given image can serve one or several functions, and that this would depend on the meaning that image holds for an individual (Ahsen, 1984). Callow and Hardy (2001) mentioned this limitation when they stated: “it may not be what (content) is imaged that influences confidence, but the function of what is imaged” (p. 15). They suggested that a differentiation must be made between the imagery content a performer uses and the function it may have. This is because two performers may image the same content, but this content may have a very different function for each of them. Research by Short et al. (2004) using the SIQ showed that different athletes used the same image for different functions, and that a single image had multiple functions for a single athlete. In particular, they identified five particularly “troublesome” items where the athletes’ perceptions were not concordant with the SIQ designation for the image. Their results were replicated and extended by Short and Fischer (2006) and Short and Zostautas (2006) who showed that skill level (low, medium and high ability swimmers and high school, college, and professional hockey players, respectively) influenced concordance findings. In all of these studies, when there were differences between the athletes’ perceptions and the SIQ categories, most of the image content was perceived by the athletes as being motivational, and most often MG-M imagery. This finding that an

image can be used for more than one function has been found by many different researchers as well (Callow & Waters, 2005; Calmels, D'Arripe-Longueville, Fournier, & Soulard, 2003; Evans et al., 2004; Fish, Hall, & Cumming, 2004; Nordin & Cumming, 2005; Short et al., 2002). It emphasizes that a distinction must be made between imagery "types" and "functions."

Thus, one of the key issues is that the SIQ measures the frequency with which athletes use images that vary by content ("*what*") based on the assumption that these images are reflective of certain functions ("*why*") (Murphy et al., 2006). However, as presented above, researchers have recognized that the images are, in fact, serving multiple functions. Conceptually, it is vital to clarify the constructs of imagery type, imagery content, imagery function, and imagery outcome (the *result* of imagery). Aligned with Murphy et al. (2006), *imagery type* should be used to denote the actual *content* of an image (e.g., seeing oneself performing a dive, feeling oneself executing a penalty kick). *Imagery function* should refer to the purpose or reason why an athlete employs an image (e.g., to enhance motivation, to learn a skill). *Imagery outcome* should indicate the end result of the imagery process (e.g. enhanced motivation, improved skill level). When defined in this manner, imagery content is what is included in each of the items on the SIQ. The subscales of the SIQ (i.e., CS, CG, MS, MG-M, and MG-A) would then be considered as imagery types, which may or may not be employed for particular functions. For instance, a hockey player may image taking a penalty shot in order to improve his technique, increase his confidence, reduce his anxiety, and improve his focus (i.e., one type which has several functions). Likewise, he might combine images of skills, strategies, and mastery for the sole purpose of improving his confidence (i.e., several types for one function).

So what does this mean for the SIQ? Instead of being a measure that assesses how often an athlete uses imagery for certain functions, it is only a measure of the frequency with which athletes use certain types of images. Conclusions could be made such as "the CS type of imagery was associated with improved skill performance," or "the MG-M type of imagery differentiated between high and low confident athletes." Conclusions such as "athletes used imagery more for its motivational functions than cognitive functions" referring to what prototypical athletes are doing would not be justified. Similarly, statements such as "the MG-M function of imagery was most associated with confidence" based on correlational data would also be misleading if the SIQ was used unless the researcher checked to see if the types of imagery were concordant with the functions. To tap the functions, one would have to ask participants why they used the particular images (as was done by Short et al., 2004). Interestingly, in a separate study, Short and Short (2005) assessed imagery function for each item on the SIQ. Then, they computed SIQ subscale scores according to the athletes' perceptions in addition to the original method of computing subscale scores. Their results showed that the imagery-confidence relationship differed according to how the SIQ subscale scores were computed.

One issue associated with examining image function *per item* on the SIQ is that some would argue that doing so violates the central tenets of nomothetic research. However, as

pointed out by Mellalieu, Hanton and Fletcher (2006) in relation to their anxiety research, these concerns are related to statistical versus conceptual and practical significance. There is a need to consider research beyond  $p = .05$ , and Alpha values greater than .70. This point was argued by Bert Carron during his keynote address at NASPSPA when he was responding to criticisms of his Group Environment Questionnaire (a cohesion measure). Sport psychology has to be considered as a practical science, which involves looking beyond traditional approaches. Research becomes stagnant when researchers simply want to repeat, repeat, and repeat. Knowledge is only expanded upon when innovative and original ideas are proposed and tested. There is no doubt that new ideas may seem controversial to some at first. For example, consider the brouhaha caused by Graham Jones, Lew Hardy, Sheldon Hanton and colleagues when they suggested that anxiety could be facilitative! However, over 50 published papers later, their viewpoint has been generally embraced by the sport psychology community and researchers have adopted their “direction and intensity” style of assessment for anxiety. The program of research has to start somewhere, and to this end, using an item level approach to understand why images are used, and which images are used for specific functions maybe where it starts for future imagery research. This ideographic approach is vital to our understanding of imagery use in sport and prescription of imagery interventions and scripts to athletes. An offshoot of examining the functions of specific images is that a researcher could re-frame the SIQ to ask athletes how often they use the specific images for a certain function. This fresh approach was taken by Ross-Stewart and Short (2006) using the functions of building, maintaining, and regaining confidence. Their format did not change the structure of the SIQ; frequency ratings were still made for each item on the SIQ, they were just tied to a specific function (i.e., “how often do you use this image to build your confidence?”). Their results allowed for conclusions to be made regarding which images and imagery types (i.e., the SIQ subscales) were associated with the particular confidence functions. In general, results such as this (i.e., trends that a specific imagery type, or image, were associated with a particular function and/or outcome of imagery) would be valuable for designing interventions for practical and research purposes. Although this is clearly a move away from the intent of the original SIQ, if researchers aspire to reach all facets of practicality from researcher to practitioner, fitness specialist, exerciser, coach and athlete, it makes sense to continue finding meaningful ways to use the SIQ.

Moving on, another concern related to SIQ concerns the number of subscales it includes. Some researchers have argued that the complex processes of imagery cannot be neatly separated into one of the five “functions” of the SIQ as proposed. For example, Abma et al. (2002) stated, “a limitation of the SIQ is that it does not tap into the athletes’ perception of the purposes and goals of each type of imagery and it assumes and requires that imagery content can be neatly classified into one of five categories” (p. 73). In other words, they recognized that the SIQ did not explain or take into account the athletes’ perceptions of the functions of the images and they also recognized that there may be more imagery “functions” than the five on the SIQ. Abma et al. stated that the SIQ “may be a practical tool for research, but it may be too restrictive to reflect the true nature of the imagery” (p. 73).

Another concern is the use of the umbrella term “motivation.” The images that are considered motivational in type on the SIQ do not accurately reflect how most sport psychology researchers conceptualize motivation. The term “motivation” is used to refer to “the hypothetical construct used to describe the internal and/or external forces that produce the initiation, direction, intensity and persistence of behavior” (Vallerand & Thill, 1993, p. 18). However, in the SIQ, the motivational images contain content that reflect confidence, arousal, anxiety and goals. These could all be separate subscales on the SIQ.

The MS subscale has been questioned as the items on the SIQ all reflect outcome goals (e.g., I image receiving a medal) rather than focusing on self-referent standards such as those involved in performance goals (e.g., I image improving my free throw performance by 10%). Athletes are not typically encouraged to only set outcome goals and therefore when results show that athletes do not use MS images as much as the others, it is hard to know if this is because athletes do not use images pertaining to goal oriented responses and activities, or if they just do not use outcome goals. The association between MS images and outcome goals has been shown in recent research by Short, Ross-Stewart, and Monsma (2006). As one would expect, they found that MS subscale of the SIQ was positively correlated with extrinsic motivation. This subscale would be a viable one to extend in parallel with the goal setting literature where goal focus, specificity, difficulty, proximity and valence could be incorporated with imagery for assessment.

The CS subscale has problems as well. It appears that some of the items on this subscale may not tapping into athletes imaging of “skills,” but instead are tapping into imagery ability (Murphy et al. 2006). Examples of this are the following items: “I can consistently control the image of a physical skill,” “I can easily change the image of a skill,” and “I can mentally make corrections to a physical skill.” Revisions to this subscale would be needed as well.

The items of the MG-A subscale seems to be particularly inconsistent. Some studies have found that this subscale correlates positively with anxiety (e.g. Monsma & Overby, 2004; Vadocz et al, 1997). Inspection of the items provides the reason for this finding. Specifically, the MG-A subscale includes items such as “*I image the stress and anxiety associated with my sport*” and “*When I image myself participating in sport, I feel anxious.*” As pointed out by Murphy et al. (2006), the MG-A subscale focuses on arousal and anxiety but does not mention images of being calm. However, when imagery scripts and interventions are created that do not employ the SIQ, images of calm clearly fall into the same category as those of psyching up, excitement, stress, and anxiety, because they are all related to arousal. For this reason, not all studies which use MG-A type images may be comparable, given that the SIQ subscales are not all-encompassing. This is not to say that the MG-A subscale is not valuable. The problem is that the “more imagery is better” suggestion is not necessarily true for these items on the SIQ. Research by Fox, Monsma, and Short (2005) showed that the relationship between the MG-A subscale of the SIQ and an anxiety measure changed from positive to negative after recoding the SIQ items.

Several additional functions of imagery have been proposed that are not included on the SIQ, or that do not “fit” into Paivio’s (1985) framework and were therefore not included in the applied model. One of the more comprehensive lists was given by Murphy et al. (2006). They suggested that imagery could be used for motor control, emotional and motivational management (i.e., enhancing motivation, changing arousal and affect), and cognitive reasons (problem solving and understanding through strategy and planning, memorizing, confidence and self-efficacy, artistic and healing functions).

Along with concerns about imagery functions, there have also been questions as to the direction of the images on the SIQ. Consider this quote made by Mike (played by Matt Damon) in the movie “*Rounders*” regarding his imagery use:

“In confessions of a winning poker player, Jack King said ‘Few players recall big pots they have won, strange as it seems, but every player can remember with remarkable accuracy the outstanding tough beats of his career.’ It seems true to me, cause walking in here, I can hardly remember how I built my bankroll, but I can’t stop thinking about the way I lost it.”

Although poker is not a sport, they do share many mental similarities (i.e., the need to be focused over long periods of time, to prevent oneself from going on “tilt,” etc.) In sport, many athletes have reported feeling their hearts pound out of their chest as they went up to bat in a crucial must-hit situation, hearing the ball land in the catcher’s mitt pitch after pitch, feeling their shoulders slouch as they ultimately strike out, and being overcome by the agony of defeat. Even after winning golf tournaments, Tiger Woods has been known to quip about missed shots during interviews. Interestingly, Murphy et al. (2006) reported that many research participants experience performance degradation after mental practice interventions. Citing an unpublished study on imagery use conducted by Jowdy, Murphy, and Durtschi (1989), they reported the following: “In response to the question, “Describe any experience where imagery has inhibited performance”, 35% of the athletes, 25% of the coaches, and 87% of the sport psychologists surveyed gave examples of imagery use inhibiting performance.” This illustrates that imagery does not always function in a positive way.

Imagery direction was one of the first characteristics studied in sport research. Positive imagery was equated with positive outcomes, and negative imagery was equated with negative outcomes. Some studies showed that imagery direction had no effect on performance (e.g., Epstein, 1980; Meyers, Schleser, Cooke, & Cuvillier, 1979) while others found that positive imagery enhanced performance and negative imagery impaired performance (e.g., Powell, 1979; Shaw & Goodfellow, 1997; Short et al., 2002; Woolfolk, Parrish, & Murphy, 1985). Others showed only negative effects for negative imagery (e.g., Taylor & Shaw, 2002; Woolfolk, Murphy, Gottesfeld, & Aitken, 1985). In 2002, Short et al. used *imagery direction* to refer to the degree to which an image either assisted performance (facilitative imagery) or hurt performance (debilitative imagery) – based on what was done in anxiety research. Their point was that it was faulty to assume that a negative image (e.g., poor golf putt) was synonymous with a negative outcome (e.g., narrowly missing the hole). Just getting close to the hole may actually be positive

for some golfers. Thus, the image (although negative in content) was actually facilitative in direction.

Recent studies on the direction of the SIQ images have consistently shown that some of the items were perceived by athletes as debilitating (or harmful or hurtful to performance). Short et al. (2006) were the first researchers to show that five of the items on the SIQ were actually perceived to be debilitating by at least 25% of a sample of approximately 300 athletes. Since then, their findings have been replicated with swimmers (Short & Fischer, 2006) and hockey players (Short & Zostautas, 2006), and athletes in general (Ross-Stewart & Short, 2006). Examples of the debilitating items include: "I imagine the stress and anxiety associated with my sport" (MG-A), "When I image myself participating in my sport, I feel anxious" (MG-A), "In my head I can recreate the emotions I feel before I compete" (MG-A), "I image myself continuing with my game/event plan, even when performing poorly" (CG) and "I image myself being interviewed as a champion" (MS).

Accordingly, this finding that some items on the SIQ are debilitating for some athletes, also has implications for the reliability of the measure. Research has shown that there is a cost to using both positive and negative items on a questionnaire in terms of its internal consistency (Barnette, 2000). Typically, in imagery research, Cronbach's Alpha values are reported for each SIQ subscale. As reported by Short and Short (2005), results from several studies (Abma et al., 2002; Beauchamp, et al., 2002; Cumming, et al., 2002; Hall et al., 1998; Hardy, Hall & Carron, 2003; Harwood, Cumming, & Hall, 2003; Moritz et al., 1996; Munroe et al., 1998; Short et al., 2004, 2006; Short et al., 2005; Short & Short, 2005; Weinberg et al., 2003) that reported individual Alpha values for the SIQ subscales showed that the values were lowest for the MG-A subscale. Simply directing readers to view results using the MG-A subscale with caution (as is typically done) because of the low reliability value may be a cop-out – masking more serious instrument development and psychometric issues. A possible solution to dealing with low internal consistency findings could be to reverse code those items that are negative and determine if they increase the magnitude of the alpha coefficients. Alternatively, researchers could follow data screening practices common among population research disciplines (e.g., communications) which would involve confirming the factor structure of the SIQ prior to testing more omnibus hypotheses.

Our last criticism of the SIQ is that it only considers imagery frequency – or how often athletes use the images. Ratings are made on a 1 to 7 scale anchored by "*rarely*" and "*often*." First, why a zero point was not included is a mystery – certainly some athletes would report not using a certain image at all. Second, there are more characteristics of imagery use that should be considered. It has already been suggested that imagery assessment needs to take into account imagery type, function, direction (debilitating/facilitative), and outcome (Murphy et al., 2006). It should be noted that imagery direction differs from imagery effectiveness (as assessed in a modification of the SIQ by Weinberg et al., 2003). For example, a person could have a helpful and effective image for achieving a particular outcome, but at the same time a person could also have a very hurtful image that was effective at impeding the outcomes that he/she was trying to

achieve. Clearly, sport psychologists would not want athletes to use images that they consider to be hurtful yet effective. The finding that certain images are debilitating (as discussed above) should be a warning to practitioners and their athletes that endorsing all of the images referenced in the SIQ could potentially harm the outcome desired.

There are other imagery characteristics that could also be assessed. For example, researchers could measure the deliberateness of the imagery (e.g., random, directed or scheduled imagery practice), imagery modality (e.g., ease/difficulty of seeing, feeling images, etc), the ability to control images, the ability to manipulate the kinesthetic properties of an image (e.g., fast, slow, hard, soft, forwards, backwards) and the vividness of the images. These other characteristics could be assessed using the images on the SIQ by changing the response set from frequency to the variable of interest. For example, after listing the 30 images on the SIQ, respondents could be directed to rate the ease or difficulty with which they could see or feel the items on the SIQ. This measure would result in imagery ability scores for each type of imagery; it may show that athletes have a more difficult time visually imaging motivational images. In such a case, an issue is whether the resulting questionnaire is a modified SIQ or a new imagery measure on its own in which the psychometric properties of such should be examined (including the factor structure). To date, reviewers appear to accept these modifications to the SIQ. For example, when they assessed effectiveness, Weinberg et al. (2003) did not “re-validate” their modified SIQ as a new measure beyond reporting Alpha values for the SIQ subscales. The same was true for Short et al. (2005) who modified the SIQ to have athletes rate how confident they were in their ability to image each item on the SIQ.

## **Summary and Conclusion**

As noted, Paivio’s (1985) framework, the corresponding SIQ, and the applied model all revolutionized imagery research in sport psychology. However, we are at a time where imagery research must evolve. Researchers must acknowledge the limitations of the SIQ and move their research into new areas. Clearly this is a more desirable path compared to simply conducting replication studies that raise the same criticisms and limitations in the discussion sections. To this end, we outline five statements that summarize our current position on imagery research, each with suggestions for future research.

1. Imagery researchers must differentiate between imagery content and functions and understand that the SIQ measures the former, not the latter. Studies could be conducted that examine what types of images are associated with specific imagery functions (e.g., the image content used for building, maintaining, and regaining confidence).
2. Imagery researchers should consider taking an item-level approach when using the SIQ. Determining which image on the SIQ is the most “powerful” for a specific function for a majority of athletes and testing the effects of this single image on various outcomes would be fascinating.
3. Imagery researchers interested in scale development and validation should consider revising specific items, extending its subscales, and the response scale on the SIQ. In addition, more types of imagery could be added.

4. Imagery researchers should be encouraged to examine other characteristics of imagery. For example, the relationship between imagery direction and effectiveness should be closely examined. If results continue to show that athletes use images that are debilitating, uncovering the reasons why would be especially fruitful. For example, do athletes simply image scripts they find in books even though the images are not personally facilitative or effective? How do coaches advise their athletes to use imagery?
5. Imagery researchers should recognize that ultimate goal of research in an applied field is to change behavior. Published results should have a practical significance. Research that takes fresh or non-traditional approaches, but have meaningful implications for athletes and practitioners should be encouraged.

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