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Athletes' ease of imaging predicts their imagery and observational learning use

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ABSTRACT

Objectives: Following the development of the Sport Imagery Ability Questionnaire (SIAQ; Williams & Cumming, 2011), the aim of the present two studies was to more comprehensively examine the relationship between sport-related imagery ability and the functions of imagery and observational learning (OL) athletes report. A second aim was to establish the SIAQ's predictive validity.
Design: Two samples of cross-sectional questionnaire data are presented in two studies.
Method: For both studies, athletes were recruited from a variety of team and individual sports, ranging in competitive level and years of experience. In Study 1, 117 participants (41 male and 76 female) with a mean age of 24.38 (SD = 9.46) completed the SIAQ and the Sport Imagery Questionnaire (SIQ; Hall, Mack, Paivio, & Hausenblas, 1998). In Study 2, 221 participants (83 male and 138 female) with a mean age of 22.34 (SD = 7.66) completed the SIAQ and the Functions of Observational Learning Questionnaire (FOLQ; Cumming, Clark, Ste-Marie, McCullagh, & Hall, 2005).
Results: Athletes' imagery ability significantly predicted their imagery and OL use. Moreover, with the exception of performance OL, predictions were stronger when the type of imagery ability closely matched the function of imagery or OL being predicted.
Conclusions: As well as demonstrating the predictive validity of the SIAQ, results from both studies support the need to use imagery ability measures that most closely match the type of imagery or OL being used.

Imagery is a popular technique well-utilized by athletes of all levels to enhance various aspects of their performance, including refining skills and strategies, regulating emotions and activation levels, and managing cognitions and motivational drive (for reviews see Cumming & Ramsey, 2009; Murphy, Nordin, & Cumming, 2008). To explain these benefits, Paivio (1985) classified imagery as serving cognitive and motivational functions at specific and general levels. The resulting 2 × 2 framework was then further extended by Hall et al. (1998) to the five functions that have underpinned sport imagery research over the last 15 years. These functions are: (1) cognitive specific (CS; imagery to improve sport skills); (2) cognitive general (CG; imagery to improve strategies, game plans, and routines); (3) motivational specific (MS; imagery to aid goal attainment); (4) motivational general-arousal (MG-A; imagery to regulate affect, arousal, and anxiety); and (5) motivational general-mastery (MG-M; imagery to manage positive cognitions and achieve appropriate attentional focus).

Hall et al. (1998) developed the Sport Imagery Questionnaire (SIQ) to measure how frequently athletes image for these reasons. Research with this questionnaire has confirmed that athletes report all five functions, but to varying extent. Motivational imagery is more frequently reported than cognitive imagery, with MG-M being the most widely used function (Cumming & Hall, 2002; Hall et al., 1998; Nordin & Cumming, 2008). It has also been well-established that athletes of higher competitive levels use imagery for all five functions more frequently than lower-level counterparts (Cumming & Hall, 2002; Gregg, Hall, & Nederhof, 2005; Hall et al., 1998). Moreover, imaging for these functions will facilitate a range of cognitive, affective, and behavioral outcomes as outlined in the applied model of imagery use (Martin, Moritz, & Hall, 1999).

The extent to which athletes' imagery effectively leads to performance-related outcomes however, is dependent on their ability to create and control these images. Athletes will vary in the degree to which they are able to form images. More elite athletes report greater vividness of movement images (Roberts, Callow, Hardy, Markland, & Bringer, 2008) and can more easily generate sport-related images (Williams & Cumming, 2011). These individual differences are important to consider because higher

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imagery ability will influence the degree to which imagery interventions are successful. For example, Robin et al. (2007) found better imagers had a more improved tennis serve return accuracy following an imagery intervention combined with physical practice than poorer imagers. Therefore, it has become standard practice to screen athletes for their imagery ability prior to their involvement in an imagery intervention. Researchers will decide whether a minimum level of imagery ability is a necessary inclusion criteria or use this measurement as a baseline to monitor changes (Cumming & Ramsey, 2009). An issue raised by a number of authors has been the need to match the type of imagery ability assessed to the nature of the imagery being performed by the athletes (Gregg, Hall, McGowan, & Hall, 2011; Hall, 1998; Williams & Cumming, 2011).

Until recently, researchers have had to mainly rely on measures of movement imagery ability to screen for interventions involving one or more functions of imagery, including those motivational in nature (e.g., Ramsey, Cumming, Edwards, Williams, & Brunning, 2010). This limitation has been addressed with the development of the valid and reliable Sport Imagery Ability Questionnaire (SIAQ; Williams & Cumming, 2011), which simultaneously measures athletes' ease of generating five types of imagery content reflective of the cognitive and motivational functions of imagery. These five types are: (1) skill imagery ability (e.g., making corrections to physical skills); (2) strategy imagery ability (e.g., making up plans and strategies); (3) goal imagery ability (e.g., winning a medal); (4) affect imagery ability (e.g., positive emotions felt during sport participation); and (5) mastery imagery ability (e.g., staying positive after a setback). Reinforcing the need to separately measure and screen for different types of imagery ability, Williams and Cumming showed that athletes find it easier to form affect images than skill images, which in turn is easier than strategy images, goal images, and mastery images.

The availability of the SIAQ now allows researchers to more fully investigate the relationship between imagery ability and use than what was previously possible. Reported in the literature is a positive association between how well athletes' image and their frequency of doing so (e.g., Nordin & Cumming, 2008; Vadocz, Hall, & Moritz, 1997). Murphy et al. (2008) explain that athletes with better imagery ability will be more likely to use imagery as a performance-enhancing technique, and because imagery ability is a skill that modifies with practice, this greater use can lead to higher imagery ability. In other words, athletes' imagery ability and use can reinforce and modify each other leading to greater effectiveness of this technique (see also Gregg et al., 2011). By providing synchronized skaters with scripts to encourage greater imagery use, for example, Cumming and Ste-Marie (2001) were also able to show how imagery ability can improve. More specifically, after five weeks of imagery training, skaters reported significant improvements to skate specific imagery ability and CS and CG imagery use.

Research has also investigated whether imagery ability can moderate the relationship between imagery use and performance related outcomes as predicted by the applied model of imagery use (Martin et al., 1999). Using the revised version of the Movement Imagery Questionnaire (Hall & Martin, 1997), Gregg et al. (2005) were unable to confirm this prediction with track and field performance. They pointed to the poor sensitivity of the performance measure as an explanation for why they did not find a moderating relationship. An alternative explanation relates to the nature of the imagery ability assessment. The MIQ-R measures how easily individuals are able to visually and kinesthetically image four general movements (knee lift, jump, arm movement, waist bend) and is unlikely to adequately represent the athletes' ability to generate more sport-specific images. With a more domain specific measure of imagery ability, Cumming (2008) was able to provide support for the predicted moderating relationship. In her study the relationship between frequency of imagery use to leisure time exercise behavior and exercise self-efficacy (coping and scheduling) was influenced by the participants' ability to generate exercise images.

Within a sport setting, progress has also been made to more fully understand the relationships between imagery ability and imagery use by taking a more refined and comprehensive measurement approach (Gregg et al., 2011). Gregg et al. (2011) assessed imagery ability in a mixed sample of athletes with the Movement Imagery Questionnaire-RS (MIQ-RS; Gregg, Hall, & Butler, 2007) and the Motivational Imagery Ability Measure for Sport (MIAMS; Gregg & Hall, 2006). The MIQ-RS is a version of the MIQ-R involving more simplified everyday movements (e.g., bending forward, pushing, pulling, reaching and grasping). It was created to make the measurement of movement imagery ability more accessible to the rehabilitation setting. The MIAMS is a sport-specific measure pertaining to the level of ease and emotion athletes experience when imaging MG-A and MG-M scenes.

By combining the MIQ-RS and MIAMS in the same study, Gregg et al. (2011) have been able to move beyond simply measuring one aspect of cognitive imagery ability (i.e., movement/skill images) to also encompassing motivational general images. They proposed that stronger relationships would be found when there was a greater similarity between the type of imagery ability assessed and the function of imagery (i.e., scores on the MIQ-RS would predict CS imagery use and scores on the MIAMS would predict MG-A and MG-M imagery use). Hypotheses were partially supported, for example, CS and CG imagery was predicted by visual and kinesthetic movement imagery ability. However, unexpected relationships also emerged. For example, when predicting CS and CG imagery, MG-A ease and MG-M emotion accounted for unique variance and emerged as the strongest predictors. A reason for these unforeseen relationships may be due to the MIQ-RS not being closely associated enough with the more complex sport-specific images reported by athletes. Even though images are cognitive in nature, they are not reflective of sport-specific cognitive images athletes report using to improve their skills and strategies. Although the MIAMS taps motivational general imagery ability, the sport-specific nature of the questionnaire might explain why certain subscales predicted cognitive imagery use. It is also noteworthy that neither the MIQ-RS nor the MIAMS directly tap content reflective of CG and MS imagery. The predicted relationship between imagery ability and use still remains to be specifically tested for these functions of imagery.

Therefore the first purpose of this two-study paper was to re-examine the relationship between imagery ability and imagery use. Because observational learning (OL) use is a closely associated strategy to imagery which also serves cognitive and motivational functions (Cumming et al., 2005), a second purpose was to examine the relationship between imagery ability and OL use. The two present studies also provide an opportunity to assess the SIAQ's predictive validity as part of the ongoing validation of this instrument. The specific aims and hypotheses for each study will be introduced in turn.

Study 1

The aim of Study 1 was to examine the relationship between sport imagery ability, as measured by the SIAQ, and imagery use, as measured by the SIQ. Because the SIAQ items evolved from the SIQ, relationships between the two questionnaires should be found. It was hypothesized that each SIAQ subscale would most strongly