Kinaesthetic Imagery: Does it exist and how can we measure it?[1]

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Introduction

The emergence of sport psychology has influenced how athletes train and compete. Increasingly, coaches and athletes are incorporating mental as well as physical skills into their training programs and competition routines. Imagery is one such mental skill. To develop an imagery program tailored to the athlete three pieces of information are vital: the imagery ability of the athlete; the effect of imagery on performance; and the motive for using imagery. This paper explores measurement of the imagery ability of the athlete. Specifically, the aim was to create new and valid measures of kinaesthetic imagery and examine the relationship these measures share with existing measures of imagery.

Main Text

Imagery is commonly utilised by athletes to enhance performance (Hall, Mack, Paivio, & Hausenblas, 1998). Imagery has been shown to increase concentration, aid motivation, alter arousal levels (Hecker & Kaczor, 1988), and enhance the acquisition of a new skill (Driskell, Copper, & Moran, 1994).

Visual imagery is understood through the processes necessary to generate and manipulate the image (Kosslyn, 1980). So, vividness (Poltrock & Agnoli, 1986), maintenance (Denis, 1991), and control (Kosslyn) are aspects used to measure visual imagery ability. Measures of imagery are either self-report questionnaires such as Betts' Questionnaire Upon Mental Imagery (QMI) (Richardson, 1969) or objective tests including and the Kit of Factor-Referenced Cognitive Tests (Ekstrom, French, Harman, & Dermen, 1976).

Research on imagery use in sport has examined the type of imagery used by athletes, when and where imagery is used, and whether imagery has a positive effect on performance. While athletes use imagery differentially in training, competition (Munroe, Hall, Simms, & Weinberg, 1998), and the off-season (Cummings & Hall, 2002), imagery is used most often just prior to competition (Munroe, Giacobbi, Hall, & Weinberg, 2000) or to overcome difficulty in competition (White & Hardy, 1998). Research on the effect of imagery on performance has found that use of kinaesthetic imagery may positively impact on athletic learning (Smyth & Waller, 1998) and performance (Fery & Morizot, 2000). Further, kinaesthetic imagery is considered particularly important when form of movement is the desired performance outcome (Fery, 2003).

Imagery may be defined in terms of the content of the image (Hall et al., 1998; Paivio, 1985). Content is broken into cognitive and motivational imagery (Paivio). In competition the skill level of the athlete influences the type of imagery that is positively associated with confidence (Callow & Hardy, 2001). Additionally, imagery ability is associated with the content of imagery that is used most often (Moritz, Hall, Martin, & Vodocz, 1996).

Imagery may also be defined by the sense it imitates including auditory, visual, gustatory, tactile, olfactory, and kinaesthetic. Kinaesthetic imagery refers to the ability to imagine the feeling of the body as it moves. There are two known measures of kinaesthetic imagery: The Vividness of Movement Imagery Questionnaire (VMIQ) developed by Isaac,

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Marks, and Russell (1986); and the Movement Imagery Questionnaire-Revised (Hall & Martin, 1997). Both measures are self-report and developed with a bi-factor structure measuring visual and kinaesthetic imagery (Hall & Martin; Isaac, et al.).

Despite an increase in research on kinaesthetic imagery ability less is known about this construct than the more popular visual imagery construct. The bi-factor structure of the VMIQ has been questioned, suggesting that it measures only visual imagery (Campos & Perez, 1990). The MIQ-R contains only four items of kinaesthetic imagery that measure ease of imagery. Similar to visual imagery, kinaesthetic imagery may possess a number of processes such as vividness and control. Thus, it is important to develop new measures that capture the complexity of kinaesthetic imagery ability.

The first aim of this study was to develop reliable and valid measures of kinaesthetic imagery that address the complexity of the construct. The second aim was to investigate the relationship between newly developed and established measures of imagery. Two new measures of kinaesthetic imagery, the Vividness of Kinaesthetic Imagery (VKI), and the Control of Kinaesthetic Imagery (CKI), were devised and validated. It was hypothesised that the VKIQ and CKIQ would show stronger correlations with the MIQ-R and the VMIQ, than with measures of visual imagery ability. It was also hypothesised that factor analysis of all questionnaires would result in the emergence of a visual imagery ability factor and a kinaesthetic imagery ability factor.

To test these hypotheses 149 participants from the University of Southern Queensland completed a battery of seven imagery questionnaires. The battery included: Betts' Vividness of Imagery Scale (QMI) (Richardson, 1969) a measure of vividness of imagery; Gordon Test of Visual Control (TVIC*)* (Richardson) a measure of control of imagery; Dean and Morris Imagery Questionnaire (D&M) (Dean & Morris, 1991) a total measure of visual imagery; Vividness of Movement Imagery Questionnaire (VMIQ*)* (Isaac, et al., 1986) a measure of visual and kinaesthetic imagery of movement; Movement Imagery Questionnaire-Revised (MIQ-R) (Hall & Martin, 1997) a measure of ease of visual and kinaesthetic imagery of movement; Vividness of Kinaesthetic Imagery (VKI) designed to measure vividness of kinaesthetic imagery and ease of imagery; and Control of Kinaesthetic Imagery (CKI) designed to measure control of kinaesthetic imagery and ease of image evocation.

Results as summarised here demonstrated that both the VKI and the CKI had excellent reliability with each exhibiting a Cronbach $\alpha = .96$ (Nunally, 1978). Principal Axis Factoring (PAF) was used to examine the factor structure of the VKI and the CKI. The results showed that both had a uni-dimensional structure. Analysis of the Pearson Product Moment Correlation provided good criterion-related validity for the VKI as the VKI correlated most highly with the kinaesthetic and vividness measures. Similarly, the criterion-related validity of the CKI was moderate. The CKI demonstrated similar correlations with all measures suggesting that control is an important aspect of: the vividness of an image; visual imagery ability; and kinaesthetic imagery ability. A single factor emerged from the PAF on the complete battery of questionnaires signifying a single imagery factor with kinaesthetic and visual components. This is in accordance with other imagery research that has found it difficult to distinguish the factors of imagery ability (see e.g. Burton & Fogarty, 2003).

Conclusions

The new measures of kinaesthetic imagery, the VKI and the CKI, were shown to be uni-dimensional measures with good reliability and validity characteristics. Analysis of the relationship between the VKI, CKI and established measures of imagery demonstrated that at this stage it is difficult to distinguish between visual and kinaesthetic imagery ability.

The new measures of kinaesthetic imagery ability require refinement, but offer greater specificity for researchers interested in examining the effect of these abilities on performance.

This information may then be utilised by athletes, coaches and sports psychologists in order to determine the best way to incorporate kinaesthetic imagery into a training program.

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