In the mind's eye

AIDAN MORAN *discusses mental imagery in sport: seeing, feeling and believing.*

MANY people believe that although sport is played with the body, it is won in the mind. Not surprisingly, sport performers increasingly turn to psychology in an effort to gain a 'winning edge' over their rivals. In this regard, mental imagery, or the ability to represent in the mind information that is not currently being perceived, is widely used by athletes in an effort to enhance their performance in competition. For example, the golfer Tiger Woods acknowledged the importance of 'seeing' and 'feeling' desired shots in his 'mind's eye' before addressing the ball:

> *You have to see the shots and feel them through your hands.* (quoted in Pitt, 1998, p.5)

Complementing such anecdotal insights are survey data showing that mental rehearsal techniques are both highly valued and practised routinely by top US Olympic athletes (Gould *et al*., 1998; Ungerleider & Golding, 1991). But what do we really know about the nature and use of imagery in athletes? What are the new directions in this field, and can the study of athletes' imagery shed new light on how the mind works?

Nature and use of imagery

Mental imagery plays a vital role in our existence. We use it to give directions to others, to try to remember where we parked our car, or to rehearse covertly what we wish to do or say in some future situation (e.g. at an interview). Diary studies (e.g. Kosslyn *et al*., 1990) show that about two thirds of our mental images are visual in nature – which may explain the dearth of research on auditory imagery (i.e. the ability to 'hear' an ambulance siren at will), or on its kinaesthetic counterpart (e.g. the ability to'feel' the muscular sensations elicited by running up a steep flight of stairs; Moran & Mac Intyre, 1998). Regardless of the sensory modality involved, imagery in athletes has been studied through a combination of in-depth interviews and psychometric tests (Hall, 1998). From such research three main findings have emerged concerning imagery use in sport (see review by Hall, 2001; Munroe *et al*., 2000).

To begin with, athletes tend to employ imagery more in pre-competitive situations (e.g. in the dressing room, on the starting blocks) than in training – a fact that suggests that they tend to visualise more for the purpose of performance enhancement than for skill mastery. Second, research indicates that athletes visualise for both motivational and cognitive purposes. The former category is rather ill defined but includes the imagination of specific goals and lowered arousal levels. For example, Richard Faulds, Britain's 2000 Olympic gold medallist in trap-shooting, used imagery to reduce performance anxiety:

> *The image is the ice-man. You walk like an ice-man and think like an ice-man.* (quoted in Nichols, 2000, p.7)

Cognitively, athletes use imagery for two main purposes – skill-learning and concentration improvement. In the first case, mental rehearsal involves a sequence of relaxing physically, closing one's eyes, and trying to see and feel oneself repeatedly performing a specific skill (e.g. a tennis serve) successfully in one's imagination. This use of imagery, called mental practice (MP), is facilitated by a specially designed 'script' that describes the skill to be learned in vivid, multisensory detail.

Interestingly, reviews of controlled experimental studies using MP show that it has a small but reliable effect on skill-learning (see Driskell *et al*., 1994). Specifically, people assigned to a mental practice condition when learning a simple motor skill tend to improve significantly more than those who are assigned to a control condition – but not as much as those who have physically practised the skill in question. This finding is somewhat paradoxical, as it shows that people can learn skills even when no sensory feedback is available.

In general, research reveals that MP is more effective for expert performers than for novices and that it is especially suitable for cognitive tasks (e.g. maze learning) that require sequential planning (see also Cooper *et al*., 2001). Unfortunately, little research has been conducted on the MP of sport skills by athletes in field settings.

Another cognitive application of imagery is as a concentration technique (Moran, 1996). In this case, athletes prepare for an event by visualising intended actions while practising in simulated competitive conditions. To illustrate, consider how Mike Atherton, the former England cricket captain, prepared mentally for a test match with Australia:

> *What I find really good for me is to spend a few solitary moments out on the pitch either the day before or on the morning of the match, which is when I do the visualisation stuff – what's going to come, who's going to bowl, how they are going to bowl…so that nothing can come as a surprise…the visualisation is vital.* (quoted in Selvey, 1998, p.2).

Clearly, a key function of imagery here is to automate one's responses to different possible competitive scenarios.

A third question probed by researchers in this field concerns the content of athletes' imagery. Unfortunately, attempts

to answer this question have been hampered by an age-old problem – namely, that it is very difficult to validate objectively the alleged content of people's imagery. Using qualitative methodology, however, studies show that the imagery of expert athletes is usually described as vivid, positive in content (except when anxiety encourages 'ironic' imagery – as happens when golfers say to themselves 'I hope I don't hit that large bunker!') and mainly visual in nature (apart from sports such as gymnastics where kinaesthetic imagery is required). A practical implication of such findings is that performers in target sports (e.g. golf) should be trained to visualise what they wish to achieve – not what they want to avoid.

New directions

Most studies in the field of imagery research are rather atheoretical in nature. Accordingly, the putative mechanisms underlying imagery effects in the learning and performance of athletic skills are unclear. So, future research should attempt to develop and test theoretical models of the imagery requirements of such skills.

Despite its apparent importance to athletes, kinaesthetic or 'feeling oriented' imagery has attracted less research attention from psychologists than has visual imagery. This oversight could be rectified by investigating the way in which expert sport performers cope with the 'force' and 'movement' demands of their chosen activity.

Another area with virtually no knowledge base is athletes' 'meta-imagery' processes – their beliefs about the nature and regulation of their own imagery skills. Clearly, it would be interesting to find out if top athletes have greater insight into, or control over, their imagery processes when compared with novices.

Finally, we need to tackle the task of validating athletes' reports of their imagery experiences. The problem here is that we may be approaching this task with the wrong theory. What if imagery were not so much something that people 'have' but something that they 'do'? If, as current cognitive research suggests, imagery and perception are functionally equivalent, then interference should occur when athletes are required to use these processes concurrently in the same modality. For example, athletes who claim to be using kinaesthetic imagery processes should display increased error rates and response latencies when required to perform a concurrent kinaesthetic perception task (e.g. estimating force or movement demands on their muscles) relative to athletes performing a secondary task in another sensory modality. Therefore, judicious use of dual-task methodology may help us to find out whether or not athletes are really using imagery when purporting to engage in mental practice.

Implications for understanding the mind

Although cognitive psychology is ostensibly concerned with understanding how the mind works in acquiring and using knowledge, it has devoted little or no attention to the world of athletic performance (although Frederick Bartlett used tennis and cricket examples when explaining his theory of schemata in the early 1930s). Indeed, the word 'sport' is conspicuously absent from the subject indexes of most textbooks of cognitive psychology. Nevertheless, imagery research in sport may help to enrich cognitive theory in several ways.

First, as explained above, sport provides a natural laboratory for the study of neglected topics such as kinaesthetic and meta-imagery processes. Second, it offers a sample of expert participants (top-class athletes) and a range of imagery tests (Hall, 1998) that may help researchers to make progress in understanding individual differences in cognitive processes. Interestingly, Kosslyn *et al*. (2001) point out that the question why people differ so much in imagery abilities remains largely unresolved. Finally, research on athletes could facilitate our understanding of the neural substrates of imagery. Recent studies (Behrmann, 2000; Kosslyn *et al*., 2001) show that people with vivid imagery show significantly increased blood flow in the occipital region when visualising. Does this pattern also emerge when functional brain-mapping techniques are applied to athletes skilled in the use of imagery? More adventurously, what areas of the brain 'light up' when kinaesthetic imagery processes are elicited?

These are just some of the cognitive issues raised by research on imagery processes in athletes. But this field has implications that go beyond empirical psychology. For example, it highlights the joy of 'playing in one's head' at any age – a practice evoked so magically by Seamus Heaney in his poem 'Markings':

We marked the pitch; four jackets for four goalposts, that was all…
And then we picked the teams and crossed the line our called names drew between us.
Youngsters shouting their heads off in a field, as the light died
And they kept on playing because by then, they were playing in their heads…

(from the collection *Opened Ground: Poems 1966–1996*, reproduced with permission of Faber and Faber Ltd)

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