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Thinking in action: Some insights from cognitive sport psychology

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ABSTRACT

Historically, cognitive researchers have largely ignored the domain of sport in their quest to understand how the mind works. This neglect is due, in part, to the limitations of the information processing paradigm that dominated cognitive psychology in its formative years. With the emergence of the embodiment approach to cognition, however, sport has become a dynamic natural laboratory in which to investigate the relationship between thinking and skilled action. Therefore, the purpose of this paper is to explore some insights into the relationship between thinking and action that have emerged from recent research on exceptional performance states (e.g., 'flow' and 'choking') in athletes. The paper begins by explaining why cognitive psychologists' traditional indifference to sport has been replaced by a more enthusiastic attitude in recent years. The next section provides some insights into the relationship between thinking and skilled action that have emerged from research on 'flow' (or peak performance) and 'choking' (or impaired performance) experiences in athletes. The third section of the paper explores some practical issues that arise when athletes seek to exert conscious control over their thoughts in competitive situations. The final part of the paper considers the implications of research on thinking in action in sport for practical attempts to improve thinking skills in domains such as business organizations and schools.

1. Introduction

At first glance, thinking and action seem to lie at opposite ends of the behavioural spectrum. After all, whereas people's thoughts are private, their actions are publicly observable – at least in principle. Despite its superficial plausibility, however, this apparent disjunction between thinking and action has proved to be problematic in cognitive psychology. It also has wider consequences both for conceptions of thinking and for educational approaches to teaching thinking. In order to understand these issues, however, a brief historical prelude is required.

During the 1970s, cognitive psychology was dominated by the information processing approach to the mind (see review by Lachman, Lachman, & Butterfield, 1979). At the heart of this approach lay the computational metaphor – the proposition that the mind is an abstract, incorporeal, general-purpose, computational system or thinking machine (Casey & Moran, 1989). This metaphor had at least three important implications for the study of mental processes such as thinking. Firstly, it suggested that thinking is a form of computation in which conscious knowledge is manipulated symbolically according to formal rules or programs. As a corollary, the formal study of thinking – or the mission of cognitive psychology – was deemed to be analogous to "trying to understand how a computer has been programmed" (Neisser, 1967, p. 6). Secondly, the computational metaphor assumed that the mind's cognitive and motor systems were functionally independent. In other words, research on cognitive processes such as thinking "could proceed independently from the study of sensorimotor

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processes and mechanisms" (Laakso, 2011, p. 410). Thirdly, the computational metaphor conveyed the impression that motor action was somehow less important than thought because it was merely the "uninteresting end-result of cognitive processing . . . the *aftermath* of cognition" (see critique by Freedman, Dale, & Farmer, 2011, p. 1; italics added).

Fortunately, the limitations of information processing psychology's disembodied approach to cognition were exposed by a combination of theoretical developments and empirical discoveries (see Laakso, 2011, for a detailed critique of this issue). Theoretically, the emergence of the 'embodiment' approach in the early 2000s promulgated the idea that cognitive representations are "grounded in, and simulated through, sensorimotor activity" (Slepian, Weisbuch, Rule, & Ambady, 2011, p. 26; see also Laakso, 2011; Shapiro, 2010). In other words, many of the brain circuits that are responsible for abstract thinking are inextricably linked to those that process sensory experience. Empirically, research on the 'functional equivalence' hypothesis (Jeannerod, 1994) showed that cognitive simulation processes (such as mental imagery) share certain representations, neural structures, and theoretical mechanisms with like-modality perception and with motor preparation and execution (Moran, Guillot, MacIntyre, & Collet, in press). For example, neuroimaging studies show that mentally simulated and executed actions rely on similar neural representations and activate many common brain areas such as the posterior parietal, premotor, and supplementary motor cortex (De Lange, Roelofs, & Toni, 2008; Munzert, Lorey, & Zentgraf, 2009). Based on such evidence, it seems clear that the neural substrates and psychological mechanisms of cognition and movement overlap significantly. Therefore, thinking cannot be arbitrarily decoupled from bodily action. Echoing this idea, Eysenck and Keane (2010) defined thinking as the 'internal processes involved in making sense of the environment, and *deciding what action might be appropriate*' (p. 1; italics added).

Against this background of shifting paradigmatic sands, and inspired by James' (1890) dictum that 'my thinking is first and last and always for the sake of my doing' (p. 333), the present paper will argue that action is the *hub* rather than the aftermath of cognition. And so, we can learn a great deal about how the mind works by studying 'thinking in action'. Of all the domains in which this theme could be explored, there is one that seems particularly suitable because of its emphasis on how thought becomes translated into skilled action – namely, sport. To illustrate the role of thinking in elite sport, consider an insight from Xavi Hernandez, the famous Spanish soccer player who won both World Cup (2010) and Champions' League (2011) medals. He revealed recently that when he joined Barcelona football club, "the first thing they teach is: Think, think, think" (cited in Lowe, 2011, pp. 6–7). But Xavi's exhortation to think raises at least four intriguing questions for cognitive psychology. First, what exactly should athletes think *about* in striving to achieve optimal performance in competitive sport? Second, can thinking too much about what one is doing – or trying to exert conscious control over actions that are normally performed automatically – cause one's skills to unravel? If so, why does this type of 'paralysis by analysis' occur? Thirdly, what practical issues arise when athletes attempt to control their thoughts more effectively? Finally, what are the implications of research on thinking and action in sport for the attempt to improve people's thinking processes in other domains such as education and business?

In addressing these questions concerning the relationship between thinking and skilled action, I shall draw on research findings from the burgeoning field of 'cognitive sport psychology' or the scientific study of mental processes in athletes (Moran, 2009).

The paper is organized as follows. To begin with, I shall explain why cognitive psychologists' traditional indifference to sport has been replaced by a more enthusiastic attitude in recent years. After that, I shall consider some insights into the relationship between thinking and action that have emerged from research on 'flow' (or peak performance) and 'choking' (or impaired performance) experiences in athletes. Of particular interest here is what happens when skilled athletes attempt to exert conscious control over their thoughts in competitive settings. Next, I shall consider some practical issues that can arise when athletes try to control their thoughts more effectively. Finally, I shall sketch some implications of research on the relationship between thinking and skilled action in sport for practical ways to improve thinking processes in other domains – from the classroom to the boardroom.

2. Cognitive psychology and sport: how indifference changed to enthusiasm

Although some early twentieth-century researchers (e.g., Judd, 1908; Lashley, 1915; Swift, 1910) used athletic skills to explore mental processes, cognitive psychologists have largely ignored the domain of sport in their quest to understand how the mind works (Moran, 2009). For example, the subject indices of popular textbooks in this field (e.g., Eysenck & Keane, 2010; Goldstein, 2011; Sternberg & Sternberg, 2012) contain few, if any, references to terms such as 'sport', 'athlete' or 'motor cognition' – the study of how the mind plans and produces skilled actions and movements. This oversight is surprising because competitive sport offers cognitive researchers a fertile natural laboratory in which to investigate how a combination of practice and pattern-recognition knowledge can help skilled performers to circumvent the limits of human information processing. For example, how do top athletes in fast-ball sports such as cricket or tennis manage to hit balls directed at them at almost 200 kmph – a speed which precludes the possibility of accurate visual tracking? In other words, how can they respond accurately to stimuli of which they are not consciously aware? By addressing the neuroscience of expertise in sport, researchers have discovered that, contrary to received coaching wisdom, cricket and tennis players do *not* actually "watch the ball" as it approaches them (Moran, 2012). Instead, based on extensive practice (see Williams & Ford, 2008), they use early signals ("advance cues") from their opponents' body position and/or limb movements to anticipate the type of delivery, trajectory and likely destination of speeding balls directed at them (e.g., see Müller et al., 2009). The