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Memory before the game

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Smith, D. K., & Holmes, P. (2004). The effect of imagery modality on golf putting performance. *Journal of Sport & Exercise Psychology, 26*, 385-395.

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Wakefield, C. J., & Smith, D. (2011). Frequency of PETTLEP imagery and strength gains: A case study. *The Sport Psychologist, 25,* 305-320.

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Memory Before the Game: Switching Perspectives in Imagining and Remembering Sport and Movement

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Keywords:

In a recent interview (Winner 2012), the Manchester United and England striker Wayne Rooney described his continued use of visualization techniques he had developed as a young player:

> Part of my preparation is I go and ask the kit man what colour we're wearing — if it's red top, white shorts, white socks or black socks. Then I lie in bed the night before the game and visualize myself scoring goals or doing well. You're trying to put yourself in that moment and trying to prepare yourself, to have a 'memory' before the game. I don't know if you'd call it visualizing or dreaming, but I've always done it, my whole life … when you get older and you're playing professionally, you realize it's important for your preparation — and you need to visualize realistic things that are going to happen in a game.

Given his attention to externally-observable details of his kit, it is presumably an external imagery perspective that Rooney deliberately cultivates. If the default hypothesis introduced in Morris and Spittle's (2012) rich and challenging target article holds good, the development and maintenance of such an external imagery perspective requires effortful cognitive control, necessary to overcome the automatic egocentric bias that grounds our more basic, default use of internal imagery perspectives. Their proposal breaks new ground in the study of the ubiquitous but

[1] My thanks to Wayne Christensen, Chris McCarroll, Doris McIlwain, Richard Menary, and Stef Savanah, and to the Australian Research Council's funding on Discovery Project DP120100187.

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elusive phenomenon of imagery perspective in sport and movement, coupling a productively critical evaluation of existing research with an intriguing developmental hypothesis. In this short paper I offer some integrative suggestions on how to assess and build on their work. I focus in particular on relations between imagery and memory, a surprisingly under-explored topic.

The fact that Rooney links visualizing with dreaming and remembering reminds us that cognitive domains which we researchers treat as separate fields are often, in practice, interwoven and mutually responsive. In drawing on broader studies of perspective-taking in developmental and cognitive psychology, Morris and Spittle (2012) helpfully point us toward the need to expand our theoretical horizons constantly. The kind of visual or visuospatial perspective primarily studied in research on both imagery and memory is, one might think, a rather literal kind of perspective. A more integrative psychology of perspective might connect visual perspective with nonvisual aspects of imagery and cognition, and with visual aspects of other cognitive processes. It might also address the interplay between distinct modalities and distinct domains. Visual, kinesthetic, emotional, and narrative perspectives need not coincide, and imagery processes most likely drive and are, in turn, informed in distinctive ways by (for example) memory, theory of mind, and spatial cognition. By first firmly distinguishing both of these different perspective modalities, and the operations of perspective in these distinct cognitive domains, we then open the door to investigating when and how they interact.

Rooney's idea of "having a 'memory' before the game" may seem curious, but it latches onto just this potential interanimation of imagining, remembering, and moving. The specificity of such *episodic simulation* (as we might call it) matters, with Rooney clearly believing that this kind of visual preparation can have performance benefits. In line with this expectation, Lisa Libby has shown that picturing a possible future action, such as voting in an election, from an external, third-person perspective makes participants not only more positive about and more highly motivated toward that action, but actually more likely to vote, compared to those who picture the same possible action from a first-person perspective (Libby, Shaeffer, Eibach, & Slemmer, 2007; see also Libby & Eibach, 2011). Shifting one's visual perspective in imagery, comment Libby and colleagues, "may appear to be a minor manipulation" but "may, in fact, be an effective strategy for translating good intentions into practical actions." a goal that athletes and movement practitioners would love to achieve reliably.

The future-directedness of these forms of visualization is not unique to imagery alone. Episodic or autobiographical memory, too, can have both kinesthetic and future-oriented dimensions and functions: When I recall playing *that* over-expansive cover drive to an outswinger on a good length early in last

week's cricket match, I may be reactivating not only some of the sensations and motor processes involved, but also resetting them for (with luck) better outcomes in my next innings. Remembering is, in many respects, for the future, functioning to direct action as well as to track the past (Bluck, Alea, Habermas, & Rubin, 2005; Conway & Pleydell-Pearce, 2000; Pillemer, 2003). Indeed, a striking consensus in recent theories of memory depicts a single complex neuropsychological system that grounds "mental time travel" to past and future alike: Closely related forms of "constructive episodic simulation" are involved both when we remember specific experiences and when we imagine and plan future events (Atance & O'Neill, 2001; D'Argembeau & Mathy, 2011; Schacter & Addis, 2007; Suddendorf, Addis, & Corballis, 2009). Thus, the mechanisms and functions of visual perspective-taking may also overlap when targeted on past and future experiences alike. Naturally, then, internal and external visuospatial perspectives can be adopted in autobiographical remembering as well as in imagery. In both cases, it matters that I see *myself* engaged in the actions in question. Morris and Spittle (2012) rightly lament the number of prior studies that sought to tap external imagery perspectives by asking participants to imagine watching somebody else perform a task. In the case of memory, when I see myself in a remembered scene, there is no uncertainty about my identity: I don't have to infer that these were *my* past actions and experiences, but just treat the self visualized in the scene as *my* past self in a way that is (both phenomenologically and neurally) entirely unlike remembering someone else's actions (St Jacques, Conway, Lowder, & Cabeza, 2011; Sutton, 2010). Self-representation is automatically engaged: Rooney doesn't waste time visualizing Ronaldo scoring goals.

Despite these obvious links between memory perspectives and imagery perspectives, the relevance for memory research of Mahoney and Avener's (1977) distinction between internal and external imagery perspectives has, perhaps, been underestimated. Nigro and Neisser, in their foundational paper on point of view in personal memory (1983), introduced the new terms of *field* (for internal) and *observer* (for external) perspectives. While there were more studies of perspective in imagery than in memory through the 1980s and 1990s, the last 10-15 years have seen an exponential growth in work on field and observer perspectives in autobiographical memory (Debus, 2007; Eich, Nelson, Adil Leghar, & Handy, 2009; Rice, 2010; Rice & Rubin, 2009). Among the robust results in this literature, imagery researchers may be particularly interested in the finding that memories are more likely to be recalled from an observer perspective when the person was more self-conscious, or self-aware, during the original experience, or is more self-conscious, or self-aware, at the time of the recollection (Cohen & Gunz, 2002; Robinson & Swanson, 1993). However, researchers in

imagery and memory should gain mutual benefits from assessing problems of operationalization and measurement in the two respective fields. Among the issues raised in this connection by Morris and Spittle (2012), I focus, as a telling example, on issues regarding the alternation or mixing of perspectives.

Morris and Spittle note that many participants "report extensive switching between the two [internal and external] perspectives both between and within imagery trials" (p.12). They have also helpfully reviewed prior suggestions in the literature, namely, that experts in certain domains may be more likely to switch perspectives and that switching is perhaps a "desirable method for experiencing imagery" (Morris, Spittle, & Watt, 2005, p.144, discussing Collins, Smith, & Hale, 1998; Hardy & Callow, 1999). Imagery researchers are to be commended for their long-standing interest in the switching of perspectives, even if this was (as Morris and Spittle note) sometimes due to a conflation between internal perspectives and motor or kinesthetic imagery (compare Morris, Spittle, & Watt, 2005). In the memory literature, in contrast, as Rice and Rubin (2009) show, many studies simply have *assumed* that internal (field) and external (observer) perspectives are mutually exclusive; participants are asked to respond either by simply indicating which perspective they adopted in retrieving each specific autobiographical event, or by using a single continuous scale to rate the perspective of each retrieval episode. In Nigro and Neisser's (1983) original studies, for example, participants had to choose either "observer," "field," or "neither," even though they noted that "subjects often say they can vary their perspectives at will" (p.478). In a recent clinical study of perspective in trauma memories, which is not discussed by Rice and Rubin, participants who spontaneously reported adopting both field and observer perspectives in recalling their traumatic experience "were encouraged to indicate the vantage point from which they predominantly remembered the event": if they continued to report both perspectives, they "were excluded from subsequent analyses" (Kenny et al, 2009).

Rice and Rubin (2009), in contrast, argue that field and observer perspectives are neither mutually exclusive nor even complementary but are, instead, independent, such that "the experience of perspective during a single retrieval attempt is not *either* first-person or third-person, it can be both" (p.887). In a series of elegant studies, they show that when participants are permitted to use two independent scales to indicate the degree to which a single memory comes to them as from their own eyes, and as an outside observer, they will often indicate that memories are accompanied, to a significant degree, by more than one perspective. The independent measurement framework for assessing memory perspectives that Rice and Rubin convincingly advocate, in preference to the standard complementary and mutually exclusive frameworks, could be adapt-

ed usefully for imagery research. So, too, could their subsequent methods for exploring the multiplicity of possible external perspectives. Morris and Spittle (2012) point out that "there are an infinite number of external perspectives from which imagery can be experienced," and that systematic variations in the specific external perspectives adopted in imagery for sport and movement should be both controlled for and explicitly addressed in future research (see also Callow & Roberts, 2010). Rice and Rubin (2011) asked participants to describe, rather than rate, their experience of perspective in memory retrieval and assessed the variety of external perspectives in terms of their distances, directions, and angles from the self in the remembered scene; making links with broader perspective-taking literatures in just the way that Morris and Spittle recommend, Rice and Rubin demonstrate that while "there is no single third-person perspective location" in autobiographical memory retrieval, the recall of specific event types does produce reliable construction of specific perspective locations. Memories of running away from someone, for example, tend to come from behind the remembered self, while "memories of swimming were anchored above the individual" (Rice & Rubin, 2011, p.575).

Morris and Spittle's (2012) default hypothesis about the development of imagery perspectives should be assessed in light of Rice and Rubin's candidate explanations for these findings on the flexibility and multiplicity of perspective in retrieval. Are perspective locations constructed on the basis of locations that individuals have experience in the past, or might other factors such as the likely location of other individuals in the remembered scene drive the construction of imagery? Setting aside this intriguing question for future research, I now briefly address the related issues of why and how we switch or experience multiple perspectives on the same (remembered or imagined) event. In addition to its intrinsic interest in sport psychology, this question is significant both in clinical psychology and philosophy of mind.

There are strong suggestions in the cognitive-behavioral literature on trauma and depression that observer (external) perspectives on past experiences are a cognitive avoidance strategy, employed consciously or automatically to regulate and minimize emotional arousal in order for individuals "to spare themselves the horror of reliving" (McIsaac & Eich, 2004, p.252), thus limiting emotional processing. This may be so, however, it needs to be proven empirically, without a prior conflation of visuospatial perspective and emotional perspective and without neglecting the possibility of experience in both field and observer perspectives on a single remembered (or imagined) event. Arguably, "emotional processing" need not be intrinsically any less likely when we adopt an external visuospatial perspective: The philosopher Peter Goldie, for example, defends the utility of external perspectives in driving emotional re-evaluation of past actions

and events, suggesting that sometimes it is only by responding from one's present perspective (rather than while still immersed in memory within the vantage point of the original experience) that one can "look the past in the eye" and integrate it into more process-based narratives (Goldie, 2003, 2012; Mackenzie, 2007). Thus, our capacity to switch perspectives, or to hold internal and external perspectives in mind at the same time, might be either triggers or symptoms of a capacity to integrate diverging perspectives on our actions.

Asking how individuals can experience multiple perspectives in memory retrieval, Rice and Rubin (2009) cautiously prefer the possibility that we switch rapidly during retrieval of a single experience over the possibility that "we experience multiple perspectives simultaneously" (p.887). The mature traditions of studying perspective-switching in movement imagery, which Morris and Spittle (2012) survey, should be assessed in this connection by memory researchers. It is not obvious that the notion of blended perspectives should be ruled out. Perhaps in visuospatial imagery and memory, as in some other cognitive domains, we are not necessarily bound by the limitations of the physical world: Perhaps, perspectives can coexist in memory and imagination in a way that they could not in perception. Compare, for example, the ways that we think spatially about the external world for the purposes of navigation and spatial planning. In the study of spatial cognition, internal and external perspectives are labelled "route," when I mentally journey along a real pathway, representing it from my own eyes within the scene, and "survey" when I work from a more objective (cognitive) map of the terrain (Wolbers & Hegarty, 2010). Barbara Tversky and her colleagues have shown that we often speak in terms of route and survey expressions in the same clause when describing navigational pathways (Taylor & Tversky, 1992). Tversky draws a striking parallel between the way in which our "spontaneous descriptions of space mix perspectives" in this way, and the fact that

> maps (as well as pictorial and other external representations) often show mixed perspectives; … many ancient and modern maps of towns and cities who the network of roads from an overhead view and key buildings from a frontal view. Like Cubist and post-Cubist art, maps can show different views simultaneously in ways that violate the laws of perspective, but that may promote understanding of what is portrayed. (Tversky, 2011, p.507).

Returning to the context of imagery in sport and movement, my speculation here is that experts in specific movement domains may have developed an ability to hold distinct perspectives in mind simultaneously, as well as more swiftly and effortlessly than non-experts, by adapting their visuospatial experience to the peculiar requirements of distinct components of their task. This is compatible with the default hypothesis proposed by Morris and Spittle (2012), but in their suggested experimental and attention-loading studies I predict additional

expertise effects. One possible (but avoidable) danger of the dual process framework that Morris and Spittle adopt is the tendency, due to overemphasis on the capacity and speed limitations of the controlled "system 2" processes, to neglect the possibility of expertise-driven processes that are fast and relatively effortless but still controlled and relatively unencapsulated. The effective chunking of representations with high information content in long-term working memory, for example, may permit flexible and controlled responses that still are practiced sufficiently enough to be resistant to some forms of attention loading in dual task paradigms (Christensen & Sutton, 2012; Ericsson & Kintsch, 1995).

Studies of the development of autobiographical memory offer a further point of contact with Morris and Spittle's (2012) default hypothesis. Early talk with parents and care-givers about the past scaffolds activities of joint reminiscing in which children can gradually participate more actively (Nelson & Fivush, 2004). The challenge of developing autobiographical memory is one of coordinating and aligning egocentric and objective conceptions of time (Campbell, 1994, 1997). The practices of memory sharing in which parents and children engage are a peculiar form of joint attention, directed — unlike other forms of joint attention — at the past. The practical engagement involved in jointly attending to past events helps the child understand that there can be different perspectives on the same once-occupied time (Hoerl, 2007; Hoerl & McCormack, 2005; McCormack & Hoerl, 1999). Likewise, the ability to represent one's self from the outside — using external perspectives in imagery and memory — might be another aspect of this gradual development of an objective conception of spatiotemporal reality as independent of one's current egocentric perspective. If this is correct, then we would indeed expect external perspectives to develop later in childhood, as Morris and Spittle suggest.

The developmental literature on visual self-recognition will also be vital in assessing Morris and Spittle's (2012) stress on the essential role of early experiences of perceiving one's own movement from an external perspective in mirrors or watching oneself on film and video. It is not immediately clear whether such an artefactually- or technologically-mediated experience of one's own reflected or filmed image is either necessary or sufficient for the capacity to construct and operate with a body image. On the one hand, Bedouin children with no prior access to mirror images seem to be able "to construct a body image from perceptual and sensory cues that they could coordinate and map onto the visual stimulus" provided by a mirror in a mark test, successfully showing surprise and acting appropriately when noticing a red dot on their reflected face (Howe & Courage, 1997, p.516, citing Priel & De Schonen, 1986). On the other hand, the imaginative generation of external perspectives in imagery might demand richer cognitive resources than are required for such basic mirror self-recognition,

which human infants consistently achieve around 18-24 months of age; this is, arguably, earlier than we might expect to find the capacity for external imagery, which we probably share with other animals including chimpanzees, great apes, and possibly also dolphins, elephants, and magpies.

But, to return to my first point, neither imagery nor memory operate in isolation. Wayne Rooney's musing as to whether his use of external imagery in having a "memory before the game" is really "visualizing or dreaming" is a reminder that external imagery perspectives are also constructed in dreams, and in other more or less unusual "autoscopic" experiences (Braithwaite & Dent, 2011; Brugger, 2002; Occhionero & Cicogna, 2011). Rather than pursuing these intriguing connections, I conclude this commentary with a plea for richer descriptive studies on the multiplicity of contexts and modalities in which perspectives are constructed and experienced. In addition to the occasional adopting of external perspectives in remembering, imagining, and dreaming, expert athletes also, of course, actively utilize actual film and video footage of their own past actions both in practice and in performance. These forms of review facilitate curiously hybrid experiences in which these external records can be coupled with or projected in different ways into athletes' own memories and, in turn, their visualizations of specific future events. At present, such technologically-mediated access to one's own actions is almost always clearly from an external perspective, although increasingly *in situ* recordings of first-person-style visual experience by head-mounted cameras are becoming available for subsequent review in elite sport. However, we need more detailed information, perhaps adding longer-term studies in cognitive ethnography (Hutchins, 1995; Kirsh, 2010) to Morris and Spittle's (2012) promising applications of concurrent and retrospective verbalization methods, about how expert practitioners in distinct movement domains actually use technology, memory, and imagery, and what integrative interactions they seek and engineer between these modalities. As Morris and Spittle note, some external perspectives on sports performance that would be physically impossible to achieve in perception can now be approximated or instantiated by new technologies, and perhaps (in their view, as a direct result) can be assimilated into expert imagery. I am not so sure that the processes and mechanisms of imagery construction are so constrained and literal as to be only able to use or replay specific perceptual data that has been previously processed either directly or by technological mediation. Likewise, I am not so sure that early "experiences of the self from the third-person perspective" will so directly drive the initial development of external imagery perspectives. But Morris and Spittle's (2012) default hypothesis is perhaps the most modest and tractable way of making sense of the apparent asymmetries between internal and external perspectives yet proposed in either imagery or memory research.

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Conceptual and Methodological Dilemmas in Imagery Perspectives Research: Piaget's Theory of Image Development as a Potential Explanation for Morris and Spittle's Default Hypothesis, with Suggestions for Future Research

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Keywords

Morris and Spittle (2012) have written a well-informed paper on an important topic in sport psychology: internal and external imagery perspectives. Their review of the literature has highlighted the dilemmas faced by researchers, and they have also proposed a fascinating default hypothesis to explain how these perspectives develop. Their hope is that by understanding this development, sport psychologists will be able to apply imagery perspectives more effectively with athletes to help them improve their performance. In this commentary I will focus on exploring these dilemmas more, providing further evidence endorsing the conceptual and methodological problems in research on mental imagery perspectives, relating the default hypothesis of internal and external imagery development to research by Piaget, and suggesting new avenues for studying the default hypothesis.

Research on Mental Imagery Perspectives: Some Persistent Conceptual and Methodological Dilemmas

Research on mental imagery perspectives is fraught with conceptual and methodological difficulties. Central to the study of imagery perspectives is the process of their operationalization. The measurement of imagery perspectives