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Commentary

'Cognitive Ethology' for humans: Inconvenient truth or attentional deficit?

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We discuss Kingstone *et al.*'s target article in the light of emerging work on cognitive ethology.

In their target article 'Cognitive Ethology: A new approach for studying human cognition', Kingstone, Smilek, and Eastwood (2008) remind us that it is important for cognitive psychologists and cognitive neuroscientists to keep asking whether their studies in the laboratory capture how humans think and act in their natural habitat. This reminder seems well warranted. When asking fellow researchers from these fields about their topics of research, one often gets answers like 'I study the Simon effect' or 'I study inhibition of return (IOR)'. And indeed, this is what people do. This indicates that certain experimental paradigms are perceived as worth studying in their own right.

Kingstone and colleagues rightly point out that we cannot simply assume that results obtained in tasks that are convenient for the researcher generalize to more complex real-life situations. They propose a new 'recipe' for studying cognition: researchers should systematically observe people's behaviour in the real world to identify relevant phenomena of study, relying on concepts prevalent in everyday life. From these observations, controlled laboratory studies should be derived that combine subjective and objective measures, as the integration of subjective reports and third-person observation provides more meaningful evidence than using each of these measures alone.

We are sympathetic to this approach and agree that certain areas of cognitive psychology and cognitive neuroscience, such as attention research, could benefit from (shall we say) paying more attention to real-world phenomena. However, we do not agree with the authors' assessment that there is a general 'pathological' response in the field or that people have ignored this issue. Rather, over the last 20 years, cognitive psychology, cognitive science, and cognitive neuroscience have seen increased interest

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in extending the range of phenomena that are addressed. In fact, there are a number of theoretical developments highlighted in these approaches concerned with the issues of situated cognition ('invariance' in the authors' terminology), distributed cognition, and conscious experience, which do address the issues raised by Kingstone and colleagues.

The term 'situated cognition' may still be associated with the challenge raised by educational psychology in the late 1980s to study learning as a situated activity (Brown, Collins, & Duguid, 1989). However, growing interest in the notion of embodiment (Wilson, 2002) has led to a much broader acknowledgement that the mind can only be understood in the context of different interactions with other agents and the environment (Clark, 1997; Varela, Thompson, & Rosch, 1991). Whereas extreme versions of embodiment imply that environment and cognitive system cannot be separated because of the dense information flow between them, more moderate positions rest on the idea that cognition is situated in particular perception-action contexts (Barsalou, 2008).

This latter assumption has led to new approaches in the study of a range of different cognitive processes, including language (e.g. Richardson & Dale, 2005; Zwaan & Taylor, 2006), thinking (e.g. Boroditsky & Ramscar, 2002), categorization (e.g. Tucker & Ellis, 2001), memory (e.g. Glenberg, 1997), problem solving (e.g. Knoblich, Öllinger, & Spivey, 2005), and numerical cognition (e.g. Lakoff & Núñez, 2000). In each case, the work attempts to take into account the real-time character of cognition, interactions between perception, action, and cognition, and constraints of interacting with the environment.

The notions of embodiment and situated cognition also imply that cognition can only be fully understood in the context of social interactions (Greeno, 1998; Smith & Semin, 2004). Rather than studying dedicated 'social processes' that may only occur in social interaction (such as mental state attribution or person perception), the core idea is that perception, action, and cognition are shaped by the social context in which we engage with others (Knoblich & Sebanz, 2006). This idea has indeed long been ignored in cognitive psychology and cognitive neuroscience, but is currently turning into a prominent topic.

To date, research in cognitive psychology and neuroscience has focused on how attention (e.g. Frischen, Bayliss, & Tipper, 2007) and action (e.g. Bach & Tipper, 2006; Sebanz, Bekkering, & Knoblich, 2006) are modulated by social context. However, increased interest in joint action – how people coordinate their actions to reach common goals (Clark, 1996) – has also led to new studies on the role of higher-level cognitive processes in social interaction (e.g. Galantucci, 2005). Kingstone and colleagues stress the importance of studying 'distributed cognition'. This term refers to the idea that cognition should be investigated at a group level rather than an individual level because cognitive systems consisting of more than one individual have properties that cannot be reduced to the cognitive properties of individual persons (Hutchins, 1995). Although studies undertaken within such a framework contribute to our understanding of cognition, we would like to point out that the social situatedness of cognition can be and has been addressed by focusing on individual minds in social context. This analysis extends our understanding of cognitive processes in the individual, shaped by the social context.

In addition to situatedness and distributed cognition, Kingston and colleagues stress the importance of relying on subjective experience. Although neuropsychological research is not really targeted in their discussion, it might actually provide an example for the authors' proposal in that patients' reports of cognitive deficits in combination

with observations guide the choice of phenomena to be studied and inform the scientific understanding of cognitive functions. For example, the subjective report of the conditions influencing neglect has led in our own work to a novel focus on the ways in which a task can modulate visual selection (Humphreys & Riddoch, 2001). We generally agree with the authors' assessment that there is widespread scepticism regarding the use of introspection, but it should also be noted that there is now a growing discussion of this issue (Jack & Roepstorff, 2003), particularly oriented to research on topics such as the experience of agency and body ownership (Tsakiris, Schütz-Bosbach, & Gallagher, 2007). To the extent that the experience of body ownership (e.g. in phenomena such as the rubber-hand illusion) is directly related to changes in measurable effects (e.g. the position of the hand in space), then it certainly pays to use introspection to at least guide further research.

Although, as noted, we do think subjective reports can add to a more comprehensive understanding of phenomena based on their phenomenology, we are sceptical about the authors' proposal to identify and describe phenomena of interest by relying specifically on everyday language. We do not think that everyday language will necessarily provide an adequate framework for the description of cognitive processes, though everyday reports may point to factors that can usefully be investigated (as in the case of neuropsychological patients). We need to distinguish between the use of everyday language to highlight topics of interest, and its use in building models.

To conclude, we think that Kingstone and colleagues' contribution raises an essential issue in cognitive psychology and cognitive neuroscience: the trade off between experimental control and 'naturalness' that has often led researchers to give up naturalness for control. We fully agree that this is a problem deserving our attention. However, given recent developments in research on embodied cognition and social cognition, we think that the field is already responding to many aspects of their call. Finally, we would like to point out that cognitive ethology (Griffin, 1978) is an established field of animal research that asks how Tinbergen's four questions about causation, on togeny, phylogeny, and adaptation (1963) can be applied to study cognition in nonhuman animals. Applying Tinbergen's questions to the study of human cognition may be the more ambitious project, and is likely to generate exciting new research that is rooted in real life (Tomasello, Carpenter, Call, Behne, & Moll, 2005).

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