Simpler for Evolution:

Secondary Representation in Apes, Children, and Ancestors

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A commentary on C.M. Heyes' target article: Theory of Mind in Nonhuman Primates

Abstract

Great apes show behavioural evidence for secondary representation similar to that of children of about two years of age. However, there is no convincing evidence for metarepresentation in apes. A good evolutionary interpretation should be parsimonious and must bring developmental and comparative data in accord. I propose a model based on the work of Perner (1991) and close by pointing out a logical flaw in Heyes' second proposed experiment.

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Although Heyes begins her argument by acknowledging developmentalists' progress in the field, she ignores the empirical and theoretical advances that have been made. Yet, these may hold the key to a sensible reconceptualization of the nonhuman primate data in an evolutionary framework. Such a framework can be based on Perner's analysis of children's developing understanding of the representational theory of mind.

The acid test for theory of mind in developmental psychology is the ability to attribute false beliefs (Wimmer & Perner, 1983), because it implies an understanding that mental states are attitudes to representations of the world rather than to the real world. Children pass false-belief tasks by about age four. According to Perner (1991), this is due to children's emerging general capacity for metarepresentation (i.e., understanding representations *as* representations). With this ability children can also distinguish between appearance and reality and can understand representational change (e.g., Gopnik & Astington, 1988). Other correlates include episodic memory (Perner & Ruffman, 1995), divergent thinking (Suddendorf & Fletcher-Flinn, 1997), imaginary object pantomime (Suddendorf, Fletcher-Flinn & Johnston, 1997) and a host of other skills that I categorize under the label *metamind* (Suddendorf, in press). Heyes is right that there is as yet no convincing evidence for a representational theory of mind in nonhuman primates, nor is the evidence convincing for any of the correlates of metarepresentation.

But children show a rudimentary consideration of mental states long before acquiring a metamind. By age two, they talk about mental states, engage in social pretence play, pass mirror self-recognition tasks, grasp synchronous imitation, and show empathic behaviour. Extrapolating from Perner (1991), one can argue that all these skills reflect children's new ability to form secondary representations (Suddendorf, in press). This is the ability to entertain and collate offline mental models (e.g., about past, future, or imaginary situations) in addition to the primary reality model. This ability is also evident in two-year-olds' skill at understanding hidden displacement, interpreting pictures and insightful problem solving. Correlations between mirror self-recognition, empathic behaviour, and

synchronous imitation have been taken as support for the emergence of the ability to form secondary representations (Asendorpf, Warkentin & Baudonniere, 1996; Bischof- Köhler, 1989; Suddendorf, in press).

The facts that all these skills develop in tandem and that they all appear logically to require secondary representations, ought to be considered in comparative and evolutionary accounts of theory of mind. Great apes are capable of secondary representation! Their capacity for insight (e.g., Köhler, 1917) shows that they can mentally compare a goal (secondary) situation with the present (primary) situation to figure out how to get from one to the other. In this light it is not very surprising that apes also display this skill in other realms such as understanding hidden displacement, pretence, mirror self-recognition, synchronous imitation, empathic behaviour, interpreting pictorial representation, and mental attribution of motivational states.

Great apes, in contrast to monkeys, show behavioural evidence very similar to that in two-year-olds in all these areas. The most parsimonious explanation of this similarity is that the same underlying mechanisms are involved. From an evolutionary perspective when all species of a superfamily (i.e., Hominoidea) share the same behavioural phenotype then this suggests homology (i.e., a common ancestor already possessed that skill). There is no apparent reason to assume that convergent evolution produced different mechanisms to create the same skills in all five sister species. Parsimony here does not refer to affordances on part of the individual or the researcher (as Heyes discusses), but to the simplicity of an evolutionary account of the data.

Combining developmental and comparative data, then, it seems reasonable to attribute the capacity to form secondary representations to two-year-old children, great apes and our common ancestor 15 million years ago. Although the ability to form secondary representations allows for limited attribution of mental states, it need not imply an understanding of representations *as* representations. Only by about age four do children develop a metamind. Since great apes have not yet demonstrated metarepresentation or any of its correlates, it has to be assumed that it evolved after our ancestors split from the line that led to modern chimpanzees. I have suggested that this occurred with *H. erectus* (dating from 1.8 mya) (Suddendorf, in press; Suddendorf & Corballis, 1997). However, it can, of

course never be proven that apes do not have a representational theory of mind. Experiments, like the ones Heyes proposes, should continue.

Heyes' second experiment, however, has a logical flaw. A subject who actually has a theory of mind would have to wonder how the trainer on the "back trials" knows how to consistently choose the wrong well. Consistently getting it wrong implies as much knowledge about which well is baited as consistently getting it right. A clever subject would therefore abandon a mentalistic strategy (choose the trainer who sees the baiting because he knows where it is) for a behavioural one (choose the indicated well if the trainer faces the well and the other if he turns his back). In order to encourage the subject to adopt a mentalistic strategy training should be realistic. That is, the trainer in the "back trials" should be guessing about the food location, and therefore be correct on half the trials. It would also seem sensible to validate the test design with children *before* attempting the more difficult task of testing nonhuman primates. More collaboration between comparative and developmental research is desirable. An evolutionary perspective should be the link.

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