

## **Kinesthetic-visual matching, imitation, and self-recognition**

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The chimpanzee Viki was raised in their home by Keith and Cathy Hayes (see Hayes 1951). Having been treated as a human child, Viki acted like one -- she played with her human parents, ate at the table, had trouble with toilet training, loved going for rides in the car, understood spoken language, used sounds to communicate her desires, pretended with imaginary objects, deceived, enjoyed attending to the pages of picture books, and used household tools like her parents. Her actions provided evidence for activities previously thought by many scientists to be largely if not exclusively human, most particularly her abilities for extensive bodily imitation and mirror-self-recognition. Although there had been earlier indications that great apes could imitate bodily actions and recognize themselves in mirrors (see Mitchell 1999a), Viki supplied the first experimental evidence that animals can imitate diverse actions, doing a good job of recreating the Hayes' actions when asked to do the same thing. Viki also used mirrors to clean up her face, attempt to pull out her tooth, and play with putting on lipstick, and thus clearly recognized her image (Hayes and Hayes 1955; Hayes and Nissen 1971). How is one to explain Viki's abilities?

Little attempt was made until several years later, when some primatologists came to believe that apes who recognized themselves in mirrors needed to have a remarkably well-developed self-concept to do so, including a complex knowledge of their internal states which was presumed to be useful in interpreting others' mental states. Although the basic idea that some sort of "self-concept" is required to self-recognize seems plausible (for how else can one recognize one's body?), the nature of the proposed self-concept was problematic -- how exactly did *this* self-concept allow an animal to recognize itself in a mirror? For example, how does knowing that one is self-congratulatory or selfish, or that one experiences mental imagery, or that others have mental states, lead one to recognize one's self in a mirror? Obviously one must have some knowledge of what one looks like -- a very specific form of self-concept -- but this raises a paradox: How can you know what you look like *before* you recognize yourself in the mirror? My answer to this question (or, more specifically, Guillaume's [1926/1971] answer), organized a whole field of research in a new way, tying self-recognition, bodily imitation and pretense, communication via simulation, recognition that one is being imitated, and mental planning together in one neat skill -- kinesthetic-visual matching (Mitchell 1993a, 1993b, 1994, 1997a, 1997b, 1999b, 2001).

Guillaume studied the development of imitation in children he knew well -- his own -- and came up with the idea that bodily imitation and self-recognition require matching between kinesthesia and vision. He argued that imitative development does not start with, but rather leads to, making matches between one's own and another's actions. According to Guillaume, initially children try to recreate the effects other people have on objects, and only gradually come to recreate other people's actions. By repeated attempts at re-creation, the child learns to match his or her own kinesthetic feelings to the visual actions of another, and also becomes aware of what he or she looks like to others, and in a mirror. In this way, children develop a match between inner and outer experience -- between their own subjective experiences and those of others. Piaget (1941/1962) acknowledged Guillaume's idea that mature bodily imitation (and mirror-self-recognition, contra Mitchell 1997a) derived from matching between kinesthesia and vision, but disagreed with Guillaume's depiction of development, arguing instead that the child imitates because he or she is interested in reproducing an action per se, not just its effects, thereby indicating intelligent awareness of the similarity between his/her own and others' actions, based on a match between kinesthetic and visual experiences. Whichever of these hypotheses is correct (and it is unclear that they are really as different as Piaget believed -- see Mitchell 1993b), the essential idea that kinesthetic-visual matching is necessary for self-recognition and any robust generalized imitation seems well taken. After such lucid solutions to the problem, Guillaume's and Piaget's hypotheses were (as so often happens in