Empathy

Philosophical and Psychological Perspectives

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Empathy, Imitation, and the Social Brain

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5.1 Introduction

Imitation and empathy have long been studied by developmental and social psychologists. These topics now are hotbeds of interdisciplinary activity and are being influenced by discoveries in cognitive neuroscience, which has begun to delineate the neural circuits that underpin these phenomena. The goal of this chapter is to bring together findings from developmental science and cognitive neuroscience on imitation and empathy.

We place imitation within this larger framework, and it is also proposed to be grounded in shared motor representations between self and other (Meltzoff & Decety (2003)) as well as regulated by executive functions (Decety (2006a)). Moreover, imitation has been theorized to scaffold the child's developing sense of agency, self- and self–other differentiation, which are also phenomenal characteristics involved in empathy. Thus, imitation and empathy are closely linked, but they are not underpinned by the identical neurological process. They are instead partially distinct, though inter-related. Studying the development and neural bases of these two abilities will enhance our understanding of both.

5.2 Infant Imitation and Foundations of Social Understanding and Empathy

Human infants are the most imitative creatures in the world. Although scattered imitation has been documented in other species, *Homo sapiens* imitate a larger range of behaviors than any other species, and they do so spontaneously, without any special training. Within the developmental literature, a good deal has been discovered about the origins and early development of the human capacity to imitate. A selective review of this work is provided below with the goal of assembling research that is relevant to

the modern discoveries about the neural mechanisms underpinning imitation and empathy.

5.2.1 Innate imitation

Meltzoff and Moore (1977) discovered that 12- to 21-day-old infants imitated tongue protrusion, mouth opening, lip protrusion, and hand movements. Infants responded differentially to two types of lip movements (mouth opening vs lip protrusion) and two types of protrusion actions (lip protrusion vs tongue protrusion). Other research demonstrated that infants differentiated two different types of tongue movements from one another, namely tongue protrusion that is thrust off-midline (slanted towards the corner of the mouth) versus the more typical tongue protrusion–withdrawal that occurs at midline (Meltzoff & Moore (1994)). Thus the neonatal imitative response is quite specific; it is not a global or a general arousal reaction.

There is also evidence that this early matching cannot be reduced to automatic resonance and is more interesting than may first appear. In one study a pacifier was put in infants' mouths as they watched the display so that they could only observe the adult demonstration but not duplicate the gestures. After the infant observed the display, the adult assumed a passive face pose and only then removed the pacifier. After the pacifier was removed, the infants imitated the earlier displays (Meltzoff & Moore (1977)). Other research documents imitation after the memory delay of 24-hours. Six-week-old infants came in on one day, observed the gestures, and went home. They then returned the next day and observed the person who showed the gestures the day before now sitting motionless with a passive face. Infants successfully imitated based on their memory of the person's now absent motor acts (Meltzoff & Moore (1994)). If the adult had shown mouth opening the day before, the infants initiated that gesture; if the adult had shown tongue protrusion, infants responded with that gesture.

Research also reveals that the response is not rigidly fixed in the form of a 'fixed-action pattern.' Infants correct their imitative attempts so that they more and more closely converge on the model demonstrated. For example, if the adult shows a novel gesture such as tongue-protrusion-to-the-side-of-the-mouth, infants will begin with ordinary tongue protrusions. They use the proprioceptive feedback from their own actions as the basis for guiding their response to the target (Meltzoff & Moore (1997)).

The participants in the previous studies were 2- to 6-weeks old. At first glance this seems young enough to justify philosophical claims about an 'innate behavior.' But perhaps neonates had been conditioned to imitate during the first weeks of life. Perhaps imitation is dependent upon prior mother–infant interaction. To resolve the point, Meltzoff and Moore (1983) tested forty newborns in a hospital setting. The average age of the sample was 32 hours old. The youngest infant was only 42 minutes old. The results showed that the newborns differentially imitated both of the gestures shown to them, mouth opening and tongue protrusion. Nativist claims are, of course, commonplace in the philosophical literature, but few tests have been conducted on newborns. You can't get much younger than 42 minutes old. *Homo sapiens* have an innate capacity

to imitate. The question now becomes: What psychological and neurological mechanisms underpin this capacity?

5.2.2 *The AIM mechanism for early imitation*

Meltzoff and Moore proposed that facial imitation is based on 'active intermodal mapping'—the AIM account (Figure 5.1). On this view infants can, at some primitive level, recognize an equivalence between the acts they see others do and the acts they do themselves. This is not a complex mechanism that requires cognitive machinations by the infant. Rather, there appears to be a very primitive and foundational 'body scheme' that allows the infant to unify the seen acts of others and their own felt acts into one common framework. The infant's own facial gestures are invisible to them, but they are monitored by proprioception. Conversely, the adult's acts are not felt by proprioception, but they can be seen. Infants can link observation and execution through what AIM terms a common 'supramodal' coding of human acts. This is why they can correct their imitative movements. And it is why they can imitate from memory: Infants store a representation of the adult's act and it is the target against which they compare their own acts. A detailed description of the metric infants use for establishing the common 'supramodal' framework between self and other is provided elsewhere (Meltzoff & Moore (1997)). The theoretical connections between infant motor imitation and human empathic reactions warrants close attention (see subsequent sections); the discovery of early motor imitation suggests a psychological and philosophical foundation for empathy prior to human language and complex adult thought.

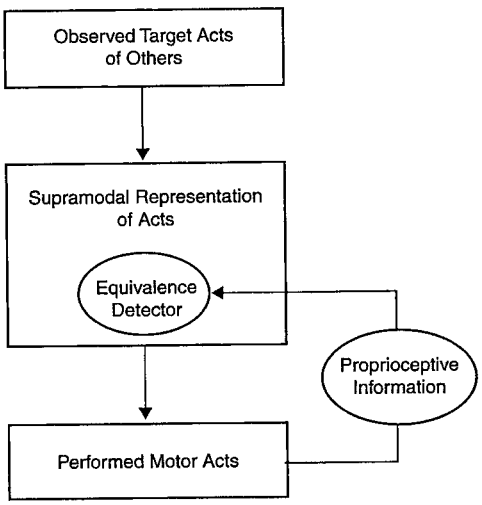

Figure 5.1 The AIM model of imitation. A supramodal representation unites the perception and production of acts within a common act space. The neural underpinnings of this supramodal representation are currently being explored (see subsequent sections of this chapter).

Source: Meltzoff & Moore (1997), with permission.

Meltzoff and Moore's hypothesis of a supramodal framework for actions emerged from developmental studies and fits well with proposals from cognitive science about action coding (the 'common coding' thesis of Prinz (1997, 2002)) and neuroscience discoveries about the mirror neuron system and shared neural circuits (see subsequent discussion in this chapter). The unique contribution from developmental science is that newborn imitation demonstrates that self–other connectedness is functional *at birth* in the human case. Imitation is a marker of innate intersubjectivity in action. At the same time, it must be underscored that newborn humans are different from both monkeys (who exhibit mirror neurons but little imitation), and from human adults. More analytic work is needed to determine whether the current convergences between the AIM hypothesis (on the psychological level), mirror neurons, and shared representations (on the neuroscience level), and other aspects of social understanding (at the philosophical level) are merely surface similarities or more substantive.

5.2.3 The 'Like Me' developmental framework

According to classical developmental theory (Piaget (1954, 1962)), newborn humans are 'solipsistic' and cannot apprehend any equivalences between self and other. The puzzle has always been to describe a developmental theory that could get an infant from such solipsistic beginnings to the empathetic, mindreading adults we see around us.

Instead of Piaget's infant solipsism theory, and based on the modern empirical work in developmental science, Meltzoff (2007a, 2007b) proposed a 'Like-Me' developmental framework for describing the infant's initial state and the early phases of intersubjectivity. The 'Like-Me' developmental framework holds that early imitation and the mechanisms that underlie it allow infants to see the behaviors of others as commensurate with their own and that this action coding in turn provides the groundwork for other developments in empathy and the grasp of other minds. The 'Like-Me' developmental framework has three steps which occur during the infancy period, prior to language (Figure 5.2). It describes the infant's innate state (step 1) and also provides an engine for change in interpersonal understanding (steps 2 and 3). The older child and adult are not locked into the same understanding of others as the newborn.

Step 1: Action representation. The first step in Meltzoff's developmental-psychological model is based on the innate equipment infants bring to interpersonal encounters. Newborn imitation provides evidence that the perception and production of acts are tightly bound in human beings. Meltzoff & Moore (1997) proposed that imitation is mediated by a 'supramodal' action representation that enables commensurate coding of acts seen and acts done (for neuroscience underpinnings, see subsequent sections of this chapter). This does not mean that the infant yet has a full-blown sense of self, which surely undergoes developmental change. Rather, it suggests that there is an innate capacity to connect actions produced by the self and observed in others. This fundamental interpersonal connection is not a learned 'association,' nor acquired by looking