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Dyadic interactions, attachment and the presence of triadic interactions in chimpanzees and humans

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ABSTRACT

From a developmental perspective, dyadic interactions with social partners and dyadic interactions with objects underpin early social cognition in humans and chimpanzees. In humans, dyadic social relationships form in the first three months of life, dyadic relations with objects form in the first 6 months of life, and triadic relations begin around 8–12 months. In chimpanzees, a similar developmental pattern is evident with dyadic social relationships forming in the first three months of life, dyadic relations with objects forming in the first 5 months of life, and triadic relations in the latter half of the first year of life. During ontogeny humans and chimpanzees experience emotional engagements, both with social partners and with objects, and these impact outcomes in social cognition. Rather than being considered too complex, diversity of socio-emotional experiences during development can be embraced, with the goal to specify how they influence social cognition outcomes in humans and in chimpanzees. This process may provide the evolutionary and biological foundations for plasticity.

1. Introduction

Primates form socio-emotional bonds from infancy, primates interact with objects in their environment, and primates communicate. Early forms of social cognition are manifest when primates communicate intentionally or otherwise engage jointly with others about objects or events. Current theories of the evolution of social cognition highlight the importance of cognition, primarily, and of cooperative motivations, secondarily (e.g., Dean, Kendal, Schapiro, Thierry, & Laland, 2012; Herrmann, Call, Hernandez-Lloreda, Hare, & Tomasello, 2007), but these early forms of social cognition may rely more on emotional engagements than cognition (Bard, Bakeman, Boysen, & Leavens, 2014). In support of this aim to discuss the emotional engagements that underpin social cognition, the term 'coordinated joint engagement' (Bakeman & Adamson, 1984) will be used rather than 'joint attention'. This definition offers three advantages to the term joint attention; 1) it allows diversity in the forms of social cognition, beyond the visual modality typical of attention; 2) it focuses on the coordination between infant and social partner; and 3) it places emphasis on the process of joint engagement, that is when infant and social partner are together jointly engaged with some object or event.

By focusing on engagement rather than just visual attention, differences are allowed in the modality with which infant and/or social partners jointly engage. Allowing diversity in the form of early social cognition is important since modalities of engagement differ across some settings and across some cultures (e.g., some cultures prefer face-to-face engagement whereas others prefer physical contact engagement with 3-month-old infants: Keller, 2007). The more conceptual term of

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'engagement' rather than 'attention' also allows for variety in the form of resulting events. For example, in some cultures it is not polite to point (Wilkins, 2003), and in some cultures, it is not polite for children to look at their elders in the eye. A typical instance of joint engagement between 1-year-old infants and adults in a rural non-Western culture can be found in the culturally specified 'give & give back' offering of objects in social exchange (Bakeman, Adamson, Konner, & Barr, 1990), in which infants do not meet the eyes of their elders (Mead & Macgregor, 1951). This pattern contrasts with typical examples of coordinated joint engagement in urban Western cultures, which include infants pointing to or 'showing' an object to an adult, i.e., moving an object into the visual field of a social partner (directing the attention of a social partner to an object, e.g., Salomo & Liszkowski, 2012).

In this review, I will discuss the foundational aspects of early social cognition in dyadic interactions (with social partners & with objects), in triadic interactions (among infants, social partners, and objects), and in attachment (the emotional bond with social partners: e.g., Bullowa, 1979). This review necessarily will take a developmental perspective: In humans, dyadic social relationships form in the first three months of life, dyadic relations with objects form in the first 6 months of life, and triadic relations form beginning at 8–12 months (e.g., Adamson, 1996). In chimpanzees, dyadic social relationships form in the first three months of life (Bard, 1994; van Lawick-Goodall, 1968), dyadic relations with objects form in the first 5 months of life (Bard, Bakeman et al., 2014), and triadic relations form beginning around 4–12 months of life (Bard, Bakeman et al., 2014; Bard, Dunbar, Maguire-Herring, Veira, Hayes, & McDonald, 2014). Interactions during ontogeny are crucially important for human infants to become intentional beings, yet little comparable attention has been given to the impact of these same processes in support of ape infants becoming intentional beings. The Lived Experiences model is proposed for the study of primate social cognition since it specifies evolutionary and biological foundations by which socio-emotional experiences during development influence social cognition outcomes (Bard & Leavens, 2014; Leavens, Hopkins & Bard, 2005).

Joint attention is said to be important because of its link with language. To learn the names of things, for instance, the infant must be able to coordinate the word with the 'thing', the referent for which the word stands. More broadly, however, joint attention is required for many of the forms of coordinated joint engagement, such as intentional communication (i.e., using a pointing gesture to indicate to a social partner, the location of a desired object). Joint attention also underlies social learning, especially imitative learning, and social referencing.

There is an extensive indirect literature indicating that chimpanzees have joint attention. The numerous ape language projects provide compelling evidence that chimpanzees can learn symbols (reviewed in Bard & Leavens, 2014). Chimpanzee adults communicate intentionally with gestures (e.g., Call & Tomasello, 1996; Leavens, Hopkins & Bard, 2005; Leavens, Russell, & Hopkins, 2005), as do orangutans (Bard, 1992; Cartmill & Byrne, 2010), and gorillas (Genty, Breuer, Hobaiter, & Byrne, 2009; Tanner & Byrne, 1996). Joint attention is required for an individual to learn something about an object from watching how a social partner manipulates it (broad definition of social learning, including imitation). Chimpanzees have learned to imitate actions on objects (Whiten, Custance, Gomez, Teixidor, & Bard, 1996) and learned to imitate tool use by watching others (Bard, Fragaszy & Visalberghi, 1995): Imitative learning requires joint attention. Chimpanzees have engaged with a social partner to learn about how an object functions as a tool (Tomasello, Davis-DaSilva, Camak, & Bard, 1987). Some theorists suggest that although chimpanzees may engage in joint attention, that it is not 'truly joint' because there is not evidence of the requisite "knowing together" (Carpenter & Call, 2013). There is a growing body of research that supports the conclusion that joint attention is not unique to humans: Joint attention is found in chimpanzees, and the other great apes.

In this review, I focus on the roles that emotion and engagement play in the development of coordinated joint engagement, and explore how this might help us to understand why different studies arrive at different conclusions about the capacity for joint attention in chimpanzees. In particular, there may be differences in emotional responsiveness, or emotional engagements with social partners and with objects, or in the motivation to coordinate engagements with social partners. In other words, emotion might play a role at each stage in the development of joint attention.

2. Enculturation and socialization effects

Chimpanzees are responsive to various environmental factors, including social partners and their cultural practices. 'Enculturated' was a term used to describe chimpanzees that had been raised by humans in language-enriched environments (e.g., Carpenter, Tomasello, & Savage-Rumbaugh, 1995; Tomasello, Savage-Rumbaugh, & Kruger, 1993). These enculturated apes showed enhanced outcomes in imitation, joint attention, and tool use compared to chimpanzees not raised in these environments. Bard and Gardner (1996) extended this concept by arguing that since chimpanzees were always responsive to the socialization process, they could be said to be enculturated by any set of socialization experiences, whether in response to a particular human social environment (human enculturated) or a particular chimpanzee social environment (chimpanzee enculturated). However, the majority of researchers reserved the term 'enculturated' to refer only to being raised in a human culture, in particular, with a symbol system.

Chimpanzee infants can be influenced by a diversity of human cultures (see below), as well as a diversity of chimpanzee cultures (e.g., Whiten et al., 1999). Therefore, there is a need to specify the details of the socio-ecologies experienced by infants across settings, to understand the influence of environmental experiences in infancy on outcomes later in life (e.g., Bard & Leavens, 2014). For example, many of the comparisons reviewed here are between two groups of chimpanzees raised in the Great Ape Nursery of the Yerkes National Primate Research Center. Although both groups were raised by humans in this biomedical institution, while living full time in groups of 4–6 same-aged chimpanzees, one group (Standard Care) experienced less than 1 h per day of human caregiving (common to institutional care), whereas the other group (Responsive

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