(Hudson 1993; Hudson et al. 1995). This reprises the issue of the role of partial understanding in development. Researchers examining the role of event knowledge in children's cognitive development have argued that knowledge displayed within familiar contexts provides the foundation for later, more generalized skill. Just as a lexicon for talking about the mental world provides children with a cognitive resource for reflection and interpretation, children's GERs allow initial "understanding-in-action" to be consolidated through reflection on internal event representations.

We propose that a more social-interactional approach is needed at this stage of social-constructivist theory development. All of these lines of research stem from approaches emphasizing the social-cultural embeddedness of development. Although specific mechanisms may vary, they constitute a "family" of social constructivist approaches. Our single concern with the C&L model is that it may not be adequately inclusive. The tendency to label as "passive enculturation" approaches that vary in small degrees from the C&L position may limit the potential for integration across research domains. Rather than focusing on differences from an individualist framework, joint attention on common principles and collaborative interactions may be more fruitful for theory development.

What infants know about intentional action and how they might come to know it

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Abstract: Carpendale & Lewis (C&L) propose that social knowledge is constructed from triadic interactions. This account generates testable predictions concerning social knowledge in infancy. Current evidence is not entirely consistent with these predictions. Infants possess action knowledge before they engage in triadic interactions, and triadic use of an action does not always precede knowledge about the action.

Carpendale & Lewis (C&L) propose an ontogenetic relation between interacting and knowing: By participating in increasingly well-organized social exchanges, children come to construct a theory of mind. Evaluating this proposal requires measuring both social actions and social knowledge. Given this requirement, C&L's review reveals striking gaps in the empirical record. The infant work presented concerns assessments of social behavior, although underlying social cognition (or lack thereof) is only inferred. The studies of older children concern social cognition as assessed in interview studies, with factors such as parenting style standing as proxies for children's social interactions. A full account must address both gaps. We will focus on the first.

C&L propose that triadic interactions, in which the infant and caretaker mutually coordinate attention on the same object, are necessary for the construction of social knowledge and, ultimately, a theory of mind. Because infants do not engage in triadic interactions until the end of the first year of life, this account predicts that they have not yet begun to construct social knowledge. C&L further predict that, once triadic interactions are established, social behavior relevant to a particular aspect of intentional knowledge will emerge before the knowledge itself does. Recent evidence from our laboratory and others' speaks to these predictions. This evidence indicates that triadic interactions and social knowledge do not always travel together in ontogeny.

Aspects of social knowledge are present months before infants engage in triadic interactions. Infants represent actions not as purely physical motions through space but rather as directed at objects or states of affairs (Baldwin et al. 2001; Csibra et al. 2003; Gergely et al. 1995; Moore 1999; Woodward 1998; Phillips et al. 2002). To illustrate, in one study (Woodward 1998), 6-month-old infants viewed a person reaching for and grasping an object. Following habituation, infants demonstrated a stronger novelty response to test events that disrupted the relation between agent and object than to test events that maintained this relation while varying the spatial properties of the reach. Infants did not respond in this way when viewing inanimate objects that touched or grasped other objects, or when viewing manual contact that appeared purposeless to adults (Woodward 1999). Therefore, infants' social knowledge reflects a foundational aspect of mature conceptions of intentional action – namely, that certain human actions are object-directed (see Barresi & Moore 1996).

This work highlights infants' knowledge about instrumental actions. C&L focus on interactions in which infant and caregiver share attention, as expressed by looking and pointing. But these are just a subset of the actions that adults view as intentional. Indeed, many investigators have elucidated infants' developing ability to extract the goals behind observed instrumental actions (Gergely et al. 2002; Meltzoff 1995; Wenner & Bauer 1999; Woodward & Sommerville 2000). Our recent findings are consistent with the thesis that experience contributes to infants' construction of social knowledge; however, in this case what matters appears to be infants' experience of acting on objects rather than of participating in triadic interactions (Sommerville & Woodward, in press).

Recent studies also elucidate infants' knowledge about the actions involved in triadic exchanges. Infants begin to follow gaze during the first year of life, but, as many have noted, this observation alone does not tell us whether infants understand the "looking at" relation (e.g., Barresi & Moore 1996). Several studies indicate that by 12 months, infants encode looking and pointing as relational (Moore 1999; Phillips et al. 2002; Woodward 2003; Woodward & Guajardo 2002). Prior to 12 months, infants respond to gaze by orienting their own attention but seem not to encode the relation between looker and object (Woodward 2003). This pattern of findings is consistent with C&L's proposal. Infants begin to understand the looking relation after several months of responding appropriately to shifts in others' gaze.

However, the emergence of pointing suggests that this pattern does not hold in all cases. Knowledge about pointing is evident before infants employ it robustly in triadic interactions. Infants' first points are often described as indexing their own attention rather than being communicative (Bates et al. 1979; Schaffer 1984a). It is not until 12 to 15 months of age that infants produce points in a clearly communicative manner and follow others' points to their distant referents (Bakeman & Adamson 1986; Carpenter et al. 1998; Desrochers et al. 1995). Furthermore, infants do not use contextual cues to determine when to point until around their second birthday (e.g., Dunham et al. 2000; Moore & D'Entremont 2001). Consistent with the thesis that experience is related to knowledge, at 10 months, those infants who produce object-directed (but not clearly communicative) points understand observed points as relational (Woodward & Guajardo 2002). Therefore, although experience may contribute to infants' knowledge about pointing, the evidence suggests that the relevant experience is not triadic in nature.

To conclude, recent findings indicate that although triadic interactions may be one source of infants' social knowledge, they are not the sole source. Infants are sensitive to the object-directedness of instrumental actions well before the onset of triadic interactions and come to understand certain actions before using them in triadic interaction. In addition to interaction, firsthand agentive experience is a likely contributor to this system of knowledge. That is, there seems to be more than one route into social understanding. This may account for the fact that all normally developing children construct a theory of mind despite the existence of broad cross-cultural variation in the nature of early triadic interactions and habits of talk about the mind (Lillard 1998; Rogoff et al. 1993).