

Joint attention and homology

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Joint attention, or the sharing of attention among people to some object or idea, provides a thread through much of development for the ways in which people acquire and utilize shared knowledge. You, the reader, are engaging in an act of joint attention with me as you read this. It is an act that is spread over time in that I wrote this well before you are reading it. It is also a quite abstract act of joint attention in that the object of our shared attention is a set of quite esoteric ideas represented in language. But, I argue, in a very real sense it is developmentally continuous with the simplest acts of gaze following that herald the onset of object-focussed interactions in the third quarter of the first year of life. In this paper, I will sketch the developmental sequence that characterizes the ontogeny of joint attention. I will point to the important developmental transitions in this ontogeny. My overall goal is to use joint attention as grist for the mill of our joint conceptual efforts in this workshop to theorize how the concept of homology may elucidate developmental continuity and change.

In infancy, joint attention is generally recognized to begin when infants start to interact with a caregiver over an object of shared interest. Several interactive behavioral phenomena that emerge in the second half of infancy characterize the phase of ‘triadic’ interactions. These interactions involve infant and adult interacting over some other object. They are termed ‘triadic’ because they involve three points of interest - infant, adult, and object - and are differentiated from earlier ‘dyadic’ interactions in which infants interact with adults in a face-to-face way but not incorporating an object into the interaction (**see figure**). Triadic interactions

actually involve the coming together of two lines of development - social interest and object interest. From as early as two months of age, infants start to engage in emotionally charged face-to-face interactions with other, notably caregivers. These interactions are highly motivating for young infants (and their caregivers). They tend to be characterized by positive emotion and are genuine interactions in the sense that both participants act reciprocally and influence the progress of the behavioral exchange. Later towards the middle of the first year, infants become interested in objects - reaching, grasping, and manipulating them. However initially these two lines of development - social interest and the object interest - are quite separate. But by about 8 months, infants start to become able to involve objects in their interactions with others. Examples of manifestations of these triadic interactions include gaze following, showing, object exchange (giving and taking), and early gestural communicative behaviors such as pointing. All of these triadic interactive behaviors involve joint attention, whereby the infant and adult share attention to an object of mutual interest, act on the object and at the same time use the object as a means to enhance the interaction with each other.

Gaze following provides perhaps the simplest manifestation of joint attention. In its earliest appearance, gaze following involves the infant, while in an interaction with an adult, observe a gaze redirection (head turn) by the adult and then turns in the same direction relative to the environment. Considerable experimental work has been carried out on various aspects of this phenomenon using modifications around a standard paradigm. This paradigm involves the infant seated face to face with an adult who engages the infant in interaction. Periodically the adult turns to one or other side to fixate a target object in the periphery and the infant's own gaze redirection is noted. Using this approach the impact of target location and gaze cue have been

investigated. In brief, we know that gaze following begins as early as 3 to 6 months when the targets are within the visual field and perhaps 3 to 6 months later when targets are outside the immediate visual field. At first gaze following involves the infant turning to the appropriate side but not necessarily fixating the same target as the adult, if there are more than one possible target. By the end of the first year, infants will use the adult's gaze to determine which of a number of targets is of interest. This development is important because it reveals how infants truly recognize the intentionality, or object-directedness of the other's gaze. Around the same time, infants will start to use gaze to find targets that may be hidden behind barriers or in containers. This transition suggests that infants are beginning to appreciate that the other's attention may be directed at absent objects.

Gaze following is one side of the achievement and maintenance of joint attention. Towards the end of the first year, infants also become adept at directing an interactive partner's attention. Infants will show objects to other by holding them up for others to see and by offering them to others. They also begin to direct attention using pointing, typically first to proximal objects and before long to more distally located objects. With joint attention, a variety of forms of interaction become possible. For example, infants can use an adult's emotional display to determine how to act in an ambiguous situation, such as with a novel and perhaps unusual toy. Together, therefore, following attention and directing attention demonstrate how infants incorporate objects as 'topics' about which interactions can take place.

Joint attention of this kind has been repeatedly shown to be important for early language learning. Tomasello (2003) and others have shown how joint attentional interactions support the

acquisition of novel nouns and verbs. Infants more easily acquire novel words when these are introduced by adult speakers during episodes of joint attention. Initially in language learning, words acquire their meaning as supports for joint attention. Infants use words spoken by others to determine the object of the other's attention. They use words themselves to direct another's attention and initiate or maintain an interaction around the focus of attention. So the onset of language is intimately tied to the capacity for joint attention.

So far, we have been talking about joint *visual* (or perhaps perceptual) attention. Through gaze following, pointing and the like infants can share visual attention to an object (or event) that exists in the immediate environment (even if not immediately visible). But the transition to language enables a critical shift from joint visual attention to joint *representational* or *conceptual* attention. The immense value of language to move joint attention to another level is that words can represent objects that are not immediately present. Words are at first tied to concrete present objects and events but before long, infants become capable of using and responding to words in reference to absent objects. The reference to a nonpresent object by an adult serves to conjure in the infant's mind an image of the referent. Similarly, the infant imagining something not present can use a word to refer to it and thereby re-present it to the adult for consideration. Once the object or topic is established through lexical representation, joint attention can ensue, but now it is not joint visual attention but joint *representational* attention.

I want to briefly consider two further developments. First, a fundamental aspect of the transition from infancy to childhood during the second year of life is the nascent ability to imagine not just nonpresent or absent objects but also imaginary objects. This ability is best illustrated by the

onset of pretend play. A classic example of pretence is the use of one object as if it is something else (Leslie, 1987). Pretence manipulates reality so that the true state of the world is adjusted to an imagined state. For instance, the child may pretend to drink out of an empty cup or use a stick as gun. Pretence reflects the ability of the developing mind to imagine counterfactual situations and language can be used in the service of this activity. Thus, the child may use language to represent an imagined situation for another person so that joint attention can be established to this imagined scenario rather than the real state of affairs.

Second, although language typically takes hold of joint attention one word at a time, by the end of the second year, children are often using multiple word utterances. Multiword utterances, and the syntax that organizes such utterances, commonly constitute a form of joint attention, whereby one word or phrase is used as a ‘comment’ on another word or phrase, the ‘topic’ (Tomasello, 2003). The topic is the object of joint attention while the comment is the manner in which the speaker wishes to stimulate interaction over that topic. The use of complex language in this way is evident by two years of age typically and it is not fundamentally different than the discourse that characterizes almost all human interaction, including our current mutual engagement as workshop participants.

Some literature

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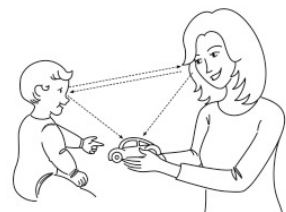
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Dyadic interaction



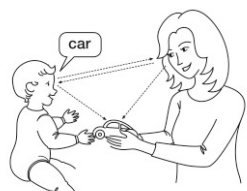
Object interest

Joint attention over concrete objects in view (gaze following)



Spatial awareness

Joint attention over concrete objects not in view



Language (words)

Joint attention over absent objects

Imagination

Joint attention over imaginary (counterfactual) objects

Language (syntax)

Joint attention over propositions (workshop on developmental homology)