This post is part of our ‘Pedagogy theory week’ series.

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For a very short presentation of pedagogy theory, see the Monday post. In this post, György Gergely replies to Marion’s Tuesday post on the A-not-B task.

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Marion scrutinizes the theory’s alternative account of how ostensive cueing leads to the induction of perseverative search errors in the A-not-B task, as shown by Topal et al. in their 2008 paper. Marion agrees that the demonstrated strong (even if not full) dependence of the perseverative errors on the presence of ostensive communicative signals represents a serious challenge to currently dominant accounts of this phenomenon (e.g., in terms of lack of sufficient inhibitory control over primed and prepotent motor responses). She argues, however, that Natural Pedagogy’s account in terms of the ostensively triggered ‘Genericity Bias’ assumption, as it is currently stated, fails to provide a satisfactory explanatory alternative. She points out that without further specifications of the level of genericity and type of projectible kind categories to be assigned as a function of ostensive signals, Natural Pedagogy theory remains compatible with an overly broad range of possible interpretations among which it has no principled way to choose. She plausibly argues that the ostensively demonstrated hiding actions are equally compatible with being about some generic property of the kind of objects hidden (e.g., what’s the ‘proper place’ they should be stored at), or about the kind or manner of hiding actions performed, or about the proper function of the container (e.g., Container A is for storing (this kind of) objects), etc. Marion recommends that “natural pedagogy’s advocates should distinguish more clearly cases where information conveyed is descriptive and concerns object-kinds (“knowledge-that”) from cases where it is normative and concerns action-kinds (“knowledge-how”). Otherwise, the interpretation of infants’ behavior is blurred by the fact that one is unable to clearly state what information is being conveyed, and what task infants are really performing.” Marion ends up concluding that due to this indeterminacy “whatever information is conveyed during habituation trials, Natural Pedagogy’s advocates can still claim that it is in view of their interpretation bias for genericity that infants perseverate in searching for the object under A”.

First, let me concede to Marion that the Topal et al. study is compatible with a number of possible interpretations that would satisfy the Genericty Bias and that, as it stands, the study is mute on which generic interpretation is actually assigned by the infants. However, this is simply an empirical matter: with laborious experimental work we (or others) should be able to differentiate between such interpretations and test them one by one, in principle eventually zeroing in on the specific type of generic interpretation that infants have assigned and that can be shown to determine their perseverative responses. For example, we were contemplating of running a condition in which we planned to change the identity of the object that is hidden during A vs. subsequent B trials to see whether it is some generalization about the type of object being hidden that infants have inferred to be communicated to them. Fortunately, we didn’t have to run this condition because when searching the (enormous) literature on the A-not-B task we have discovered a (long forgotten) highly relevant study by Shubert et al. (1978) that carried out precisely this manipulation. The results are clear and informative: there was a significant reduction in perseverative A searches in the toy-change condition (only 4 out of 12 infants during the first search trial) when compared to the same-toy condition (11 out of 12) – and the pattern of errors in subsequent trials was also significantly reduced. This cannot be predicted purely on the basis of ‘information about action’: the object’s identity (or kind) seems to have been clearly involved in the interpretation that infants have assigned.

The theoretical point that I am trying to make here is that I don't think that specifying the level of genericity to be assigned in referential interpretation should be prescribed by the ostensively induced Genericity Bias itself. I don't agree with Marion that Natural Pedagogy theory should formulate the Genericity Bias so that it should somehow spell out and specify the particular level of genericity, the degree of width of referential scope, or the specific content types that the infant's referential interpretation of different ostensive communicative acts will arrive at. Vagueness with regards to specifying genericity is not a weakness of Natural Pedagogy theory or its formulation of the Genericity Bias hypothesis. Specifying the level of genericity arrived at any given act of ostensive communication is a matter of pragmatic inference that is based on the available communicative and contextual information (including background knowledge) that bear on the specification of the scope of intended reference that the communicator attempts to convey. Genericity Bias simply implements a built-in expectation that ostensive referential communication is a distinguished informational source used for the cultural transmission of shared and generalizable knowledge about generic types of referents. It is an interpretive 'bias' on inferential processes of referential disambiguation that fosters the assignment of wide-scope and generic interpretations over episodic ones as long as the former are compatible with the communicative and contextual evidence available.

The Genericity Bias assumption of Natural Pedagogy generates non-trivial predictions in other paradigms than the A-not-B task

Example 1. Differential processing of kind-relevant vs. non-kind-relevant object properties as a function of ostensive communicative context

Finally, I would briefly refer to some of the other type of evidence that shows the explanatory and predictive power of the GB hypothesis much better than the much discussed A-not-B task. As Marion pointed out, Yoom & Csibra's 2007 study demonstrated that in an object recognition task 9-month-old infants encode better the perceptual features of an object, while performing significantly worse in encoding the object's spatial position when the object is presented to them by an ostensively communicating agent's referential gestures than when the object is observed without being accompanied by such communicative cues. According to Natural Pedagogy, this is due to the ostensive activation of the Genericity Bias as a result of which potentially kind-relevant object properties (such as shape) are better encoded than spatial location that is an irrelevant object property from the point of view of kind membership. With Marian Chen and Gergő Csibra, we have recently extended this hypothesis of the interpretation-modulating role of ostensive cuing to test the influence of the ostensive referential presentation context on another object property that – similarly to spatial position – is not carrying relevant information about kind membership of particular objects: namely, relative numerosity. We familiarized 12-month-olds with two or three objects of the same kind (each having the same shape and colour) being placed behind an occluder in an object recognition looking time paradigm. When during test phase the occluder was removed, the infants saw either the same number of objects with different features (kind-relevant property change), or a different number of objects with the same features (non-kind-relevant property change). We found that when during familiarization the demonstrator ostensively addressed the infants while placing the objects behind the occluder (ostensive communicative condition) they were significantly better at detecting a change in kind-relevant object features (such as shape and texture) while being worse at detecting a change in the non-kind-relevant property of numerosity, while the opposite pattern was found when the presentation context did not involve ostensive cuing.

Example 2. Communicative function demonstration induces kind-based artifact representation in preverbal infants

We have recently tested the Genericity Bias hypothesis in the domain of learning about artifact functions in 10-month-olds (Futo et al., 2010) by applying the object individuation paradigm of Xu

and Carey. Two different novel artifacts were sequentially brought out at either one or the other side of an occluder by a hand that performed a different action on each, resulting in the consequent display of a different sensory effect. When a female voice greeted the infant in motherese before the artifacts emerged (ostensive function demonstration condition), infants interpreted the two different functional uses as providing generic information specifying two different artifact kinds to which the particular artifacts were represented to belong. As a result, infants inferred that there must be two objects behind the occluder. Indeed, they showed increased looking times when only one was revealed during the test phase. In contrast, in the non-ostensive cueing condition (where instead of motherese, a synthesized mechanical non-speech sound transform was presented) the 10-month-olds showed no object individuation (i. e., they did not expect two objects behind the screen). This suggests that without ostensive cuing they interpreted the two manual actions as different episodic functional uses of the same object. Furthermore, in another version of the ostensive cuing condition we found that the sequential demonstration of the two different functions on a single artifact emerging at one or the other side of the occluder generated the illusion of the presence of two objects behind the screen. These results indicate that ostensively presented information on artifact function was used by 10-month-olds as an indicator of kind membership, and infants expected one specific function to define one specific artifact kind.

József Topál et al.'s 2008 paper (gated)
Topál, J., G. Gergely, A. Miklósi, A. Erdhöhegyi, and G. Csibra. (2008) Infants' perseverative search errors are induced by pragmatic misinterpretation, Science, 321, 1831-1834.

Yoon et al.'s study on the genericity bias
Yoon, J.M.D., M.H. Johnson, and G. Csibra. (2008) Communication-induced memory biases in preverbal infants. PNAS, 105, 13690-13695.

Futó et al.: Communicative function demonstration induces kind-based artifact representation in preverbal infants

Futo, J., Teglas, E., Csibra, G., & Gergely, G. (2010). Communicative function demonstration induces kind-based artifact representation in preverbal infants. Cognition, 117, 1-8.