

This post is part of our 'Pedagogy theory week' series.

[Monday](#) [Tuesday](#) [Wednesday](#) [Thursday](#) [Friday](#) [Saturday](#)

For a very short presentation of pedagogy theory, see the [Monday](#) post. Here, Marion Vorms describes and discusses the Pedagogical treatment of a famous psychological effect. György Gergely will discuss her critiques on [Saturday](#).

The so-called “perseverative search error” (or “A-not-B error”) was first observed by Piaget. A-not-B errors are mistakes performed by infants close to 1 year of age. The standard experimental set up highlighting these errors consists in a hide-and-search task, divided into two phases. During the first phase (habituation, or “A-trials”), the demonstrator repeatedly hides an object under one (A) of two containers (A and B) in full view of the infant, who is allowed to retrieve the object after each hiding event. After this habituation period, the demonstrator hides the object under container B (still in full view of the infant). During this second phase (test trials, or “B-trials”), infants frequently look for the object under container A. Various explanations have been given of this phenomenon, appealing to deficits in inhibitory control over the motor response involved in searching at location A, to constraints on short-term memory, to attentional biases, or even to motor simulation of the observed hiding action at location A through activation of the mirror neuron system. It is worth noting that most of these explanations share the assumption that A-not-B errors have more to do with the development of action, rather than with the development of object representation — they all reject Piaget’s original explanation in terms of infants’ incomplete understanding of object permanence (indeed, there is now strong evidence for object permanence in 2-months-olds, as Renée Baillargeon for instance has shown).

As often, natural pedagogy’s advocates’ strategy consists in designing a modified version of the classical experimental paradigm (here, A-not-B tasks), by varying the absence or presence of ostensive-communicative cues, thus highlighting infants’ differential responses according to the context (ostensive-communicative or not). So far, indeed, A-not-B errors had always been highlighted in ostensive-communicative contexts.

In their 2008 paper, Topál et al. hypothesize that perseverative search error might (at least partially) be due to a pragmatic misinterpretation of the nature of the conveyed information.

Instead of taking it as episodic information about the location of the object in a particular game situation, infants, in ostensive-communicative contexts, tend to interpret information conveyed during A-trials as generic information about this kind of object (they interpret the situation as a teaching session, rather than as a hide-and-search game). On this assumption, Topál et al. predict that infants’ performance must be better in non-communicative contexts (the mistake rate must be lower), since, in such contexts, they are less likely to generalize information conveyed during A-trials.

Three groups of 10-months-olds are tested in three different contexts. In the ostensive-communicative context, the demonstrator establishes eye contact with the baby, and addresses him/her in infant-directed speech. In non-communicative context, the demonstrator does not look at

the baby, her face and torso being 90° away from him/her. In nonsocial context, the demonstrator acts from behind a curtain. Results show that infants are indeed more disposed to commit errors in ostensive-communicative (86%) than in non-communicative (57%) and nonsocial (64%) contexts. None of the existing explanations of A-not-B errors (in terms of lack of inhibition of motor response and in terms of mirroring) is able to account for these differences. Indeed, habituation trials in both ostensive-communicative and non-communicative contexts provide infants with the same amount of motor and visual experience of the manual action toward container A. Therefore, the authors conclude that infants' higher disposition to commit A-not-B errors in ostensive-communicative contexts supports natural pedagogy theory.

To what extent does natural pedagogy theory explain A-not-B errors?

Certainly, these experiments show that ostensive-communicative cues contribute to some extent to infants' perseverative errors. Moreover, interpreting the higher rate of errors in ostensive-communicative contexts as a result of some kind of "generalization" of information conveyed during the habituation trials seems plausible. However, as I shall argue now, the explanatory import of infants' bias for generalizability in the case of A-not-B errors is still unclear.

No explanatory framework alone is sufficient to account for A-not-B errors

As the authors themselves acknowledge, the significant rate of errors in non-communicative and nonsocial contexts shows that infants' search behavior calls for an explanation appealing to other cognitive factors, such as their "inhibitory, information processing, and memory skills" (p. 1833). Therefore, it is inaccurate to claim, as they do, that their "results are not compatible with the current widely accepted explanations for the A-not-B perseverative bias" (ibid). These explanations are obviously insufficient to account for the reduced rate of errors in non-communicative and nonsocial contexts, but they might well be compatible with an additional explanation. And, as authors acknowledge, natural pedagogy theory alone is itself insufficient to account for A-not-B errors. Therefore, one might ask the following questions: How does natural pedagogy theory combine with other explanations of the A-not-B error? Do ostensive-communicative contexts increase the influence of the cause(s) (whatever it/they be) of infants' errors? Or do they add another cause to context-independent cause(s)? In order to answer such questions, one needs to clarify the description of infants' search behavior in terms of natural pedagogy's hypotheses.

What kind of "generic information"?

Natural pedagogy theory states that ostensive-communicative contexts trigger infants' expectation to be taught relevant and generalizable information about a referent. It is far from clear, however, what the referent is, and what generic or semantic information is in fact conveyed in Topál et al.'s experiments. Consequently, it is unclear how generalization of this information can explain infants' search behavior. *Prima facie*, one might think that the referent is the object being hidden, or rather the pair including the referent and the container, the information conveyed bearing on a certain relation holding between them. This is what the authors suggest when they state that infants interpret the information as being "about some generalizable property of the referent kind (e.g., "this type of object is usually found in container A")" (p. 1832).

However, such a description of what happens during habituation trials seems inaccurate. Indeed, the demonstrator does not merely draw infants' attention to the fact that the object is under container A. This would be the case, for instance, if she uncovered the object already hidden under A, or, better still, if she pointed at the object, before the container was placed on it, preferably by another agent, thus restricting the demonstrator's ostensive action to pointing. But, in Topál et al.'s experiments, the demonstrator performs an action: she hides the object under A. Therefore, it seems plausible

that the information which ostensive-communicative cues highlight as new, relevant, and generalizable, is information about an action rather than information about a permanent property of an object.

This interpretation seems consistent with the idea (highlighted by Gergely Csibra, in another important paper on pedagogy theory) that infants do not consider location as a permanent and intrinsic property of objects. This is also consistent with the widely shared assumption that A-not-B errors have to do with development of action, rather than with object representation. Indeed, as Susan Carey and Elizabeth Spelke emphasize, children have been found to engage in A-not-B search patterns also when an object is visible, as well as when they see motions of covers over potential hiding places containing no object at all. All this suggests that infants' behavior is due to pragmatic misinterpretation of information about action, rather than information about objects. However, since A-not-B tasks are not imitation tasks, it is unclear what this information, and what the relevant action might be (it cannot be as simple as "in such a situation, one should hide object under container A by performing a hand-action") might be (it cannot be as simple as "in such a situation, one should hide object under container A by performing a hand-action").

These considerations do not dangerously challenge natural pedagogy's advocates' conclusions. Indeed, one could easily admit the equivalence of information about the function of an object (container A is for storing this kind of object) with information about how one should use such object. And, as both György Gergely and Gergo Csibra have suggested in personal communications, information about an action has to be bound to something recognizable in order to know when to reproduce it. Moreover, we have at least two kinds of evidence showing that the identity of the object does matter in the A-not-B tasks (thanks to György Gergely for these remarks). First, ostensive demonstrations in Topál's experiments involves more than simply manifesting the action of putting object X under container A. The experimenter first demonstratively shows X (moving it forth and back in the air, saying "look!" — ostensive "object-showing"). Second, there is empirical evidence for the importance of the object's identity: an old study shows that there is considerable reduction of error when the object changes from A-trials to B-trials. One could then conclude that the information being generalized bears on some action related to an object.

But, still, the following questions remain: what exactly is this action? What is the object's function involved in the demonstration? One could suggest something like: "This is where we normally put this (kind of) object, where it ought to be put". But there is a further problem: A-not-B tasks are not imitation tasks, where the child is supposed to reproduce the action performed by the experimenter. Here, there are two different actions involved: the demonstrator's and the infants' ones. Therefore, if one wants to provide a normative reading of the information being conveyed, then one has to clarify what this information, and what the relevant goal of the action (and the adequate means to reach it) might be. It cannot be as simple as "in such a situation, one should hide object X under container A by performing a hand-action".

Whatever information is conveyed during habituation trials, natural pedagogy's advocates can still claim that it is in virtue of their interpretation bias for generalizability that infants perseverate in searching the object under A. However, as we have seen above, natural pedagogy alone is insufficient to account for these errors. Therefore, since one has to combine it with other explanations, and to clearly delineate what its explanatory import is, one needs to clarify how exactly one should describe infants' behavior as the consequence of their generalizing some information. I do not deny that natural pedagogy offers a promising framework for explaining A-not-B errors. But my main conclusion is that, since its explanatory power relies on the idea of an interpretative bias for generalizability, one needs to clearly state what exactly is being generalized.

In particular, I believe 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.

Certainly (as György Gergely mentioned in a personal communication) it may be difficult to draw such a distinction since, in the case of artefacts-kinds, descriptive information about function always involves a normative dimension about how one should use it. But, if one acknowledges that this information is not purely descriptive (that it is not merely about object-kinds) and that it involves a normative component (it is also about an action) then, again, in Topál’s experiments, the interpretation of the infants’ behavior is blurred by the fact that there are two actions involved (hiding and searching). In brief, I think that the fact that infants, in A-not-B tasks, are asked to perform a task which is not the same as the demonstrator’s somehow blurs the description of their behavior in terms of Natural Pedagogy.

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.

[\(link\)](#)

Piaget’s original A-not-B effect

Piaget, J. (1954) *The Construction of Reality in the Child*, New York: Basic Books.

[\(link\)](#)

Renée Baillargeon on object permanence and physical reasoning

Baillargeon, R. (1994) A model of physical reasoning in infancy. *Advances in Infancy Research*, vol. 9, Rovee-Collier, C., and L. Lipsitt (eds), Norwood, NJ: Ablex, 114-139.

According to natural pedagogy theory, location is not a permanent and intrinsic feature of objects  
Yoon, J.M.D., M.H. Johnson, and G. Csibra. (2008) Communication-induced memory biases in preverbal infants. *PNAS*, 105, 13690-13695.

[\(link\)](#)

The A-not-B error is not explained away by object representation, Carey and Spelke say.

Carey, S., and E. Spelke. (1996) Science and core knowledge, *Philosophy of Science*, 63:4, 515-533.

[\(link\)](#)