

I have included explanations of how the different theories explain each set of results in an effort to clarify the issues. I did not expect you to justify your answers in the in-class activity last Friday, I just thought it would be useful for you if I did it this way.

**Findings consistent with Piaget's theory of development:**

9-month-olds make the A-not-B error in the classic task (one object, two identical locations, several A-trials before B trial)

8-month-olds who make the A-not-B error, look at the A position in the B trial. That is, their reaching and their looking agree.

*These findings are consistent with the view that children at this age do not have a complete understanding of **object permanence**, and are not able to represent the object without the sensory-motor component (without seeing it, without the actions that have been performed on it).*

**Findings inconsistent with Piaget's theory of development:**

Infants are more likely to succeed in the B trial if the two locations are perceptually dissimilar.

Normal 29-month-olds make the A-not B error, but same-aged children with SMA (A motor impairment), do not.

9-month olds do not make the A-not-B error in a habituation paradigm (measures looking time, not reaching).

3-month-olds show that they know hidden objects continue to exist in a habituation paradigm (looking measure).

Infants are less likely to make the A-not-B error when the object is visible for a longer time; more likely when it is visible less time.

12-month-olds are more likely to make the A-not B error when there is a bigger delay between the time the object is hidden in the B trial and the moment they are allowed to reach.

Infants succeed at the B trial when it is preceded by 1 A trial, but not when it is preceded by 6 A trials. Infants succeed in the B trial when it is preceded by 11 A trials.

*If Piaget were still around, he might be able to explain some of these as failure to form an abstract representation. For example, the contrasting lids help infants because the lids and the locations are part of the infant's "primitive" representations of the objects. That is, the baby cannot form an abstract OBJECT representation devoid of details such as it's color, where it is found, and what the baby has done with it. If you think about it that way, the explanation is very in line with dynamical systems, because this last theory posits that we are – at all times, not just during infancy – a sensory-motor system. However, dynamical systems explains the findings without bringing up the construct of **representation**, and suggests that you can observe A-not-B type errors even beyond what Piaget termed "the sensory-motor stage".*

**Findings consistent with Information processing theories of development:**

9-month-olds make the A-not-B error in the classic task (one object, two identical locations, several A-trials before B trial)

8-month-olds who make the A-not-B error, look at the A position in the B trial. That is, their reaching and their looking agree.

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*All of these findings can be explained from an Information Processing point of view. The contradicting findings with looking versus reaching responses can be explained as failure to inhibit the motor plan that has been successful. A different explanation of the same result is that infants have more experience with looking than with reaching (simply put, at this age they've been looking for a significantly longer time than they have been reaching), so performance in looking measures is more advanced than in reaching measures.*

*The U-shape observed in terms of number of trials can be explained as a combination of perseverative reaching (inability to inhibit old reaching patterns) and the child's motivation. After looking for the toy in A 11 times, they are quite bored of it, so there is a natural bias for the novel location which helps them overcome the repeated reaching to A.*

*The U-shape observed in terms of delay before the B-trial can be explained as a function of two different memory systems competing to direct the reaching: latent memory of all the past reaches to A's competes with active memory of the recent reach to B. As time passes, the active memory to B gets weaker and cannot overcome the latent memory of A reaches, hence children are more likely to reach to A; but as even **more** time passes, the latent memory of reaches to A starts fading, so it is less of a competition for the memory of the object being hidden in B.*

*The SMA results are explained by the extra processing time SMA children have since they have slower response time because of their motor disability, thus allowing them to make a more sound reasoning and/or inhibit the impulsive response of pointing to the place where the toy was last found.*

### **Findings consistent with a Dynamic Systems perspective of development:**

9-month-olds make the A-not-B error in the classic task (one object, two identical locations, several A-trials before B trial)

8-month-olds who make the A-not-B error, look at the A position in the B trial. That is, their reaching and their looking agree.

Infants succeed at the B trial when it is preceded by 1 A trial, but not when it is preceded by 6 A trials.

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*These findings can be explained from the Dynamic Systems perspective as a result of the behavior of several components acting together. First, infants make the A-not-B error because looking-reaching-searching and so on are all intertwined. At each A-trial, the system follows a behavior, a trajectory, with each subsequent reach to A, the system is more likely to follow that same trajectory (that trajectory forms an attractor, a behavior the system will tend to produce). The observed hiding event at B also sets up an attractor that pulls attention and looking (but not reaching) to the B location, but this attractor to B is not strong enough to overcome the attractor directing the infant to reach to A.*

*The different results in looking versus reaching tasks can be explained by the fact that the reaching/motor component was not involved in the A-trials in looking, so that part of the system is not pushing for A on the B trial.*

*The fact that children are more likely to fail when they have more A trials is explained because each A trial makes a history, makes the “attractor” state stronger, so each A trial makes it more likely that the child will repeat the reaching-to-A behavior.*

*The U-shape observed in terms of delay before the B trial, can be explained with the dynamics of memory. As the delay is longer, the attractor for B fades away, as does the attractor for A, but since the attractor for A is stronger, it wins out and the result is a reach for A. With even more time, you get an unbiased system again, as all (or almost all) of the system’s history fades.*

*The SMA results are explained by the different dynamics of reaching in children with SMA versus healthy children. The differences in the timing, the details of the reach, will set up the systems differently, giving the two groups different biases.*

### **Findings inconsistent with a Dynamic Systems perspective of development:**

Infants succeed in the B trial when it is preceded by 11 A trials.

*I think this is not explained by Dynamic Systems because each A trial should only serve to make the attractor for A even stronger. It is unclear how something like “boredom” would be incorporated, though in principle it is possible to give the system a bias for novelty which will make each subsequent A trial have a relatively smaller effect in building the bias to reach to A.*