

Baillargeon: innate object knowledge

PSYB3 3.3.2 Cognitive development

Piaget's account of object permanence

Piaget (1954) claims that infants do not conceive of objects that have an independent existence, separate from themselves. In the infant's world, objects pop in and out of existence as they impinge on the child's senses or cease to do so. Before about eight or nine months an infant will not search for a toy that is hidden under a cloth in front of it. Piaget took the child's failure to search to mean that once the object was out of sight, it was also out of the child's mind, since the child did not understand that the toy continued to exist whilst hidden. Around nine months, the child will begin to search for the hidden object. However, it does not have a full understanding of the independent existence of objects. If a toy is hidden in one place, and then immediately moved *in the child's view* to another hiding place, the child will still search for it in the first location it saw the object hidden (this is called the 'A not B error'). Piaget thought that this represented a transitional phase in the child's understanding. The child has a notion that the object still exists whilst hidden, but believes that it is its own actions that determine the place where the toy will be uncovered, as if the act of searching 'calls the object back into existence'. The child's belief that its own perceptions and actions are the centre of everything is a manifestation of what Piaget called egocentrism. It is not until the child is about eighteen months old that it reliably searches for an object in the correct location.

Challenges to Piaget's account

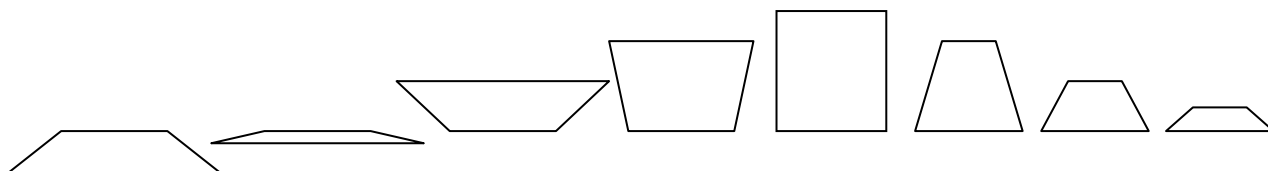
A number of researchers have pointed out that Piaget's search tasks may not be a valid test of infants' object permanence. The problem is that failure to search might indicate a number of things besides the lack of an object concept: that the child has been distracted, lost interest, or can't co-ordinate its muscular movements to carry out the search. Piaget assumed that an infant's failure to perform (carry out the search) indicates a lack of competence (an understanding of object permanence). This may have led him to underestimate children's abilities. By analogy, if you were introduced to a five year-old child and the child did not talk (i.e. did not *perform* speech) you probably would not immediately assume that the child was unable to talk (i.e. lacked the *competence* to speak). More likely you would assume that something was preventing the child from displaying its competence at speaking (shyness, for example). But Piaget seems to be making just such an error: when the child does not search, Piaget concludes that it lacks the underlying capacity to do so.

If it is true that Piaget's search task does not measure an infant's competence it follows that a task more in tune with what an infant can do well might be able to detect signs of object permanence at a younger age than the eight or nine months claimed by Piaget. Bower et al (1971) designed a task that used a skill that infants acquire much younger than eight months: the ability to direct where they look. Infants can follow (track) a moving object with their eyes. In Bower et al's study, four month-old infants were shown a train moving along a track. The train went behind a screen that blocked the infant's view. A researcher carefully observed where the infants looked. According to Piaget, as soon as the train was no longer visible the infants should lose interest and look elsewhere, since for them the train no longer exists. Bower et al found, however, that the infants would direct their gaze to the other side of the screen, where the train would be expected to emerge. This implies an understanding that the train still exists even though the infant cannot see it. In follow up studies things were arranged so that instead of the train, a different object emerged from the other side of the screen. When this happened, some of the infants showed signs of surprise, suggesting again that they *expected* the train to emerge. All this was recorded with four month-old children,

suggesting that Piaget did indeed underestimate the age at which children develop object permanence.

Baillargeon's violation of expectation studies

A further challenge to Piaget's claims comes from a series of studies designed by Renee Baillargeon. She used a technique that has come to be known as the violation of expectation (VOE) paradigm. It exploits the fact that infants tend to look for longer at things they have not encountered before. In a VOE experiment, an infant is first introduced to a novel situation. They are repeatedly shown this stimulus until they indicate, by looking away, that it is no longer new to them. In Baillargeon et al's (1985) study, the habituation stimulus was a 'drawbridge' that moved through 180 degrees.



The infants are then shown two new stimuli, each of which is a variation on the habituation stimulus. In Baillargeon's experiments, one of these test stimuli is a possible event (i.e. one which could physically happen) and the other is an impossible event (i.e. one that could not physically happen in the way it appears). In the 'drawbridge' study, a coloured box was placed in the path of the drawbridge. In the possible event, the drawbridge stopped at the point where its path would be blocked by the box. In the impossible event, the drawbridge appeared to pass through the box and ended up lying flat, the box apparently having disappeared.

Baillargeon found that infants spent much longer looking at the impossible event. She concluded that this indicated surprise on the infants' part and that the infants were surprised because they had *expectations* about the behaviour of physical objects that the impossible event had violated. In other words, the infants *knew* that the box still existed behind the drawbridge and, furthermore, that they *knew* that one solid object cannot just pass through another. The infants in this study were five months old, an age at which Piaget would say that such knowledge is quite beyond them.

In a similar study, Baillargeon (1987) habituated 3 month-old infants to a truck rolling down a track and behind a screen. The screen was removed. A box was introduced and placed either beside the track where the truck would roll past it or on the track where it should block the truck's path. The screen was then replaced and the truck sent down the track as before. In both events the truck passed behind the screen unimpeded. This would be impossible where the box had been placed so as to block the track. Baillargeon found, once again, that the infants looked significantly longer at this impossible event and concluded that they *knew* that the box still existed despite being behind the screen and that it should have blocked the path of the truck. Her studies therefore seem to indicate that three month-old infants have an understanding of objects that Piaget says does not appear until nine to twelve months.

The 'core knowledge' theory

In Piaget's theory, infants acquire their knowledge of objects by interacting with the world around them. It is through having experiences of interacting with objects that the child gradually realizes that things have an independent existence of their own, that they occupy space and persist in time. This takes time for the child to work out, which is why object permanence is only present after about nine months. But Baillargeon's results seem to show that object knowledge is present from a much earlier age, one at which infants have very limited experience of interacting with objects. So where does their knowledge of objects come from?

Baillargeon (1987) suggested two possibilities. Either infants are born with the capacity to acquire object knowledge very easily (innate fast learning) or they are born with an understanding of the properties of objects (innate object knowledge). The latter hypothesis was developed by Spelke et al (1992) who argue that infants are born with what they call core knowledge. This core knowledge includes a basic understanding of the physical world, including the properties of objects such as:

- Solidity of objects: each object occupies space; objects cannot pass through each other.
- Continuity of motion: objects move in paths through space; an object can only get from A to B by moving on a continuous path that starts at A and ends at B.

At birth, these rules are rather primitive. As the child develops they become more sophisticated and interconnected. Baillargeon (2002) suggests that the child's understanding develops from experiences where its primitive ideas are challenged, which is in agreement with Piaget. However, her and Spelke's theory that infants are born with some understanding of the world conflicts fundamentally with Piaget's theory that the child's understanding comes entirely from its own experiences. Whilst Piaget takes an empiricist or interactionist position, Baillargeon and Spelke are nativists.

Criticisms of Baillargeon's research

There are many studies that have used Baillargeon's methodology, and they consistently produce similar results. As a consequence, the core knowledge theory is widely accepted amongst developmental psychologists. However, there are those that object the Baillargeon's and Spelke's interpretation of the VOE findings. Their criticism is that Baillargeon has gone far beyond what the data actually show. She says that when infants look for longer at the impossible events, this is because they are *surprised* because their *expectations* have been violated. Schoner and Thelen (2004) point out that all the VOE studies definitely show is that the infants notice a *difference* between the two events they have been shown. Everything else is an extrapolation from this. Schoner and Thelen argue that there are many reasons why infants might prefer looking at the 'impossible' events. For example, in the 'drawbridge' study, the 'impossible' event involves more movement than the 'possible' event. They conclude that Baillargeon has mistakenly assumed that the only difference between her stimuli is that one is 'possible and the other is 'impossible'. However, there are actually many differences between the two stimuli, any of which might be the reason why infants look more at one than the other. What Baillargeon and Spelke claim is evidence of innate knowledge of the physical world, Schoner and Thelen say is no more than the effect of confounding variables.

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