

Development of thought

Developmental psychology is one of the core areas in the field of psychology; developmental psychology focuses on the changes that occur in the life span. Today we will mainly talk about changes that occur from infancy to teenage years, although developmental psychologists also study adulthood and aging. Two main questions are asked by developmental psychologists: 1) How to best characterize the changes that occur in the life span? Are those changes stage like, with distinct steps, or are they happening on a continuum? 2) Are there critical periods during development for which skills need to be acquired or else those skills would never be learned correctly? Language is an example of a skill that has to be learned during the critical period. There is now enough body of research showing that if a child is not exposed to language by the age of 12, that child will never acquire language normally. Language is an example of a skill that depends on a critical period.

The brain does not develop like other parts of the body do. For the rest of the body, the only thing that changes with growth is the size of the parts and the proportion of the body that they occupy. But when we are born, the brain is missing parts. The brain does not just change quantitatively, it also changes qualitatively as new parts develop. That's very important because the things that infants are not able to do are fundamentally linked to brain development. The brain matures from the back to the front, we talked about this in the brain lecture: The elementary parts of the brain, the minimum parts necessary for us to breath and eat, are present when we are born, but other parts develop as we age, and the frontal lobe is not fully developed until the teenage years of so.

Brain development

What does it mean to say that the brain matures up as we age? Brain maturation happens in terms of neural connections. At birth, there are fewer neurons, and those neurons are not well connected to each other. By 15 months, there is a huge increase in neural connections. In addition to the number of neural connections, electrical activity in the brain changes as we age. Electroencephalographs (EEG) are used to measure electrical activity in the brain. There is typically very little activity at 3 weeks of age, the line describing the activity is almost flat. At 4 months, the line has a lot more variation.

What abilities do we have when we are born? Mostly we just have basic reflexes, for example:

- Babinski reflex: that's when infants curl their toes when their feet touched
- Moro reflex: that's when infants throw their arms out and arch their back usually during sleep
- Grasping reflex

As babies get older, they develop the ability to do a range of motor movements. There is a lot of variability in terms of when those motor milestones occur.

Theories on how child development occurs

Jean Piaget had profound effect on developmental psychology and is often referred to as the father of developmental psychology. He was the first to ask questions about what is going on as we go from childhood to adulthood. He believed that the developmental changes were stage like rather than on a continuum. He argued that development could be divided in 4 stages: the sensorimotor stage, the preoperational stage, the concrete operational stage and the formal operational stage.

- 1) **The sensorimotor stage** (birth to 2 years): at that stage, the child is just navigating world, seeing and perceiving, without thinking. During that stage, infants learn the concept of **object permanence**: they learn that if an object disappears or is hidden, it does not mean that the object stopped existing. Infants learn this around 6 months old. Before they learn of object permanence, infants believe that things that are out of sight stop existing. In class, we watched a video to illustrate the concept of object permanence. When an interesting toy is hidden under a cover, infants who don't know object permanence yet stop being interested in the object, and start looking around for other things. The infants who had the concept of object permanence might instead move the cover to try to recover the object.
- 2) **Preoperational stage** (2 to 7 years): during this stage, children learn to represent the world around them by using language, symbols, etc. There are two key things that characterize this stage:
 - **egocentrism**: children at this stage are too oriented to their knowledge and their interest and have a very hard time focusing on other people's knowledge and taking other people's perspective.
 - Lack of the **concept of conservation**: children at this stage don't understand that quantities don't change just because they are represented in a different form. We watched a video to illustrate the lack of a concept of conservation. Children saw two parallel rows of candies that had the same number of candies. Then when the candies in one of the rows were pulled apart so that there was more space between the candies and the row looked longer, children who did not have the concept of conservation thought that there were more candies in the row that was modified. Children who had the concept understood that increasing the space between candies does not increase the number of candies. In another example, children saw two glasses that were exactly the same, and that had the same quantity of water. Then the water from one of the glasses was poured into a container that was shorter but wider. Again children who did not have the concept of conservation thought the taller glass had more water.

- 3) **Concrete operational stage** (7 to 12 year): at this stage, children are less egocentric, and they have a good understanding of the laws of conservation. In addition they are able to reason about concrete things (that they can see and touch, that happened), but have a hard time reasoning about abstract things (like hypothetical situations).
- 4) **Formal operational stage** (12 to adulthood): at this stage children are pretty much like adults.

Challenges to Piaget's account of development

Piaget's theory argued that development happened in stages and that for each stage, children have some limits to what they know until they move to the next stage. Piaget's account was well accepted in the field of developmental psychology until the 70s. Then researchers began to challenge Piaget's account. The researchers who were challenging Piaget mainly disagreed with Piaget's beliefs on what it was that children knew at each stage. The researchers who were disagreeing with his theory did not believe that development happened in distinct stages. They believed that development happened in a continuum. Additionally those researchers believed that children and infants knew more than what Piaget described and that Piaget had underestimated the amount of knowledge children and infants had about the world. In one experiment, babies sucked one of two pacifiers that they never got a chance to see. The pacifiers were different in texture. Then the babies were shown the two pacifiers. The researchers found that babies looked longer at the pacifier they had been given. Researchers who study infants use duration of gaze (looking time) to know what babies are thinking. When babies look at something longer, it means that the object is novel and interesting. So the babies found the pacifier they had sucked more interesting, which suggests that babies are doing more than sensing and perceiving information.

In class we watched a video about looking time in babies for magical events, which were described by the researchers as events that violate laws of nature. Children around the age of 4 can easily be convinced that something happened because of magic, and can be led to believe in Santa Claus; so they are satisfied with the explanation that magic makes things happen. It's usually parents who convince children that magic is a valid explanation for extraordinary events. Older children around the age of 7 who know more about how the world works are less likely to believe in magic. The interesting thing is that babies (they have not yet been exposed to magic as an explanation for extraordinary things by the parents) are intrigued by magical events and don't just accept them as such. Babies typically look longer when they see an event that violates physical laws, which suggests that they are puzzled. In the video, babies saw a doll go from the left to the right side of a podium by moving across the podium, and the babies weren't puzzled. But when the doll that was on the

left appeared on the right side without having crossed the podium (in fact there were 2 dolls instead of one crossing), the babies looked longer. The babies had a sense that something could not get from one place to another without crossing space and moving towards that direction. In another experiment, babies looked longer when a box appeared to stand in the air without any support or anything in contact with it. The babies had a sense that things cannot float in the air, which can be understood as an elementary concept of gravity.

The studies in the video showed that babies had some rudimentary knowledge of how the world works. Piaget had argued that infants were not able to have any representations of the world. But the simple studies with babies show something different: in order for infants to be surprised by magical events, they must have some sense of how things should be in the world, they have expectations, and expectations are representations.

Preferential looking: the fact that how long an infant looks at an object is an indication of how interesting and surprising an object is.

Habituation: when an event is presented to an infant over and over again or when there isn't anything intriguing in an event, infants look for very little time.

Theory of mind

Theory of mind: children's understanding of other people's minds. Children tend to think that what they know is what everyone else knows. They don't appreciate that some of their knowledge is unique to them, and that others might not have the same information. This is one of the areas of developmental psychology that has been studied the most.

Class video to demonstrate theory of mind: in one experiment, a child saw a juice box. Then child was asked what was in the box, to which the child replied "juice". Then the experimenter took ribbons out of the box. The child knew that the box contained ribbons and not juice. When asked about what another child who was not in the room would think was in the box, the participant child said "ribbons". The child did not understand that another child who was not in the room would not have access to the knowledge that the box did not contain juice.

Children also don't understand deception because they can't think of other people's minds. They don't realize that they can provide false information to someone who does not know what they know. They think that if they know it, then everyone knows it. Because they are very egocentric, it's hard for them to know what others know.

A typical design that has been used in research to demonstrate children's lack of theory of mind is the false belief problem. Children are told for example that Sally put a

marble in the basket, then she left. Her friend Ann came, took the marble out of the basket and put it in a box. Then children are asked where Sally would look for her marble. They say "in the box", they don't realize that because Sally was not in the room, she does not know that the marble was moved from the basket to the box, therefore she would look in the basket.