

OUT OF SIGHT, BUT NOT OUT OF MIND

Piaget, J. (1954). *The development of object concept: The construction of reality in the child* (pp. 3-96). New York: Basic Books.

How did you progress from an infant, with a few elementary thinking skills, to the adult you are now, with the ability to reason and analyze the world in many complex ways involving language, symbols, and logic? Your first reaction to this question may very likely be to say, "Well, I acquired these intellectual abilities through learning: the process of interacting with my environment and the teaching I received from adults as I developed."

While this explanation seems intuitively correct to most people, many developmental psychologists believe that there is much more to acquiring intellectual abilities than simple learning. The prevailing view about intellectual development is that it is a process of maturation, much like physical development, that occurs in a predictable fashion from birth through adulthood.

Do you look at an infant and see a person who, with enough learning, is capable of adult physical behaviors? Of course not. Instead you know that there is a process of physical maturation that will enable the child to behave in increasingly complex ways over time. Until the child achieves a given level of development, all the learning in the world cannot produce certain behaviors. For example, consider the behavior of walking. You probably think of walking as a learned behavior. But imagine trying to teach a six-month-old to walk. You could place the infant on an Olympic schedule of eight hours of practice every day, and the child will not learn to walk. This is because the child has not yet reached the physical maturity to be able to perform the behavior of walking.

Intellectual, or cognitive, development is seen by most researchers in much the same way. There are certain levels of thinking and reasoning ability that cannot be understood until an appropriate stage of cognitive development has been reached, no matter how much learning takes place. Psychology owes its realization and understanding of this conceptualization of cognitive development to the work of the Swiss psychologist Jean Piaget (1896-1980).

Piaget is one of the most influential figures in the history of psychology. His work not only revolutionized developmental psychology, but also is the foundation of all subsequent investigations in the area of the formation of the intellect. Piaget was originally trained as a biologist and studied the inborn ability of animals to adapt to new environments. While Piaget was studying at the Sorbonne in Paris, he accepted a job (to earn extra money) at the Alfred Binet Laboratory, where the first intelligence tests had been developed. He was hired to standardize a French version of a reasoning test that had been developed in English. It was during his employment in Paris that Piaget began to formulate his theories about cognitive development.

THEORETICAL PROPOSITIONS

The work at the Binet Laboratory was tedious and not very interesting to Piaget at first. But then he began to notice some interesting patterns in the answers given by children at various ages to the questions on the test. Children at similar ages appeared to be making the same mistakes. That is, they were using the same reasoning to reach the same answers. And what fascinated Piaget was not the correct answers, but the thinking that produced the wrong answers. Based on these observations, he theorized that older children had not just learned more than the younger ones, but were thinking differently about the problems. This led him to question the current prevailing definition of intelligence, based on a test score, in favor of one that involved a more complete understanding of the cognitive strategies used by children at various ages (Ginzburg & Opper, 1979).

Piaget devoted the next 50 years of his life and career to studying intellectual development in children. His work led to his famous theory of cognitive development, which for decades was a virtually undisputed explanation for how humans acquire their complex thinking skills. His theory holds that all humans develop through four stages of cognitive development that always occur in the same sequence and at approximately the same ages. These are summarized in Table 1.

As important as his theory itself were the techniques Piaget used to study the thinking abilities in children. At the Binet Laboratory, he realized that if his new conceptualization of intelligence were to be explored, new methods had to be developed. Instead of the usual, overly rigid standardized tests, he proposed an interview technique that allowed the child's answers to influence the direction of the questioning. In this way, the processes underlying the child's answers could be best explored.

One of the most remarkable aspects of Piaget's research is that in reaching many of his conclusions, he studied his *own* children, Lucienne, Jacqueline, and Laurent. By today's scientific standards, this method would be highly questionable because of the rather extreme possibility of bias and lack of objectivity. However, as there

are always exceptions to rules, Piaget's findings from his children have been successfully applied to all children universally.

TABLE 1 Piaget's Stages of Cognitive Development

STAGE	AGE RANGE	MAJOR CHARACTERISTICS
Sensori-motor	0–2 years	<ul style="list-style-type: none"> • All knowledge is acquired through senses and movement (such as looking and grasping) • Thinking is at the same speed as physical movement
Preoperational	2–7 years	<ul style="list-style-type: none"> • Object permanence develops • Thinking separates from movement and increases greatly in speed • Ability to think in symbols develops • Nonlogical, “magical” thinking • Animism: all objects have thoughts and feelings • Egocentric thinking: unable to see world from others' points of view
Concrete operations	7–11 years	<ul style="list-style-type: none"> • Logical thinking develops, including classifying objects and mathematical principles, but only as they apply to real, concrete objects • Conservation of liquid, area, volume • Ability to infer what others may be feeling or thinking
Formal operations	11 and up	<ul style="list-style-type: none"> • Logical thinking extends to hypothetical and abstract concepts • Ability to reason using metaphors and analogies • Ability to explore values, beliefs, philosophies • Ability to think about past and future • Not everyone uses formal operations to the same degree, and some not at all

Obviously a single chapter in this book is far too little space to explore more than a small fraction of Piaget's work. Therefore, we will focus on his discovery of a key intellectual skill called *object permanence*. This ability provides an excellent example of one of Piaget's most important findings, as well as ample opportunity to experience his methods of research.

Object permanence refers to your ability to know that an object exists even when it is hidden from your senses. If someone walks over to you now and takes this book out of your hands and runs into the next room, do you think that the book or the book-snatcher has ceased to exist? Of course not. You have a *concept* of the book and the person in your mind even though you cannot see, hear, or touch them. However, according to Piaget, this was not always true for you. He demonstrated that your cognitive ability to conceive of objects as permanent and unchanging was something you, and everyone else, developed during your first two years of life. The reason this ability is important is that without it, problem solving and internal thinking are impossible. Therefore, before a child can leave the sensori-motor stage (0 to 2 years; see Table 1) and enter the preoperational period (2 to 7 years), object permanence must be mastered.

METHOD AND RESULTS

Piaget studied the process of developing object permanence using *unstructured evaluation methods*. For infants and very young children, these techniques often took the form of games he would play with his children. Through observing their problem-solving ability and the errors they made in the games, Piaget identified six substages of development that occur during the sensori-motor period and are involved in the formation of the object concept. For you to experience the flavor of his research, these six stages are summarized here with examples of Piaget's interactions with his children from his own observational journals:

- *STAGE 1 (Birth to 1 month)* This stage is concerned primarily with reflexes relating to feeding and touching. There is no evidence of object permanence during this first month of life.
- *STAGE 2 (1 to 4 months)* During stage 2, while there is still no sign of an object concept, there are behaviors that Piaget interprets as preparing the infant for this ability. The child begins to repeat

purposely behaviors that center on the infant's own body. For example, if an infant's hand accidentally comes in contact with its foot, it might reproduce the same movements over and over again to cause the event to be repeated. Piaget called these *primary circular reactions*. Also, at this stage, infants are able to follow moving objects with their eyes. Often, if an object leaves the child's visual field and fails to reappear, the child will turn its attention to other visible objects and show no signs of searching for the "vanished" object. Piaget called this behavior *passive expectation*. The following interaction between Piaget and his son, Laurent, illustrates this:

Observation 2. Laurent at 0;2 [0 years, 2 months]. I look at him through the hood of his bassinet and from time to time I appear at a more or less constant point; Laurent then watches that point when I am out of his sight and obviously expects me to reappear. (p.9)

The child limits himself to looking at the place where the object vanished: Thus he merely preserves the attitude of the earlier perception and if nothing reappears, he soon gives up. If he had the object concept ... he would actively search to find out where the thing could have been put. ... But this is precisely what he does not know how to do, for the vanished object is not yet a permanent object which has been moved; it is a mere image which reenters the void as soon as it vanishes, and emerges from it for no objective reason. (p. 11)

- *STAGE 3 (4 to 10 months)* It is during this stage that children begin to purposefully and repeatedly manipulate objects they encounter in their environment (*secondary circular reactions*). The child begins to reach for and grasp things, to shake them, bring them closer to look at or place in the mouth, and to acquire the ability of rapid eye movements to follow quickly moving or falling objects. Late in this stage, the first signs of object permanence appear. For example, children begin to search for objects that are obscured from view if a small part of the object is visible.

Observation 23. At 0;9 I offer Lucienne a celluloid goose which she has never seen before; she grasps it at once and examines it all over. I place the goose beside her and cover it before her eyes, sometimes completely, sometimes revealing the head. Two very distinct reactions ...

When the goose disappears completely, Lucienne immediately stops searching even when she is on the point of grasping it. ... When the beak protrudes, not only does she grasp the visible part and draw the animal to her, but ... she sometimes raises the coverlet beforehand in order to grasp the whole thing! ... Never, even after having raised the coverlet several times on seeing the beak appear, has Lucienne tried to raise it when the goose was completely hidden! Here ... is proof of the fact that the reconstruction of a totality is much easier than search for an invisible object. (pp. 29-30)

Still, however, Piaget maintains that the object concept is not fully formed. To the child at this stage, the object does not have an independent existence, but is tied to the child's own actions and sensory perceptions. In other words, "it would be impossible to say that the half-hidden objective is conceived as being masked by a screen; it is simply perceived as being in the process of disappearing" (p. 35).

- *STAGE 4 (10 to 12 months)* During the later weeks of stage 3 and early in stage 4, children have learned that objects continue to exist even when they are no longer in sight. A child will search actively and creatively for an object that has been completely hidden from view. While on the surface this may indicate a fully developed object concept, Piaget found that this cognitive skill is still incomplete because the child still lacks the ability to understand *visible displacements*. To understand what Piaget meant by this, consider the following example (you can try this yourself). If you sit with an 11-month-old and hide a toy completely under a towel (call this place A), the child will search for and find it. However, if you then openly hide the toy under a blanket (place B), the child will probably go back to searching where it was previously found, in place A. Furthermore, you can repeat this process over and over and the child will continue to make the same error, called the *A-not-B effect*.

Observation 40. At 0;10 Jacqueline is seated on a mattress ... I take her parrot from her hands and hide it twice in succession under the mattress, on her left, in A. Both times Jacqueline looks for the object immediately and grabs it. Then I take it from her hands and move it very slowly before her eyes to the corresponding place on her right, under the mattress, in B.

Jacqueline watches the movement very attentively, but at the moment when the parrot disappears in B she turns to her left and looks where it was before, in A. (p.51)

Piaget's interpretation of this error in stage 4 was not that children are absentminded, but that the object concept is not the same for them as it is for you or me. To 10-month-old Jacqueline, her parrot is not an individual, permanent, separate thing that exists independently of her actions. When it was hidden and successfully found in A it became a *parrot-in-A*, a thing that was defined not only by its *parrotness*, but also by its hiding place. In other words, the parrot is just a piece of the overall picture in the child's mind and not a separate object.

- *STAGE 5 (12 to 18 months)* Beginning around the end of the first year of life, the child gains the ability to follow visible sequential displacements and searches for an object where it was last visibly hidden. When this happens, Piaget claimed that the child had entered stage 5 of the sensori-motor period.

Observation 54. Laurent, at 0;11, is seated between two cushions, A and B. I hide the watch alternately under each; Laurent constantly searches for the object where it has just disappeared, that is sometimes in A, sometimes in B, without remaining attached to a privileged position as during the preceding stage. (p. 67)

However, Piaget points out that true object permanence remains incomplete because the child is unable to understand what he called invisible displacements. Imagine the following example. You watch someone place a coin in a small box and then, with their back to you, they walk over to the dresser and open a drawer. When they return you discover that the box is empty. This is an invisible displacement of the object. Naturally, you would go to the dresser and look in the drawer. Well, as Piaget demonstrated, perhaps it is not so "natural."

Observation 55. At 1;6 Jacqueline is sitting on a green rug and playing with a potato, which interests her very much (it is a new object for her). She ... amuses herself by putting it into an empty box and taking it out again. I then take the potato and put it in the box while Jacqueline watches. Then I place the box under the rug and turn it upside down, thus leaving the object hidden by the rug without letting the child see my maneuver, and I bring out the empty box. I say to Jacqueline, who has not stopped looking at the rug and who realized that I was doing something under it: "Give Papa the potato." She searches for the object in the box, looks at me, again looks at the box minutely, looks at the rug, etc., but it does not occur to her to raise the rug in order to find the potato underneath. During the five subsequent attempts the reaction is uniformly negative. (p. 68)

- *STAGE 6 (18 to 24 months)* Finally, as the child approaches the end of the sensori-motor period (refer back to Table I), the concept of the permanent object becomes fully realized. Entry into this stage is determined by the child's ability to represent mentally objects that undergo invisible displacements.

Observation 66. At 1;7 Jacqueline reveals herself to be ... capable of conceiving of the object under a series of superimposed or encasing screens . . . I put the pencil in the box, put a piece of paper around it, wrap this in a handkerchief, then cover the whole thing with the beret and the coverlet. Jacqueline removes these last two screens, then unfolds the handkerchief. She does not find the box right away, but continues looking for it, evidently convinced of its presence; she then perceives the paper, recognizes it immediately, unfolds it, opens the box, and grasps the pencil. (p.81)

Piaget considered this cognitive skill of object permanence to be the beginning of true thought: the ability to use insight and mental symbolism to solve problems. This, then, prepares the child to move into the next full stage of cognitive development: the preoperational period, during which thought separates from action, which allows the speed of mental operations to increase greatly. In other words, object permanence is the foundation for all subsequent advances in intellectual ability. As Piaget stated:

The conservation of the object is, among other things, a function of its localization; that is, the child simultaneously learns that the object does not cease to exist when it disappears and he learns where it does go. This fact shows from the outset that the formation of the schema of the permanent object is closely related to the whole spatio-temporal and causal organization of the practical universe. (Piaget & Inhelder, 1969)

DISCUSSION

This method of exercises and observation of behavior formed the basis of Piaget's work throughout his formulation of all four stages of cognitive development. Piaget contended that all of his stages applied universally to all children, regardless of cultural or family background. Additionally, he stressed several important aspects relating to the stages of development of the object concept during the sensori-motor period (see Ginzburg & Opper, 1979, for an elaboration of these points).

1. The ages associated with each stage are approximate. Since Piaget's early work only involved three children, it was difficult for him to predict age ranges with a great deal of confidence. For example, certain abilities he observed in Jacqueline at age 1;7 were present in Lucienne at 1;3.
2. Piaget maintained, however, that the sequence of the stages was invariant. All children must pass through each stage before going on to the next, and no stage can ever be skipped.
3. Changes from one stage to the next occur gradually over time so that the errors being made at one stage slowly begin to decrease as new intellectual abilities mature. Piaget believed that it is quite common and normal for children to be between stages and exhibiting abilities from earlier and later stages at the same time.
4. As a child moves into the next higher stage, the behaviors associated with the lower stages do not necessarily disappear completely. It would not be unusual for a child in stage 6 to apply intellectual strategies used in stage 5. Then when these prove unsuccessful, the child will invoke new methods for solving the problem typical of stage 6 reasoning.

CRITICISMS AND RECENT APPLICATIONS

Although Piaget's conceptualization of cognitive development has dominated the field of developmental psychology for the last 40 years, he has certainly not been without critics. Some of them have focused primarily on questioning Piaget's basic notion that cognitive development happens in discrete stages. Many learning theorists have disagreed with Piaget on this issue and contend that intellectual development is continuous, without any particular sequence built into the process. They believe that cognitive abilities, like all other behaviors, are a result of modeling and a person's learning and conditioning history.

Other critics of Piaget's ideas have claimed that the age ranges at which he asserted specific abilities appear are incorrect, and some even argue that certain cognitive skills may already be present at birth. Object permanence is one of those abilities that has been drawn into question. In a series of ingenious studies, using newly developed research methodology, developmental psychologist Renee Baillargeon and her associates have demonstrated that infants as young as two and one-half months of age appear to possess early forms of object permanence (Aguilar & Baillargeon, 1999; Baillargeon, 1987). She and others assert that the methods used by Piaget were inadequate to measure accurately the abilities of very young infants. Additional evidence of the possibility that object permanence may indeed be an inborn skill comes from a study by Wilcox, Nadel, and Rosser (1996) in which premature infants were tested using methods similar to those in Baillargeon's work to see if they could remember the correct location of a disappearing and reappearing toy lion. Their findings indicated that not only did infants as young as two and one-half months correctly remember the toy's location, but the premature infants' performance on these tasks did not differ significantly from full-term babies.

Piaget's concepts and discoveries are influencing research discoveries in an ever-widening variety of fields. This is evidenced by the large number of recent articles that have cited Piaget's book that forms the basis for this discussion: more than 170 between 2000 and 2003. For example, one study compared six and one-half-month-old infants' tendency to search for objects hidden by darkness to their tendency to search for objects hidden under a cloth in the light, as in Piaget's games with his children (Shinsky & Munakata, 2003).

Interestingly, the researchers found that "infants have a genuine advantage in searching for objects hidden in the dark" (p. 281) compared to objects hidden by coverlets in the light. However, the authors were unsure as to why this difference may exist. One explanation may be that the appearance of the coverlet interferes with the infants' new, tenuous ability of representing the object mentally. An alternate explanation may be that our ability to think about, and search for, objects in the dark is more important from an evolutionary, survival perspective than doing so when items are merely hidden beneath something in the light.

Another study citing Piaget's work on object permanence found an association between development of the object concept and sleep in nine-month-old infants (Scher, Amir, & Tirosh, 2000). The findings indicated that infants with a more advanced grasp of object permanence experienced significantly fewer sleep difficulties than those with lower levels of the object concept. This makes a certain intuitive sense, if you think about it. After all, if you weren't sure all your stuff would still be there in the morning, you probably wouldn't sleep very well either!

CONCLUSION

As new methods for studying infants' cognitive abilities have been developed, such as preference-looking and habituation-dishabituation techniques, some of Piaget's discoveries are being drawn into question (see Dworetzky, 1996 for a discussion of such research methods). In fact, there are numerous ongoing controversies surrounding his theory of cognitive development. This controversy is healthy in that it motivates research that will eventually lead to even greater improvements in our knowledge about our intellectual abilities.

Controversy notwithstanding, Piaget's theory remains the catalyst and foundation for all related research. His work continues to guide enlightened people's ideas about research with children, methods of education, and styles of parenting. Piaget's contribution was and is immeasurable.

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