Infants:
Cognitive Development

Legal Niceties
The Video

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Teaching Guide

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Summary

Infants' brains are actively developing with everything they experience. This program examines how newborns fit into the sensorimotor stage of development. It traces cognitive development from simple reflexes to the beginnings of thought. It explores infant intelligence, information processing and memory. Viewers will see the progression of infant communication from crying--to giggling--to euphoric babbling and their first words. The program provides tips that can be used by parents and caregivers to foster cognitive and language development.
Key Facts About The Infant Brain

Structure and Function

- Neurons are the basic nerve cells in our brains. These cells communicate with each other thanks to branch-like fibers called dendrites.

- Dendrites receive messages from other neurons through small gaps between them called synapses.

- As babies are exposed to objects, people, and events, their brain cells create more connections.

- It is possible for one cell to connect to as many as 15,000 other cells.

- Brain cell connections become permanent when the same thing happens repeatedly.

- When children hear the same words and phrases many times, they learn to understand speech and strengthen the language connections in the brain.
Key Facts About Stage Theory

The Sensorimotor Stage

- Much of our knowledge about cognitive development has been influenced by the work of developmental theorist Jean Piaget.
- Piaget’s theory is based on stages, where each stage builds upon the last. Each stage has sub-stages.
- Infants are in the sensorimotor stage.
- Inborn reflexes include
  - rooting - turning their heads towards something that touches their cheek
  - sucking - the tendency to suck at things that touch their lips
  - stepping - the movement of legs when they are held with their feet touching the floor
- Object permanence is the understanding that objects and people exist even when they cannot be seen.

Piaget’s Sensorimotor Stage  (All ages are approximate)

<table>
<thead>
<tr>
<th>Simple reflexes</th>
<th>First month of life</th>
<th>Inborn, simple reactions to their world</th>
</tr>
</thead>
<tbody>
<tr>
<td>First habits and primary circular reactions</td>
<td>Month 1 - 4</td>
<td>combine separate actions into one activity</td>
</tr>
<tr>
<td>Secondary circular reactions</td>
<td>Months 4 - 8</td>
<td>Interact with objects around them, and when that interaction results in a pleasing effect, they repeat it</td>
</tr>
<tr>
<td>Coordination of secondary circular reactions</td>
<td>Months 8 - 12</td>
<td>Engage in goal-directed behavior which involves the understanding of cause and effect relationships</td>
</tr>
<tr>
<td>Tertiary circular reactions</td>
<td>Months 12-18</td>
<td>Deliberately change their behaviors in order to cause a desired outcome and conduct mini-experiments</td>
</tr>
<tr>
<td>Beginnings of thought</td>
<td>18 months – 2 years</td>
<td>Ability to think symbolically</td>
</tr>
</tbody>
</table>
Key Facts About Information Processing

Intelligence
- The exact definition of intelligence is not agreed upon by psychologists, educators or other experts.
- Most of these approaches deal with developmental scales based on peer comparisons.
- Some of the areas researchers examine include activities involving motor skills, language use, memory, problem solving, adaptive behavior, and personal-social behavior.
- If an infant varies significantly from the performance of her peers at a given age, it may be helpful to identify a child that may need special help and attention.

Information Processing and Memory
- Information processing approaches are all about the way that individuals take in, use and store information.
- Information processing has three steps: encoding, storage, and retrieval.
- Encoding is the process by which information is first stored in a form that is usable to memory.
- Babies pick and choose which bits of information to focus on and encode and her brain cells use the encoded information to connect with other brain cells.
- Retrieval is the process by which information in memory is located, brought into awareness, and used.
- A part of the brain called the hippocampus is what enables an infant’s memory skills.
- Memory can be separated into implicit and explicit memories.
- Implicit memories are memories which we are not consciously aware of, but which affect our behavior.
- The first few times an infant sucks food from a bottle, grasps an object or crawls, they really have to think about it. But through repetition, these skills become increasingly subconscious or implicit.
- Explicit memories are memories that require conscious cognitive effort to retrieve.
- We know that repetition creates lasting memories and babies love repetition.

Key Facts About Language Development
Communication

- During the first month of life, infants communicate with their parents and caregivers by crying. Babies quickly learn that crying will bring them food, company, or comfort.

- Babies who are exposed to sign language hand gestures, babble with their hands.

- By 6 months, their babbling begins to reflect only the sounds of the languages they hear around them.

- Babbling allows babies to imitate the rhythm, syllables, sentence length, and inflection of the speech that they hear. This is the groundwork for learning and expressing language.

- They eventually learn that “Ma-ma” gets more of a response from their mother, and “Da-da” from their father. They begin to realize that specific sounds have specific meanings.

Learning Language

- Receptive speech refers to language that they can understand but not articulate.

- Productive speech refers to when infants know what they want to say and vocalize sounds to try to express themselves.

- During the first year of life, the number of words that infants understand grows by 22 new words a month. Words that they learn to speak increase by 9 words a month.

- Infant-directed speech is characterized by short simple sentences, a high pitch, and intonation that has a singsong quality—what is commonly known as “baby-talk”.

- Speech and language difficulties can be caused by Down syndrome, general language delay, and hearing impairment.

- Early diagnosis from a doctor can help identify a problem and begin the needed treatment that helps an infant attain the best language proficiency possible.

Progression of Infant Communication

(All ages are approximate)
<table>
<thead>
<tr>
<th>6 weeks</th>
<th>Social smile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Months 1 – 4</strong></td>
<td>Communicates with giggles and protests</td>
</tr>
<tr>
<td></td>
<td>Draw out vowels sounds like “ooooh” and</td>
</tr>
<tr>
<td></td>
<td>“ahhhhh”</td>
</tr>
<tr>
<td><strong>Months 4 - 7</strong></td>
<td>Babble strings of consonants.</td>
</tr>
<tr>
<td></td>
<td>Their cries become deliberate. (They test to see the responses they get)</td>
</tr>
<tr>
<td><strong>Months 8 - 12</strong></td>
<td>Imitate words they hear</td>
</tr>
<tr>
<td></td>
<td>Use pointing and gesturing</td>
</tr>
<tr>
<td></td>
<td>Understand receptive speech</td>
</tr>
<tr>
<td><strong>1 Year</strong></td>
<td>Speak first words</td>
</tr>
</tbody>
</table>
Suggested Activities

• Research Jean Piaget’s theory of cognitive development and contrast this with current research.

• Name three activities in which infants and their caregivers are engaged together on a daily basis. Brainstorm ways that caregivers can foster cognitive and language development during each of these activities.

• Using the activities from the above activity (or think of new ones), describe how infants are learning during each one. Describe each in terms of the information-processing model. (encoding, storage, and retrieval).
Infants: Cognitive Development

Matching Quiz

Match the words in the first column to the best available answer in the second column.

1) primary circular reactions
2) secondary circular reactions
3) hippocampus
4) encoding
5) storage
6) retrieval
7) implicit
8) explicit
9) receptive
10) infant directed speech

_____ Stage which involves infants’ behavior with their own body that they repeat over and over- for the sake of fun and novelty.

_____ The placement of information into memory.

_____ Memories which we are not consciously aware, but which affect our behavior.

_____ Kind of speech that refers to infants understanding what others are saying and to which they can respond accordingly.

_____ Short simple sentences, a high pitch, and intonation that has a sing-song quality- what is commonly known as “baby-talk”

_____ Stage which involves repeated pleasurable behaviors, which involve infants’ interactions with objects or people in their environment.

_____ The process by which information in memory is located, brought into awareness, and used.

_____ Memories that require conscious cognitive effort to retrieve

_____ Part of the brain that enables an infant’s memory skills.

_____ The process by which information is first stored in a form that is usable to memory.
Infants: Cognitive Development

Matching Quiz Answer Key

__1__ Stage which involves infants’ behavior with their own body that they repeat over and over- for the sake of fun and novelty.

__5__ The placement of information into memory.

__7__ Memories which we are not consciously aware, but which affect our behavior.

__9__ Kind of speech that refers to infants understanding what others are saying and to which they can respond accordingly.

__10__ Short simple sentences, a high pitch, and intonation that has a sing-song quality- what is commonly known as “baby-talk”

__2__ Stage which involves repeated pleasurable behaviors, which involve infants’ interactions with objects or people in their environment.

__6__ The process by which information in memory is located, brought into awareness, and used.

__8__ Memories that require conscious cognitive effort to retrieve

__3__ Part of the brain that enables an infant’s memory skills.

__4__ The process by which information is first stored in a form that is usable to memory.

1) primary circular reactions
2) secondary circular reactions
3) hippocampus
4) encoding
5) storage
6) retrieval
7) implicit
8) explicit
9) receptive
10) infant directed speech
Infants: Cognitive Development

Fill-In-The-Blank

Select the correct term from the list below and write it in the blank space. Some terms may be used more than once, while others not at all.

1. Piaget’s theory of cognitive development is divided into _____________.

2. ______________ are the basic nerve cells in our brains.

3. The parts of brain cells that receive messages are called ________________.

4. The removal of unused brain cell connections in order to strengthen others is called ________________ pruning.

5. Infants fall into the ________________ stage of development.

6. When newborns exhibit behaviors like rooting, sucking, and stepping; these are ________________ or unlearned, involuntary responses to outside stimuli.

7. The word ________________ in sensorimotor stages refers to the fact that infants like to repeat experiences over and over again.

8. The understanding that objects and people exist even when they cannot be seen is called object ________________.

9. ________________ speech is when infants know what they want to say and vocalize sounds to try to express themselves.

10. Often, infants use pointing and ________________, as well as facial expressions as nonverbal ways to make their feelings known.

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<tr>
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<td>sections</td>
<td>predictive</td>
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Infants: Cognitive Development

Fill-in-the-Blank Exercise Answer Key

1. Piaget’s theory of cognitive development is divided into **stages**.

2. **Neurons** are the basic nerve cells in our brains.

3. The parts of brain cells that receive messages are called **dendrites**.

4. The removal of unused brain cell connections in order to strengthen others is called **synaptic pruning**.

5. Infants fall into the **sensorimotor** stage of development.

6. When newborns exhibit behaviors like rooting, sucking, and stepping; these are **reflexes** or unlearned, involuntary responses to outside stimuli.

7. The word **circular** in sensorimotor stages refers to the fact that infants like to repeat experiences over and over again.

8. The understanding that objects and people exist even when they cannot be seen is called **object permanence**.

9. **Productive** speech is when infants know what they want to say and vocalize sounds to try to express themselves.

10. Often, infants use pointing and **gesturing**, as well as facial expressions as nonverbal ways to make their feelings known.

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Additional Resources

Jean Piaget
http://www.piaget.org/

Cognitive development
http://www.edpsycinteractive.org/topics/cogsys/piaget.html

Speech and language milestones

Information processing
http://www.edpsycinteractive.org/topics/cogsys/infoproc.html