Cognition

- What is cognition?
- Piaget’s Perspective
- Post-Piagetian Work
- Information Processing in Children

What is Cognition

- Inner processes and products of the mind that lead to “knowing”
- Includes all mental activity
  - Attending, remembering, symbolizing, categorizing, planning, reasoning, fantasizing etc....
- Research focuses on
  - What typical courses of development are
  - Identifying individual differences
  - Mechanisms of cognitive development

Cognitive Development - Piaget
Constructivism

• The belief that children actively create knowledge rather than passively receiving it from the environment.
  – Knowledge is constructed from experience
  – Born with ability and desire to learn.
  – Must be active to learn.
  – Thinking/learning is internalization of physical knowledge.

Adaptation

• Fundamental process by which schemes are altered through experience.
• Comprised of two complementary processes.

Mechanisms of Change

• Assimilation: that fits cognitive
  – schemas
Mechanisms of Change

• Accommodation: changing beliefs to conceptual

Equilibration

• Equilibration: regulatory process that maintains a functional balance between assimilation and accommodation

Process of Equilibration

• Children are satisfied with mode of thought (equilibrium)
• Become aware of shortcomings in existing knowledge (disequilibrium)
• Adopt a more sophisticated mode of thought (return to equilibrium)
Characteristics of Stages of Cognitive Development

• Each stage represents a qualitative change in thinking
• Culturally Invariant
• Includes structures and abilities of previous stages

Stages of Cognitive Development

• Sensorimotor
• Preoperational
• Concrete Operational
• Formal Operational

Sensorimotor Stage

• Birth to 2 years of age
• Use senses, motor skills to gain knowledge
Circular Reaction

- Way of building initial knowledge base by trying to repeat some chance event caused by their own motor activity.

Sensorimotor Stage

<table>
<thead>
<tr>
<th>Substage 1: Simple Reflexes</th>
<th>Birth to 1 month</th>
<th>Reflexes at the center of cognitive life: Building blocks of sensorimotor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substage 2: First habits and Primary circular reactions</td>
<td>1-4 months</td>
<td>Coordinate separate actions into single, integrated actions</td>
</tr>
<tr>
<td>Substage 3: Secondary circular reactions</td>
<td>4-8 months</td>
<td>Begin to act on outside world</td>
</tr>
<tr>
<td>Substage 4: Coordination of secondary circular reactions</td>
<td>8-12 months</td>
<td>Calculated approaches. Object permanence begins</td>
</tr>
<tr>
<td>Substage 5: Tertiary circular reactions</td>
<td>12-18 months</td>
<td>Carry out miniature experiments to observe consequences</td>
</tr>
<tr>
<td>Substage 6: Beginnings of thought</td>
<td>18-24 months</td>
<td>Capacity for mental representation or symbolic thought. Imagine where objects might be that they cannot see.</td>
</tr>
</tbody>
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Object Permanence
Criticisms of Piaget’s Theory

- Can have skills characteristic of two stages at one time period
- Findings may only work with Piaget’s tasks

Object Permanence

- Piaget studied manual search—this may underestimate competence:
  - manual abilities may be poor
  - may not understand how to search (but understand objects)
  - motivational factors
Post-Piagetian Perspectives

Renée Baillargeon

• Looking time as a measure of reactions to "possible" and "impossible" events

• Violation-of-expectation:
  – possible event is consistent with the belief or expectation examined in the experiment
  – impossible event violates this belief or expectation

• If the infant possesses the belief, they should find the impossible event novel or surprising and therefore look longer at the impossible than at the possible event.

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Habituation Events

Test Events

Possible Event

Impossible Event

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Information Processing
Types of Learning

- Classical Conditioning
  - Blass et al. (1984)
-Operant Conditioning
  - HAS paradigm
  - Foot-kick paradigm
- Information Processing - Habituation

Foot-kick Paradigm

- Rovee-Collier and colleagues
- Operant conditioning
- Recognition memory

Habituation Procedures

- Used to assess cognitive competence
  - Declining interest indicates learning
  - Novelty responsiveness indicates discrimination of new versus familiar
- Older infants habituate faster than younger infants
- Infants of same age require more time to encode complex stimuli than simple stimuli
Habituation Procedures

- Habituation: decline in orienting response as initially novel stimulus becomes familiar.
- Dishabituation: recovery of orienting response when an habituated stimulus changes.
What is a Concept?

• Definition: General ideas or understandings that can be used to group together objects, events, qualities, abstractions that are similar in some way

• Infants form concepts from the beginning
  • Core-knowledge theories: Infants have a biological predisposition to form concepts
  • Piaget’s theory: Infants physical interactions with objects help them learn about concepts
  • Information-processing approach: Through basic processing skills (e.g., association), infants make connections about many aspects of a concept
  • Sociocultural theories: Looks at the way the social world influences an infant’s conceptual development

Category Development

• Infancy
  • Broad category divisions help infants make accurate inferences
  • Category hierarchies begin to develop
    Example: Inanimate object, eating utensil, spoon, soup spoon, tablespoon
  • Perceptual categorization: grouping by similar appearances, such as color, size, movement, begins early in infancy
    • By age 1, function of objects is included in this process
  • Around 18 months infants focus on specific parts of objects, not the whole object (e.g., must have wings to be a bird)
  • Around 2 years of age infants focus on overall shape and what function goes with an object

• Beyond Infancy
  • Category Hierarchies
    • Basic Level: First to develop due to consistent characteristics
      ➔ e.g., Doll
    • Subordinate Level: Basic Level, plus extra characteristics
      ➔ e.g., Barbie doll
    • Superordinate Level: Object does not have all of the consistent characteristics
      ➔ e.g., Toy
    • Subordinate and superordinate categories are taught by caregivers
  • Causal Understanding: Understanding “why” helps children learn categories
Cause–effect relations

Hearing that wugs are well prepared to fight and gillies to flee helped preschoolers categorize novel pictures like these as wugs or gillies (Krascum & Andrews, 1998). In general, understanding cause–effect relations helps people of all ages learn and remember.

Number processing

- Infants attend differentially as if they understand number concepts
Number processing

- Infants attend differentially as if they understand number concepts
- Infants have a non-linguistic “counting” mechanisms

Systems for number representation

- Object-file representations
  - Infants visually track objects and their properties, including number
  - Quantity is limited (up to 4 objects)