Chapter 5
Cognitive Development in Infancy
How do scientists know what babies know?

- Habituation
  - Loss of interest suggests the baby recognizes the stimuli.
- Novelty responsiveness
  - Interest and more time spent looking at new stimuli
- Evidence of learning/remembering from prior exposure
- Showing a sequence of events and measuring whether baby imitates them
Piaget and Infant Cognitive Development

- Infant actively constructs an understanding of the world.
- Adaptation – process whereby knowledge is altered by experience
  - Assimilation
  - Accommodation
Piaget’s Views

• **Assimilation**
  - Information can be incorporated according to what the infant already knows
  - Allows the infant to use existing understanding to make sense of the world

• **Accommodation**
  - The infant changes to reach new understanding
    - The modification of existing understanding to make it apply to a new situation
  - Allows the infant to understand reality better and better

• **Sensorimotor Intelligence**
  - Refinement of innate schemes by experiences of the senses and motor actions
Stage Theory

- Sensorimotor
  - Causality
  - Object permanence
  - Mental representation

- Challenges to Piaget
  - Underestimated sensory and organization capacities of infants
  - Object permanence and mental representation appear much earlier in development.
  - Infants more cognitively sophisticated than he believed.
Piaget’s Sensorimotor Stage
Object Permanence

- The realization that objects still exist when hidden from sight
  - 2 months – rudimentary expectations shown by surprise when an object disappears
  - 6 – 8 months – looking for a missing object for a brief period of time
  - 8 – 12 months – reaching for or searching for a toy that is completely hidden
Piaget’s Sensorimotor Stage

Imitation

- 2 months – can imitate actions they could see themselves make
- 8 – 12 months – can imitate other people’s facial expressions
- 1 year – imitation of any action that wasn’t in the child’s repertoire begins
- 18 months – deferred imitation (a child’s imitation of some action at a later time) begins
Table 5.1: Sensorimotor Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>Approximate Age</th>
<th>What the Baby Can and Cannot Do</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Birth to 1 month</td>
<td>Infants do not accommodate, so mental development is minimal. Everything is assimilated into their existing understanding and very slowly.</td>
<td>They cannot recognize that stimuli belong to solid objects in the outside world—for instance, that sounds come from other things.</td>
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<tr>
<td>Stage 2</td>
<td>1 to 4 months</td>
<td>Infants coordinate different aspects of their understanding of the world.</td>
<td>They coordinate hand and mouth (deliberately putting their fingers in their mouth).</td>
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<td>Stage 3</td>
<td>4 to 7 months</td>
<td>Infants are aware of relations between their own behavior and the environment.</td>
<td>When infants accidentally produce environmental events—kicking the side of the crib shakes the mobile that is attached to the railing, for instance—they may repeat them, suggesting that they want to review their effects on the environment.</td>
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<tr>
<td>Stage 4</td>
<td>7 to 10 months</td>
<td>Infants construct relations among environmental stimuli.</td>
<td>They coordinate a face and a voice as being from the same source.</td>
</tr>
<tr>
<td>Stage 5</td>
<td>10 to 18 months</td>
<td>Infants accommodate to the outside world and discover many unexpected relations among objects.</td>
<td>They attempt to see whether milk leaks out of a bottle at different rates depending on the angle of the bottle and the force with which it is squeezed.</td>
</tr>
<tr>
<td>Stage 6</td>
<td>18 to 24 months</td>
<td>Infants now can form a mental representation; for example, imagining the whereabouts of an invisible object.</td>
<td>When a ball rolls under a sofa, for example, a child will move around the sofa and anticipate the reemergence of the ball.</td>
</tr>
</tbody>
</table>
Video: Piaget’s Sensorimotor Stage
Mental Representation in Infancy

• Categorization – grouping separate items into a set according to some rule
• Remembering – infants remember previously experienced events
• Play
  • Exploratory play- Children’s play in which activities are tied to the tangible properties of objects
  • Symbolic play- Children’s play that enacts activities performed by the self, others, and objects in pretend or make-believe scenarios
Infant “Intelligence”

- How much do children at the same age vary in their “intelligence”?

- Infant tests
  - Bayley Scales of Infant Development
  - Lack of predictive validity
Video: Baby Geniuses
Infant Mental Development in Social Context

- Ecological perspective
  - Infant development influenced by proximal and distal forces

- Influence of parents
  - Scaffolding:
    - Providing learning opportunities, materials, hints, and clues when a child has difficulty with a task
  - Ethnotheories:
    - Parents’ belief system that motivate them to behave in the ways they do
Language Development in Infancy

- Phonology – sounds must be produced and perceived
- Semantics – meaning of words must be learned
- Syntax – grammar of language must be understood for meaningful communication
Figure 5.3: Milestones in Language Development in Infancy

- Understands prepositions ("in," "under")
- Imitates words
- Can find a named picture in a book ("dog")
- Follows a simple question
- Understands a prohibition
- Responds to simple commands
- Understands gestures and responds to "bye-bye"
- Discriminates emotional tones in speech
- Responds to human speech

- Uses first pronouns, speaks in phrases or sentences
- Uses two words in combination
- Says five or more words
- Says first word
- Repeats syllables ("ma-ma," "da-da")
- Vocalizes several syllables
- Coos

Approximate range of age of onset (months)
Language Comprehension and Production

- Comprehension (understanding language) comes before production (speaking language).
- Comprehension of 50 words around 13 months
- Production of 50 words around 18 months
Figure 5.4: Individual Differences in Language Development
Individual Variation in Language Development

- Quantitative differences
  - Number of words
  - Mean length of utterances

- Qualitative differences
  - Referential:
    - Vocabulary includes a high proportion of nouns
    - Speech provides information and refers to things in the environment
  - Expressive
The First Words

Expressive language

- The ability to produce words
- 12-13 months — babies begin to say first words
- Words learned slowly in context with specific situations and cues
The Building Blocks of Language

- Infant-directed speech
  - Varying inflection, speed, and word choice when talking with infants

- Turn taking
  - Conversational give-and-take

- Gesture
  - Nonverbal support of communication
Making and Understanding Sounds

- Sound Perception

- Sound Production
  - Prelinguistic stage
  - One-word stage
  - Multi-word stage
Video: Infants & Toddlers: Language Development
How Infants Learn Words

- Holophrasis
  - Use of single word for everything

- Problems with learning words
  - Immediate reference problem
  - Extension problem
  - Whole object assumption
  - Mutual exclusivity
How Infants Learn Grammar

- Grammar – set of rules for combining words into meaningful and interpretable communications
- Skinner suggested that infants learn by imitation and reinforcement.
  - Transitional probabilities
- Chomsky argued that aspects of syntax are innate.
  - Universal grammar