COGNITIVE DEVELOPMENT IN INFANCY AND TODDLERHOOD

I. PIAGET'S COGNITIVE-DEVELOPMENTAL THEORY

A. Key Piagetian Concepts

1. Piaget believed children move through four stages of development between infancy and adolescence.

2. During the sensorimotor stage, infants and toddlers "think" with their eyes, ears, hands, and other sensorimotor equipment.

3. What Changes With Development: a. Piaget believed a child's schemes change with age. b. Schemes are action-based at first and later will move to a mental level.

4. How Cognitive Change Takes Place: a. Adaptation 1) Adaptation is the process of building schemes through direct interaction with the environment, 2) Assimilation is a part of adaptation in which the external world is interpreted through existing schemes. 3) Accommodation is the part of adaptation in which new schemes are created or old ones adjusted to produce a better fit with the environment. 4) Equilibrium exists when children are not changing very much and they are in a steady, comfortable cognitive state; assimilation is used more than accommodation. 5) Disequilibrium is the state of cognitive discomfort which occurs during times of rapid change; accommodation is used more than assimilation. 6) Back-and-forth movement between equilibrium and disequilibrium leads to the development of more effective schemes. b. Organization 1) Organization is an internal process of rearranging and linking together schemes to form an interconnected cognitive system. 2) Schemes reach a true state of equilibrium when they become part of a broad network of structures that can be jointly applied to the surrounding world.

B. The Sensorimotor Stage

1. Piaget based the sensorimotor stage on his observations of his own children.

2. The Circular Reaction: a. Circular reactions are the means by which infants explore the environment and build schemes by trying to repeat chance events caused by their own motor activity. b. These reactions are first centered on the infant's own body. Subsequently, they change to manipulating objects and then to producing novel effects in the environment.

3. Substage 1: Reflexive Schemes - a. Piaget regarded newborn reflexes as the building blocks of sensorimotor intelligence. b. At first, babies suck, grasp, and look in much the same way, no matter what the circumstances.

4. Substage 2: Primary Circular Reactions-The First Learned Adaptations - a. Infants develop simple motor skills and change their behavior in response to environmental demands. b. The first circular reactions are primary in that they are oriented towards the infants' own bodies and motivated by basic needs.

5. Substage 3: Secondary Circular Reactions-Making Interesting Sights Last - a. Circular reactions of this substage are secondary in that the infants repeat actions that affect the environment. b. Infants can imitate actions that they have practiced many times.

6. Substage 4: Coordination of Secondary Circular Reaction - a. Intentional, or goal-directed, behavior is the combination of schemes to solve problems. b. Piaget regarded means-end action sequences as the first sign that babies appreciate physical causality.

c. Object permanence is the understanding that objects continue to exist when they are out of sight; it is not yet complete in this substage. d. AB search errors are committed by infants in this substage. Infants 8- to 12-months-old only look for an object in hiding place A after the object is moved from A to hiding place B.

7. Substage 5: Tertiary Circular Reactions-Discovering New Means Through Active Experimentation - a. Circular reactions in this substage are tertiary in that the infant repeats actions with variation-exploring the environment and bringing about new outcomes. b. Experimentation leads to a more advanced understanding of object permanence. Toddlers no longer make the AB search error.

8. Substage 6: Mental Representation-Inventing New Means Through Mental Combinations - a. Mental representations are internal images of absent objects and past events. b. The toddler can now solve problems through symbolic means instead of trial-and-error. c. Representation allows deferred imitation-the ability to copy the behavior of models who are not immediately present. d. Functional play is motor activity with or without objects during the first year and a half in which sensorimotor schemes are practiced. e. At the end of the second year, representation permits toddlers to engage in make-believe play.

C. Recent Research on Sensorimotor Development

1 . New studies show that infants display many cognitive capacities earlier than Piaget believed.

2. Reasoning About the Physical World: a. Object Permanence 1) Research indicates that babies as young as 3 1/2 months of age understand object permanence. 2) Infants understand object permanence before they are capable of demonstrating their knowledge through action. b. Searching for Objects Hidden in More than One Location 1) Recent findings reveal that poor memory cannot account for infants' unsuccessful performance on the AB task. 2) Before 12 months, infants seem to have trouble translating knowledge about an object's movement from one place to another into a successful search strategy. c. Other Aspects of Physical Reasoning 1) Habituation-dishabituation research reveals that young infants are aware of object substance, physical limits on object motion, and the effects of gravity. 2) A beginning grasp of physical causality is also present very early.

3. Deferred Imitation: a. Research indicates that 6-week-old infants demonstrate deferred imitation of facial expressions. b. Deferred imitation becomes more flexible and complex by the end of toddlerhood enabling children to better understand and predict others' behavior.

D. Evaluation of the Sensorimotor Stage

1. Some capacities, such as object permanence and deferred imitation, emerge much earlier than Piaget believed.

2. In contrast to Piaget's ideas, infants appear to develop in a gradual and continuous manner and not in step-like stages.

3. Consistent with Piaget's views, research indicates that motor activity does facilitate the early construction of knowledge.

4. A Perceptual View: a. Some researchers believe that schemes develop through looking and listening rather than just through acting on the world. b. Renee Baillargeon argues that infants understand their physical world by first making all-or- none distinctions and adding to these as they encounter relevant information.

5. A Nativist View: a. Researchers who take a nativist view of development believe that infants' cognitive skills are based on innate, or inborn, knowledge. b. The modular view of the mind assumes that each type of knowledge has its own module, or genetically prewired neural system in the brain, and maturational timetable.

6. A Compromise Position: a. Built-in mental equipment that infants possess might best be viewed as a set of biases, or learning procedures. b. Infant cognitive skills emerge gradually, depending on biological makeup and experience. c. Piaget's work inspired a wealth of research

on infant cognition. d. Piaget's observations have been of great practical value, particularly for teachers and caregivers.

II. INFORMATION PROCESSING

A. Information processing focuses on many different aspects of thinking such as attention, memory, categorization skills, and problem solving.

B. The Structure of the Information-Processing System

1. Mental strategies operate on and transform information, increasing the efficiency of thinking as well as the chances that information will be retained.

2. Information first enters the sensory register where sights and sounds are briefly held before they decay or are transferred to short-term memory.

3. Working, or short-term, memory is the conscious part of the mental system where information is actively "worked" on to ensure that it will be retained.

4. Long-term memory is the limitless permanent knowledge base.

5. Categorization of information increases the likelihood that information will be easily retrieved from long-term memory.

6. The capacity of the mental system, the amount of information that can be retained and processed at once, expands with age.

C. Attention

1. Infants gradually become more efficient at managing their attention, taking information in more quickly.

2. Research reveals that preterm and newborn infants require a long time to habituate and dishabituate to novel stimuli.

3. By 4 months, infants attention becomes more flexible and they are better able to disengage or shift attention from one stimulus to another.

4. Sustained attention improves throughout the first year.

5. With age, infants and toddlers become more interested in what others are attending to.

D. Memory

1. Habituation research indicates 3-month-old infants can recognize a stimulus 24 hours later.

2. Recognition is a type of memory that involves noticing whether a stimulus is identical or similar to one previously experienced.

3. Recall is a type of memory that involves remembering a stimulus that is not present; by the middle of the first year, infants can engage in recall.

4. Infantile amnesia, or the fact that practically none of us can remember events before age 2 or 3, may be due to brain development during early childhood. Alternatively, it may be due to the emergence of autobiographical memory, which occurs during the preschool years.

E. Categorization

1 . Evidence indicates that infants organize their physical, emotional, and social worlds.

2. By the end of the first year, categories are conceptual-based on function and behavior.

3. During the second year, children actively categorize items during their play.

F. Evaluation of Information-Processing Findings

1. Information-processing research emphasizes the continuity of thinking from infancy into adulthood.

2. One drawback to this approach is that, although it separates the different components of cognition , it does not build a broad, comprehensive theory of cognitive development.

3. More recent theorists have combined Piaget's theory with the information-processing approach or applied a dynamic systems view to early cognition to overcome this weakness.

III. THE SOCIAL CONTEXT OF EARLY COGNITIVE DEVELOPMENT
A. Vygotsky believed that complex mental functions originate in social interaction.
B. The zone of proximal development refers to a range of tasks that a child cannot yet handle alone, but can do with the help of more skilled partners.
C. Research indicates that adult guidance and support within the zone of proximal development is related to advanced play, language, and problem-solving skills during the second year.

IV. INDIVIDUAL DIFFERENCES IN EARLY MENTAL DEVELOPMENT
A. Cognitive theories are concerned with the process of development. In contrast, mental tests measure cognitive products that reflect mental development.
B. Infant Intelligence Tests

1. Most infant tests consist of perceptual and motor responses as well as some tasks that measure early language and problem solving.

2. The Bayley Scales of Infant Development consist of the Mental Scale, which includes items such as turning to a sound and looking for a fallen object; and the Motor Scale, which assesses gross and fine motor skills.

3. Infant test scores may not accurately reflect abilities because the babies are likely to become distracted, tired, or hungry during test administration.

4. Computing Intelligence Test Scores: a. Results for people at each age level form a normal or bell-shaped curve, in which most scores fall near the center and progressively fewer fall out toward the extremes. b. An intelligence quotient is a score that permits an child's performance on an intelligence test to be compared to the performances of other children of the same age.

5. Predicting Later Performance from Infant Tests: a. Although infant tests are carefully constructed, they are poor predictors of later intelligence. b. In one study, the average IQ shift between 2 and 17 years of age was as great as 28.5. points. c. Infant test scores are called developmental quotients rather than lQs because they do not tap the same intelligence dimensions measured at older ages. d. Infant test scores have somewhat better long-term prediction for extremely low-scoring babies. e. The habituation-dishabituation response and Piagetian object permanence tasks predict IQ more effectively than traditional infant measures.

C. Early Environment and Mental Development

1. The Home Environment: a. The Home Observation for Measurement of the Environment is a checklist for gathering information about the quality of children's home lives through observation and parental interviews. b. An organized, stimulating physical setting and parental encouragement, involvement, and affection repeatedly predict infant and early childhood IQ, regardless of SES and ethnic group. c. When parents are intrusive with questions and instructions, infants and toddlers are likely to be distractible, show less mature forms of play, and do poorly on mental tests.

2. Infant and Toddler Day Care: a. Today, over 60 percent of mothers with a child under age 2 are employed. b. Quality of day care has an impact on children's mental development and social skills. c. Developmentally appropriate practice is a set of standards that specify program characteristics that meet the developmental and individual needs of young children of varying

ages, based on current research and consensus of experts. d. Day care in the U.S. is affected by a macrosystem of individualistic values and weak government regulation and funding.

D. Early Intervention for At-Risk Infants and Toddlers

1. Studies indicate that children of poverty are likely to show gradual declines in intelligence test scores and to achieve poorly when they reach school age.

2. Interventions for infants and toddlers are either center- or home-based. The Carolina Abecedarian Project is a center-based project that demonstrates the benefits of continuous, high-quality enrichment from infancy through the preschool years.

3. The more intense the intervention, the greater the intellectual gains of participating children.

V. LANGUAGEDEVELOPMENT

A. On average, children say their first word at around 12 months of age, with a range of 8 to 18 months.

B. Between 1.5 and 2 years, toddlers combine two words; soon their utterances increase in length and complexity.

C. Three Theories of Language Development

1. The Behaviorist Perspective: a. This perspective regards language development as entirely due to environmental influences. b. Through operant conditioning, parents reinforce their baby's sounds that most sound like words. c. Imitation combines with reinforcement to promote language development.

2. The Nativist Perspective: a. This view assumes that children are born with a biologically-based system-called the language acquisition device -for mastering language. b. Chomsky maintained that the LAD contains a set of rules common to all languages; thus, children speak in a rule-oriented way from the beginning. c. Children all over the world tend to master language milestones in a similar sequence- evidence that fits with Chomsky's ideas. d. Can Great Apes Acquire Language? a) Findings reveal that the ability of chimps to acquire a humanlike language system is limited. b) Even pygmy chimps, a highly intelligent species, require several extra years of training to attain the basic grammar understood by human 2- and 3-year-olds. e. Language Areas in the Brain a) Humans have evolved specialized regions in the brain that support language skills. b) Broca's area, located in the frontal lobe, controls language production. c) Wernicke's area, located in the temporal lobe, controls language comprehension. f. Limitations of the Nativist Perspective 1) Researchers have had difficulty identifying the single system of grammar believed to underlie all languages. 2) Research indicates that language acquisition is not immediate but occurs in a steady and gradual manner.

3. The Interactionist Perspective: a. This view emphasizes that language achievements emerge through the interaction of innate abilities and environmental influences. b. Native capacity, a strong desire to interact with others, and a rich linguistic and social environment contribute to budding a child's language capacities. c. A great deal of evidence supports the interactionist position.

D. Getting Ready to Talk

1. Cooing and Babbling: a. Around 2 months, babies make vowel-like noises called cooing. About 6 months, consonants combine with vowels and the baby begins babbling. b. Babies must hear human speech for babbling to develop further. c. Adult-infant interaction increases the amount of spoken language a baby is exposed to.

2. Becoming a Communicator: a. By 4 months, infants and adults follow each other's gaze. The adults label what is seen. Experiencing this joint attention often speeds up language development. b. Simple infant games such as pat-a-cake and peek-a-boo demonstrate conversational turn-taking. c. At the end of the first year, infants use preverbal gestures to influence the behavior of others.

E. First Words

1 . Children's first words usually refer to important people, objects that move, familiar actions, or outcomes of familiar actions.

2. Underextension is a vocabulary error in which a word is applied to a smaller number of objects and events than is appropriate.

3. In contrast, overextension occurs when a word is applied to a wider collection of objects and events than is appropriate.

F. The Two-Word Utterance Phase

1 Vocabularies slowly build from age 12 to 18 months. However, between 18 and 24 months, children may add from 10 to 20 new words a week.

2. Telegraphic speech is the two-word utterance phase of toddlers which leaves out smaller and less important words.

G. Comprehension versus Production

1 . Production is the words and word combinations that children use.

2. Comprehension is the language that children understand.

3. At all ages, comprehension develops ahead of production. Comprehension only necessitates recognition of word meaning, whereas production requires active recall of the word and its meaning.

H. Individual and Cultural Differences in Early Language Development

1 . Many studies show that girls are ahead of boys in early vocabulary growth.

2. A referential style of early vocabulary learning is one in which toddlers mainly use language to label objects.

3. An expressive style uses language mainly to talk about one's own feelings and needs and those of other people.

4. Referential style vocabularies grow faster than expressive styles because languages contain more object labels than social phrases.

5. A problem with language development may exist if a child is greatly delayed when compared to language norms, if he does not follow simple directions, or if he has problems putting thoughts into words.

I. Supporting Early Language Development

1 . When adults speak to infants and toddlers, they often use a form of language called child-directed speech that consists of short sentences with high-pitched, exaggerated expression and very clear pronunciation.

2. From birth on, children prefer to listen to CDS, and the use of CDS supports early language development.

3. Make-believe play, reading to toddlers, and conversational give-and-take between toddlers and adults all support early language learning.

4. CDS is an example of how the zone of proximal development operates.