Continuity and Change in Cognitive Development

Lecture 36

Development as Quantitative Change

The Child as "Short, Stupid Adult"

- Training Studies (Gesell & Thompson, 1929)
  - Twin Girls: "T" & "C"
  - Length of Training
- Hopi Cradleboards (Dennis, 1940)
  - Swaddled for first year of life
  - Age of Walking (by 18 mos.)
  - Lesions in Occipital Bone

Kiowa baby in a cradle board. Charles H. Stephens Collection, University of Pennsylvania Museum of Archaeology and Anthropology

Gesell Developmental Schedules

Gesell (1940)

- Motor
- Adaptive
- Language
- Personal-Social

2.0y: Runs Well, No Falling
Walks Up and Down Stairs

2.5y: Tries to Stand on 1 Foot

3.0y: Walks on Tiptoe, >2 Steps

3.5y: Stands on 1 Foot >2 secs
Jumps, Both Feet Leave Floor

4.0y Stands on 1 Foot 2-7 secs
Walks Down Stairs

4.5y: Hops on 1 Foot

5.0y: Stands on 1 Foot >9 secs

5.5y: Stands on 1 Foot 12 secs

6.0y: Stands on 1 Foot Alternately

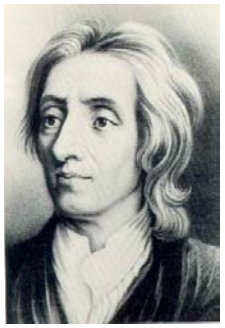
The Growth of Intelligence

- Binet & Simon (1905): Mental Age
  - Correlated with Chronological Age
    - Test Items Clustered by Age Level
- Terman (1916): IQ
  - "Ratio" IQ = MA/CA x 100
- Wechsler (1936)
  - "Deviation" IQ

The Origins of Knowledge

- Nativism (Descartes)
  - Innate Knowledge
    - Independent of Sensory Experience

- Empiricism (Locke)
  - Knowledge Acquired Through Experience
  - Child as a *Tabula Rasa*



Qualitative Stages of Intellectual Development

Piaget (1951, 1952)

- Schema
- Assimilation and Accommodation
- Stages of Cognitive Development
  - Sensory-Motor Intelligence
  - Pre-Operational Thought
  - Concrete Operations
  - Formal Operations
- Landmarks of Stages

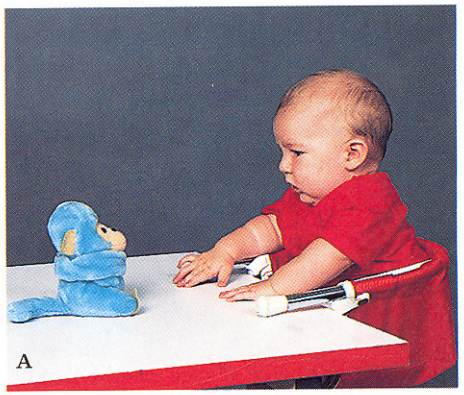
Sensory-Motor Intelligence

Birth to Age 2

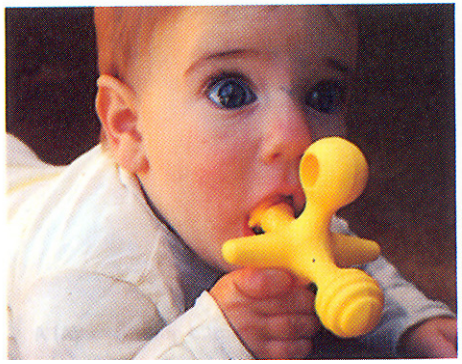
- Unrelated Sensory Experiences

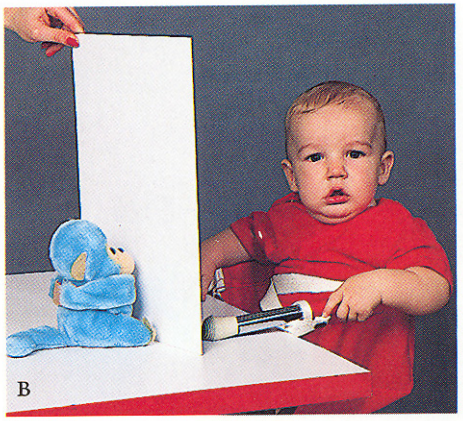
  "A Blooming, Buzzing Confusion"

  William James



- Reflex-Like Motor Responses
- Sensory-Motor Schemata



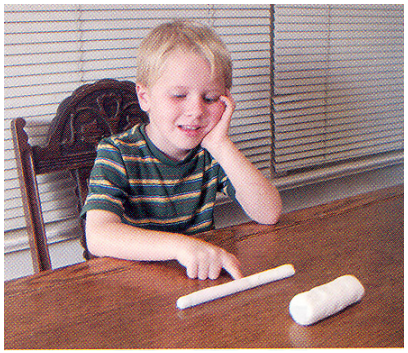


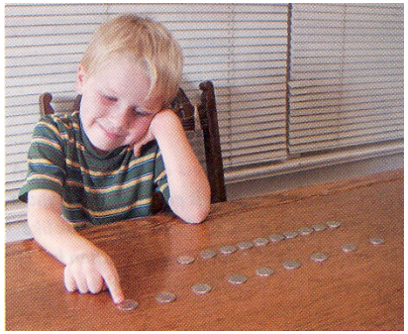
- Failure of Object Permanence

The Pre-Operational Period

Age 2-7

- Object Permanence
- Unrelated Internal Representations
- Conservation Failure

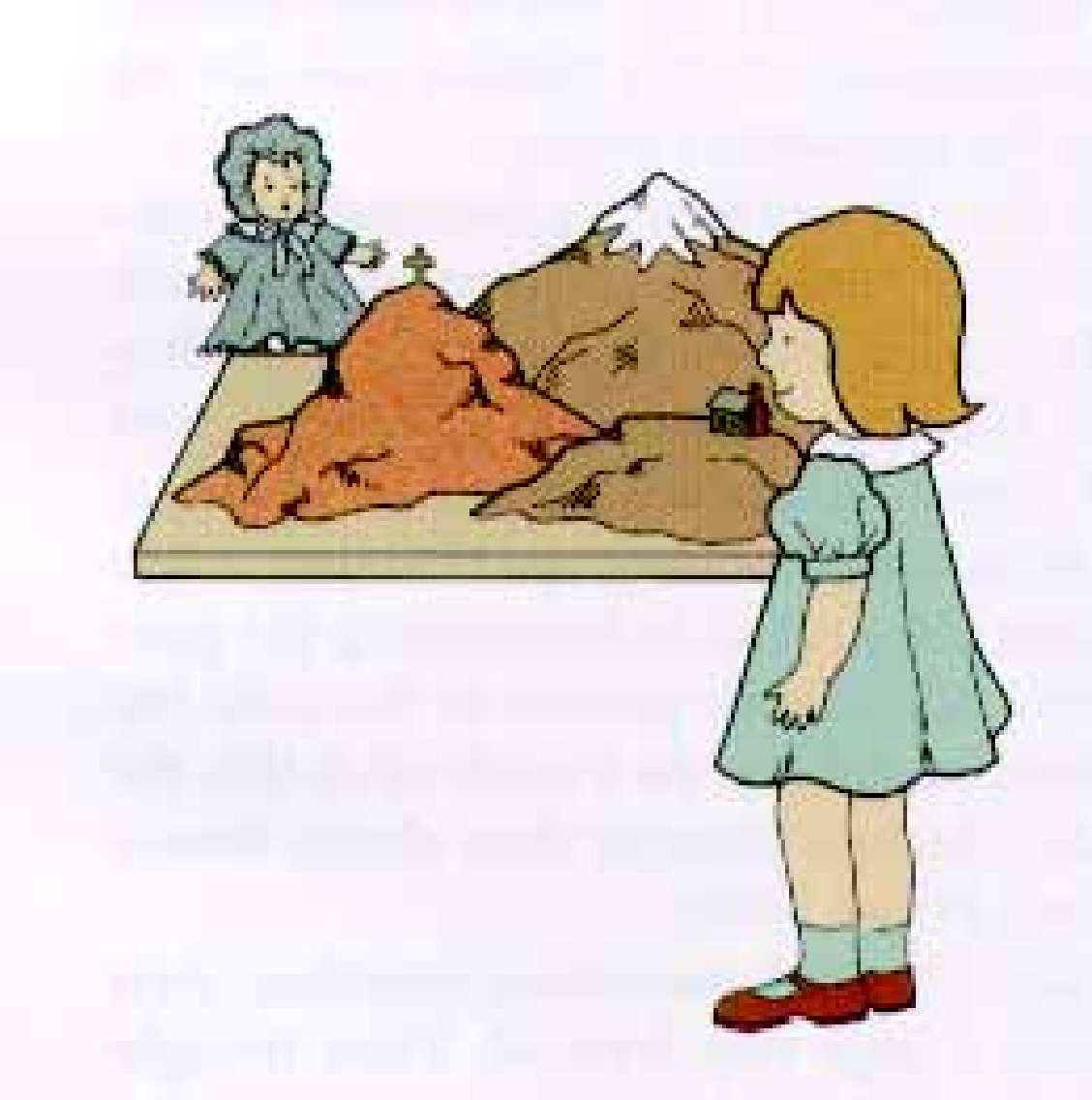




- Egocentrism

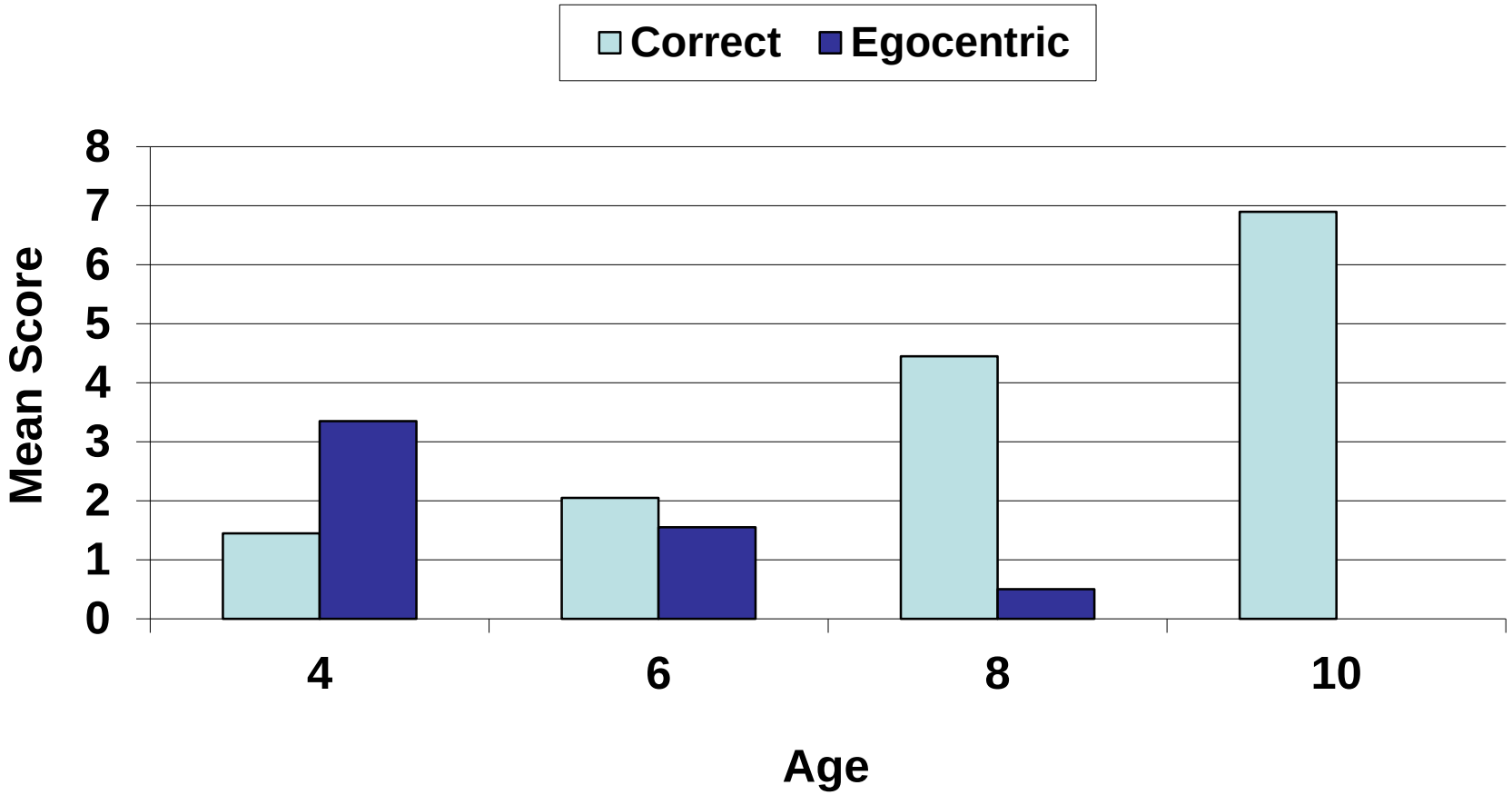
The “Three Mountains” Task

Piaget & Inhelder (1956/1967)



Age and Egocentrism

Brodzinsky (1980)

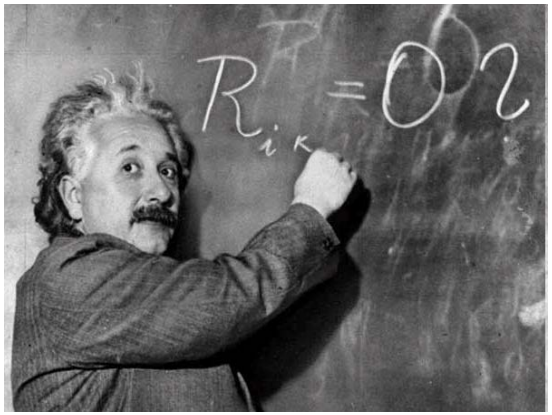


Concrete Operations
Age 7-12

- Achievement of Conservation
  - Take Account of Transformations
- Loss of Egocentrism
  - Take Another's Point of View
- Attention
  - Not Controlled by Salience
- Classification by Shared Properties
  - Hierarchical Structure

Formal Operations
Age 12 and Up

- Hypothetico-Deductive Reasoning
  - From General Principles to Specific Instances
  - The Child as “Naïve Scientist”
- Inductive Reasoning
  - From Specific Instances to General Principles
- Reflective Abstraction
  - Reflect on Own Thoughts
- Propositional Logic
  - If *P* Then *Q*

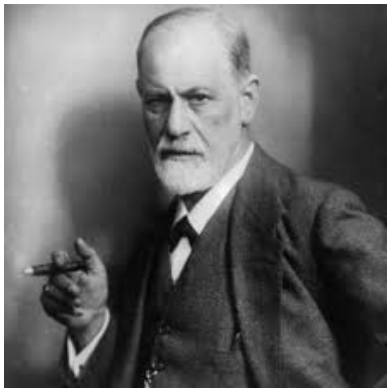


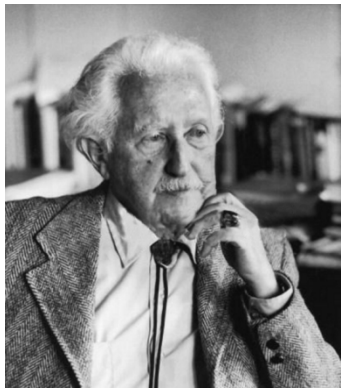
Other Stage Theories of Development

Sigmund Freud:

Psychosexual Development

1. Oral
2. Anal
3. Phallic
4. Latency Period
5. Genital





Erik Erikson:

"Eight Ages of Man"

1. Trust vs. Mistrust
2. Autonomy vs. Shame
3. Initiative vs. Guilt
4. Industry vs. Inferiority
5. Identity vs. Role Confusion
6. Intimacy vs. Isolation
7. Generativity vs. Stagnation
8. Ego integrity vs. Despair
9. Despair vs. Hope, Faith (?)

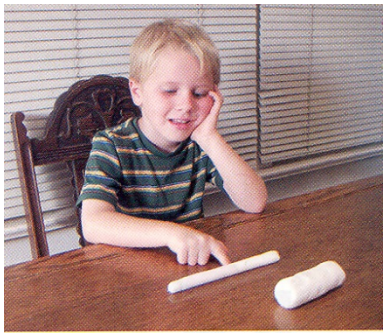
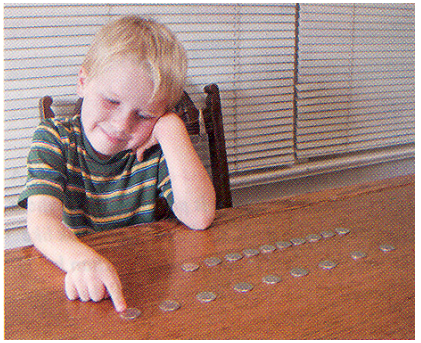
Stages of Moral Development

Lawrence Kohlberg

- Pre-Conventional
  - Obedience and Punishment
  - Self-Interest
- Conventional
  - Interpersonal Accord and Conformity
  - Authority and Obedience
- Post-Conventional
  - Social Contract
  - Universal Ethical Principles
  - Transcendental Morality (?)

Critique of the Piagetian Stages

- *Decalage*
  - Not a Quantum Shift?

- "Lower Boundaries" of Stages
  - How Low Can you Go?

“Counting Principles” in Pre-Operational Children

Gelman & Gallistel (1978)

- One-to-One Correspondence
- Stable Order
- Cardinality

1
1
“Blitz”

2
5
“Blatz”

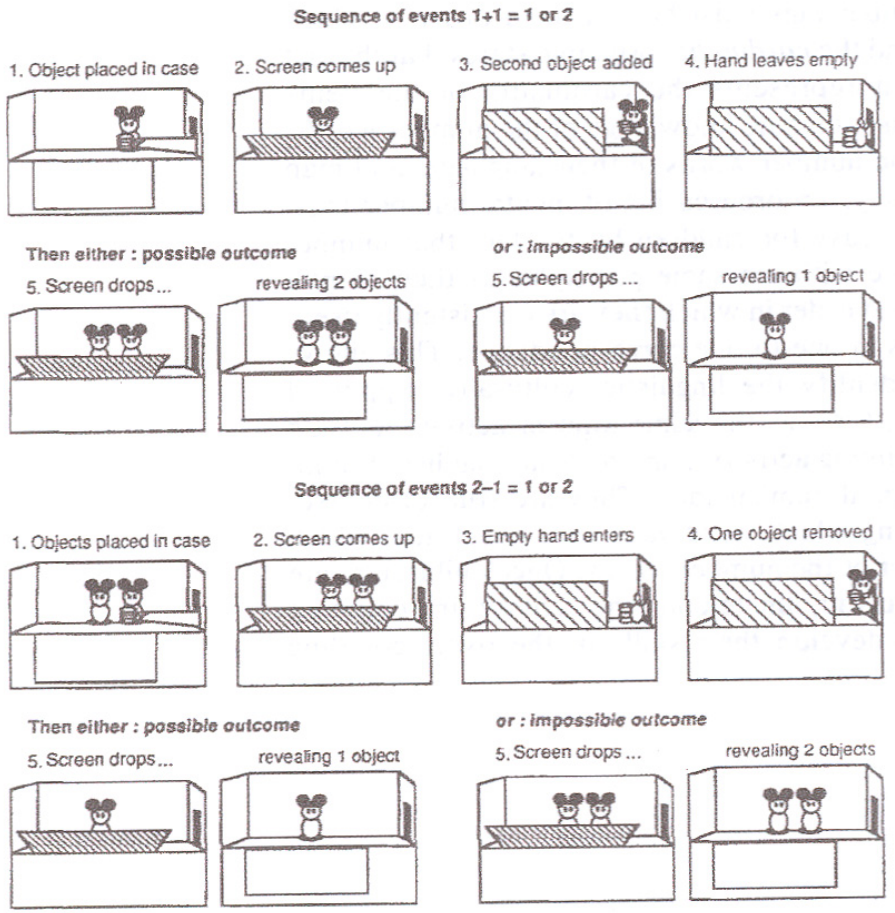
3
3
“Bluck”

4
8
“Blit”

Infant Arithmetic

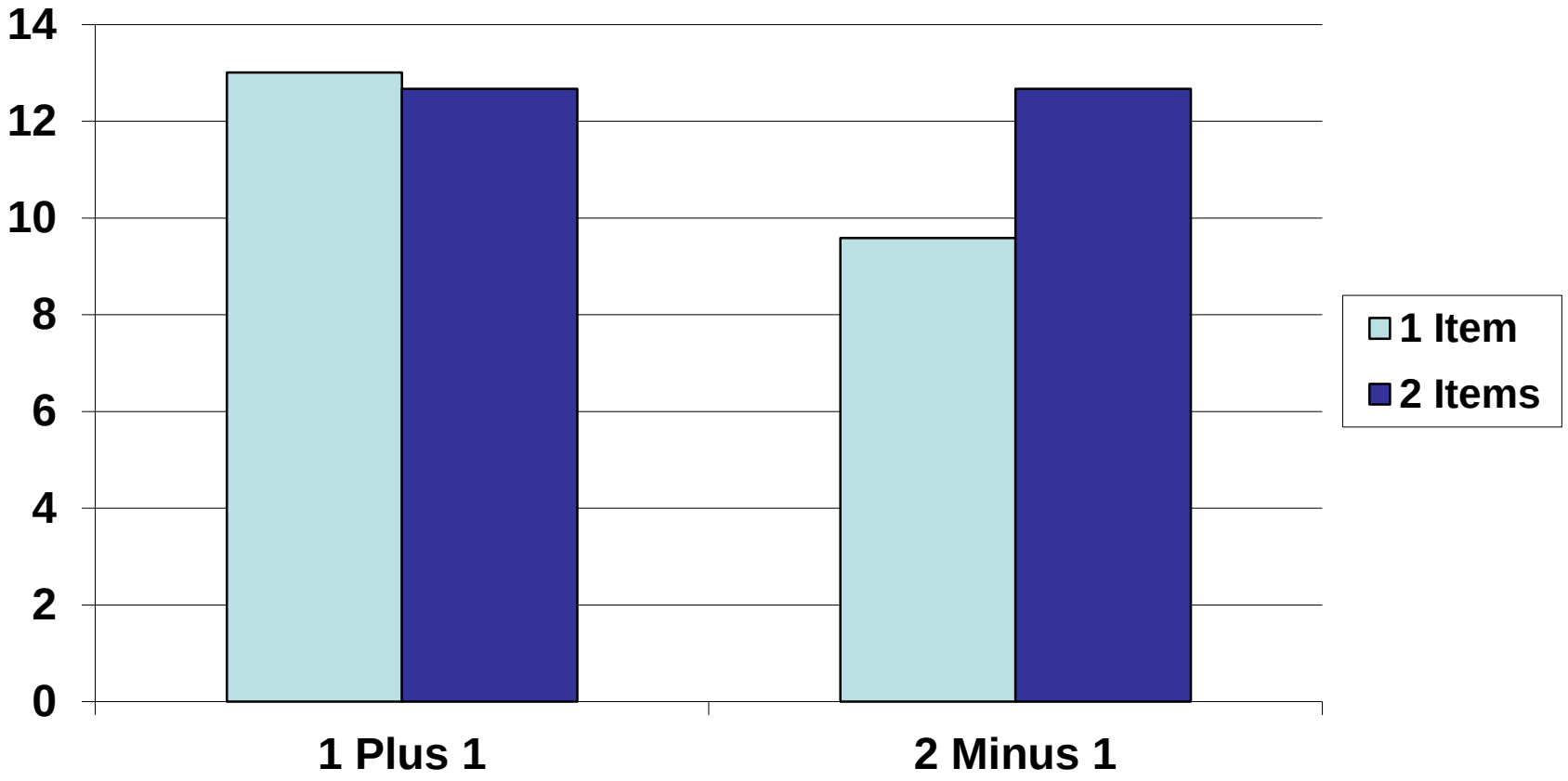
Wynn (1992)

- 4-5 month-old Infants
- Looking Time
  - Measure of Attention
    - Surprise
- Baseline Control
  - 1 vs. 2 Items
- Arithmetic Test
  - Add 1+ 1
  - Subtract 2 – 1



Looking Times

Wynn (1992)



Stage Theories of Development

- Universal
- Obligatory
- Stereotyped
- Irreversible

Development as the Acquisition of Expertise

Chi, Glaser, & Farr (1988); Bedard & Chi (1992)

- Young Child as Novice
  - Expertise Acquired Through Learning
- Characteristics of Expert Problem-Solving
  - Cross-Referencing
  - Higher-Order Patterns (“Chunks”)
- Expertise vs. Learning
  - Qualitative Leaps
    - Successive Reorganization of Task Performance
  - Infant not a Blank Slate
    - Innate if Rudimentary Cognitive Apparatus

Development as Metacognition

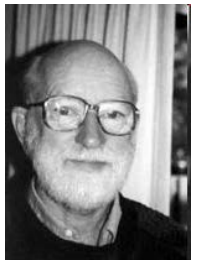
Gleitman, Gleitman, & Shipley (1972); Flavell (1979)

Cognition *About* Cognition

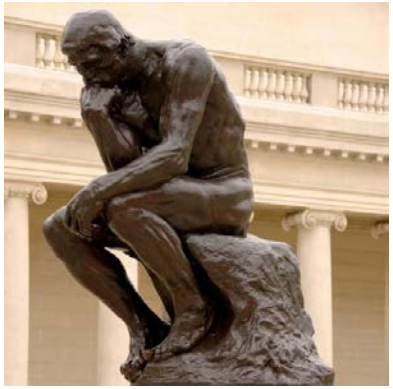
- Monitoring What You Know
- Appreciation of Cognitive Processes
  - Metalanguage
  - Metamemory

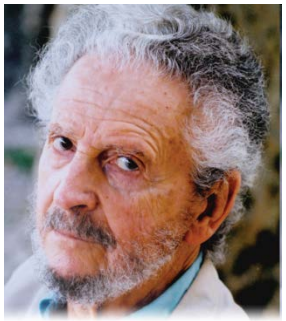
Aspects of Metacognition

Flavell (1979)



- Goals or Tasks
  - Objectives of Cognition
- Actions or Strategies
  - What Works for a Given Task
- Metacognitive Knowledge
  - Understanding of Influences on Cognition
- Metacognitive Experiences
  - Thoughts and Feelings About Cognition





The Theory of Mind

Premack & Woodruff (1978)
Wellman (1990)
Baron-Cohen (1991, 1995)

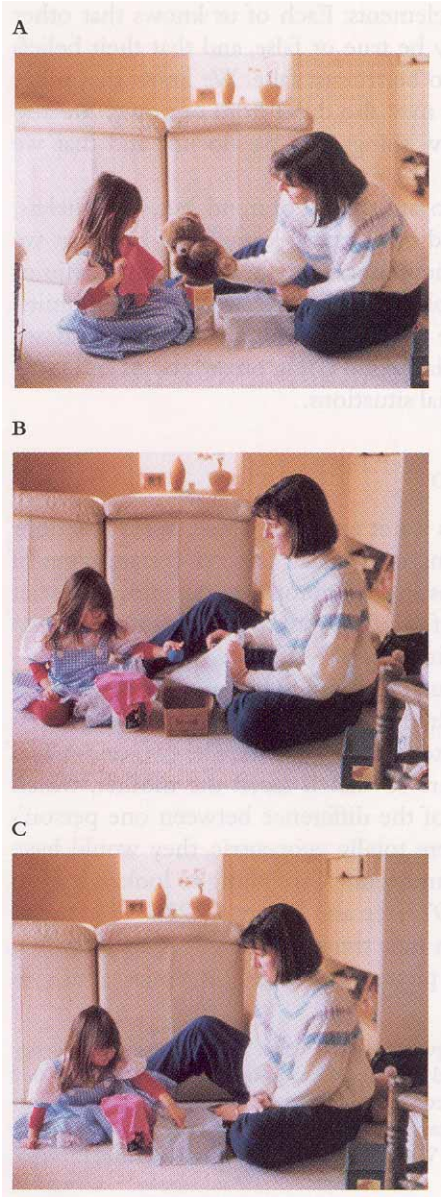
The Ability to Impute Mental States to Ourselves and Other People

- Knowledge of Our Own Minds
  - Mental States Separate from Outside World
  - Can Control Beliefs, Feelings, Desires
  - Introspection
- Knowledge of Other Minds
  - Others' Mental States May Differ from Ours
  - Others Have Different Experiences
  - Infer Others' Beliefs, Feelings, Desires

“False Belief” Task Example

After Wimmer & Perner (1983)

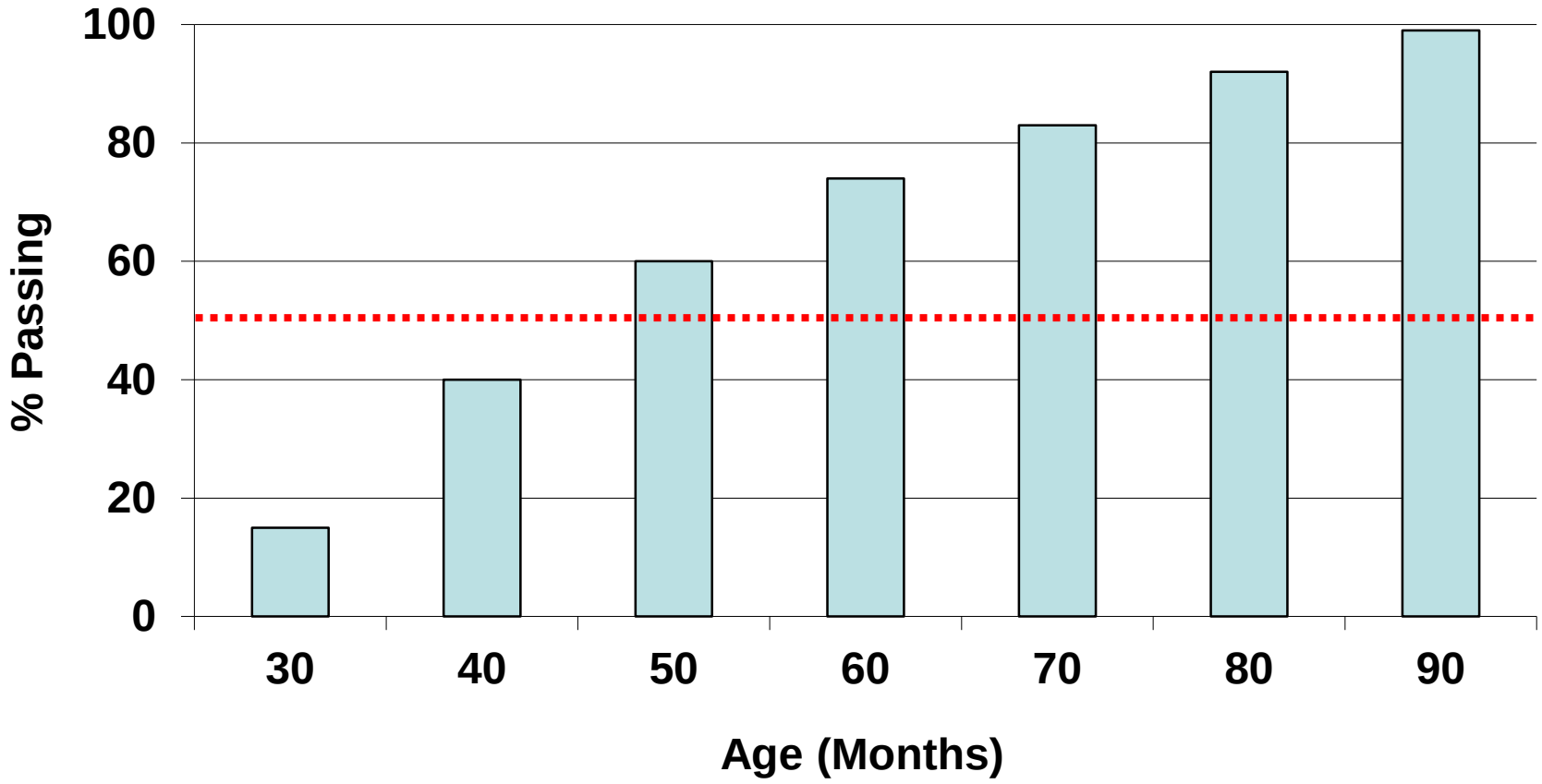
- Experimenter, Child, and Puppet
- Puppet Hides Ball in Oatmeal Container
- Puppet Put Away
- Experimenter, Child Switch Ball to Box
- Puppet Brought Back
- Where will it look?
  - 3 to 4-Year-Olds: “In the Box”
    - “Because that’s where it is”
  - 4 to 5-Year-Olds: “In the Oatmeal Container”
    - “Because that’s where he *thinks* it is”



Gleitman (1999)

Age and False Belief Test Performance

Wellman et al. (2001)



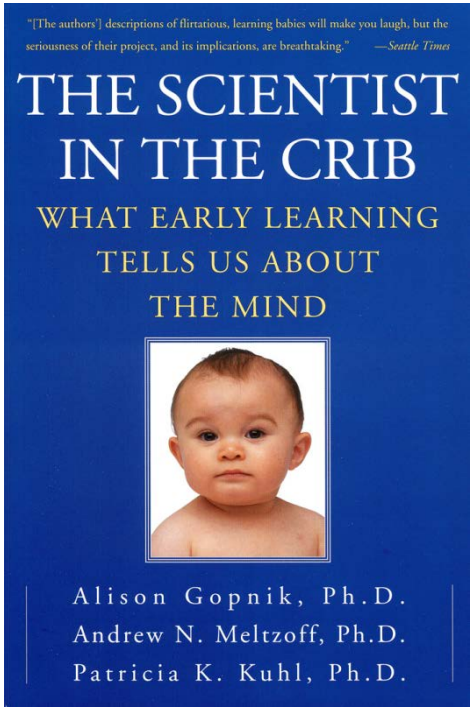
The "Theory Theory" of Cognitive Development

Gopnik & Wellman (1994)
Gopnik & Meltzoff (1997)
Gopnik, Meltzoff, & Kuhl (2000)

- Piaget: Child as "Naïve Scientist"
  - Actively Exploring and Experimenting
    - Formulate Hypotheses
    - Gather Evidence
    - Revise Hypotheses
- Develop Theories of World
  - Abstract, Coherent Knowledge Systems
    - Predict, Control Events
    - Interpret and Explain Events

Theory-Formation as Learning

- Forms of Learning
  - Learning from Conditional Probabilities
    - Classical Conditioning
  - Learning from Interventions
    - Instrumental Conditioning
  - Observational Learning
    - Precept
    - Example



The Child is Not a *Tabula Rasa*

- Innate Theoretical Capacity
  - Form, Test, Revise Understanding
- "Starting-State" Nativism
  - "Substantive Innate Theories" of Various Domains
- Actively Engaged in Theory-Testing
  - Understanding Surprising Events
  - Generalize from Examples
    - Induce Categories from Instances
  - Test and Revise Understanding