

**Social-Cognitive
Development**
Fall 2015

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Three Aspects of Development


- Ontogenetic
 - Development in Individual Organism
 - Empiricism vs. Nativism
- Phylogenetic
 - Evolution Across Species
 - Children vs. Chimpanzees
- Cultural
 - Cognitive Anthropology
 - “Primitive” vs. “Advanced”
 - Literacy, Political/Economic Development
 - Culture (Independent of Development)

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Ontogenetic View of Development

What is the difference between
the mind of an adult and that of a child?

- Quantitative
 - Neonatal Mind as *Tabula Rasa*
 - Acquire Knowledge Through Experience
- Qualitative
 - “Babies Are a Lot Smarter Than We Think”
 - But Just Think Differently
 - Continuity vs. Discontinuity



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Piagetian Approach to Development



- Nativism *and* Empiricism
 - Analogy: Genotype to Phenotype
- Innate Cognitive Endowment
 - Primitive Cognitive Schemata
- Development as Dialogue
 - Assimilation of Environment to Schemata
 - Accommodation of Schemata to Environment

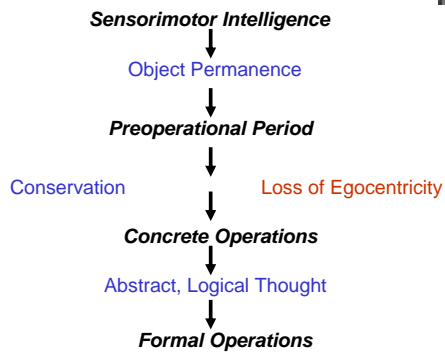
4

Genetic Program for Change

- Discontinuities as Stages
 - Sensory-Motor
 - Pre-Operational Period
 - Concrete Operations
 - Formal Operations
- Final Accomplishment
 - Abstract Concepts
 - Formal Logic

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Piagetian Milestones



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Loss of Egocentrism as a Milestone in Social Cognition

“The belief that other people experience the world as the child does”

- Transition Between Pre-Operational Period, Concrete Operations
 - “Point of View” Task
 - Before Age 4; Age 4-7; After Age 7
- Relation to Conservation
 - Same Object Can Look Different, Depending on Point of View

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The “Three Mountains” Task

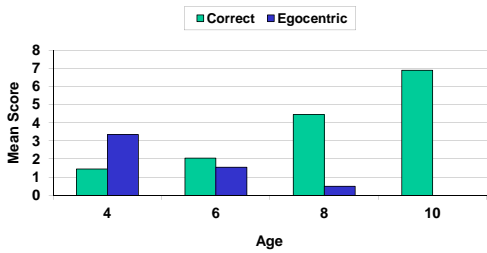
Piaget & Inhelder (1956/1967)



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Age and Egocentrism

Brodzinsky (1980)



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Theory of Mind

Premack & Woodruff (1978)

- Understanding That We Have Mental States
 - Knowledge, Beliefs, Thoughts, Feelings, Desires
 - Others Have Mental States Like We Do
- Metacognition
 - Knowledge of the Contents of Our Own Minds
 - Knowledge of Mind's Operating Principles
- Knowledge of Other Minds
 - Other People Have Mental States
 - Infer Mental States from Behavior

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The "Theory Theory" of Cognitive Development

Wellman, 1990; Gopnik & Wellman (1992)



- Child as Naïve Scientist
 - Induces Theories from Experience
 - Innate Reasoning Abilities
 - Test Hypotheses Deduced from Theory
 - Revises Theory in Light of Empirical Evidence
- Knowledge of How World Works
 - Naïve Physics, Biology
 - Naïve Sociology?
- Knowledge of How People Work
 - Naïve Psychology?

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Elements of a Theory of Mind

- Other People Have Beliefs
 - May Be True or False
 - May Differ From Our own
- Other People Have Thoughts, Feelings, and Desires
 - May Differ From Our Own
- Cognitive Development as the Development of *Social Cognition*
 - *Infer Mental States from Behavior*

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"False Belief" Task Example

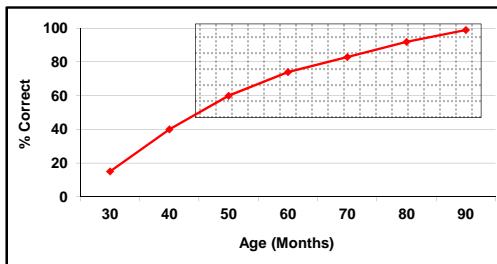
After Wimmer & Perner (1983)

- Experimenter, Child and Puppet
- Experimenter Makes Puppet Hide Ball in Oatmeal Container
- Puppet Put Away
- Experimenter and Child Switch Ball to Box
- Puppet Returns: Where Will It Look?
- 3,4-Year-Olds, Box
 - "Because that's where it is"
- 4,5-year-Olds, Oatmeal Container
 - "Because that's where he *thinks* it is"



Age and False Belief

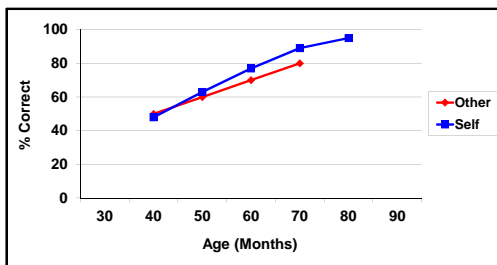
Wellman et al. (2001)



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False Belief About Self and Other

Wellman et al. (2001)



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Intersubjectivity

Schutz (1932)

- Subjectivity (Consciousness)
 - I am outgoing.
 - I feel happy.
 - I want to be alone.
- Intersubjectivity (Social Cognition)
 - I perceive that she is outgoing.
 - I perceive that she feels happy.
 - I perceive that she wants to be alone.

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Intersubjectivity and Intentionality

Two Meanings of *Intentionality*

- Motivational Sense of *Intention*
 - Goal-Directedness of Behavior
 - Bentham (1780), Anscombe (1957)
- Epistemic Sense of *Intentionality*
 - “Aboutness” of Mental States
 - Brentano (1874)
 - Intersubjectivity
 - Beliefs About Someone Else’s Beliefs

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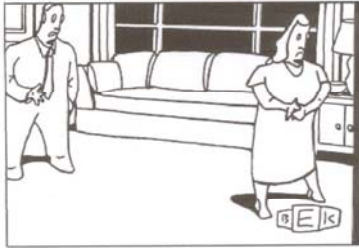
Intersubjectivity as Higher-Order Intentionality

- 1st-Order Intentionality
 - I feel happy.
- 2nd-Order Intentionality
 - Lucy knows that I feel happy.
- 3rd-Order Intentionality
 - Judy believes that Lucy knows that I feel happy.
- 4th-Order Intentionality
 - Stan forgot that Judy believes that Lucy knows that I feel happy.

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Levels of Dyadic Intersubjectivity

Bruce Eric Kaplan, *New Yorker* (10/26/1998)



"Of course I care about how you imagined I thought you perceived I wanted you to feel."

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Levels of Intentionality

Dunbar (2000), after Kinderman et al. (1998)

Intentionality

1. Jane believes that
2. Peter supposes that
3. Sarah thinks that
4. Simon believes that
5. Sarah would like to go out with Peter

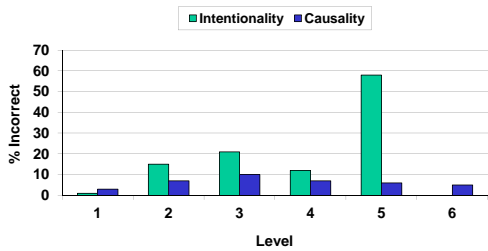
Causality

1. A caused B
2. B caused C
3. C caused D
4. D caused E
5. E caused F
6. F caused G
7. G caused H

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Levels of Intentionality

Kinderman et al. (1998)



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Second-Order False Beliefs

Perner & Wimmer (1985)

- First-Order False Belief
 - Mary thinks that the ball is in the can.
 - The ball is really in the box.
- Second-Order False Belief
 - *John thinks that...*
 - Mary thinks that the ball is in the can.
 - Mary really thinks that the ball is in the box.

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The Ice-Cream Truck Story

Perner & Wimmer (1985)

1. John and Mary think that the ice-cream truck will stay in the park all day.
Mary says she is going to buy an ice cream in the afternoon.
Mary leaves John in the park
2. John learns that the truck is moving to the church.
Mary not present for this information.
3. **Mary learns that the truck is moving to the church**
John is not present for this information
4. John goes to Mary's house for help with his homework.
Mary's mother says she went to get an ice cream.

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Test for Theory of Mind

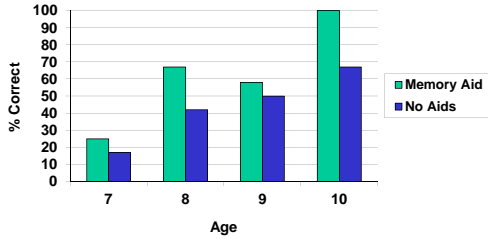
Perner & Wimmer (1985)

- First-Order Theory of Mind
 - Where did Mary go to get ice cream?
- Second-Order Theory of Mind
 - Where did John go to look for Mary?
- Justifications
 - Belief-Belief
 - He doesn't know that she already knows that the van moved.
 - Belief-Information
 - He doesn't know that she had talked to the ice-cream man.
 - Initial Location
 - She said that she would go to the park to get ice cream.

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Second-Order Theory of Mind

Perner & Wimmer (1985)



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Do Infants Have a Theory of Mind?

Clements & Perner (1994)

- 2- and 3-Year Olds
 - Say Where the Puppet Will Look
 - Incorrectly Identify New Location
 - Look Where the Puppet Will Look
 - Correctly Identify the Old Location
- Understanding May Not Be Expressed Verbally
 - Competence vs. Performance

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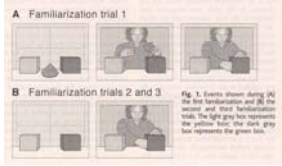
Do Infants Have a Theory of Mind?

Onishi & Baillargeon (2005)

- 15-Month-Old Infants
- Totally Nonverbal Task
 - Violation of Expectancies
 - Familiarize Child with Situation
 - Target's Behavior Violates Expectancies
 - Infants Look Longer at Counterexpectational Events

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Familiarization Trial

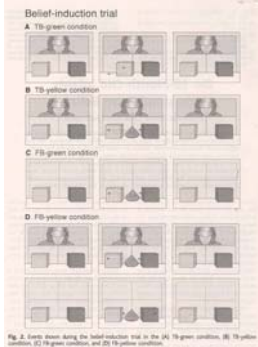


- Trial 1
 - Actor Hides Watermelon
 - in Green Box
 - not Yellow Box
- Trials 2, 3
 - Actor Returns
 - Reaches into Green Box

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Belief-Induction Trial

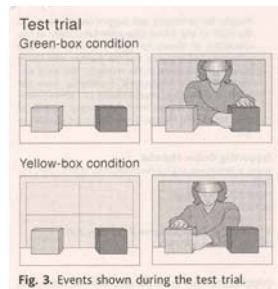
- True Belief Green
 - Actor Watches
 - Yellow Box Moves Toward Green
- True Belief Yellow
 - Actor Watches
 - Watermelon Moves to Yellow
- False Belief Green
 - Actor Ignorant
 - Watermelon Moves to Yellow
- False Belief Yellow
 - Actor Watches
 - Watermelon Moves to Yellow
 - Ignorant
 - Watermelon Moves Back to Green



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Test Trial

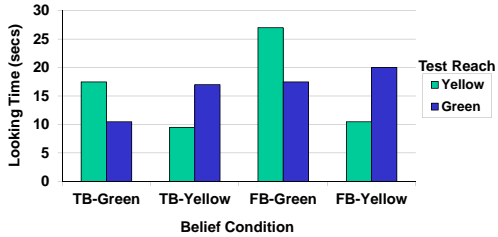
- Actor Opens Doors
 - Reaches into Green Box
- Or
- Reaches into Yellow Box



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Looking Times in the Non-Verbal False-Belief Task

Onishi & Baillargeon (2005)



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Infants Have a Theory of Mind!

- Infants Know What Others Believe
 - Might be Incorrect
 - Beliefs May Differ From Their Own
- Infants Expect Others to Behave in Accordance with Their Beliefs
 - Pay Attention When They Do not

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The Theory of Mind in the Brain

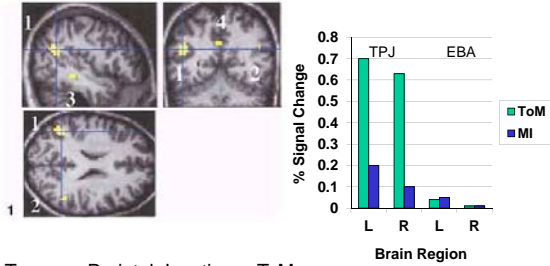
Saxe & Kanwisher (2003)

- Adult fMRI Study
- Read Stories
 - True and False Beliefs
 - Boy Making Papier Mache Goes to Store for Glue
 - Mother Throws Out Newspaper Strips
 - Mechanical Inference
 - Teakettle Left Boiling on Stove All Night
 - No Water Left in the Morning
 - Human Action (No True/False beliefs)
 - Woman Walking to Work
 - Detours to Avoid Crane

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Brain Activation During Theory-of-Mind Reasoning

Saxe & Kanwisher (2003)



Temporo-Parietal Junction -- ToM
Extra-Striate Body Area -- Human Body

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Theory of Mind Beyond False Beliefs

Wellman & Liu (1994)

- Diverse Desires
- Diverse Beliefs
- Knowledge Access
- Contents False Belief
- Explicit False Belief
- Belief-Emotion
- Real-Apparent Emotion

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Diverse Desires

- Two Snacks: Carrot or Cookie
- Own Desire
 - Child States Preference
- Target Desire
 - “Mr. Jones” Has Other Preference
 - Which Will Mr. Jones Choose?
- Correct
 - Target Desire Opposite to Own Desire

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Diverse Beliefs

- Cat Hiding: Bushes or Garage
- Own Belief
 - Child States Belief
- Target Belief
 - “Linda” Has Other Belief
 - Where Will Linda Look?
- Correct
 - Target Looking Opposite to Own Belief

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Knowledge Access

- Closed Drawer, Toy Dog Inside
- Own Knowledge
 - Child Knows Dog is Inside
- Target Knowledge
 - “Polly” Has Never Seen the Drawer
 - What Does Polly Think Is Inside?
- Correct
 - Target Has No Knowledge

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Contents False Belief

- *Band-Aid* Box with Toy Pig Inside
- Own Knowledge
 - Child Knows Pig is Inside
- Target Knowledge
 - “Peter” Has Never Seen This *Band-Aid* Box
 - What Does Peter Think is Inside?
- Correct
 - Target Thinks Box Contains *Band-Aids*

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Explicit False Belief
(Modeled on False-Belief Task)

- “Scott” Wants to Find His Mittens
 - They’re *Really* in His Backpack
 - He *Thinks* They’re in the Closet
- Where Will He Look?
 - Correct
 - Target Looks in Closet

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Belief-Emotion

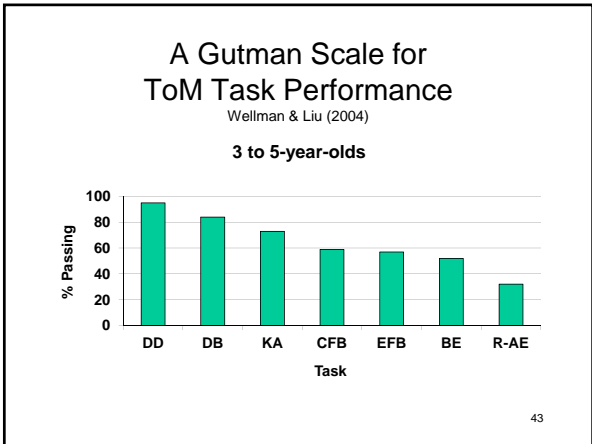
- “Teddy” and *Cheerios* Box with Rocks In It.
 - “Teddy” Likes *Cheerios*, Goes Out to Play
 - Comes Back Inside for Some *Cheerios*
- How Happy is Teddy
 - When He Sees the Box?
- When He *Opens* the Box?

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Real-Apparent Emotion

- Three Emotional Faces
 - Happy, Neutral, Sad
- “Rosie” Tells a Mean Joke About “Matt”
- “Matt” Tried to Hide How He Felt
 - How Did “Matt” Really Feel?
 - How Did “Matt” Try to Look to the Others?



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- ### Steps Toward a Theory of Mind
- Wellman & Liu (1994)
- 3-Year Olds
 - Diverse Desires
 - Diverse Beliefs
 - 4-Year-Olds
 - Knowledge Access
 - Contents False Belief
 - 5-Year-Olds
 - Real-Apparent Emotion
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The "Theory of Mind" as *Mindreading*

Simon Baron-Cohen (1995)

The ability to infer what is on someone else's mind

- Elements of Mindreading
 - Intentionality Detector
 - Eye-Direction Detector
 - Shared-Attention Mechanism
 - Theory-of-Mind Mechanism
- Cognitive Modules
 - Brain Modules

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Elements of Theory of Mind

in Biologically Normal Children
Baron-Cohen (1995)

Age Group	ID	EDD	SAM	ToMM
< 9 Months	+	+		
9-18 Months	+	+	+	
4 Years	+	+	+	+

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Mindblindness Hypothesis of Autism

Baron-Cohen (1995)

Autistic Individuals Lack the Ability
to Infer What Is On Someone Else's Mind

- Elements of Mindreading
 - Intentionality Detector
 - Eye-Direction Detector
 - Shared-Attention Mechanism
 - Theory-of-Mind Mechanism
- Autism as Specific Deficit in Social Cognition

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Mindblindness in Autism

"Kanner Syndrome" (1943)



"He seems almost to draw into his shell and live within himself....
When taken into a room, he completely disregarded the people and instantly went for objects....
When a hand was held out to him so that he could not possibly ignore it, he played with it briefly as if it were a detached object....
He did not respond to being called, and did not look at his mother when she spoke to him...."

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Mindblindness in Autism

"Kanner Syndrome" (1943)



"He never looked up at people's faces.
When he had any dealings with persons at all, he treated them, or rather parts of them, as if they were objects.
He would use a hand to lead him.
He would, in playing, butt his head against his mother as at other times he did against a pillow.
He allowed his boarding mother's hand to dress him, paying not the slightest attention to her...."

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Mindblindness in Autism

"Kanner Syndrome" (1943)



"...[O]n a crowded beach he would walk straight toward his goal irrespective of whether this involved walking over newspapers, hands, feet, or torsos, much to the discomfiture of their owners.
His mother was careful to point out that he did not intentionally deviate from his course in order to walk on others, but neither did he make the slightest attempt to avoid them.
It was as if he did not distinguish people from things, or at least did not concern himself about the distinction."

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Characteristic Symptoms of Autism

Kanner & Eisenberg (1956)



- Profound Lack of Affective Contact with Other People
- Anxiously Obsessive Desire for the Preservation of Sameness
- Fascination for Objects, which are Handled with Skill in Fine Motor Movements
- Mutism, or a Kind of Language that Does Not Seem Intended to Serve Interpersonal Communication
- Retention of an Intelligent and Pensive Physiognomy and Good Cognitive Potential Manifested, in Those Who Can Speak, by Feats of Memory or, in the Mute Children, by Their Skill in Performance Tests

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“Autistic Psychopathy”

Asperger (1944)



- Fundamental Disturbance of Contact
- Characteristic Peculiarities of Eye Gaze
- Paucity of facial and gestural expression
- Deficiencies in Expressive Language
- Failure to Assimilate and Learn Adults' Knowledge

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Commonalities in Description

Wing (1991)



- Social Isolation, Egocentricity, and Lack of Interest in the Feelings of Ideas of Others
- Language Not Used for Social Interchange
- Impaired Nonverbal Communication
- Lack of Imaginative Play
- Hypersensitivity to Noise
- Repetitive Activities
- Clumsiness in Gait
- Negativism, Aggressiveness, Destructiveness
- Special Abilities
- Males > Females

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Autistic Disorder vs. Asperger's Disorder

DSM-IV (1994)

- Autistic Disorder
 - Impairment in Social Interaction
 - Repetitive/Stereotyped Behavior
 - Impairments in Communication
- Asperger's Disorder
 - Impairment in Social Interaction
 - Repetitive/Stereotyped Behavior
 - Little or No Delay/Impairment in Communication
 - Little or No Delay in Cognitive Development

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Autism Spectrum Disorder

DSM-5



- Persistent Deficits in Social Communication and Interaction
 - Deficits in Socio-Emotional Reciprocity
 - Deficits in Nonverbal Communication
 - Deficits in Developing, Maintaining, and Understanding Social Relationships
- Restricted, Repetitive Patterns of Behavior, Interests, or Activities
 - Stereotyped or Repetitive Motor Movements
 - Insistence on Sameness
 - Highly Restricted, Fixated Interests, Abnormal in Intensity
 - Hyper- or Hypo-Reactivity to Sensory Input

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Elements of Theory of Mind

Children in Diagnostic Groups

Baron-Cohen (1995)

Diagnostic Group	ID	EDD	SAM	ToMM
Normal > 4 y/o	+	+	+	+
Blindness	+		+	+
Retardation	+	+	+	+
Autism (1)	+	+		
Autism (2)	+	+	+	

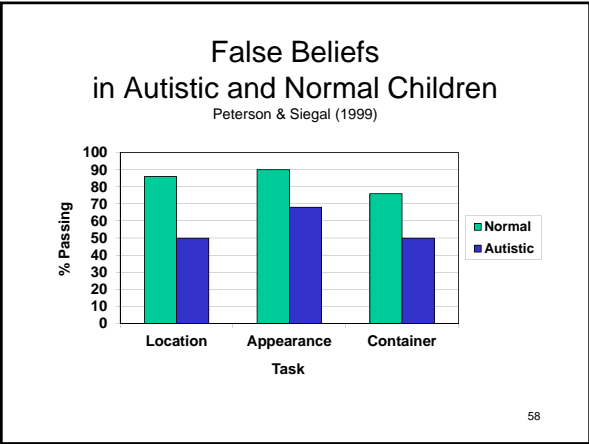
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False Beliefs in Normal and Autistic Children

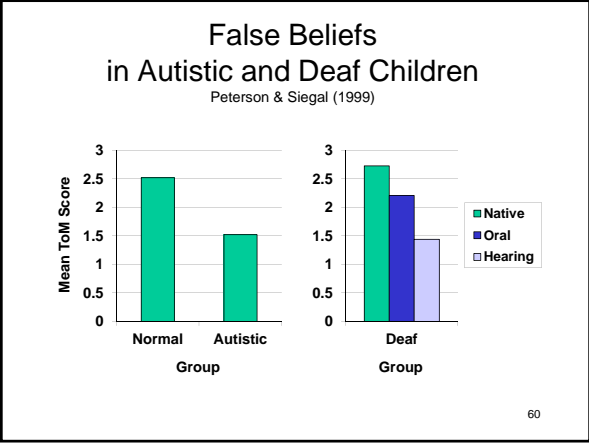
Peterson & Siegal (1999)

- Normal Children Aged 4-5 Years
- Autistic Children Aged 9-10 Years
- 3 False Belief Tasks
 - Changed Location
 - Changed Appearance
 - Misleading Container

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- ### False Beliefs in Normal, Autistic, and Deaf Children
- Peterson & Siegal (1999)
- Normal Children Aged 4-5 Years
 - Autistic Children Aged 9-10 Years
 - Deaf Children Aged 9-10 Years
 - Native Signers
 - Oral Deaf
 - Deaf Signers from Hearing Families
 - 3 False-Belief Tasks
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Problems with the TOM Hypothesis

Tager-Flusberg (2007)



- Universality of Deficit in Autism
- Uniqueness of Deficit in Autism
- Executive Function Deficits
- Confound with Language/Affect
- Does Not Explain Superior Visual Attention
- Heterogeneity of Autism
- Excessive Reliance on False-Belief Task
 - Verbal vs. Nonverbal Assessment

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Theory of Mind in Autism

- Neurological Account
 - Impairment in Brain Modules Supporting Social Cognition
- Environmental Account
 - Conversational Basis for Social Cognition
 - Theory of Mind Deficits in Deaf, Aphasic
- Interactionist Account
 - Brain Impairment Affects Social Interaction
 - Social Interaction Deficit Impairs Theory of Mind

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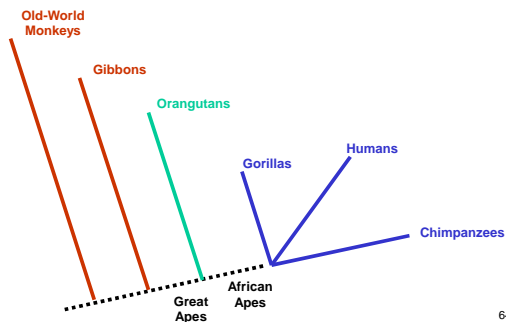
Phylogenetic View of Development

What is the Difference Between the Mind of a Human and That of an Animal?

- Humans are Animals too!
- Quantitative
 - Learning Capacity
- Qualitative
 - Continuity vs. Discontinuity
 - Are Animals “a Lot Smarter Than We Think”?

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A Short Course in Primate Evolution



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Does the Chimpanzee Have a Theory of Mind?

Premack & Woodruff (1978b)

- Imputes Mental States to Himself and Others
 - Purpose or Intention
 - Believing, Knowing, Doubting
 - Pretending
 - Promising and Trusting
- Do Animals Impute Mental States...
 - to Conspecifics?
 - to Other Species?

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Novel Problem Sets for Sarah

Premack & Woodruff (1978a)

- 14 y/o Wild-Born Chimpanzee
 - Taught Simplified Visual “Language”
 - Has Semantics, Not Syntax
 - Enjoyed Watching Television
- Variant on Kohler’s Experiments
 - Observe Human with a Problem
 - 30-Second Scene Played on Videotape
 - Choose Solution from 2 Alternatives
 - Still Pictures -- Place Correct Near TV
 - Verbal Feedback



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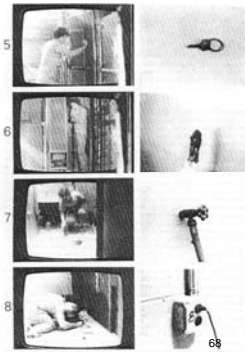
Four Problems About Food

- Suspended Bananas
 - Step on Box
- Bananas Behind Mesh
 - Reach with Rod
- Bananas Behind Box
 - Push Box Aside
- Box Too Heavy
 - Remove Cement Blocks*



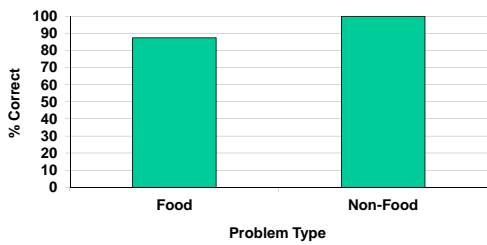
Four Problems Not About Food

- Escape from Locked Cage
 - Get Key on Ring
- Get Heater Running
 - Light Wick
- Wash Dirty Floor
 - Attach Hose to Faucet
- Play Record Player
 - Plug in Power Cord



Sarah's Problem-Solving Performance

Premack & Woodruff (1978a)



Sarah Was Usually Correct on the *First* Trial!

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Sarah's Theory of Mind

- Can Connect Representations of Problems with Representations of Solutions
- Not Confined to Problems Involving Food
 - Set 1 vs. Set 2
- Doesn't Require Personal Experience
 - Set 2, "Key Problem" vs. Others
- Entails Observational Learning
- Imputing Mental States to Humans
 - What Would the Human Do?
 - What Should He Do?
 - What Would I Like to See Him Do?

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Does the Chimpanzee Have a "Theory of Mind" as *Mindreading*?

After Baron-Cohen (1995)





- Intentionality Detector
- Eye-Direction Detector
- Shared-Attention Mechanism
- Theory-of-Mind Mechanism

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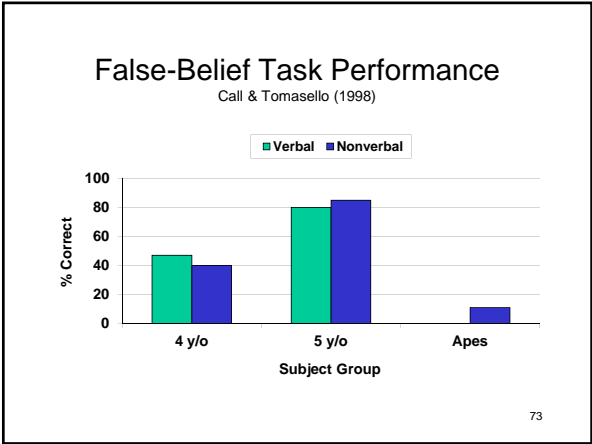
Non-Verbal False-Belief Task

Call & Tomasello (1998)





- "Hider" Hides Reward in 1 of 2 Containers
 - In View of "Communicator"
 - Previously Shown to be Reliable
 - Invisible to Subject
- Then Communicator Leaves Room
- Hider Switches Location of Containers
 - In View of Subject
- Communicator Returns to Room
 - Marks Old Box as Correct
- Which Box Does Subject Choose?


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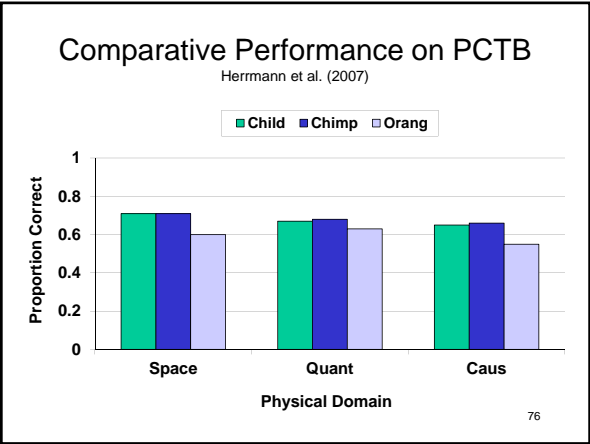


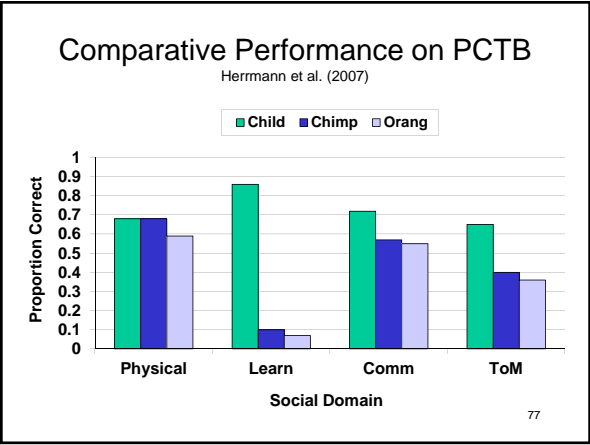
- ### Primate Cognition Test Battery
- Herrmann et al. (2007), after Call & Tomasello (1997)
- Physical Skills
 - Space
 - Spatial Memory
 - Object Permanence
 - Rotation
 - Transposition
 - Quantities
 - Relative Numbers
 - Additive Numbers
 - Causality
 - Noise
 - Shape
 - Tool Use
 - Tool Properties

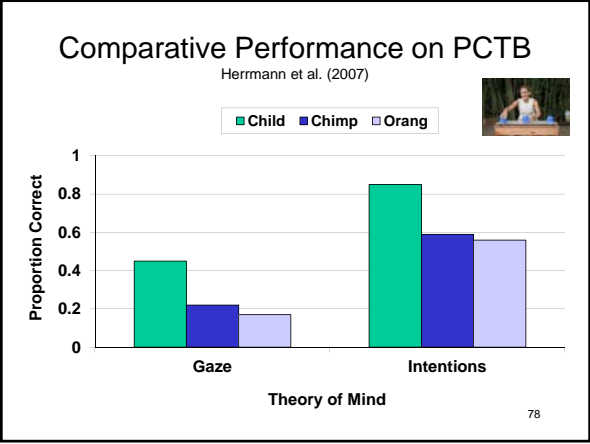

 - Social Skills
 - Social Learning
 - Communication
 - Comprehension
 - Pointing Cups
 - Attentional State
 - Theory of Mind
 - Gaze Following
 - Intentions
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- ### Comparative PCTB Performance
- Herrmann et al. (2007)
- 106 Chimpanzees (M age = 10)
 - 32 Orangutans (M age = 6)
 - 105 Children aged (M age = 2.5)


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Critique of Primate Social Cognition

De Waal et al. (2008); Herrmann et al. (2008)



- **Confounds**
 - With Parents vs. Confined Alone
 - Verbal vs. Nonverbal Instructions
 - Experimenter: Conspecific or Not
- **Conclusions**
 - Plenty of Social Learning from Other Apes
 - Apes May Have a Theory of the Ape-Mind!

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Elements of Theory of Mind

in Nonhuman Animals and Children

Age Group	ID	EDD	SAM	ToMM
Monkeys	+			
Great Apes	+	+	?	
Children > 4 y/o	+	+	+	+

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The Primate Theory of Mind

Povinelli et al. (2000, 2001, 2002)



- **Nonhuman Primates Lack Theory of Mind**
 - Intentionality Detector, Eye Direction Detector
 - No Shared Attention Mechanism
 - No Theory of Mind Mechanism
- **But What About Woodruff & Premack?**
 - Rudimentary Understanding of *Desire*
 - Apparently No Understanding of *Belief*
- **Ape Social Behavior is Remarkably Complex**
 - But No Ability to Interpret Behaviors in Terms of Mental States

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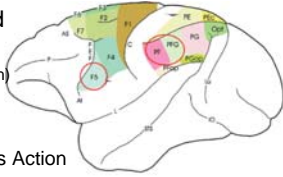


Mirror Neurons

DiPellegrino, Rizzolatti et al. (1992)
Galese et al. (1996); Rizzolatti (2004); Iacoboni (2008)



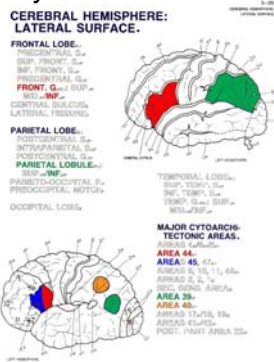
- Single-Unit Recording in Macaque Monkeys
 - Reaching for Piece Food
 - Premotor Ventral Cortex
 - Areas F4, F5 (Hand, Mouth)
 - Brodmann Areas 44, 45
 - Observing Action
 - Premotor Cortex Prepares Action
 - Not Supposed to be Involved in Visual Perception
- Neurons “Reflect” Observed Behavior
 - Critical for Recognizing Action(?)



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A Mirror Neuron System for Action

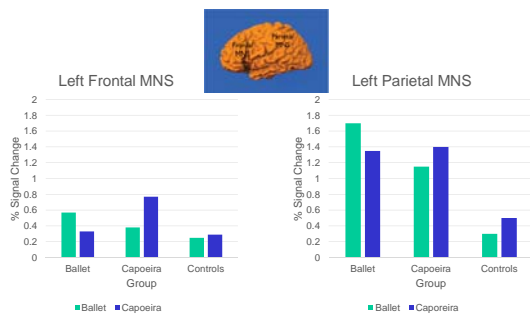
- Neuroimaging
 - Observe Action of Other
- “Presumed” Locations
 - Homologous Structures
- Premotor Cortex
 - Inferior Frontal Gyrus
 - Brodmann Areas 44, 45
- Somatosensory Cortex
 - Inferior Parietal Lobule
 - Brodmann Areas 39, 40



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The Mirror Neuron System in Dancers

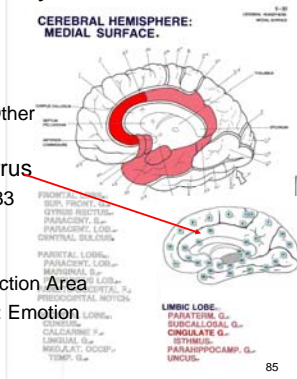
Calvo-Merino et al., (2004)



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A Mirror Neuron System for Emotion

- Neuroimaging
 - Observe Emotion of Other
 - Disgust, Pain
- Anterior Cingulate Gyrus
 - Brodmann Areas 24, 33
 - Includes the Insula
- Part of “Limbic Lobe”
 - Broca: Olfactory Projection Area
 - Papez, Kluver & Bucy: Emotion



Mirror Neurons as the Neural Basis of Social Cognition

Gallese et al. (1996, 2004); Rizzolatti (2004); Iacoboni (2008)

- Understanding Action and Emotion
 - Directly Link 1st and 3rd Person Perspectives
 - “I do” and “I feel”
 - “He does” and “He feels”
- Implications
 - “Foundation of Empathy”?
 - “Foundation of Morality”?
 - “Broken” in Autism?
- “Brain Region Du Jour”
 - The “left brain/right brain of the 21st century”



“Unifying Neural Hypothesis

Gallese et al. (2004)

“[T]he understanding of basic aspects of social cognition depends on activation of neural structures normally involved in our own personally experienced actions or emotions. By means of this activation, a bridge is created between others and ourselves.”

- When Activation Flows “Downstream”
 - Creates Action or Emotion
- If Cortical Centers Decoupled from Periphery
 - Simulation → Understanding
- Not Just *Thinking* About Others
 - Experiential Insight



“The Driving Force Behind the ‘Great Leap Forward’ in Human Evolution”

Ramachandran (2000, 2009)

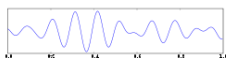


“Mirror neurons will do for psychology what DNA did for biology: they will provide a unifying framework and help explain a host of mental abilities that have hitherto remained mysterious and inaccessible to experiments.”

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“Broken Mirrors” Theory of Autism

Ramachandran & Oberman (2006); after Altschuler et al. (1999)

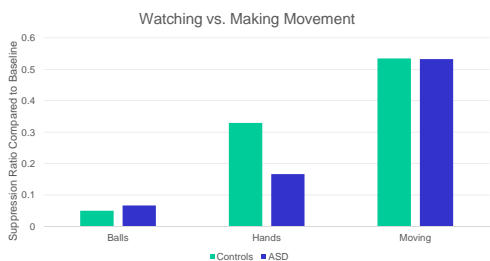


- “Mindblindness” Theory is Incomplete
 - Simply Restates Symptoms
 - Need Biological Mechanism
- Impoverished Mirror-Neuron System
- Reduced Mu-Wave Activity in Motor Cortex
 - Similar to Alpha Waves (8-13 Hz)
 - Recorded Over Premotor Cortex
 - Blocked by Making/Watching Voluntary Muscle Activity
 - But Not in Autistic Children

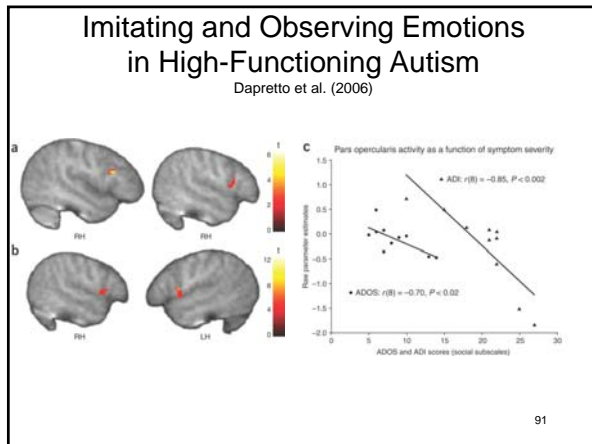
89

EEG Mu-Wave Blocking in Autism Spectrum Disorder

Oberman et al. (2005)



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Critique of Mirror Neurons

Hickok, Gernsbacher in Gallese et al. (2011)

- Action Selection vs. Action Understanding
 - Mirror Neurons Don't Have Semantics
 - Support Sensorimotor Integration
- Can Understand Actions Without Execution
 - Broca's (Expressive) Aphasia
 - Spectator Sports
- Activation by Observation Mediated by Goals
 - Actions of Others Relevant for Action Selection

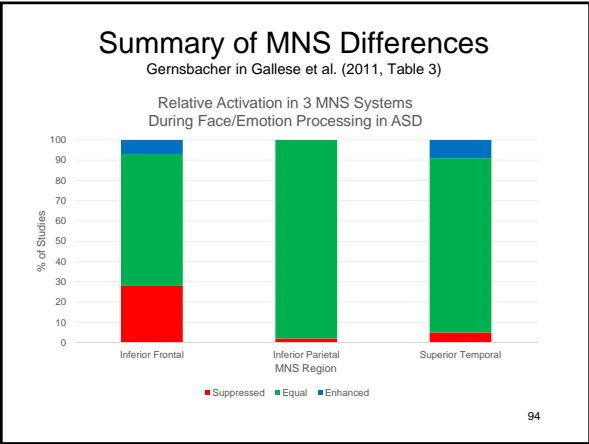
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Critique of *Broken* Mirror Neurons

Gernsbacher in Gallese et al. (2011)

- Failures to Replicate Initial Findings
 - No Differences in Mu-Blocking
 - Imitation-Specific Activity in BA 44/45
 - No Differences between Autistic and Normal Children
 - 90% of Studies Show No Activity in Normals!
- Findings of Structural MRI
 - No Differences in Cortical Thickness
 - No Differences in Gray Matter Density/Volume


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Cultural View of Development

Lillard (1997); Rogoff (2003)



How is Mind Affected by Cultural Context?

- Theory of Mind Innate
 - Implies No Cultural Differences
- Bias in Subject Populations
 - Western / Developed Societies
- Theory of Mind Acquired During Socialization
 - “A Specific European-American Formulation”?

Lillard (1997, p. 268)

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Early Cross-Cultural Studies of Mind

Mead (*Growing Up in New Guinea*, 1930; 1932); Kohlberg (1966)




- Manus of New Guinea
 - Children Are Not Animistic
 - But Adults Are




- Atayal of Formosa
 - Children Don't Believe Dreams Reflect Reality
 - But Adults Do
- Each Reverses the Pattern in America


96

Rinawa in the Illongot

Rosaldo (1980); Lillard (1997, 1998)



- **Headhunting Tribe in Philippines**
 - Interest in Social Relations >> Internal Life
- **Seat of Thought, Emotion**
 - Located in Heart, Not Brain
 - Property of All Living Things
 - Human, Animal, Plant
 - Leaves Body Over Life Cycle, Disappears at Death
 - Leaves Body During Dreams
 - Can Be Stolen Through Magic
 - Restored Through Ritual



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Witchcraft in the Azande

Evans-Pritchard (1976); Lillard (1997, 1998)



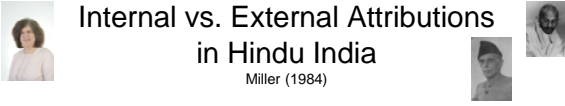
- **Farming Tribe in Central Africa**
 - Sacrifice Chickens for Oracles
 - Oracle never Wrong
 - Errors Attributed to Witchcraft
- **Unfortunate Events Explained by Witchcraft**
 - No Sense of Internal Causation
 - All Causation by External Agents
 - Witchcraft Motivated by Envy
 - Accused Always Deny Practicing Witchcraft



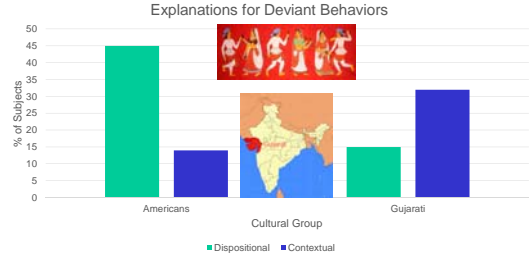
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Internal vs. External Attributions in Hindu India

Miller (1984)



Explanations for Deviant Behaviors



Cultural Group	Dispositional (%)	Contextual (%)
Americans	~45	~15
Gujarati	~15	~35

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Explanations of Behavior

After Lillard (1997, 1998, 1999)



Intentional System

- Trait
- Belief-Desire
- (Perceived) Situation
- Other Person
- Gods and Spirits

No Intentionality

- Biological
 - Neurophysiology
 - Genetics
 - Evolution
- Astrology
- Automaticity

100

The Theory of Mind May Not Be Innate

Lillard (1997, 1998, 1999)



- Mind is a Concept in “Folk Psychology”
 - Mental States as Reasons for Behavior
 - *Other Folks’ Psychology* May Be Different
- Cultural Differences
 - Concept of Mind
 - Distinction Between Thinking and Feeling
- Concept of Mind a Cultural Product (?)
 - Not Pre-Adapted, Modular
 - Acquired Through Socialization
 - Maintained Through Cultural Transmission

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A Universal Grammar of Folk Psychology?

Lillard (1997, 1998, 1999)



- Innate Module for Explaining Behavior
 - No Culture is Absolutely Behavioristic
 - All Languages Have Words for Mental States
 - Even Though Users Don’t Discuss Them
- Cultures Vary in Parametric Settings
 - Preferences, Constraints
 - Produces Variance in Adult Conceptualizations
- Universal False Belief
 - We Notice When Behavior...
 - Does Not Accord With the Way the World Really Is
 - Explanation May Differ Across Cultures

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Return to the Ontogenetic View

- Cross-Cultural Similarity in Children
- Development Entails Socialization, Acculturation
 - Produces Cross-Cultural Differences in Adults
- Cultural “Choice” in Explanations of Behavior
 - Whether to Have a Theory of Mind
 - Which Aspects of Mind to Emphasize

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