

Psychology 2200

Developmental Psychology I: Fundamentals

Radical Cognitive Development



learning objectives

- describe which mental operations are needed to solve abstract or hypothetical problems (e.g., pendulum problem)
- describe the four stages of Piaget's cognitive developmental theory
- explain the Piagetian tasks and identify the age after which children have them mastered
- discuss the implications of Piaget's theory for teaching children in school
- explain how Piaget's theory suggests that cognitive development is discontinuous



textbook readings for this lecture

pages	topic	note
225-227	introduction	
228-230	sensorimotor stage	stop at the end of "mental representations"
239-245	preoperational stage	stop at the end of "lack of hierarchical ..."
249-251	concrete operational stage	
253-257	formal operational stage	

IQ

- IQ not concerned with the **process** of intelligent action
- IQ is **product**-oriented: performance on a certain kind of test
 - tells you **if** someone figures things out
 - does not tell you **how** people figure things out



activity

the pendulum problem

- groups of 2
 - **materials:** 2 weights, 2 pieces of string, your own timer
 - set-up demonstration
 - I>CLICKER
- which factors affect how long it takes for the pendulum to swing back and forth (periodicity)?
- string length
 - weight on end
 - starting height
 - length and height
 - none of the above

to solve problem: operations

operations:
isolate one factor
test whether it
affects periodicity



string
length

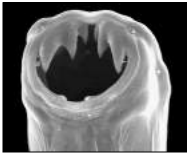
weight
on end

starting
height

<http://www.radiolab.org/story/91691-sculptors-of-monumental-narrative/>

how'd Rockefeller do it?

hookworm



outhouse



Dickson Despommier



The South



Banjo player from Deliverance

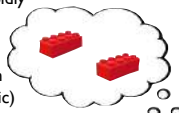


8 mins

Piaget's Theory



- operations
 - mental representation of actions that obey logical rules
 - operations develop with age, coming online rapidly and discontinuously
- endgame: formal operations
 - operating in the realm of the abstract, based on fundamental principles (e.g., laws of physics, logic)
 - What can kids do? What can't they do?
- studying errors
 - learn about how children understand the world by observing the mistakes they make
 - what errors do kids make?



stage 4: formal operations

propositional logic

- Let's say that if you hit a glass with a feather, the glass will break.
 - Joe hits a glass with a feather. What happens?
I>CLICKER
- A. nothing
B. the glass breaks
C. the feather breaks
D. both the glass and the feather break



stage 4: formal operations

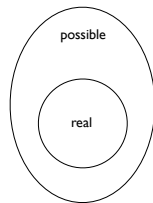
propositional logic

- teen in stage 4
- child in stage 3
- propositional logic requires operating in the abstract/hypothetical



stage 4: formal operations

- principles underly reality
 - formal logic (e.g., principles of physics) applies always
 - understand that the real is just a special case of the possible (makes it special?)
 - both governed by formal operations
 - mentally operate in the realm of *concepts*
- two examples
 - hypothetico-deductive reasoning
 - e.g., pendulum problem, "lazy Southerner" problem
 - start with hypothesis, logically deduce testable inferences, isolate inferences, test one at a time
 - propositional logic
 - abstract system of logic that does not require reference to real-world circumstances (e.g., feather and glass problem)



stage 3: concrete operations

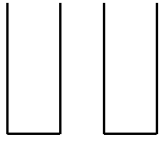
conservation of volume task

- child/teen in stage 3
 - pass test
 - requires operating on concrete (visible) matter
 - Why did she tilt her head to examine the glasses but then stop?
- A. no reason - just random behavior
B. she had an itch in her ear
C. she was falling asleep but then awoke
D. she was in a state of transition between two mental frameworks
E. none of the above

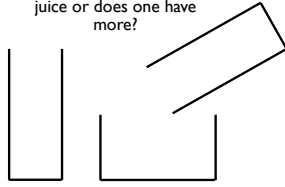


stage 2: preoperational conservation of volume

Is there the same amount of orange juice in each glass or does one have more?



Now does each glass have the same amount of orange juice or does one have more?



up to 6 years, children say the left one has more

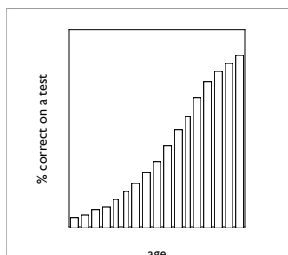
stage 3: concrete operations

- operations fully functional
 - logical, flexible, organized
 1. conservation: changing shape does not change amount
 2. classification: awareness of classification hierarchies (M > people?)
 3. seriation: ability to order items along a quantitative dimension such as length or weight
 4. spatial reasoning: ability to mentally alter (e.g., rotate) an image or draw a cognitive map
- implication in school setting?
 - ready for science (the visible kind)
 - not ready for philosophy
- operations only working in the realm of the real/concrete

summary

stage	hardest Piagetian task passed	easiest Piagetian task failed	ability	age (years)
1 sensorimotor	(none)	object permanence	think by seeing, hearing, touch	0-2
2 preoperations	object permanence	conservation	mental representations firmly in place	2-6
3 concrete operations	conservation	hypothetico-deductive reasoning	operations applicable to concrete situations	6-11
4 formal operations	hypothetico-deductive reasoning	(none)	operations applicable to situations real & imagined	11+

IQ
continuous



Piaget
discontinuous

