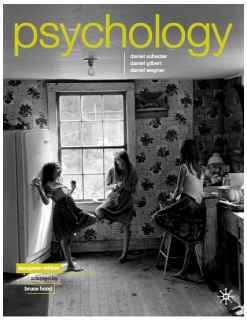


Lecture 5
Post-Piagetian Cognitive Development

Alternative Approaches

- General processing
- Neuroscience approaches
- Intuitive Theories
- Memory (Dr. Briscoe will say more about this)
- Socio-cultural (see Lectures 9)

General Information Processing
(see lecture 5)

PERCEPTION

ATTENTION

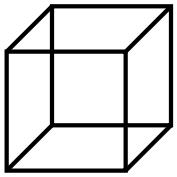
MEMORY

REASONING

INTELLIGENCE

PERCEPTION

Ambiguous figures reveal that the perceptual organization of the mind



In a study of 4-11-yr-olds, younger children reported only seeing one object.

Older children could see the two objects and alternate between them.

(Elkind & Scott, 1962)

Similarly, younger children only spot the individual components of composite arrangements and miss the overall Gestalt

(Elkind, Koegler, & Go 1964)

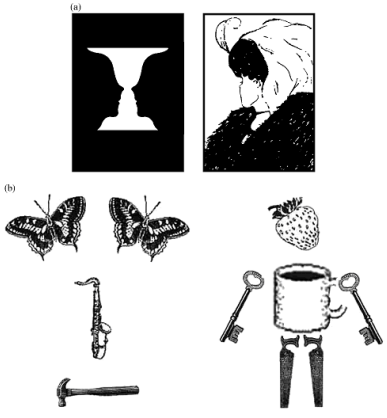


Figure 15.1 Examples of (a) ambiguous figures; (b) composite objects.

Higher Order Perception is increasingly organized

Selective Attention

In general, there are significant improvement in selective attention on a variety of tasks across development.

Initially, children's attention during the early years is involuntarily triggered. With age comes an increasing ability to control attention selectively.

This presents some interesting effects. For example, older children are better at remembering cards from one category and ignoring those from another. Whereas younger children remember cards from both categories.

(Hagen, 1967)

MEMORY

(see Dr. Briscoe Lectures)

Short-term memory (working memory)
- phonological (digit span)
- visuospatial (patterns)

Long-term memory
- semantic (knowledge)
- episodic (specific events)
- autobiographical (personal)

Each of these aspects of memory shows qualitative change through to the adolescent period (rehearsal @7yrs)

Beyond 7 years, mostly quantitative change through to adolescence

Many of the LTM changes reflect different encoding strategies (elaboration, organization, clustering)

Reasoning

DEDUCTIVE: "process of deriving inferences that make explicit what is implicit in the information available to us."

Example: All cows can fly
Bertha is a cow.
Deduction: Bertha can fly.
(specific conclusion)

INDUCTIVE: "use of specific examples to draw a general conclusion."

Example: Bertha the cow can fly
Trudy the cow can fly
Induction: Some cows can fly
(general conclusion)

Formal Operations (from Lec 4)

Piaget argued that all child develop into adolescents capable of logical reasoning (Formal Operations Stage)

Problem is that many adults fail logical problems.

E.g All A are B
All B are C
Then All A are C
Some A are C
BUT All C are B
All B are A
Then All A are C
Some A are C

abstract reasoning is harder than concrete examples

Young children can reason deductively when given real examples

Analogical Reasoning

Understanding relationships between elements
"A is to B as C is to D"

For example seed is to plant as acorn is to ????

Young children below 7 find analogies very hard
By 9-10 years, beginning to grasp simple analogies

Adolescents are capable of abstract thought whereas younger children need concrete examples.
Hence they have problems with counter-factuals
"If ants > dogs> elephants, which is largest animal?"

Neuroscience Approaches

Increasing maturation of cortical areas, especially in the prefrontal cortex may enable increasing executive control.

Executive control supports general functions
- working memory
- selective attention
- inhibitory control
- planning

Neuroscience Account of Search Errors

Although, the infant may know where the object is, they are unable to inhibit the previously reinforced response.

This sometimes leads to a dissociation between looking and action

Older children will make A not B errors if an increasing delay is inserted between hiding and search.

Increasing the delay, increases the load on WM and the interferance from prepotent responses.

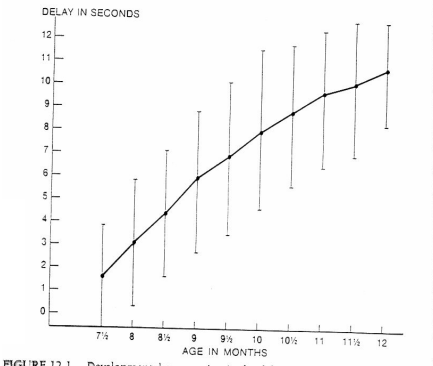
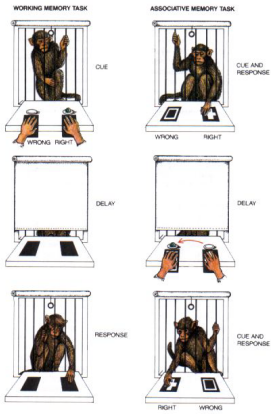


FIGURE 12.1. Developmental progression in the delay at which the AB error occurs in infants. From Diamond (1985). Copyright 1985 by the Society for Research in Child Development. Reprinted by permission.

Effects of Frontal Lesions on Search Performance

Lesions to the prefrontal cortex disrupt performance on a WM search task (very similar to A not B) but not an associative memory task. (Diamond, 1991)



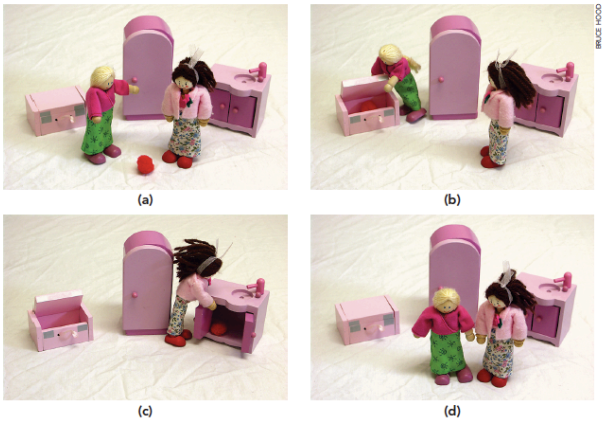
Frontal Lobes Support Flexible Thinking

Many task require ignoring irrelevant information.

Piagetian conservation tasks require ignoring the appearance following the transformation.

Similar dissociations have been reported in frontal patients on the Wisconsin card sorting task and children on ToM tasks. (see Lecture 9)

Sally- Anne False Belief Task



Sally-Anne Task (3-Year-old)

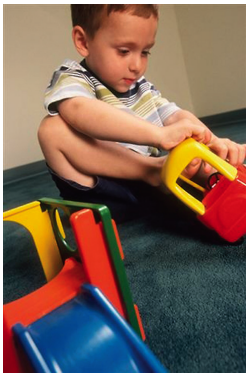
Scale Errors

Breakdown between perception, action and cognition.

Toddlers fail to grasp the relative size of objects relative to their bodies.

Follows an inverted 'U' shape between 18-30 months.

Dorsal–ventral dissociation?
Inhibitory failure?



(Deloache et al., 2004)

Scale Errors

Core Knowledge Theories

- Suggest that a child is born with some 'hard-wired' understanding about the world
- Navigation, counting skills, understanding solid objects
- Concepts: units of thought (Carey, 2009)
- Intuitive Theories
  - Frameworks for understanding that are not taught

Intuitive Theories

Children spontaneously form intuitive theories, not rules.

Coherent sets of core beliefs or propositions

Resistant to counter-evidence, not always right

Examples

Biological Theories: What makes something alive?

Physical Theories: What are the properties of the physical world?

Psychology Theories: What is the mind and how does it work?

Balance
Karmiloff-Smith & Inhelder (1975)

Objects always balance at their geometric centre.

4-yr olds pass
6-yr olds fail
8-yr olds initially fail but then pass

6-year-olds are unable to be flexible in their reasoning

Caught in the Grip of a Theory

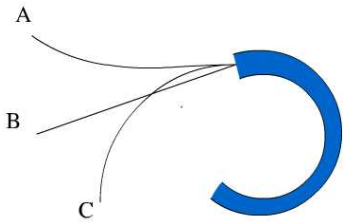
Naïve theories are surprisingly difficult to eradicate.

Human reasoning is consistently flawed by naïve theories.

Kuhn (1989) identified problems
1) Fail to understand the importance of evidence.
2) Seek confirmatory evidence rather than test their theory
3) Reinterpret or ignore evidence to fit with theory

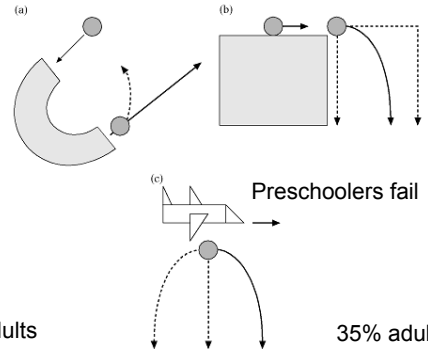
Gravity Errors

Naïve Physical Reasoning in Adults



44% of 12 yr-olds
65% of university students

Kaiser et al, 1986



Preschoolers fail

When shown correct sequences, adults and children ignored the evidence of their own eyes

35% adults fail

Figure 15.8 (a) The C-curve task used by Kaiser et al. (1986). (b) and (c) Two tasks used by Kaiser et al. (1985).

Changing Intelligence

- Intelligence can and does change
- But not—usually — dramatic change
- Relative intelligence
- Absolute intelligence
- Flynn effect (0.3% rise annually)

(15 points higher each 50 years)

TABLE 9.6 The stability of intelligence test scores over time

Study	Mean initial age (years)	Mean follow-up age (years)	Correlation (r)
1	2	9	0.56
2	14	42	0.68
3	19	61	0.78
4	25	65	0.78
5	30	43	0.64–.79
6	50	70	0.90

Source: Adapted from Deary et al., 2000

Improving Intelligence

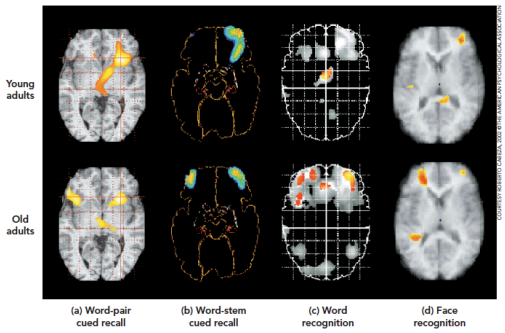
- Correlation between formal education level and IQ is high (r = 0.55 to 0.90) – why?
- Intelligence of schoolchildren declines in the summer
- Cognitive enhancers
  - methylphenidate (Ritalin)
  - Ampakines (boost glutamate)
  - Modafinil (dopamine reuptake inhibitor)

These drugs influence executive functions

Adulthood

- Most older adults compensate effectively for these declines
- Change in bilateral symmetry?
  - brain of younger adult trying to remember shows strong activation in localized areas
  - brain of older adult trying to remember shows activation of multiple areas

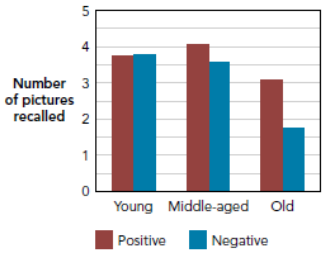
Bilaterality



Across a variety of tasks, older adults show more bilaterality than younger adults

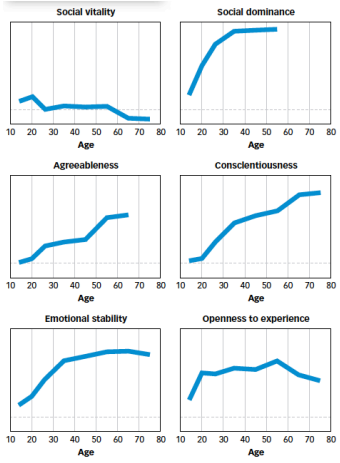
Older Adulthood

- Memory is also affected by changing orientations (what we focus on)
- Socioemotional selectivity theory
  - focus on the future versus focus on the moment
  - useful information versus positive information

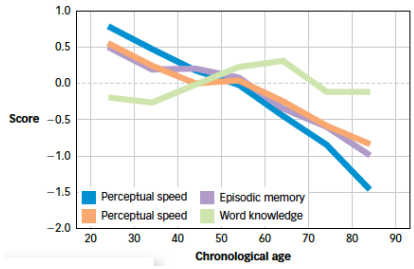


Personality

As adults age, they become more emotionally stable and conscientious but less socially vital and less open to experience (Roberts & Mrocek, 2008)



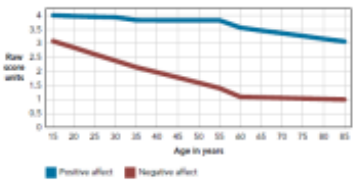
Cognitive Decline



After the age of 20, people show dramatic declines on most measures of cognitive performance even though their level of knowledge remains stable (Salthouse, 2006).

Older Adulthood

- Despite our youth-oriented culture, older adults are happy
  - fewer "peripheral" friends
  - just as many close friends
- And less negative



Summary

•General processing develops towards more efficient strategies

•Children become increasing more flexible in their thinking

•Some of this developmental change is related to the increasing maturation & activity of prefrontal cortex

•Cognitive development requires not only the acquisition of information but the active inhibition of intrusive thoughts

•Cognitive performance declines with age but older adults compensate and change their focus of attention