Outline

- Theories of Cognitive Development
  - Piaget vs. Vygotsky
  - Piaget's stages of cognitive development
  - Can development be accelerated?
  - Educational implications
- Language development
  - The information to be learned
  - Main stages
  - Two current theories

Cognitive and Language Development

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Cognitive Development

Some central questions in cognitive development
- Are changes in cognitive ability domain-general or domain-specific?
- Are there qualitatively different stages or is change gradual and smooth?
- Is development just learning or does something change in the brain to make children cleverer?
- Is development “genetically controlled”?

Cognitive Development

“Above: Despite their relatively large cranial capacities, babies such as this one are so unintelligent that they are unable to distinguish colourful squeaky toys from food sources”

(SATIRE)

Piaget and Vygotsky

Piaget vs. Vygotsky
- Piaget's stages of cognitive development
- Can development be accelerated?
- Educational implications

Language development
- The information to be learned
- Main stages
- Two current theories
Piaget
- Related upon clinical method, using probing questions to uncover what children understood
- Was interested in errors children make and the possibility that these were not random
- Searched for a systematic pattern in the production of children’s errors
- Worked towards logically, internally consistent explanation of children’s errors
- Studied how knowledge is acquired and developed theory of “genetic epistemology”
- Studied thought and language in pre-schoolers and early school-age children
- Believed that intelligence arises progressively in the baby’s repetitive activities
- Described how concepts of space, time, causes, and physical objects arise in development
- Investigated the beginnings of fantasy and symbolization in infancy
- Outlined a theory that states that the pressures of thinking and language lie in the elementary actions, perceptions, and imitations of babies
- Influenced by evolutionary theory: child has to ‘adapt’ to environment by altering cognitive structures

Vygotsky
- Concerned with historical and social aspects of human behaviour that make human nature unique
- Social and cultural factors are important in the development of intelligence
- Speech carries culture in that it stores the history of social experience and is a ‘tool’ for thought
- People are different from animals because they use tools to create artefacts that change the conditions of life
- There is a close link between the acquisition of language and development of thinking
- Gave prominence to the importance of social interaction in development as it influences language and thought
- Does not deal with fixed stages of development but describes “leading activities” typical of certain age periods around which intellectual development is organised

“Stages” in theories of development

<table>
<thead>
<tr>
<th>Period of development</th>
<th>Piaget</th>
<th>Vygotsky</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infancy (birth to 6 months)</td>
<td>Sensori-motor</td>
<td>Affiliation</td>
<td>Preoperational</td>
</tr>
<tr>
<td>Early childhood (6 to 36 months)</td>
<td>Proportional</td>
<td>Play</td>
<td>Preoperational</td>
</tr>
<tr>
<td>Middle childhood (3 to 12 years)</td>
<td>Concrete operational</td>
<td>Learning</td>
<td>Concrete operational</td>
</tr>
<tr>
<td>Adolescence (12 to 19 years)</td>
<td>Formal operational</td>
<td>Peer</td>
<td>Formal operational</td>
</tr>
<tr>
<td>Adulthood (19 years and above)</td>
<td>Formal/operational</td>
<td>Work</td>
<td>Formal/operational</td>
</tr>
</tbody>
</table>

Piaget’s stages of development

- **Stage I: Sensori-motor development**
  - **Stage I: Reflexes** (birth to 6 weeks)
  - **Stage II: Primary circular reactions** (6 to 12 months)
  - **Stage III: Secondary circular reactions** (1 to 18 months)
  - **Stage IV: Co-ordinated secondary circular reactions** (12 to 18 months)
  - **Stage V: Tertiary circular reactions** (18 months to 2 years)
  - **Stage VI: Symbolic representation** (From 2 years)

- **Failure of object permanence before 9 months**

Mechanism of change: adaptation (Assimilation + Accommodation)
Object permanence passed by Stage IV (9-12mo) infant but infant makes strange perseverative errors

Stage 2: Pre-operational (2-7 years, pre-school)
- Mental operations are internalised forms of actions that are mastered during infancy
  - ordering
  - combining things in the physical world
  - separating
- Pre-operational child can reason about simple problems but system lacks critical linkages and is not internally consistent
  - child only able to focus on one salient feature of task at a time [conservation]
  - child characterised by egocentrism - can look on world only from own position [perspective taking task]

Stage 3: Concrete-operational (age 7-11)
- Child becomes able to perform operations that are directly related to objects
- Egocentrism reduces - greater ability with language leads to greater socialisation
- More objective view of world and causes of physical events and their relationships

Stage 4: Formal operational (age 11-15)
- Reasoning no longer limited by what can be directly seen or heard (abstraction, symbolic thought)
- Can develop logical propositions and test hypotheses (even hypothetical scenarios)
  - “Pure” thought independent of action.
- All types of thought now available (although content perhaps limited)
- Adolescents show lingering egocentrism, and naïvety about applicability of logical thought (idealism)

Destination: The thinker as Scientist?
Is there any further development?

Some argue for later advances in cognition towards the end of adolescence and into adulthood.

What is the purpose of laws?
- "If we had no laws, people could go around killing people" (12-13 year olds).
- "To ensure safety and enforce the government". "To limit what people can do" (13-14 year olds).
- "To provide publicly agreed norms for social cohesion given the historical context in which a particular culture exists" (15 year old).

Ultimate 'stages' are very dependent on education and culture.

Comparison: formal vs. concrete reasoning

Transitive inference: If A=B and B=C then A=C

If related to physical objects, solvable by child at concrete stage
- Use wooden ruler to show that two rods are the same length.
- Only at formal stage can the problem be solved when posed on a purely verbal and hypothetical plane.
  "Say that John is taller than Mary and Mary is taller than Jane. Who is the tallest?"

Evaluation of Piagetian theory

- General framework influential.
- Much of it wrong in detail.
- Notion of domain-general stages dubious, notion of general purpose cognitive processes also challenged.
- Under-estimated abilities of infants.
- Theory too impoverished to explain language development.
- No obvious explanation for increase in "power" of cognitive system with age (e.g., how can child learn to be cleverer?)
- Little emphasis on social or emotion factors, or on abnormal development / developmental disorders.

Sensitive experiments reveal earlier understanding of physical world in infants.

Looking behaviour reveals surprise at 5.5 months if tall rabbit does not appear in gap.

Less abstract versions of tasks improve performance – context helps.

Possible
Impossible.
Education

- Later cognitive development influenced by schooling (literacy, numeracy)
- Must build on existing skills
  - literacy: visual object recognition, speech sound knowledge
  - numeracy: quantity estimation, object individuation, learning number words
- Educational implications of stage theory:
  - Stages suggest order of educational goals
  - “It’s not what you do, it’s the way that you do it”
  - Teacher creates situations to challenge child, doesn’t impart knowledge

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Flexibility of cognitive development

- Cognitive development cannot be accelerated much by hot-housing (intensive tuition) but it can be delayed by a poor physical and social environment
- Young babies can learn rote associations (picture = “Mozart”) - this is not advanced cognitive development
- Performance of young children can be improved by setting tasks in familiar physical and social contexts
- Genes play a role in at least the variability of cognitive development

Language Development

- What has to be learned?
  - Sources of knowledge required to use language:
    - phonology (the sounds words are made up from)
    - semantics (individual words and their meanings)
    - syntax (combinations of words)
    - pragmatics (how to use language in a social setting)

- Nuts and bolts of language
  - Language is about learning the words and rules (the recipe) - it is essentially creative.
  - Sentences have underlying structure - grammatical rules apply to underlying structure (nouns, verbs, etc.) not surface form
  - These rules include semantic and grammatical rules, but also complex rules of social usage
    - greetings to be used in each language
    - “taboo” words
    - polite forms of address
    - styles appropriate to different situations
Stages of language acquisition

- Stages are variable and not correlated with IQ
  - First sounds (pre-linguistic) - reflexes
  - Babbling (around 6th month) - not a prerequisite for learning to speak
  - First words (around first year) - holophrastic sentences
    - e.g. "up" = "pick me up"
  - Two word stage (around second birthday) - holophrastic words combined into sentences with clear syntactic and semantic relations, and single intonation contour
    - "allgone sock"
    - "byebye boat"
    - "more wet"
    - "it ball"
    - "dirty sock"

(No 3 word stage)

Move straight to telegraphic speech

Then progressively longer and more complex sentences

Initial utterances omit function words (to, the, can, is) and include only content words
  - "Can stand up table"
  - "What that?"
  - "Ye play little tune"
  - "Andrew want that"
  - "Cathy build house"
  - "No sit there"

These sentences still have grammatical structure

Sentence length vs complexity

Maximum sentence length

Sentence complexity

With development, sentences more closely approximate adult grammar

- addition of function words
- inflectional and derivational rules
- Grammar complete by age 5!

Acquisition of syntactic rules is impressive given input

Vocabulary explosion: production lags behind comprehension, learning word meanings is initially hit and miss

- Pragmatics
  - What does the speaker know? What does she know about what you know?
  - Changing literal meaning via social context - metaphor, irony, sarcasm. Implied messages

Comprehension vs. production

(parental ratings)

Theories of language acquisition

- Do children learn by imitation? - No
- Do they learn by reinforcement or explicit tuition? - No
- Language isn’t just about producing and comprehending speech - cf. sign language
- Apes can’t learn or use grammar - this is a uniquely human ability
- Acquisition explained by a special human ability for learning language - details remain controversial
Inside-out vs. Outside-in theories

A COMPARISON OF INSIDE-OUT AND OUTSIDE-IN THEORIES OF LANGUAGE DEVELOPMENT

<table>
<thead>
<tr>
<th>Source of Structure</th>
<th>Key Theories</th>
<th>Inside-out theories</th>
<th>Outside-in theories</th>
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<tbody>
<tr>
<td>Initial structure</td>
<td></td>
<td>Linguistic</td>
<td>Stock or cognitive</td>
</tr>
<tr>
<td>Mechanisms of language development</td>
<td></td>
<td>Domain-specific</td>
<td>Domain-general</td>
</tr>
<tr>
<td>Source of structure</td>
<td></td>
<td>Inside</td>
<td>Learning procedure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kohler (1951)</td>
<td>Nelson (1977)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Snow (1971)</td>
</tr>
</tbody>
</table>


+ Connectionism / neural networks

Reading

- **Cognitive development**

- **Language development**

**Indicative Statements**

1. Piaget’s theory of cognitive development is domain-general and based on stages.
2. Pre-schoolers usually fail conservation tasks.
3. More sensitive experimental measures have revealed greater sensori-motor abilities in infants than Piaget first supposed.
4. Cognitive ability is in part genetically constrained, and its development cannot be markedly accelerated.
5. Language development is about learning the ‘recipe’ for language rather than its surface forms. Syntax may be a unique human attribute.