Non-linguistic cognition in animals and children

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Davidson (1999). *The emergence of thought.* p.11

The difficulty in describing the emergence of mental phenomena is a conceptual problem: it is the difficulty of describing the early stages in the maturing of reason, the stages that precede the situation in which concepts like intention, belief, and desire have clear application. In both the evolution of thought in the history of mankind, and the evolution of thought in an individual, there is a stage at which there is no thought followed by a subsequent stage at which there is thought. To describe the emergence of thought would be to describe the process which leads from the first to the second of these stages. What we lack is a satisfactory vocabulary for describing the intermediate steps…

We have many vocabularies for describing nature when we regard it as mindless, and we have a mentalistic vocabulary for describing thought and intentional action; what we lack is a way of describing what is in between. This is particularly evident when we speak of the 'intentions' and 'desires' of simple animals. We have no better way to explain what they do. It is not that we have a clear idea what sort of language we could use to describe half-formed minds; there may be a very deep conceptual difficulty or impossibility involved. That means there is a perhaps insuperable problem in giving a full description of the emergence of thought.

I am thankful that I am not in the field of developmental psychology!

Outline

1   **Introductory remarks**

2   **The roots of objective thought: object cognition**

3   **Instrumental action & practical reasoning**

4   **Social cognition**

5   **Conclusions and questions**

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1 Introductory remarks

- **Intermediate levels and positions in between** *public lingualism* (Brandom, Davidson, Dummett, Sellars et al.) & *Mentalese lingualism* (Fodor)

- **Language: from a psychological point of view itself in need of explanation**

- **Thinking & Speaking: Towards a dialectical picture**

- **Thinking with and without words**

  (1)   Thinking without any words

  (2)   Thinking about a domain D without having the corresponding words (dispositionally)

  (3)   Thinking about a domain D without using the corresponding words (thinking alound or subliminally) (occurrently)

- "Language, that is, communication with others, is thus essential to propositional thought. This is not because it is necessary to have the word to express a thought (for it is not)."

  (Davidson, 1994, p. 234)

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2 The roots of objective thought: object cognition

Three ways of carving up the world   (Strawson, 1959)

(i)   **Feature placing**

(ii)   **Spatio-temporal tracking of bodies (proto-objects)**
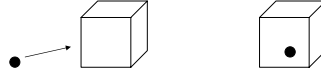
(iii)   **Sortal individuation**

Austen Clark (2004). Feature-placing and proto-objects. *Philosophical Psychology.* 17(4).

Tracking bodies and object permanence
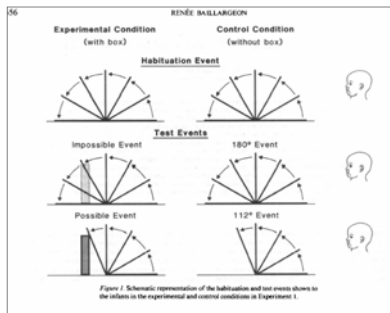
Piaget's (1952) stages of sensorimotor intelligence

Stage 4   Beginning of simple object permance   8/9 months
           → searching for occluded object

Stage 4: Search measures

Implicit dishabituation measure (Baillargeon, 1987)
→ Competence much earlier: 4 months

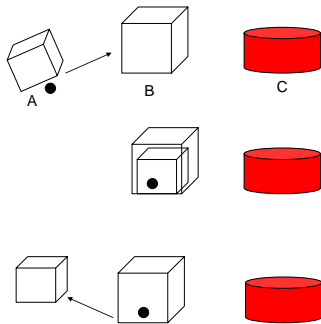**Tracking bodies and object permanence**

Piaget's (1952) stages of sensorimotor intelligence

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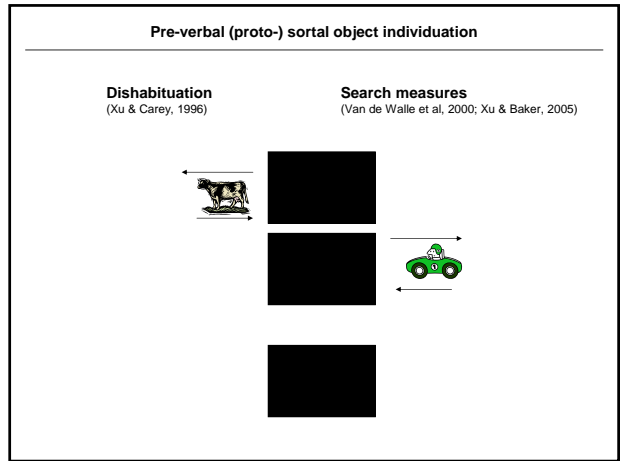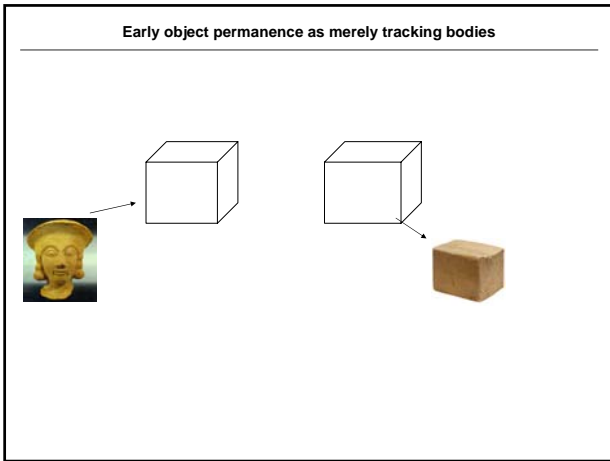Stage 6   Full object permanence   18-24 months

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Stage 6

Piaget:
• rudimentary sense of necessity   ("…*must be* in A or B…")
• reasoning from negated disjunct   ("…*if* it's *not* in A, then…")

Results with non-human animals (see Tomasello & Call, 1997)

▪ Monkeys, cats and dogs reach stages 4 and 5
▪ Great apes reach stage 6

Early object permanence as merely tracking bodies

Pre-verbal (proto-) sortal object individuation

Dishabituation
(Xu & Carey, 1996)

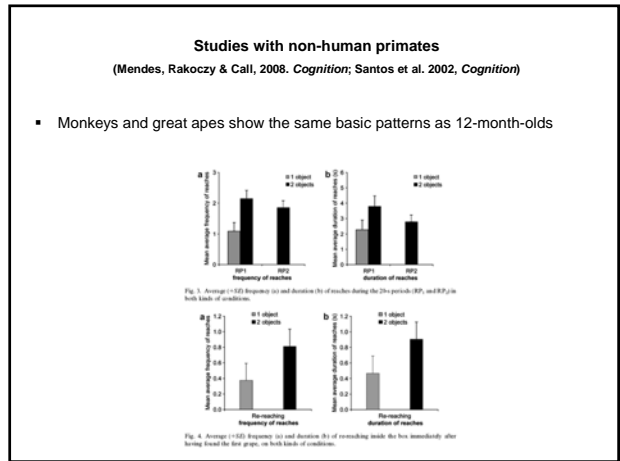**Search measures**
(Van de Walle et al, 2000; Xu & Baker, 2005)

Results with infants

- Shift from spatio-temporal tracking to feature-/kind-based individuation: around 12 months (in both dishabituation and search measures)
- Correlated with language comprehension
- Performance enhanced when sortal labels are used
- Hypothesis (Xu, 2002): Kind-based (sortal) object individuation essentially language-dependent & therefore uniquely human
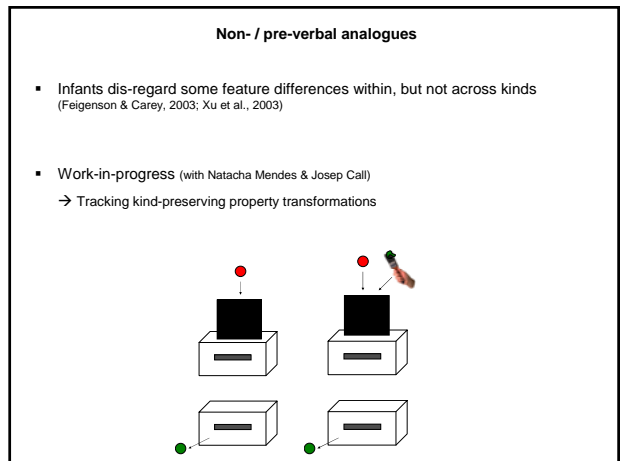

Xu & Carey, 1996

Xu & Baker, 2005

Studies with non-human primates

(Mendes, Rakoczy & Call, 2008. *Cognition*; Santos et al. 2002, *Cognition*)

- Monkeys and great apes show the same basic patterns as 12-month-olds

Basic methodological problem

- Features & kind (necessarily) confounded

Studies on essentialism in older children

- Dis-entangling features and kinds (e.g. Keil, 1989)
- Adoption, costume stories etc.

Non- / pre-verbal analogues

- Infants dis-regard some feature differences within, but not across kinds
  (Feigenson & Carey, 2003; Xu et al., 2003)

- Work-in-progress (with Natacha Mendes & Josep Call)
  → Tracking kind-preserving property transformations
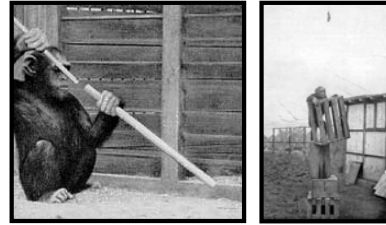
3 Instrumental action and practical reasoning

Non-verbal criteria for instrumental action & (proto-) practical reasoning
- Flexibility
- Persistence
- Signs of (non-) fulfillment
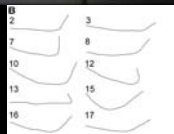- Anticipation and monitoring
  …

Ontogeny
- After Piaget (1952): from stage 4 (~8 months) on
- Examples:
  - removing obstacles to retrieve objects
  - pulling a cloth to retrieve a toy
  …

Comparative studies
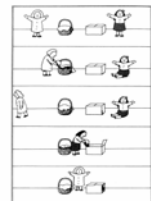

Köhler, 1925

Weir et al., 2002

Mendes, Hanus & Call (2007)
Hanus, Mendes, Tennie & Call (in preparation)

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4 Social cognition

Second-order individual intentionality

- **Complex forms: understanding epistemic subjectivity etc. ("theory of mind")**

  - development: from around 4 years
  - comparative: (almost) consesus: uniquely human

- **Simpler forms: understanding non-epistemic perception and intentional action**

  - development: from around 9 months
  - comparative: (almost) consensus for a long time: uniquely human

Understanding perception: New findings with apes

subordinate   dominant   Food
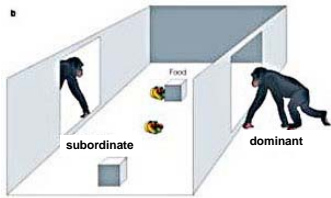
Hare et al. (2000, 2001)

Understanding intentional action: New findings with apes

- **Distinguishing unwilling – unable**
  (Call et al., 2004)
- **Human-raised chimpanzees: Helping others with instrumental problems**
  (Warneken & Tomasello, 2006)
- **Human-raised chimpanzees: Some imitation**
  (Tomasello & Carpenter, 2005)

Shared / collective WE-intentionality
(Bratman,1992; Gilbert, 1990; Searle,1990, 1995; Tuomela & Miller, 1988)

"The biologically primitive sense of the other person as a candidate for shared intentionality is a necessary condition of all collective behavior"
(Searle, 1990, p. 415)

Developing from 2nd year on, in particular

- **Cooperative activities**
  - joint instrumental acts (involving division of labour & role reversal)
  - joint games

- **Pre-verbal communication**
  - joint attentional frameworks
  - proto-declarative pointing

Social cognition, collective intentionality & dialectical development

Tomasello & Rakoczy, 2003. *Mind & Language*

1. **First year of human ontogeny: simple forms of first-order intentionality**
   → object cognition & instrumental intentional action

2. **Around 1 year: Dawning of simple second-order intentionality**
   → understanding perception & action

3. **Second year: Beginning of shared/collective WE-intentionality**
   → joint attention (triangulation), communication, cooperation, language, conventional practices

4. **Cognitive-cultural dialectics**

enables

Individual intentionality
(1st & 2nd order)

Entry into
collective intentionality
- Language
- Conventional practices

transforms
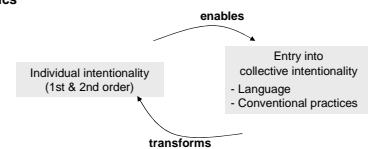
Early WE-intentionality & games of pretence

Pretend play

FICTION

FACT

Adam & Eve
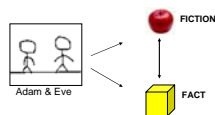
- Ontogenetic emergence: from ~ 18 months (→ simultaneously with language)
- Logically complex structure: coordination of fact & fiction
  (and quarantining problem)
- Early competence by far exceeds explicit linguistic expressability
- Comparatively: uniquely human
- Joint pretending
  - (one of) the first we-intentional activities with (proto-) institutional form:
    X counts as a Y   (Searle, 1995; Walton, 1990)

  - → rich (proto-) inferential & normative structure

PRETENDING-TRYING studies
Rakoczy, Tomasello & Striano, 2004, 2006; Rakoczy & Tomasello, 2006

- **Hypothesis:**   **Young children understand the intentional structure of pretense and –based on this– enter into joint pretense acts ("We pretend X")**

- **Test case: pairs of superficially similar "as-if-behaviours".**

  Trying to X   **Pretending to X**
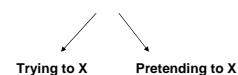
- **Subjects: 22-, 26- and 36-month-olds**
- **RESPONSE MEASURES: children's imitative and inferential reactions**

MODEL

Behaving-as-if POURING

Trying to pour   Pretending to pour

CHILD perceives both *"under these descriptions"*, respectively

ACTION

- really pour / try to *really* pour
- appropriate inferential instrumental action (e.g. use tool to open container)

- pretend to pour
- appropriate inferential pretense action (e.g. pretend to drink)

PRETENDING   **TRYING**

Inferential pretense / Inferential trying

22-month-olds   26-month-olds   36-month-olds

Number of responses

p = .08.

Pretense model / Trying model

(i) Action competence from 2 years

(ii) Explicit linguistic competence years later only

Grasping the normative structure of joint pretence
(Rakoczy, in press. *Developmental Psychology*)

Language & sophisticated folk psychology

Individual intentionality (1st & 2nd order)

enables

Entry into collective intentionality
- Language
- Conventional practices

transforms

Language & sophisticated folk psychology

The "4-year-revolution"

- **Understanding epistemic subjectivity: False Belief Test** (Wimmer & Perner, 1983)
- **Appearance-reality distinction** (Flavell et al., 1987)
- **Understanding incompatible perspectives (Level 2 perspective taking)** (Flavell et al., 1981; Perner, 1991)
- **Executive function, delay of gratification etc.**
  → 1 interpretation: reflexive self-consciousness & higher-order desires (Perner, 2000)

Evidence for language-dependence (overview: Astington & Baird (Eds.), 2005)

- **Correlations**
- **Deaf children: native signers versus non-signers**
- **Training studies**
- **Online verbal shadowing tasks** (DeVilliers)

→ **Davidson is right in *one* sense**

Language & sophisticated folk psychology

Crucial aspects of language

▪ **Pragmatic: perspective-shifting discourse (Harris, 1996)**

▪ **Grammatical: "that" complementation propositional attitude discourse**
(deVilliers & deVilliers, 2000)

→ **compatible with Sellarsian construal:**

- from understanding *thinking-out-loud* to understanding *thinking*

- from "*say that p*" → to: "*think that p*"   (e.g., Garfield et al., 2001)

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5 Conclusions & questions

Our ability to think what is or what may be going on at a distance will seem more mysterious than it is if one overemphasises the differences (enormous and important as they are) between our cognitive abilities and those of animals …

Our highly developed and highly discriminating abilities to think about situations that we are not observing are developments of powers that we share with other animals. (Putnam, 1999, p. 48)

There is certainly a continuum between proto-conceptual and fully conceptual behavior (and in the case of the higher primates, it may be that the line is blurry).
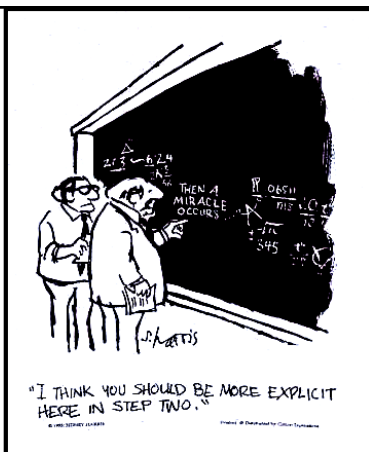
But at the same time, one must not make the mistake of supposing that language is merely a "code" that we use to transcribe thoughts we could perfectly well have without the code (ibid., p. 161)

Questions & challenges

▪ **Spelling out satisfactory analyses of non-linguistic (proto-) inferences**
→ implication modelled on causality? (Bermudez, 2003)
→ viable semantic notion of (material) inferences without formal vehicle?

▪ **Spelling out the scopes and limits of non-linguistic thought**
→ why exactly can't the dog think about his master the day after tomorrow (Wittgenstein), or that the cat is on the biggest tree around (Davidson)?

▪ **Spelling out the role of language in transforming tought**
→ What exactly does language do beyond 'transcribing'?

Relevant psychological approaches & theories:

▪ **Language as domain-general integration device (of domain-specific cognition)**
(e.g., Spelke, Carey, Carruthers)
Examples:
- spatial cognition (Spelke, 2004)
- numerical cognition (Carey, 2001)

▪ **Representational redescription: Making it explicit (what's implicit in domain-specific abilities at first)** (e.g. Clark & Karmiloff-Smith, 1993)
- from sub-doxastic to doxastic
- from non-conceptual to conceptual
- from encapsulation to inferential promiscuity
- from failing to fulfilling the Generality Constraint (Evans, 1982)

"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Thanks to