

Lecture 04

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1. Background

Knowledge of objects depends on abilities to (i) segment objects, (ii) represent them as persisting and (iii) track their interactions.

Question 1 When do humans come to meet the three requirements on knowledge of objects?

Discovery 1 Infants manifest all three abilities from around four months of age or earlier.

Question 2 How do humans come to meet the three requirements on knowledge of objects?

Discovery 2 Although abilities to segment objects, to represent them as persisting through occlusion and to track their causal interactions are conceptually distinct, they are all characterised by the Principles of Object Perception and they may all be consequences of a single mechanism.

Question 3 What is the relation between the model specified by the Principles of Object Perception and the infants?

The simple view The principles of object perception are things that we know or believe, and we generate expectations from these principles by a process of inference.

The Core Knowledge View The principles of object perception are not knowledge, but they are core knowledge. And we generate expectations

from these principles by a process of inference.

Discovery 3 The Simple View generates systematically false predictions. (And the Core Knowledge View generates no relevant predictions by itself.)

Question 4 What is the relation between adults' and infants' abilities concerning physical objects and their causal interactions?

2. The CLSTX Hypothesis: Object Indexes Underpin Infants' Abilities

Leslie et al say an object index is 'a mental token that functions as a pointer to an object' (Leslie et al. 1998, p. 11)

'Pylyshyn's FINST model: you have four or five indexes which can be attached to objects; it's a bit like having your fingers on an object: you might not know anything about the object, but you can say where it is relative to the other objects you're fingering. (ms. 19-20)' (Scholl & Leslie 1999)

Object indexes ...

- guide ongoing action (e.g. visual tracking, reaching)
- influence how attention is allocated (Flombaum et al. 2008)
- can be assigned in ways incompatible with beliefs and knowledge (e.g. Mitroff et al.

2005; Mitroff & Alvarez 2007)

- have behavioural and neural markers, in adults and infants (Richardson & Kirkham 2004; Kaufman et al. 2005).
- are subject to signature limits (Carey 2009, pp. 83–87)
- sometimes survive occlusion (Flombaum & Scholl 2006)

The *object-specific preview benefit* is the reduction in time needed to identify that a letter (or other feature) matches a target presented earlier when the letter and target both appear on the same object rather than on different objects.

The CLSTX conjecture Infants' abilities concerning physical objects are characterised by the Principles of Object Perception because infants' abilities are a consequence of the operations of a system of object indexes (Leslie et al. 1998; Scholl & Leslie 1999; Carey & Xu 2001; Scholl 2007).

A *signature limit of a system* is a pattern of behaviour the system exhibits which is both defective given what the system is for and peculiar to that system.

3. Core Knowledge vs Object Indexes

Consider the conjecture that infants' abilities concerning physical objects are characterised by

the Principles of Object Perception because infants' abilities are a consequence of the operations of a system of object indexes. If this conjecture is true, should we reject the claim that infants have a core system for physical objects? Or does having a system of object indexes whose operations are characterised by the Principles of Object Perception amount to having core knowledge of those principles?

Outstanding problem Since having core knowledge of objects does not imply having knowledge of objects, how can the emergence in development of knowledge of simple facts about particular physical objects be explained? What is the role of core knowledge of objects, and what other factors might be involved?

4. Phenomenal Expectations Connect Object Indexes to Looking Behaviours

How could the operations of object indexes explain purposive actions like looking longer at one thing than another?

First idea: the operations of object indexes give rise to corresponding beliefs. Objection: if four- and five-month-olds had such beliefs they should search for occluded objects, which they do not (e.g. Shinsky & Munakata 2001; Moore & Meltzoff 2008). And anyway, object indexes do not always give rise to beliefs even in adults

(Mitroff et al. 2005).

Second idea: phenomenal expectations ...

Phenomenal Expectations are aspects of the overall phenomenal character of experiences which their subjects take to be informative about things that are only distantly related (if at all) to the things that those experiences intentionally relate the subject to.

Phenomenal expectations can be thought of as sensations in approximately Reid's sense: they are monadic properties of events, specifically perceptual experiences, which are individuated by their normal causes and which alter the overall phenomenal character of those experiences in ways not determined by the experiences' contents (so two perceptual experiences can have the same content but distinct sensational properties).

Phenomenal expectations are signs: they can lead to beliefs only via associations or further beliefs (Reid 1785a, Essay II, Chap. 16, p. 228; Reid 1785b, Chap. VI sect. III, pp. 164–5).

5. Development is Rediscovery

How do you get from core knowledge to knowledge proper?

The Assumption of Representational Connections: the transition involves operations on the contents of core knowledge states, which transform them into (components of) the contents of

knowledge states.

Most proposals rely on this assumption, including: (i) Spelke's suggestion that mature understanding of objects derives from core knowledge by virtue of core knowledge representations being assembled (2000); (ii) claims by Leslie and others that modules provide conceptual identifications of their inputs (Leslie 1988); (iii) Karmiloff-Smith's representational re-description (1992); and (iv) Mandler's claim that 'the earliest conceptual functioning consists of a redescription of perceptual structure' (1992).

If object indexes influence actions only via phenomenal expectations, the Assumption of Representational Connections is wrong.

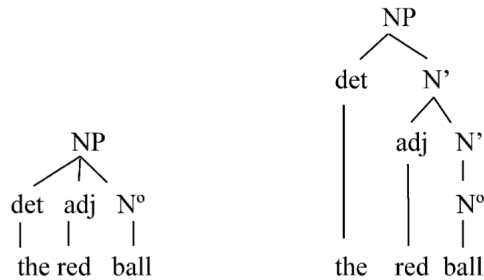
Alternative assumption: the transition depends only on the effects of core knowledge states on behaviour, attention, and sensation.

Development is rediscovery: the emergence of knowledge involves rediscovering information already encoded as core knowledge.

6. Syntax / Innateness

Is the syntactic structure of 'the red ball' (a) flat or (b) hierarchical?

- a. Flat structure hypothesis b. Nested structure hypothesis



from Lidz et al. 2003

1. 'red ball' is a constituent on (b) but not on (a)
2. anaphoric pronouns can only refer to constituents
3. In the sentence 'I'll play with this red ball and you can play with that one.', the word 'one' is an anaphoric pronoun that refers to 'red ball' (not just ball). (Lidz et al. 2003; Lidz & Waxman 2004).

'The assumption in the preferential looking task is that infants prefer to look at an image that matches the linguistic stimulus, if one is available' (Lidz et al. 2003).

6.1. Poverty of stimulus arguments

How do poverty of stimulus arguments work?
See Pullum & Scholz (2002).

1. Human infants acquire X.
2. To acquire X by data-driven learning you'd need this Crucial Evidence.
3. But infants lack this Crucial Evidence for X.
4. So human infants do not acquire X by data-driven learning.
5. But all acquisition is either data-driven or innately-primed learning.
6. So human infants acquire X by innately-primed learning .

'the APS [argument from the poverty of stimulus] still awaits even a single good supporting example' (Pullum & Scholz 2002, p. 47)

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