Joint Action & the Emergence of Mindreading

What are modules?
& what is their role in development?

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Outline

Why we need a notion of modularity (§0)

There is a problem—current accounts of modularity are inadequate (§1).

I have a solution (§2).

This solution implies a constraint on how modules might explain cognitive development (§3).

Illustration: speech perception (§4).

Why we need a notion of modularity (§0)

1. There are subjects who can pass A-tasks but cannot pass B-tasks.

2. These subjects' success on A-tasks is explained by the fact that they **can** represent (false) beliefs

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2. These subjects' success on A-tasks is explained by the fact that they **can** represent (false) beliefs

in a modular process

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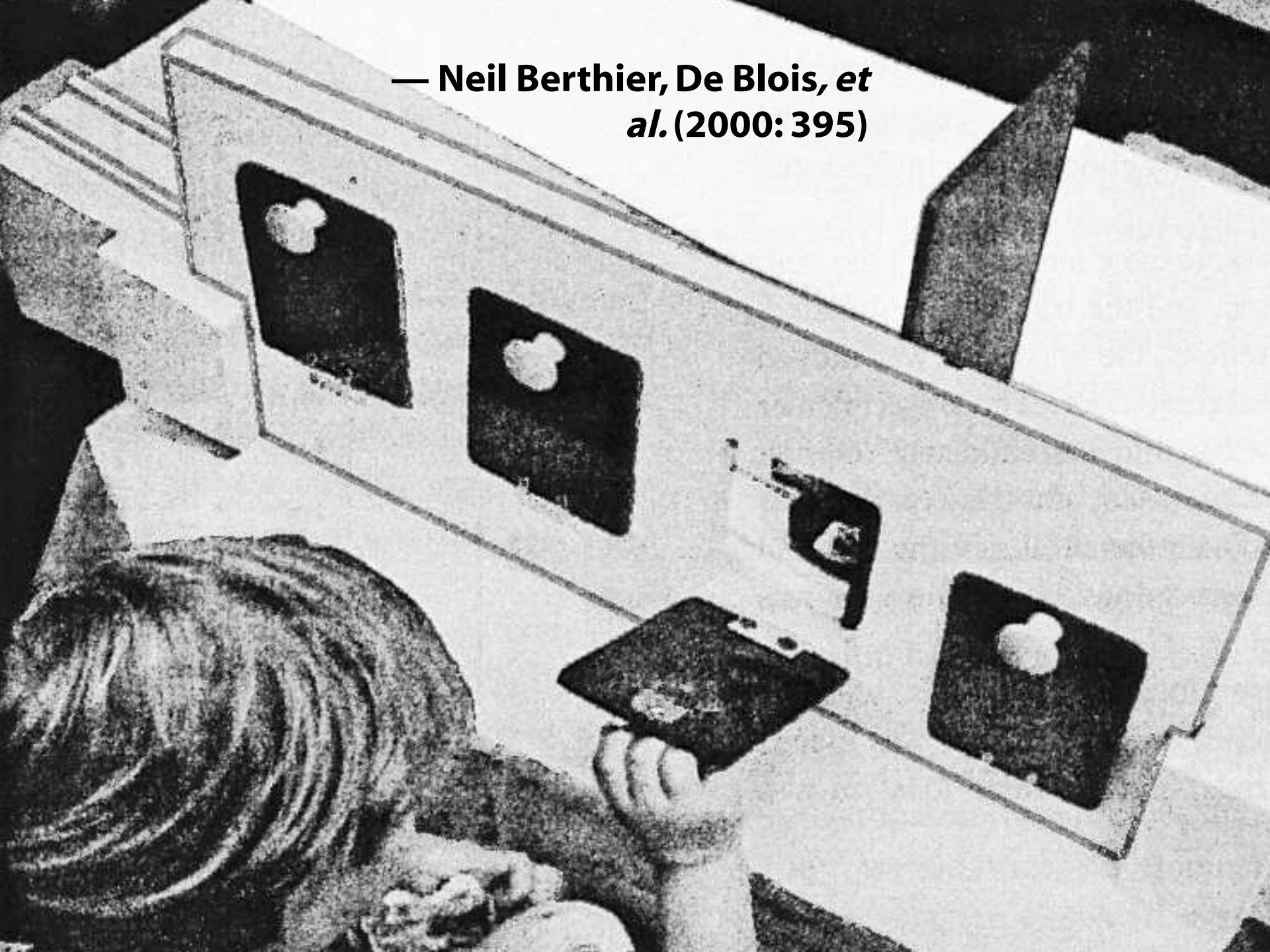
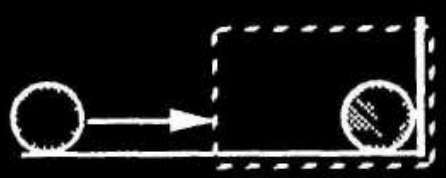
in a non-modular process



— Neil Berthier, De Blois*, et al.* (2000: 395)

habituation



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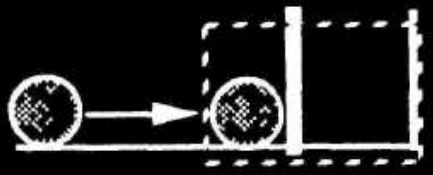

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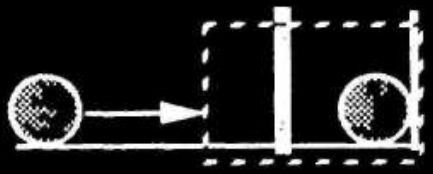

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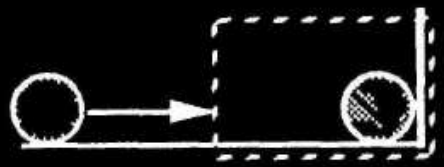

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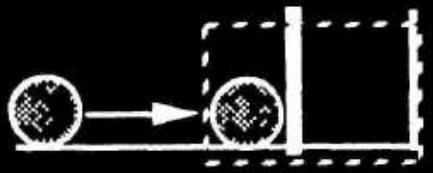

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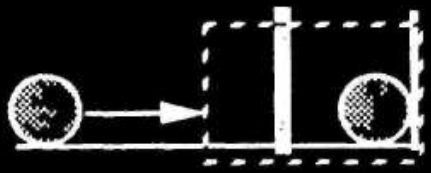

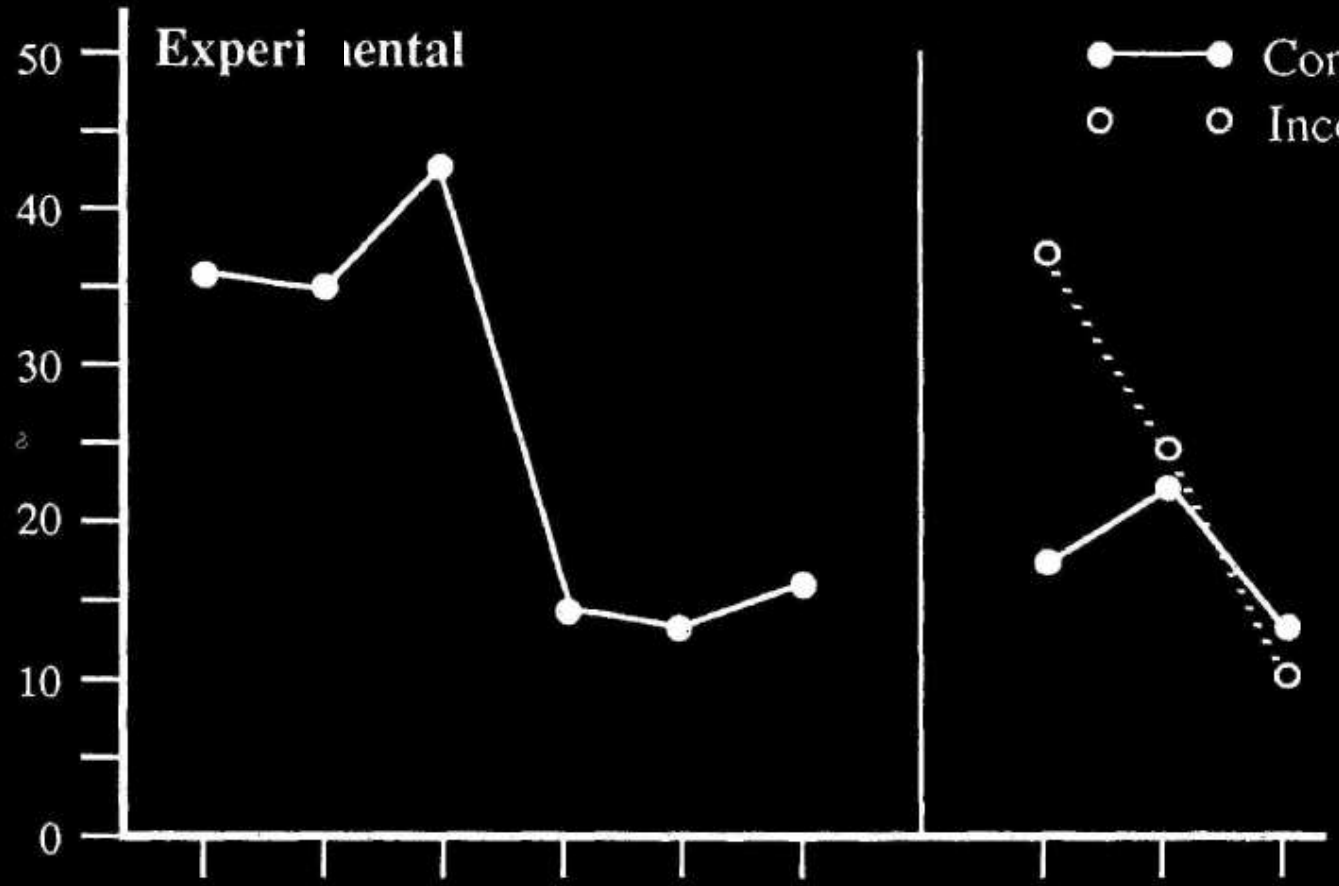

Sources Spelke 1991, Gergely, Csibra & Biro 1995, Csibra 2003 p. 125 fig. 6, Mark Steyvers' web page for PSYCH 140C

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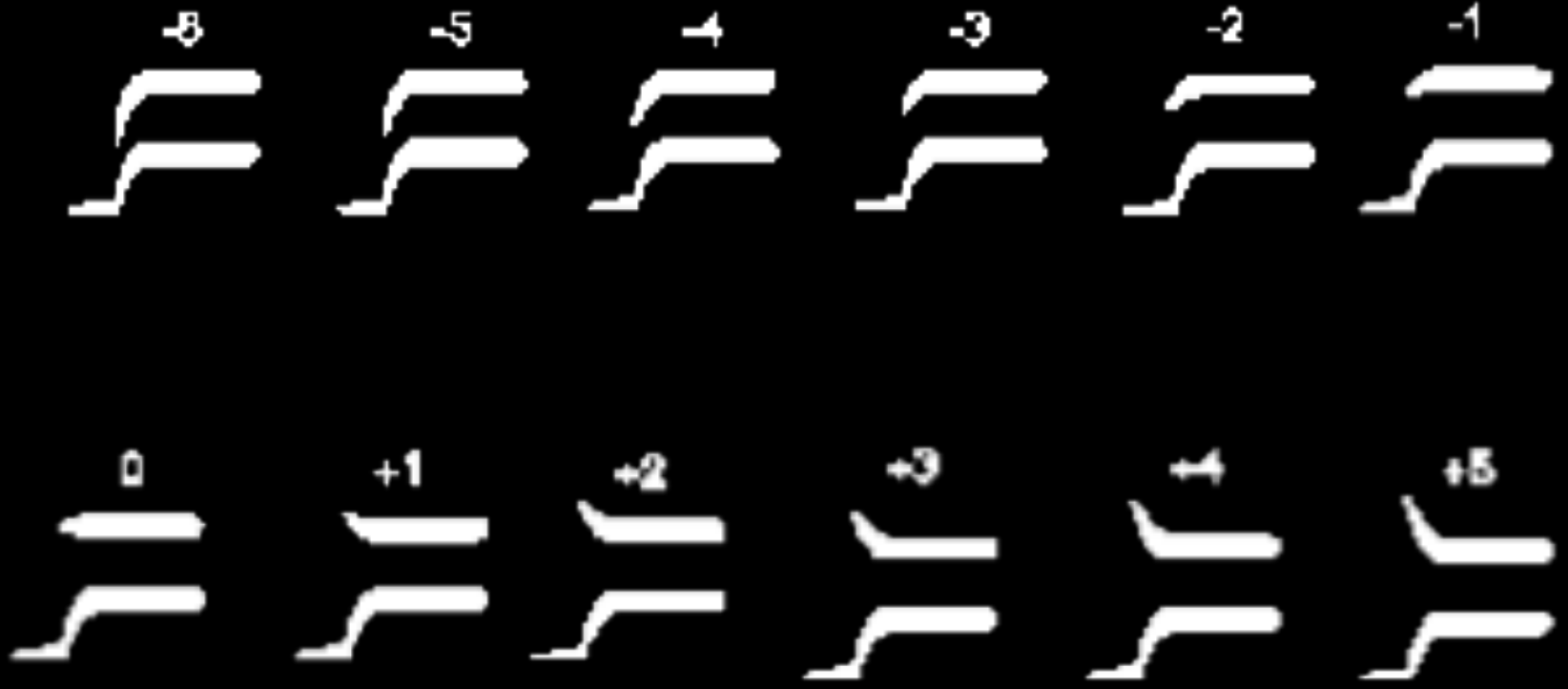

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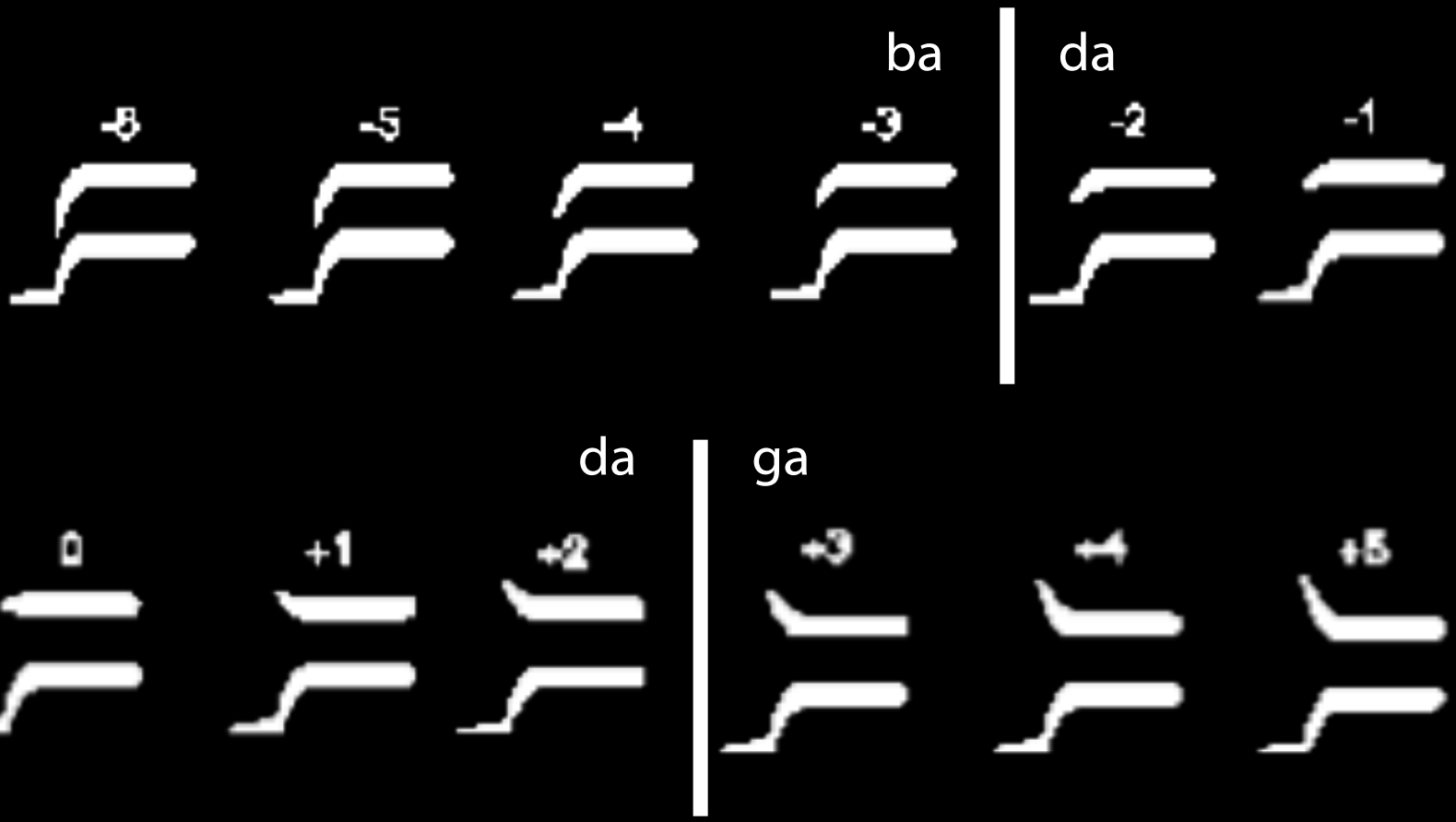

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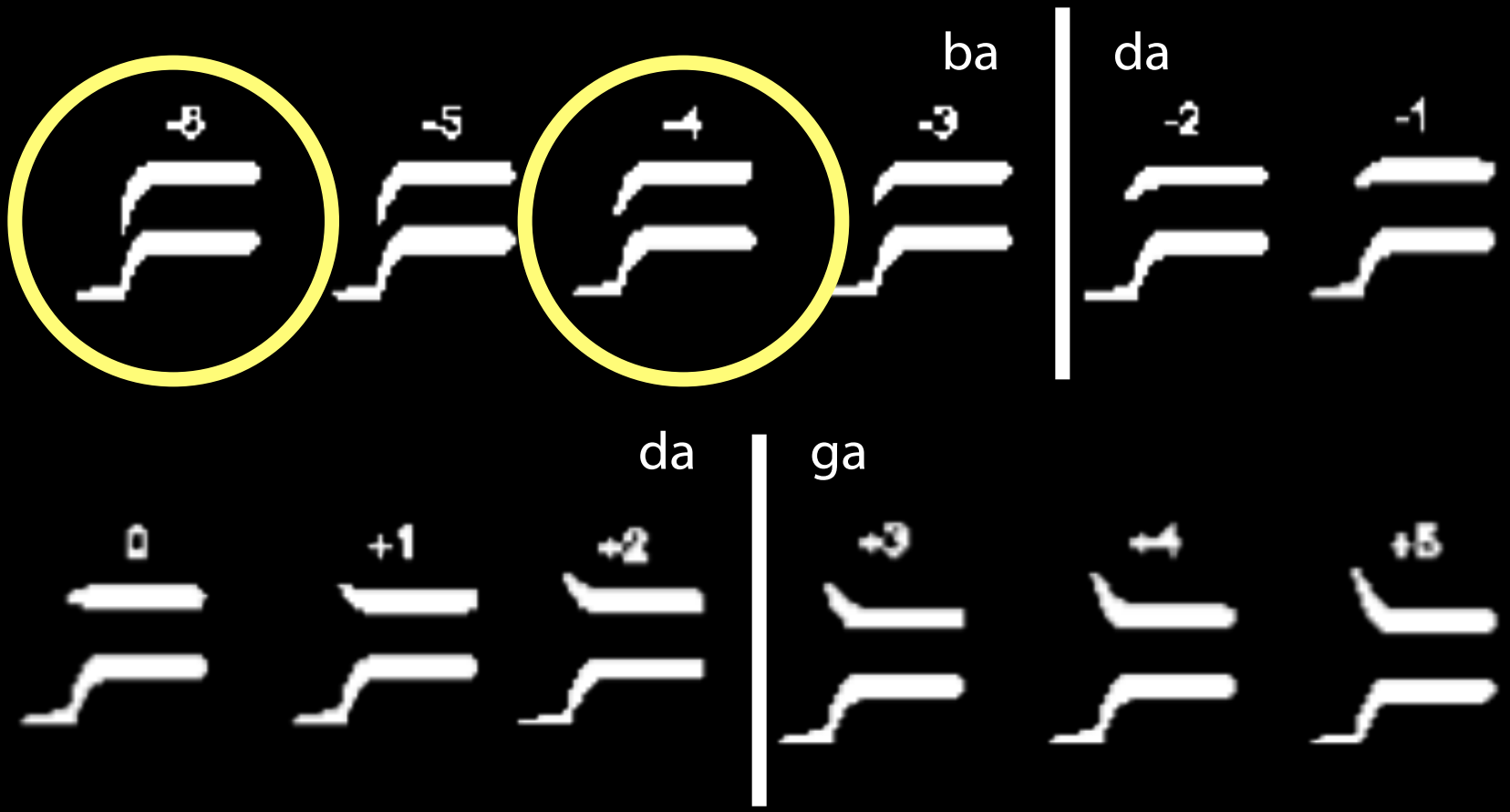

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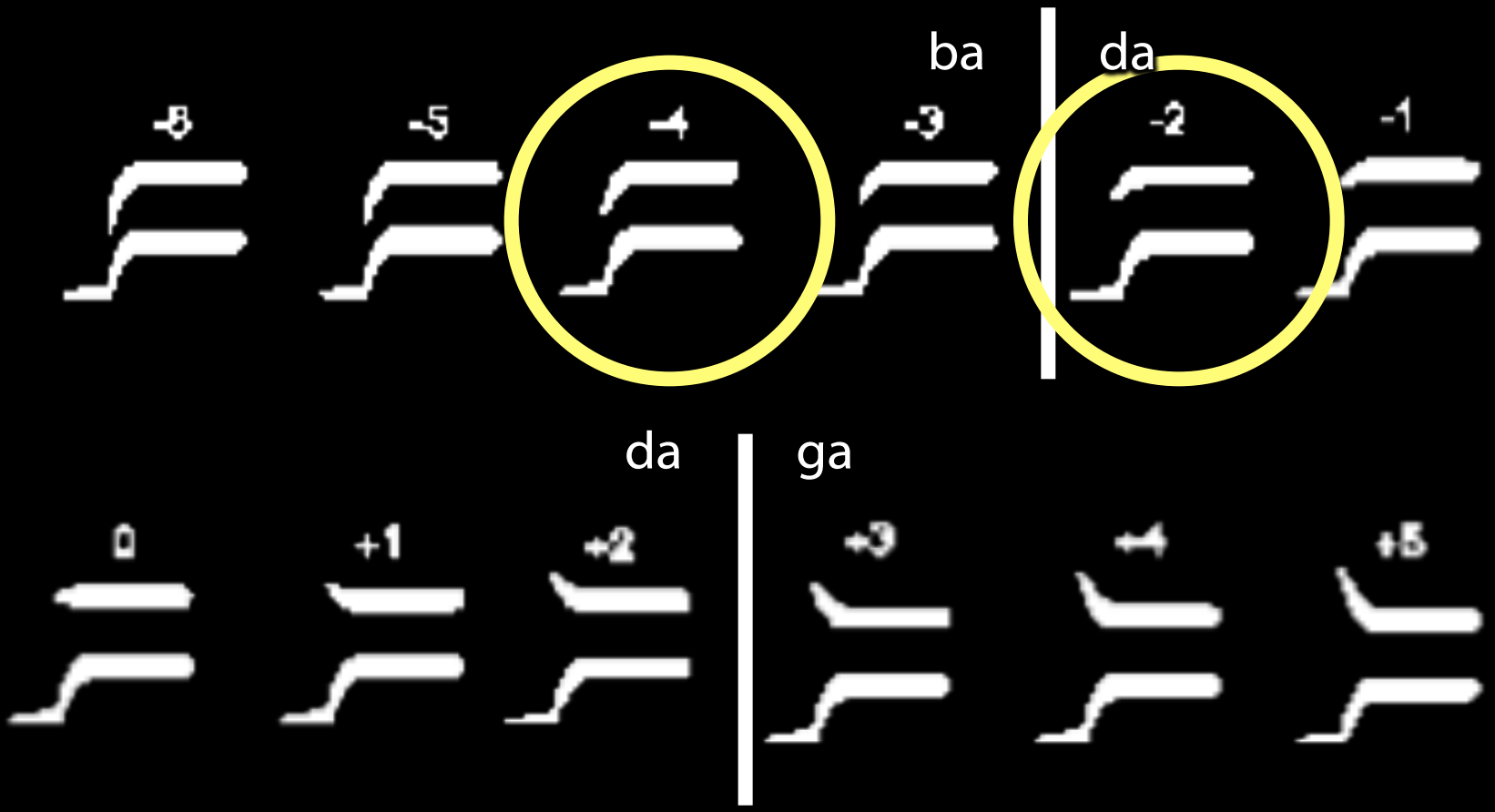

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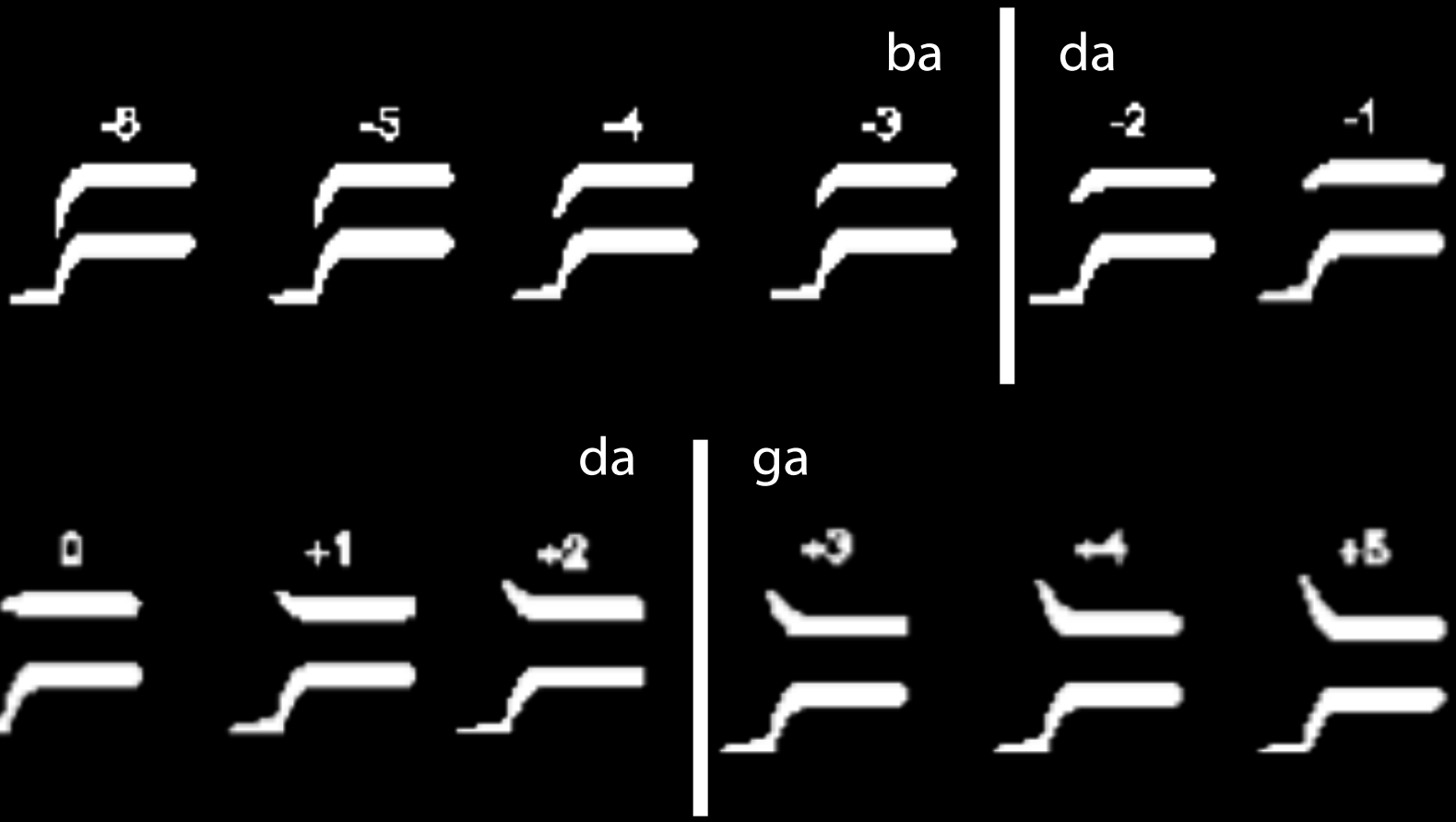

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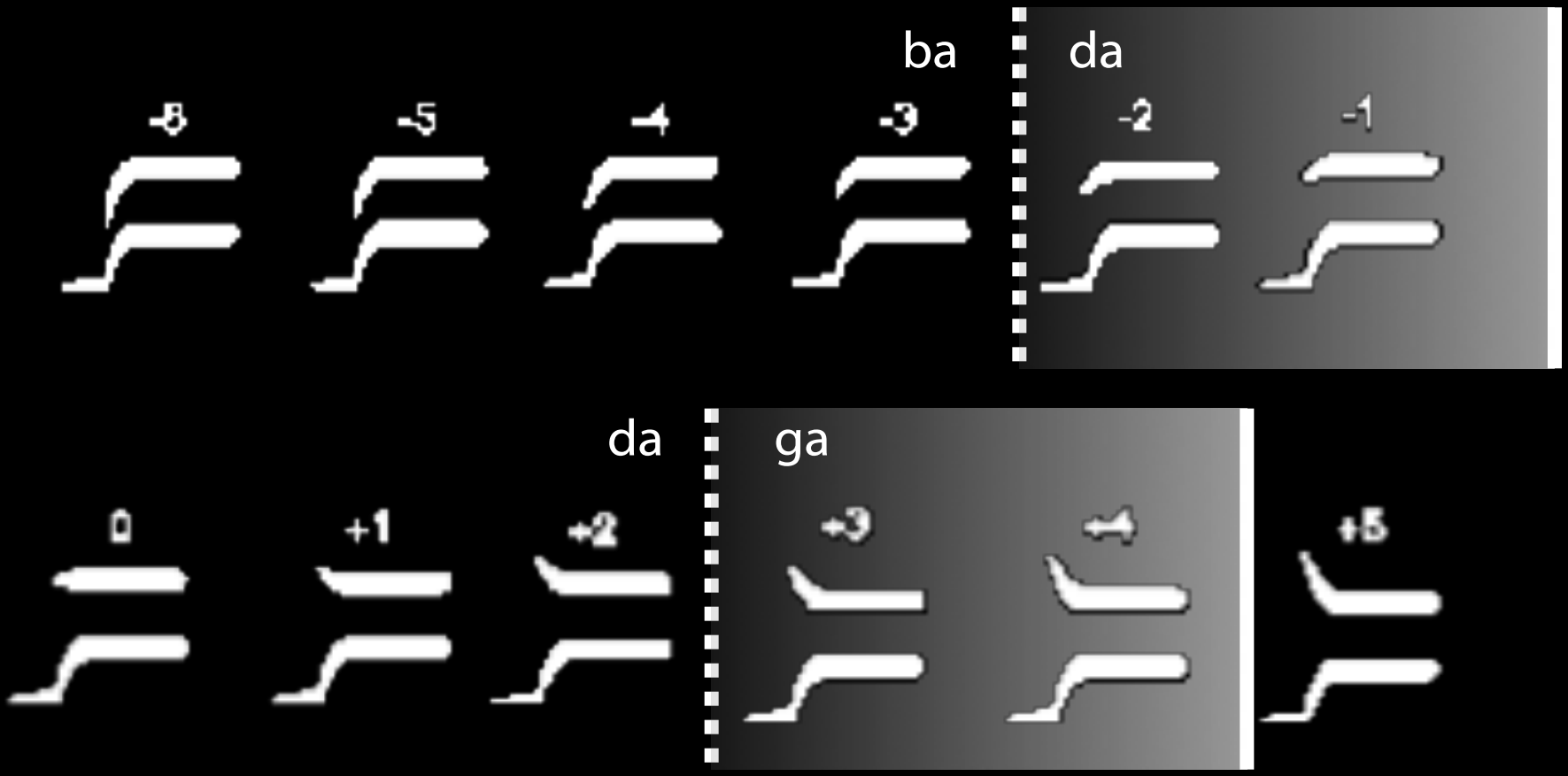

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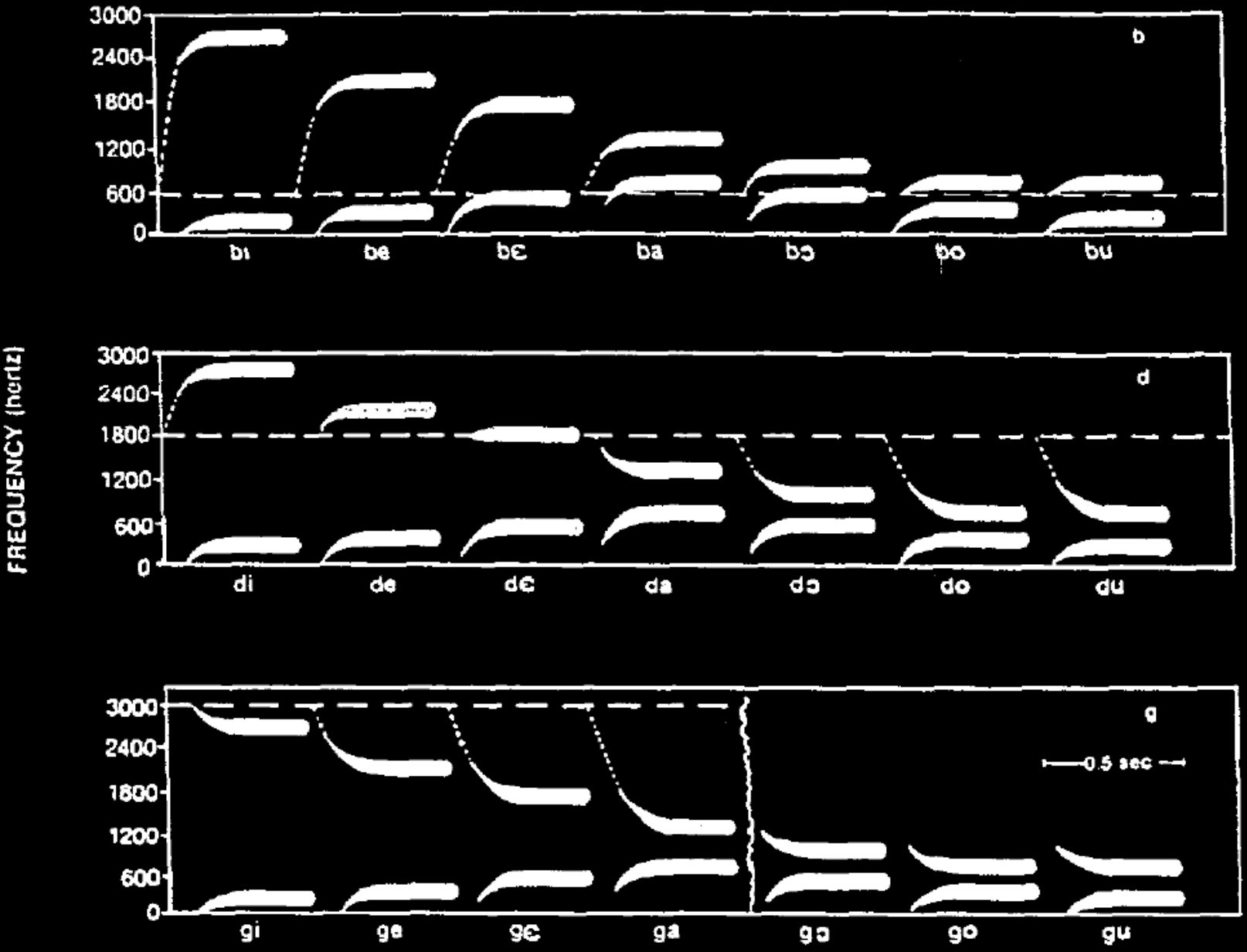

source Jusczyk (1997: 44)

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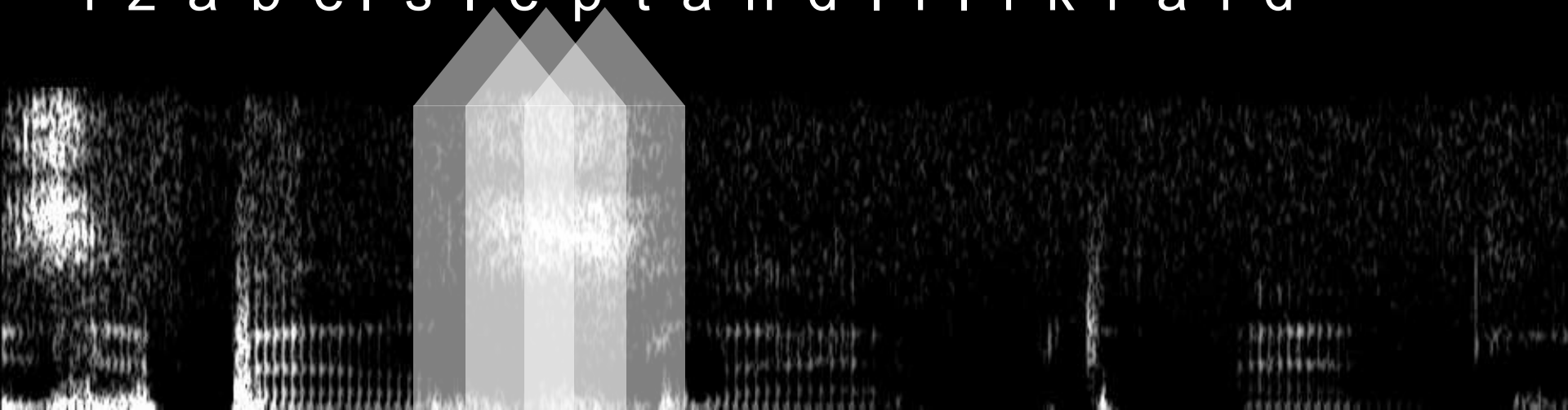
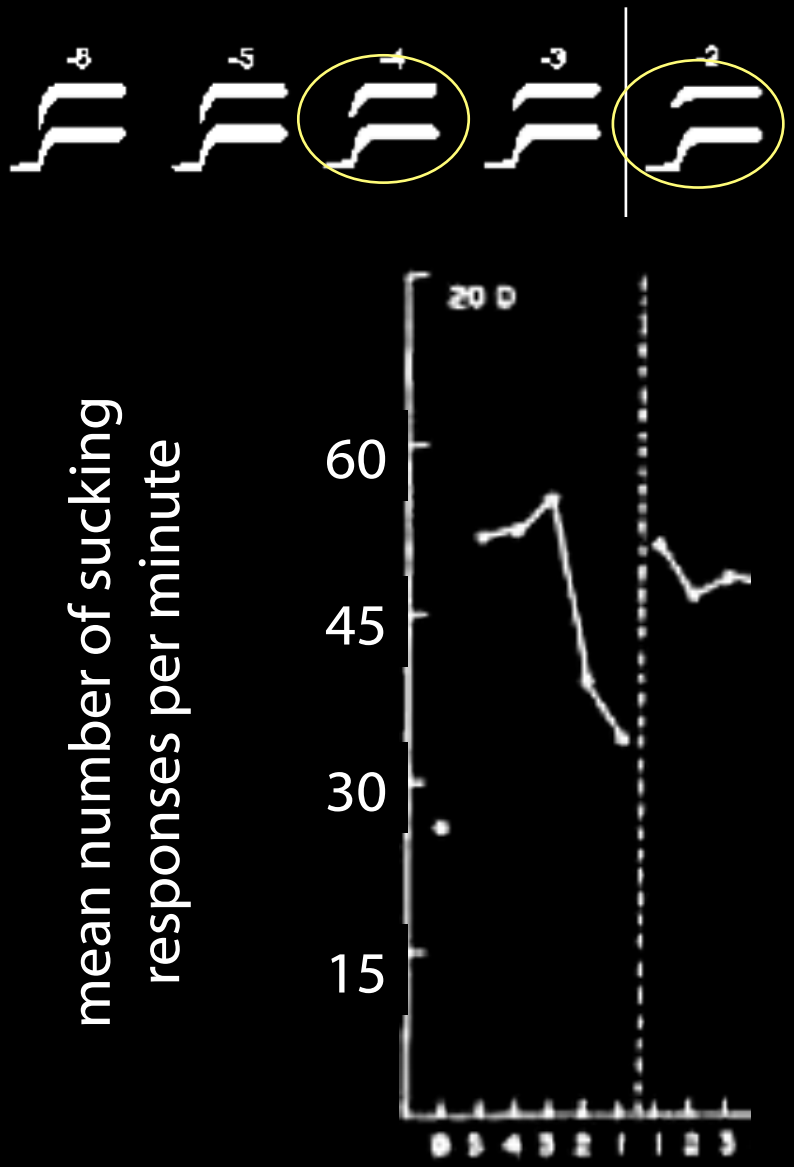
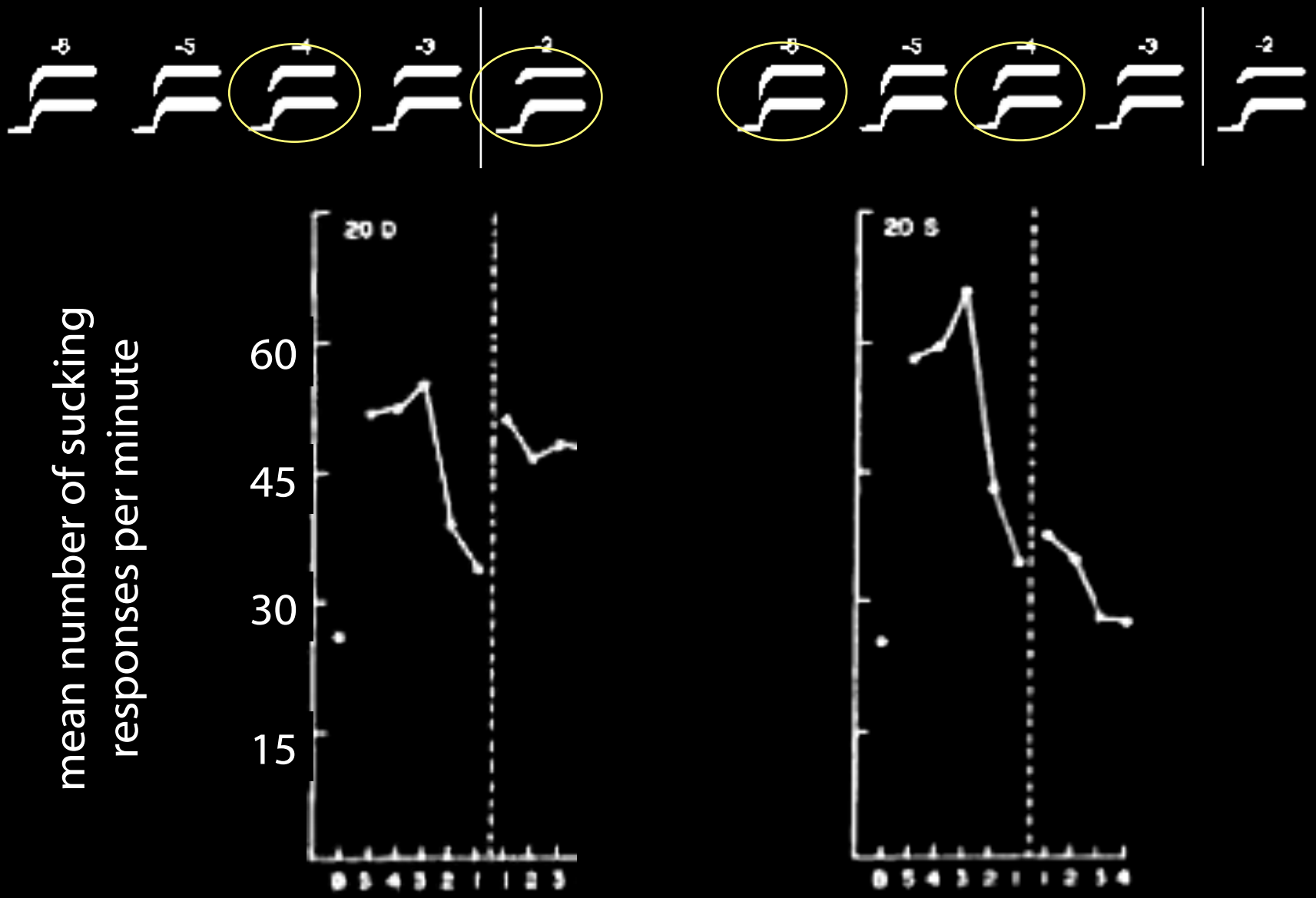




source Eimas, Siqueland, et al. (1971: 304, figure 2)



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4 months: categorical perception of phonemes

Tests of phonological awareness:

- sorting according to initial phoneme
- tapping once per phoneme
- phoneme segmentation
- phoneme blending
- phoneme elision
- word completion

Success on these tasks is statistically explained by a single factor

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4 months: categorical perception of phonemes
3-4 years: phoneme judgements

Habituation tasks: humans can represent phonetic structure from around age four months

Phonological awareness tasks: humans cannot represent phonetic structure until age 3-4 years

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in a modular process

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There is a problem

Modules

1. they are 'the psychological systems whose operations present the world to thought';
2. they 'constitute a natural kind'; and
3. there is 'a cluster of properties that they have in common … [they are] domain-specific computational systems characterized by informational encapsulation, high-speed, restricted access, neural specificity, and the rest'

(Fodor 1983: 101)

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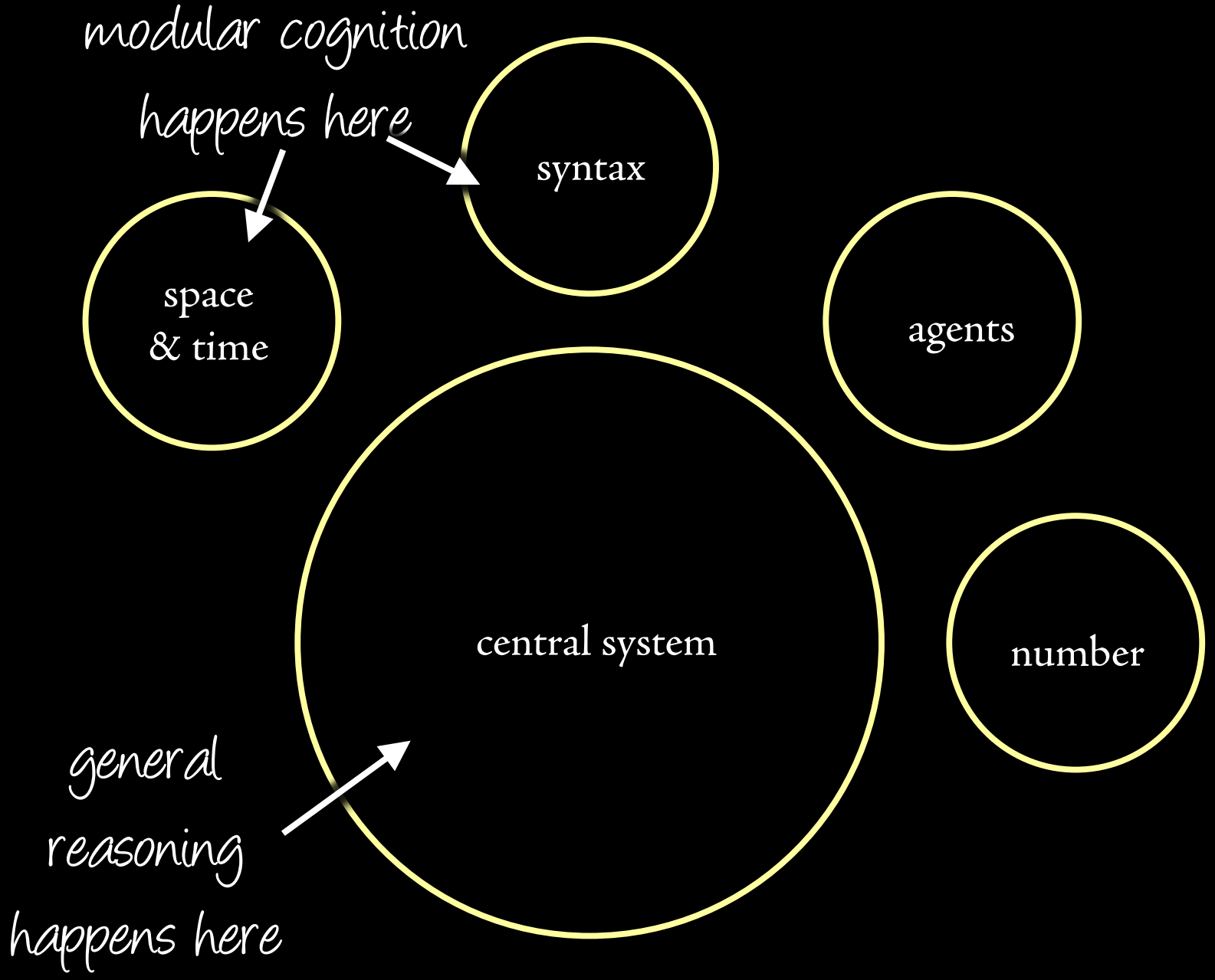
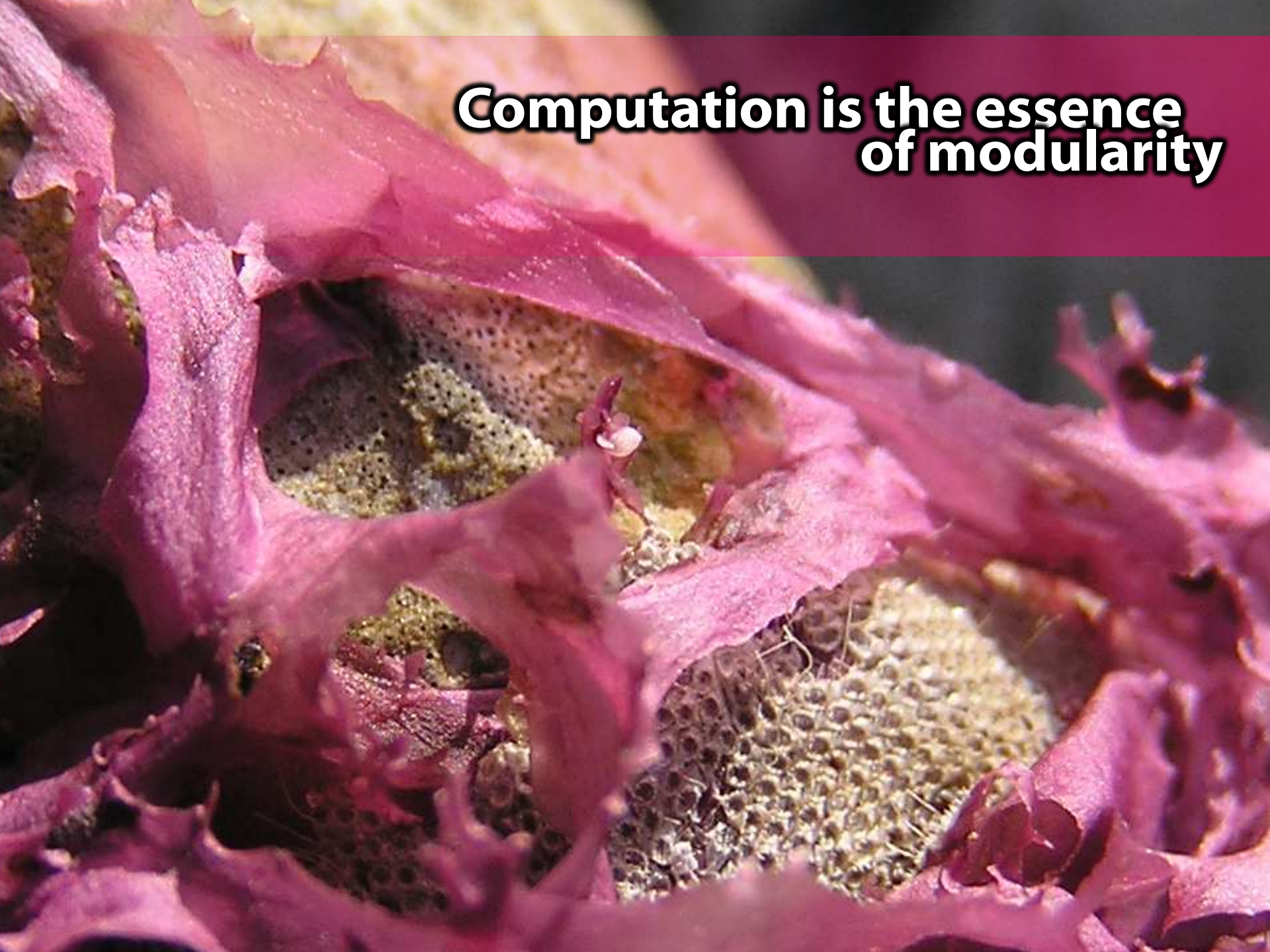

modular cognition happens here
syntax
space & time
agents
central system
number
general reasoning happens here

An account of modularity has to explain why the properties associated with modules occur together

Computation is the essence of modularity



The Computational Theory of the Mind

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(a) have intentional content;

(b) have a systematic effect on thought and action; and

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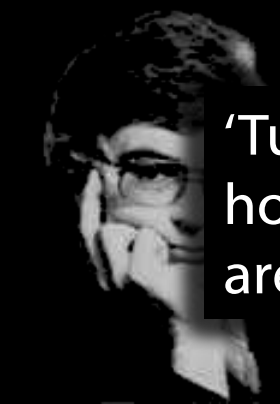

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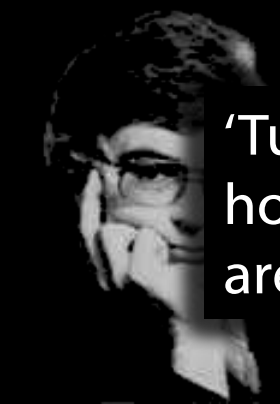

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Thought: P&Q

Representation1

Thought: Q

Representation2

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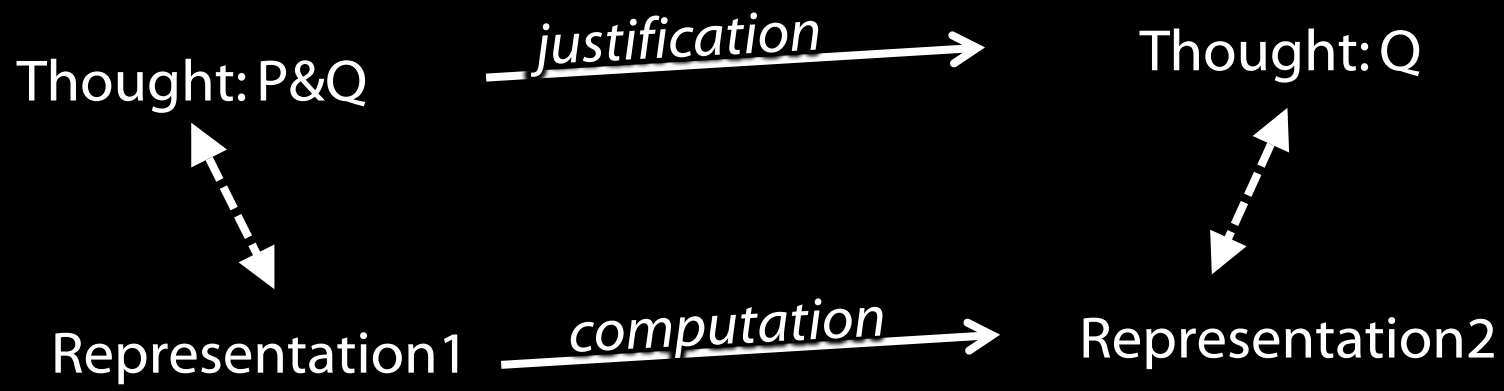

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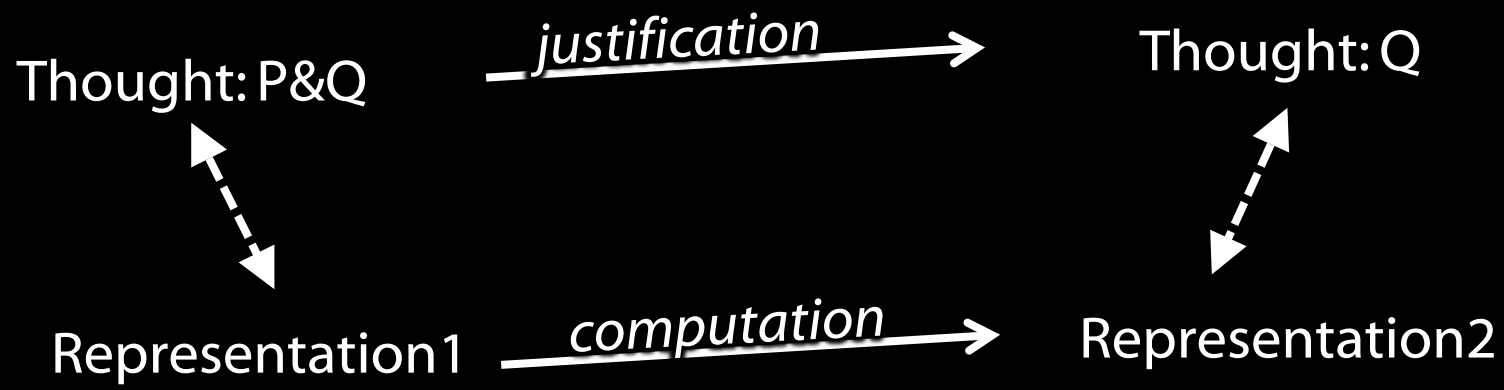

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'sooner or later, we will all have to give up on the Turing story as a general account of how the mind works'

(Fodor 2000: 47)

Fodor's (?) argument

1. Computational processes are not sensitive to context-dependent relations among representations.

2. Thinking sometimes involves being sensitive to context-dependent relations among representations as such.

3. Therefore, not all thinking is computation.

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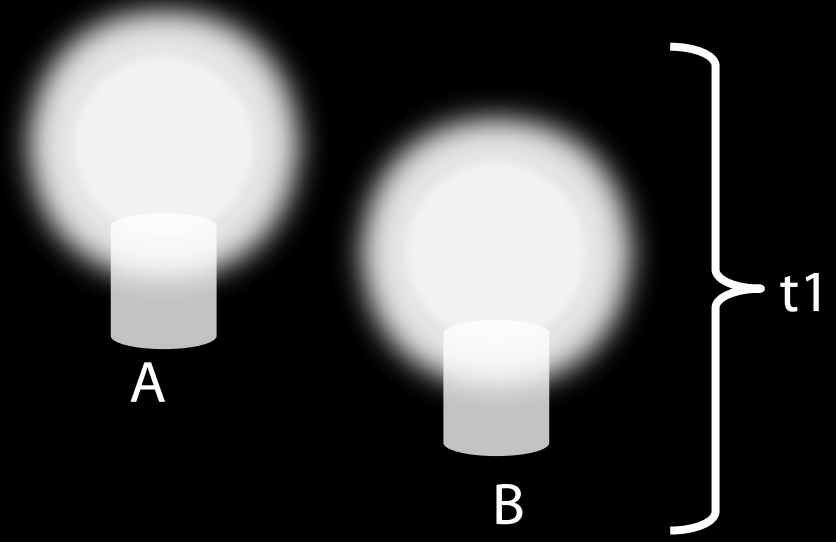

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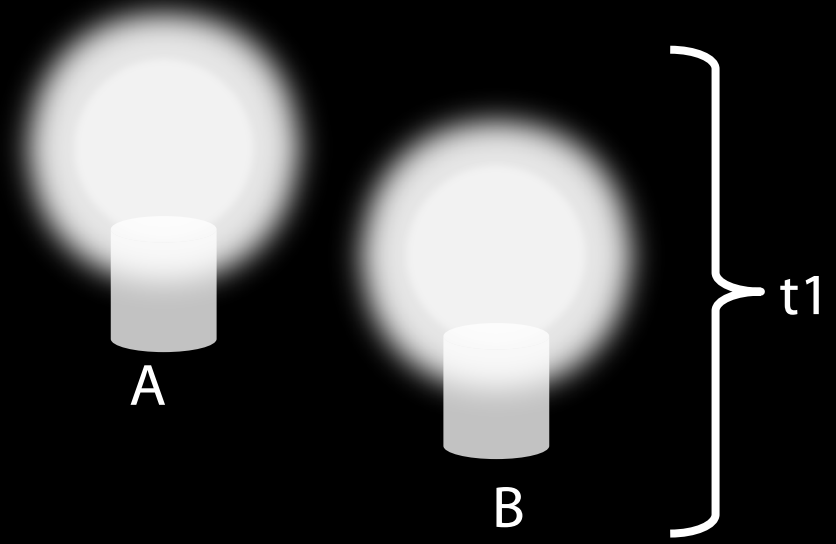

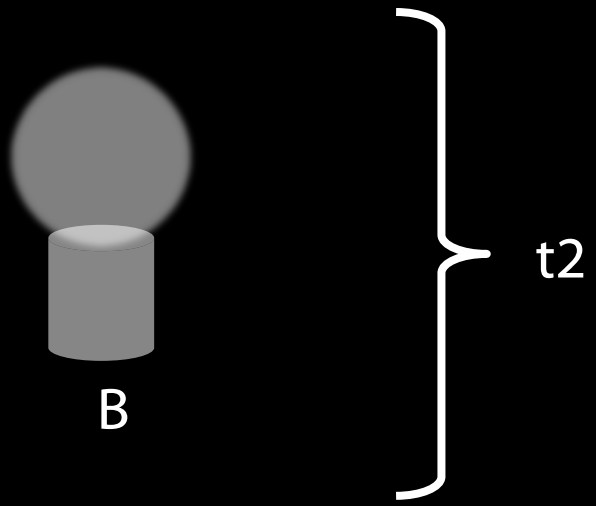

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‘the Computational Theory is probably true at most of only the mind’s modular parts. … a cognitive science that provides some insight into the part of the mind that isn’t modular may well have to be different, root and branch’

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Consequences for the role
of modules in development

How do modules facilitate development?

(1) Role of modules …

Modules provide 'a basic infrastructure for knowledge and its acquisition'

(Wellman and Gelman 1998: 524)

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(1) Role of modules …

Modules provide 'a basic infrastructure for knowledge and its acquisition'

(Wellman and Gelman 1998: 524)

(2) How modules fulfil this role …

'The module … automatically provides a *conceptual identification* of its input for central thought … in exactly the right format for inferential processes'

(Leslie 1988: 193–4 my italics).

What are concepts?

The concept OBJECT is …

(a) that in virtue of having which we are able to reason about objects as such;

(b) that in virtue of having which we are able to compute information about objects as such.

How do modules facilitate development?

(1) Role of modules …

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(Wellman and Gelman 1998: 524)

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associative process → physiological change → sensory experience → thought process

The role of modules in development can be explained without appeal to direct representational links between modules and thought.

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Modular cognition …

* results in eye movements
* directs attention
* provides categorical perception

Summary so far

Theme: the role of modules in development

(1) several views assume that there are direct representational relations between modules and thought;

(2) this assumption is implausible if modular cognition and thinking are different kinds of process

(3) there is an alterative


Perceiving & thinking about speech

Liberman and Mattingly's motor theory of speech perception

* speech perception is modular

* speech perception is categorical

* the objects of speech perception are intended phonic gestures

How does modular cognition of speech interface with general reasoning? Does it provide conceptual identifications of phonemes?


4 months: categorical perception of phonemes
3-4 years: phoneme judgements


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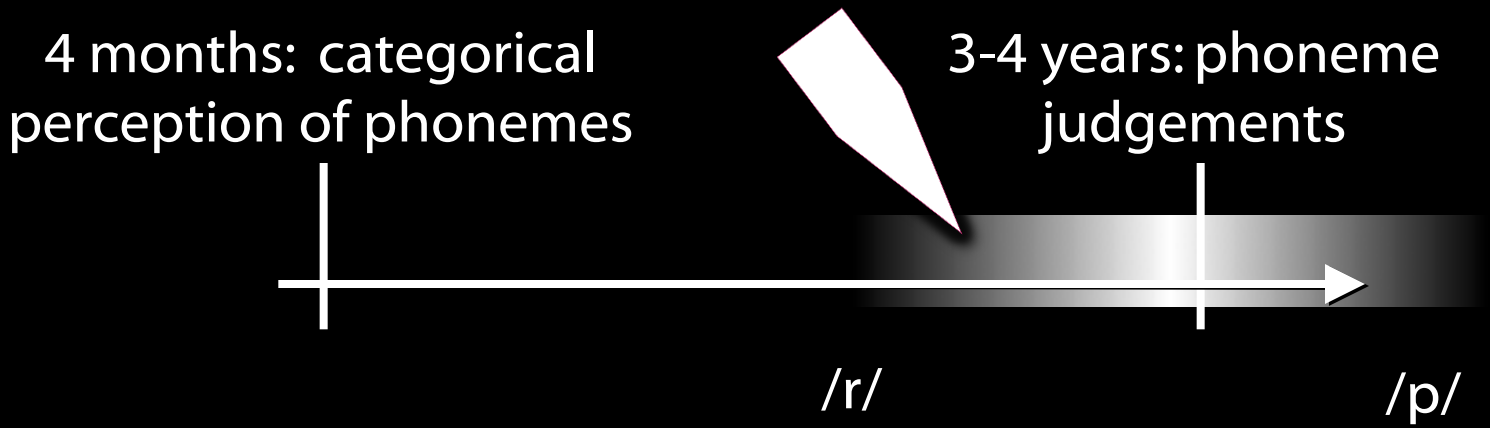
3-4 years: phoneme judgements
/r/
/p/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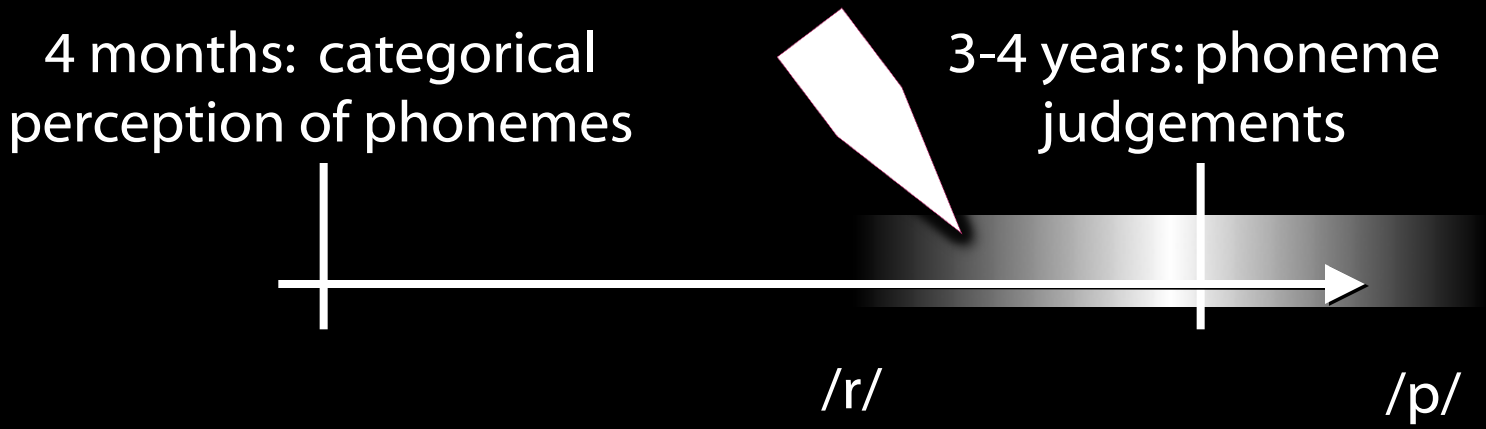
'we believe that children's performance depends on cognitive capacities that are continuous over human development'

(Spelke 2001: 336)



Summary so far

* The speech module supports categorical perception of phonemes

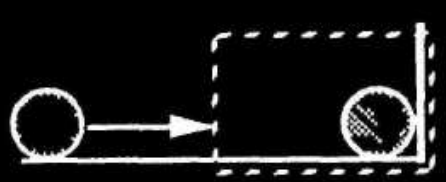
* Categorical perception is not conceptual identification

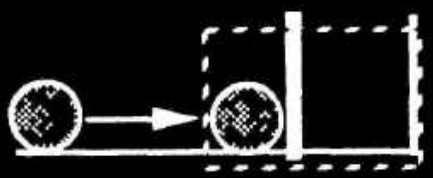
* This explains the 3-4 year gap between perception and conception of phonemes.

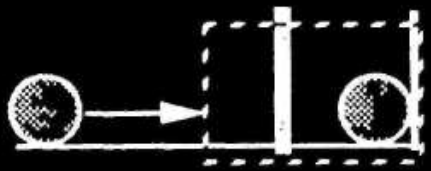
habituation

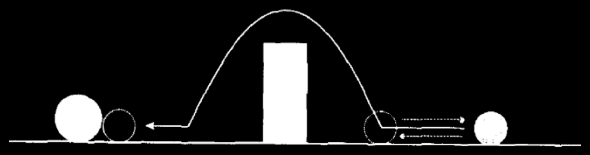
consistent

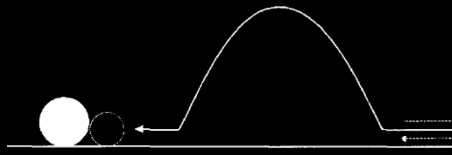
inconsistent

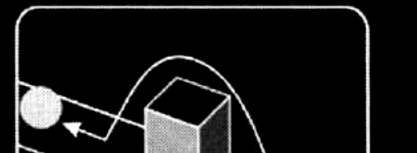












Sources Spelke 1991, Gergely, Csibra & Biro 1995, Csibra 2003 p. 125 fig. 6, Mark Steyvers' web page for PSYCH 140C

Conclusion

Conclusions

1. If modules exist, there is more to modularity than a cluster of features.
2. Modular cognition differs from thinking in being a different kind of process; specifically, in being a special kind of computational process.
3. The 'concepts' and 'knowledge' involved in modular cognition differ in kind from those involved in general reasoning.
4. The relation between modular cognition and general reasoning is indirect.
5. Categorical perception of speech provides a model of non-representational communication between modules and thought

Nativism about knowledge
Not all knowledge is acquired by learning

Poverty of Stimulus Argument

(1) Experience alone wouldn't enable us to know truths about X.

(2) But we do know truths about X.

Therefore:

(3) Some knowledge about X must be innate.

The Problem of Truth
Knowledge involves true beliefs and it's hard to see how beliefs could be true unless acquired through learning.