Carving up the world

Semantic typology and cognition

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Bloomfield's curse

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- Our perspective: There is a universal continuous conceptual similarity structure between entities (objects, events, . . .)
- These spaces bias (1) learnability, (2) transferability, and even (3) adult categorical structure and hence shape lexica

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- Revealing cases: asymmetric overextension errors
  - General case: *a* means A and *b* means B
  - Children use *a* to refer to B, but not *b* to refer to A
- Some known cases
  - Dutch: *op* 'horizontal, stable support' for 'tenuous support', but not *aan* 'tenuous support' for 'horizontal stable support',
  - English: *blue* for 'purple', but not *purple* for 'blue'
  - Dutch: *leggen* 'lay' for 'put, set', but not *zetten* 'put, set' but for 'lay'

Our method: inferring maps from cross-linguistic data

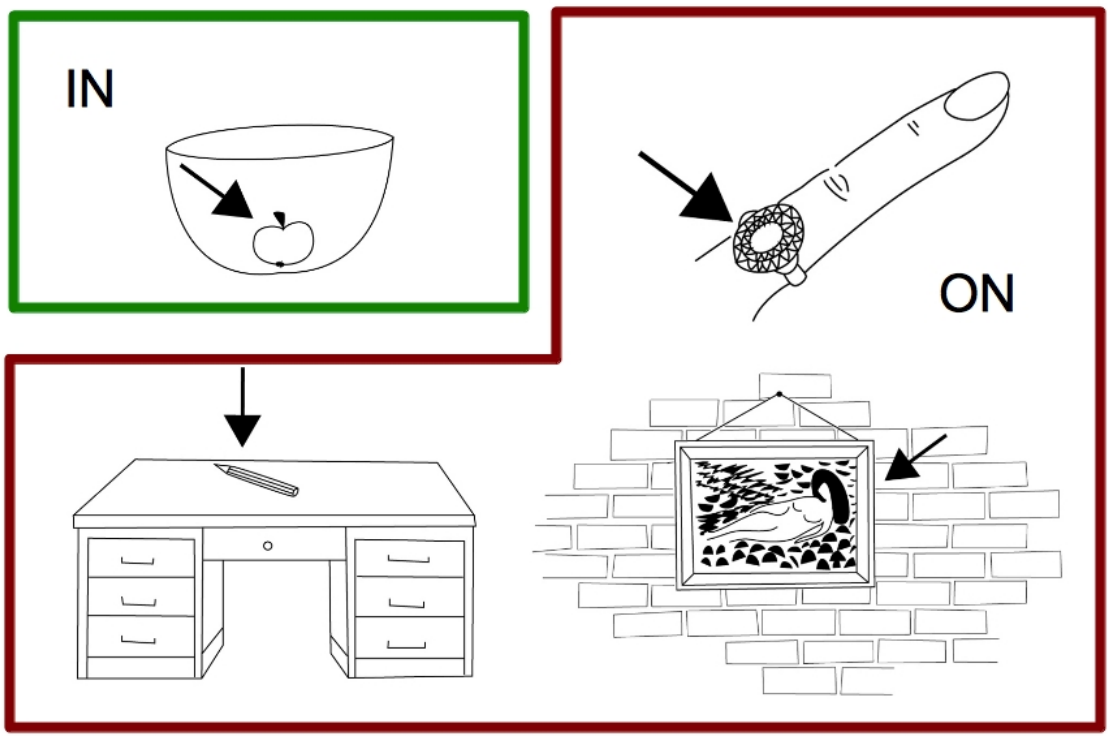
General approach: Typology reveals conceptual space

- Gentner & Bowerman (2009): Typological Prevalence Hypothesis
  - The more languages refer two entities with a single label, the more cognitively similar they are
  - The more similar a group of entities is, the easier it is to learn a category extending over them

General approach: Elicit data

Ask speakers of a sample of languages to describe a series of situations

English



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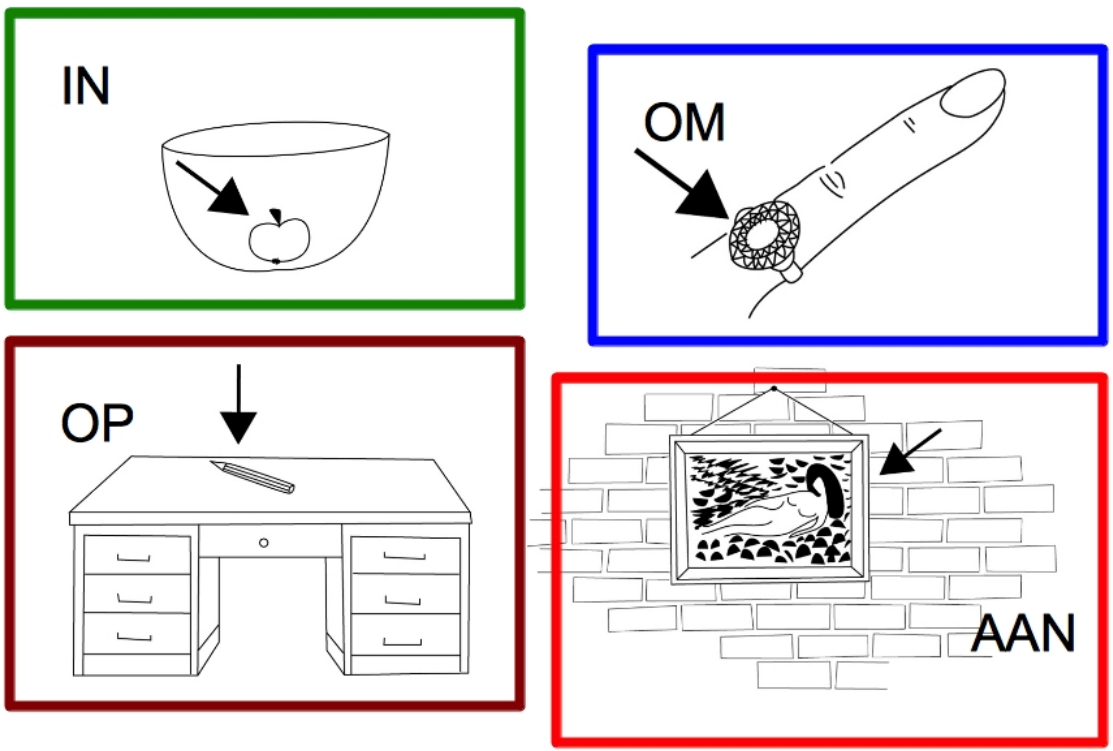

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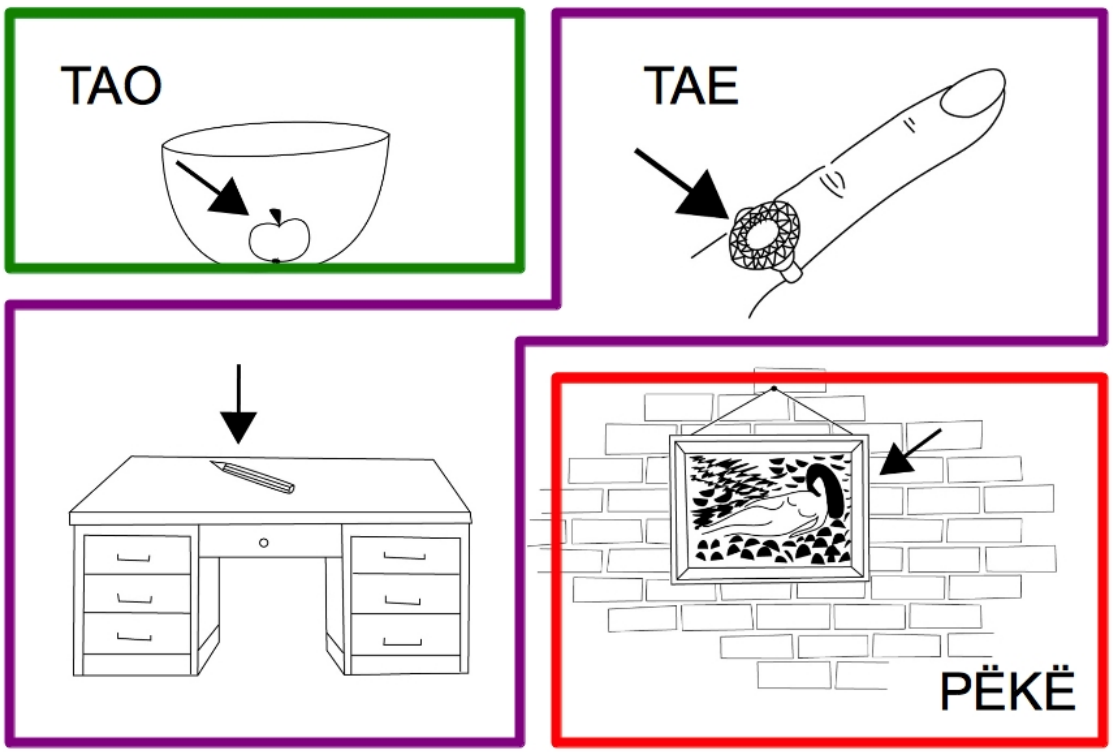
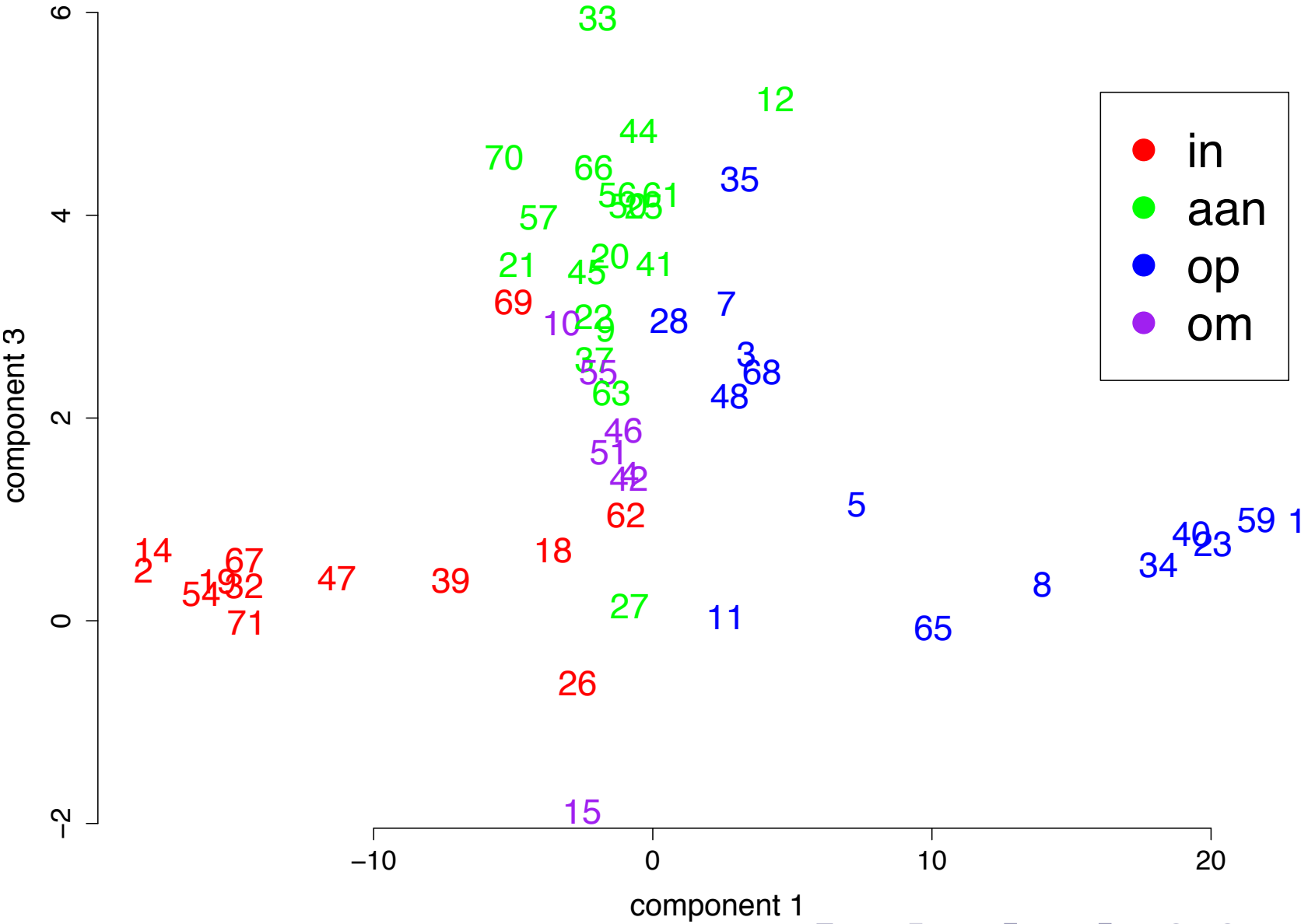


Count

situation	English	Dutch	Tiriyo
APPLE IN BOWL	in	in	tao
PAINTING ON WALL	on	aan	pëkë
RING ON FINGER	on	om	tae
PENCIL ON TABLE	on	op	tae

Dutch in the PCA space (components 1 and 3)

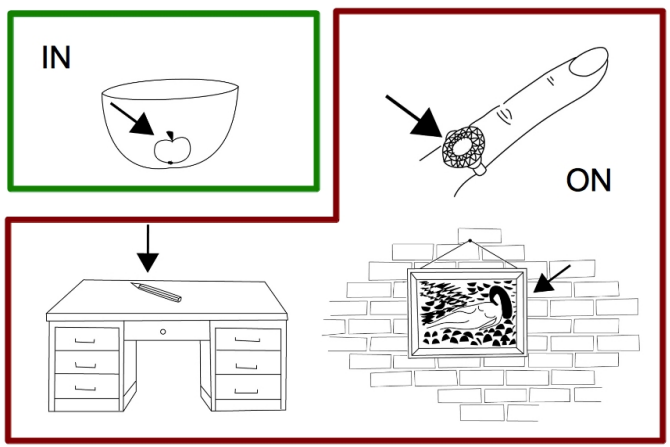


Case #1: acquiring spatial prepositions in Dutch and English

Data

- Gentner & Bowerman (2009): naming spatial relations in Dutch and English
  - English children make next to no errors

English



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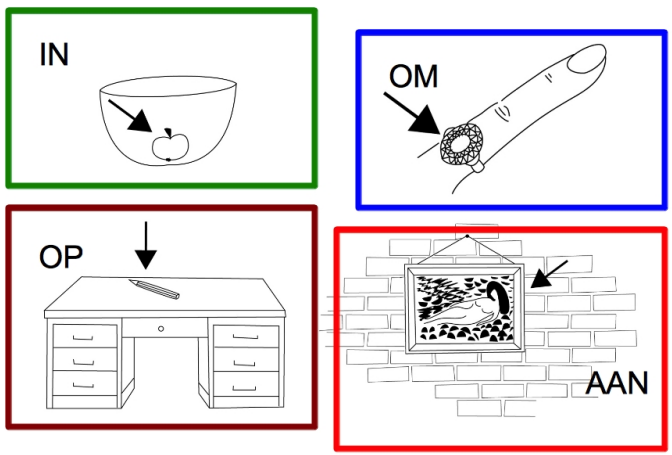

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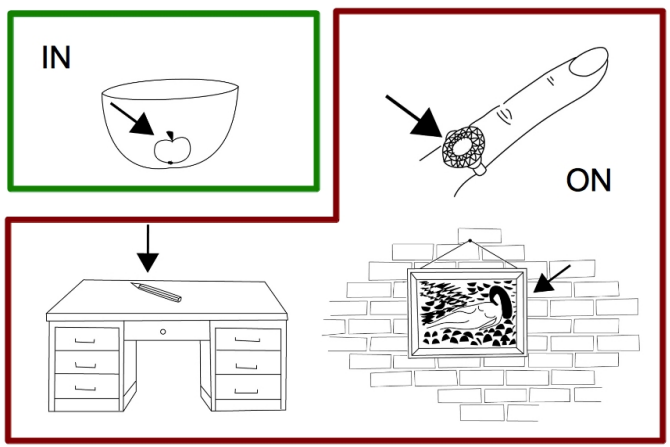

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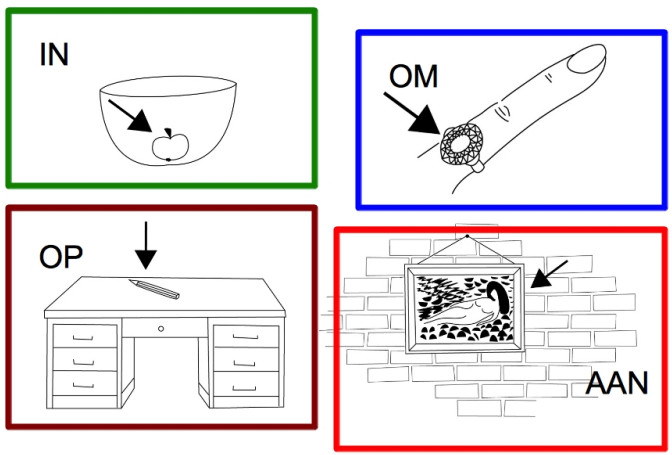

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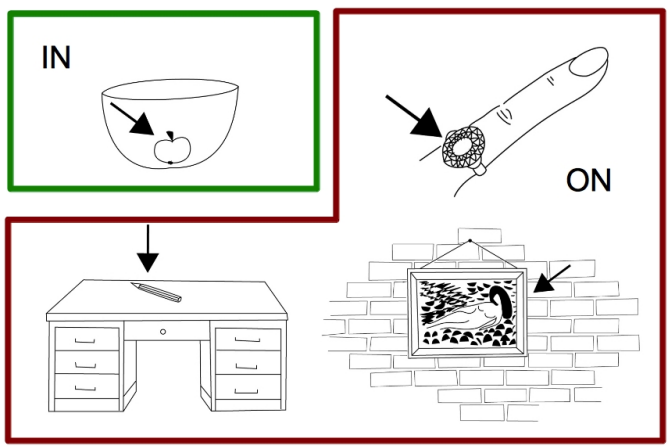
- Gentner & Bowerman (2009): naming spatial relations in Dutch and English
  - English children make next to no errors
  - Dutch children use *in* for IN and *op* for OP correctly
  - Dutch children overextend *op* to AAN and OM situations
  - But hardly ever *aan* or *om* to OP

English



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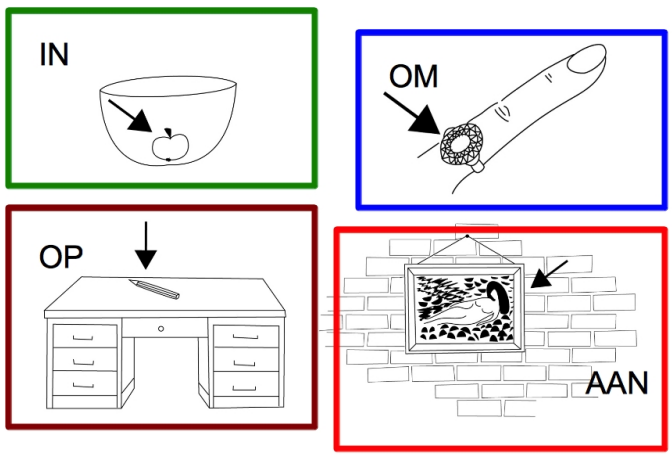

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- Incrementally integrates into knowledge base
- Various cognitive models give v. similar results

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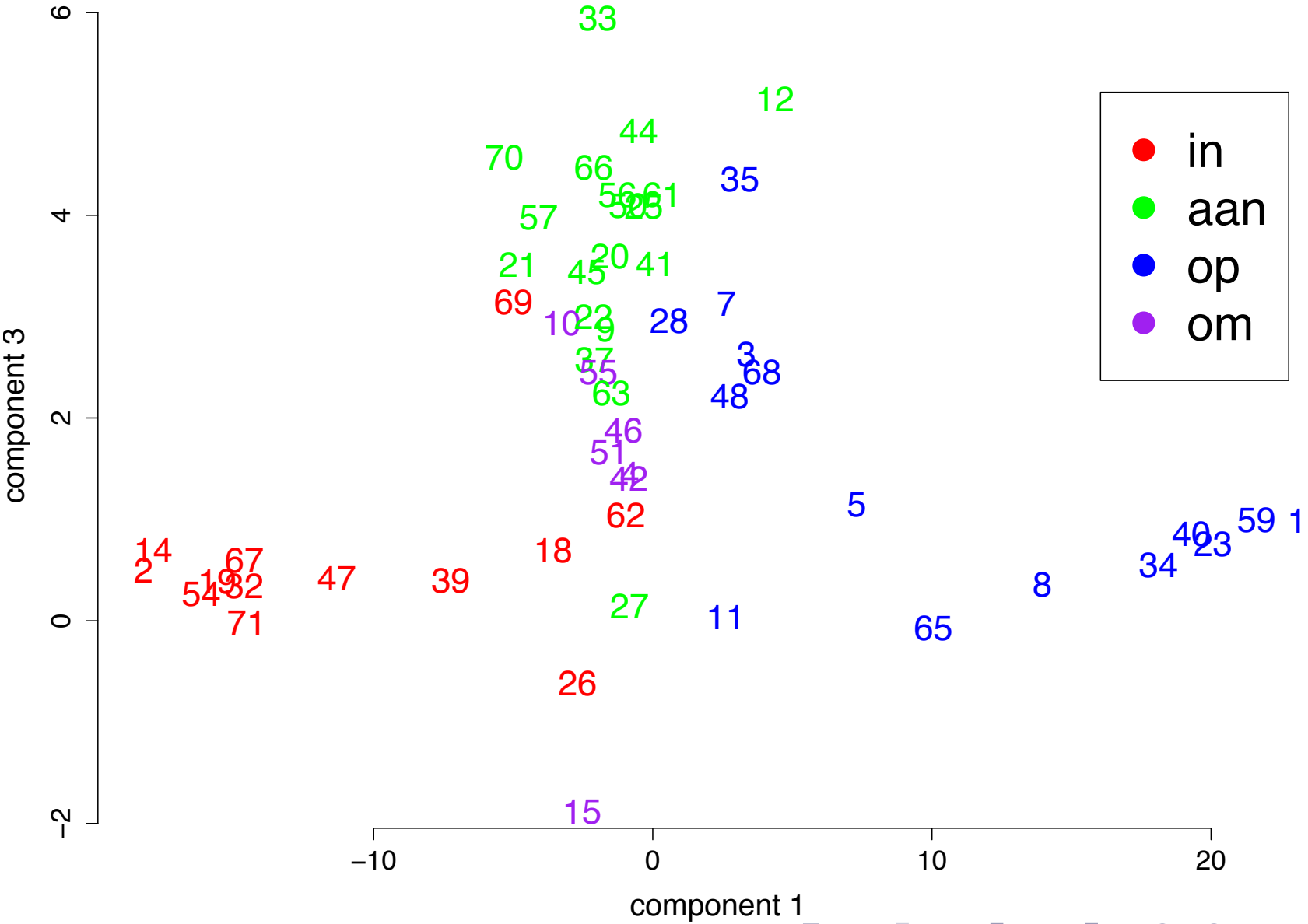
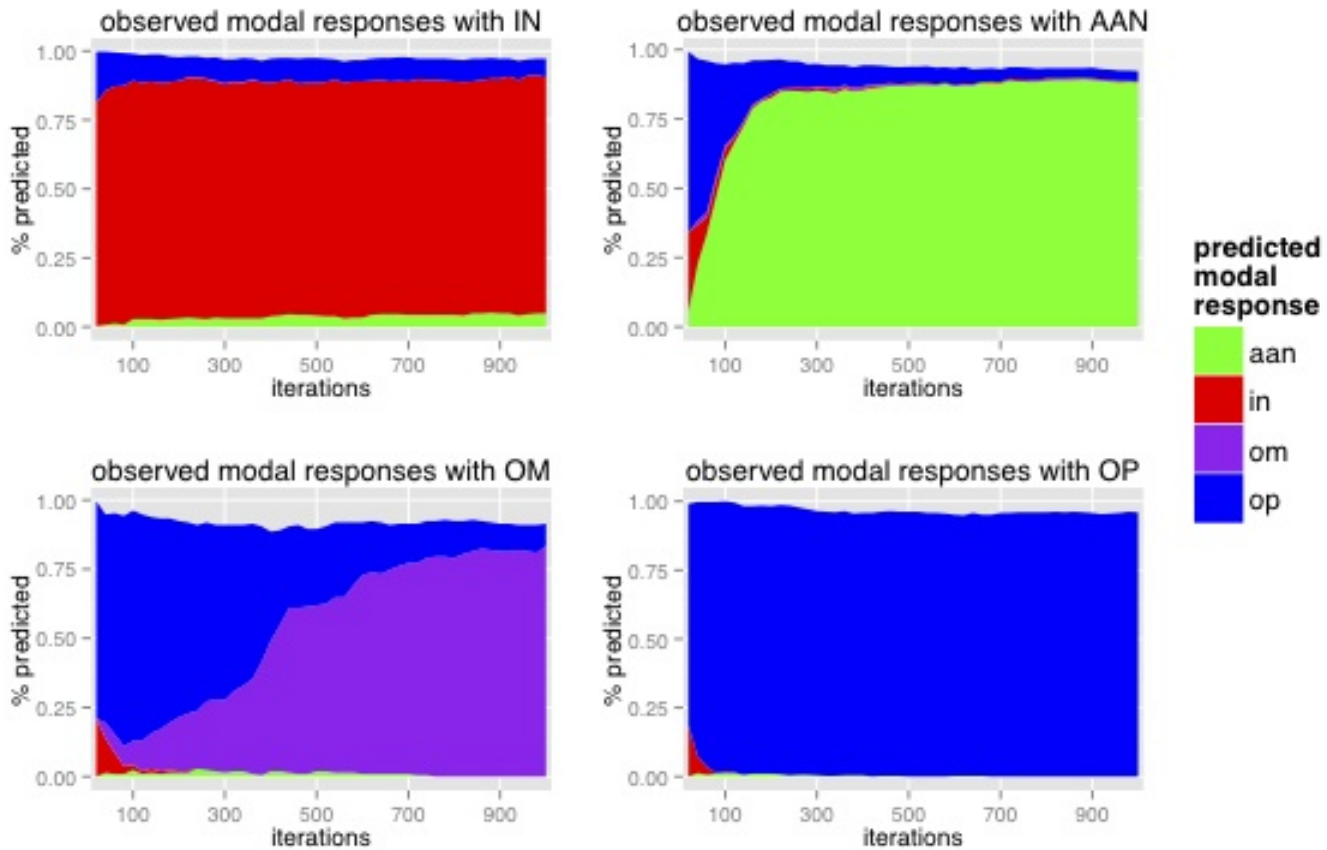


Beekhuizen, Fazly & Stevenson (2014): Model simulates asymmetrical overextension errors due to lay-out space

Overextension patterns



Adult category structure (work with Nick Lester, UCSB)

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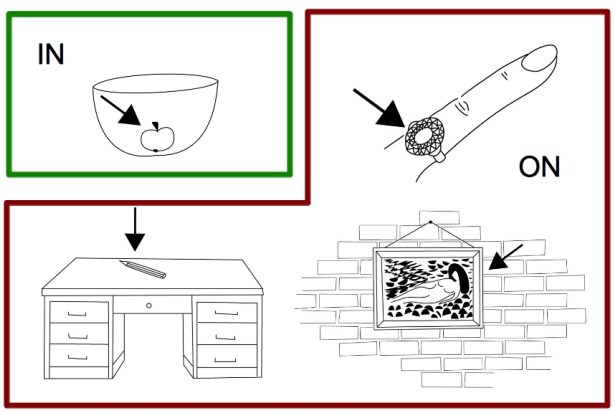
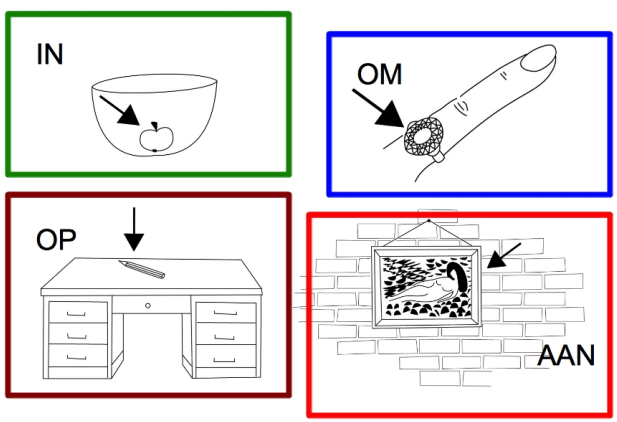
- Prediction: faster judgements for more prototypical situations





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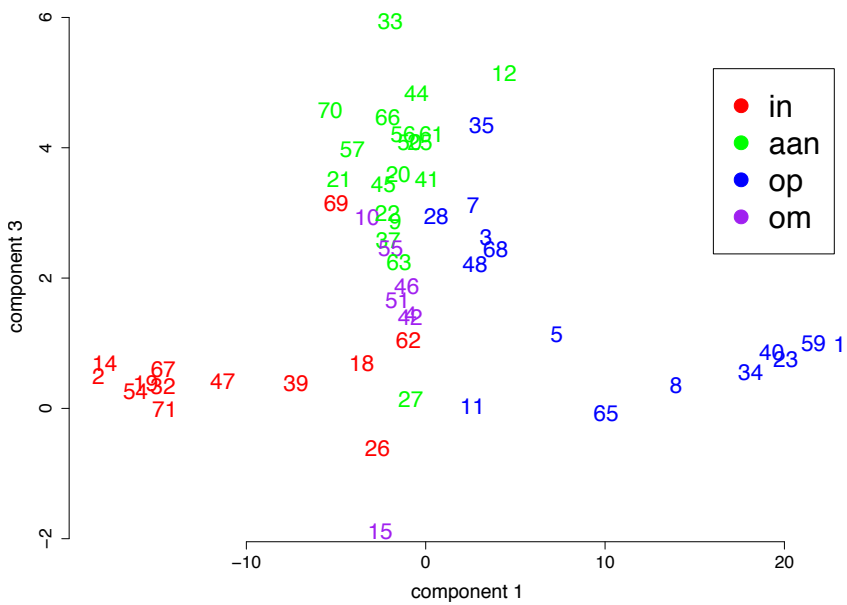
- Preliminary results: distance to cross-linguistic prototype highly predictive of RT



Case #2: acquiring color terms in Russian and English (dissociating crosslinguistic bias from perception)

Data

- English: Bateman (1915) 6-12yos – 8 color chips
  - *blue* for PURPLE, not vice versa

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- English: Bateman (1915) 6-12yos – 8 color chips
  - *blue* for PURPLE, not vice versa
- Russian: Davies et al. (1998) 3-6yos – 12 color chips
  - *sinij* 'dark blue' for LIGHT BLUE, not *goluboj* 'light blue' for DARK BLUE
  - *sinij* 'dark blue' for PURPLE, not *fioletovyj* 'purple' for DARK BLUE
  - *krasnyj* 'red' for PINK, not *rozovyj* 'pink' for RED
  - ...

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- Same learning approach
- Contrasting two approaches: using *Lab* space (perceptual space of color) versus crosslinguistic space

Results: Beekhuizen & Stevenson (2015; 2016)

- compare model's rankings of term given chip with observed rankings
- crosslinguistic space (`CL`) for English: poor fit
- but it is complementary to `perceptual` for English!

	Russian	English
`perceptual`	.91	.96
`CL`	.91	.91
`perceptual+CL`	.90	.98
no-development baseline	.81	.95

Fit with child data (Kendall τ_b for term rankings).

Final thoughts

- Deriving semantic space from crosslinguistic data provides novel way of modeling semantic space
- Test case: asymmetric overextension errors
- Space goes beyond mere perception: case of COLOR
- Not just acquisition: organization of adult categories reflects this space too.

Thank you!