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Adults take advantage of fine phonetic detail when learning words in a novel language

Bożena Pająk, Sarah C. Creel, & Roger Levy

[bɔˈʒɛna ˈpajɔ̃k] [ˈsɛɹə si kɹil] [ˈɹɑdʒəˠ ˈlivi]

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Introduction

- Learning and processing a language involves integrating multiple pieces of information at once
  - e.g., phonetic cues + mapping between meaning and phonetic form

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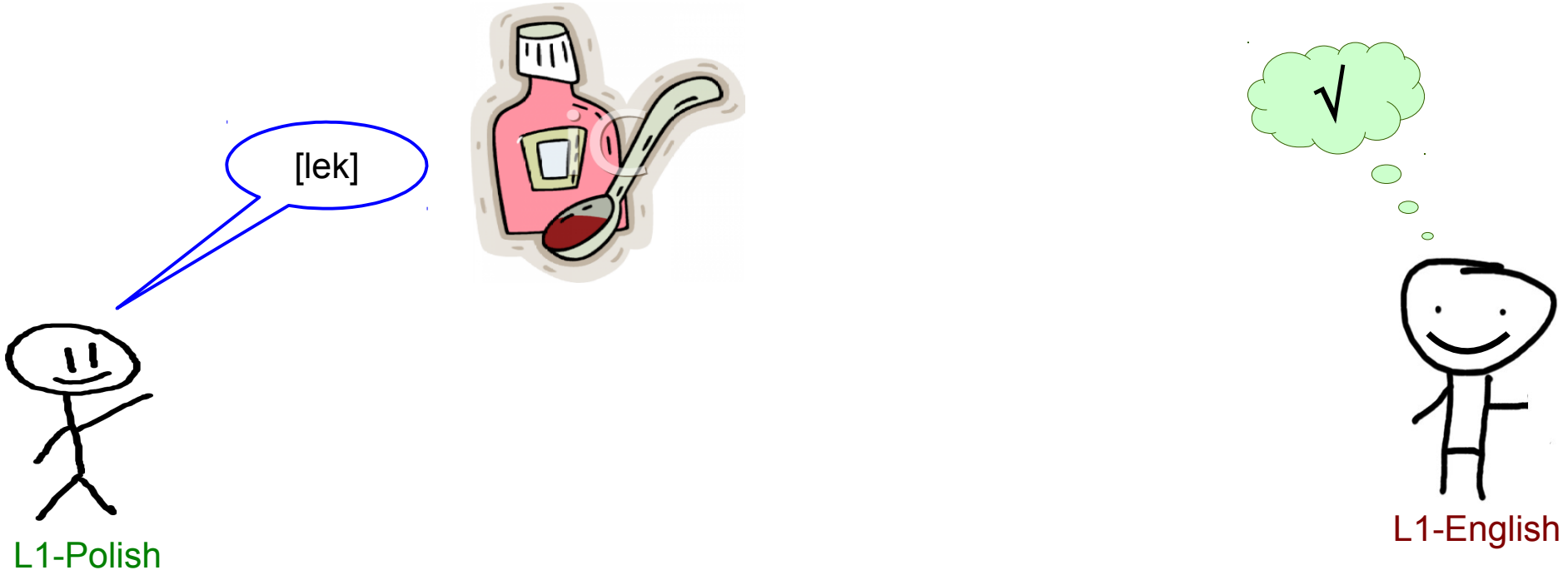

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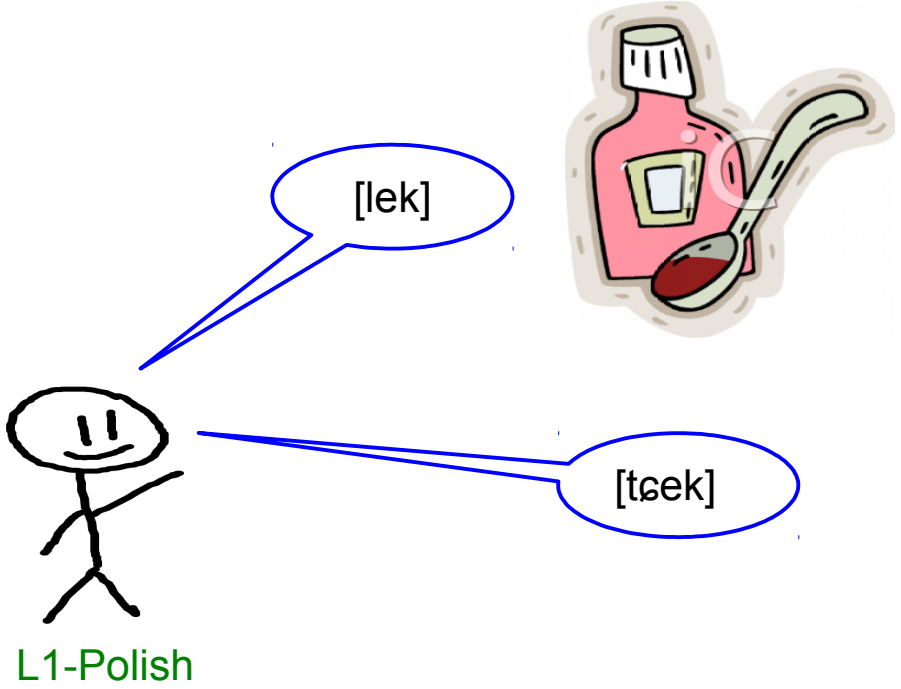

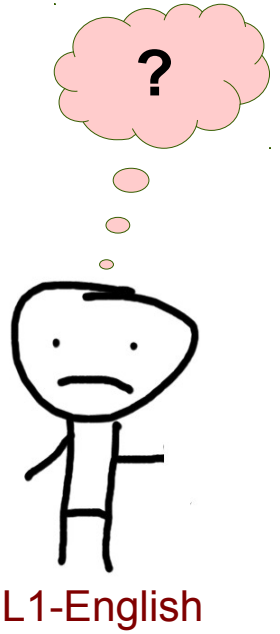

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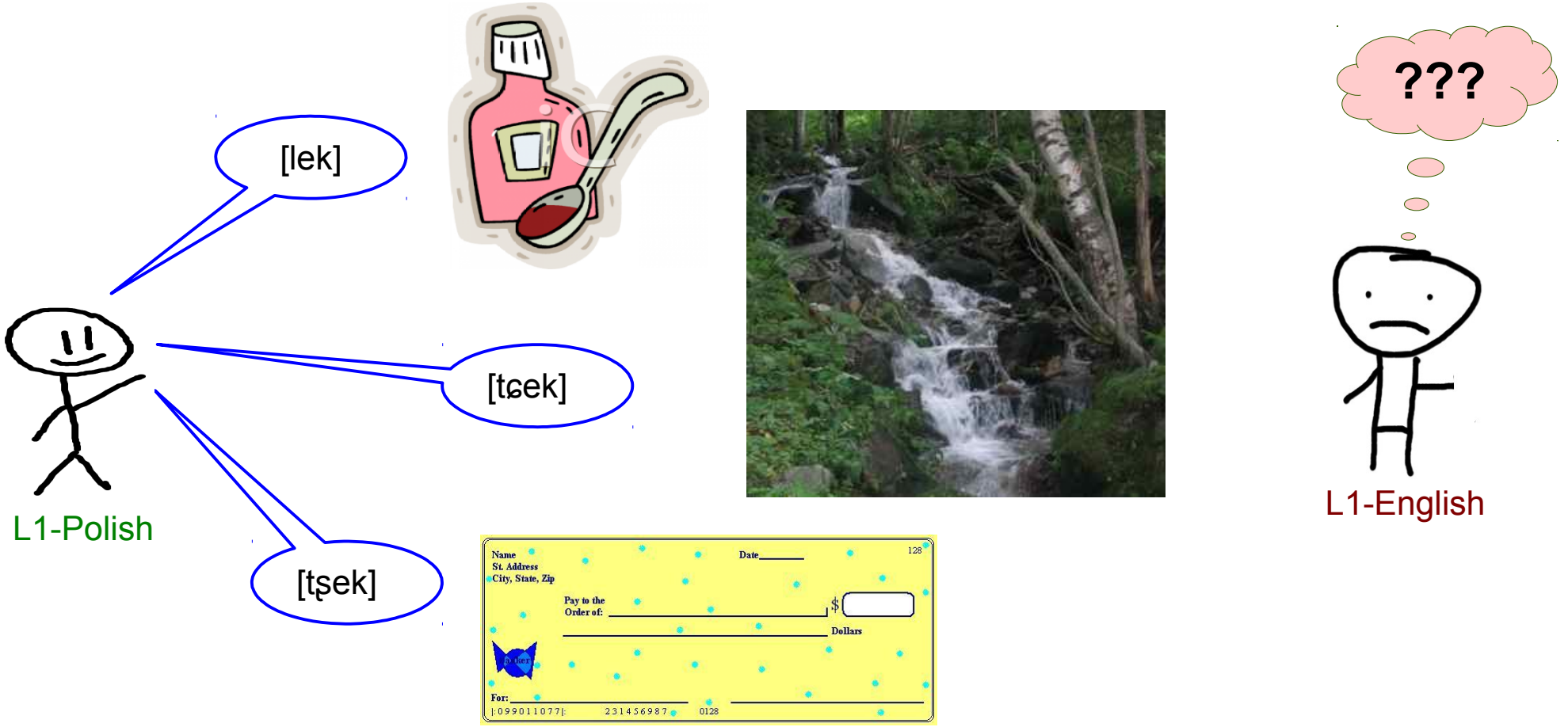
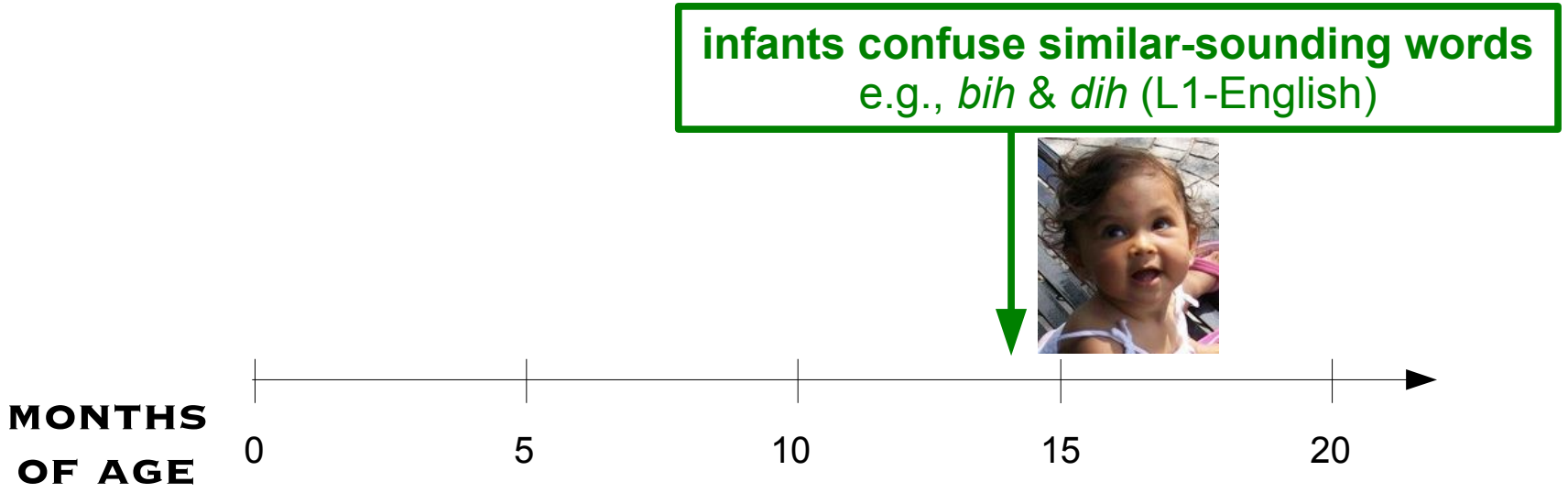


Question

Are beginner L2 learners able to **both** pay attention to fine phonetic detail **and** learn word meaning?

Infants

- Attending to phonetic detail while learning new words is hard for young infants



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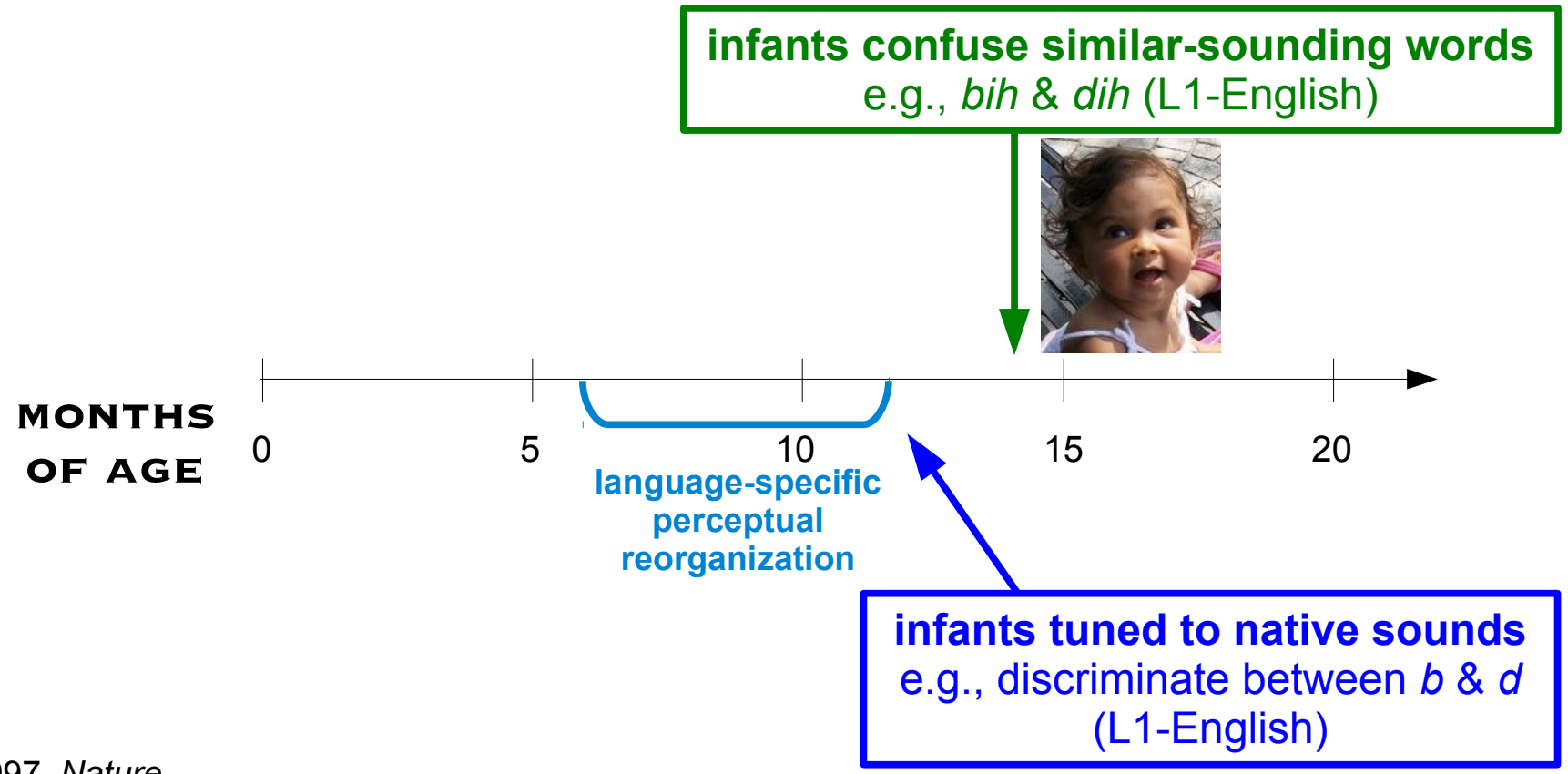

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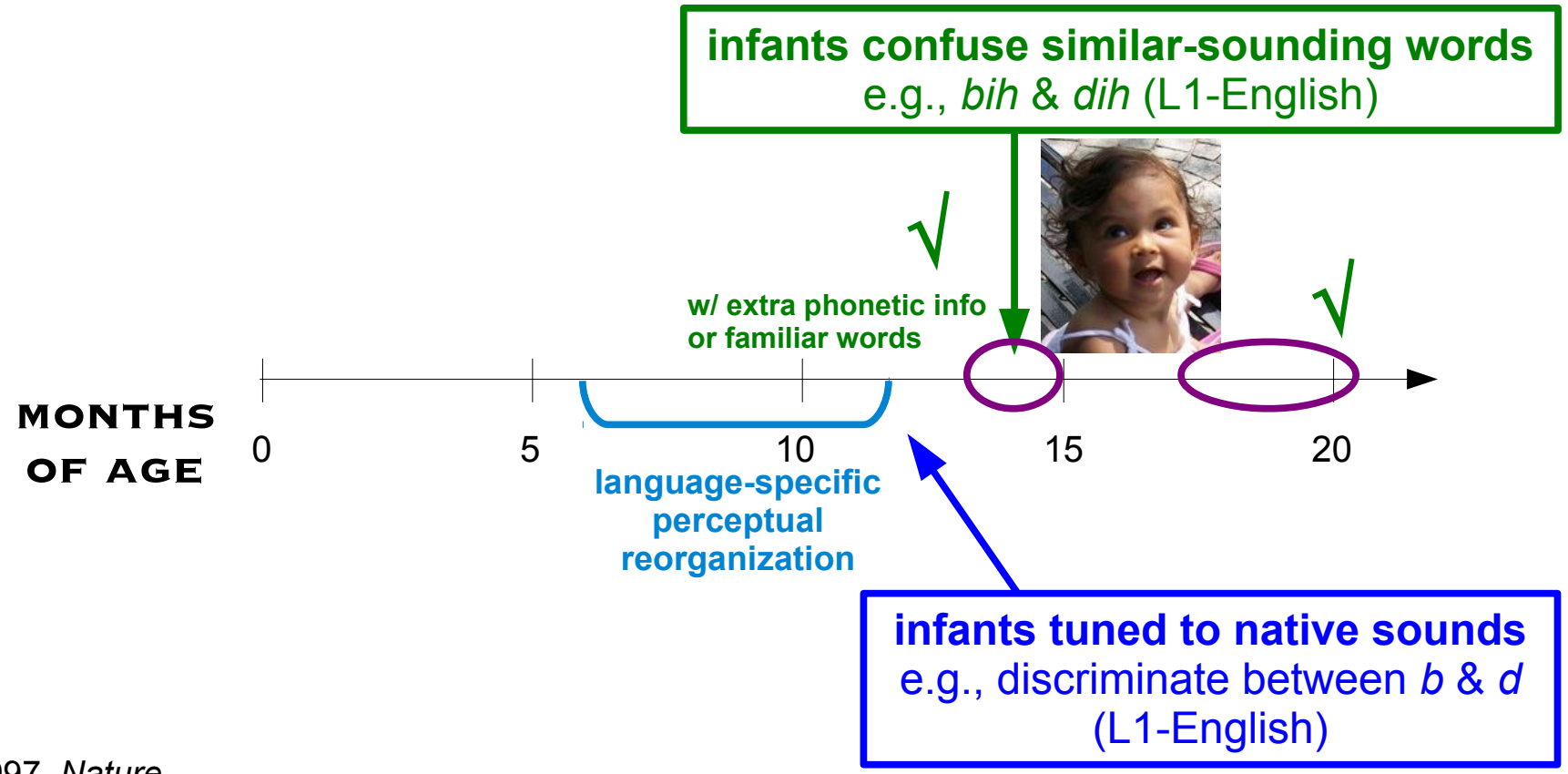

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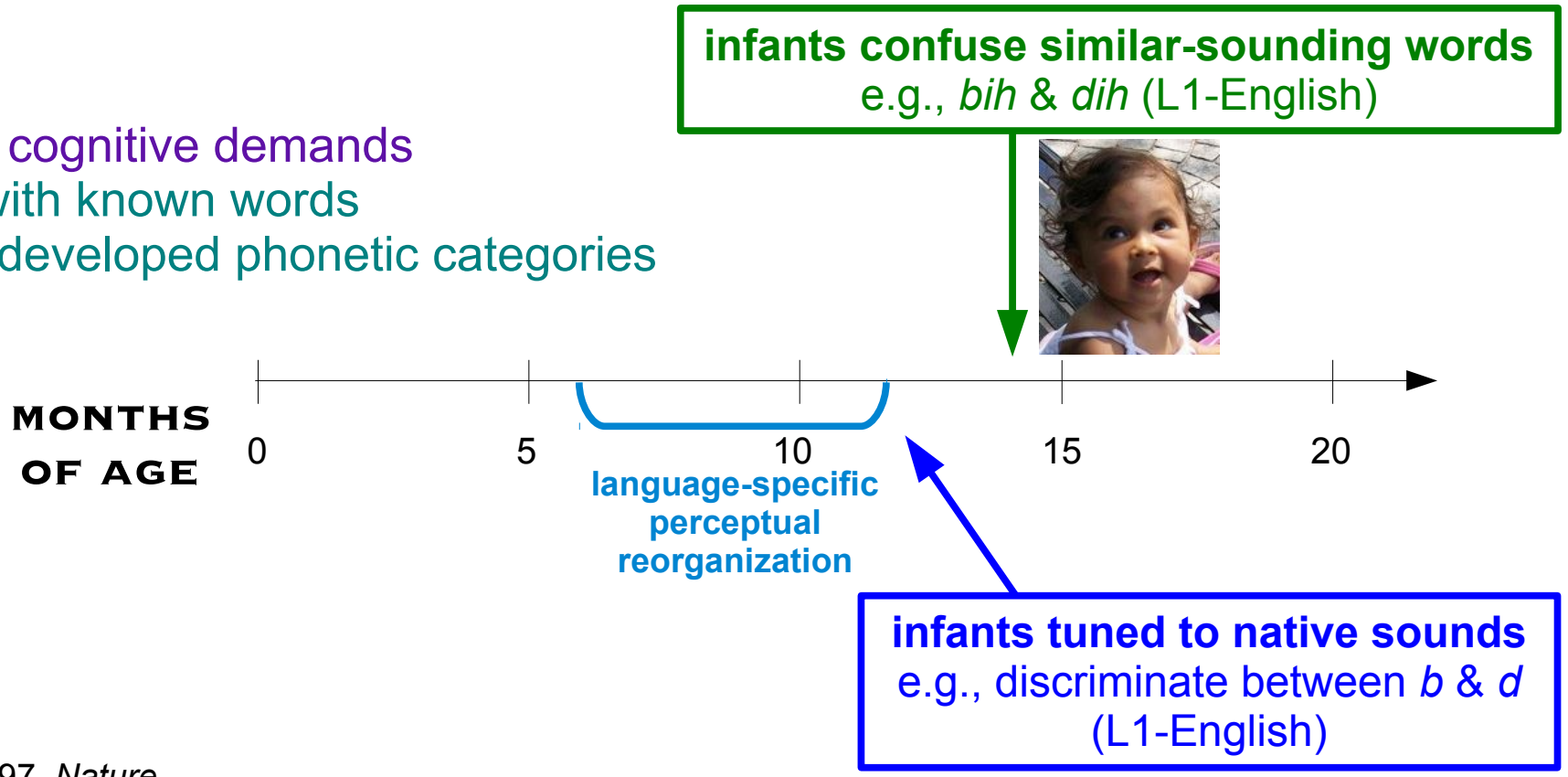
Infants

- Attending to phonetic detail while learning new words is hard for young infants

Explanations:

- attentional or cognitive demands
- competition with known words
- incompletely developed phonetic categories



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What about adults?

- There are reasons to expect that adult L2 learners might have difficulties similar to 14-month-olds at the early stage of word learning:
  - competition with other L2 words, but also L1 words
  - incompletely developed L2 phonetic categories, interference from L1
- But we might also expect adult L2 learners to perform better than 14-month-olds:
  - adults have better developed attentional and cognitive capacities

What we know about word learning in L2

- Learning similar-sounding words is hard if they are contrasted by hard-to-discriminate sounds
  (Strange & Dittmann 1984, Dobel et al. 2009)

  - Example: ***rake*** – ***lake*** for **L1-Japanese** speakers

    - b/c Japanese speakers have difficulty discriminating between English ***r*** and ***l***
      (Goto 1971, Iverson et al. 2003, Miyawaki et al. 1975)

      (due to Japanese only having one category in that acoustic-phonetic range;
      Best 1995, Best & Tyler 2007, Flege 1995, Kuhl & Iverson 1995)

What we know about word learning in L2

- But adults can be trained on perception & categorization of these hard-to-discriminate sounds

  (Goudbeek et al. 2008, Lim & Holt 2011, Logan et al. 1991, Maye & Gerken 2001, McClaskey et al. 1983, Pająk & Levy 2011, Perfors & Dunbar 2010, Pisoni et al. 1982)

  - Example:
    - L1-English speakers can be trained to discriminate a non-native VOT contrast, such as prevoiced vs. voiceless unaspirated stops
    - this trained perceptual ability generalizes to untrained places of articulation

What we know about word learning in L2

- Perceptual training on novel sounds helps with word learning, but doesn't generalize (e.g., to related sounds) in a word learning task
  (Perfors & Dunbar 2010)

  Example:

  prevoiced

  - perceptual training for L1-English speakers on discriminating ***[G]ipur*** vs. ***[K]ipur*** helps to later associate these words with meaning

    voiceless unaspirated

  - but it doesn't generalize to learning ***[B]ipur*** – ***[P]ipur***
  - even though it generalizes perceptually to discriminate ***B*** vs. ***P***

- This is similar to infants having difficulty learning ***bih*** & ***dih*** despite discriminating ***b*** vs. ***d***
- But adults only received a short distributional training on ***G*** vs. ***K***, and their discrimination of ***B*** vs. ***P*** might simply not be sufficiently robust
  - whereas 14-month-old infants can easily discriminate ***b*** vs. ***d*** in their L1

Current study

- We aim for a more direct comparison with the situation of 14-month old infants learning new words that they can tell apart perceptually
- We use novel minimal-pair words with subtle distinctions that our ppts have been shown to distinguish perceptually
- Unlike in Perfors & Dunbar (2010), we don't train ppts on a novel contrast, but we take advantage of their perceptual abilities that come from their L1s

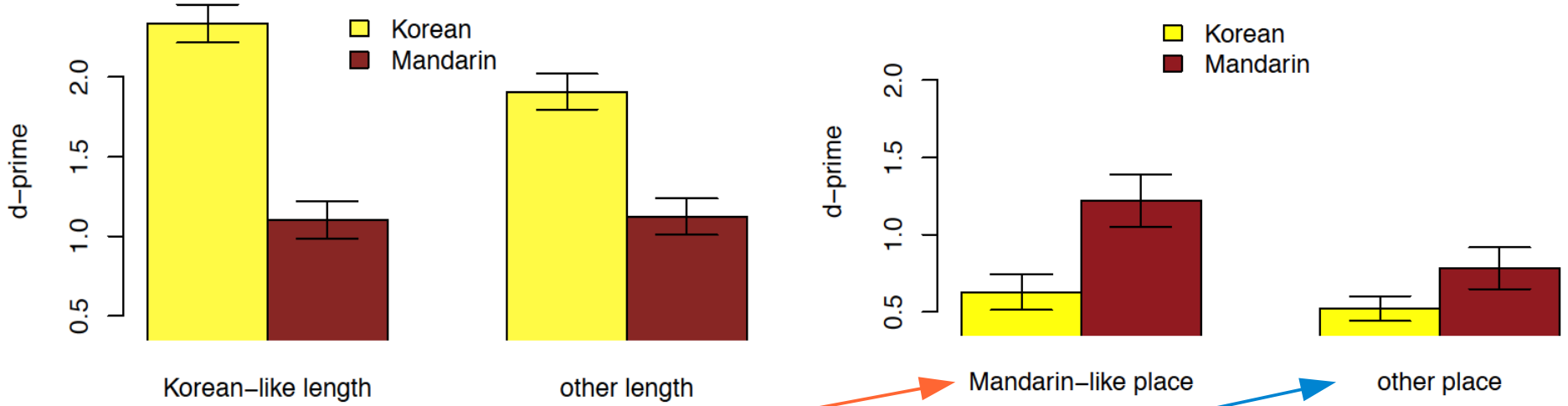
Experiment: general predictions

- If better developed attentional and cognitive capacities enable L2 learners to attend to fine phonetic detail at the early stage of word learning
  - then adults should be able to use their perceptual abilities generalized from L1

- If other factors are more important: like competition with known words or incompletely developed phonetic categories
  - then adults should have difficulty, just like 14-month-old infants

Experiment: participants

- Korean-English & Mandarin-English bilinguals (N=54)
- Known perceptual biases of Korean & Mandarin speakers:
  (Pająk & Levy, in prep.)
  - Korean > Mandarin at perception of **length** **kena - kenna**
  - Korean < Mandarin at perception of alv.-pal. vs. retroflex **place** **ketɕa - ketʂa**
    (w/o following vowel transition cue)



transfer & **generalization to novel segments**

	length short and long sounds	**place** alveolo-palatal and retroflex sounds
Korean language	√	
Mandarin language		√

Experiment: materials

12 “length” words each in a minimal pair	
short	long
tala kema kena	talla kemma kenna
taja diwa difa	tajja diwwa diffa

Cs exist in Korean

+

(control)

4 “place” words each in a minimal pair	
alveolo-palatal	retroflex
gotɕa	gotʂa
goʑa	goʒa

Cs exist in Mandarin

Experiment: materials

12 “length” words each in a minimal pair	
short	long
tala kema kena	talla kemma kenna
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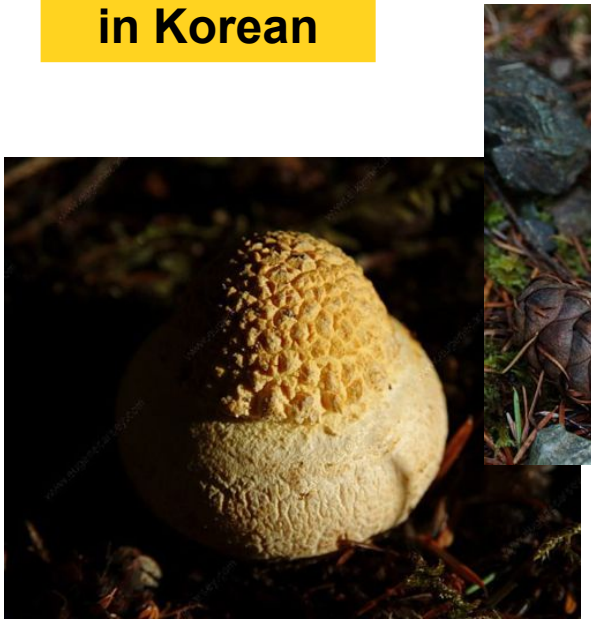
WORDS FOR MUSHROOMS

Cs exist in Korean

Cs exist in Mandarin



Experiment: training

MEANING

DIWWA

MEANING

TALA

Experiment: training

MEANING

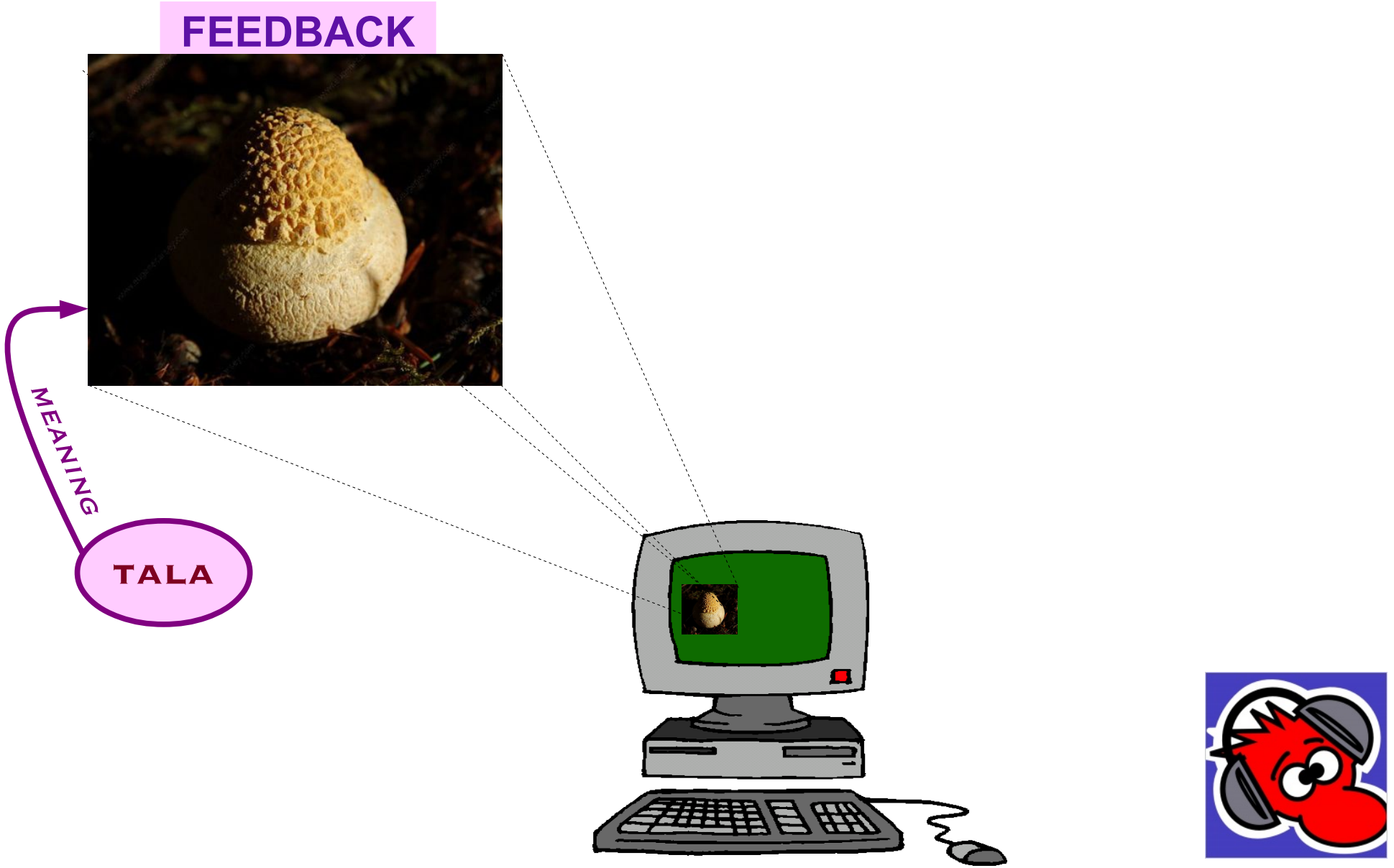
DIWWA

MEANING

TALA

[tala]

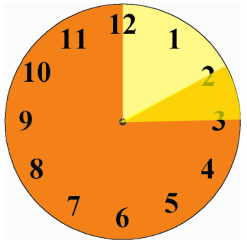
Experiment: training



Experiment: training

DISSIMILAR PICTURE PAIRS
tala-diwwa
kenna-taja
gotʂa-kema
difa-goʐa
...

each word played 8x



Experiment: testing

NO FEEDBACK

MEANING

TALLA

MEANING

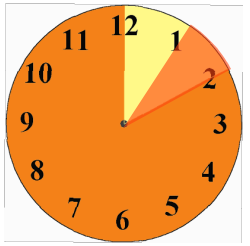
TALA

[tala]

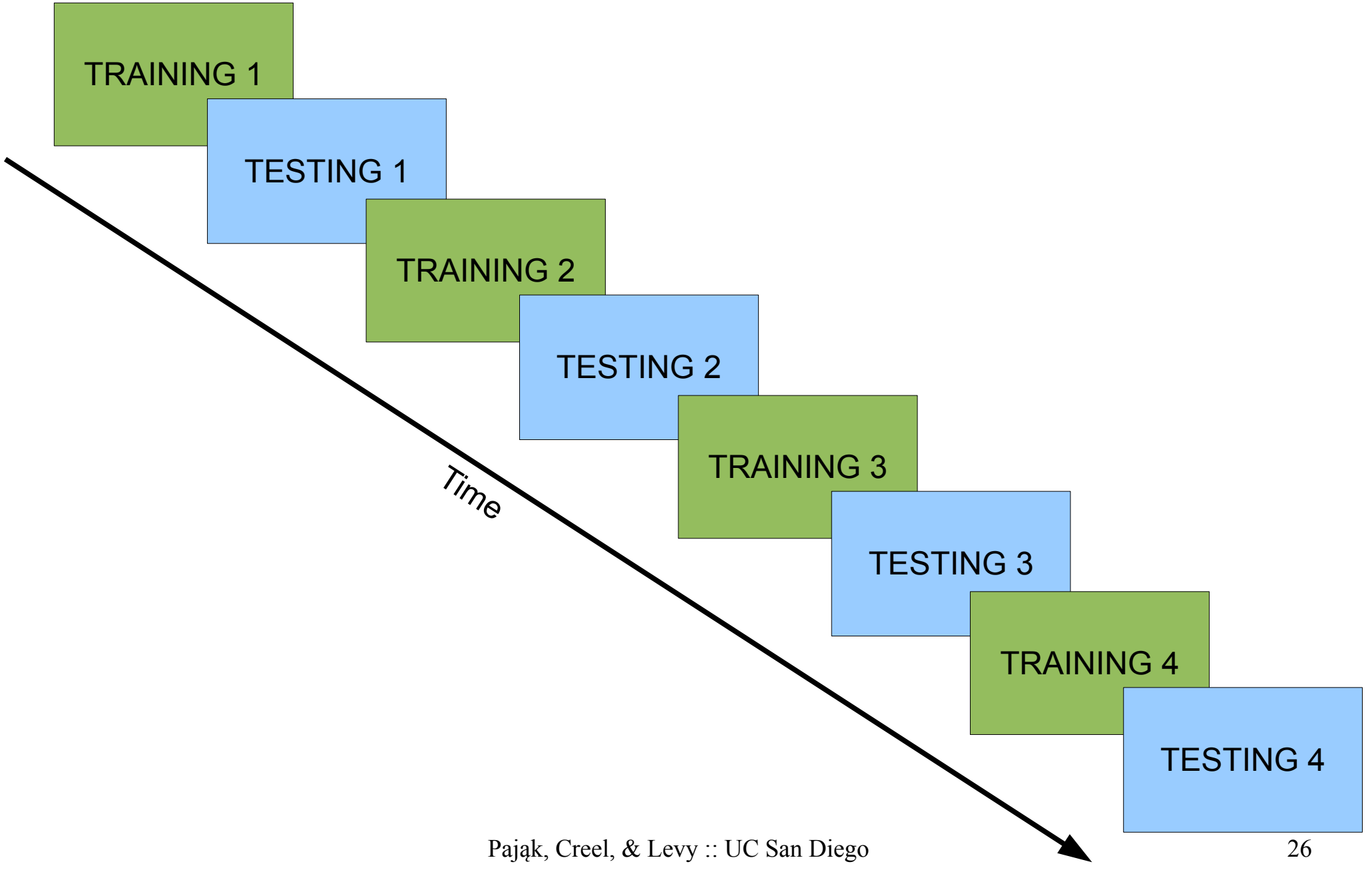
Experiment: testing

PICTURE PAIRS	
Filler-Dissimilar	**tala-goʒa**
Filler-Similar	**tala-taja**
Critical-Length	**tala-talla**
Critical-Place	**goʒa-goʐa**

each word played 4x



Experiment: timeline



Experiment: predictions

for all participants:

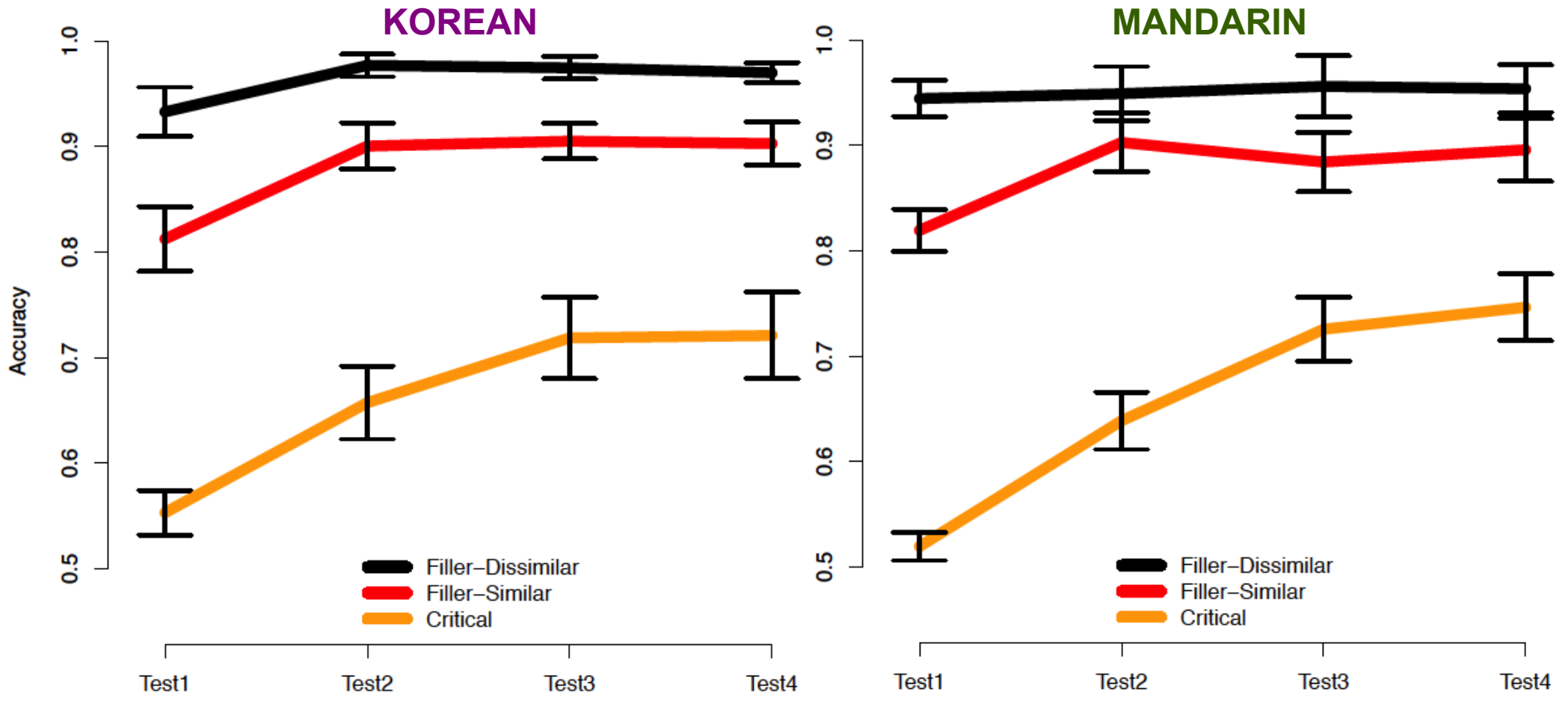
Filler-Dissimilar > Filler-Similar > Critical

tala-goʑa

tala-taja

tala-talla
goʑa-goʐa

Experiment: results



Experiment: predictions

If adults use fine phonetic detail at the early stage of word learning, then:

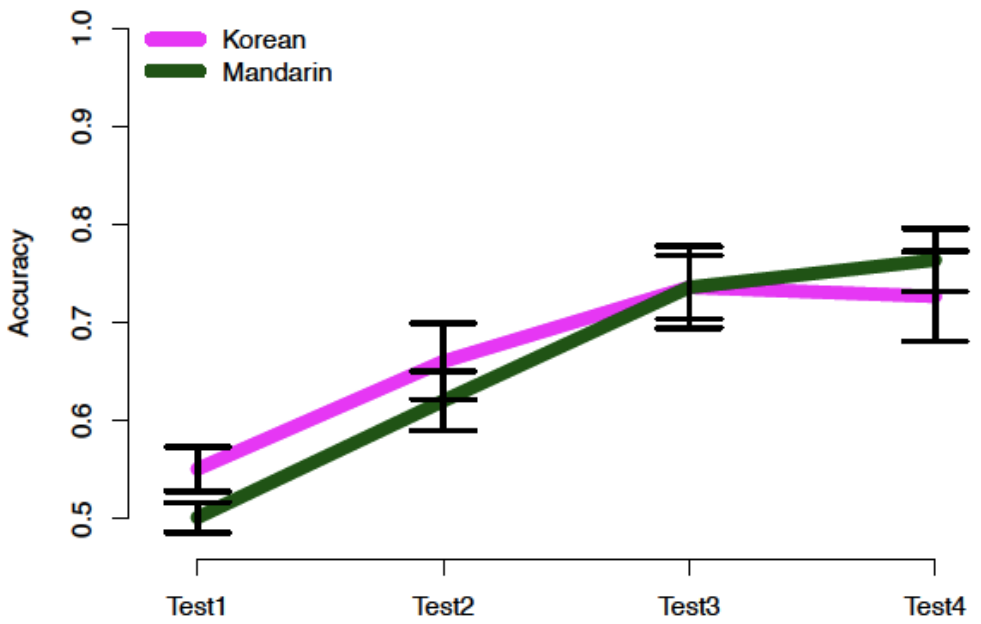
Korean ppts > Mandarin ppts at Critical-Length tala-talla

Korean ppts < Mandarin ppts at Critical-Place goʑa-goʑa

Experiment: results

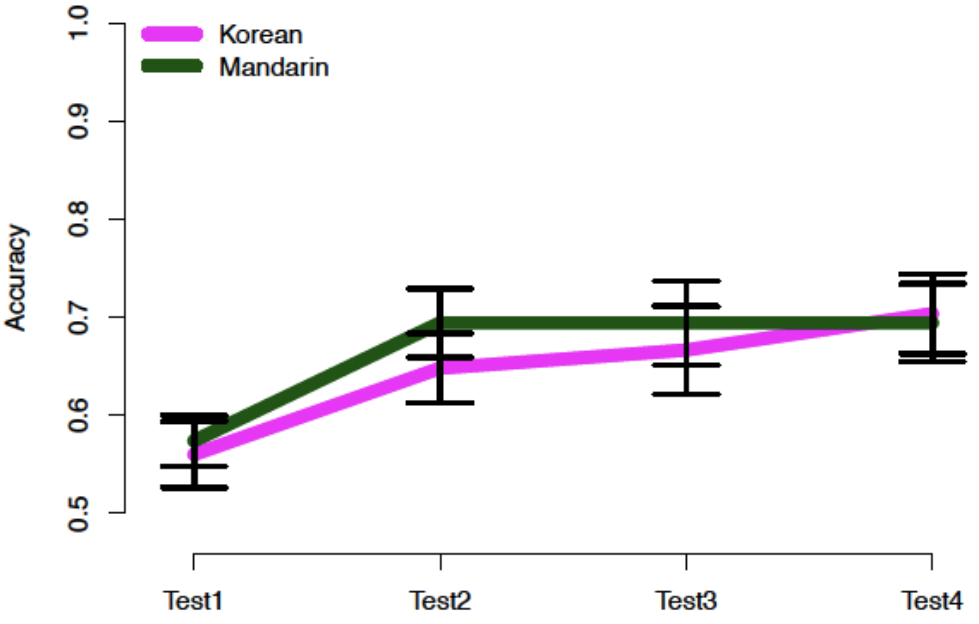
LENGTH

tala-talla



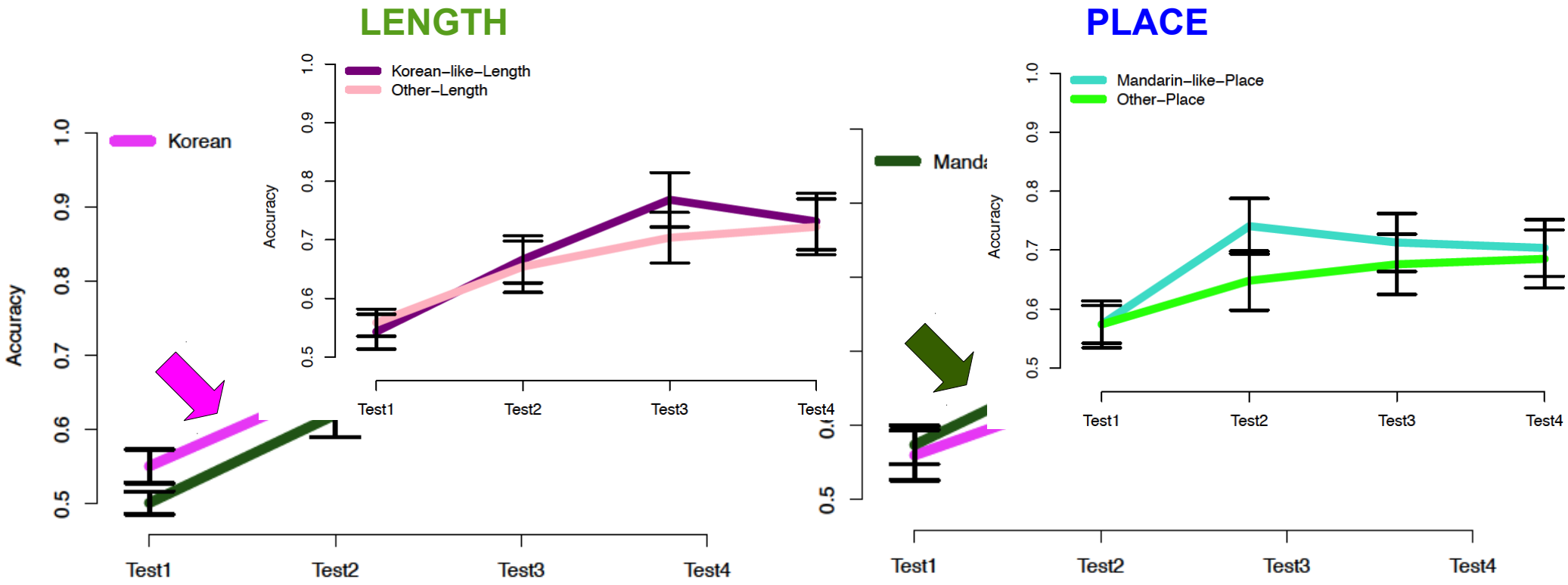
PLACE

goʑa-goʑa



- Korean & Mandarin ppts not significantly different – only overall numerical tendency in the predicted direction
  - no evidence that ppts use their perceptual advantages

Experiment: results



- Korean & Mandarin ppts not significantly different – only overall numerical tendency in the predicted direction
  - no evidence that ppts use their perceptual advantages
  - exact segments don't seem to matter

Question

Learners vary in their attention, motivation, and learning skills.

Do better learners use fine phonetic detail?

Experiment: splitting ppts by performance on fillers

TOP HALF (N=27)

Korean: N=13
Mandarin: N=14

95% ACCURACY ON FILLERS

BOTTOM HALF (N=27)

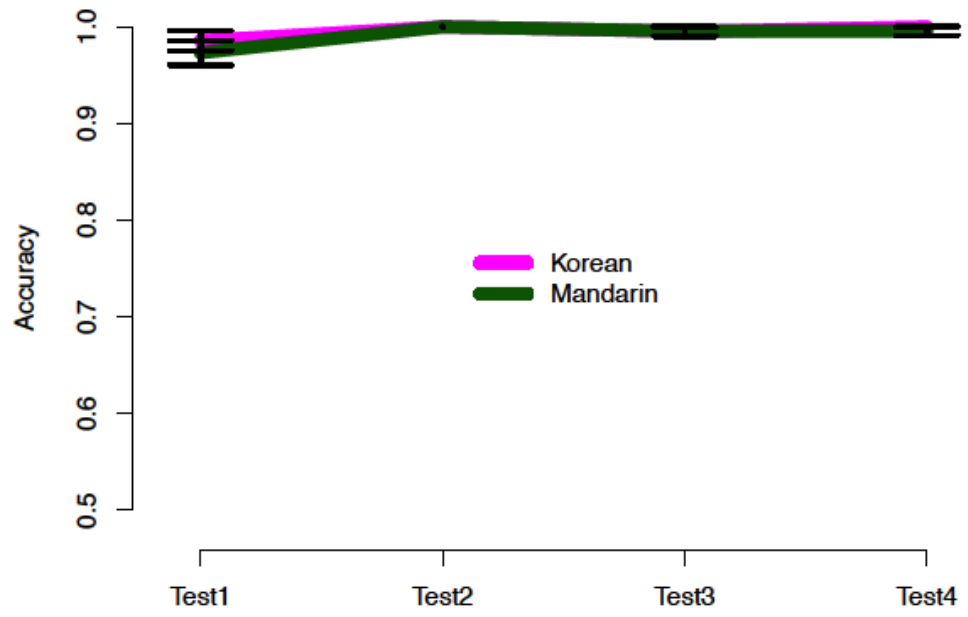
Korean: N=14
Mandarin: N=13

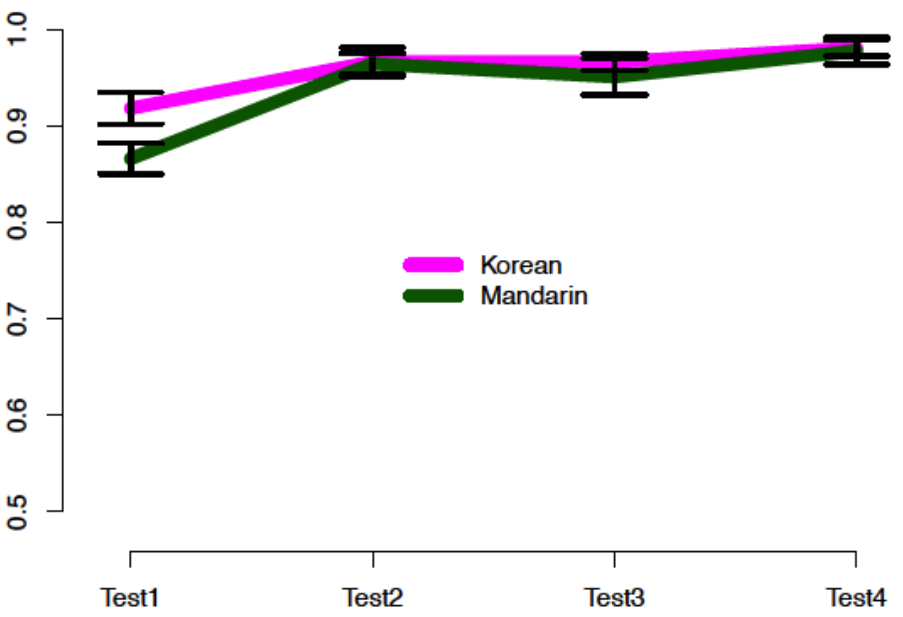
Experiment: splitting ppts by performance on fillers

FILLER-DISSIMILAR (tala-goʑa)

FILLER-SIMILAR (tala-taja)

TOP HALF (N=27)





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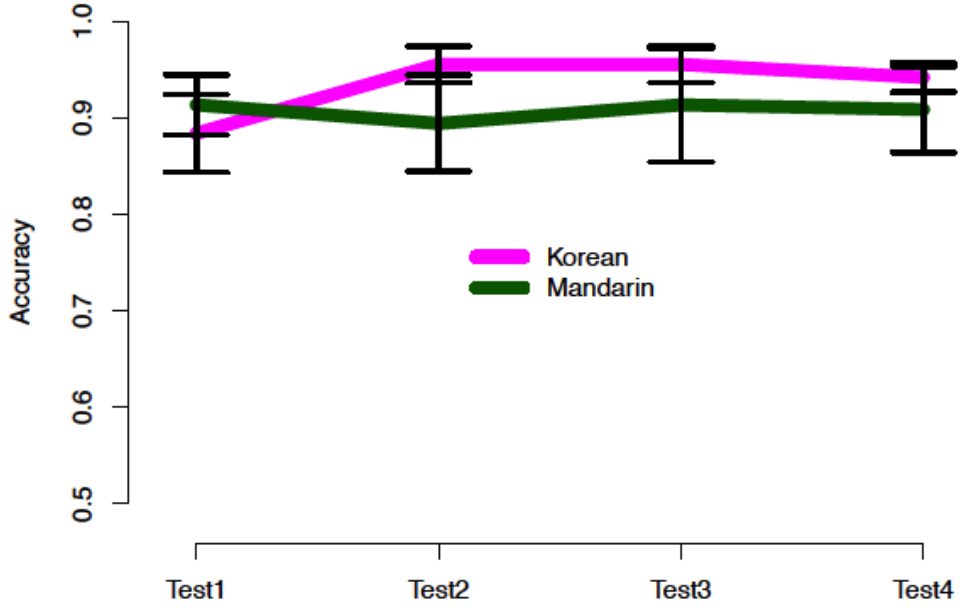
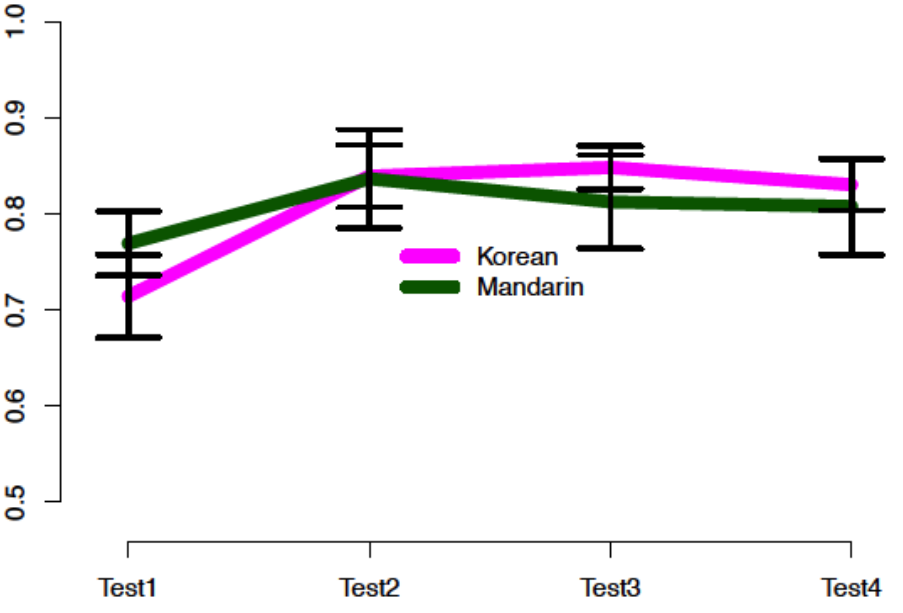




Experiment: predictions

If only better learners use fine phonetic detail at the early stage of word learning, then:

For ppts scoring high on fillers:

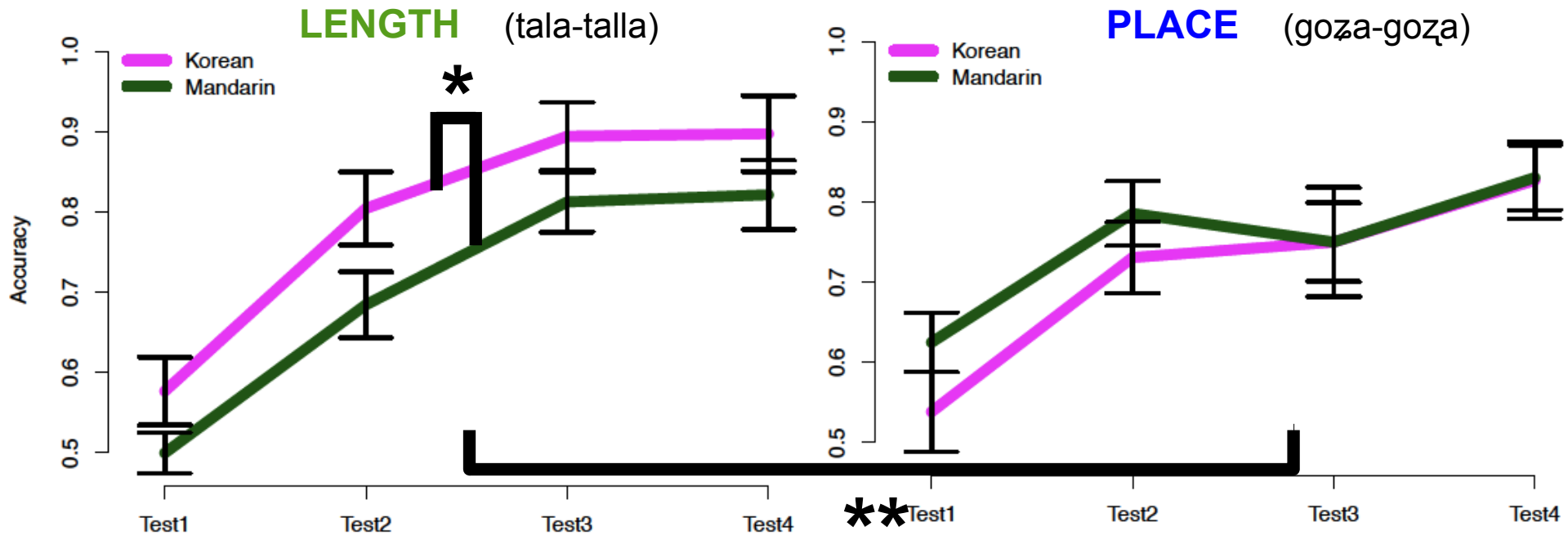
Korean ppts > Mandarin ppts at Critical-Length tala-talla

Korean ppts < Mandarin ppts at Critical-Place goʑa-goʐa

Experiment: results split by performance on fillers

TOP HALF (N=27)

95% ACCURACY ON FILLERS



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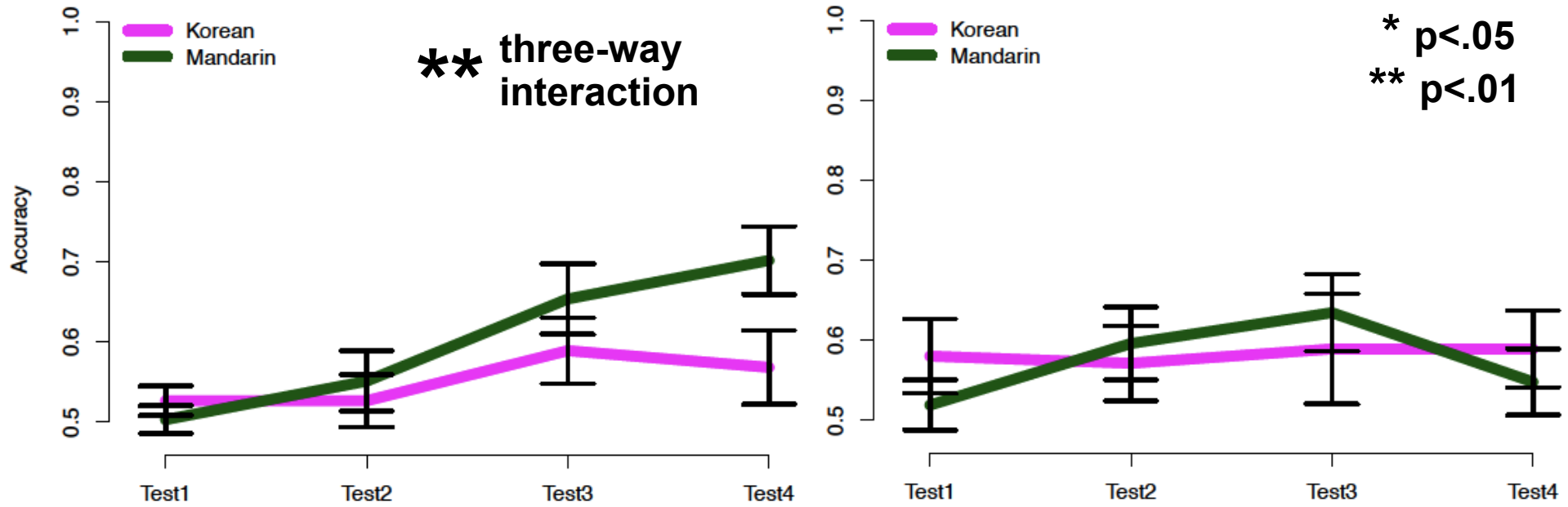

Experiment: summary

- There seems to be something inherently hard about the early stage of word learning that precludes attention to fine phonetic detail
  - adult L2 learners – just like 14-month-old infants – don't take full advantage of their perceptual abilities when beginning to learn words
- Since adults have well-developed attentional and cognitive capacities, the reasons for difficulties in L2 might be, as also proposed for infants:
  - competition with known words
  - incompletely developed phonetic categories
- But learning also seems modulated by attentive & cognitive factors
  - better learners do attend to phonetic detail, but worse learners don't

Conclusion

Are beginner L2 learners able to **both** pay attention to fine phonetic detail **and** learn word meaning?

Yes, but only good learners

- more attentive?
- more motivated?
- with better learning skills?

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Thank you

Discussion:

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