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Learning Japanese word order and spatial terms through a computerized training game: Does more variable input help?

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Word order in different languages

- English (Subject Verb Object): ***Fido bit Jack*** ***Jack bit Fido***
- Irish (Verb Subject Object): ***bit Fido Jack***
- Japanese (Subject Object Verb): ***Jack Fido bit***

- **Our earlier work:** children find it hard to acquire a novel word order via passive training (observing events, without feedback)

- **New work:** look at learning word order in a game context – following last years conference talk from Diana Pili-Moss *"Teaching Second Languages Through computer games"*

Pili-Moss, D. (2017). DOI: https://doi.org/10.22599/jesla.25

Japanese word order and spatial terms

- Japanese – verb last
- Nouns also followed by case markers (e.g. tells you what is the object)
- Where English would use spatial preposition uses case marker following the noun (“postpositions”)

banana o chokorēto no ue ni oku

object case-marker

above

oku = put

banana o chokorēto no shita ni oku

below

Japanese word order and spatial terms

banana o chokorēto no ue ni oku

banana o chokorēto no shita ni oku

- Can children learn:
  - that the order of the nouns, and the case marker they are followed by, affects the meaning of the sentence?

Japanese word order and spatial terms

banana o chokorēto no ue ni oku

chokorēto o banana no shita ni oku

- Can children learn:
  - that the order of the nouns, and the case marker they are followed by, affects the meaning of the sentence?
  - the meanings of the two spatial post-positions

X **no ue ni** = ABOVE X
X **no shita ni** = BELOW X

➢ **Critical generalization test: UNTRAINED sentences with new nouns**

- Note: spatial terms can cause difficult for children in their first language, especially if have Developmental Language disorder

Previous training study with children with DLD

- Hsu & Bishop (2014):
  - English speaking children with DLD trained to understand prepositions ***under/above*** and using a computerized game
  - Children moved pictures around the screen
  - Error-less training procedure (with feedback)

- Current Work adapt this paradigm:
  - Language materials from Japanese (produced by native speaker)
  - Can be used by children even without any previous knowledge of the language (cognates).

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oku = put

Training game

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oku = put

Training game

banana o chokorēto no shita ni oku

object case-marker

below

As in Hsu and Bishop, use “error free ” training - i.e. feedback and continue until produce correct response

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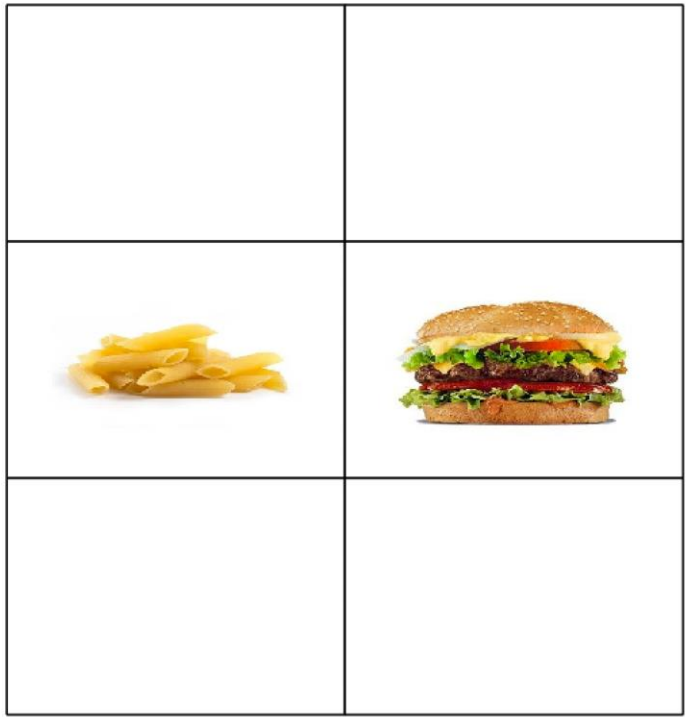

Play sentence

Finished!

Variability Manipulation

- Some previous work suggests that hearing more *varied* examples leads to better generalization
  - E.g. Denby et al. 2017: adults learning rules about what sounds occur at the ends of syllables learn better from more varied examples

- Variability doesn't always help younger learners - c.f.
  - Gwen's talk earlier today
  - Our other work on learning Gender classes in Italian

- **CURRENT WORK:** do children generalize better if they learn from a varied set of sentences, or just a few exemplars?

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MORE GENERALIZATION PREDICTED HERE

Low variability version:

- 2 “above” sentences
- 2 “below” sentences

- each heard 14 times

(total = 56)

High variability version:

- 28 “above” sentences
- 28 “below” sentences

- each heard ONCE

(total = 56)

8 nouns in each case

Methods

Participants

- Forty English speaking 7-8 year olds
- 20 in each version
- No knowledge of Japanese (or language with **post**positions)

Day 1

- Vocab game
- Training game (32 trials)

Day 2 (one week later)

- Training game (24 trials)
- Vocab game 2
- Generalization test (24 trials)

- **Vocabulary game:** hear word in Jap, click on picture
- **Training:** as you've seen (half the children get the LV, half the HV version)
- **Generalization test:** like training, but with and no feedback and new nouns (introduced in vocab test2)

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Results:

- Children very good at identifying the vocabulary (above 80% correct)

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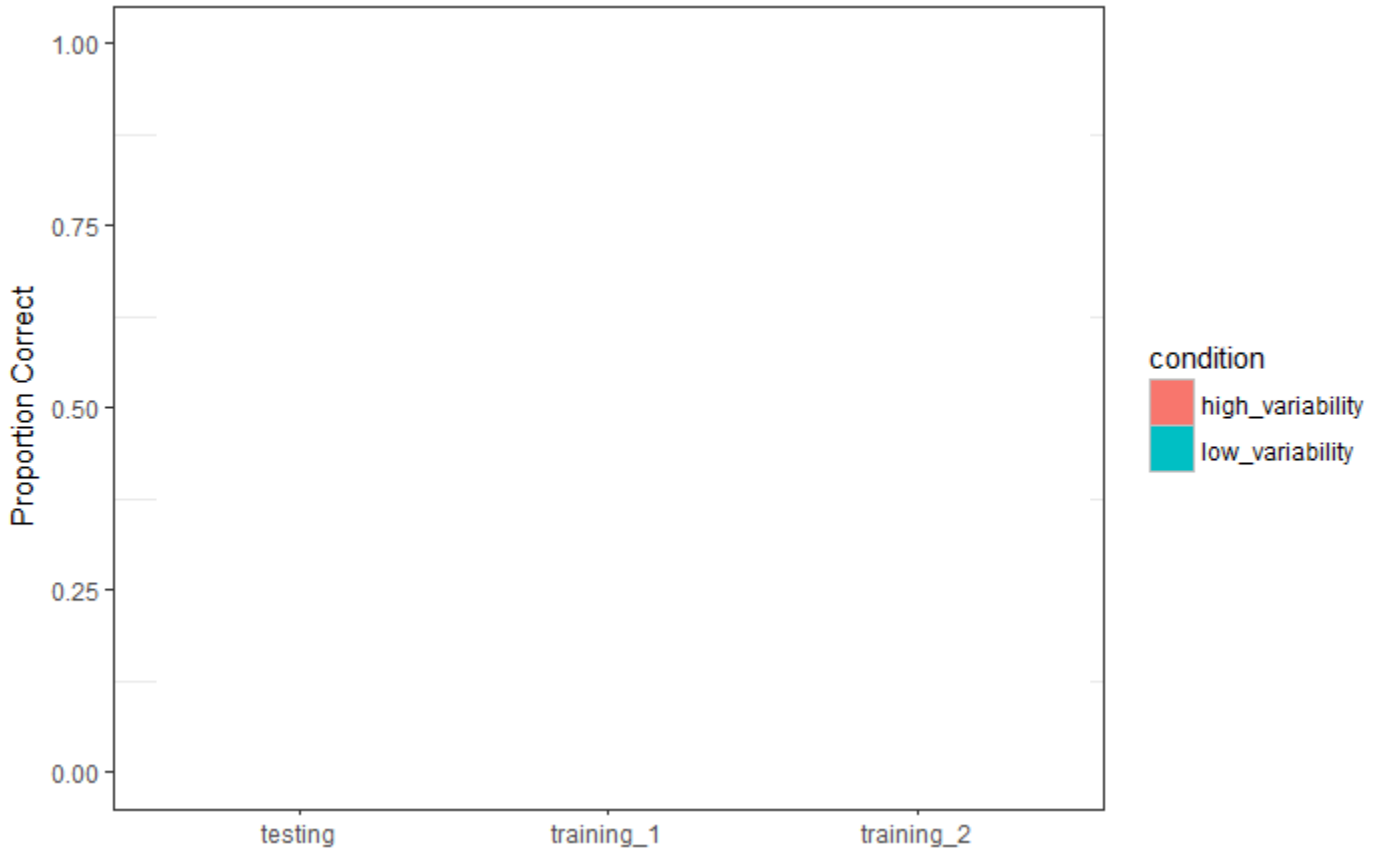
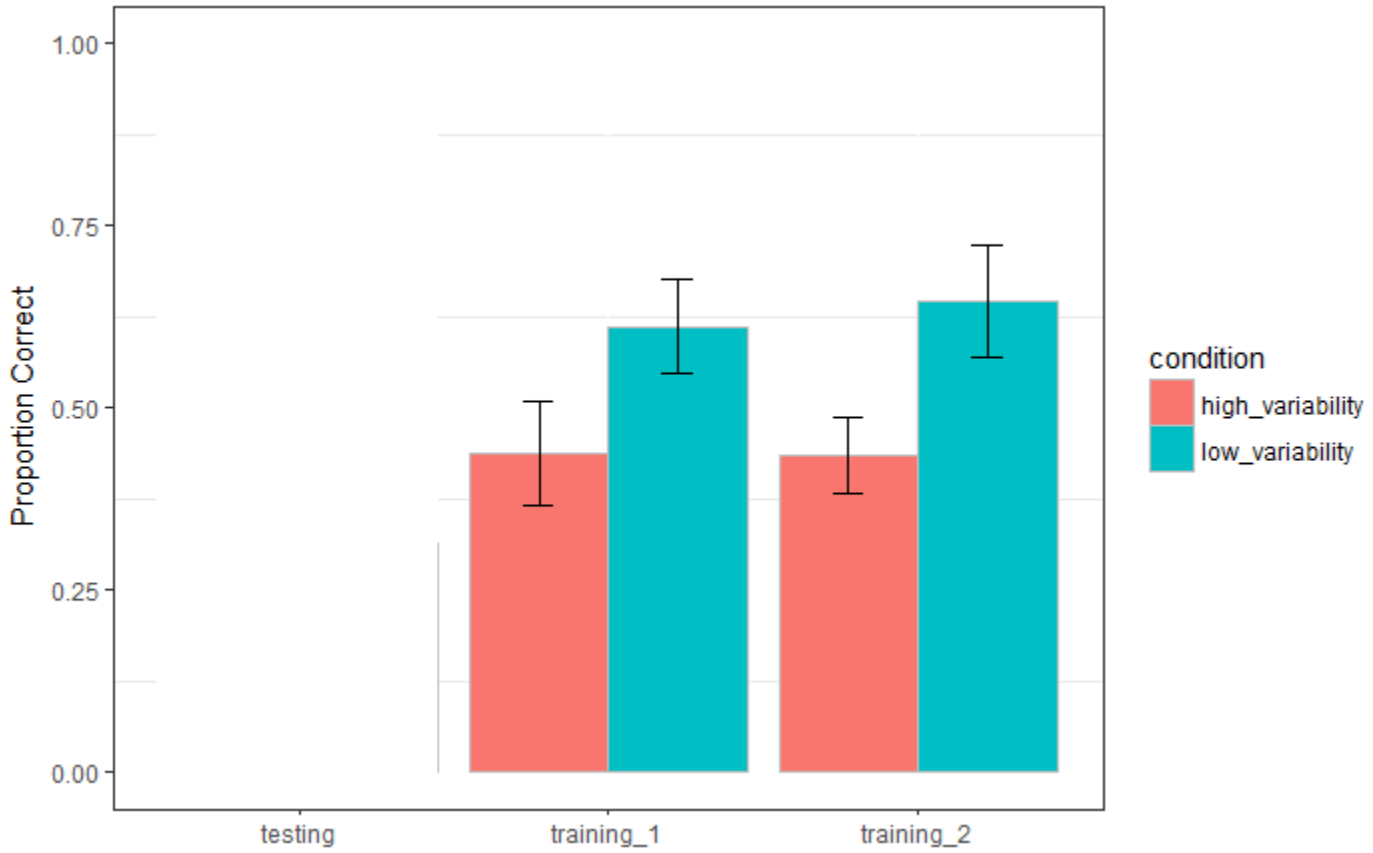
Results: Train & Test



Results: Train & Test

TRAINING:

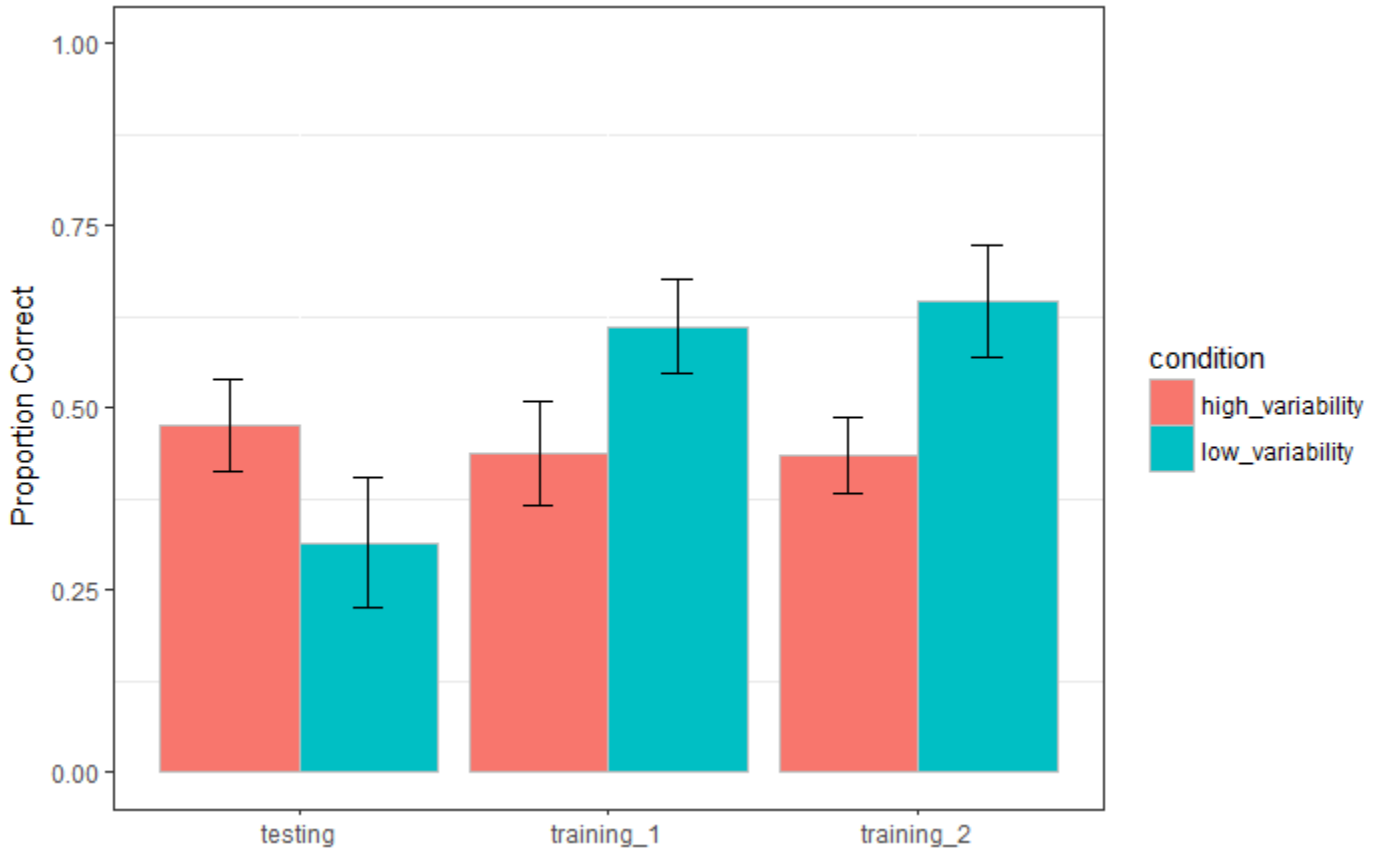
- no difference between sessions
- **better in LOW variability condition (i.e. children who are hearing 4 repeating sentences)**



Results: Train & Test

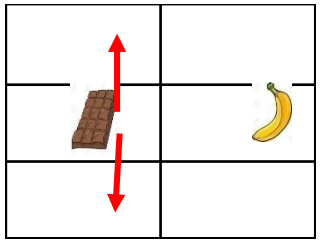
GENERALIZATION TEST

- **better in HIGH variability – i.e. more generalization after hearing more varied sentences in training**



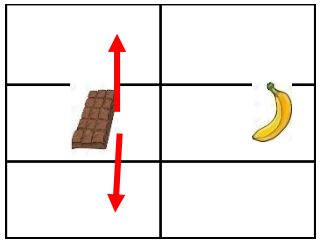
Results: What kinds of errors are they making?

			HV	LV
ILLEGAL MOVES			1%	10%



Results: What kinds of errors are they making?

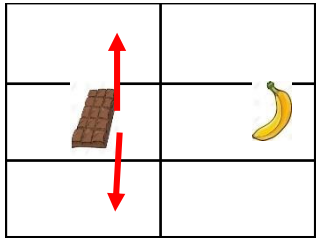
			HV	LV
ILLEGAL MOVES			1%	10%
LEGAL MOVES	MOVE **IN**CORRECT PICTURE		23%	23%
	MOVE CORRECT PICTURE		76%	68%



WORD ORDER KNOWLEDGE IN BOTH CONDITIONS

Results: What kinds of errors are they making?

			HV	LV
ILLEGAL MOVES			1%	10%
LEGAL MOVES	MOVE **IN**CORRECT PICTURE		23%	23%
	MOVE CORRECT PICTURE	ABOVE /BELOW **IN**CORRECT	28%	36%
		ABOVE /BELOW CORRECT	48%	32%



ONLY HV CONDITION LEARN

X **no ue ni** = ABOVE X

X **no shita ni** = BELOW X

In Sum:

- **Training**
  - *Didn't* see difference between sessions (maybe because one week apart?)
  - stronger performance when repeatedly trained on the same sentences

- **Generalization Test**
  - stronger performance when trained with lots of different sentences

➢ *although both groups of children learn that the first noun is the one that moves, only those with variable training learn the **generalized meanings** of the spatial terms*

Discussion and Future directions

- ➢ Seeing varied exemplars is necessary to form generalized representations
- Not all children generalized and average performance still low
- Can we boost learning and generalization further?
  - More sessions?
  - Closer together?
  - **Skewed input:** Hsu and Bishop find good learning with a **mixture of some highly frequent repeated items along side unique sentences**
- How important is using cognates?
  - Can we mix in some non-cognates, will they learn the words?
- What happens if things get harder?
  - Mixed word order, have to rely on case

  banana o chokorēto no ue ni oku == chokorēto no ue ni banana o oku

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References

- Hsu, H. J., & Bishop, D. V. (2014). Training understanding of reversible sentences: a study comparing language-impaired children with age-matched and grammar-matched controls. *PeerJ*, *2*, e656.

- Pili-Moss, D. (2017). Tracking the early stages of child and adult comprehension of L2 morphosyntax: A pilot study. *Journal of the European Second Language Association*, 1(1), 113–125, DOI: https://doi.org/10.22599/jesla.25