Like Yoda speak I

Using artificial language learning experiments to study language change

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Collaborators

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Word order change

Middle French

(1) Et ces parolles m'**a** compté *le* *roy*
and these words me.CL=has told the king
'And the king has told me these words.'
(Wolfe 2021: 7, *Commyn* 9)

Modern French

(2) Et *le* *roi* m'**a** raconté ces paroles
and the king me.CL=has told these words

Sources

Ways to study language change

- Historical texts & records
- Language change in progress (e.g. heritage languages)
- Language acquisition experiments
- Modelling
- …

… but how can causality be established? **Artificial language learning!**

Artificial language learning

Artificial language learning (ALL)

- Creation of miniature linguistic system
- Participants are exposed to language, afterwards learning measured
- Successfully used with adults and children (Gomez & Gerken 2000, Folia et al. 2010, Culbertson & Schuler 2019)
- Advantages:
  - Experimenter has control over factors of interest
  - Control for prior learning

Artificial language learning

Successful application in various linguistic disciplines

- Typology & language universals (e.g. Culbertson et al. 2012, Tabullo et al. 2012)
- Sociolinguistics (Sneller & Roberts 2018)
- Phonological change (Yin & White 2018)

→Suitable to study syntactic change

Overview

I. Learning and loss of V2

II. Experiment 1

III. Experiment 2

Learning & loss of V2

- Robust attestation of evidence for V2 in learners' input necessary (Lightfoot 1999, 2006, Yang 2000)
- Loss of V2 in French (Yang 2000):
  - OVS, XVSO → V2; SXVO, XSVO → SVO
  - Analysis of sentences with *pro*-drop ambiguous: [X *pro* V] or [X V *pro*]
  - Roberts (1993): 5-18% VS structures, 40-52.5% SV structures in MidFr
  - More V>2 sentences than VS structures → SVO grammar
- How does the evidence for V2 need to be distributed to facilitate the acquisition of V2 the most?

Evidence for V2

Ideal input for learners of V2 language

- Ambiguity of SVO structures → Non-subject-initial sentences required
- Maximal variability of preverbal element (i.e. high entropy of preverbal position) and V2 without exceptions…
- … but maximal variability of what?
  - Phrase types: NP/DP, PP, AdvP, CP etc. (Lightfoot 1999, 2006, Sitaridou 2012)
  - Grammatical functions: S, O & A (Yang 2000, 2002)

Variation and learning in the lab

The effect of variability on learning

- Facilitating effect of variability domain-general (Raviv et al. 2022)
- Goméz (2002), Goméz & Maye (2005):
  - Learning of non-adjacent dependencies by infants and adults (aXc, bXd)
  - Finding: Better learning of dependency when variability in X is higher

Variability and the acquisition of V2

- V2: X-V_{fin}
- X = 1/3 S, 1/3 O & 1/3 A should result in best learning outcome

Hypothesis

Hypothesis

- The learnability of a verb second (V2) grammar is conditioned on the entropy of the preverbal position
- A higher preverbal entropy entails better learning of a V2 grammar

Learning V2

- Extrapolation of the flexibility regarding the preverbal constituent to novel structures

Predictions

Predictions

- Participants learning a skewed V2 language should extrapolate V2 to new structures in fewer instances than participants learning a non-skewed language
- Learners of a skewed V2 language should show diminished discrimination of novel V2 and ungrammatical V3 structures compared to participants learning an unskewed V2 language

Experiment 1

Exp.1: Participants

- 314 participant tested, 230 included in analysis (73.2%)
  - Uni.: 74/94
  - O-dom.: 78/118
  - A-dom.: 78/102
- Prolific
  - Self-reported US-nationals
  - Monolingual English speakers
  - Raised monolingually

Exp.1: Training phase

Materials

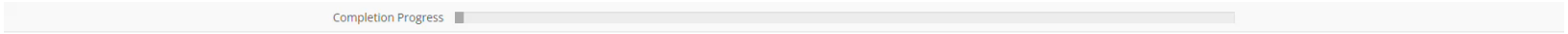
- Semi-artificial language
- 90 V2 sentences constructed from 30 {S, O, V, A} sets
- Uniform condition: 33.3%-33.3%-33.3%
- Skewed conditions: 60%-20%-20%

(3) a. The author **revises** eventually a novel in Boston.

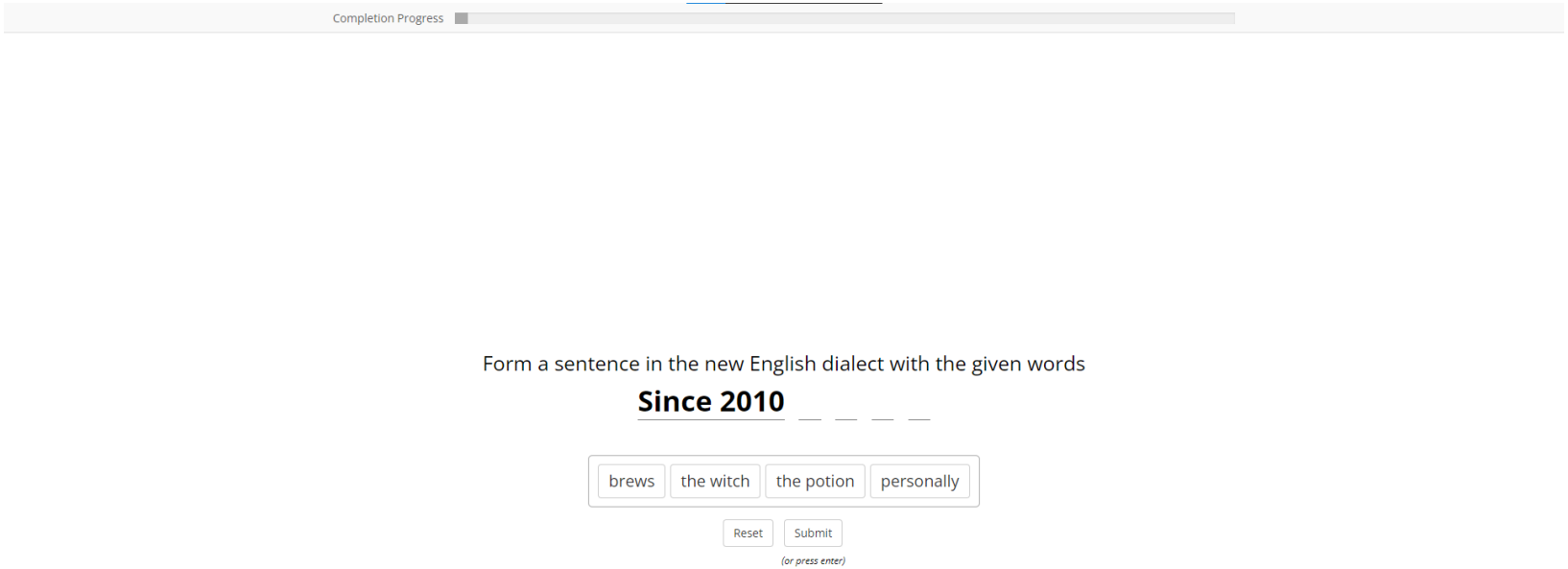
b. A novel **revises** the author eventually in Boston.

c. In Boston **revises** the author eventually a novel.

Exp.1: Training phase



Exp.1: Training phase



Exp.1: Testing phase

Production task

- Participants are provided with scrambled English words and must form sentence in artificial language
- Familiar constituent types (4 trials):
  - S, O, A (e.g. *Sophia*, *a carol*, *on Christmas*)
- Novel constituent types (4 trials each):
  - indirect objects (e.g. *to the prosecutor*)
  - complex adjuncts (e.g. *during the conflict*)

(4) {the waiter, awkwardly, to the guest, **passes**, the saltshaker}

Exp.1: Testing phase

Judgement task

- Participants see V2 & V3 sentences and need to judge grammaticality of it
- Familiar constituent types in initial position (4 trials each):
  - Direct objects
  - Simple adjuncts
- Novel constituent types in initial position (4 trials each):
  - Indirect objects
  - Complex adjuncts

Exp.1: Testing phase

(5) To the congregation **shows** the priest silently the candle.

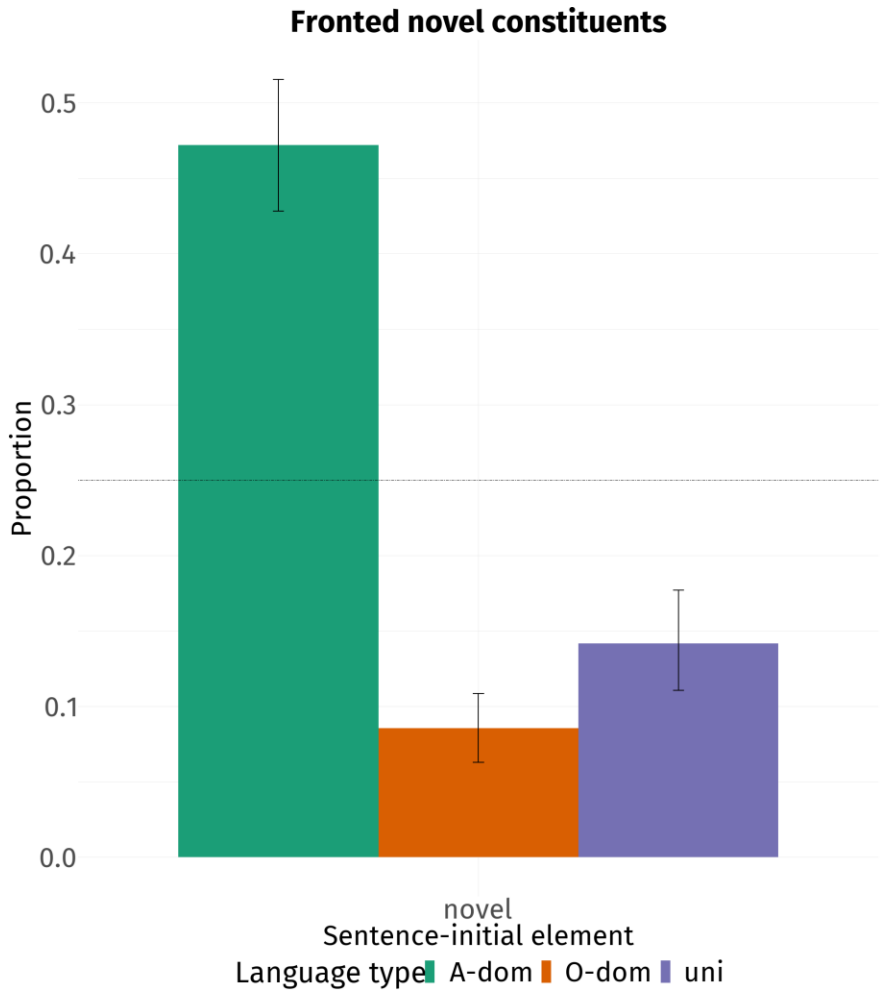
(6) In late April **regrets** the politician openly his misconduct.

(7) To the doctor the patient **describes** precisely the pain.

(8) At the moment the referee **verifies** briefly the decision.

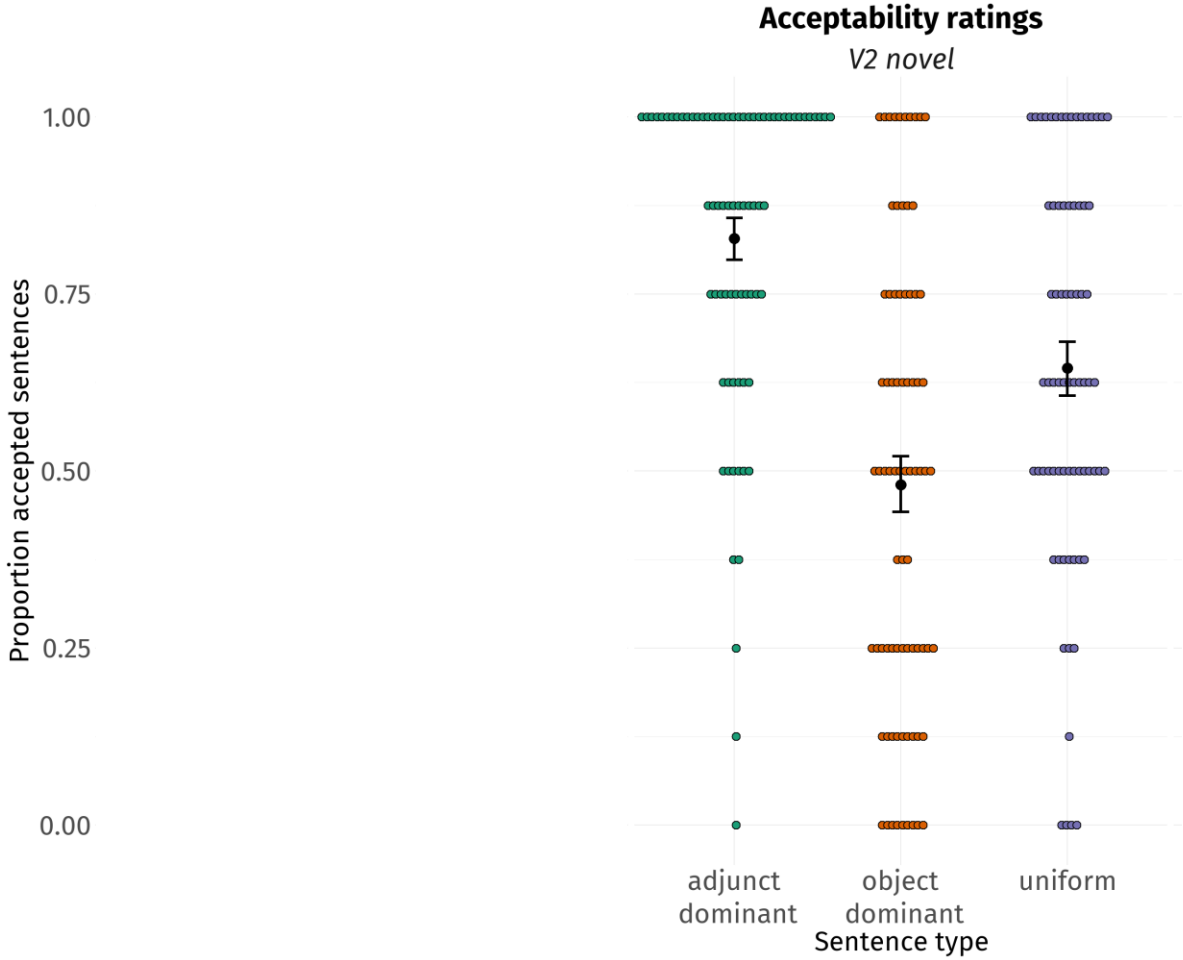
Exp.1: Results – Production

- **Prediction**: fewer novel constituents fronted in skewed condition
  - Confirmed for O-dom. but not for A-dom.
  - Apparent advantage for learners in A-dominant condition



Exp.1: Results – Judgement

- **Prediction**: Higher ratings for *V2 novel* in uni. condition
  - V2-new: A-dom. > Uni > O-dom.
- **Prediction**: Better discrimination btw. *V2 novel* & *V3* in uni. condition
  - Discrimination: A-dom. > Uni = O-dom.



Exp. 1: Discussion

- V2 language easily learnable in short period
- Predictions mostly confirmed for O-dom. condition
- Participants in A-dom. condition exceed participants in uniform condition
- Why do participants in A-dom. and O-dom. condition differ?
  - More variability in A-dom. (PPs, AdvPs) than in O-dom. (DPs)?
  - Different types of violation?
  - Learning advantage through adjuncts?

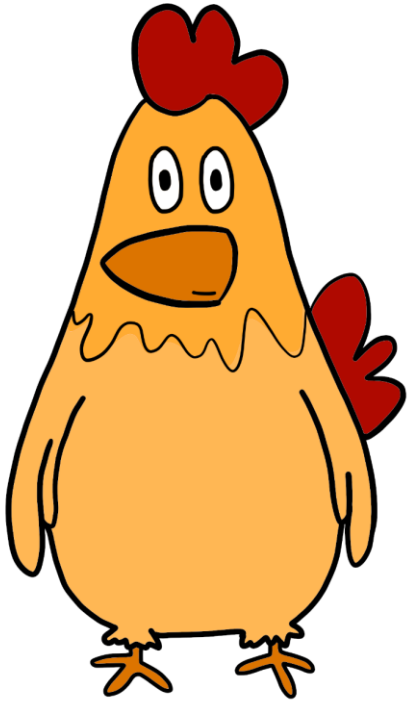
Experiment 2

Exp.2: Participants

- 211 participant tested, 197 included in analysis (93.4%)
  - Uni.: 50/55
  - S-dom.: 48/52
  - O-dom.: 50/53
  - A-dom.: 49/51

- Prolific
  - USA, UK, Ireland, Australia, Canada, New Zealand
  - Monolingual English speakers
  - Raised monolingually

Exp.2: Noun training



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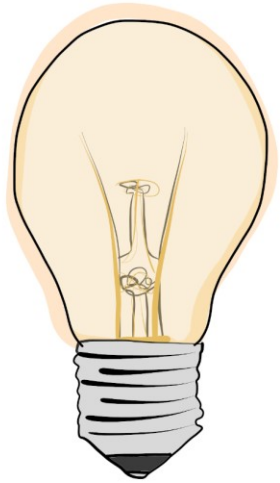

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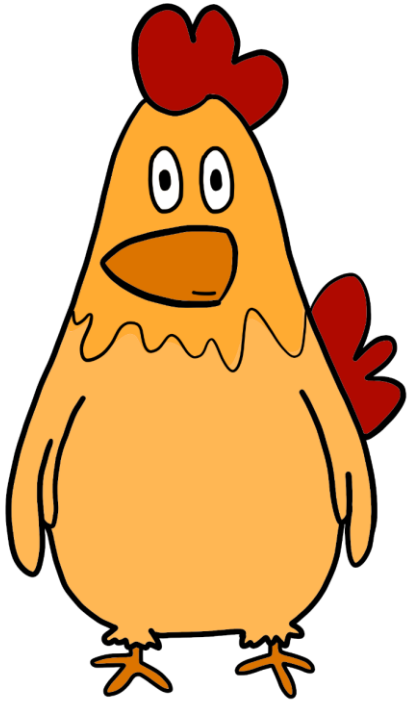
* Many thanks to Clem Ashton

Exp.2: Noun testing



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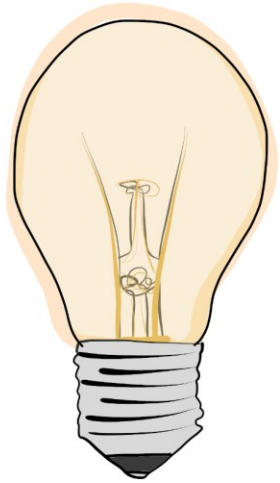

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Exp.2: Adposition training

en flek

Exp.2: Adposition testing

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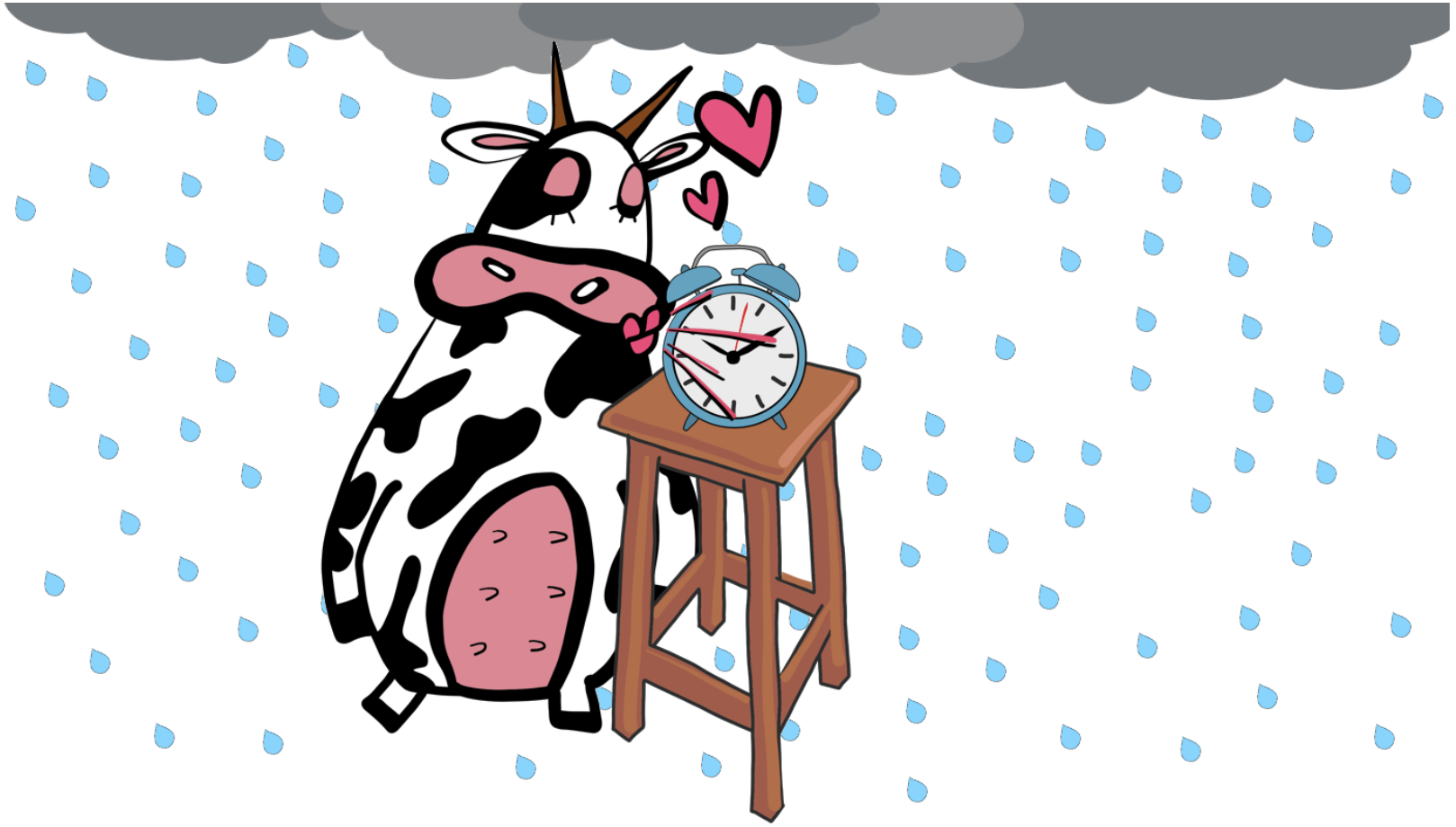
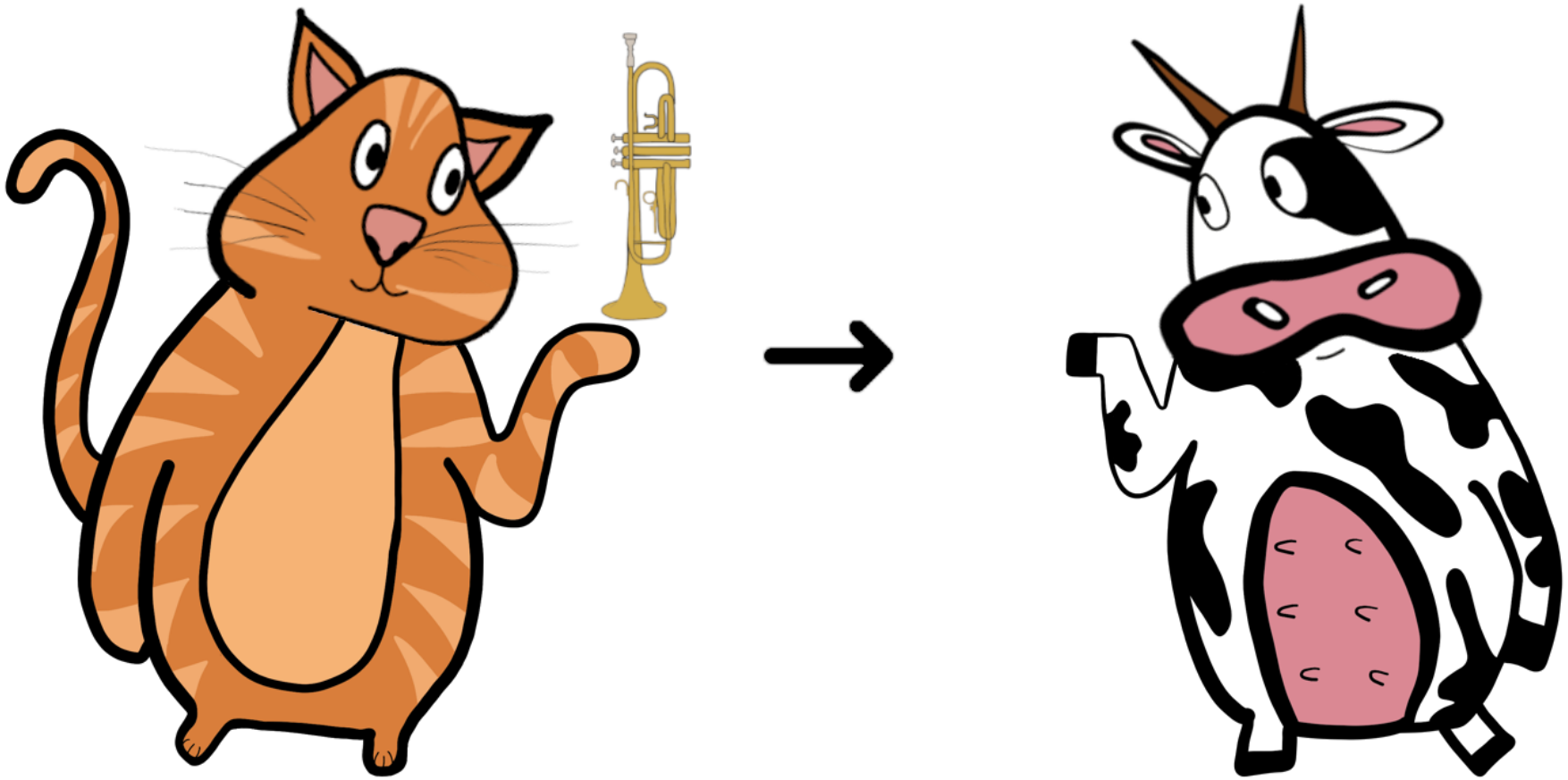
Exp.2: Sentence training



Exp.2: Ditransitive scene



Exp.2: Introduction of novel lexical items

- Presentation of additional animal, object & adposition
  - Random selection for each participant
  - Similar introduction as for other elements in training
- Introduction of ditransitive verb *hada* ‘give’
  - Description of meaning

Exp.2: Testing phase

Production task – Bag of words

- Familiar constituent types
  - Subject, direct object, adjunct
  - Lexically familiar, lexically novel
- Novel constituent types
  - Lexically familiar indirect object
  - Lexically novel indirect object

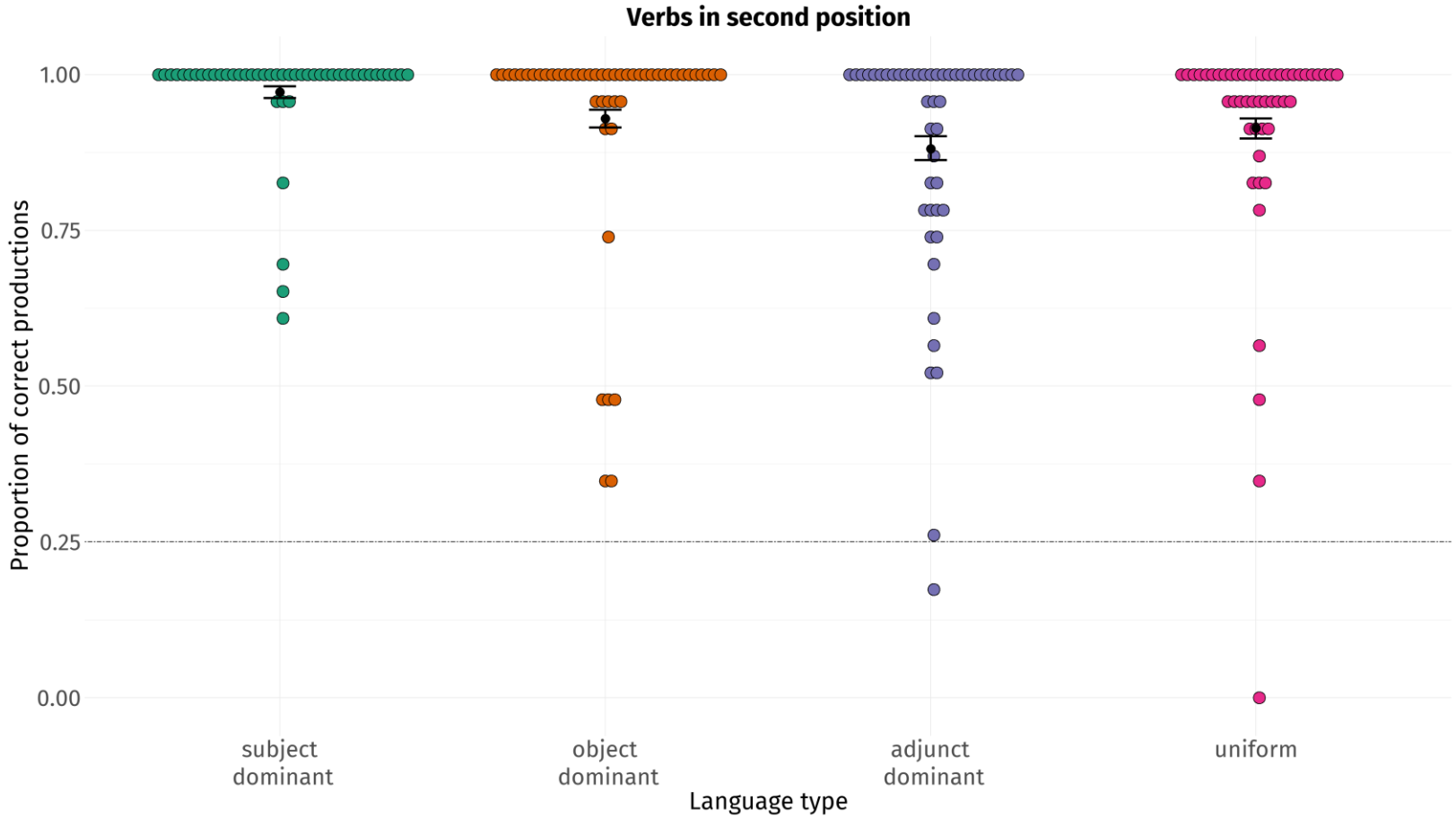
Exp.2: Testing phase

Judgement task – Sentence types

- V2 familiar
  - familiar clause-initial constituent type (S|O|A), lexically familiar
  - familiar clause-initial constituent type (S|O|A), lexically novel
- V2 novel
  - novel clause-initial constituent type (IO), lexically familiar
  - novel clause-initial constituent type (IO), lexically novel
- V3

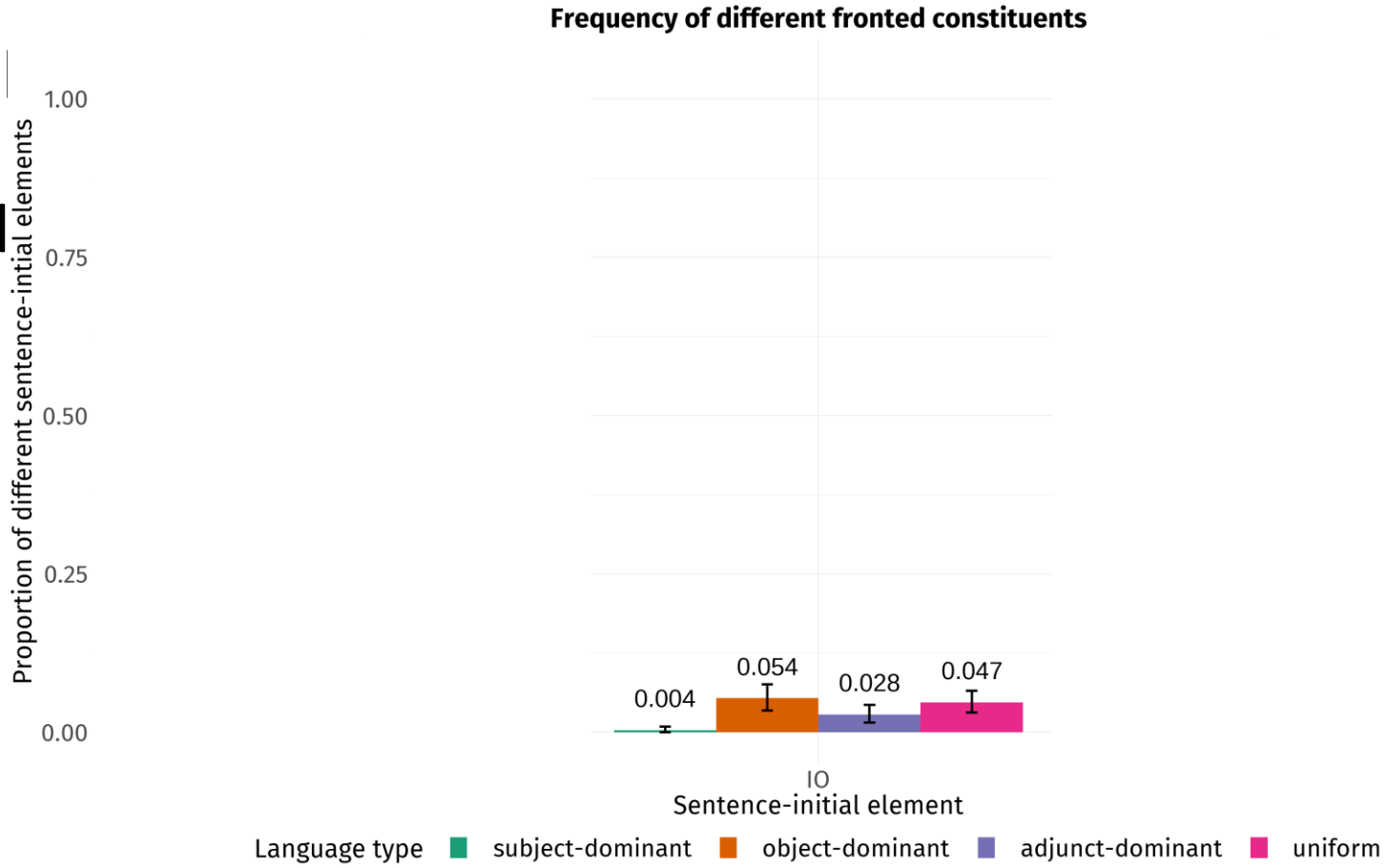
Exp.2: Results – Production

- **Prediction**: Prop. of V2 sentences > chance, no significant Δ btw. conditions
  - V2 > chance
  - S-dom = O-dom
  - S-dom > A-dom, uni
  - O-dom = A-dom = uni



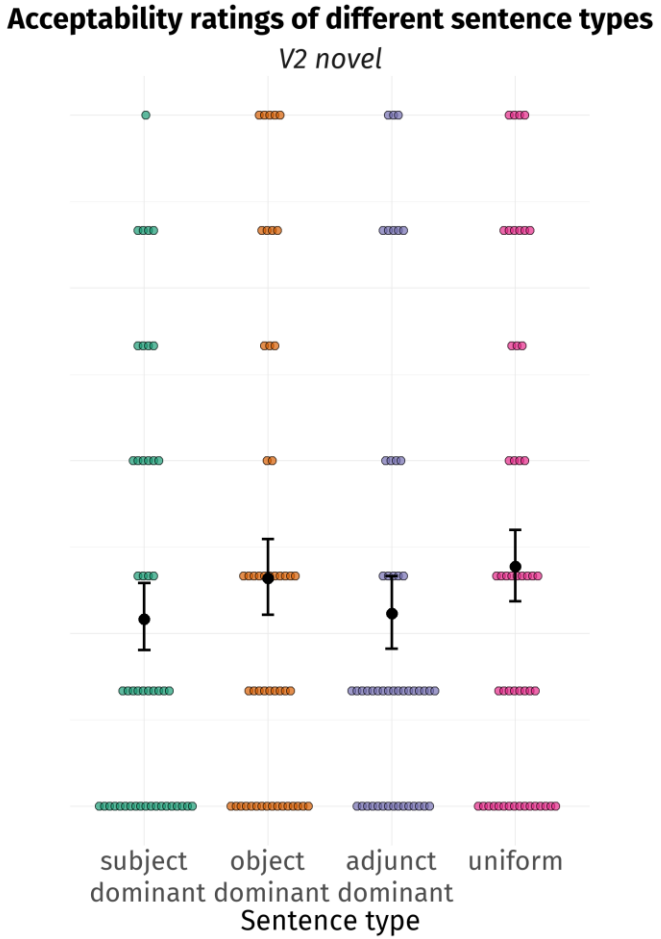
Exp.2: Results – Production

- **Prediction**: fewer novel constituents (lexically & syntactically) fronted in skewed conditions
  - No significant differences btw. conditions
  - Subjects dominate



Exp.2: Results – Judgement

- **Prediction**: Higher ratings for *V2 novel* in uni. condition
  - V2-new: S-dom. = O-dom. = A-dom. = Uni
- **Prediction**: Better discrimination btw. *V2 novel* & *V3* in uni. condition
  - Disc.: S-dom. = O-dom. = A-dom. = Uni



Exp.2: Discussion

- Positioning rule of verbs reliably learned
- Null result: no difference between conditions
- Why are participants hesitant to generalise beyond input?
  - Number of training items to low?
  - Insufficient lexical variability?
  - Absence of variation of grammatical categories?

General discussion

- V2 can be learned in right experimental environments
- Distributional properties of input can affect learning outcome of V2
- Variability of grammatical categories, not grammatical functions decisive
- Results support view that diminished evidence for V2 in input results in loss of V2
- Significant amount of A-initial sentences may be crucial for V2 acquisition
- ALL can complement study of language change

Literature

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