Reading Between the Rules
The Acquisition of Opaque Phonological Interactions

Larissa Melville   lmelvill@sfu.ca   Kira Bondi   kirab@sfu.ca   Allyson Ugalde   amu1@sfu.ca

Background & Previous Research

- More than one phonological rule? → Order matters
  - Some phonological environments may be **taken away** by previous rules.
  - Some phonological environments may be **masked**.
- The surface form may not explicitly show how each rule was applied .
  - write → /raɪt/ → /rʌɪt/ → /rʌɪɾɪŋ/ (Raising and flapping)
- If it is apparent how the rules were applied, the surface form is **transparent**. (Kiparsky, 1973)
- If it is not apparent, the surface form is **opaque**. (Kiparsky, 1973)
- When learning a language, it is expected that:
  - *Transparent interactions are more easily learned than opaque ones* (Prickett 2019).

The Current Study

- Partial replication of Pricket (2019).
- Two different rule interactions in made-up languages:
  - Transparent (Language 1)
  - Opaque (Language 2)
- Each language: Same phonological rules, different order.

1. Palatalization:

s → ʃ / ___ { i/e }
z → ʒ / ___ { i/e }

2. Vowel Harmony:

v → [α back, α round]/
___ v [α back, α round]

Transparent	
	/kos + o + i/
Vowel Harmony	kos**ei**
Palatalization	ko**ʃ**ei
	[koʃei]

Opaque	
	/kos + i + o/
Palatalization	ko**ʃ**io
Vowel Harmony	koʃ**uo**
	[koʃuo]

Hypotheses

(1) Opaque interactions are more difficult to learn than transparent interactions.
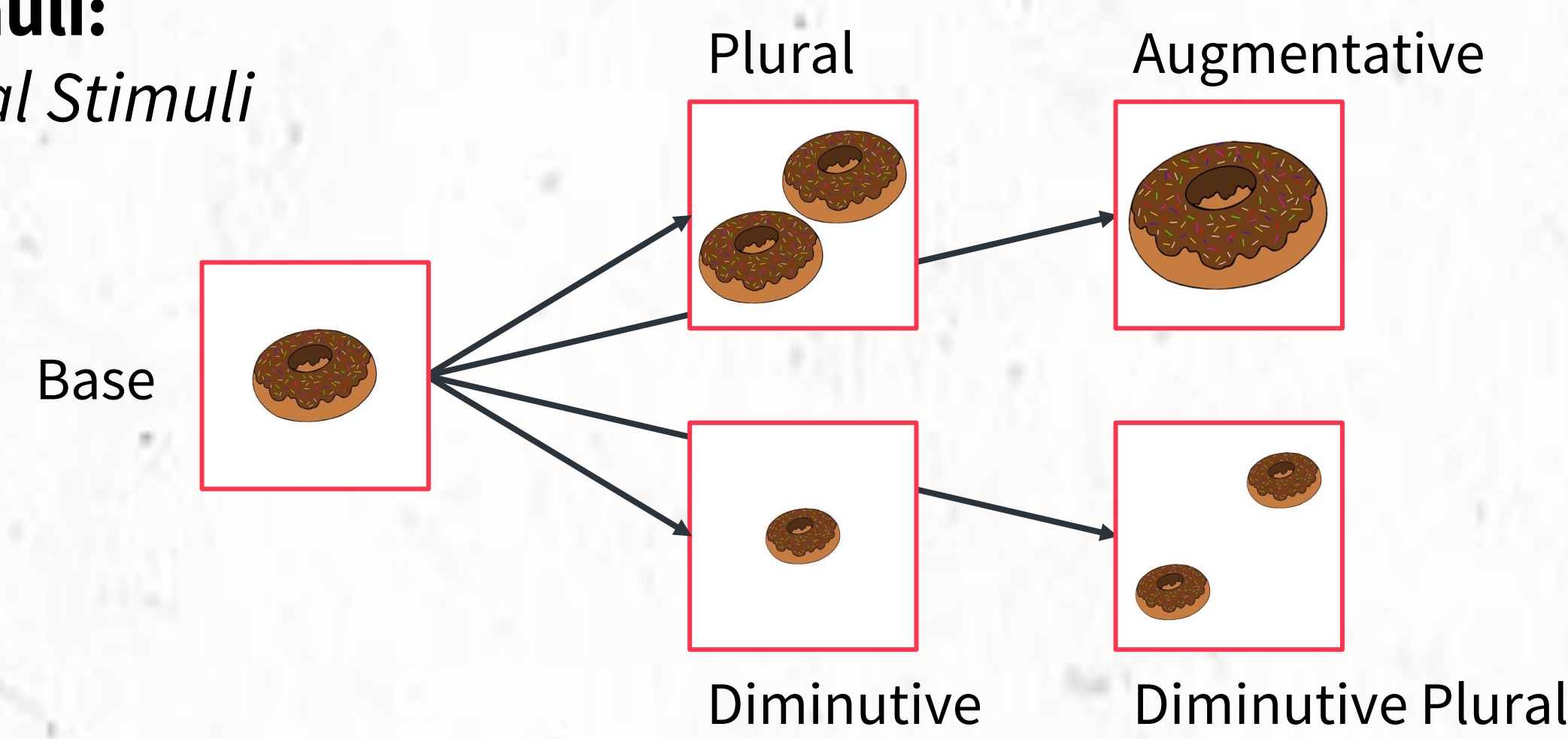(2) Rules involving two interactions will be less accurate than those with one.

Methodology

Participants:
- SFU Students, English speakers

Stimuli:
Visual Stimuli

Base, Plural, Augmentative, Diminutive, Diminutive Plural

Auditory Stimuli
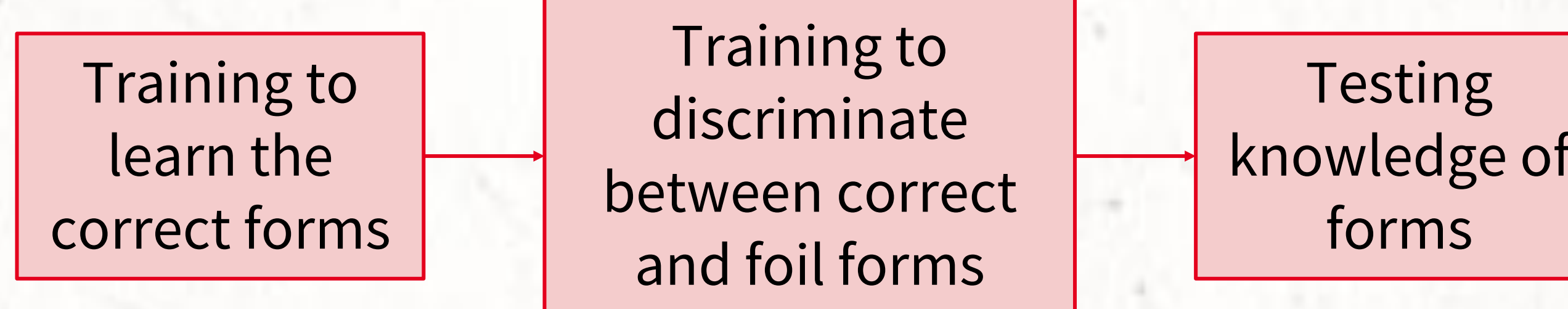- Phonological rule applications **in pseudowords**
  - Diminutive, augmentative, plural = one rule applies
  - Diminutive plural = two rules apply

	Transparent (Lang 1)		Opaque (Lang 2)	
Base	base + ∅	/gos/	base + ∅	/gos/
Diminutive	base + i	/gosh**i**/	base + i	/gosh**i**/
Augmentative	base + e	/gosh**e**/	base + u	/gos**u**/
Plural	base + o	/gos**o**/	base + o	/gos**o**/
Diminutive Plural	base + o + i	/gosh**ei**/	base + i + o	/gosh**uo**/

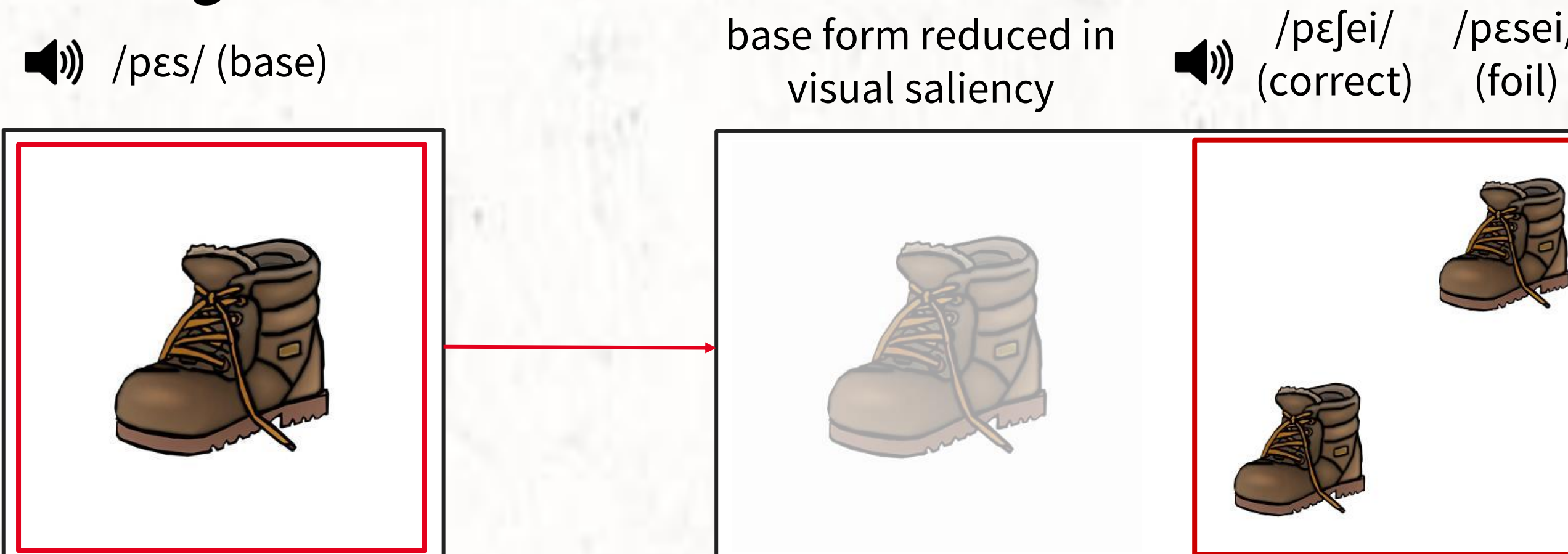- Foils (rule fails to apply):
  - /goʃi/ → correct palatalization
  - /gosi/ → incorrect foil palatalization

Procedure:
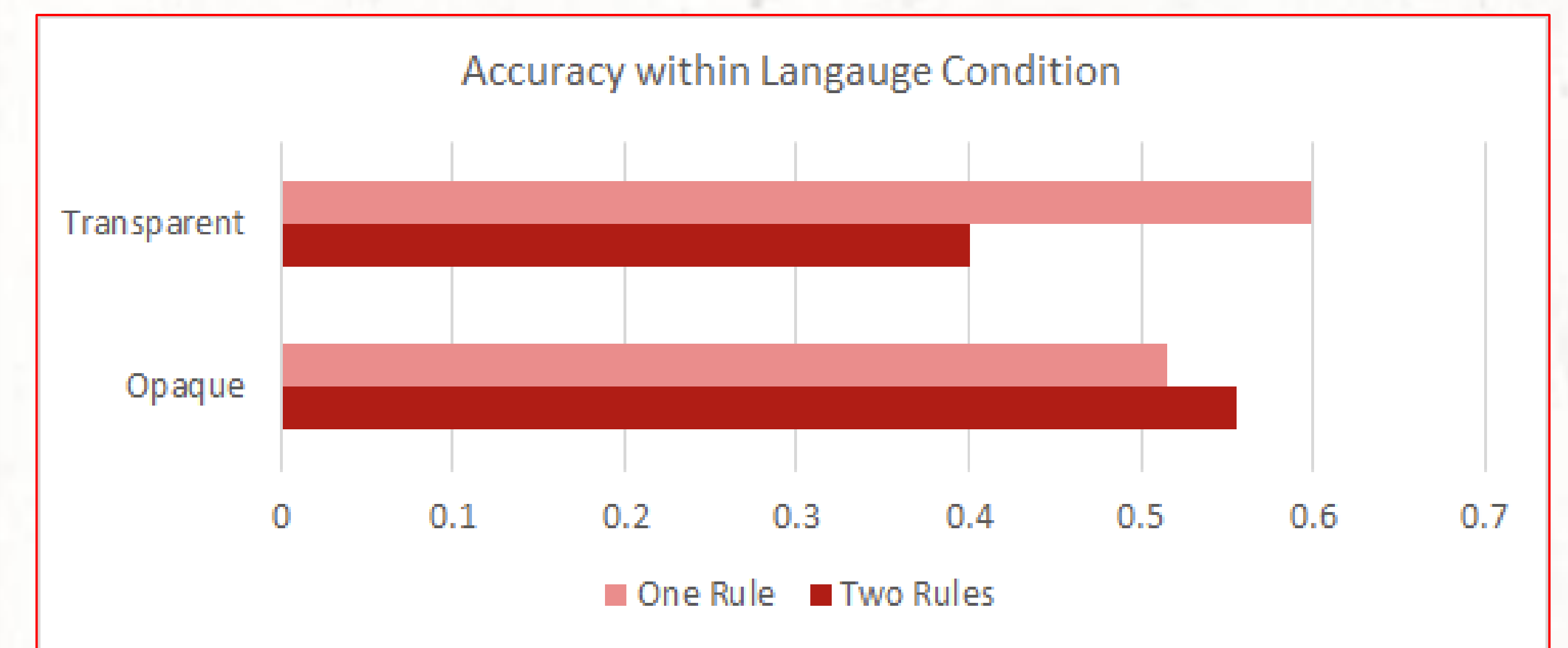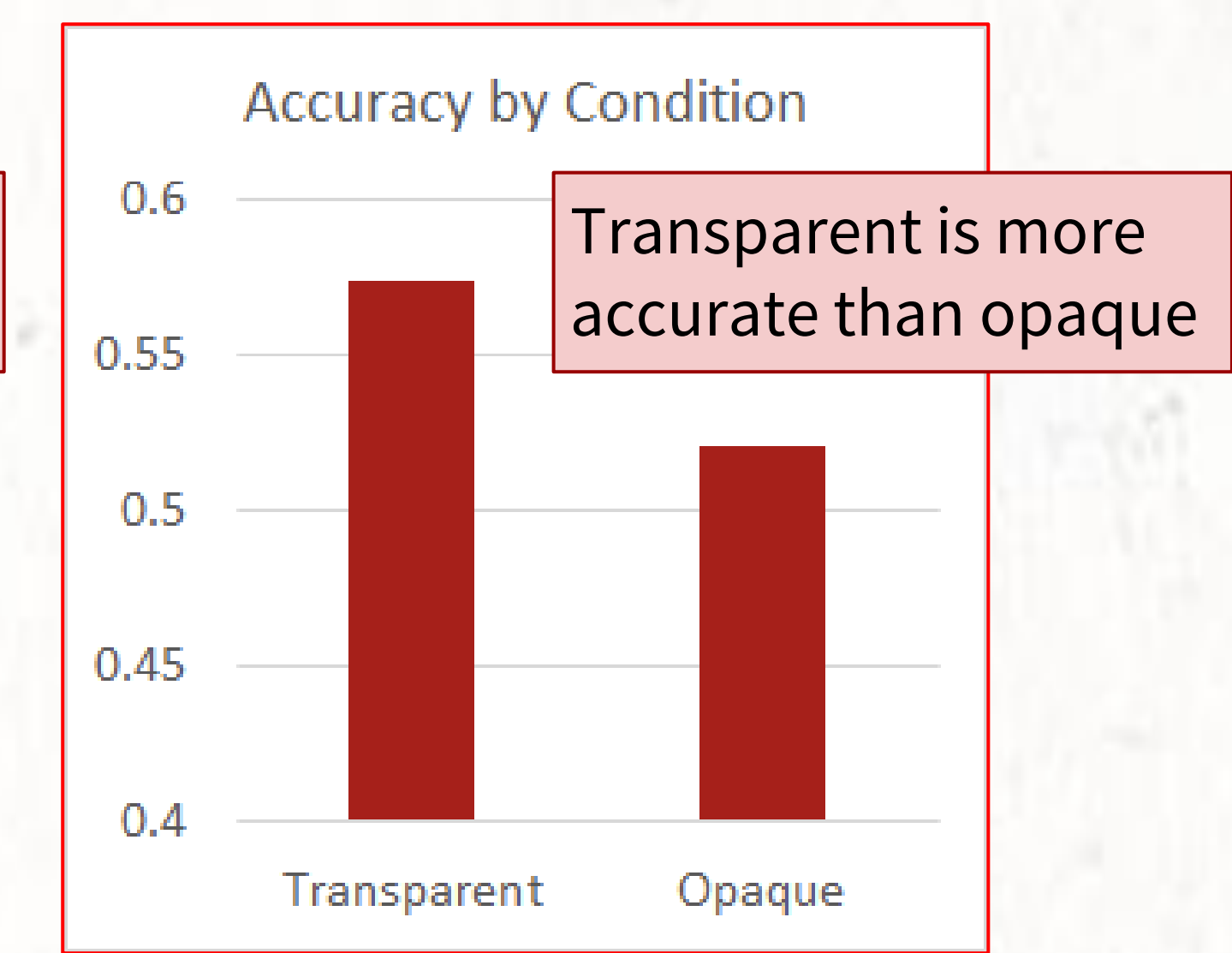
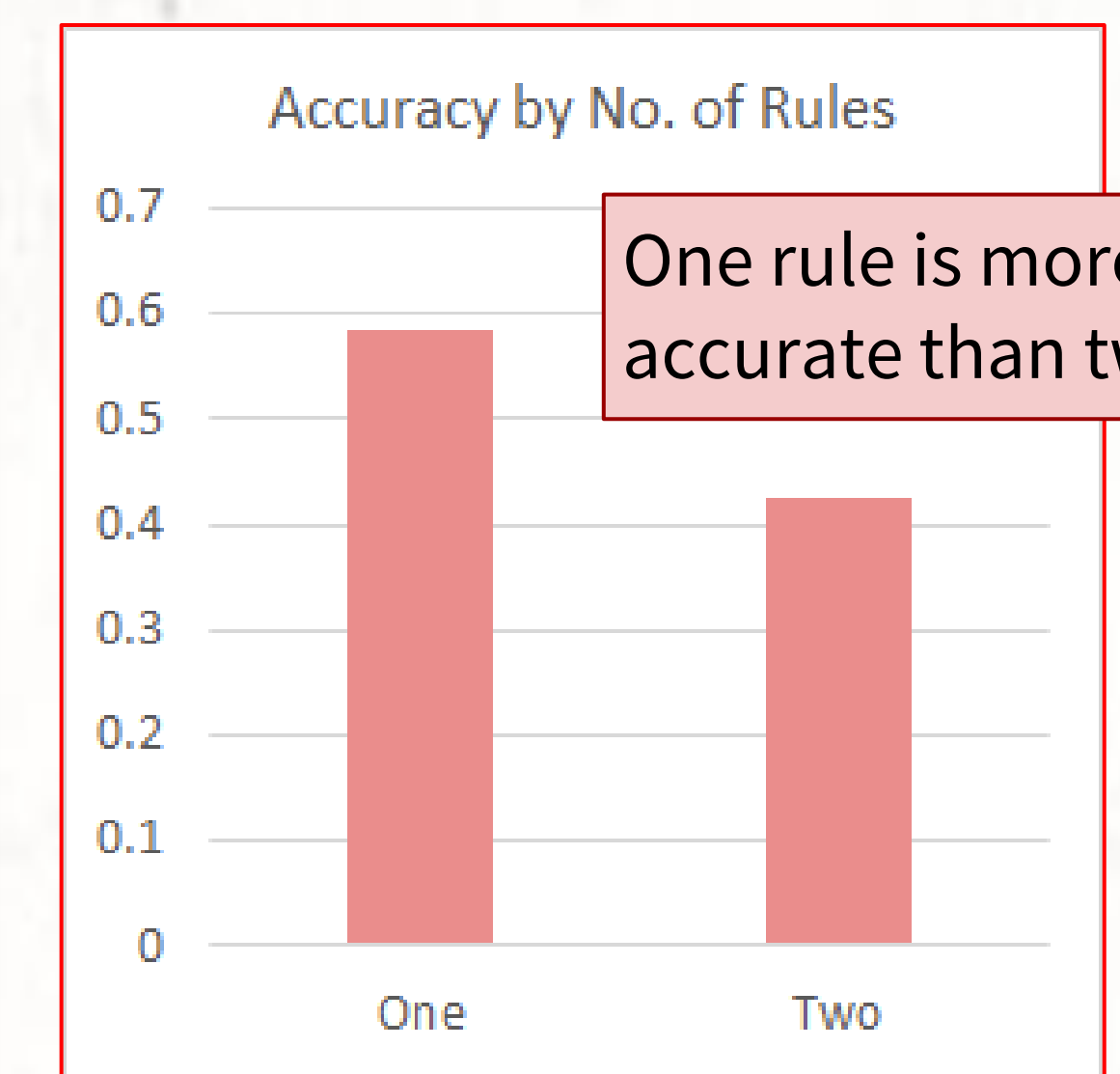Training to learn the correct forms → Training to discriminate between correct and foil forms → Testing knowledge of forms

Testing Trial:

🔊 /pɛs/ (base) → base form reduced in visual saliency 🔊 /pɛʃei/ (correct) /pɛsei/ (foil)

Press 'A' for the first word or 'L' for the second word

Present Results

Preliminary Results:
6 Participants → 5 Transparent Condition / 1 Opaque Condition

Accuracy by No. of Rules — One rule is more accurate than two

Accuracy by Condition — Transparent is more accurate than opaque

Accuracy within Langauge Condition — One Rule, Two Rules

- One rule is more accurate within transparent condition
- Opaque condition shows unexpected results

Considerations and Future Directions

Some Limitations:
- Less control of the experimental environment online.
  - Are they wearing headphones
- Varying language backgrounds (e.g., native Mandarin speakers)

This study uses **Canadian English adult** speakers.
It looks mainly at **what is difficult** in these interactions.

Child speakers
➢ At what age do children perform on par with adults?

Eye-tracking
➢ Do people process opaque forms slower?

References

Kiparsky, P. (1973). *Abstractness, opacity and global rules.* Indiana University Linguistics Club.
Prickett, B. (2019). Learning biases in opaque interactions. *Phonology, 36*(4), 627-653.