Island Extraction Sensitivity in First- and Second-Generation Bilinguals: A Pupillometry Study

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Introduction
This study uses pupillometry to test sensitivity to island violations of varying strength during processing in bilinguals’ first-learned language.

- Task-evoked pupillary responses (TEPR) reflect unconscious attentional or computational demands (e.g., Kahneman & Beatty, 1966).
- Pupillometry reveals differential processing of wh-gaps in native speakers and L2 learners of English (Fernandez et al., 2018).
- Late bilinguals and heritage speakers have same first language, but differ in life-time exposure and use (Fernandez, 2021).
- Pupillometry has not been utilized to measure sensitivity to island violations.
- Island violation types have varying degrees of acceptability (e.g., Chomsky, 1986; Sprouse & Hornstein, 2013).

Participants
Two groups of Spanish-English bilinguals, proficient in both languages.

First-Generation (FG)
- Spanish-English Late Bilinguals (n=19)
- Eng
- Spa

Second-Generation (SG)
- Heritage Speakers of Spanish (n=26)
- Eng
- Spa

Sentence types and Acceptability Ratings
Sentence types (1-5) were rated in an AIT by Spanish-English late-bilinguals and heritage speakers in a previous study (Montrul, 2018). Judgments for each sentence type had different ranges between gram. and ungram. conditions. Sentence types were given increasing ‘acceptability differential’ codes reflecting difference in acceptability between grammatical and ungrammatical.

The differential code aligns with violation strength noted in previous literature (Chomsky, 1986; Sprouse & Hornstein, 2013).

1. Comp-trace (CT) (n=20) Acceptability Differential/Violation Strength = 0
   ¿Quién, en qué / ¿qué ___ había comido la torta?
   What sister did Inés confess that / *Ø had eaten the cake?

2. WH-ellipsis (NH) (n=15) Acceptability Differential/Violation Strength = 1
   ¿Qué enfermera, confirmó Laura [Ø | que | por qué ___ habló la medicina?]
   What nurse did Laura confirm that / *Ø had taken the medicine?

3. Complex-NP complement (CNPC) (n=15) Acceptability Differential/Violation Strength = 2
   ¿Qué insectos, escuchó Gimena [Ø | ¿el reportaje] que ___ invadía el campo?
   What insect did Gimena hear /Ø *report that was invading the countryside?

4. Relative clause (RC) (n=15) Acceptability Differential/Violation Strength = 3
   ¿Cuál, ___ mostró el documento [Ø | que] el critico odiaba?  
   What critic showed the documentary that / *Ø had offended?

5. Temporal adversial adjunct (TA) (n=15) Acceptability Differential/Violation Strength = 4
   ¿Qué juez ___ dio el veredicto ___ después que el defensor presentó su caso?
   What judge gave the verdict after the defense attorney presented his case?

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Conclusions
- First-generation bilinguals’ increase in TEPR amplitude for sentence types with greater acceptability differentials provides evidence for increase in processing effort across island violations types.
- Second-generation bilinguals show similar processing effort for all grammatical sentences and all ungrammatical sentences, regardless of acceptability differential.
- Increased TEPR amplitude for second-generation in low-differential island violations may be due to more effortful processing of ungrammaticality than first-generation speakers.
- The individual variable that best explains increased TEPR amplitude in level 3 violations (RC & TA): primary and secondary formal education through the Spanish language. This suggests that recognition of strong island violations may be influenced by exposure to academic language.

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