1. Introduction

- Where does the bias in parsing ambiguous relative clauses come from? Is it influenced by the previous statistics people have collected?
- Prior work: Representation of abstract dependencies in language & other domains (e.g. Menon & Kaiser, 2013; Mitchell et al., 1995; Scheepers et al., 2011; van de Cavey & Hartsuiker, 2011).

- What about abstract relations represented through word-level statistical regularities in an artificial language?
- Research question: Can adjacent and non-adjacent structures derived from word-level statistics prime the low vs. high attachment preference during the production of relative clauses (RCs)?

- We manipulated the dependencies participants encountered in the priming material:
  - Non-adjacent dependency sequences (A, X, C) from Gomez, 2002. A non-adjacent dependency (NAD) is a three-word sequence such that the first word uniquely predicts the third word, while the second word can vary.
  - This structure models the linear sequence of high attachment in RCs (e.g., Kevin counted the fans of the singer who were excited).

- Hypothesis: if abstract relations extracted from lexical statistics trigger syntactic priming, learning the non-adjacent dependency should prime participants to produce more high-attachment relative clause completions than control participants.

- English RC’s have a default low-attachment bias (e.g., Brysbaert & Mitchell, 1996). Can this be weakened by non-adjacent primes?
- Prediction: If non-adjacent lexical-level representations prime dependency formation in RCs, participants should produce more high-attachments after non-adjacent sequences than after adjacent sequences (ACX, and XAC).

2. Experiment Design

• **STEP 1:** Training phase (~20 min):
  Participants (n=50) heard three-word ‘word’ strings in an artificial language (adapting stimuli from Gomez’02, e.g. choon glaik jub). During listening, they answered a question on what word was just played every few minutes.

  - Between-subjects design, participants encounter different dependencies:
    - Non-adjacent group (n=20) was trained on non-adjacent dependencies (A, X, C)
    - Two adjacent groups (n=10 each) trained on adjacent dependencies (A, C, X, and X, A, C)
    - Baseline group (n=10) trained on random three-word orders with no dependencies.

• **Step 2:** Test phase (~20 min)
  Two trial types:
  a. hear three-word sequence [prime], say whether it’s in the language
  b. write completions for RC fragments

- On critical trials:
  - Artificial language prime occurred immediately before RC fragment.
  - Expected answer to artificial language prime: Yes.
  - Then complete relative clause fragment.
- Sentence fragments on critical trials were ambiguous RC fragments, people wrote continuations:
  Kevin counted the fans of the singer who
  a. ...were really excited (HA)
  b. ...was performing that night (LA)

3. Results

- Coding: RC completions analyzed as high-attachment (HA), low-attachment (LA), or ambiguous (coded as missing in Logistic Regression).

- Successful learning of non-adjacent dependencies: Above-chance performance in test-phase learning questions (p<0.001, Mixed-effects Logistic Regression).

- RC completions influenced by NAD primes:
  - More high-attachment completions in nonadjacent prime group than other 3 groups (p<0.001, Mixed effects Logistic Regression) ⇒ Fig. 1
  - People who learned a non-adjacent dependency in the artificial language were more likely to produce RCs that attach to the non-adjacent (higher) noun compared to people in control conditions (who learned local dependencies or no dependencies)
  - People trained with nonadjacent primes do not follow any item-level (Figure 2) or group-level (Figure 3) tendencies to complete a sentence with High Attachment bias with regard to explicit knowledge of Non-adjacent Dependency questions.

- Performance in the NAD task
  - Figure 3. No group-level relationship between Correctness in Priming Test and RC Completion Attachment Biases. Correlation: -0.0538 (p=0.82)

4. Discussion

- Abstract relations represented through newly-learned word-level statistical regularities can prime the attachment biases of relative clauses.
- The lack of ‘word’-level effects suggest that the representation for RC attachment bias is unlikely to be the same statistical representation at the lexical level that people are trained on.
- This suggests that the underlying representations of attachment biases are best regarded as highly abstract and finely attuned to statistical regularities in the input.

- Future plans: Test this with Spanish. Spanish RCs have a high attachment bias (e.g., Brysbaert & Mitchell, 1996). By priming Spanish speakers with adjacent dependencies, we can see whether their high-attachment bias would be primed to produce low-attachment relative clauses.

References


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