Predicting Whether a Sentence Will be Passive

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Sentences are temporarily ambiguous

Listeners can’t interpret sentences until they gather enough information

On-line processing models posit that listeners actively process sentence information as they receive it, vs. off-line models, where listeners wait to receive all information first

Multiple sources of information can inform listeners of potential parses
- Lexical biases (e.g., frequency of a word, given a context)
- Frequency of a category, given a context
- Argument structure
- Intonation

What about local acoustics?

Little research on role of local acoustic cues (pitch, amplitude, morpheme duration) in disambiguating sentences

Rehrig et al. (2015) found that English speakers consistently lengthen the stem of passive sentences
  - The pig was kissed by the sheep vs. The pig was kissing the sheep
  - 7 naïve participants lengthened verb stems in the passive
  - Passive verb stem lengthening is a robust phenomenon

Usefulness of passive verb stem lengthening

Are all listeners equally sensitive to acoustic cues?

How salient must these cues be to be useful?

What happens when the cues vary?

Previous study: Comprehension & eye-tracking study (Stromswold et al., under review) suggests that adults may predict upcoming syntax while hearing ambiguous portions of active & passive sentences

Comprehension gating experiment

Current study: Recordings of active/passive sentences truncated after verb stem
- Participant from Rehrig et al.’s production study
- Truncations were morphosyntactically ambiguous
  - “The bear was lick—”

Two sentences appear on monitor
- One active, one passive
- Participants chose the sentence that was the best completion of the truncated audio

Participants

40 monolingual native English speakers
Rutgers University students, 18-26 years old
Normal hearing and normal or corrected-to-normal vision
Naïve to the purpose of the experiment
Stimuli

100 trials: 32 active, 32 passive, 36 fillers
- Target verbs: 2x active, 2x passive (agent/patient reversal)
  - The bear/dog was slapping the dog/bear
16 scenarios (Animal NP pairs with verb)
- Determined by series of pre-drawn images
Fillers and catch trials
- Catch trial sentences differed in identity of first NP
  - Various active fillers

Target verbs

16 target verbs: chase, comb, kick, kiss, lick, pat, pinch, poke, punch, push, scrub, shove, tickle, touch, trap, wash

Phonological constraints (in order of importance)
1. Did not begin in /s/ or /z/ – scrub violates
2. Took either [t] or [d] participle – pat violates
3. Monosyllabic – tickle and pat violate
4. Onset was a stop consonant – scrub, like, wash violate (not chase if treating ch as a cluster starting with [t])
5. CVC (i.e., avoid consonant clusters)
  - Violations in onset position: scrub, trap (and chase)
  - Violations in coda position: punch, pinch (and trap)

Target trial

+ 

(The bear was lick~)

Target trial

The bear was licking the dog
The bear was licked by the dog

Catch trial

+ 

Catch trial

(The cow was behind –)

Data from 38/40 participants

Accuracy results – cum. binom.

64 targets: At least 40
- Only 23 participants above chance levels
- 15 were at chance levels (betw. 26 and 39 correct)
- Potential expectation bias

Accuracy: Active and Passive Syntax

\[ F(1,37) = 54.387 \quad p < 0.001 \]

Reaction Time: Active and Passive Syntax

\[ F(1,37) = 8.765 \quad p = 0.005 \]
Slicing issues – Included closure of consonant for passives

Does the length of the verb stem affect accuracy?

Verb stem length varies within stimuli for active and passive sentences
  - Some active verb stems are longer than others
  - Some passive verb stems are shorter than others

Are participants less accurate in these cases?

Stimulus Verb Stem Duration by Verb

Stimulus Verb Stem Duration by Syntax and Accuracy

Expectation Bias

Of 100 trials: 32 were passive, 68 were active
  - 32 active targets, 36 active fillers
  - No conscious awareness of verb stem cue
    - Felt like guessing
    - Low accuracy on actives:
      - Wanted to select passives and actives equally often?

Accuracy: First 15 and Last 15 Trials
Summary & conclusion
Rehrig et al. (2015) found passive verb stem lengthening to be a robust acoustic phenomenon in English speakers.

Speakers may listen for verb stem lengthening as an acoustic cue to the passive voice.

Some verbs may be better at transmitting this cue.

Given that people are more accurate for passives, it's possible that there is only a passive cue, and no complementary active cue.

If no cue detected, default to active voice (actives are more frequent, less expensive than having two cues).

In line with constraint satisfaction models.

For “difficult” verbs, information from other sources (context, intonation, etc.) could further inform the listener.

Future studies:
- Address potential expectation bias.
- Passive closure splicing.

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References


