

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)

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

Target trial

+

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

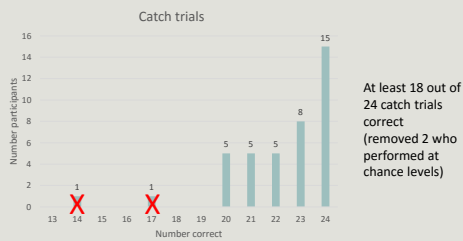
(The cow was behind–)

Catch trial

The cow was behind the hippo

The hippo was behind the cow

Data from 38/40 participants

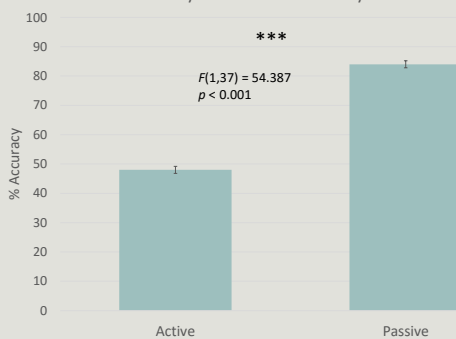


Accuracy results – cum. binom.

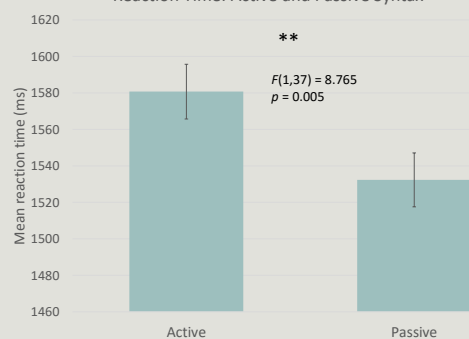
64 targets: At least 40

- Only 23 participants above chance levels
- 15 were at chance levels (betw. 26 and 39 correct)
- Potential expectation bias

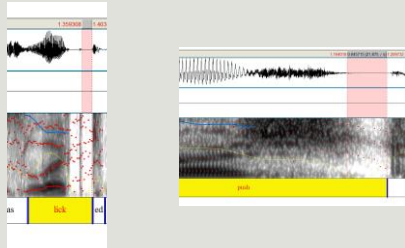
Accuracy: Active and Passive Syntax



Reaction Time: Active and Passive Syntax



Slicing issues — Included closure of consonant for passives



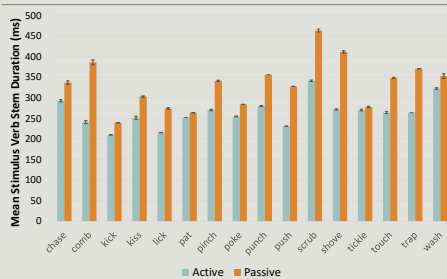
Does the length of the verb stem affect accuracy?

Verb stem length varies within stimuli for active and passive sentences

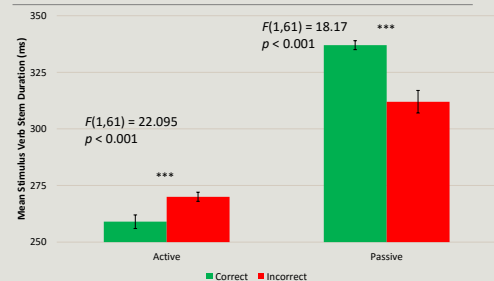
- Some active verb stems are **longer** than others
- Some passive verb stems are **shorter** than others

Are participants less accurate in these cases?

Stimulus Verb Stem Duration by Verb



Stimulus Verb Stem Duration by Syntax and Accuracy



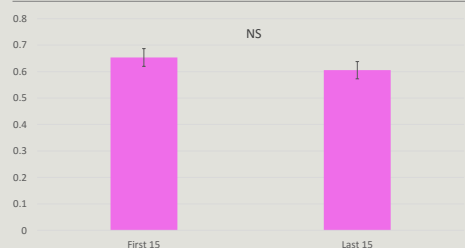
Expectation Bias

Of 100 trials: 32 were passive, 68 were active
 32 active targets, 36 active fillers

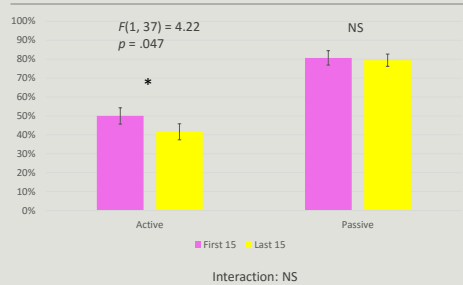
No conscious awareness of verb stem cue

- Felt like guessing
- Low accuracy on actives:
 - Wanted to select passives and actives equally often?

Accuracy: First 15 and Last 15 Trials



Accuracy: Active/Passive in First 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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