Exploring how speakers mark, and listeners assess, certainty

Amanda Pogue & Michael K. Tanenhaus
University of Rochester
apogue@ur.rochester.edu

Introduction

Marking certainty:

- Speakers should only provide information that they know to be true according to the Maxim of Quantity. Presumably they also want to be considered reliable sources for information they convey
- This suggests that speakers should structure their utterances to accurately signal their degree of confidence.
- Speakers have a variety of options available to signal certainty (e.g., disfluencies, lexical choices, hedges, facial expressions, gestures, etc)
- Listeners should be able to recover from a speaker's production their amount of confidence in their utterance (see: Smith & Clark, 1993; Brennan & Williams, 1995; Swerts & Krahmer, 2005), and take that into consideration when generalizing from the speaker's productions

Main Questions:

1. How and why do speakers mark their confidence-level in speech?
2. How do listeners use this information when generalizing from a speaker, or through continued interaction?

Pre-task

Read the following sentences out loud.

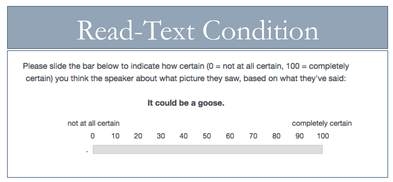
It could be a goose.

Imagine that you are in a task where you have to tell someone what you saw, but it only briefly flashed on the screen, or it's mostly occluded. So, you might know what it is, but you might also be wrong.

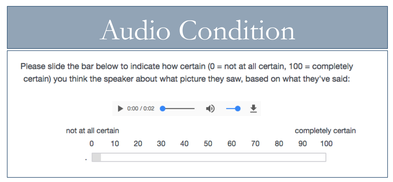
It could be a goose.

Experiment 1

Read-Text Condition



Audio Condition

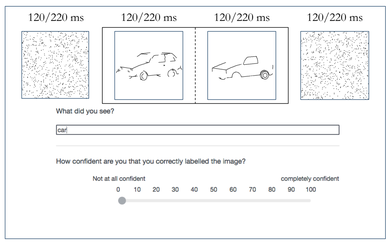


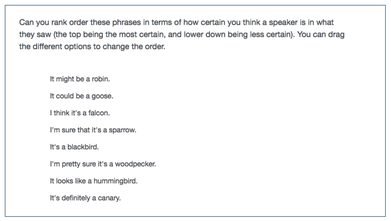
Mechanical Turk Study:

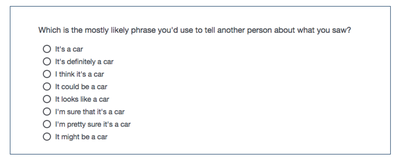
- Read-Text Condition (n=16)
- Audio Condition (n=160)
- 8 items used in the pre-test
- Audio: one recording of each (randomly assigned)

Phrase	Read-text Confidence	Listen (Read)	Listen (Uncertainty)	Read-text Rank	Listen Rank
It could be a goose	36.994	37.706	36.283	7.125	7.063
It might be a robin	39.294	41.094	37.494	6.375	6.375
I think it's a falcon	49.918	48.918	50.919	5.688	5.644
It looks like a hummingbird	57.080	61.362	52.797	5.25	5.381
I'm pretty sure it's a woodpecker	65.476	68.110	62.842	4.063	4.319
I'm sure that it's a sparrow	84.220	87.510	80.930	2.688	2.919
It's a blackbird	86.777	88.864	84.689	2.625	2.525
It's definitely a canary	90.935	90.246	91.624	2.188	1.775

Experiment 2







Mechanical Turk Study:

- n=32
- 2 durations (120/220 ms)
- 2 deletion types (preserves / does not preserve the geon)
- 20 trials per participant (with 4 possible lists, with items counterbalanced across sbjs)

Phrase	Label Confidence
It could be a goose	25.163
It might be a robin	28.798
I think it's a falcon	46.458
It looks like a hummingbird	45.828
I'm pretty sure it's a woodpecker	68.577
I'm sure that it's a sparrow	80.300
It's a blackbird	91.765
It's definitely a canary	93.192

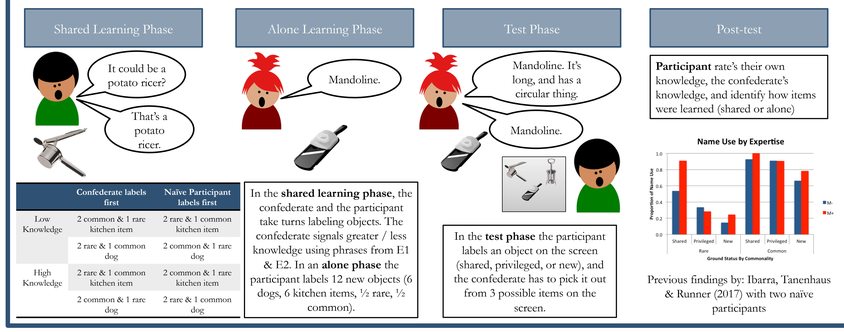
	Geons Disrupted	Geons Intact
120ms	43.52	58.37
220ms	48.28	66.18

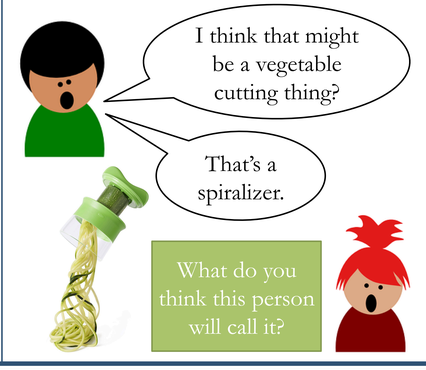
Results:

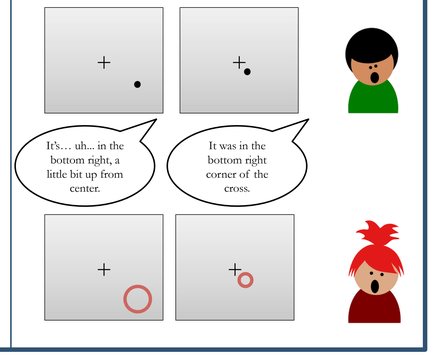
- More confident when they saw the items for longer durations (p <.02)
- More confident when the geons were left intact (p <.001)

Main Findings: We find a stable order of the rated certainty of the utterances, and their rankings; but individual differences in the amount of certainty conveyed [Experiment 1]. We find a relationship between speakers' confidence ratings and the kind of phrase they would use to communicate what they saw to another person (suggesting a strong relationship between confidence and lexical choice) [Experiment 2].

Future and Current Directions:







References: Biederman, I. (1987). Recognition-by-components: a theory of human image understanding. *Psychological review, 94*, 115-147. Brennan, S. E., & Williams, M. (1995). The feeling of another's knowing: prosody and Wlled pauses as cues to listeners about the metacognitive states of speakers. *Journal of Memory and Language, 34*, 383–398. Grice, H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (Eds.), *Syntax and semantics: Speech acts* (Vol. 3, pp. 41–58). New York: Academic Press. Ibarra, A., Tanenhaus, M.K., & Runner, J.T. (2017). Effects of shared learning on choice of referring expressions mitigated byclikelihood of prior knowledge. Poster Presented at the CUNY Conference on Sentence Processing, Boston, MA. Smith, V. L., & Clark, H. H. (1993). On the course of answering questions. *Journal of Memory and Language, 32*, 25– 38. Swerts, M., & Krahmer, E. (2005). Audiovisual prosody and feeling of knowing. *Journal of Memory and Language, 53(1)*, 81–94.