



FORMAL SEMANTIC APPROACHES TO SOCIOPHONETIC VARIATION

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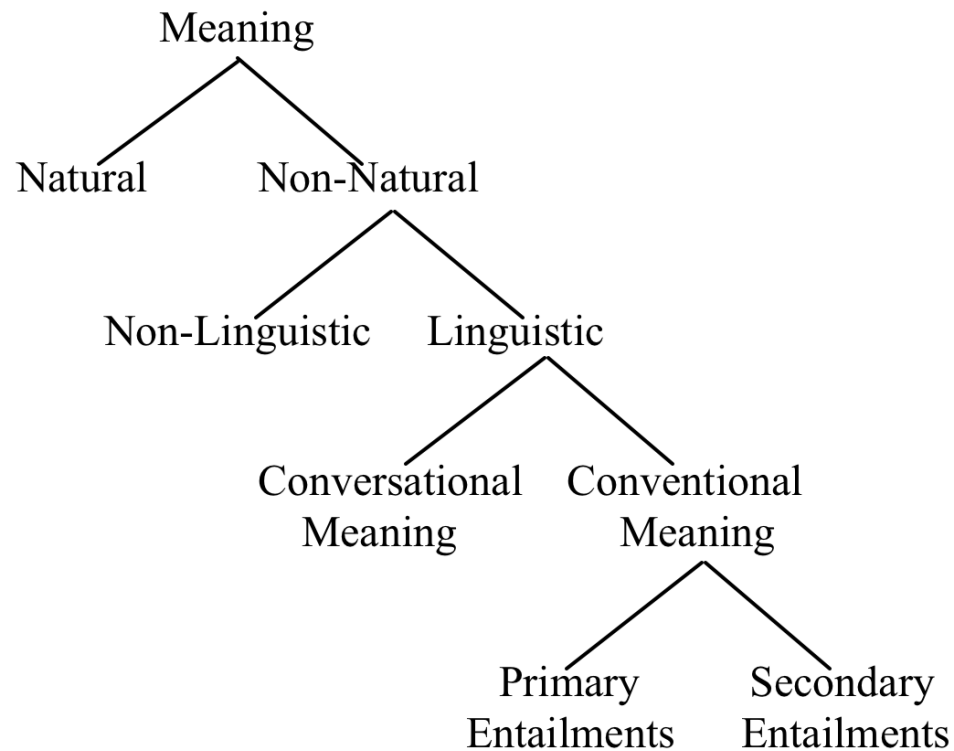
RESEARCH QUESTIONS

- Do sociolinguistic meanings and semantic meanings have anything in common?
 - If so, what?
- Could the kinds of distinctions that semanticists make among kinds of meaning – and the tools they have developed to test those distinctions – be made useful as resources for investigating sociolinguistic meaning?
 - If so, how?

GENERAL APPROACH

- Take tests used in semantics for classifying some types of meanings that are intuitively relevant for sociolinguistic meaning.
- Modify those tests so that they can be applied to sociophonetic (and hopefully, many other) meanings.
- Test the new paradigm with semantic data to make sure it works as expected.
- Extend the paradigm to sociophonetic variables to see to what extent they follow the same patterns.
- Control for some of the interferences there are in trying to interpret sociolinguistic meanings.

A POSSIBLE CLASSIFICATION OF MEANING



SEMANTIC TESTS FOR MEANING

- Dependent on the logical relationships between sentences
- Usually evaluated in a formal paradigm
- **Entailment** is a relationship between the meanings of two sentences. If one sentence is necessarily true whenever the other is, the first sentence is entailed by the other sentence.

ENTAILMENT

(1) Three students passed the test.

(2) At least one student passed the test.

(3) Three students ate ice cream.

- Sentence (1) entails sentence (2).
- Sentence (1) does not entail sentence (3).
- Different patterns of entailment distinguish different kinds of meaning.

EXAMPLES OF PRIMARY AND SECONDARY ENTAILMENTS

(4) Kathleen, a phonologist, stopped studying syntax.

- Primary entailment:
 - Kathleen stopped studying syntax.
- Secondary entailments:
 - Kathleen once studied syntax. (Presupposition)
 - Kathleen is a phonologist. (Conventional Implicature)
 - Kathleen exists. (Presupposition)
- These meanings are all entailments of (4).

EXAMPLES OF PRIMARY AND SECONDARY ENTAILMENTS

Here's another way of looking at this:

- “Sociolinguistics is awesome” is an entailment of each of the three following sentences, but it is primary in the first and secondary in the others:
 - 5) Sociolinguistics is awesome.
 - 6) Ben knows that sociolinguistics is awesome.
 - 7) Sociolinguistics, which is awesome, is my favorite subject.
- How do we know?

TESTS TO DISTINGUISH PRIMARY AND SECONDARY ENTAILMENTS

- There are a number of tests used to distinguish primary and secondary entailments.
- Focus today: Family of Sentences Tests (Frege 1896; Chierchia & McConnell-Ginet 1990)

NEGATION AS A TEST

- Begin with two sentences' meanings, one of which is entailed by the other (A entails B).
- We're asking whether that entailed meaning (B) is a primary or secondary entailment of A.
- For the test, negate the sentence that entails the other (A) and ask whether B is still entailed by the negated version of A.
- If 'yes', then B is a secondary entailment of A (and a secondary entailment of negated A).
- If 'no', then B is a primary entailment of A (and not entailed by the negated version of A at all).

NEGATION AS A TEST

Primary Entailment Example:

- Two sentences; the meaning of A entails the meaning of B:
 - A: Sociolinguistics is awesome.
 - B: Sociolinguistics is awesome.
- Question: Is B a primary or secondary entailment of A?
- Negated-A: Sociolinguistics is not awesome.
- Is B still entailed by the negated version of A?
- No! Therefore, it is a primary entailment of A, and not an entailment of negated-A.

NEGATION AS A TEST

Secondary Entailment Example:

- Two sentences; the meaning of A entails the meaning of B:
 - A: Ben knows that sociolinguistics is awesome.
 - B: Sociolinguistics is awesome.
- Question: Is B a primary or secondary entailment of A?
- Negated-A: Ben doesn't know that sociolinguistics is awesome.
- Is B still entailed by the negated version of A?
- Yes! Therefore, it is a secondary entailment of A, and also a secondary entailment of negated-A.

QUESTIONING AS A TEST

- Begin with two sentences' meanings, one of which is entailed by the other (A entails B).
- We're asking whether that entailed meaning (B) is a primary or secondary entailment of A.
- For the test, question the sentence that entails the other (A) and ask whether B is still entailed by the questioned version of A.
- If 'yes', then B is a secondary entailment of A (and a secondary entailment of questioned A).
- If 'no', then B is a primary entailment of A (and not entailed by the questioned version of A).

QUESTIONING AS A TEST

Primary Entailment Example:

- Two sentences; the meaning of A entails the meaning of B:
 - A: Sociolinguistics is awesome.
 - B: Sociolinguistics is awesome.
- Is B a primary or secondary entailment of A?
- Questioned-A: Is sociolinguistics awesome?
- Is B still entailed by the questioned version of A?
- No! Therefore, it is a primary entailment of A, and not an entailment of questioned-A. (It could be true if the answer to questioned-A is “yes,” but crucially it is not *necessarily* true.)

QUESTIONING AS A TEST

Secondary Entailment Example:

- Two sentences; the meaning of A entails the meaning of B:
 - A: Ben knows that sociolinguistics is awesome.
 - B: Sociolinguistics is awesome.
- Is B a primary or secondary entailment of A?
- Questioned-A: Does Ben know that sociolinguistics is awesome?
- Is B still entailed by the questioned version of A?
- Yes! Therefore, it is a secondary entailment of A, and also a secondary entailment of questioned-A.

HOW TO EXTEND THE FOS TESTS TO SOCIOLINGUISTICS

- Methods used in semantics include:
 - consulting your own intuitions
 - experimentally testing something about meaning
- Methods used in sociolinguistics include:
 - ethnographic interviews/surveys
 - experimentally testing something about variation
- Thus, we feel that the best common ground would be an experimental paradigm that tests both lexical and sociophonetic meanings so that they can be compared directly.
- What follows is our attempt to do this.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

- Though some studies have been conducted on when people draw inferences (e.g., Tversky & Kahneman 1983; Politzer 2007), none have investigated primary vs. secondary entailments.
- Given that there's no standard in this area, we tried to design an experimental paradigm that could apply to both semantic and sociolinguistic (and potentially any) kinds of meaning.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

- As we saw before, an entailment can be primary or secondary.
- We saw that both primary and secondary entailments are entailed by basic (positive, simple) sentences.
- We also saw that secondary entailments are entailed by FoS environments (negation, questioning, etc.), but that primary entailments are not.
- Thus, in this experiment, we have two kinds of stimuli (primary and secondary entailments) and two kinds of environments (basic and FoS).

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

Basic Example:

- Entailment being tested: “Sociolinguistics is awesome.”
- “Basic” environment:
 - Primary entailment stimulus: “Sociolinguistics is awesome.”
 - Secondary entailment stimulus: “Ben knows that sociolinguistics is awesome.”
- In both of these stimuli, the stimulus is an “A” sentence and the entailment being tested is a “B” sentence.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

FoS Example:

- Entailment being tested: “Sociolinguistics is awesome.”
- “FoS” environment (Negation):
 - Primary entailment stimulus: “Sociolinguistics is not awesome.”
 - Secondary entailment stimulus: “Ben doesn’t know that sociolinguistics is awesome.”
- In both of these stimuli, the stimulus is a “negated-A” sentence and the entailment being tested is a “B” sentence.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

Procedure:

- Used an on-line survey of native speakers of Minnesotan English
- Participants heard an audio stimulus of a sentence.
 - e.g., “Eunique knows that a paper has to be at least 10 pages long.”
- They were then asked a follow-up question designed to determine how they interpreted the entailments of that sentence.
 - e.g., “How surprised would you be to learn that a paper has to be at least 10 pages long?”
 - Entailment tested: “A paper has to be at least 10 pages long.”
- Participants rated their surprise level on a scale from 1-5, with 1 being “very surprised.”

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

- Each stimulus was followed by three “How surprised would you be to learn ...?” questions.
 - One asked about the entailment itself.
 - One asked about something else in the sentence.
 - One asked about something in the real world tangentially related to the sentence.
- These extra questions were designed to draw attention away from the question of interest and to help us judge how well participants were paying attention.
- Filler questions were counterbalanced in their predicted surprise levels to elicit a wide use of the scale.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

Basic Example:

- Entailment being tested: “A paper has to be at least 10 pages long.”
- “Basic” environment:
 - Primary entailment stimulus: “A paper has to be at least 10 pages long.”
 - How surprised would you be to learn that a paper has to be at least 10 pages long?
 - Expected surprise level: **Low**
 - Secondary entailment stimulus: “Eunique knows that a paper has to be at least 10 pages long.”
 - How surprised would you be to learn that a paper has to be at least 10 pages long?
 - Expected surprise level: **Low**

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

FoS Example (negation):

- Entailment being tested: “The president is on vacation.”
- “FoS” environment (negation):
 - Primary entailment stimulus: “The president isn’t on vacation.”
 - How surprised would you be to learn that the president is on vacation?
 - Expected surprise level: **High**
 - Secondary entailment stimulus: “The cabinet doesn't know that the president is on vacation.”
 - How surprised would you be to learn that the president is on vacation?
 - Expected surprise level: **Low**

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

FoS Example (questioning):

- Entailment being tested: “Juan is going home.”
- “FoS” environment (questioning):
 - Primary entailment stimulus: “Is Juan going home?”
 - How surprised would you be to learn Juan is going home?
 - Expected surprise level: **Not necessarily low**
 - Secondary entailment stimulus: “Did you know that Juan is going home?”
 - How surprised would you be to learn that Juan is going home?
 - Expected surprise level: **Low**

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

Predictions:

- For basic environments, surprise levels should be the *same* across the two kinds of stimuli.
- For FoS environments, surprise levels should *differ* across the two kinds of stimuli.
 - For negation FoS environments, surprise levels should be on opposite ends of the scale for the two kinds of stimuli.
 - For questioning FoS environments (and other FoS environments), surprise levels are predicted to be more variable for primary entailment stimuli than secondary entailment stimuli.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

- Question: “How surprised would you be that X?” (Positive Polarity)

Environment	Primary Entailment Stimulus	Secondary Entailment Stimulus
Basic	Not surprised	Not surprised
FoS	Surprised / variable	Not surprised

- Question: “How surprised would you be that not-X?” (Negative Polarity)

Environment	Primary Entailment Stimulus	Secondary Entailment Stimulus
Basic	Surprised	Surprised
FoS	Not surprised / variable	Surprised

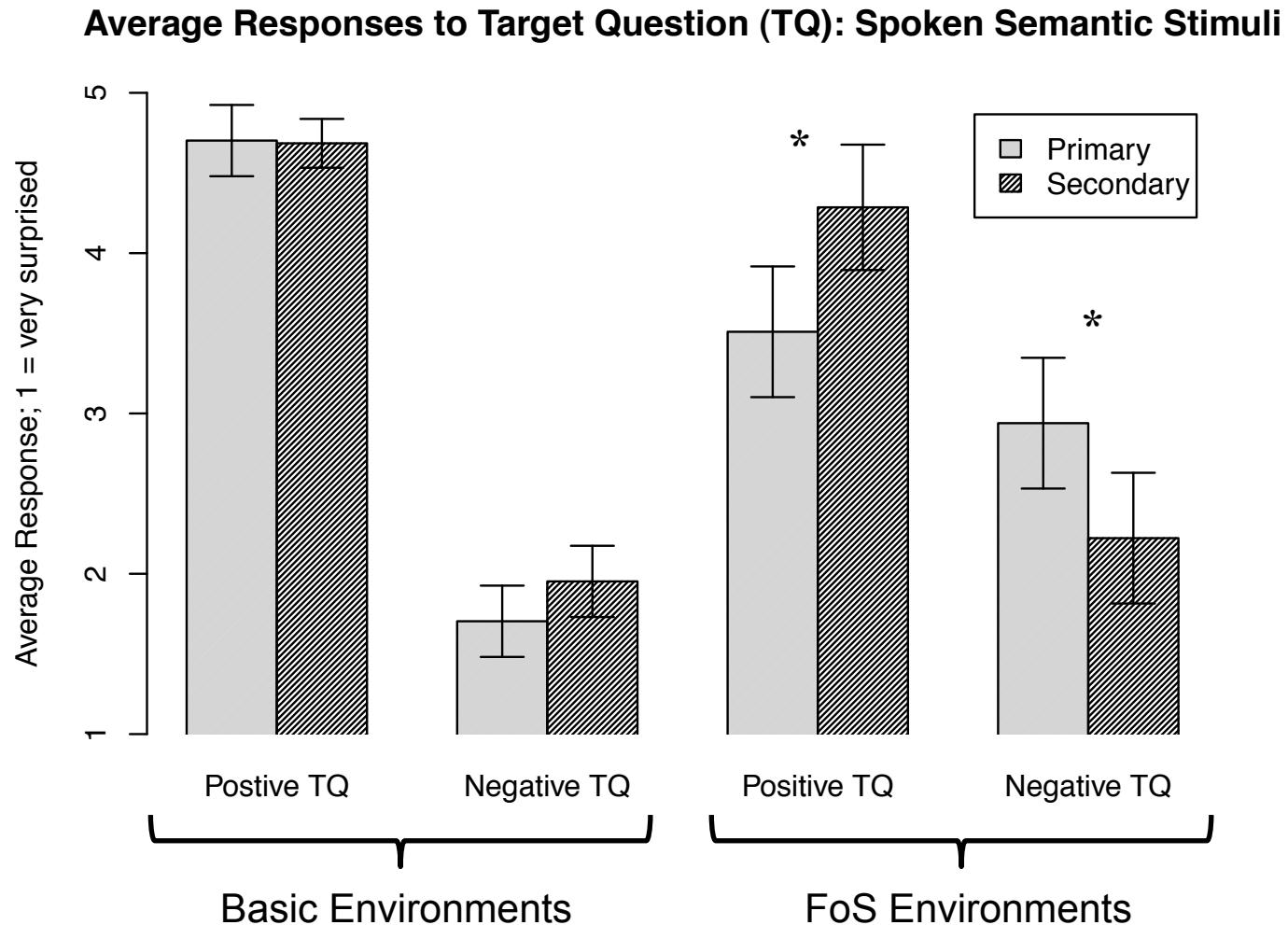
EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

- There were 36 basic and 44 FoS environments.
- There were also 10 filler sentences.
- There were two overall versions of the same survey. (90 stimuli total per survey)
- Each version had half primary stimuli and half secondary stimuli.
- The two versions complemented each other in terms of which kind of stimuli participants heard.
 - E.g., where one version had “Is Juan going home?” (primary), the other had “Did you know that Juan is going home?” (secondary).
- Both versions had the same follow-up questions.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS

- The stimuli were recorded by 5 trained linguists, 2 male and 3 female.
- Each talker recorded both the primary entailment and secondary entailment versions of the stimuli they produced so that there were not talker differences across the two versions of the survey.
- Stimuli were pseudo-randomized to ensure that stimuli recorded by the same talker were well mixed.
- The randomization of the two versions of the survey were the same.

EXPERIMENT: IMPLEMENTING THE FOS TESTS IN SEMANTICS



SUMMARY

- Formal semantics uses entailment to distinguish kinds of meaning.
- One important distinction is between “primary” entailments and “secondary” entailments, which can be distinguished using the Family of Sentences tests.
- The FoS tests can be implemented experimentally, and the results of applying them to typical semantic data are as predicted – that is, naïve language users distinguish between primary and secondary entailments in expected ways.

APPLICATION

- Once an experimental paradigm for the distinction between primary and secondary entailments is established, it can be applied to other types of meaning.
- Of particular interest is its application to social meanings: do the meanings of sociophonetic variables have any properties in common with primary entailments or secondary entailments?
- Similar questions can be asked and methodology used to compare other types of meaning to other categories of meaning.

REFERENCES CITED

- Chierchia, Gennaro, and Sally McConnell-Ginet. 1990. *Meaning and grammar: An introduction to semantics*. Cambridge, MA: MIT Press.
- Frege, Gottlob. 1896. Letter to Peano. In Gottlob Frege (ed.), *Philosophical and Mathematical Correspondence*. Chicago: University of Chicago.
- Politzer, Guy. 2007. The psychological reality of classical quantifier entailment properties. *Journal of Semantics*, 24(4), 331-343.
- Tversky, Amos, and Daniel Kahneman. 1983. Extension versus intuitive reasoning: The conjunction fallacy in probability judgment. *Psychological Review*, 90(4), 293-315.

REFERENCES FOR OUR WORK

- Munson, Benjamin. 2007. The acoustic correlates of perceived sexual orientation, perceived masculinity, and perceived femininity. *Language and Speech* 50(1): 125-142.
- Munson, Benjamin, Sarah Jefferson & Elizabeth McDonald. 2006. The influence of perceived sexual orientation on fricative identification. *Journal of the Acoustical Society of America* 119: 2427-2437.
- Munson, Benjamin, Elizabeth McDonald, Nancy DeBoe & Aubrey White. 2006. Acoustic and perceptual bases of judgments of women and men's sexual orientation from read speech. *Journal of Phonetics* 34: 202-240.
- Munson, Benjamin & Lindsey Zimmerman. 2006. The perception of sexual orientation, masculinity, and femininity in formant-resynthesized speech. Paper presented at NWA V, Columbus, OH.
- Munson, Benjamin, Kathleen Currie Hall, and E. Allyn Smith. 2009. *An acoustic analysis of /ae/ variation and its relationship with perceived sexual orientation*. Paper presented at the 157th Meeting of the Acoustical Society of America, Portland, OR.
- Smith, E. Allyn, Kathleen Currie Hall, & Benjamin Munson. (2010). Bringing semantics to sociophonetics: Social variables and secondary entailments. *Laboratory Phonology*, 1(1), 121-155.
- Smith, E. Allyn, Benjamin Munson, and Kathleen Currie Hall. 2008. *Rethinking the meaning of Minnesotan /ae/: Sexual orientation or personal well being?* Paper presented at New Ways of Analyzing Variation, Houston, TX.