

Great Expectations: weighting expectancy when processing degraded speech

Katherine M. Simeon¹, Klinton Bicknell², Tina M. Grieco-Calub¹

Northwestern University

¹Department of Communication Sciences & Disorders

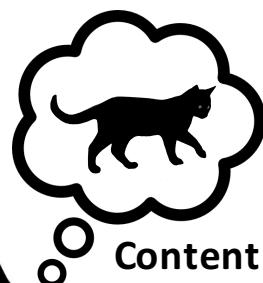
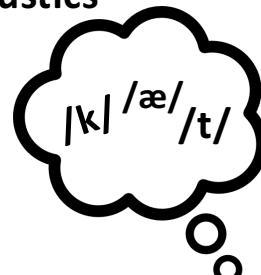
²Department of Linguistics

Linguistic Society of America Annual Meeting

Austin, TX – January 8, 2017



Acoustics



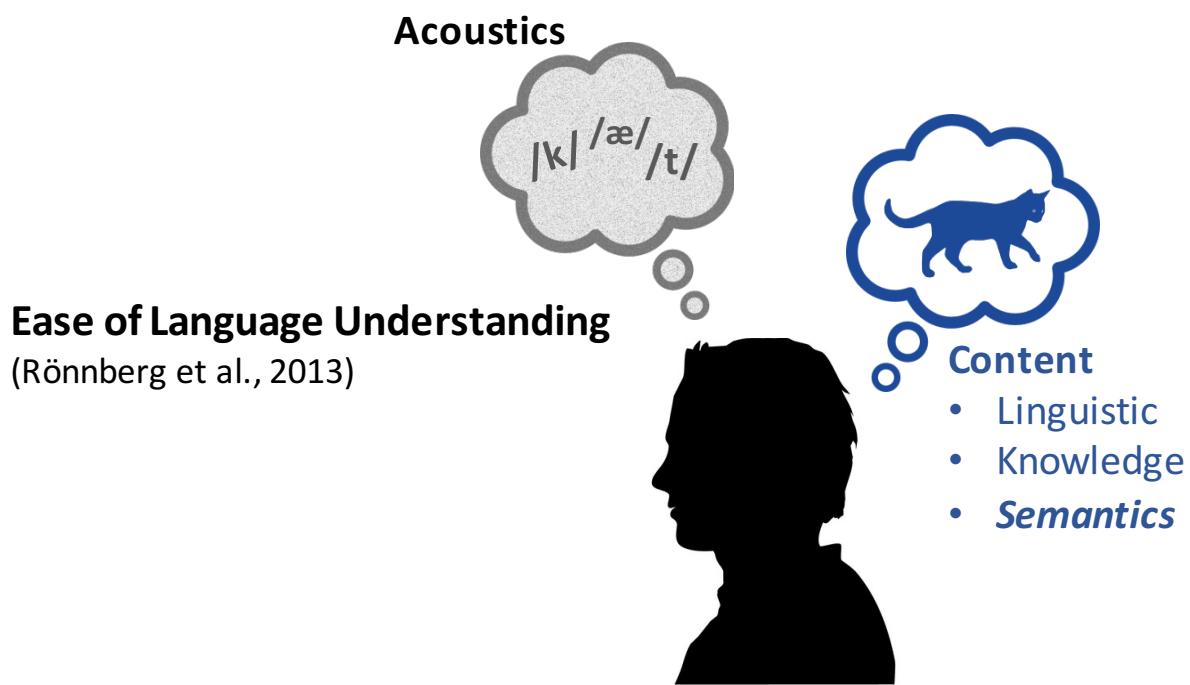
Content

- Linguistic
- Knowledge

Difficult listening conditions



Aydelott et al., 2006; Mattys et al., 2012; Rönnberg et al., 2013; Pichora-Fuller et al., 1995
Image sources: John Storey (SF Chronicle); Aram Boghosian (Boston Globe); Tasos Katopodis (AFP/Getty Images)



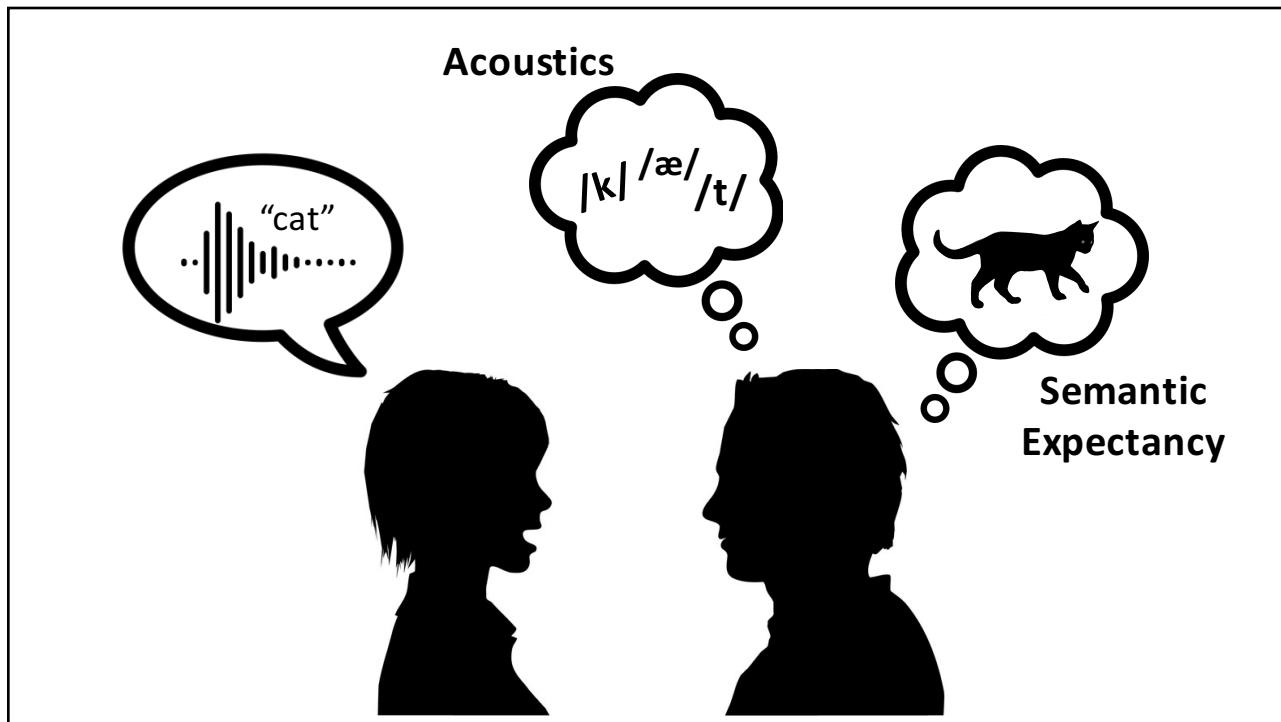
Semantic Expectancy

Surrounding linguistic information that influences the interpretation of speech

The boy hits the ball with the bat.

The boy looks at the bat.

Bloom & Fischler, 1980; Block & Baldwin 2010



How do we weight acoustics & expectancy?

Semantic expectancy is advantageous in difficult listening conditions

Age-related differences

- Older individuals benefit the most from semantic expectancy
- Younger individuals benefit less from expectancy information

Fallon et al., 2002; Federmeier et al., 2002; Lash et al., 2013; Pichora-Fuller et al., 1995; Rönnberg et al., 2013; Winn, 2016

Research Questions

How do acoustics and expectancy information work together in spoken language processing?

→ How does this change based on the acoustic environment?

Methods: Expectancy Conditions

(1) Congruent Expectancy:

The boy hits the ball with the **bat**.

(2) Conflicting Expectancy:

The boy hits the ball with the **cat**.

(3) Neutral: The boy looks at the **bat/cat**.

Methods: SNR Conditions

Sentences overlaid with speech-shaped noise in different signal-to-noise ratios (SNR):

-12 dB SNR

-7 dB SNR

Quiet

Methods: Participants

- 24 young adults with normal hearing
- Monolingual English speakers

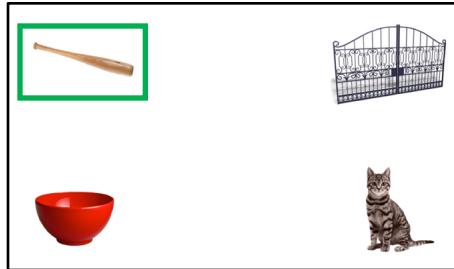


*“The boy hit the ball with the **bat/cat**”*



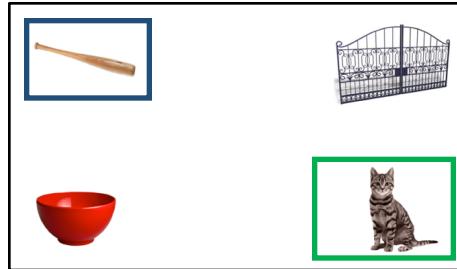
Predictions

Congruent



*"The boy hit the ball with
the bat"*

Conflicting



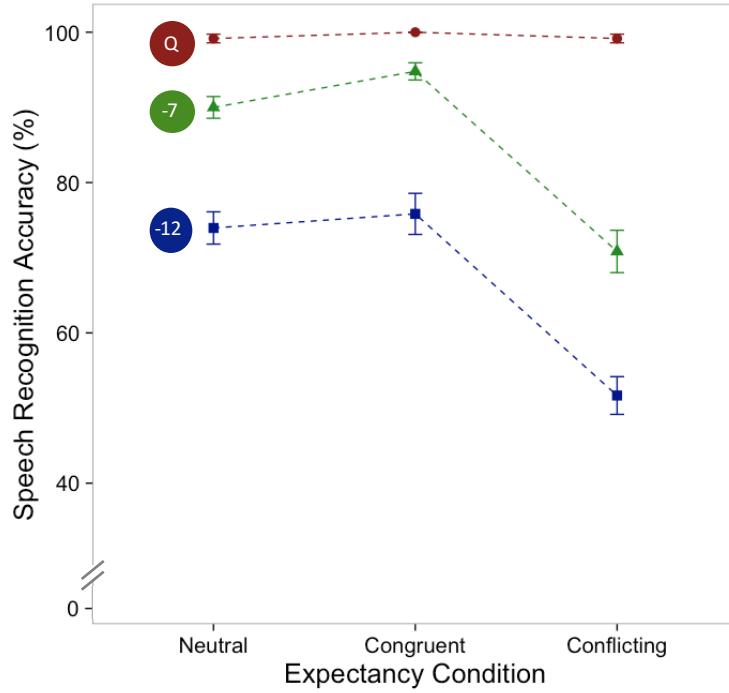
*"The boy hit the ball with
the cat"*

Task Accuracy ↑

Task Accuracy ↓

Accuracy

Better Performance ↑





Congruent Expectancy



Random

*"The boy hit the ball with the **bat**"*

Initial Phoneme Competitor



Rhyme Competitor



Conflicting Expectancy



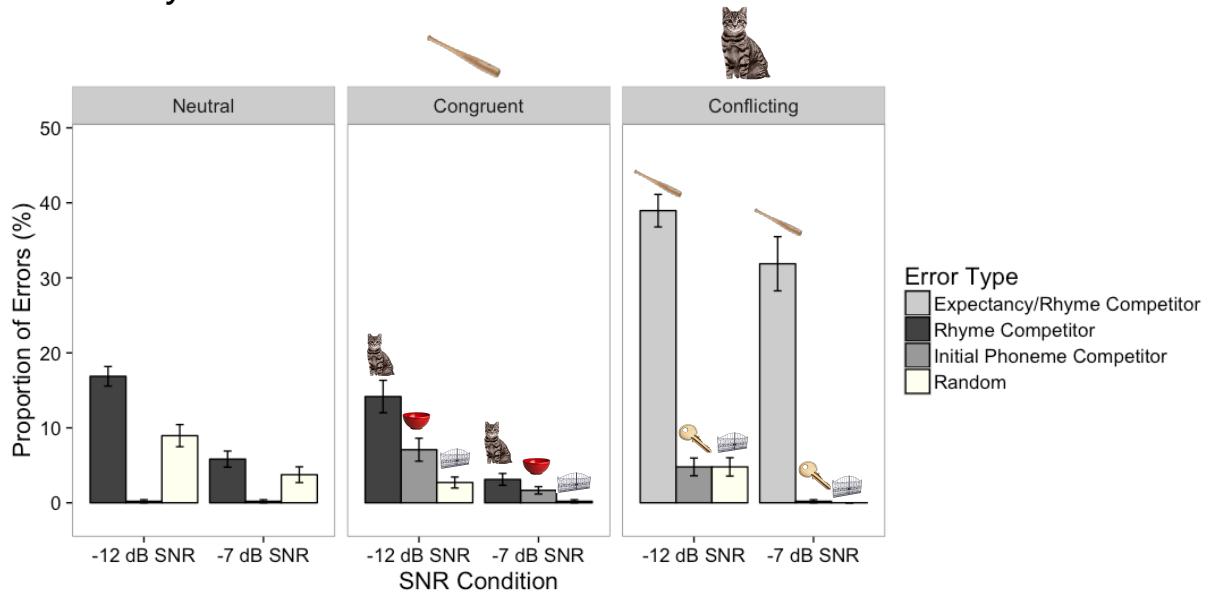
Random

*"The boy hit the ball with the **cat**"*

Initial Phoneme Competitor

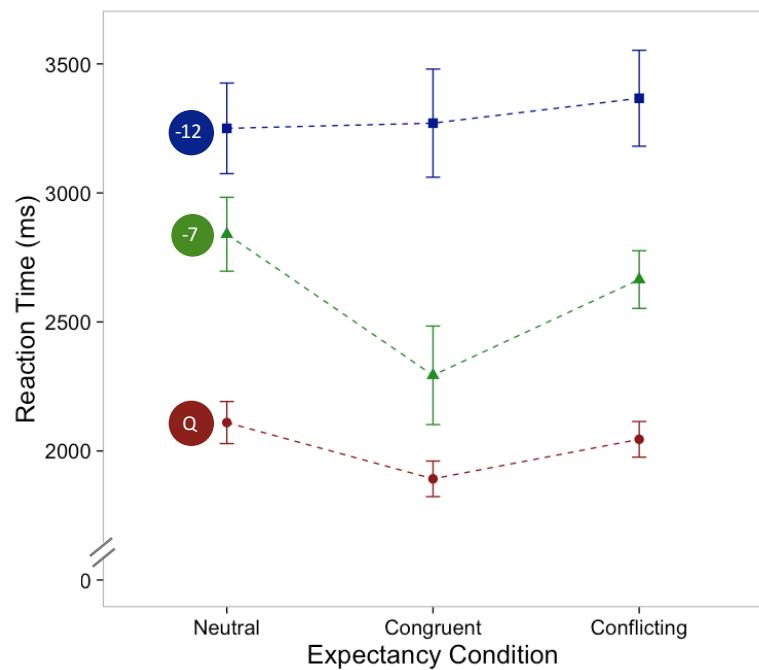


The boy hit the ball with the...



Reaction Time

Better/Faster

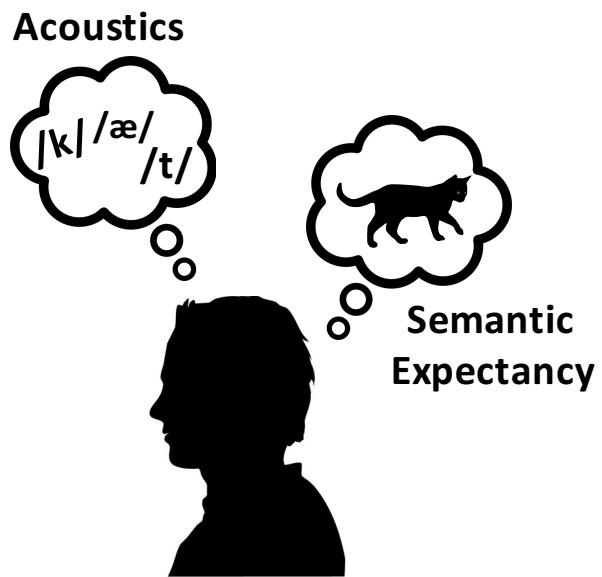


Summary

Expectancy information can help in poor acoustics

Majority of errors from selecting the Expectancy Competitor

Expectations can mislead listeners in background noise



Conclusions & Future Directions

Listeners increase their reliance on expectancy when acoustics are degraded

What happens in chronic degradation?

- E.g. Individuals with hearing loss

Thank You!

- Members of the Hearing & Language Lab
- Northwestern Cognitive Science Program

