Northwestern

Children's use of phonological & semantic information during spoken word recognition

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Speech processing is **active** & **incremental**

Jusczyk & Luce, 2002

/ɛ/	/lɛ/	/fə/	/ɛlɛfənt/
Elephant	Elephant	Elephant	
Elevator	Elevator	~~*Elevator*~~	
Egg	~~*Egg*~~	~~*Egg*~~	
Empty	~~*Empty*~~	~~*Empty*~~	
Echolocation	~~*Echolocation*~~	~~*Echolocation*~~	
Embers	~~*Embers*~~	~~*Embers*~~	

This process requires…

/ɛ/	/lɛ/	/fə/	/ɛlɛfənt/
Elephant	Elephant	Elephant	
Elevator	Elevator	~~Elevator~~	
Egg	~~Egg~~	~~Egg~~	
Empty	~~Empty~~	~~Empty~~	
Echolocation	~~Echolocation~~	~~Echolocation~~	
Embers	~~Embers~~	~~Embers~~	

This process requires…

Auditory Input

/ɛ/	/lɛ/	/fə/	/ɛlɛfənt/
Elephant	Elephant	Elephant	
Elevator	Elevator	~~Elevator~~	
Egg	~~Egg~~	~~Egg~~	
Empty	~~Empty~~	~~Empty~~	
Echolocation	~~Echolocation~~	~~Echolocation~~	
Embers	~~Embers~~	~~Embers~~	

This process requires…

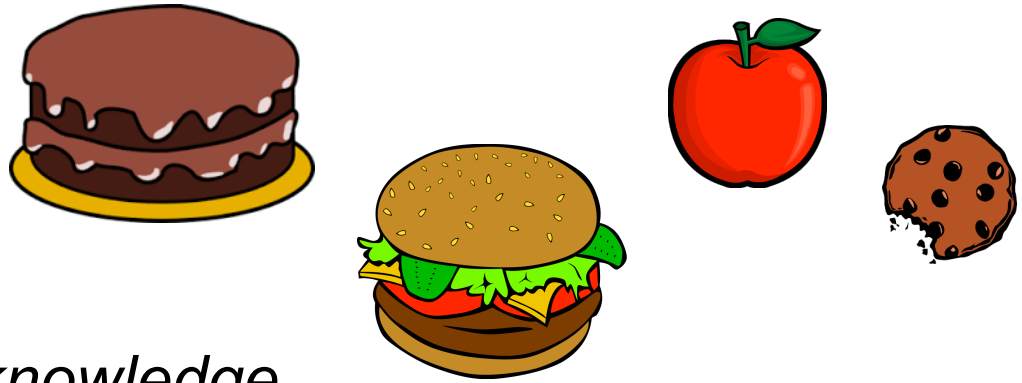
Auditory Input

Prior Knowledge

/ɛ/	/lɛ/	/fə/	/ɛlɛfənt/
Elephant	Elephant	Elephant	
Elevator	Elevator	~~Elevator~~	
Egg	~~Egg~~	~~Egg~~	
Empty	~~Empty~~	~~Empty~~	
Echolocation	~~Echolocation~~	~~Echolocation~~	
Embers	~~Embers~~	~~Embers~~	

Using prior knowledge

The boy **eats**

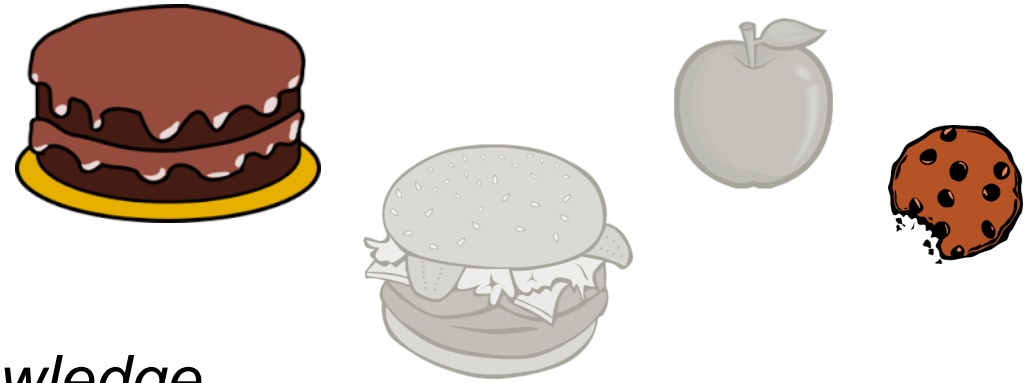


semantic *knowledge*

Kamide, 2008; Mani & Huettig, 2012

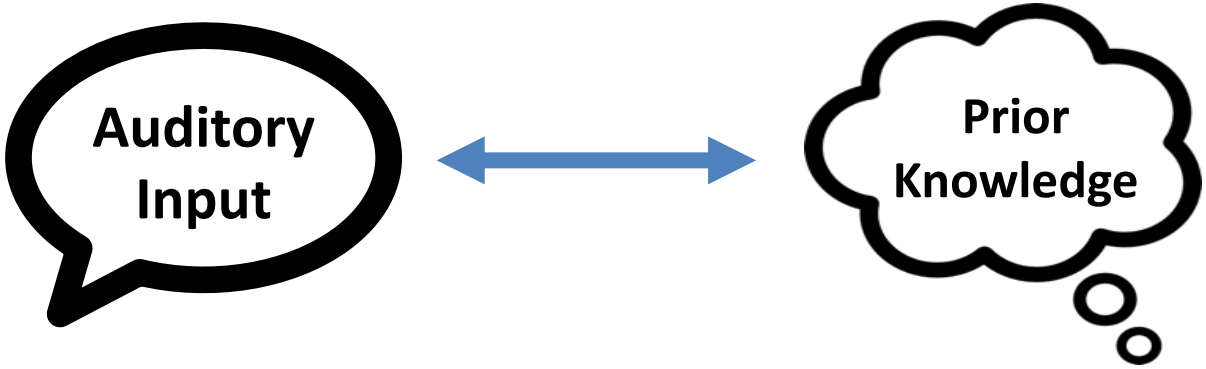
Using prior knowledge

The boy eats the **/k/**…



lexical *knowledge*

Kamide, 2008; Mani & Huettig, 2012



Phonological representations can:

- **Activate** potential candidates
- Result in **competition** amongst candidates

Semantic information can further **constrain** candidate set.

Allopenna, Magnuson, & Tanenhaus, 1998; Marslen-Wilson, 1987

Developing active processing

Skills develop with experience

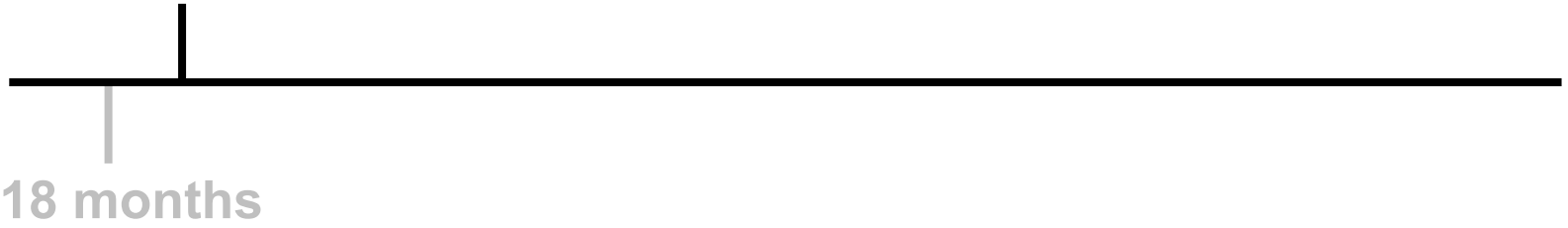
Developing active processing

18 months
Children can recognize a word from just the beginning phonetic segments

Fernald, Swingley, & Pinto (2001)

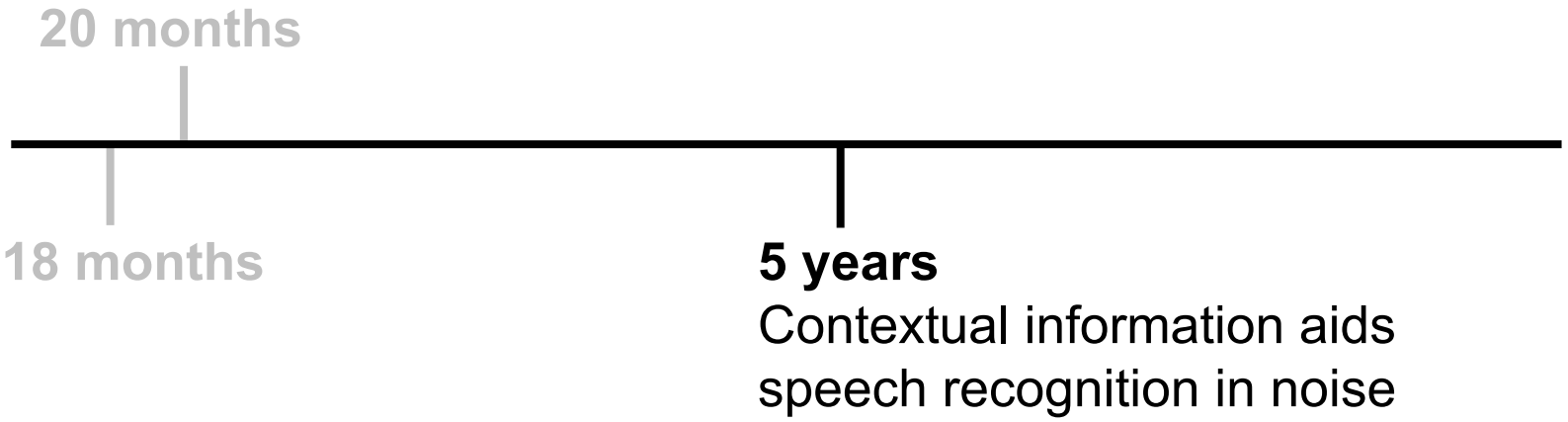
Developing active processing

20 months
Children can use coarticulation cues to anticipate words



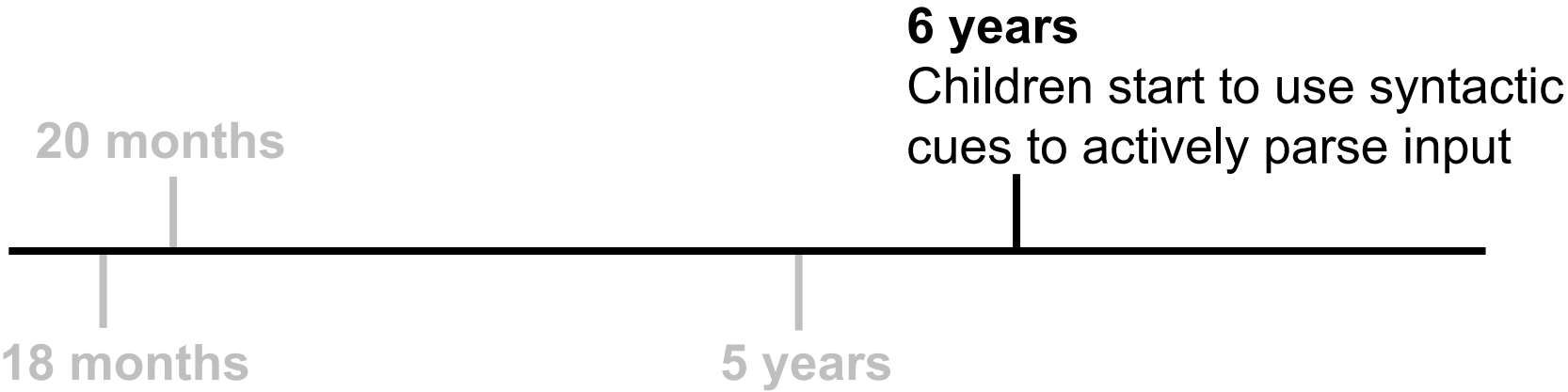
Mahr et al. (2015)

Developing active processing



Fallon, Trehub, & Schneider (2002)

Developing active processing



Atkinson, Wagers, Liz, Phillips, & Omaki (2018)

Developing active processing

Vocabulary

Experience that contributes to prior knowledge

Borovsky, Elman, & Fernald (2012); Borovsky, Ellis, Evans, & Elman (2016);
Graf Estes, Gluck, & Grimm (2016)

Research Questions

How does **phonological** and **semantic information** impact children's spoken word recognition?

- How do children respond to phonological competition?
- How do children use surrounding semantic information?
- How are these cues taken together?

Participants

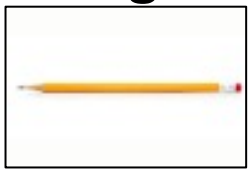
Children **6-10 years of age**

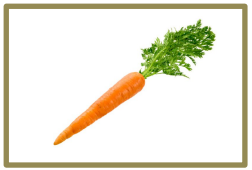
- N = 36 (M = 7.92)
- Normal Hearing
- Monolingual English speakers

Visual World Paradigm

Find the **pencil**

Target

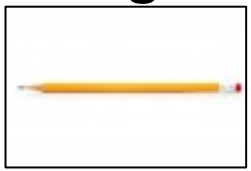


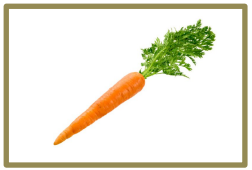


Competitor Conditions

Find the **pencil**

Target



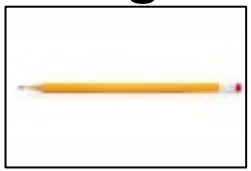


Unrelated
Distractor

Competitor Conditions

Find the **pencil**

Target



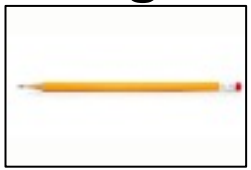
Phonological Onset

Semantically-Related Prime

Find the **pencil**

Prime

Target



Phonological Onset

Semantic Norming

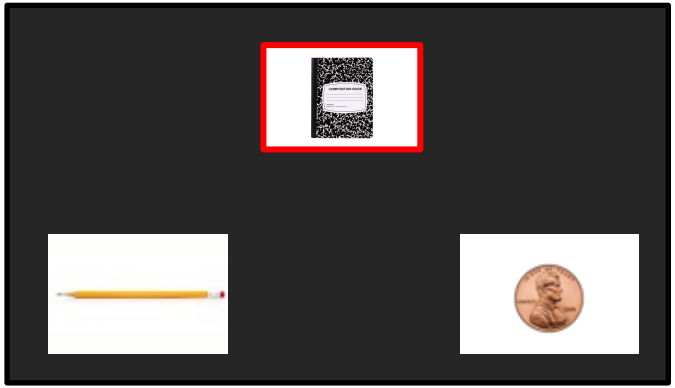
Participants:

Children 5-10 years of age

- N = 26
- Normal Hearing
- Monolingual English Speakers

Image Relatedness Task:

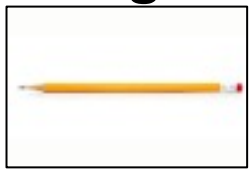
Required 90% agreement with the target image



Brysbaert & Biemiller (2017); Kuperman, Stadthagen-Gonzalez, & Brysbaert (2012)

Experimental Conditions

Find the **pencil**



Prime Conditions

- No Prime
- Prime (Semantically-related)

Competitor Conditions:

- Phonological Onset Overlap
- Unrelated Distractor

Outcome Variables

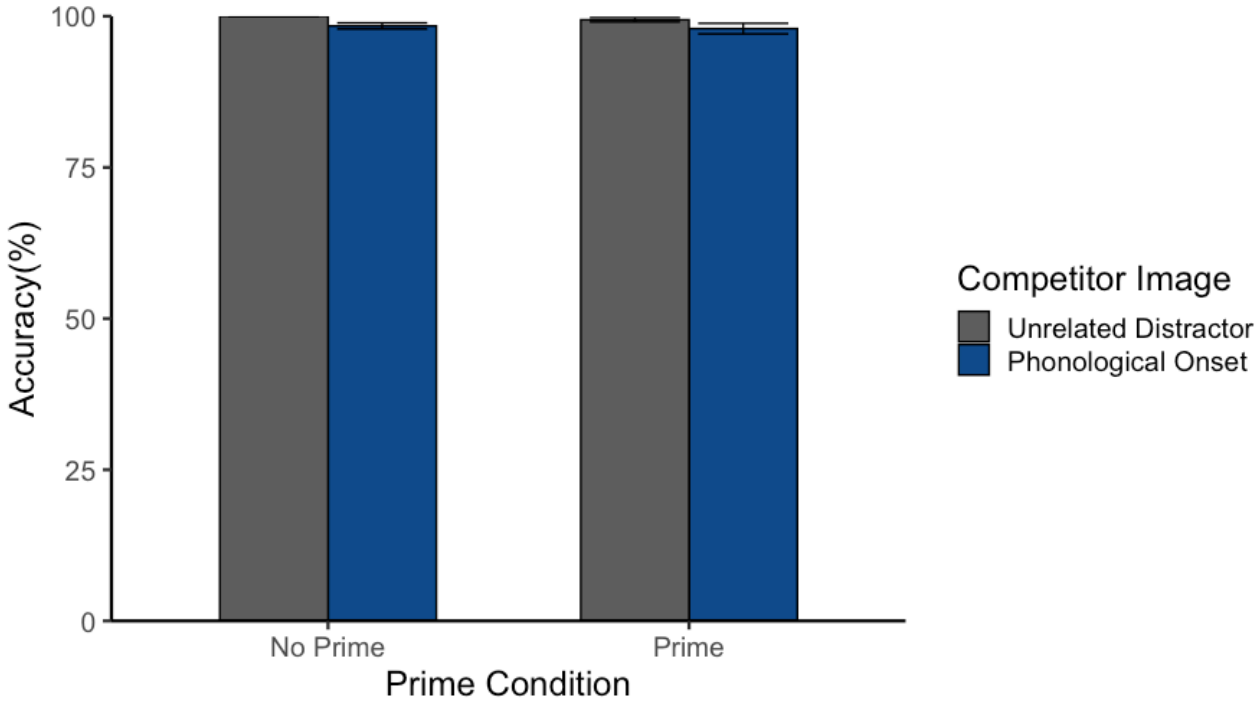
Two-Alternative Forced Choice Task

- Selection Accuracy

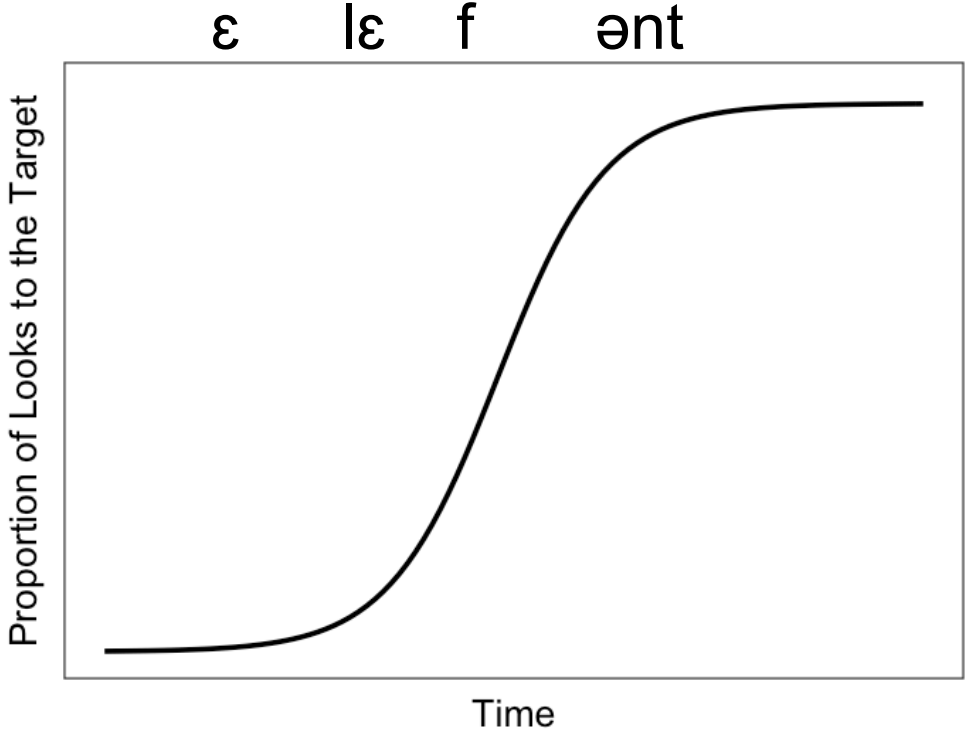
Eye Tracking Task

- Proportion of looks to the target image over time
- Speed of looking to the target

Selection Accuracy



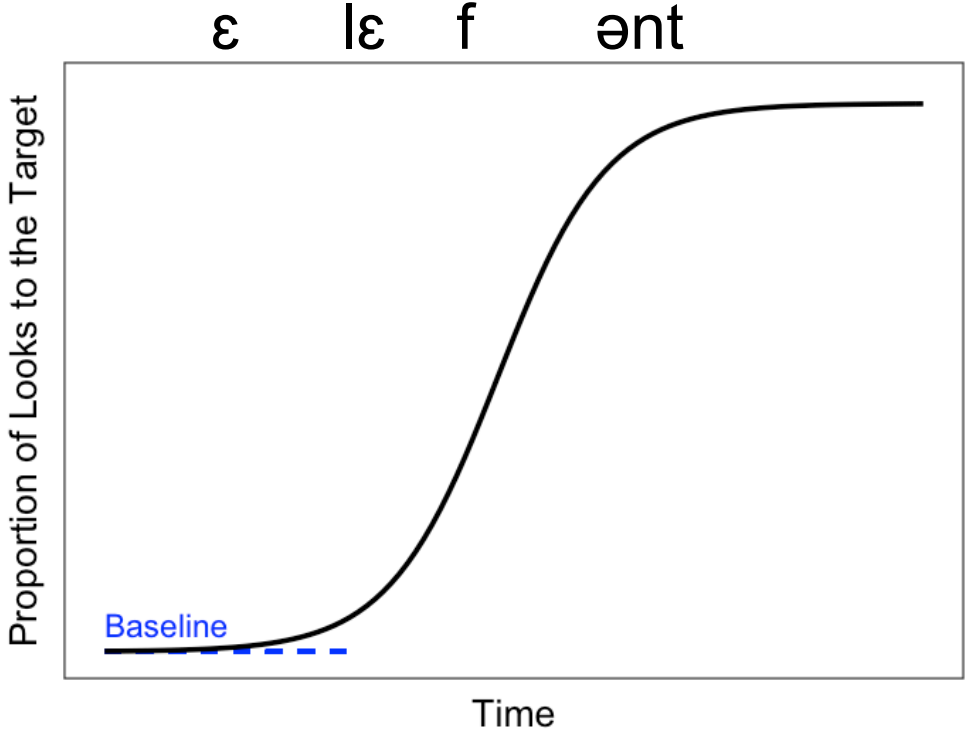
Time course of spoken word recognition



Looks to the target image **over time**

Time is relative to the **onset of the target word**

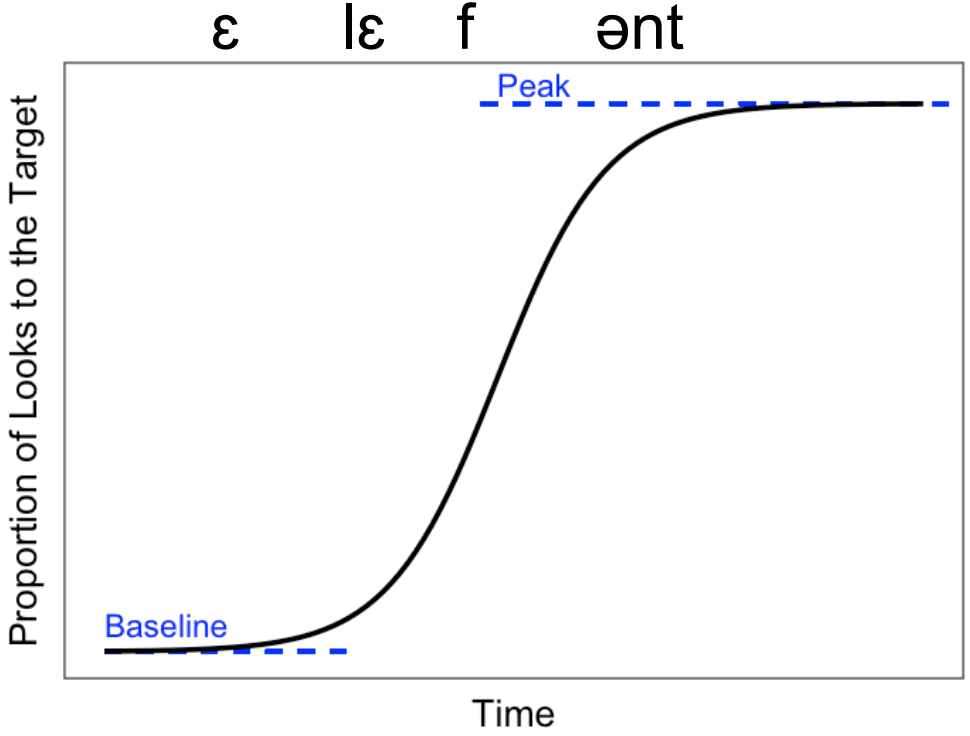
Time course of spoken word recognition



Looks before the onset of the target word

McMurray (2019)

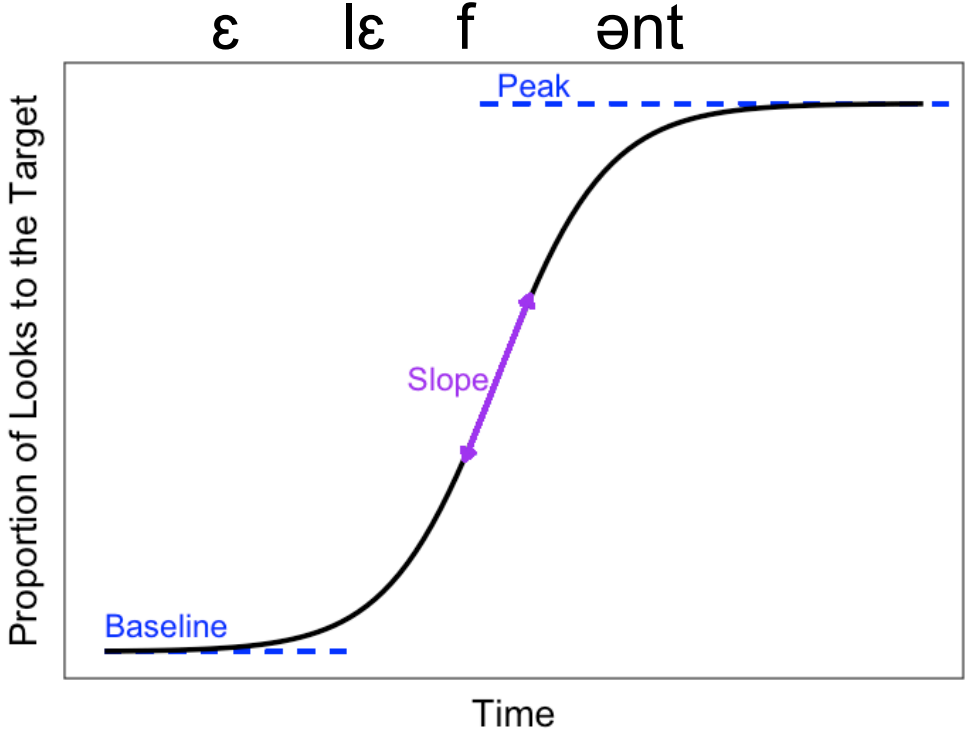
Time course of spoken word recognition



When looks to the listener commits to a target image

McMurray (2019)

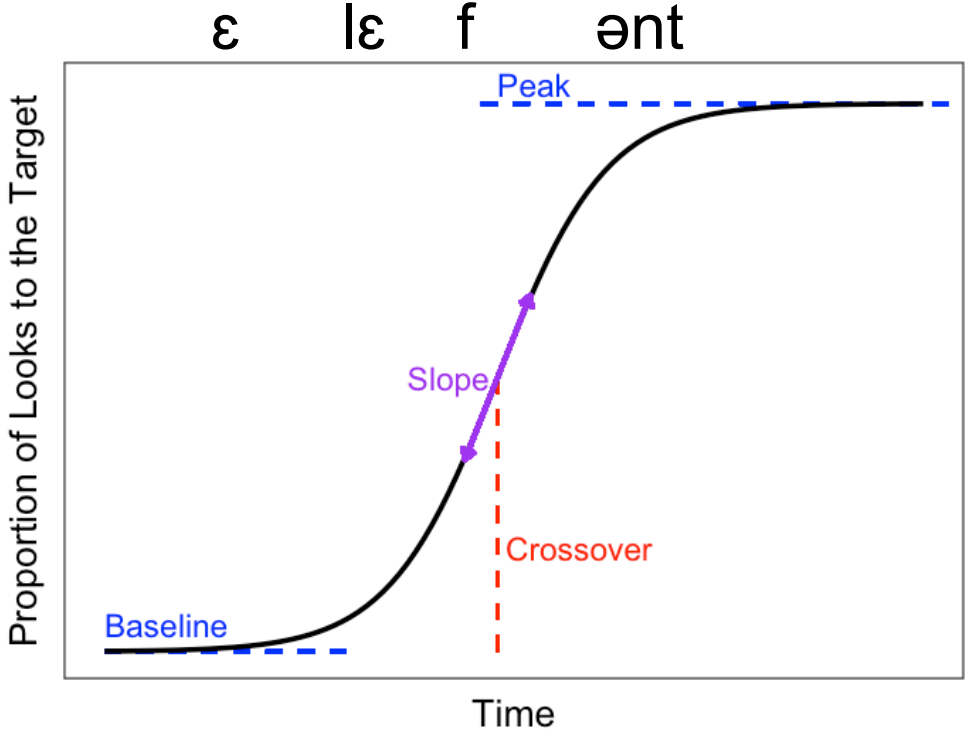
Time course of spoken word recognition



Speed of looking to the target

McMurray (2019)

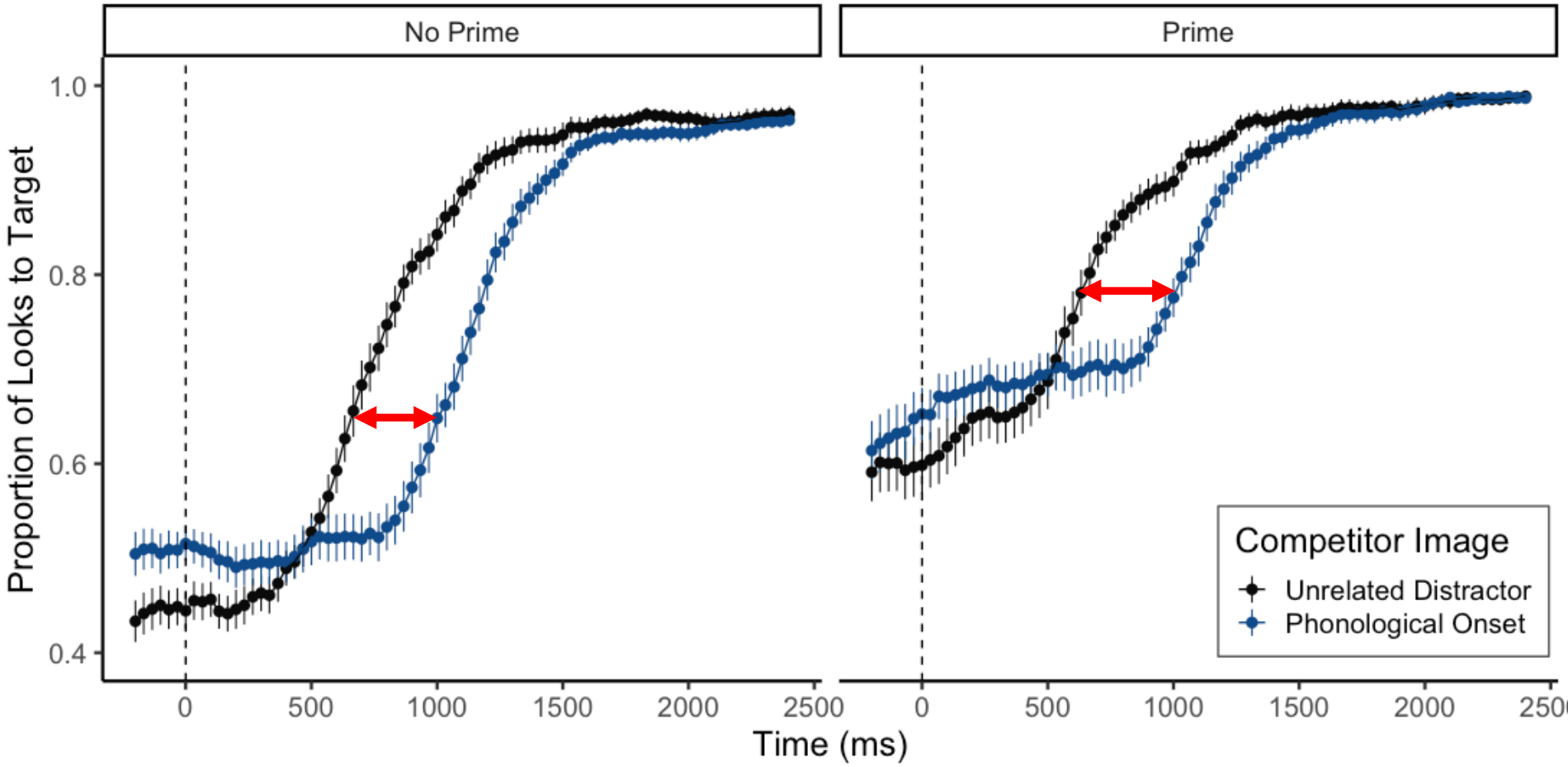
Time course of spoken word recognition



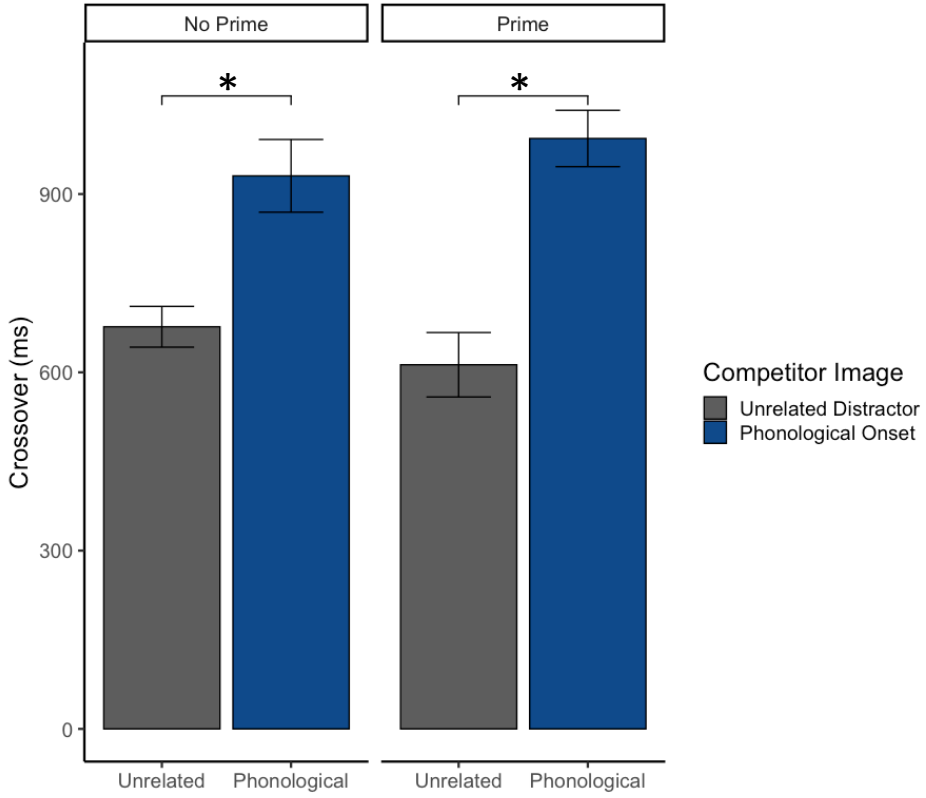
The midpoint between the baseline and peak

McMurray (2019)

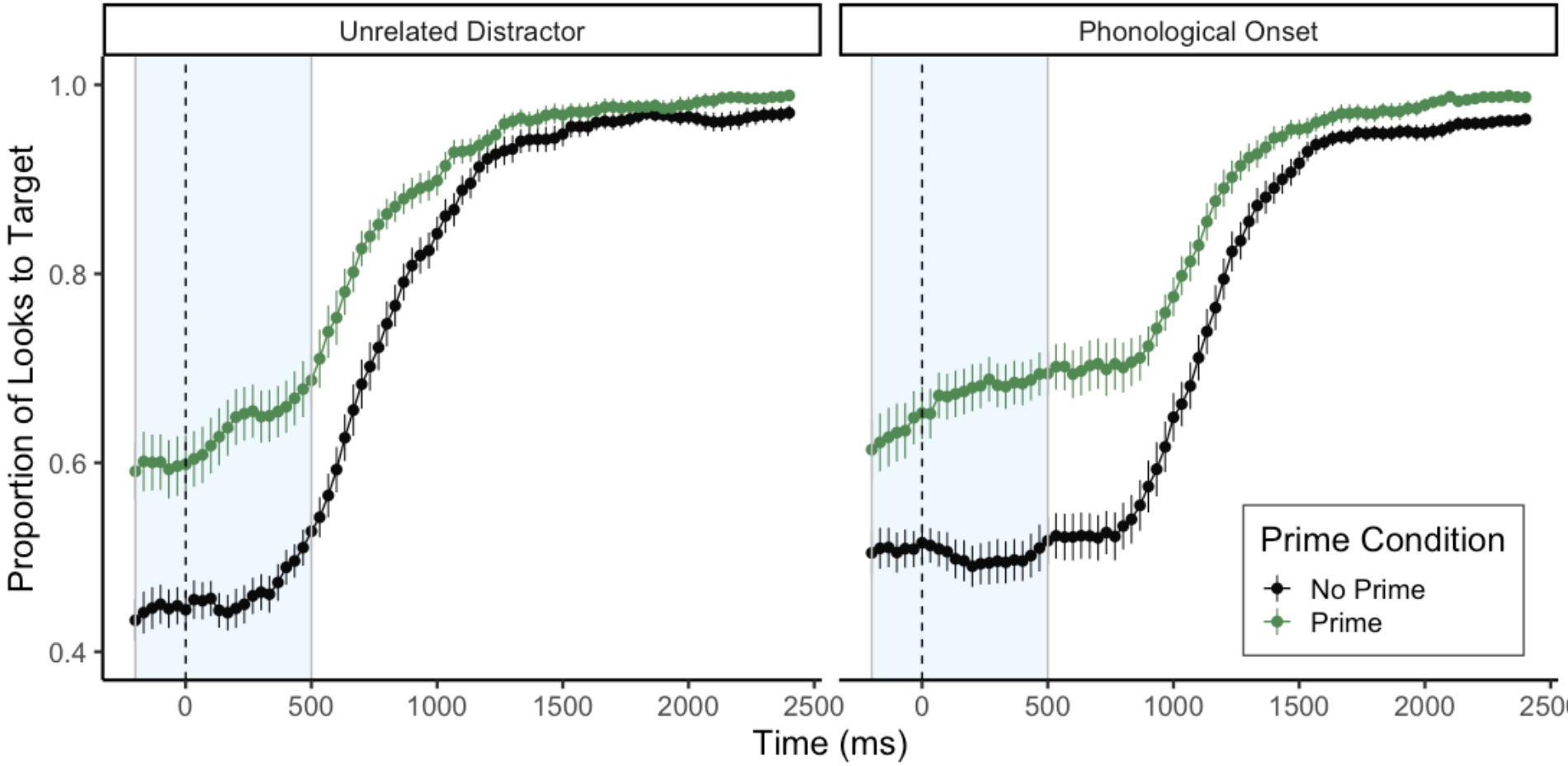
Phonological onset overlap result in later looks to the target



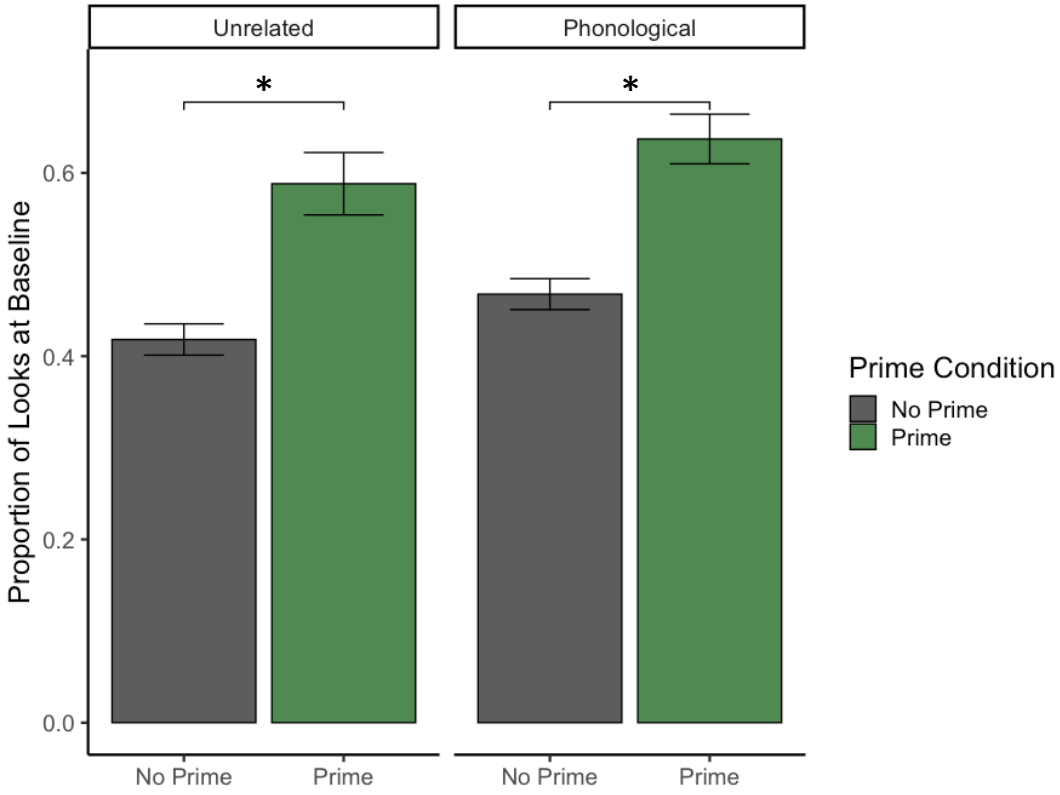
Phonological onset overlap result in later looks to the target

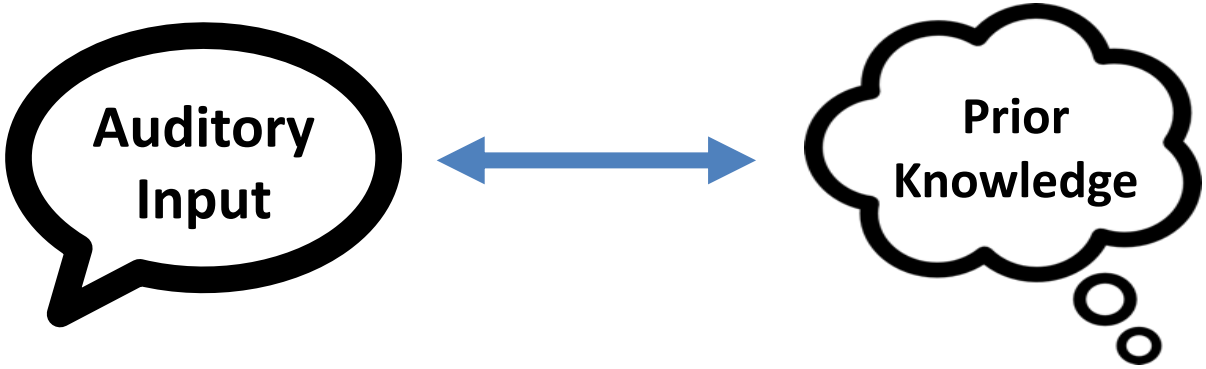


Semantic primes increase initial looks to the target

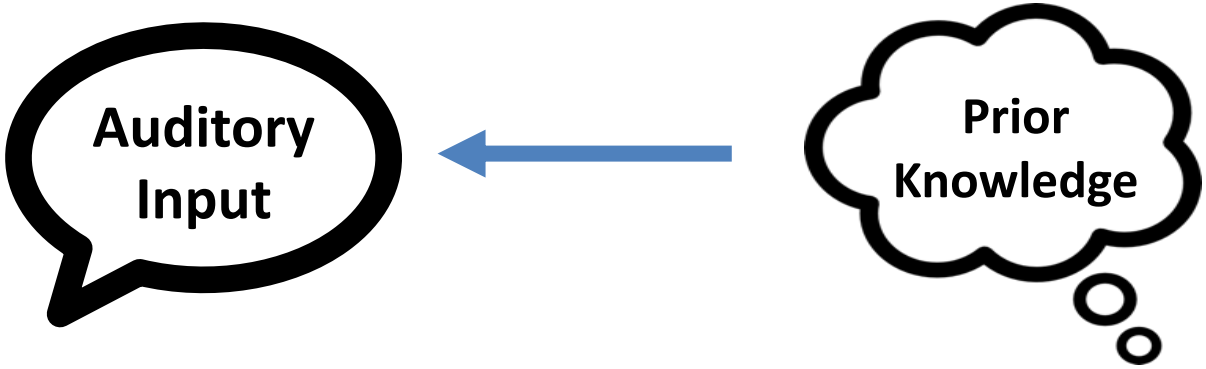


Semantic primes increase initial looks to the target





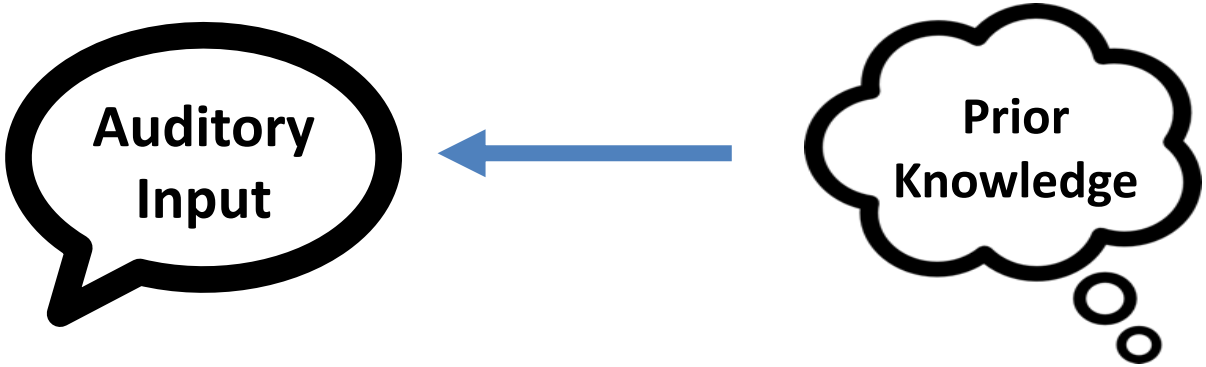
Children are sensitive to **phonological competition**



Semantic priming can facilitate spoken word recognition.

However, image primes do not get rid of phonological competition completely.

What is the semantic prime doing?



Facilitates a bias to the semantically-related image

However, semantic relations are not sufficient to commit to the target image.

Sheldon & Martin (1992)

Future Directions

How does **age** impact phonological competition and semantic relations?

How does **acoustic degradation** impact this process?

Acknowledgments

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- Tristan Mahr

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