Inhibition predicts lexical competition in older adults' spoken word recognition

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Introduction

- With age, perceptual sensitivity to certain phonetic contrasts decreases (Anderson et al., 2012) and uncertainty becomes more pronounced in speech perception
  - Becomes harder to inhibit similar-sounding high frequency lexical competitors (Revill & Spieler, 2012)
- Inhibitory deficits suggested to play a role in older adults' speech perception difficulties (Hasher & Zacks, 1988)
  - McMurray et al. (2014) found increased lexical competition, not perception deficit, in adolescents with SLI

Research Questions

Do older and younger adults differ in their sensitivity to VOT?

- Change in looks to competitor with varying VOT

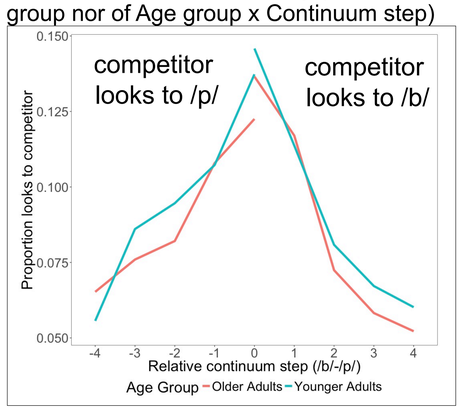
How does lexical competition affect older adults' word recognition?

- Overall increased looks to competitor

Do individual differences in inhibition modulate lexical competition?

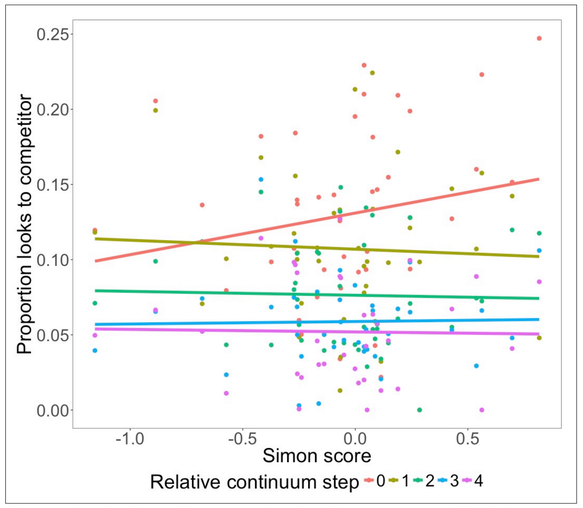
Results

- Mixed-effects models investigating effect of age group, relative continuum step, and inhibition on log-transformed proportion looks to the competitor image
  - Separate models for /p/- and /b/- side of continuum; only 'correct' responses included in analysis (McMurray et al., 2014)
- Older adults do not show increased lexical competition nor decreased VOT sensitivity (No main effect of Age group nor of Age group x Continuum step)



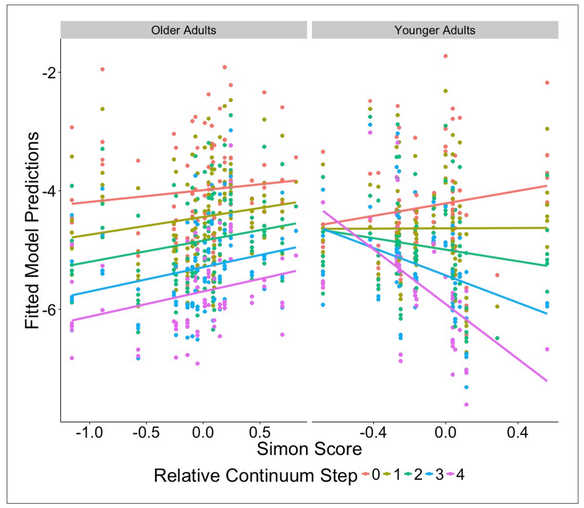
Proportion looks to the competitor by Relative continuum step and Age group.

- Poorer inhibition predicts more looks to the competitor as stimuli becomes more ambiguous (/p/: Simon x Continuum step interaction – β=-0.98, p=0.03)



Proportion looks to the competitor by Simon score and Relative continuum step. Note that this only displays the /p/-side of the continuum.

- Different effect of inhibition on continuum step in younger and older adults (/p/: Simon x Continuum step x Age group interaction – β=-2.65, p=0.01)



Fitted model predictions by Simon score, Relative continuum step, and Age group. Note that this only displays the /p/-side of the continuum.

Method

Participants

- 23 Older adults (ages 60-76, M_{age}=67.1)
- 19 Younger adults (ages 18-33, M_{age}=22.1)

Stimuli

- 6 /b/-/p/ minimal pairs (bin-pin, beach-peach, etc.)
  - 9-step VOT continua made in Praat (Boersma & Weenik, 2016)

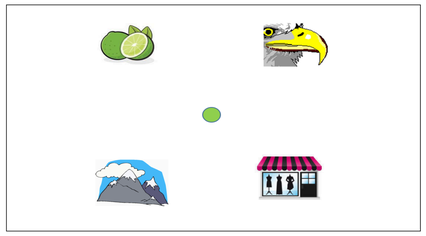
Procedure

Visual World Paradigm

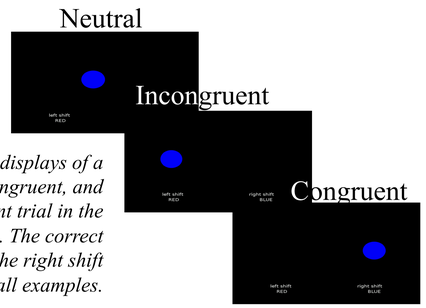
- 2 /b/-/p/ competitor images, 2 distractor images
- Participants click circle to hear target word, click on image which matches, while eye movements are recorded
- 6 min. pairs x 9 steps x 10 repetitions = 540 test trials + equal number of fillers = 1080 trials

Simon Task (Craft & Simon 1970; Mueller, 2011)

- Measure of domain-general inhibition
- Participants respond based on colour of stimulus, while inhibiting presentation side
  - Red circle = left shift key; blue circle = right shift key
  - Simon score = RT incongruent trials – RT neutral trials



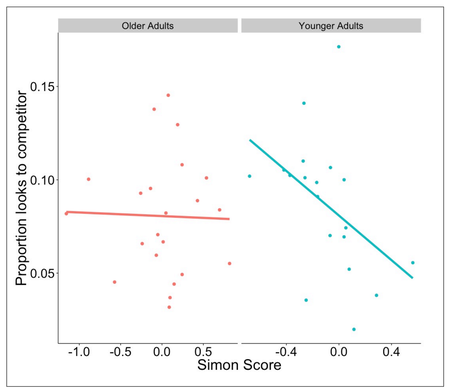
Example test display screen. Participants click on the green circle to play the target word.



Example test displays of a neutral, incongruent, and congruent trial in the Simon Task. The correct response is the right shift key in all examples.

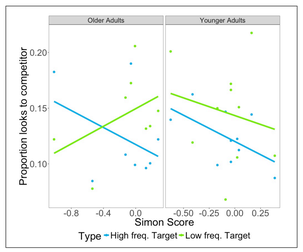
Results

- Poorer inhibition in younger adults predicts less looks to the competitor (/b/: Simon x Age group interaction – β=-1.91, p=0.02)



Proportion looks to the competitor by Simon score and Age group. Note that this only displays the /b/-side of the continuum.

Effect of Lexical Frequency?



Older adults with poorer inhibition are more distracted by high frequency items

Younger adults with poorer inhibition look less to competitors overall

Conclusion

Sensitivity to VOT and overall lexical competition remain similar in older and younger adults

General inhibitory ability and age important for how well competitors can be ignored, especially in increasingly ambiguous speech

- YA with poorer inhibition pay little attention to weak competitors, more distracted by strong competitors than YA with better inhibition
- OA with poorer inhibition may be more distracted by increasingly ambiguous competitors

References

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