Relative fundamental frequency under increased cognitive load in individuals with healthy voices

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Introduction

Under cognitive stress and autonomic arousal:

- Voice quality changes[1]
- Laryngeal muscle activity increases[2,3]

Are these changes in voice quality associated with increased laryngeal muscle tension?

Relative fundamental frequency (RFF) — an acoustic correlate of laryngeal tension

Decreased RFF suggests increased laryngeal tension

Objective

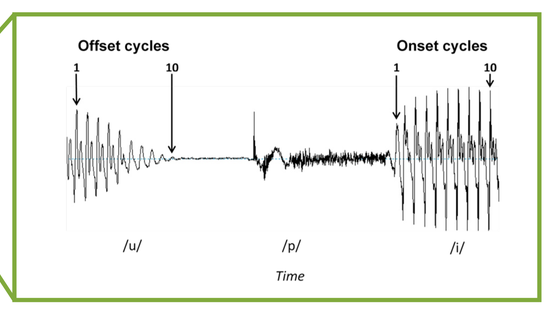
To determine the effect of increased cognitive load on relative fundamental frequency (RFF) in individuals with healthy voices

Methods

Measuring RFF

- Voiced–voiceless–voiced sound sequences
- RFF offset — transition from voiceless to voiced sound
- RFF onset — transition from voiced to voiceless sound

Then our pal gave red, blue, pink, & green new posters to us



Participants

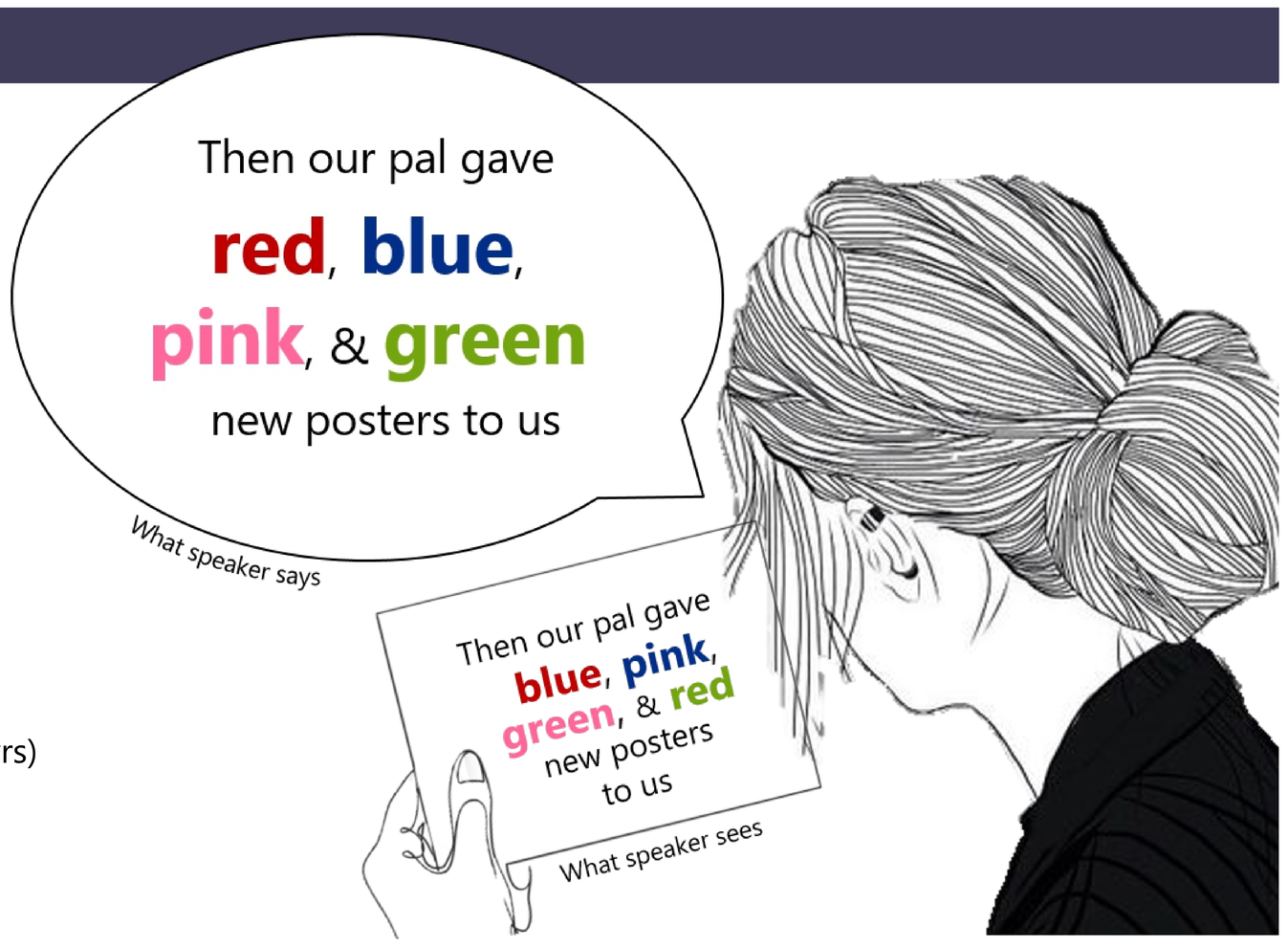
20 adults with healthy voices (10 F,10 M; 18-22 years old, *M*=20.2 yrs)

Sentence-level Stroop task

- 6 congruent = standard cognitive load
- 6 incongruent = increased cognitive load

Analysis

- Manual RFF analysis
- Two-way ANOVA with main effect of condition



Stroop task

Example of sentence in incongruent condition

Results

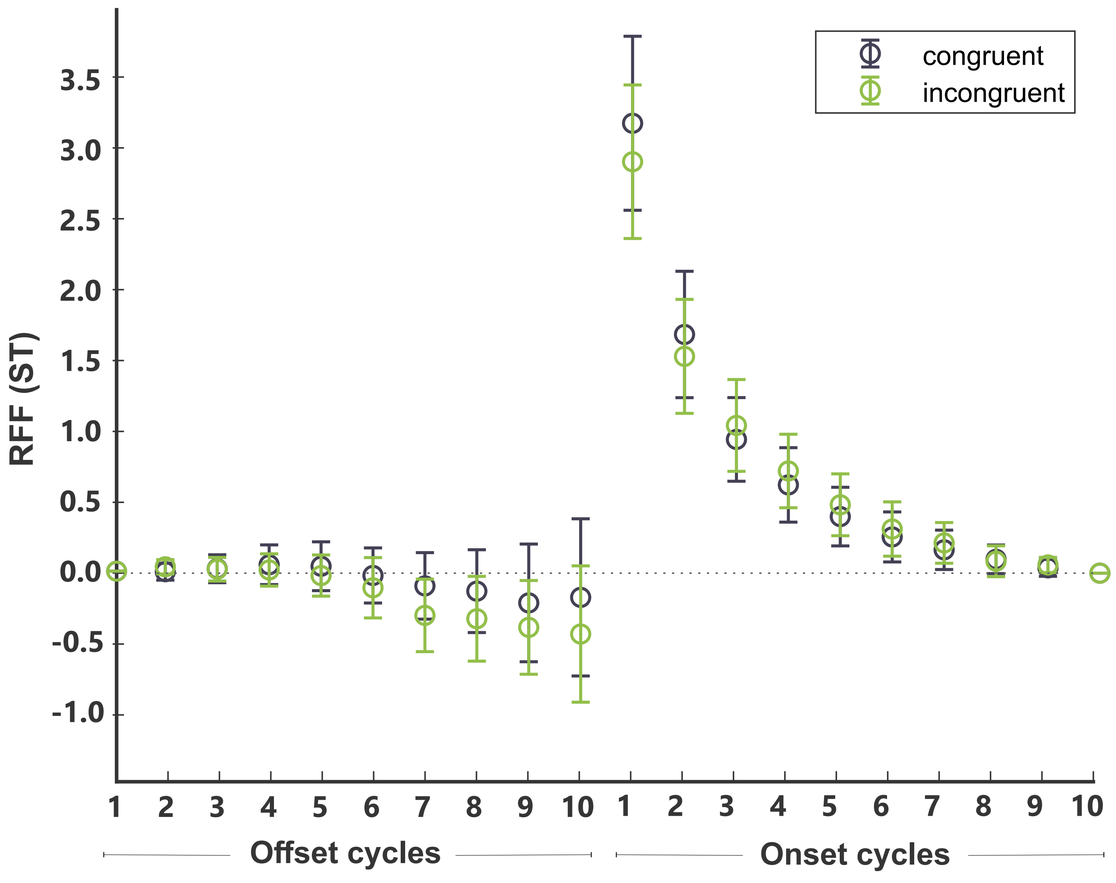
RFF offset

Small but significant effect of condition

RFF onset

No significant effect of condition

Mean RFF offset and onset in congruent and incongruent conditions



Discussion

RFF offset decreased under cognitive load, consistent with increased laryngeal tension[2]

RFF onset showed no significant effect of cognitive load

Differences in RFF offset and onset suggest a specific pattern of laryngeal tension[4]

Patterns of laryngeal tension may distinguish between different voice disorders[4]

Conclusions

Changes in voice quality observed under cognitive loading may be driven by increased laryngeal muscle tension

Results provide further evidence for RFF as a correlate of laryngeal tension

Acknowledgments

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NIDCD
National Institute on Deafness and Other Communication Disorders

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