Aging effects on prosodic marking in German: An acoustic analysis

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Background

Aging effects

- On physiological system: e.g. central nervous system, (musculo)-skeletal system, respiration, slowing down of movements
- On speaking rate [1,2], fundamental frequency [3,4], vowel formants [3,4]

So far, not much is known about aging effects on prosodic structure (highlighting important information)

Research Question: How does aging affect strategies used to express prosodic prominence within the acoustic domain? [5,6]

Method

Subjects

- 3 older (aged 65-80 years), 3 younger (aged 20-30 years) native speakers of German

Speech material

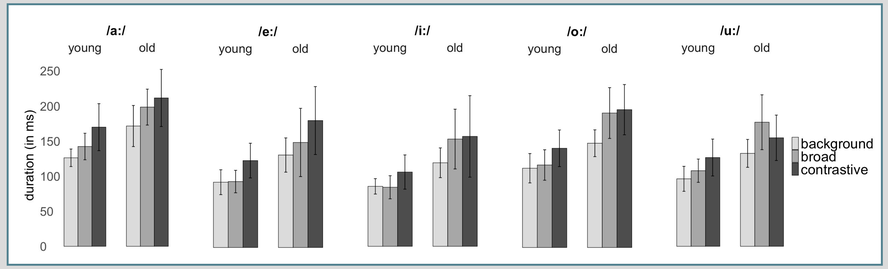
- 10 target words representing girl names (e.g. *<Mila>*) with lexical stress on first syllable
- Question-answer paradigm to render target word in **background** vs. **broad** vs. **contrastive** (see below) condition

Hat der Opa der Kati gewunken?	**Der Opa hat der Mila gewunken.**
'Had the grandpa waved to Kati?'	'The grandpa had waved to Mila.'

Acoustic measurements

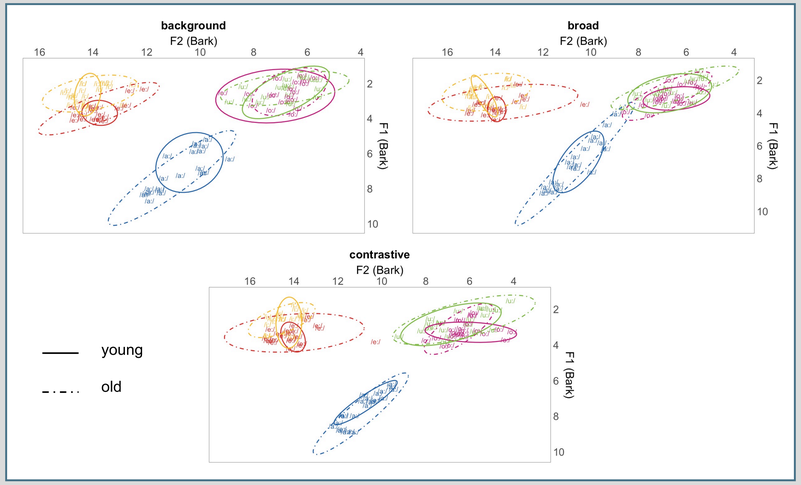
- Vowel durations
- F1 & F2 measured at the vowels' midpoint
- Acoustic vowel space → calculating vowel articulation index *(VAI)* & vowel space area using /i:, a:, u:/ [7,8]

Results



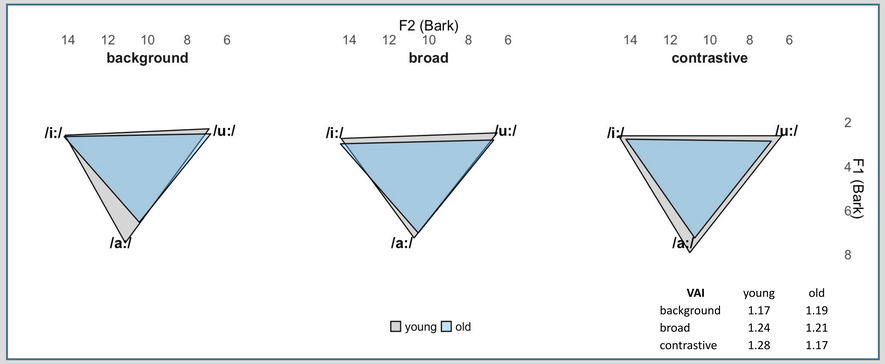
Vowel durations

- Both age groups: duration of stressed vowel increases → longer in contrastive focus (accented) than in background (unaccented)
- Older subjects: longer vowel duration in respective conditions in all vowel types



Formant values

- Older subjects realize /a:/ more centralized
- Older subjects show less variability than younger subjects in all vowel types



VAI	young	old
background	1.17	1.19
broad	1.24	1.21
contrastive	1.28	1.17

Acoustic vowel space

- Older subjects: VAI increases from background to broad, but decreases from broad to contrastive
- Reduced vowel space in older subjects (strongest effect in /a:/)
- Strongest aging effects on VAI in contrastive focus (older = 1.17 vs younger = 1.28)

Discussion/Conclusion

- **Prosodic structure:**
  - *Temporal* and *spatial* modifications of the stressed vowel in both age groups to increase prominence from background (unaccented) to contrastive focus (accented) [6,9]
- **Aging effects:**
  - *Longer* vowel durations but more *centralized* vowel qualities in older speakers → due to physiological constraints of vocal tract & slowed down movements [10,11] → increase in duration could also be interpreted as a compensation strategy for the reduced vowel space to mark prominence
  - *Less variability* of vowel formants in older speakers → indicates a less *flexible* vowel system for prosodic marking

References

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