

Changes in fundamental frequency and F_1 across chronological age

Introduction

- Chronological age is used widely in academic research and yet it is poorly understood how accurately it measures ageing across the lifespan.
- The present study aims to determine whether f_0 and F_1 correlate linearly with chronological age (CA), in hopes of continuing current ageing research in linguistics [1, 2], and consider how we should be evaluating age across the lifespan in future research [3].

Methods

Participants

- 17 speakers (9 female and 8 male)
- 22-79 years old (M=51.65, SD=18.09). Male ages ranged from 22-79 years old (M=57, SD=18.21) and females from 22-67 years old (M=46.89, SD=17.61)

Data collection and materials

- A word list was used to collect speech data and questionnaire was used to collect social and biological data from participants.
- The word list was made up of 40 words. Within this, there were 10 words aiming to elicit a /æ/ vowel, 10 for the /i:/ vowel, and 10 for the /ε/ vowel, plus an extra 10 distractor words. 469 tokens were eventually used in the final data.

/æ/ Words	/ε/ Words	/i:/ Words
liar	dress	fleece
mother	protest	bleed
question	effort	sheep
vessel	confess	grief
again	attest	leaf
caution	net	evil
denim	head	believe
melon	regrets	beach
across	press	breeze
extra	excess	freed

Table 1: Word list used to extract /æ/, /ε/ and /i:/ vowels from participants.

Results

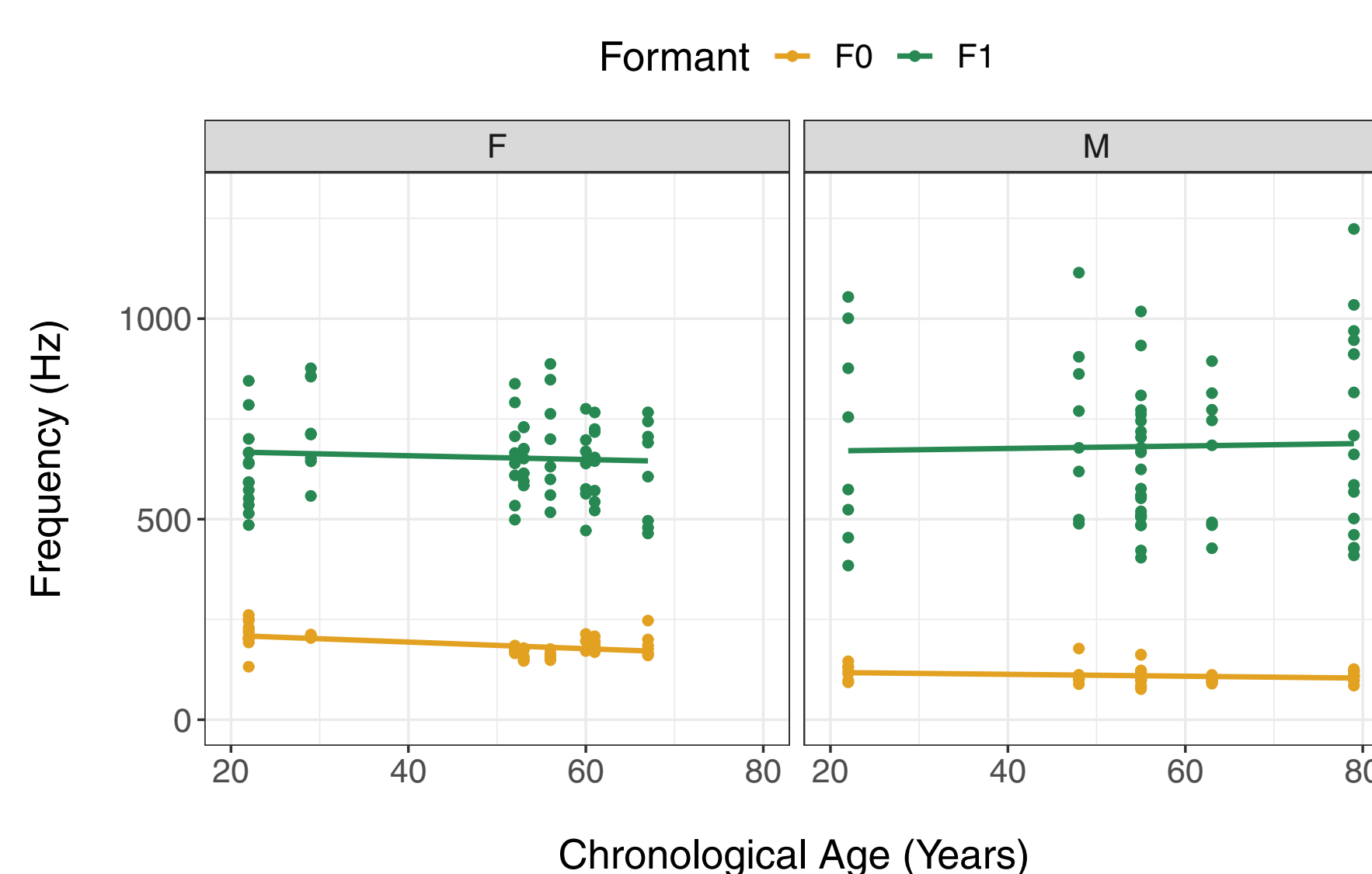


Figure 1: f_0 and F_1 against chronological age results for the /æ/ vowel.

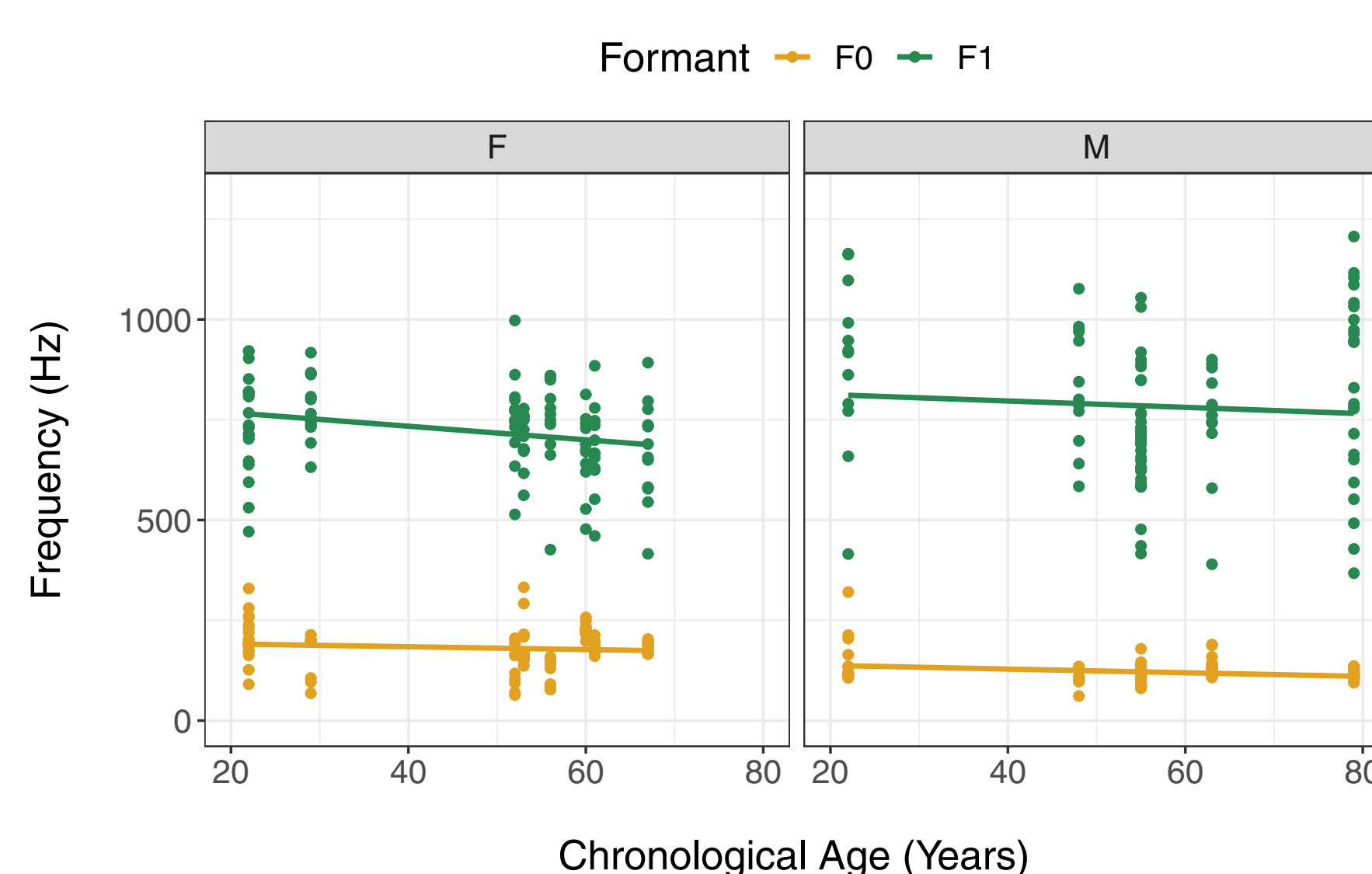


Figure 2: f_0 and F_1 against chronological age results for the /ε/ vowel.

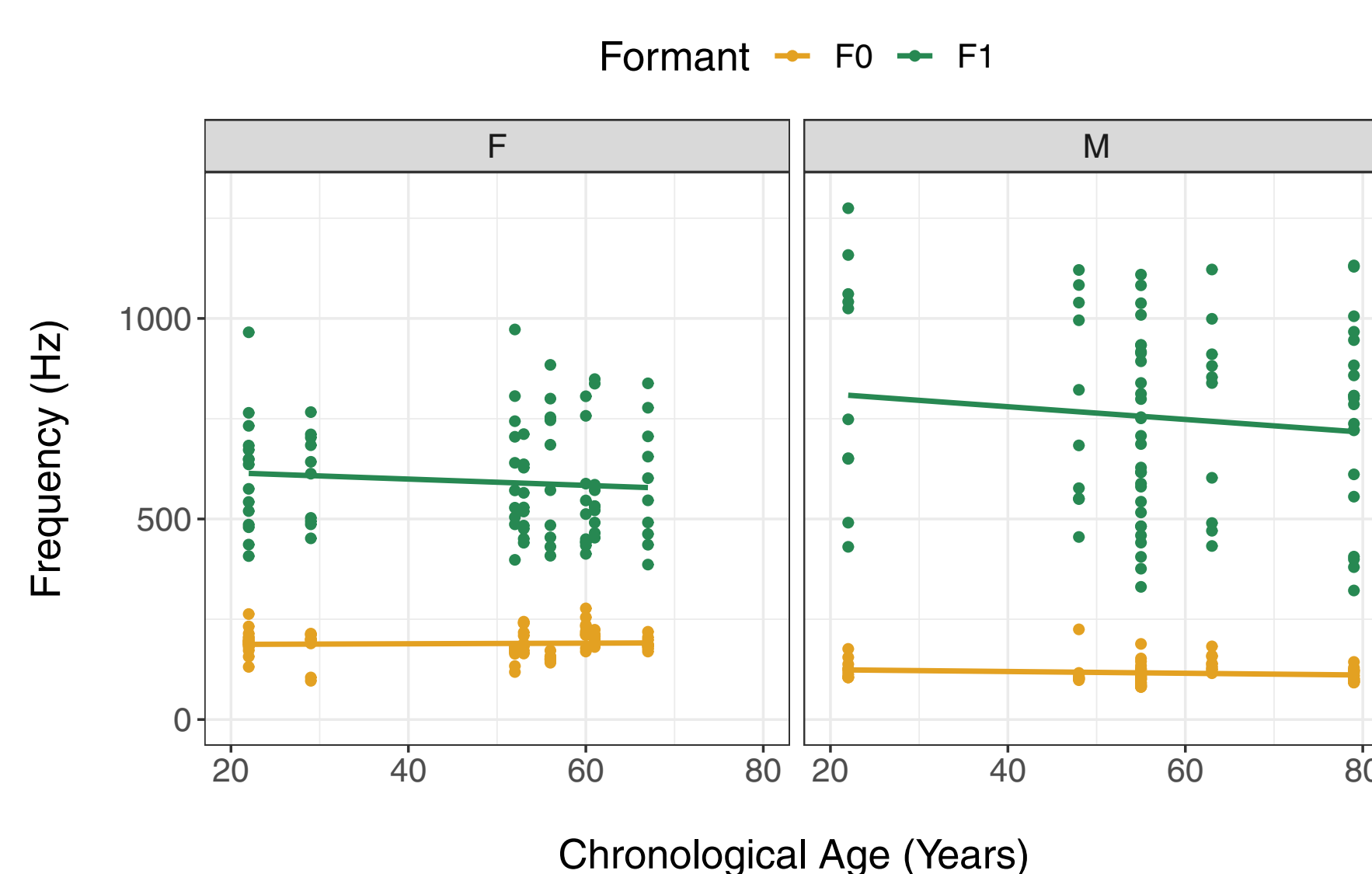


Figure 3: f_0 and F_1 against chronological age results for the /i:/ vowel.

Discussion and Conclusions

- Results suggest that there are very weak non-significant correlations between f_0 and CA, and F_1 and CA.
- There appears to be little difference between the vowels presented in this study suggesting the weak relationship between CA and f_0 , and CA and F_1 is consistent across the vowels.
- The slight linear decrease we do see across CA could stem from changes in f_0 and F_1 as a consequence of the vowel space centralising due to ease of articulation as we get older. Though previous results on this are mixed and vary between the genders [4, 5, 6], partly due to hormonal changes such as menopause in women [7].
- However, results are not linear, instead there are troughs [8, 9], perhaps due to differences within speakers [2], anatomical differences such as men having longer pharynxes [10], or perhaps there is a social reasoning behind it.
- As f_0 and F_1 follow a similar trajectory we might assume that this stems from the intrinsic relationship between f_0 and F_1 [11, 12], with F_1 simply following f_0 across CA in order to maintain perceptual distance [2].
- Overall, however there is little change across CA in f_0 , and in F_1 , suggesting that there is a weak relationship between f_0 and CA, and F_1 and CA.

Limitations and future research

- These results could also have been influenced by low token numbers, using an apparent-time methodological approach and significant gaps in age groups such as between 30-40 years for both sexes.
- Future research should explore further the implications of social and biological ageing, and explore a wider range of ages in order to fully understand how speech production changes across the lifespan.

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