

## Auditory variation in Scottish coda /r/ in child speech

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Coda /r/ in Scottish English has been weakening for many decades, with traditional taps/trills being replaced with approximants, and weakly rhotic variants, indexing social identity, now common across the Central Belt (Lawson et al., 2018). Studying rhoticity in contemporary child speech can help determine whether /r/ weakening is accelerating, while also understanding the linguistic, regional and social factors contributing to the weakening of coda /r/. Apparent-time data can also show how rhoticity changes across the developmental stages of childhood. This paper reports on child coda /r/ production using data from the VariCS project, a large-scale real/apparent time cohort study investigating child speech in Scotland (Kuschmann et al., 2022-2026). We carried out an auditory analysis of coda /r/ produced by 226 children aged 5-11, who were audio recorded in 23 Primary Schools across 7 Scottish Councils in Central and Southern Scotland in 2022. The current study focusses on the first phase of recordings. Audio productions of coda /r/ occurred in the following words: *car*, *spider*, *helicopter*, *flowers*, *scissors*, drawn from two tasks, (i) a bespoke picture-elicitation word-naming task, produced three times by each child, and (ii) a standardised articulatory and phonology screening test (Dodd et al., 2002).

**Auditory coding and analysis** - 840 tokens of coda /r/ were independently classified by two trained phoneticians on a rhoticity ‘weak-to-strong’ ordinal continuum after (Lawson et al., 2011): (1) no /r/ → (2) derhoticised → (3) alveolar → (4) retroflex → (5) tap → (6) trill, using a Praat (Boersma & Weenink, 2013) MFC interface with randomisation. Classifiers were in agreement (one category leeway) for 82% of tokens after an initial rating task. Tokens where raters were > 2 categories apart were re-rated by both classifiers using the same MFC interface, increasing agreement (1 category leeway) to 95%. 5% of tokens were discarded as either unclassifiable (2%), or raters were 2< apart in agreement (3%). The final averaged rater classifications served as the dependent variable in a linear mixed-effects model regression. Fixed effects included the linguistic covariates (1) *stress* (stressed vs. unstressed) and/or (2) *word*, as well as the social-indexical covariates (3) *gender*, (4) *age.in.months*, (5) *region* (East Central, South Central, and West Central Scotland), and (6) Scottish Index of Multiple Deprivation (*SIMD*; deciles 1–10) for school postcode. After checking for collinearity, we also included an interaction for *gender* × *region*. Speaker was included as a random intercept.

**Auditory analysis results** - Results show a surprising absence of taps and trills, with 65% of tokens rated as “alveolar” or “retroflex” approximants, but only 1% as taps. Audibly-weakened variants, which made up 34% of tokens, may well include underlyingly tapped variants. Statistical analysis showed that *word* was a significant predictor of /r/ strength ( $F(4,630.03)=8.39, p < 0.0001$ ), with the /r/ in (stressed) *car* being produced with a significantly stronger rhotic than /r/ in the other words. *age.in.months* was also a significant positive predictor of /r/ strength ( $F(1,217.48)=8.30, p=0.004$ ). For every increase of one month in age, tokens were rated 0.01 of a category more /r/-ful, see Fig 1. *region* showed weaker influence: with tokens produced by speakers from the Scottish Borders tending to be rated as less rhotic than tokens from speakers from other Scottish regions.

**Conclusion** - These findings suggest a significant reduction in traditional Scottish rhotic variants and a potential acceleration of /r/ loss, with over a third of tokens rated as weakly rhotic. However, there may also be developmental factors at play, given that levels of rhoticity continue to increase throughout childhood.

### References

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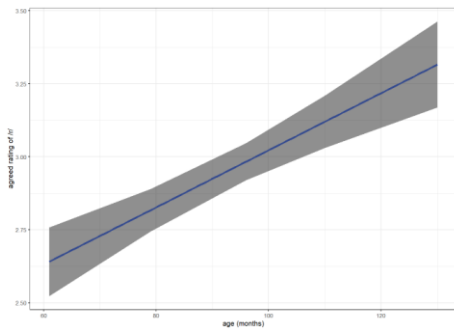


Fig.1. Predicted rated rhoticity by *age.in.months*.