Sound change or community change? The speech community in sound change studies: A case study of Scottish Gaelic

1 Abstract

This paper considers the typical focus of analysis in a sound change study across generations: the speech community. I argue that changes in social practices across generations may mean that comparisons across generations can be problematic, and these issues are particularly pertinent in small and endangered language communities. Using data from Scottish Gaelic (Celtic, ISO = gla), a minority endangered language of Scotland, I exemplify the challenges posed by the speech community construct via an examination of lateral production in subsequent generations of speakers. Gaelic traditionally contrasts three phonemic laterals, but analysis shows that this might be changing. There are two possible directions for sound change in the Gaelic lateral system: results show that younger speakers produce some palatalised laterals as palatal glides without laterality. Meanwhile, the remaining laterals are less acoustically distinct among younger generations suggesting the possibility of future merger. While there are differences among the groups of speakers, I argue it is potentially problematic to consider this to be a form of sound change due to differences in social practices among generations surrounding Gaelic usage and socialisation. Ultimately, I advocate for a socially-informed approach to sound change study to sympathetically take into account local social structure.

2 Introduction

2.1 Speech community and sound change

In studies of sound change, subsequent generations from a particular community are usually compared to infer change in the system, be that through the apparent-time model, or in a real-time design. For example, in Labov’s seminal (1966) work, subsequent generations of Lower East Side New Yorkers are compared to infer change in apparent time. Similarly, more recent studies such as Hay et al. (2015) use this method for their comparison of archival and contemporary recordings of New Zealand English. In a real-time design, members of the same community are compared at different life stages (panel study e.g. Haddican et al. 2013). Or, similar members of the same community are studied at different time points (trend study e.g. Cukor-Avila 2002). For example, in Sankoff & Blondeau (2007), 32 speakers were recorded in both 1971 and in 1984 to compare /r/ production over time in Montreal in a real-time panel study. Also, the 32 speakers recorded in Montreal in 1971 were compared to 32 different speakers recorded in 1984 in a trend study. All of these studies assume that the community in which speakers participate is a stable enough social entity for meaningful comparison of speech to take place. The construct upon which any apparent- or real-time study of sound change relies is the speech community as a unit of analysis for change. This may be a very large speech community e.g. New Zealand, or a smaller one such as York. In comparing speakers within a community, we can say whether and how the variety of that community has changed.

As the speech community is such a central construct, there has been much discussion about its nature and how membership might be defined (Patrick 2004, Rampton 2009, Coupland...
Patrick (2004) gives an extensive overview of the development and theoretical evolution of the speech community in linguistics. Broadly, in the Ethnography of Speaking approach to the field (Gumperz 1968, Hymes 1972), linguistic behaviour is seen as one of the many resources used in the creation of meaning. This approach prioritises long-term immersion with a small group of informants rather than generalising to larger populations and inferences about wider linguistic structure. The Ethnography of Speaking approach defines the speech community as a set of shared linguistic and social norms (Gumperz 1982). Labovian sociolinguistics developed along a slightly separate line of enquiry focussing on larger samples and with greater emphasis on wider generalisation. Classically, Labov sees a speech community as some set of shared linguistic values within social or geographical space (1972:463). Coupland (2010:100) notes that no lasting consensual definition of the speech community has been reached, but within these two broad approaches to language and variation outlined above it can be seen that a definition should encompass both shared social and linguistic norms.

Defining what these shared linguistic and social norms might constitute is clearly problematic and dependent on the level of abstraction intended (Rampton 2009). For example, in a study of sound change it can be assumed that some aspect of linguistic behaviour is undergoing change and might not be shared between generations. In order to assess the possibility of change within a particular community, it must be demonstrated that the community is to some extent fundamentally the same across generations. At the same time, it can hardly be expected that older community members and younger members, or members across time, will share all social practices, but enough must be shared in order to make comparison of linguistic behaviour meaningful. Thomason & Kaufman (1988:10) express the same concepts and suggest that ‘normal transmission’ from generation to generation will occur when the sociolinguistic context is ‘relatively stable’ i.e. when all speakers considered form a socially consistent speech community.

This paper will explore where the boundary lies between enough shared social practice and too little. At what point is it appropriate to compare generations in a sound change study, and at what point is it no longer appropriate as speakers do not constitute the same speech community? This is a challenging question to solve. In this study, I aim to explore these issues with data relating to possible sound changes in the lateral system of Scottish Gaelic, a minority endangered language of Scotland. The data presented here are a small-scale analysis aiming to exemplify the issues raised above and provide some context to the discussion. This investigation in a small language throws the issues raised above into sharp focus but generalisations to larger languages are also relevant.

2.2 Gaelic

Scottish Gaelic is usually known simply as ‘Gaelic’ [galik] by its speakers and will be referred to as such henceforward. There were approximately 58,000 Gaelic speakers in Scotland according to the most recent UK Census (Census 2011 report 1). Gaelic was widely spoken across Scotland in medieval times (MacKinnon 1974), but is now a minority language spoken by around 1% of the population. UNESCO classifies Gaelic as ‘definitely endangered’ (Moseley 2010), census figures show numbers of Gaelic speakers is in decline, and a dialect
of Gaelic was once the prototypical example of language obsolescence (Dorian 1981). The number of Gaelic speakers in Scotland according to national censuses is shown in Figure 1.

![Graph showing number of Gaelic speakers in Scotland according to UK national censuses. Sources: MacAulay (1992:141), Census 2001 report, Census 2011 report 1.]

The densest concentration of Gaelic speakers is found in the chain of islands off Scotland’s north-west coast, the Outer Hebrides/Western Isles, although important populations also live in lowland cities due to historical emigration (Withers 1998) and recent language revitalisation policies (McLeod 2006). In the Outer Hebrides, approximately 60% of inhabitants speak Gaelic (Census 2011 report 2). The location and density of Gaelic speakers across Scotland is shown in Figure 2.
In the Western Isles, the experience of Gaelic speakers differs across generations. Typically, the oldest generation of speakers aged 65 and upwards grew up in Gaelic-dominant environments and learned English on entering compulsory education. Gaelic is the code of choice in conversations with friends and neighbours. While these older speakers learned Gaelic as a first language in the home, family language transmission has become increasingly rare across generations. A community survey in 2011 described intergenerational transmission of Gaelic in the Outer Hebrides as ‘broken’ (Munro et al. 2011:11). Instead, there is now greater reliance on immersion schooling as a method of Gaelic acquisition (Will 2012, Nance 2020). Gaelic Medium Education (GME), an adapted form of immersion schooling, has been available to parents in Scotland since 1985 and allows children from any home language background to receive their education in Gaelic. GME is now the default method of primary education in the Outer Hebrides but parents can request that their child attend English-only schooling. Children in GME classes typically use Gaelic in classroom settings but prefer English as a peer group language in the playground and outwith the school setting (Nance 2013, Nance 2020).
2.3 Research Questions

Here, I will exemplify the challenges posed by the speech community construct via an examination of possible sound changes in Gaelic’s lateral system. Specifically, I consider whether different generations of Gaelic speakers produce the phonemic categories traditionally described for the language, and how acoustically distinct phonemic categories are from one another.

3 Methods

3.1 Laterals in Gaelic

Gaelic is described as having three phonemic laterals, a dental velarised lateral, a dental palatalised lateral and an alveolar lateral without secondary articulations: /l̪ˠ/ (Borgstrøm 1940, Oftedal 1956, Ladefoged et al. 1998, Nance 2014). I refer to these laterals as velarised, palatalised and alveolar respectively. The contrast can be exemplified in near-minimal triplets such as càl/kʰaːl̪ˠ/ ‘cabbage’, caill/kʰaill̪ʲ/ ‘lose’ and cài/kʰail̪/ ‘something’.

Gaelic has a wider system of contrastive palatalisation across the consonant system, and three-way contrasts between palatalised, velarised and plain phonemes in the sonorants (Nance and Ó Maolalaigh 2019, Nance and Kirkham 2020). The different lateral phonemes are common across Gaelic, although ‘true’ minimal pairs/triplets appear to be rare in the language (Shuken 1980, Ladefoged et al. 1998).

While contrasts in secondary palatalisation are relatively common across the world’s languages (17% of languages in Bateman 2007), three-way palatalisation contrasts are much rarer and not found in English. Previous studies of sound change in minority, endangered language settings suggest that sounds which are typologically unusual and not shared in the societally-dominant language are most likely to undergo change (Jones 1998, Thomason 2001). These authors report a reduction in the number of phonemic contrasts in contexts of language endangerment as system-internal change but accelerated due to the sociolinguistic context. My analysis considers the possibility of change in the lateral system in two respects: firstly, whether palatalised laterals are being produced as palatal glides, an existing phoneme in Gaelic. Delateralisation in palatal articulations is widely reported in Romance e.g. Gómez & Molina Martos (2016), and was noticed previously in young speakers’ palatalised Gaelic laterals but not systematically analysed (Nance 2014). Secondly, I consider whether laterals are becoming more acoustically similar as a possible pre-cursor to a reduction in the number of phonemic contrasts (Nance and Stuart-Smith 2013).

3.2 Speakers

This study focusses on an area with a high density of Gaelic speakers, the Isle of Lewis, which is most the northerly island in the Outer Hebrides. The study adopts an apparent-time design taking the geographical location of Lewis and the social practice of using Gaelic as the definition of the community under study. Data were collected from thirty-five speakers, with a focus in particular on younger age cohorts. The four age groups considered are detailed below:
1. Children: 18 children aged 7-11 attending primary GME (10f, 8m). The children had lived in Lewis for their whole lives. For full details see Nance (2020).

2. Adolescents: 11 adolescents aged 13-14 attending secondary GME (5f, 6m). The adolescents had lived in Lewis for their whole lives. For further details see Nance (2015).

3. Middle-aged: 3 speakers aged 35-50 (3f). These speakers were born and raised in Lewis but were currently working in Glasgow. In Scottish island communities it is very common to work on the mainland and then return to one’s home island later in life. For further details see Nance (2013).

4. Older: 3 speakers aged 60-80 (3f). The older speakers were born and raised in Lewis, had worked on the mainland for varying periods of time and then returned to Lewis. For further details see Nance (2013).

Most of the children and adolescents came from homes where both parents spoke English to them, though some had Gaelic-speaking grandparents. A small number had one Gaelic-speaking parent (4/18 children, 3/11 adolescents), and a very small number had two Gaelic-speaking parents (2/18 children, 0/11 adolescents). All parents were very supportive of GME and even where English is spoken in the home parents often provide Gaelic resources or attend classes themselves. The home language background of these young people is therefore a mix of English and Gaelic. Previous studies found few differences between those with more Gaelic input at home and those with less Gaelic input at home, so this factor is not analysed further here with the aim of considering aggregate patterns. For full details see Nance (2014, 2020).

### 3.3 Data and recordings

The data were collected via a word list reading task. The children were recorded in a quiet place in their school using a Beyerdynamic Opus 55 headset microphone and USB Pre mixer connected to a laptop and digitised at 44,100Hz sampling rate. Words were presented on picture cards and were designed to be recognisable to children. The word list contained word-medial laterals and is shown in the Appendix. Each word was repeated twice in random order among distractor items. Data from the adolescents and adults were also recorded with the headset microphone, a Rolls Live mixer and laptop computer. Data were presented on the laptop screen with accompanying pictures and were repeated three times among distractors. The word list for these groups contained word-initial and word-medial laterals (see Appendix). The adolescents and middle-aged adults were recorded in their school or workplace respectively, and the older adults were recorded in their homes.

### 3.4 Analysis

The total token counts included in the analysis are as follows:

1. Children: 216 (median = 11 per speaker, range = 8-12)
2. Adolescents: 388 (median = 33 per speaker, range = 24-36).
3. Middle-aged adults: 107 (median = 36 per speaker, range = 35-36)
Three analyses were carried out on the data. First, an auditory analysis was carried out to ascertain whether all tokens were produced as laterals. In the case of some phonemically palatalised laterals, a substantial number were produced as palatal glides (Section 4.1). The difference between a glide and lateral is illustrated in Figure 3 (though labelling for this analysis was done auditorily only). This figure shows the production of the same word \textit{leabhar ‘book’} /\textipa{\textipa{l̪}_\textipa{ʲ}_\textipa{ɔ}_\textipa{ɾ}}/ by two male adolescent speakers. There is a very high \textit{F2} in the glide as compared to the lateral: approximately 2800Hz (glide) vs 2200Hz (lateral).

![Spectrogram and waveform comparison of palatalised lateral vs. palatal glide at the start of the word ‘leabhar’.](image)

The results of this auditory analysis show that children and adolescents produce some glides, but adult speakers produced none at all. Due to the complete absence of palatal glides among the adult speaker groups I do not analyse this through inferential statistics further.

The second analysis considered the acoustic properties of tokens produced with laterality (i.e. the glides were excluded from the acoustic analyses). The data were low-pass filtered to 11,025Hz and downsampled to 22,050Hz prior to analysis in Praat (Boersma & Weenink 2019). Data were then labelled using Praat TextGrids for lateral steady state as defined by a phase of the lateral where \textit{F2} was stable (Carter & Local 2007). Linear Predictive Coding formant values were estimated using Emu (Winkelmann et al. 2017), manually checked for accuracy, and hand-corrected where necessary using the Emu functions.

Previous acoustic analysis has shown that the difference between the first two formants can capture differences between the lateral phonemes (Shuken 1980, Ladefoged et al. 1998, Nance 2014, Nance and Kirkham 2020). Specifically, the velarised lateral is characterised by low \textit{F2} and high \textit{F1}, the palatalised lateral has high \textit{F2} and low \textit{F1}, and the alveolar lateral has intermediate values. I therefore present values of \textit{F2}-\textit{F1} which captures the palatalisation or velarisation gesture (Section 4.2, Sproat & Fujimura 1993, Nance 2014, Kirkham et al. 2019). Comparing the differences between formants will already include
some degree of normalisation for vocal tract length so the data were not normalised further
for sociolinguistic differences (Simonet 2010, Kirkham et al. 2019, Nance 2014). Data are
reported in Bark (Traunmüller 1990) to approximate the perceptual response of the ear (see
Morris 2017, Nance 2020 for others who have taken this approach).

The F2-F1 acoustic data from each group of speakers were modelled via Conditional
Inference Trees (CTrees) (Breiman 2001, Tagliamonte & Baayen 2012, Levshina 2015). CTree
analysis is a non-parametric technique which functions by first testing which independent
variable is most closely associated with the dependent variable. If an association is made at
a pre-defined significance level, the data are split, and the process repeated. For further
explanation see Levshina (2015:291). Each group of speakers was modelled separately to
allow for the possibility of different significant splits in the data. The analysis of the child
data considered lateral phoneme and gender, and the data from the other speaker groups
also considered word position. The middle-aged and older adults are all female so their
analysis does not include gender.

The final analysis considers the acoustic distinctiveness of the lateral phonemes. Acoustic
data from the two predicted most extreme phonemes, the velarised and the palatalised
laterals, were extracted for analysis. First the median F2-F1 for velarised laterals was
calculated for each speaker. Then, I calculated the median F2-F1 for palatalised laterals for
each speaker, and calculated the Euclidean distance between these two medians in order to
quantify the acoustic space used (Section 4.3).

The Euclidean Distances for each speaker group were regressed against speaker group in a
standard linear model. The baseline speaker group was the older speakers and contrast
coding was used. As there is only one value per speaker (Euclidean distance), mixed effects
modelling with random intercepts was not used here.

4 Results

4.1 Auditory analysis

The first analysis auditorily coded laterals as to whether they were realised as laterals or
palatal glides. The latter variant only occurs in the palatalised lateral category. The results of
this labelling are shown in Figure 4. The middle-aged and older speakers did not produce
any of their palatalised laterals as glides at all so this finding is not analysed further
statistically. The children produced 29% of their palatalised laterals as palatal glides and the
adolescent speakers 27%.
Figure 4: Proportions of phonemically palatalised laterals produced as glides or laterals (auditory coding) for each speaker group. Token counts are shown at the top of each bar.

4.2 Acoustic analysis

The first acoustic analysis considers whether all speaker groups maintain the phonemic categories described for Gaelic laterals (Figure 5). This was analysed via a CTree built for each group. The CTrees built for each group are shown in Figure 6-Figure 9. These figures show that overall, each group of speakers display a distinction between velarised and alveolar/palatalised laterals, and then another significant split between alveolar and palatalised laterals as the first branches in the tree.¹ The adolescent female speakers produce slightly higher F2-F1 in alveolar laterals than the male speakers. There are no differences according to gender among the children. Word position differences include initial palatalised laterals have higher F2-F1 than medial palatalised laterals in adolescent and middle-aged speakers, and initial velarised laterals have higher F2-F1 than medial laterals in adolescent speakers.

¹ Note Nance (2020) considered differences within the group of children and found the youngest (7-year olds) do not produce a difference between palatalised and alveolar laterals. However, here I have aggregated all of the children together to compare them to other groups of speakers.
Figure 5: F2-F1 values from all speaker groups. Each facet shows boxplots of palatalised, alveolar, and velarised laterals.

Figure 6: CTree analysis of children’s lateral data.
Figure 7: CTREE analysis of adolescents' lateral data.

Figure 8: CTREE analysis of middle-aged speakers' lateral data.
4.3 Euclidean Distance analysis

The Euclidean Distance analysis is shown in Figure 10. Middle-aged and older speakers have the largest Euclidean Distance, adolescents are somewhere in the middle and children have the lowest.

The Euclidean Distance was then regressed against speaker group and the results are in Table 1. The model shows a significant effect of group ($F(3,28) = 10.91, p < .001$) by which children are significantly lower than older speakers. Adolescents have a lower value than the older speakers but this is not significant ($p = .06$). Middle-aged speakers have almost the same Euclidean Distance values as the older speakers.
Table 1: Regression model conducted on Euclidean Distance

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td>Intercept</td>
<td>6.71</td>
<td>0.8587</td>
<td>7.818</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Children</td>
<td>-4.0389</td>
<td>0.9358</td>
<td>-4.316</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Adolescents</td>
<td>-1.9276</td>
<td>0.9791</td>
<td>-1.969</td>
<td>.06</td>
</tr>
<tr>
<td>Middle-aged</td>
<td>-0.3955</td>
<td>1.2145</td>
<td>-0.326</td>
<td>.75</td>
</tr>
</tbody>
</table>

4.4 Summary of results

The auditory analysis shows that children and adolescent speakers produce their phonemically palatalised laterals as palatal glides nearly a third of the time (Section 4.1). Middle-aged and older speakers do not do this. In terms of acoustics, all speaker groups make a distinction between phonemic categories (Section 4.2), but the acoustic difference (Euclidean Distance) between categories is greater among older and middle-aged speakers and significantly lower among children (Section 4.3).

5 Discussion

The analysis presented here considers possible sound changes in progress in the Gaelic lateral system. The results above show differences between generations and using the apparent-time model we might infer sound change here: potentially, the palatalised lateral is changing to be realised as a palatal glide some of the time, and categories of laterals are becoming more similar across generations. In this section I will discuss how we must be cautious about using the apparent-time model in contexts of small or endangered languages where the context of generations differs significantly, such as the context of Gaelic.

The first important factor is that in minority language settings where the language is acquired to a large extent through the educational system, acquisition of complex structures not shared in the dominant language may be later than can be expected in other language settings, or might not occur at all. For example, Thomas et al. (2014) found that young Welsh speakers with lower amounts of input in the home lag behind L1 Welsh-speaking children in morphology acquisition. They suggest that such children might ‘catch up’ when sufficient quantity of input is received, but this will take longer if they only receive input at school. Kennard (2013) considers mutation acquisition in child Breton speakers, young adults, and older speakers. She shows that although children in immersion education have not yet acquired the mutation system, young adults who have finished Breton immersion education have done so. It may be the case that the young Gaelic speakers recorded here will, in the future, acquire the lateral system in the traditional manner, but have not done so yet. In light of these findings, there may not actually be a sound change in progress at all in Gaelic laterals.

A second important factor is that an apparent-time model assumes some kind of continuity in the speech community. As discussed in the Introduction, there is no definitive way of precisely defining the speech community, but it can be assumed that a definition would include some shared linguistic and social practices. The different groups of speakers analysed here differ in many linguistic and social practices surrounding Gaelic and Gaelic
use: how they acquired the language (to a greater or lesser extent depending on family),
their experience of Gaelic at school, the use of Gaelic in the wider community, their
language code choice among friends, and their experience of Gaelic’s political status in
Scotland. As such, the community of Gaelic speakers on Lewis is socially and linguistically
not consistent, leading to the question as to whether it is meaningful to consider speakers
part of the same speech community and comparable as generations. Thomason & Kaufman
(1998:10) specifically highlight contexts of extreme language shift as situations which might
be too unstable to constitute the sociolinguistic context where change via transmission can
occur. Yet the context of Lewis described here is not one of extreme shift, younger speakers
are of course still Gaelic speakers, but their experience of Gaelic is different.

A final factor in endangered/revitalising language settings is that the youngest group of
speakers will not be socially or numerically the same as the older groups. For example, in
the context of contemporary Gaelic, in 2018-19 there were 3,467 pupils enrolled in primary
GME classes, but only 1,423 in secondary (Bòrd na Gàidhlig 2020). GME is increasing in
popularity and availability so it is probable that the secondary figures will rise in coming
years, but even allowing for this there is considerable drop-off between primary and
secondary-age speakers. Dunmore (2019) shows that few former GME pupils who are now
young/middle-aged adults continue to use Gaelic. For younger generations then, it is likely
that at each life stage only those speakers most motivated and most dedicated to Gaelic,
with resources available, continue using the language. In this respect, the population of
young adult Gaelic speakers are a small, and (typically) dedicated, proportion of the children
who start GME and may not be comparable.

6 Conclusion

This study considers the extent to which linguistic and social practice must be shared
between generations in order to make them meaningfully comparable through the
apparent-time model. To attempt to answer this question I would suggest that a socially-
informed knowledge of the community is crucial and must be included in any possible
analysis of sound change in such communities. Recognition of what is enough shared social
practice must in some part stem from how the community perceives itself. While there are
sometimes suggestions of communication breakdowns between GME pupils and older
speakers (e.g. Will 2012:124), it is largely recognised that GME pupils are the future of the
language and an important part of Gaelic society (e.g. Bòrd na Gàidhlig 2018).

Even when it is accepted that comparing generations is possible, I argue that it is important
to consider the points raised in the Discussion above when interpreting results. For
example, in the case of the data presented here, I do not think it possible to conclusively say
sound change is taking place without further data. Certainly, there are differences between
the speaker groups compared, but further conclusions are not possible. The context of
Gaelic throws into sharp focus these questions of what can constitute a speech community
and thus be meaningful in generational comparison. However, this issue is not limited to
small and endangered languages. Older and younger speakers in different communities will
always differ in some aspects of social and linguistic practice so these factors must be taken
into account in studies of community language change.
7 Ethical statement

This project was granted ethical approval through the School of Social and Political Sciences and the College of Social Sciences Ethics Committee, University of Glasgow (adolescent, middle-aged speakers, older adults), and the Faculty of Arts and Social Sciences Management School Ethics Committee, Lancaster University (children). Adult participants gave consent to anonymously participate in the research. Parents gave consent for the adolescent and child speakers to anonymously participate in the research and I underwent a background assessment by Disclose and Barring Service (Scotland) and Protection of Vulnerable Groups (Scotland) before working with children.

8 Acknowledgements

Many thanks to the people who took part in this study, as well as the schools who facilitated data collection. Thank you very much to the anonymous reviewers and Georgia Zellou for their constructive comments on earlier versions of the manuscript. The work was funded with a Lord Kelvin and Adam Smith PhD studentship (University of Glasgow) and an Early Career Small Grant (Lancaster University).

9 References


## Appendix

### Table 2: Word list used for child speakers

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<th>Word</th>
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<th>English</th>
<th>Word position</th>
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<td>saʔɔx</td>
<td>dirty</td>
<td>medial</td>
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<tr>
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<td>medial</td>
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<td>town</td>
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<td>ɛlan</td>
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<td>t̪u</td>
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<tr>
<td>l̪ʲ</td>
<td>cailleach</td>
<td>kʰa</td>
<td>]ɔx</td>
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### Table 3: Word list used for adolescent, middle-aged and older adults

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