

## Article

# They Talk *Mutumuṯu*: Variable Elision of Tense Suffixes in Contemporary Pitjantjatjara

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**Abstract:** Vowel elision is common in Pitjantjatjara and Yankunytjatjara connected speech. It also appears to be a locus of language change, with young people extending elision to new contexts; resulting in a distinctive style of speech which speakers refer to as *mutumuṯu* ('short' speech). This study examines the productions of utterance-final past tense suffixes /-nu, -ṇu, -ṇu/ by four older and four younger Pitjantjatjara speakers in spontaneous speech. This is a context where elision tends not to be sociolinguistically or perceptually salient. We find extensive variance within and between speakers in the realization of both the vowel and nasal segments. We also find evidence of a change in progress, with a mixed effects model showing that among the older speakers, elision is associated with both the place of articulation of the nasal segment and the metrical structure of the verbal stem, while among the younger speakers, elision is associated with place of articulation but metrical structure plays little role. This is in line with a reanalysis of the conditions for elision by younger speakers based on the variability present in the speech of older people. Such a reanalysis would also account for many of the sociolinguistically marked extended contexts of elision.

**Keywords:** Australian languages; elision; sound change; variation and change



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## 1. Introduction

This study investigates phonetic variability in utterance-final past tense suffixes /-nu, -ṇu, -ṇu/ in Pitjantjatjara, a Western Desert (Pama-Nyungan) language of Central Australia. Word- or phrase-final vowel elision has been documented in several Australian languages as a phonetic process in connected speech, but also as an outcome of historical sound change. In current day Pitjantjatjara, there are signs of both regular vowel elision in connected speech and an ongoing change in progress extending the contexts of this elision. Alongside these processes, there are signs of vowel elision in contexts which tend not to be perceptually salient to native speakers and listeners. The production of vowels in these contexts appears to be highly variable and not sociolinguistically marked. Our first aim in this paper is to provide a fine-grained acoustic phonetic analysis of vowel elision in one of these highly variable but not sociolinguistically or perceptually salient contexts. Our second aim is to describe any apparent change in progress between generations within this less salient context. Our research questions are:

1. How are Pitjantjatjara speakers producing utterance-final past tense suffixes?
2. Does a comparison of older and younger speakers suggest a change in progress?
3. If there is evidence of a change in progress, what does this change look like?

Based on spontaneous speech data from eight female speakers, we compare the productions of younger (17–26) and older (52–69) speakers. This is one of the first phonetic studies to specifically focus on final vowel elision in an Australian language, and we aim to shed light on the mechanisms by which this type of sound change might occur, using the apparent time construct (Cukor-Avila and Bailey 2013). This is also one of the first phonetic

studies of Pitjantjatjara to consider connected speech processes in naturalistic, spontaneous speech.

The paper is structured as follows. The remainder of this section introduces further background and context for the study. We first introduce the language (Section 1.1) and summarise some previous descriptions of vowel elision in Pitjantjatjara and the closely related Yankunytjatjara (Section 1.2). We then discuss the sociolinguistic setting for this study (Section 1.3). Section 2 describes the data and methods we use in analysing this phenomenon, and Section 3 presents the results. We discuss these results and compare them to similar phenomena in other Australian languages in Section 4, before concluding in Section 5.

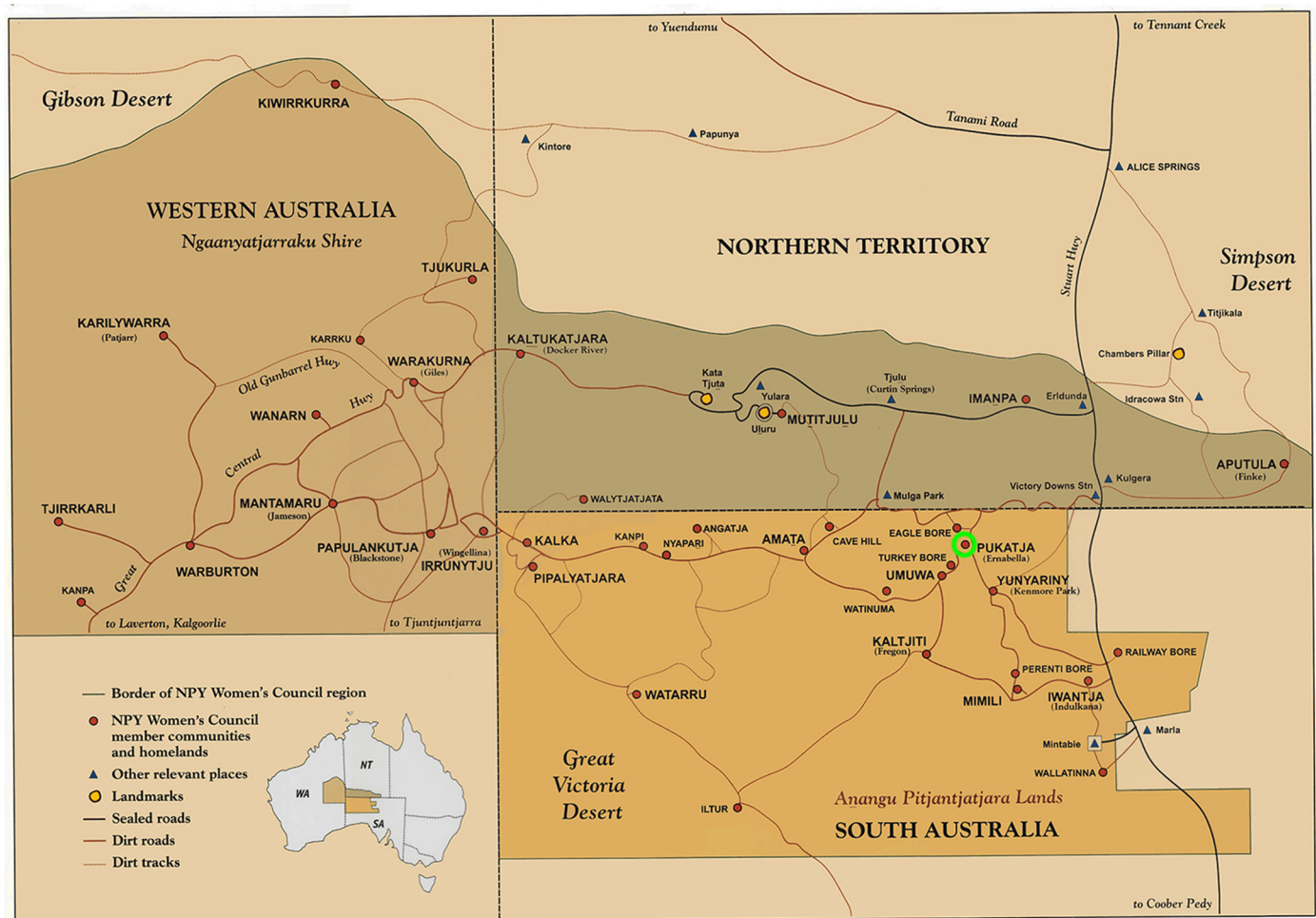
### 1.1. Pitjantjatjara

Pitjantjatjara is a Western Desert, Pama-Nyungan language. It is spoken as a dominant language and learned by children as a first language in numerous communities across Central Australia. As of the 2016 census, there are at least 3000 people who speak Pitjantjatjara at home ([Australian Bureau of Statistics \(ABS\) \(2016\)](#)). It is primarily spoken in the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands, in the far north-west corner of South Australia. It is also spoken in communities north of the border in the Northern Territory, and to the west, in Western Australia. The data for this study was recorded in Pukatja, a remote community also known as Ernabella (marked in green in Figure 1). There are many people with both Pitjantjatjara and Yankunytjatjara heritage in this community, although Pitjantjatjara is the dominant variety spoken. These two varieties are closely related and have a great deal of grammatical and lexical overlap; we thus refer to [Goddard \(1985\)](#) description of vowel elision in Yankunytjatjara below.

Phonologically, the language has much in common with other Pama-Nyungan languages. There are 17 phonemic consonants, shown in Table 1 with IPA to the left and the official orthography in parentheses to the right (where the two are not identical). Most relevant to this study are the 5 place distinctions in the nasal series: /ŋ, ɲ, ɳ, ɽ, m/. There are three vowels /a, i, u/, with a phonemic length distinction only in the first syllable of the word. Traditional Pitjantjatjara has a constraint that words must end in a vowel (phonologically); for example, consonant-final nominal stems, in the absence of suffixes, receive an epenthetic *-pa* which ensures this constraint is met.

**Table 1.** Pitjantjatjara consonant inventory. Adapted from [Tabain and Butcher \(2014\)](#), p. 190).

	<i>Bilabial</i>	<i>Apical</i>		<i>Laminal</i>	<i>Velar</i>
		<i>Alveolar</i>	<i>Post-Alveolar</i>	<i>Alveo-Palatal</i>	
<i>Stops</i>	p	t	ṭ ( <u>t</u> )	c (tj)	k
<i>Nasals</i>	m	n	ɳ ( <u>n</u> )	ɲ (ny)	ŋ (ng)
<i>Laterals</i>		l	ɭ ( <u>l</u> )	ʎ (ly)	
<i>Tap</i>		r			
<i>Glides</i>			ɽ ( <u>r</u> )	j (y)	w



**Figure 1.** Map of Ngaanyatjarra Pitjantjatjara Yankunytjatjara (NPY) Region, used with permission from NPY Women's Council (<https://www.npywc.org.au/about/> accessed on 1 April 2021). The location of Pukatja is highlighted in green.

A phonetic/phonological overview of the sound system of Pitjantjatjara is provided by Tabain and Butcher (2014). Other phonetic studies of the language by Tabain and colleagues have investigated lexical stress (Tabain et al. 2014), stop bursts (Tabain and Butcher 2015), nasal consonants (Tabain et al. 2016), intonation (Tabain and Fletcher 2012), and the alveolar–retroflex distinction (Tabain et al. 2020). Butcher (1996) also reports on some connected speech processes in Pitjantjatjara along with some other Australian languages. As well as these, Defina et al. (2020) investigated the prosody of clause chains in the language. This study builds on these by considering synchronic variation, and by examining processes which occur in spontaneous connected speech.

In this study, we are specifically focused on past-tense suffixes. There are three allomorphs /-nu, -ɲu, -ɲu/, depending on the conjugation class of the verb; we refer to these collectively as -Nu to represent the different nasal segments. The four conjugation classes are partially determined according to the metrical structure of the verbal stem (Wilmoth and Mansfield 2021). Verbal stems whose right edges are aligned with the right edge of a bimoraic metrical foot are assigned to the l- or Ø-class, and take the past tense allomorphs -ɲu and -ɲu, respectively; e.g., (carpa)<sub>φ</sub>-ɲu 'enter-PST' in the Ø-class, and (ampu)<sub>φ</sub>-ɲu 'hug-PST' in the l-class. Stems which are monomoraic or end in an unfooted syllable are assigned to the n- or ng-class, and take the -nu or -ɲu past tense allomorphs, respectively; e.g., (carpa)<sub>φ</sub>(cu-nu)<sub>φ</sub> 'insert-PST' in the n-class, (u-ɲu)<sub>φ</sub> 'give-PST' in the ng-class. This means that in the l- and Ø-classes, the past tense suffix is unfooted, whereas it is footed when affixed to verbs in the n- and ng-classes. This also means that the retroflex allomorph -ɲu is always unfooted, while the alveolar allomorph -nu is always footed. The

velar allomorph -ŋu can be footed or unfooted depending on whether it is in the Ø- or ng-class. The above analysis is illustrated in Table 2; see Wilmoth and Mansfield (2021) for the full details.<sup>1</sup> As we will show below, metrical structure and place of articulation have relevance for variable elision of final vowels.

Table 2. Allomorphy of past tense suffix.

Conjugation	Completely Footed Root, Suffix Unfooted		Root Ends with Unfooted Syllable, Suffix within Foot	
	Ø-class	l-class	ng-class	n-class
PST allomorph	/-ŋu/	/-ŋu/	/-ŋu/	/-nu/
Examples	(carpa) <sub>φ</sub> -ŋu ‘entered’ (waŋka) <sub>φ</sub> -ŋu ‘spoke’ (ɲina) <sub>φ</sub> (kati) <sub>φ</sub> -ŋu ‘sat down’	(ta:) <sub>φ</sub> -ŋu ‘burst’ (paca) <sub>φ</sub> -ŋu ‘bit’ (wirca) <sub>φ</sub> (paka) <sub>φ</sub> -ŋu ‘ran’	(u-ŋu) <sub>φ</sub> ‘gave’ (citi) <sub>φ</sub> (ti-ŋu) <sub>φ</sub> ‘shivered’ (pika) <sub>φ</sub> (cara) <sub>φ</sub> (ri-ŋu) <sub>φ</sub> ‘became sick’	(cu-nu) <sub>φ</sub> ‘put’ (murn) <sub>φ</sub> (ma-nu) <sub>φ</sub> ‘mooded’ (kawa) <sub>φ</sub> (li-nu) <sub>φ</sub> ‘lost’

### 1.2. Vowel Elision in Pitjantjatjara and Yankunytjatjara

In this section we provide an overview of vowel elision in Pitjantjatjara and Yankunytjatjara. There is no discussion of elision in Pitjantjatjara in early sources such as Trudinger (1943), who was living in Pukatja, or Douglas (1957), who provides a sophisticated early phonetic and phonological description of Western Desert (encompassing a number of lects including that spoken at Pukatja).

In Yankunytjatjara, Goddard (1985, pp. 14–16) describes patterns of elision of ‘weak vowels’. These are defined as unstressed vowels which follow an unstressed syllable and precede a stressed syllable (either within a word or across word boundaries). Following Wilmoth and Mansfield (2021), we understand ‘weak’ to refer to unfooted vowels. Goddard describes these elisions within prosodic words or phrases, and only in cases of vowel hiatus or where there are homorganic consonants on either side of the targeted vowel. Examples of this are shown in (1). Goddard makes no mention of utterance-final elision.

- (1) i. *wanti-ra* *iya-ŋi* / (wanti)<sub>φ</sub>ra (ija)<sub>φ</sub>ŋi/ → [wantirijaŋi]  
 leave.alone-MV send-PRS  
 ‘let go without harming’
- ii. *palu-nya* *tjana-nya* / (palu)<sub>φ</sub>ɲa (cana)<sub>φ</sub>ɲa/ → [paluɲcanɲa]  
 3sg-acc 3pl-acc  
 ‘them’
- iii. *apu-ngka* *katu* / (apuŋ)<sub>φ</sub>ka (katu)<sub>φ</sub>/ → [apuŋkatu]  
 rock-LOC above  
 ‘on the hills’

Langlois (2004), documenting teenage girls’ Pitjantjatjara in Utju/Areyonga in the 1990s, describes similar patterns of elision as Goddard, as well as extensions to the contexts of elision, which speakers refer to as *tjitjiku wangka* ‘children’s talk’ (p. 33).<sup>2</sup> Although the possible phonological contexts are not fully explicated, the examples suggest the following additional contexts which are relevant for this study:

- (a) Elision can occur utterance-finally; examples of utterance-final *mulap(a)* ‘true’ and *watalp(i)* ‘almost’ are given. The utterance final past tense elision we focus on in this paper falls within this category.
- (b) Vowels can be elided even when they would be expected to be within a foot, e.g., in the perlativ suffix /-wanu/ being pronounced as [wan].

<sup>1</sup> Previous descriptions of Pitjantjatjara/Yankunytjatjara (e.g., Eckert and Hudson 1988; Goddard 1985) include an additional phonologically conditioned allomorphy in the l-class whereby the retroflex /ɲ/ in suffixes becomes an alveolar /n/ following /i/-final stems, for example -nu in *witi-nu* ‘catch-PST’ compared to -ŋu in *paca-ŋu* ‘bite-PST’. This is more likely not part of the phonological representation but a result of the retroflex-alveolar distinction being nearly indistinguishable in nasals following /i/ (Tabain et al. 2020). It is however standard practice in written Pitjantjatjara to spell this as -nu; this is reflected in this paper. Findings related to variable retroflexion in the past tense suffix are discussed below.

<sup>2</sup> Note that this final vowel elision is a different phenomenon from the ‘short-way language’ described by Langlois (2004, 2006). The ‘short-way language’ is a type of secret language/language game used by teenage girls, in which initial syllables are dropped.

Those teenage speakers recorded by Langlois would now be in their forties, in between the two age cohorts examined in this paper. Anecdotally, it seems that Pukatja Pitjantjatjara is somewhat more conservative than Utju/Areyonga Pitjantjatjara, and many speakers have commented that various features now used by young people in Pukatja are in fact ‘Utju way’. (Utju/Areyonga is approximately 400 km north of Pukatja and has a higher proportion of residents with other language backgrounds, such as Pintupi-Luritja, Warlpiri, or Arrernte; the latter is phonologically very different from Western Desert languages).

As this study is focussed on the particular context of past tense suffixes, we will not include a detailed analysis of the current contexts for vowel elision, and their frequencies among different speakers given different linguistic conditions. Final vowel elision is extremely frequent in the Pitjantjatjara currently spoken in Pukatja, particularly among young people, and broadly similar to what Langlois (2004) described in Areyonga Teenage Pitjantjatjara. It is hoped that this study can serve as the phonetic basis for further variationist research into this variable in other contexts.

### 1.3. From Subconscious Variation to Sociolinguistic Meaning

One of the main motivations for this study is the concerns that speakers have voiced regarding language change. Older Pitjantjatjara speakers often express worry for the future of their language. This is not only regarding potential language shift, but also what they perceive as changes initiated by young people which are not *mulapa* ‘true’ Pitjantjatjara. One of these changes is the shortening of words, i.e., final vowel elision, as can be seen in the following passage from speaker SL<sup>3</sup>. Here, we also see the source of the title of this paper: *they talk mutumutu* [short].

- (2) *Nganana winki educationpangka waakaripai tjuta, nganana kulini anangu pulka tjutangu, ngururitja tjutangu. M-lu purunypa, K-lu purunypa nganana kulira wangkapai “Wiya! Wiya nyuntu tjukurpa kampa kutjupara wangkanyi, nyaa, mutuni nguwanpa. Tjukurpa mulapa nyuntu nyangatja alatji wangka.” Sometimes we tell the young ones, nganampa families, to really you know speak Pitjantjatjara wasa you know? “Pitjantjatjara wangka nyaa word long.” Ka palu tjana, they talk mutumutu. Tjana mutumutura wangkanyi. They cut Pitjantjatjara. Tjana mutumutura wangkanyi. . . . Tjukutjuku tjana putu kulini wara wangkanytjaku munu tjana mutura wangkanyi, mutumutu. Alatji.*

All of us education workers think so, all the old people and middle aged people, like M and K. We hear it and we say, “No! No, you’re changing those words, it’s like you’re shortening them. Speak like this, say the words properly.” Sometimes we tell the young ones in our families, to really, you know, speak Pitjantjatjara the long way, you know? “Say those Pitjantjatjara words the long way.” But **they talk mutumutu** [short]. They shorten it when they’re speaking. They cut up Pitjantjatjara. They shorten it. . . . They don’t fully understand how to say it the long way, so they say it short. It’s like that.

(SW20190425-08-PitjKunpuKanyini)

The same phenomenon of ‘shortening’ words is discussed in this excerpted passage, from participant NB:

- (3) *Ka wangka nyanga paluru nganampa kuwari kampa kutjuparingu, ka tjitji malatj tjutang kuwari wangka kutjupa tjuta wangkanyi. Palu wangka nyanga paluru, wangka palulatuya ngaranya paluru, tjukutjuku tjukutjuku panya wangka, mutumutu tjana palyani, tjukutjuku tjukutjuku.*

Our language has changed, and the children nowadays are speaking lots of different languages. The language is still here, but a little bit at a time, they’re making it short, just a little bit at a time.

(SW20190531-01-TjukurpaPt1)

<sup>3</sup> This has been lightly edited for fluency and to redact names; the code-switching into English is because this was an informal conversation with the first author and should not be taken as representative of typical code-switching practices in everyday speech between Pitjantjatjara speakers.



As these comments show, word-final vowel elision is a very salient sociolinguistic variable associated with young people, and a cause of concern for many older Anangu.<sup>4</sup> However, vowel elision is not limited to young people, and is not always noticed by speakers. The focus of this study was also selected in part due to the experiences of the first two authors. While transcribing with Pitjantjatjara speakers, we encountered many cases where we could not hear a final vowel or suffix, but they would reject transcriptions without it. Though they understand and support our goal of representing language variation and are generally happy to transcribe spontaneous Pitjantjatjara speech with non-standard spelling, they would often insist that an elided tense or case suffix was in fact fully present and should be written down. There was a mismatch in our perception of the speech signal due to our different linguistic experiences. As our proficiency as non-native Pitjantjatjara listeners has improved, at times we have found ourselves perceiving ‘phantom’ vowels or suffixes for which there is no spectrographic evidence. This perceptual illusion could be due to residual cues, or to listener expectations in the absence of audible phonetic cues. Listener expectation has been shown to motivate listeners to ‘hear’ vowels that are not phonetically present, as in several studies of perceptual vowel epenthesis in Japanese, for example (e.g., Dupoux et al. 1999; Kilpatrick et al. 2019).

If a vowel or suffix is absent or just barely perceptible, this might serve as the source of a sound change, according to a listener-oriented model of sound change (e.g., Ohala 1981). That is, while one generation might perceive a full suffix due to their expectations based on prior experience and/or perception of subtle acoustic cues, following generations may encounter more reduced realizations more often, and their phonological representation of the form of the suffix may eventually differ, leading to the absence of the vowel or suffix entirely.

Based on these and other experiences, and conversations with speakers such as those excerpted above, it appears that in some contexts word-final vowel elision is a stylistic resource associated with young people, while in other contexts (such as inflectional suffixes) it is below the level of consciousness. We focus on the latter context to shed some light on how the former, more sociolinguistically salient changes may have been initiated.

## 2. Materials and Methods

The data for this study comes from eight native Pitjantjatjara speakers, all female. While the gender variable would certainly be interesting to investigate with regard to these phenomena, as female researchers ourselves we abide by local norms in working most closely with women. The speakers were selected from a larger corpus to represent a ‘younger’ and ‘older’ cohort. The younger speakers were 17, 17, 24, and 26 years old at the time of recording. The older speakers were 52, 59, 62, and 69. Speakers were recruited through our various connections and relationships, as part of several ongoing research projects in Pukatja. Data collection for this project received ethics approval from the University of Melbourne Human Research Ethics Committee (project numbers 1953646.1 and 1647234.2). Permits to travel and conduct research on the APY Lands were granted by APY. All participants provided their informed consent and were paid for their time.

Speakers were recorded with a Sennheiser lapel microphone (model ew-100-eng-g3) or a Countryman ISOMAX headset microphone (model MHHP6HH05L), with either a Zoom H6 or H4n recorder depending on the session, sampled at 48 kHz. The data consists of spontaneous speech of different genres, including conversation, narrative, and semi-structured elicitation such as storybook or cartoon retellings. For the younger speakers, and usually but not always with the older speakers, recordings were conducted within groups of peers, not alone with the researcher.

Utterance-final tokens of past tense verbs were extracted from the corpus, and any examples with overlapping speech, excessive background noise, or other factors such as coughing or laughing were excluded. The utterance-final context was chosen as it is a

<sup>4</sup> Anangu, meaning ‘person’, is used as an ethnonym to denote Aboriginal people from the Western Desert regions of Australia.

common context for elision and allows us to control for the linguistic environment. The verbs extracted were those which were initially transcribed with a full past tense suffix, or with the final nasal only, in a first pass (non-phonetic) transcription; due to the perceptual reasons mentioned above, verbs were not transcribed as missing suffixes entirely. Where perceptual cues may have been ambiguous, intended past tense suffixes were identifiable based on the context of the discourse, for example within a narrative told in the past tense. There were 280 tokens in total; the number of tokens per speaker is shown in Table 3. The verb class and lexical item of each token were coded by the first and second authors. The original orthographic transcription of the suffix was blinded so as not to bias the phonetic analysis. The third author then conducted a fine-grained acoustic phonetic analysis of each token. Each verb was analysed in terms of the realization of the nasal (present or absent and its quality), the realization of the vowel (present or absent and its quality), and any other notable aspects. This analysis was carried out using both auditory and acoustic analysis (observing cues in the spectrogram), using Praat version 6.1.34 (Boersma and Weenink 2020). Each analysis category is defined and illustrated below.

**Table 3.** Overview of speaker age and number of tokens within the Younger and Older cohorts.

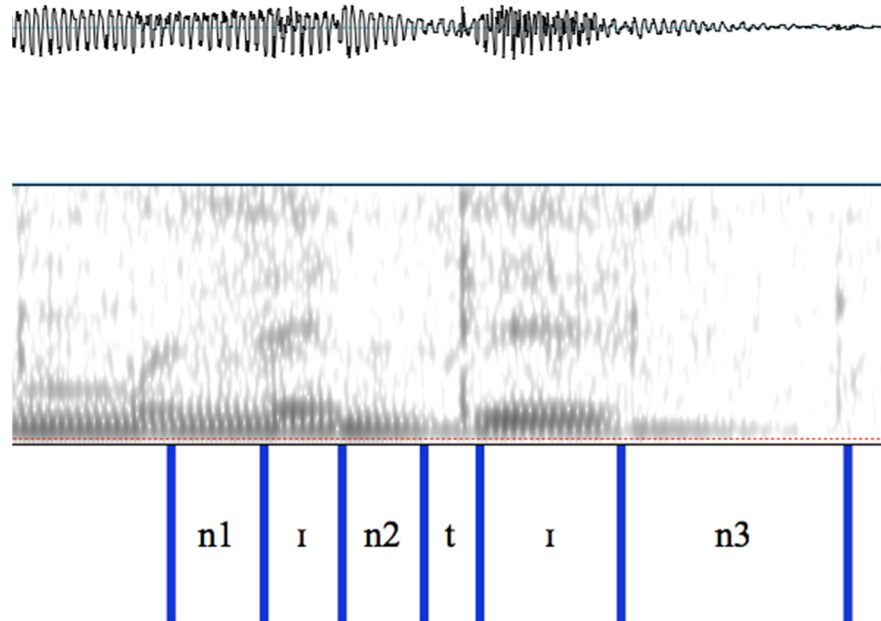
Cohort	Initials	Age	Tokens
Younger	AR	17	37
	CB	24	16
	DM	17	56
	TE	26	35
		<b>Mean age: 21</b>	<b>Subtotal: 144</b>
Older	MD	59	26
	NB	62	24
	UT	52	65
	YB	69	21
		<b>Mean age: 60.5</b>	<b>Subtotal: 136</b>
			<b>Total tokens: 280</b>

### 2.1. Denasalization

Denasalization is a process that is reported to be common in connected speech in Australian languages, especially in suffixes and especially in nasal-vowel-nasal-vowel sequences (Butcher 2006, p. 10). Butcher (1999, p. 480) describes denasalization as occurring when the ‘lowering of the velum is often “left too late”, with the result that orality perseverates into the nasal consonant’. This means it is not uncommon for nasal segments to appear on spectrograms as oral stop-like, having a less resonant nature than a prototypical nasal. Denasalised nasals can have less evident formant activity, or no evident formant activity, having far less resonance than a prototypical nasal. On spectrograms they may appear as completely stop-like, simply having a ‘voice bar’ with the same characteristics as a voiced stop, and in some cases in our data these were followed by a release burst as would be observed for a stop. Note that this is not the same as a prestopped nasal, which consists of short stop-like activity at the beginning of a nasal segment (i.e., Butcher 1999); instead denasalization applies to the entire segment.

Figure 2 shows a devoiced nasal at the end of a word (where the vowel is deleted). This example contains three /n/ segments in the word ninti-nu ‘teach-PST’. The first in the sequence (n1) is a prototypical nasal, the second (n2) is less nasal-like (formants are weaker) and the last (n3) appears entirely denasalised. This segment has no formant activity and its very low energy is also evident on the waveform when compared with the other nasals in the sequence. There is a pre-stop at the beginning of the ‘n3’ segment which highlights the fact that denasalization is not necessarily exactly the same as having absolutely no nasal airflow. For a large proportion of this segment there is little spectral activity aside from a ‘voice bar’ which indicates vocal fold vibration, and then the voicing cuts out entirely

towards the end of the segment. There is also an oral release burst evident at the very end of 'n3'. The auditory impression is similar to what English speakers describe as speaking while holding one's nose or having a blocked nose (i.e., there is far less nasality).

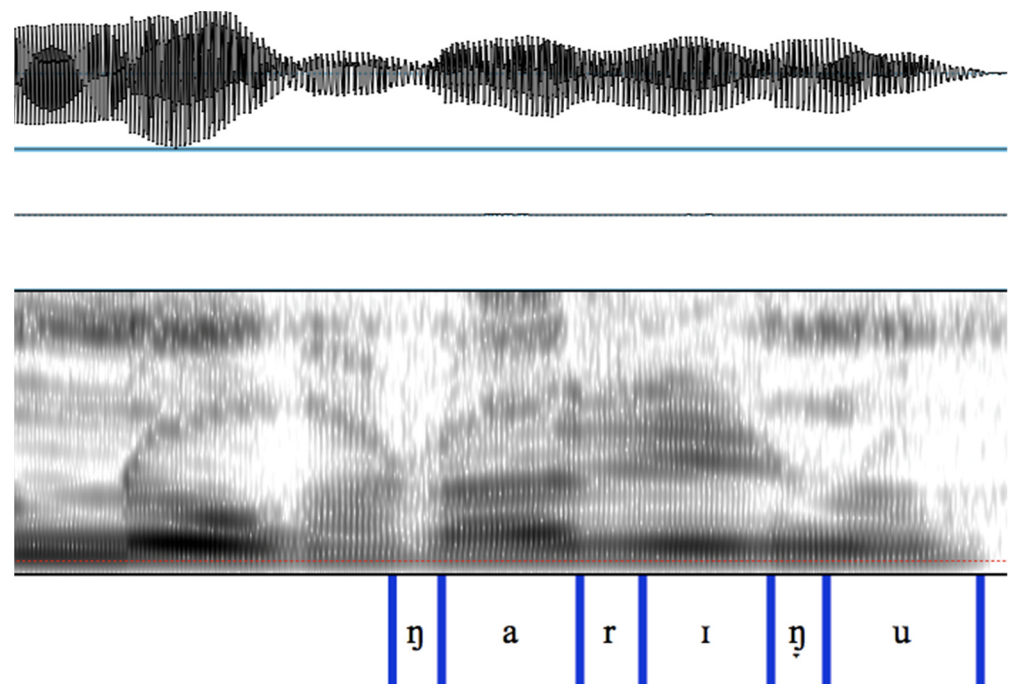


**Figure 2.** Example of denasalization by younger speaker DM (ninti-nu ‘teach-PST’) (SW20190331-10-EggStory).

## 2.2. Approximation

This is also a common process for nasals in Australian Indigenous languages, as reported by Butcher (2006, p. 10). In the example below, the initial nasal in ɲari-ɲu ‘lie-PST’ is a prototypical nasal, the second (in the suffix) is approximated. Approximants are often described as having vowel-like acoustic structure (i.e., Ladefoged and Maddieson 1996, p. 372), and this is certainly evident in the example shown in Figure 3. The approximated nasal in the suffix appears more vowel-like on the spectrogram, which is caused by less supralaryngeal constriction. This is seen in measures highlighting greater amplitude and resonance, including more darkness in the spectrum and more energy in the waveform for the approximated /ɲ/. There is also clearly evident formant structure in the approximated nasal. By contrast the word initial nasal has less energy due to the fact that there is vocal tract constriction for this articulation; it is lighter in the spectrum, the waveform dips, and while nasal formants are evident on the spectrum, they are not vowel-like.

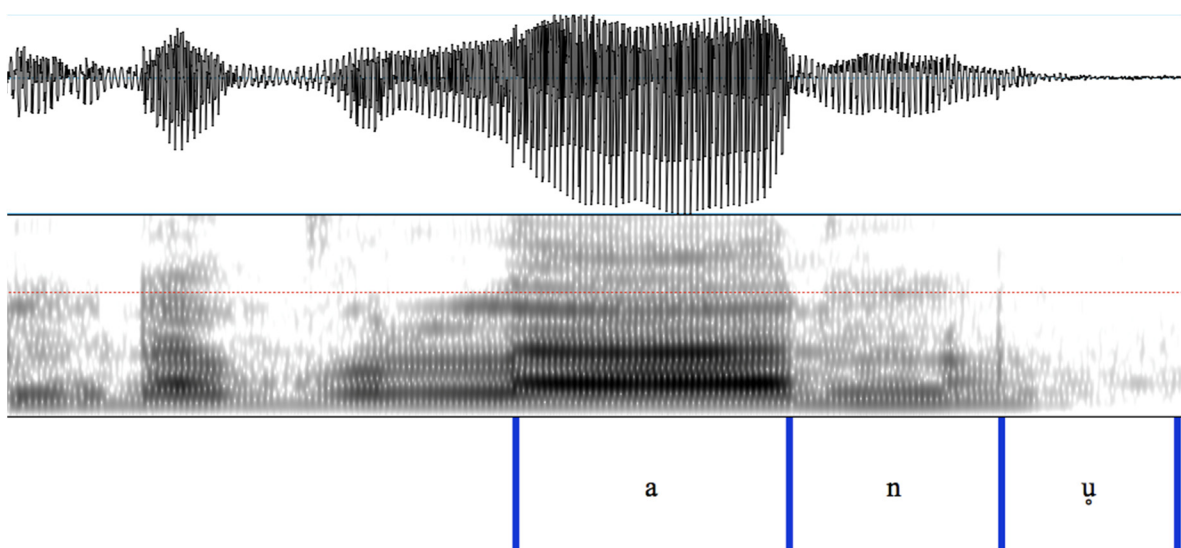




**Figure 3.** Example of approximation by older speaker UT (ŋari-ŋu ‘lie-PST’) (Umatji\_20181031).

### 2.3. Devoicing

Devoicing was a common occurrence in the data, both for nasal consonants and vowels. In Figure 4, showing the word a-nu ‘go-PST’, the final vowel is heavily devoiced and there is an evident difference between the initial voiced /a/ and the devoiced final /u/ vowel. The /a/ has clear formant structure, high energy activity on the waveform and is especially dark on the spectrum (highlighting resonance). The /u/ by contrast has formant structure typical of a close back vowel as would be expected, with low F1 and low F2 (Ladefoged and Maddieson 1996, p. 286), but has very little voicing—the energy on the waveform peters out, and there is only slight voicing in the initial portion of the spectrum indicated by the energy in the lower portion of the spectrogram which indicates vocal fold vibration.



**Figure 4.** Example of devoicing by younger speaker TE (a-nu ‘go-PST’) (SW20190412-07-BKCow).

#### 2.4. Shortening

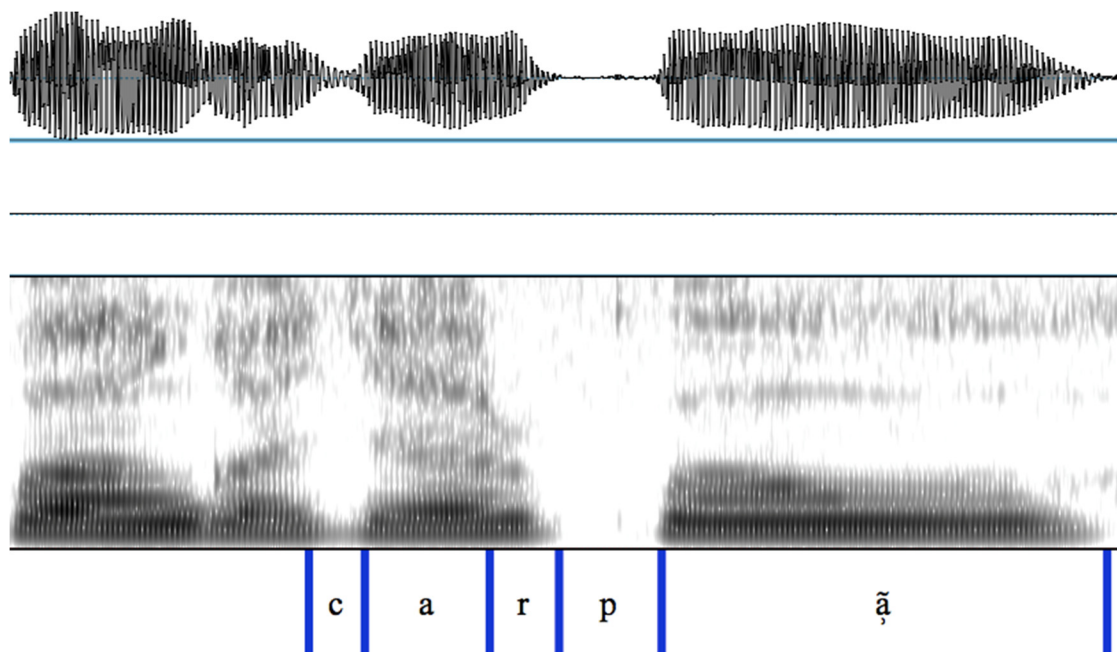
Vowels and consonants were categorized as short impressionistically, when they short relative to the majority of tokens produced by the speaker. Short vowels were often similar in length to English schwa. Other processes of vowel reduction, such as centralization, were not analyzed.

#### 2.5. Place of Articulation

The transcribed place of articulation of the suffix nasal was blinded for the phonetic analysis. The difference between alveolar, palatal and velar nasals tends to be very salient auditorily, and there are also acoustic cues that assist in determining place of articulation. Alveolar nasals lack acoustic cues found in VN and NV transitions for the other places of articulation; for example, when N is a palatal, F2 is especially high in preceding and following vowels. When the nasal is velar, it is common to see a velar pinch in F2 and F3 in VN transitions. The third author coded place of articulation based on these auditory and acoustic cues and we then compared this coding with the phonemic place of articulation of each lexeme.

#### 2.6. Nasalization and Rounding

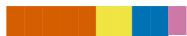







The example in Figure 5 shows a case in which there is both nasalization and rounding on the final vowel in the stem. Rounding on vowels is generally indicated by a lower F3. While rounding could be difficult to see visually on a spectrogram without comparing with an unrounded vowel counterpart, this example is useful because the rounding begins shortly after the vowel articulation has started, so it is easy to see the F3 movement which dips within the first part of the vowel; in this case the formant movement cannot be attributed to any other kind of coarticulation given that the vowel occurs word and phrase finally. It is also worth noting that the vowel here is especially long, possibly a compensatory strategy because of the loss of segments.

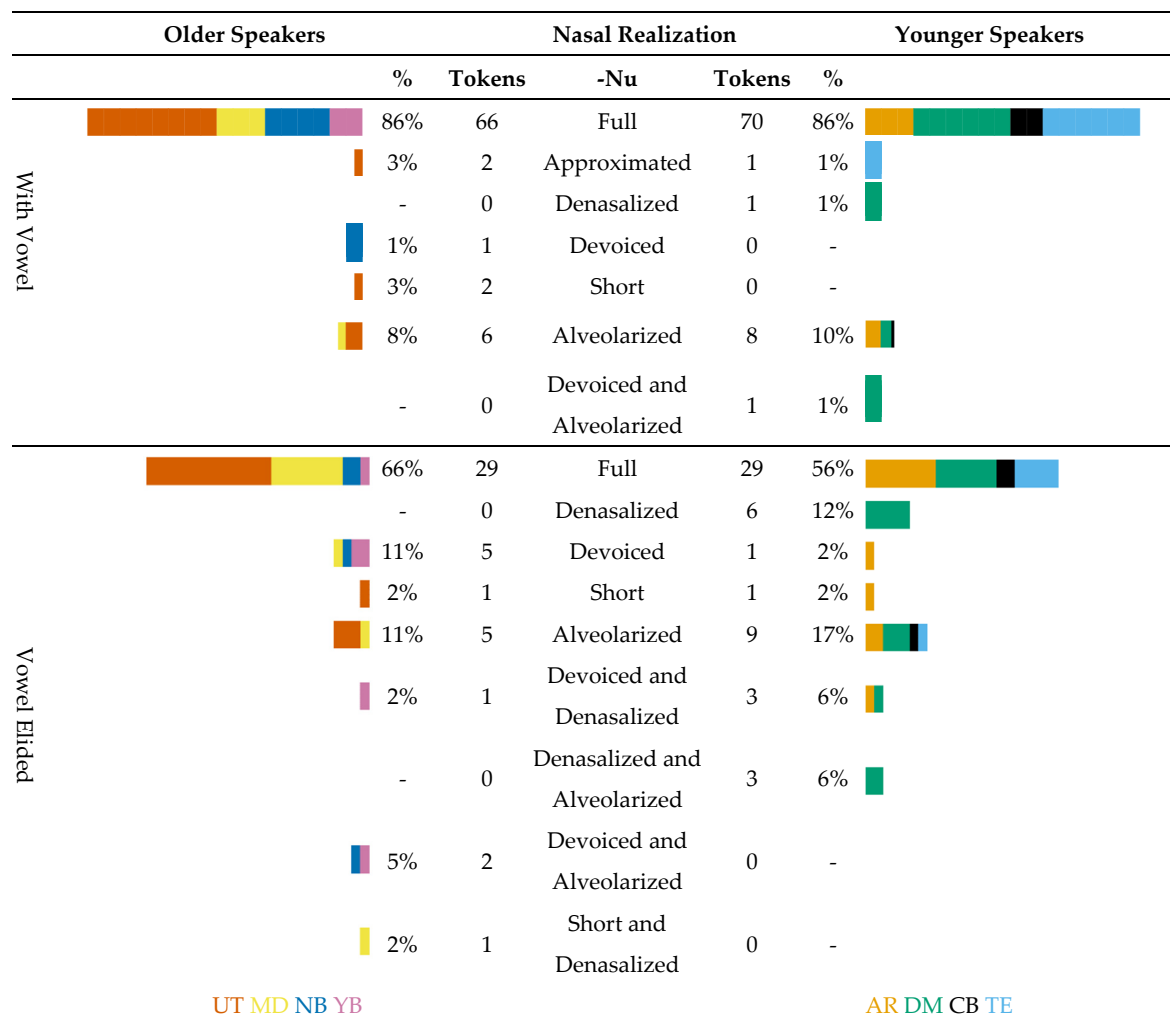


**Figure 5.** Example of nasalization and rounding on the final vowel segment of the verb stem (carpa-ŋu ‘enter-PST’) (Umatji\_frog-mamu-ECOM).

Nasalization has a number of acoustic cues, though not all of these will always be evident on a spectrogram, especially in connected dynamic speech. Ladefoged and Maddieson (1996, pp. 288–89) describe a weaker second formant in nasalised vowels, and



Older Speakers				Vowel Realization				Younger Speakers				
				%	Tokens	-Nu	Tokens	%				
				49%	39	Full	61	75%				
				19%	15	Devoiced	8	10%				
				10%	8	Short	2	3%				
				23%	18	Short and	10	12%				
						Devoiced						
UT MD NB YB									AR DM CB TE			



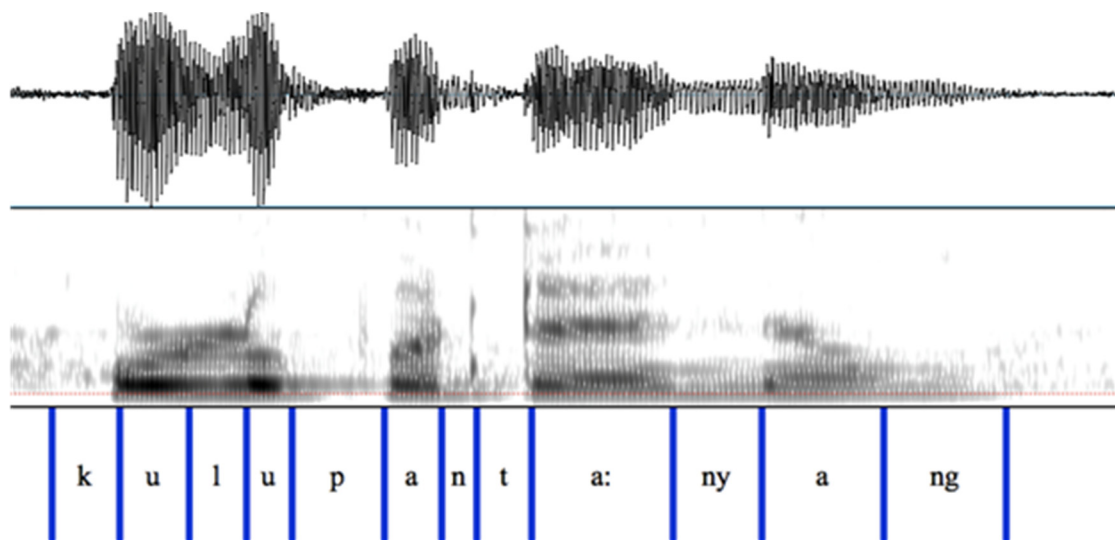
**Figure 9.** Realization of nasal when present. Above the line, vowel produced. Below the line, vowel not produced. Pre-stopping is not indicated here. Colors refer to individual speakers, ordered youngest to oldest, left to right.

When the vowel was produced, Older and Younger speakers tended to produce a full nasal consonant preceding it (86% of tokens among both cohorts). In some cases, the nasal was produced with degrees of lenition even when the subsequent vowel was fully produced. The lenition processes in these cases were: approximation, denasalization (observed with Younger speakers only), devoicing (observed with Older speakers only), shortening (observed with Older speakers only), or a shift of the place of articulation to alveolar such that /ɲ/ or /ŋ/ were realized as [n]. There was only one instance with multiple types of reduction of the nasal when the vowel was also produced; in this instance a younger speaker both devoiced and shifted the place of articulation to [n]. When the vowel was present, the most frequent process affecting the nasal was a change in the place of articulation.

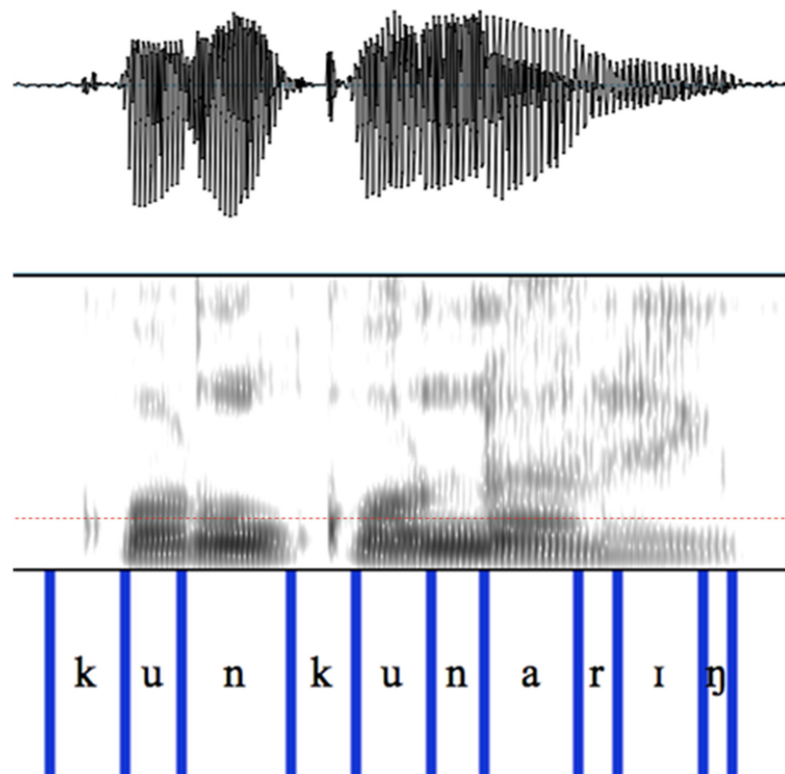
Lenition of the nasal consonant was more frequent when the following vowel was not produced. In that case, Younger speakers lenited the nasal 44% of time, compared to 34% of the time among the Older speakers. Combinations of lenition processes were also more frequent when the vowel was absent. Older speakers tended to devoice and change the place of articulation, while Younger speakers, particularly DM, tended to denasalize and change the place of articulation. Simultaneous devoicing and denasalization was observed with both cohorts. Denasalization and change in place of articulation was observed with the younger cohort only (DM), devoicing and change in place of articulation was observed with the older cohort only, as was denasalization and shortening. We considered all of



these processes to be types of reduction. Figure 10 shows a spectrogram of an example of a fully realized nasal with the vowel elided. Figure 11 shows the spectrogram of the word *kunkun-ari-ŋ(u)* ‘sleep-INCH-PST’ produced by UT with a shortened nasal and no vowel. In the final vowel of the stem, formants 2 and 3 show a clear ‘velar pinch’, indicating the onset of a velar closure. There is then a short period of nasal consonant closure straight after the vowel where /ŋ/ is labelled, but no evidence of a final vowel. It is clear that voicing ceases after the velar closure.



**Figure 10.** Example of a suffix produced with a full nasal, but an elided vowel by Younger speaker AM. In this example the final syllable of the preceding word (*ya*) is also elided though the vowel is lengthened. ( ... kulupa=nta=jā ŋa-ŋu ‘ ... small-and.then-3PL.A see-PST/and then they saw a little (truck)’. (SW20190412-05-T&JDuckling).



**Figure 11.** Example of a shortened nasal with an elided vowel by Older speaker UT (*kunkunari-ŋu* ‘sleep-PST/slept’). (SW20190328-02-MonsterStory).

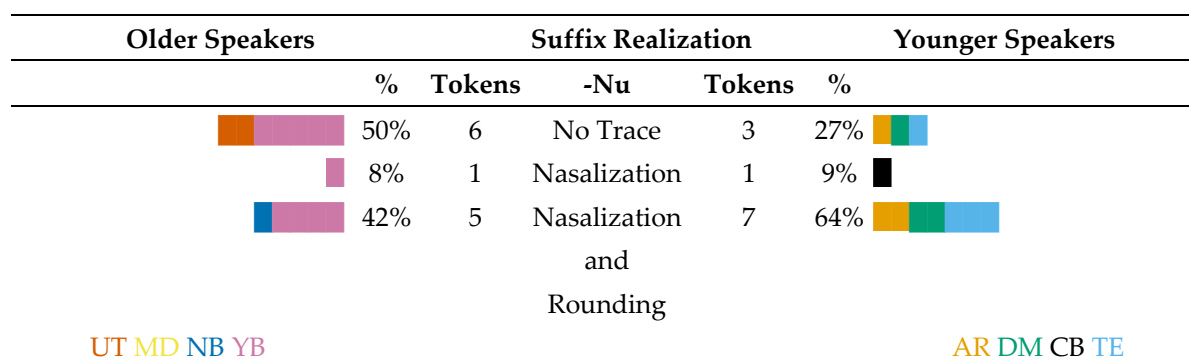
Nasal consonants were also regularly (phonetically) prestopped; this was observed in various contexts including the utterance-final past tense suffixes. Older speakers produced 15% of their past tense suffix nasal consonants with prestopping, while Younger speakers prestopped 8% of tokens. Prestopping was observed with fully produced nasals and those where the place of articulation was changed. Since this does not represent a lenition of the consonant, we will not examine it further here.

### 3.3. Suffix Deletion: When Neither Nasal Nor Vowel Are Produced

Sometimes, speakers of both age groups fully elided the suffix, producing neither the nasal nor the vowel segment of the past tense suffix. This occurred in 9% of Older speaker tokens and 8% of Younger speaker tokens. Speakers elided the entire suffix with verbs of all lengths, including monosyllabic verb roots u-ɲu ‘give-PST’ and ɲa-ɲu ‘see-PST’; this was unexpected given Pitjantjatjara has been analyzed as having a bimoraic word minimum (Goddard 1985, p. 13).

One of the questions raised in Section 1.3 was whether there are any remaining phonetic traces of the elided segments that may lead speakers to perceive suffixes as being present. When the syllable was elided, there were detectable traces on the final vowel of the verb stem 50% of the time for Older speakers, and 73% of the time for Younger speakers.

In some cases, only nasalization of the final stem vowel was detectable (8% for Older speakers and 9% for Younger). In most cases where there was some trace of the elided tense suffix, both nasalization and lip rounding were detectable (42% for Older speakers and 64% for Younger). See Figure 12 for the distribution of this across cohorts and speakers.



**Figure 12.** Residual features of elided suffixes on final vowel of verb stem. Colors refer to individual speakers, ordered youngest to oldest, left to right.

### 3.4. Comparison of Older and Younger Speakers

The phonetic analysis described above showed extensive variation in the production of utterance-final past tense suffixes by both Older and Younger speakers. In this section, we examine whether there were any significant differences between the productions of these two cohorts. Our focus is on the extent of elision or lenition, with the hypothesis that younger speakers may lenite suffixes more often or to a greater extent. We coded extent of lenition by adding one point for every process of lenition (e.g., devoicing, shortening, place reduction) of the nasal or vowel and three points if the nasal or vowel was fully elided. This created a quantifiable scale of reduction from 0 (fully produced nasal and vowel) through to 6 (fully elided suffix, with or without residual traces on the verb stem). For example, a value of 1 was given to any token with a devoiced vowel or nasal. A reduction value of 2 was given to a token with a devoiced nasal and vowel. A reduction value of 3 was given to a token with a full nasal and no vowel, or to a token with an alveolarized nasal and a devoiced and shortened vowel. Tokens with no vowel and a lenited nasal have a value of 4 or 5. Fully elided suffixes—with and without trace nasalization and lip rounding on the stem—were coded as 6. Tokens where the suffix nasal was phonemically alveolar /n/ were marked ineligible for place of articulation reduction (17% of tokens).

We examined whether there was a difference in extent of reduction between the two cohorts using a Linear Mixed Effects model within RStudio (R Core Team 2020; RStudio Team 2020) with the glmmTMB package (Magnusson et al. 2020). Extent of reduction was the dependent (ordinal) variable. Fixed effects were AgeGroup (Older or Younger), Footedness (is the suffix within a metrical foot or not), Place of Articulation (is the nasal consonant velar or not<sup>5</sup>, abbreviated PoA), and Length (is the verb stem monomoraic or not). These are all dichotomous variables and all contrasts were set to sum to zero. The starting model was the maximal model with all potential interactions. Interactions with Length were removed as they led to confounds (all monomoraic verb roots have suffixes within a metrical foot) or they were not significant and their removal improved the fit of the model. Random slopes for speaker with Footedness, Place of Articulation and Length were initially included, but excluded due to nonconvergence. The final model and all effects can be seen in Table 4.

**Table 4.** Results of Linear Mixed Effects model exploring factors influencing reduction of utterance-final past tense suffixes.

Model	Reduction ~AgeGroup*Footedness*PoA + Length + (1   Speaker) Observations = 280, Speakers = 8			
	$\beta$	Std Dev	z	p
<i>Random effects</i>				
Speaker	0.153	0.392		
Residual	3.155	1.776		
<i>Fixed effects</i>				
(Intercept)	3.142	0.198	15.887	<0.001
AgeGroup	0.195	0.183	1.068	0.339
Footedness	0.337	0.179	1.879	0.061
PoA	−0.544	0.121	−4.477	<0.001
Length	0.010	0.214	0.048	0.962
AgeGroup0.Footedness	0.235	0.113	2.084	0.038
AgeGroup*PoA	0.052	0.115	0.447	0.655
Footedness*PoA	−0.145	0.122	−1.195	0.233
AgeGroup*Footedness*PoA	−0.391	0.116	−3.382	0.001

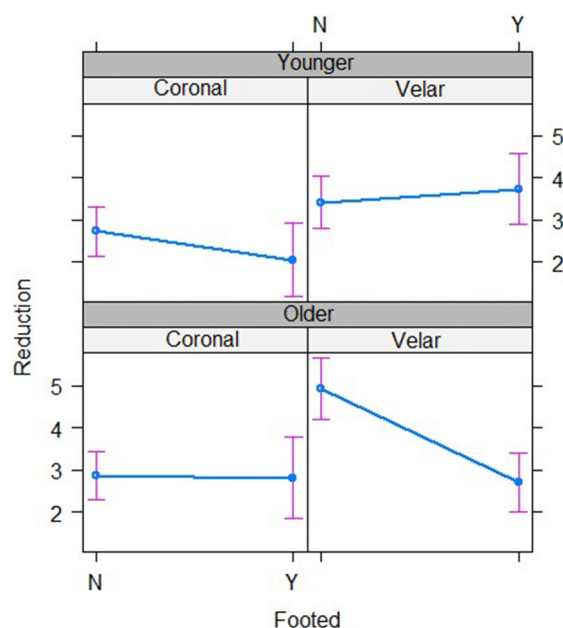
The final model was:

$$\text{Reduction} \sim \text{AgeGroup} * \text{Footedness} * \text{PoA} + \text{Length} + (1 | \text{Speaker})$$

There was a significant effect of Place of Articulation; suffixes with velar nasals were more likely to be reduced. There was also a significant two-way interaction of AgeGroup with Footedness. Moreover, the three-way interaction AgeGroup, Footedness and Place of Articulation was significant. An examination of the effects plots (Figure 13) shows that Older speakers are more likely to reduce if the nasal is velar AND the suffix is unfooted, but if one of those conditions does not hold—i.e., if the suffix is footed OR the consonant is coronal—they tend not to reduce the suffix.

Younger speakers were more influenced by place of articulation in their reduction processes. They were more likely to reduce the suffix if the nasal is velar. This difference in place of articulation was more marked for footed syllables, but beyond this there was no apparent influence of Footedness for the Younger speakers, unlike for Older speakers.

<sup>5</sup> Note that for the coronal nasals, place of articulation is confounded with Footedness: retroflex nasals always have unfooted suffixes and alveolar nasals always have footed suffixes. Thus we focus here in the analysis on velar versus coronal nasals and the model effectively does the comparison between retroflex (unfooted coronal) and alveolar (footed coronal) in the interaction between Footedness and Place of Articulation.



**Figure 13.** Effects plot of the three-way AgeGroup\*Footedness\*PlaceofArticulation effect. A higher reduction value indicates a greater tendency to reduce the past tense suffix. The plot shows the clear trend for Older speakers to reduce when the suffix is Not footed AND the nasal consonant is velar. The younger speakers show a tendency to reduce more with velar consonants in general and little difference according to footedness.

#### 4. Discussion

This paper set out to determine how Pitjantjatjara speakers are producing utterance-final past tense suffixes /-nu, -ɲu, -ŋu/ (RQ1), whether a comparison of older and younger speakers suggests a change in progress (RQ2) and if so, what form it takes (RQ3).

##### 4.1. Variable Elision in Pitjantjatjara and Other Australian Languages

Regarding the first research question, it was found that the realization of past tense suffixes was highly gradient. Nasals were found to be fully produced, approximated, denasalized, devoiced, shortened, or completely absent; all forms of reduction that are known to occur in Australian languages (Butcher 1996, 2008). In addition, some nasals shifted to an alveolar place of articulation, so that the nasal in the suffix was still fully present, but realized as /n/. Sometimes, nasal realizations involved a combination of these processes. Vowels were fully produced, devoiced, short, short and devoiced, or absent. In some cases, both the nasal and the vowel were absent and so the suffix was completely elided, in these cases residual cues such as nasalization or rounding were sometimes found on the final vowel of the verb stem. This wide variation in realization of both the nasal and vowel was observed with all speakers, regardless of age.

While both age groups exhibited the full range of suffix productions from fully realized nasal and vowel all the way through to fully elided, there was nevertheless a difference between age groups in the conditions under which speakers in each group tended towards elision. Older speakers were more likely to elide the suffix if the nasal was velar and the final syllable was not footed, but not if it was footed or if the consonant was coronal. Younger speakers, on the other hand, were less influenced by metrical structure, while place of articulation was a clearer contributing factor. These observed patterns in the contexts of elision both fit with what is known about elision in Australian languages generally. For example, Butcher (1996, p. 91) notes that elision can be conditioned by particular segments or prosodic conditions; also observing that its occurrence is highly gradient and variable.

Similar patterns of full and gradient word-final vowel elision are found in many Australian languages, beyond Western Desert. In Kayardild, Evans (1995) describes a regular

process of ‘prosodic truncation’, whereby /a/ is deleted utterance-finally. Bowerman (2013) also discusses utterance-final devoicing in Bardi, as well as variation in the elision of word-final vowels, which ‘is both a phonetic and a phonological process’ (p. 91). There are differences in the presence of final vowels between different dialects of Bardi, as well as a higher occurrence of final vowels in older materials as compared to modern materials. In Yidiny too, there is a semi-regular process of deletion of unfooted, word-final vowels (see Dixon 1977; Round 2017 inter alia).

In other languages, vowel elision is less phonologised. In an overview of connected speech processes in Australian languages, Butcher (2008) gives several examples of vowel elision word- and/or utterance-finally in Pitjantjatjara, as well as Warlpiri, Djambarrpuyju, and Adnyamathanha. These languages differ in the precise contexts in which vowels are elided; a representative example from each is given in Table 5. In the first three examples, the final vowel in the first of two words is elided, while the final vowel of *waraci* is elided in the final example. In the Warlpiri example, a vowel is also elided utterance finally.

**Table 5.** Examples of final vowel deletion in Pitjantjatjara, Warlpiri, Djambarrpuyju, and Adnyamathanha, adapted from Butcher (2008).

Phonemic	English	Careful Speech	Connected Speech
<b>Pitjantjatjara</b>			
/ˈkuɬaŋku wacaŋu/	‘the older brothersaid’	[ˈkudɛŋɡu wɛɬɛŋu]	[ˈkudɛŋɡwɛɬɛŋu]
<b>Warlpiri</b>			
/ˈkucaɭucu ˈcapuŋunu/#	‘He asked melike this.’	[ˈkɔɬɛɭɔɬu ˈcɛbɔŋɔŋu]	[ˈkɔɬɛɭɔɬɛbɔŋɔŋ]
<b>Djambarrpuyju</b>			
/ˈpicɛartɪ ˈliŋku/	‘say, then’	[ˈbɪcɛɛrdɪ ˈliŋɡu]	[ˈβɪcɛɛrd ˈleŋɡu]
<b>Adnyamathanha</b>			
/ˈwaraci/	‘emu’	[ˈwɛɛɛci]	[ˈwɛɛɛc]

Hansen and Hansen (1969) do not describe regular patterns of vowel elision in their description of Pintupi<sup>6</sup> phonology, but they do note an occurrence of elision with remaining traces of rounding similar to what we observe here for Pitjantjatjara (Section 3.3): ‘When word final, a nonstressed rounded nasal is a portmanteau phone signaling the sequence of the phonemes ŋu or nu: ŋalkutiŋu ‘had just eaten’ (p. 157); that is, the vowel itself is elided but its rounding feature is realized on the nasal.

The phenomenon of word- and/or utterance-final elision is common across Australian languages, and our phonetic analysis in this study shows how gradient these productions can be, and how such a change in progress might happen between generations of speakers.

#### 4.2. Language Contact and Change

Regarding our second and third research questions, we found a difference between age groups suggesting a change in progress, whereby elision by younger Pitjantjatjara speakers is likely no longer driven by footedness. One question stemming from this observation is to what extent this is a contact induced change, or a language-internal shift. Utterance-final devoicing or elision is cross-linguistically a very common locus of sound change both in contact situations and language-internally, see for example Cser (2015). This is also the case in Australian languages, where such changes have occurred in the traditional languages mentioned above as well as in contact varieties or situations of language shift. For example, in young people’s Dyirbal, Schmidt (1985, p. 64) found that the future suffix *-ny* was frequently elided completely (amongst other changes to verbal morphology). In

<sup>6</sup> Pintupi is a closely related Western Desert language spoken to the north of Pitjantjatjara.



Modern Tiwi, Lee (1987, p. 71) found that morpheme-final vowels were elided more often by younger speakers in vowel hiatus contexts.

A similar loss of final vowels has occurred in some case markers (e.g., dative *-ki* → *-k*) in the mixed language Light Warlpiri (O'Shannessy et al. 2019; O'Shannessy 2006); which likely had its source in phonetic variation in Warlpiri. In a study of Warlpiri connected speech, Ingram et al. (2008) found that there can be radical lenition at phrase edges, particularly in inflectional suffixes. In this context, there can be 'extensive anticipatory vowel assimilation, often the sole remaining cue to an otherwise completely lenited following consonant' (p. 94); this is similar to our findings in Section 3.3 and Hansen and Hansen (1969) observation mentioned above for Pintupi. Pentland and Ingram (2005) also describe utterance-final lenition processes in Warlpiri in some detail, including breathy voice, glottalization, and devoicing. In contrast to Pitjantjatjara, vowel or syllable deletion happened utterance finally, but not utterance-medially; note that this is also contrary to some Warlpiri examples in Butcher (2008), such as that presented in Table 5. This type of phenomenon likely instantiated an ongoing change in the realization of case markers in several Warlpiri-speaking communities, especially those where Light Warlpiri is now spoken (O'Shannessy et al. 2019; O'Shannessy 2006).

While regularizing and increasing vowel elisions are observed as linguistic changes in traditional languages such as Bardi (Bowern 2013) and contact languages such as Light Warlpiri (O'Shannessy et al. 2019; O'Shannessy 2006), the Pitjantjatjara situation is different. Our present findings for Pitjantjatjara do not suggest such an increase in the elision of utterance-final past tense vowels. Rather, what we see is a reanalysis of the associated contexts of elision. While we cannot be sure what has caused this shift, it appears to be language-internally driven based on a plausible reanalysis of the speech younger speakers hear. Older speakers produce highly gradient realizations of utterance-final past suffixes, with a tendency to elide with Ø-class verbs where the suffix is unfooted and contains a velar nasal. Younger speakers appear to have focused more on the velar context rather than the metricality of the suffix. This shift could be related to the relative frequency of each verb class. Ø- and l-class verbs with their unfooted suffixes are more frequent than ng- and n-class verbs. This means that suffixes with velar nasals are more often in the high elision unfooted context. However, a fuller investigation of the contexts of elision across the language and their frequencies would be needed to better understand the motivations behind the younger speakers' reanalysis.

#### 4.3. Syncretism and Blocking Effects

One further point worth comparing between Pitjantjatjara and Light Warlpiri is in the forms of the ergative and locative case markers. The Warlpiri ergative *-ngku* varies between *-ngku*, *-ngu* and *-ng* in Light Warlpiri, whereas the locative *-ngka* varies between *-ngka* and *-nga*, but not *-ng* (O'Shannessy et al. 2019; O'Shannessy 2006, p. 20). The avoidance of locative *-ng* is interpreted as a blocking effect, so as to maintain a distinction between ergative and locative case. In contemporary Pitjantjatjara as spoken at Pukatja, we see similar variation in the realization of case markers. The ergative varies between *-ngku*, *-ngu*, and *-ng* (as well as *-ngk* before a vowel-initial word). However, there does not appear to be any blocking effect with the locative, which varies between *-ngka*, *-nga*, *-ng*, and *-ngk*, even though this results in syncretism with the ergative. Whether the *-ng* and *-ngk* forms are ergative or locative can only be determined by context.

This is relevant for the current paper as a similar syncretism may arise in Pitjantjatjara tense suffixes if vowels are completely elided. One potential explanation for the observed contexts of elision could then be that speakers are avoiding syncretism or ambiguity with other tense suffixes, specifically the present tense forms. A comparison of the past vs. present endings is shown in Table 6. The l-class forms are indicated with \*; these are the forms which would result in syncretism should the final vowel of the tense suffixes be wholly elided, leaving only /-ŋ/. A tendency not to elide the unfooted but retroflex l-class past tense *-ŋu* might therefore also be interpreted as being due to a blocking effect.

**Table 6.** Pitjantjatjara past and present tense endings.

	Ø-Class	l-Class	ng-Class	n-Class
Past	/-ŋu/	/-ŋu/*	/-ŋu/	/-nu/
Present	/-ŋi/	/-ŋi/*	/-ŋaŋi/	/-naŋi/

This scenario is similar to a historical change in Kukata (Platt 1968). Kukata and Kukatja are two Western Desert varieties traditionally spoken further south of Pitjantjatjara/Yankunytjatjara with a verbal paradigm very similar to Pitjantjatjara. Kukata appears to have already undergone a change due to final vowel elision on present and past tense suffixes, with the exception of retroflex-initial suffixes -ŋu/-ŋi in the l-class. This is illustrated in Table 7. Forms where this final vowel has been lost in Kukata are indicated with \*. The final /i/ or /u/ has been lost in Kukata in most present and past tense allomorphs, where the retained consonant (/ɲ/ or /ŋ/) distinguishes between the tenses. However, in the l-class forms, loss of the final /i/ or /u/ would mean that the present and past are indistinguishable.

**Table 7.** Tense suffixes in Kukatja vs. Kukata, adapted from Platt (1968).

	Lect	Imperative	Non-Past/Present	Past	Gloss
l-class	Kukatja Kukata	kuliŋa kuliŋa	kuliŋi kuliŋi	kuliŋu kuliŋu	‘to listen’
Ø-class	Kukatja Kukata	waŋka waŋka	waŋkaŋi waŋkaŋ*	waŋkaŋu waŋkaŋ*	‘to speak’
ng-class	Kukatja Kukata	puwa puwa	puŋaŋi puŋaŋ*	puŋaŋu puŋaŋ*	‘to hit’
n-class	Kukatja Kukata	cura cura	cunaŋi cunaŋ*	cunaŋu cunaŋ*	‘to put’

The observed patterns of elision by older Pitjantjatjara speakers are in line with this syncretism avoidance explanation. We found that while older speakers tend to elide unfooted syllables more than footed ones, this only held for the velar-initial Ø-class suffixes and not the retroflex-initial l-class suffixes. It should be noted, however, that the Pitjantjatjara elision is not as categorical as in Kukata and older speakers do not always elide the vowel in Ø-class suffixes, nor do they consistently produce the vowel in l-class suffixes, or even in the footed and not potentially syncretic n- and ng-class suffixes. A potential alternative explanation is a phonetic effect: Butcher has noted that peripheral segments (i.e., velar nasals) are ‘particularly prone to lenition’ (1996, p. 91). It is not possible to decide between these two potential explanations based on the current study.

The younger speakers’ tendency to elide whenever the suffix is velar-initial results in more elisions with the Ø- and ng-class verbs, neither of which would result in a syncretism with the present tense.

#### 4.4. Sociolinguistic and Perceptual Salience

Word-final vowel elision is a very salient sociolinguistic variable associated with young people in the Pitjantjatjara speaking community. This shortening of words is often commented on as a cause for concern by older Anangu, as seen in the reflections excerpted in Section 1.3. In contrast, utterance-final elision of past tense suffixes and their vowels is not perceptually salient to Pitjantjatjara speakers and our results show older speakers and younger speakers are equally likely to elide these vowels. The contexts of elision do, however, differ between the two groups, with younger speakers relatively uninfluenced by metrical structure. This is in line with, and a potentially contributing factor to younger speakers eliding vowels in footed syllables more generally, a context which is not associated

with elision by older speakers. This phenomenon may then become a salient point of difference, where younger people are eliding vowels which older people feel should not be elided, as far as the rhythmic nature of speech is concerned, such as in the non-traditional contexts observed by [Langlois \(2004\)](#).

One question is why the elision of these past-tense suffix vowels is so much less salient to native listeners than elision within lexical roots. A potential reason is a difference in predictability between lexical stems versus grammatical affixes. Speakers may be hearing illusory vowels and nasals because they expect the suffix to be there, as observed for Japanese listeners hearing illusory vowels between consonant clusters which are not allowable within Japanese phonology ([Dupoux et al. 1999](#); [Kilpatrick et al. 2019](#)). Further research would be needed to determine whether the vowels in grammatical suffixes are more predictable than the final vowels of lexical stems in Pitjantjatjara. Another possibility is that the vowel, and nasal if elided, are still perceptible by native listeners because traces of them remain in the speech signal. Indeed, we detected nasalization and rounding in many cases where the suffix was elided, especially within the younger speakers' productions.

There are parallels here with the phenomenon of rhoticity attrition in Scottish English, whereby articulatory gestures may remain even in cases where they were not audible or observable acoustically. Using ultrasound, [Lawson et al. \(2014\)](#) discovered that words produced without an audible /r/ were often nevertheless produced with noticeable /r/ gestures. This suggested that speakers were continuing to produce /r/ speech gestures although they were no longer articulating them sufficiently in order to produce an audible /r/ signal or a visible spectrographic trace. The situation seems similar with Pitjantjatjara utterance-final vowel and nasal deletion in past tense suffixes (although we are reporting on cases with spectrographic traces). Speakers appear to often still be articulating the nasal and vowel gestures. These articulatory gestures are often producing detectable traces with nasalization and rounding noticeable in the audio signal. It is very possible that speakers are still producing these gestures even when they leave no audible or visible traces, though this would be a matter for another study using video recordings and/or articulatory analysis such as electromagnetic articulography (EMA) and/or analysis of nasal airflow with a nasal-oral airflow mask.

## 5. Conclusions

Word-final vowel deletion is a pervasive property of Pitjantjatjara connected speech. The extension of vowel deletion to a broader range of contexts is strongly associated with younger speakers and this is acknowledged as an ongoing change within the language. In this study, we examined the spontaneous productions of utterance-final past tense suffixes /-nu, -ɲu, -ŋu/ by four older and four younger Pitjantjatjara speakers. Elision in this context is not salient to native listeners who in fact were noted to report hearing 'phantom vowels' when vowels were elided in this context. Our results show that both older and younger speakers elide these vowels in approximately 40–50% of cases. Speakers in both groups produced highly gradient and variable realizations of the nasal (fully realized, approximated, denasalized, devoiced, shortened, shifted to alveolar, or absent) and of the vowel (fully realized, shortened, devoiced, absent). In many cases, when the suffix was elided there remained traces of nasalization and rounding on the final segment of the verb stem.

While both age groups showed similar rates of elision, the contexts of elision varied significantly between the two groups. Older speakers tended towards elision when the suffix was in an unfooted syllable, but only if the nasal was velar. In contrast, younger speakers were not influenced by metrical structure and rather tended towards elision whenever the nasal was velar. Thus, the patterns of elision by younger speakers appear in line with a reanalysis of the conditions for elision, but this reanalysis is nonetheless based on patterns found in the productions of older speakers. In the context of utterance-final past tense suffixes, both systems produce a similar rate of elision. However, the tendency for younger speakers to elide vowels in footed as well as unfooted final syllables is in

line with a noticeable extension of vowel elision in lexical stems. This increase in vowel elision is likely one of the more perceptually salient differences commented upon by older speakers as part of ongoing language change. Along with the linguistic aims outlined above, we hope that this research can help to inform the community about how variation already present in Traditional Pitjantjatjara may have been one factor that has influenced this perceived change in the language.

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