Acoustic correlates of stress in Kaytetye words

In Kaytetye [ˈkeɾd̪ɛtʃ], the first syllable with an onset carries the main stress, like most Indigenous Australian languages (cf. Goedemans, 2010). Unlike most Australian languages, however, the vast majority of Kaytetye words begin with an unstressed vowel. Both word-initial and word-final vowels can be reduced, or even omitted entirely in some contexts (cf. Example 1, p. 2). A class of short words, for which there are 70 content words, exhibits a non-optional vowel on the left edge (i.e. it is never reduced or deleted in casual speech) and the stressed (and final) vowel is never reduced (cf. Example 2). Additionally, short and long words form a natural class through exponents of the locative, instrumental and ergative case (-le on long words, -nge on short words; cf. Turpin, 2000). In this paper, we examine the acoustic features of stressed and unstressed vowels in short (V.CV) and long (V.CV.CV) word types to ascertain whether they exhibit acoustic differences.

The recordings used for the acoustic analyses were originally created for the purpose of implementing a multimedia Kaytetye-to-English dictionary. A single speaker AR – a 41-year old speaker of Kaytetye, literate in both English and Kaytetye – read out the headwords in a sound attenuated recording studio. Each word was repeated twice, generating two tokens per word. Analyses were conducted on 45 tokens of short words and 38 tokens of long words – a dataset of 166 stressed and unstressed vowels. Note that analyses of Kaytetye propose only two phonemic vowels (Koch, 1980; Breen, 2001) and all the vowels in the analysed words were broadly [ɛ]. For the purpose of conciseness in the discussion, we propose a notation of the four vowels that is outlined in the word examples (p. 2).

Results indicate that the stressed vowels are produced with a significantly higher pitch (F0) and intensity. Significant differences were found for F1 – but not F2 and F3 – between stress conditions. Pairwise comparisons between the four vowels showed a three-way separation — /@/, a/, /e*/ and /a*/ — for the F0 and F1 measures. A four-way separation was found for intensity. There were no overall effects of vowel on F2 and F3. Although significant differences were found in intensity between the vowels and between stress conditions, a fitted mixed effects model revealed that intensity was not a predictor of stress within our data; only F0 and F1 were found to be significant predictors.

Interestingly, for word-final /e*/ in short words, there was considerable audible aspiration even after the termination of F2 and higher frequencies that was not present at the end of long words. Given that word-final aspiration is a commonplace phenomena, the duration of the stressed vowel in short words was taken at the vowel-offset and not at the word-offset (cf. Fig. 1). The mean durations for unstressed and stressed vowels in these words (/@/ and /e*/) were found to be indistinguishable. This is of particular interest given that it has been noted that monosyllables are often longer than polysyllables, as syllable length is inversely proportional to the number of syllables in the word (Garrett, 1999; Lehiste, 1972). This is true for our data only if the word-offset point is used for /e*/ duration, as indicated by a four-way separation (shortest to longest: /a/, /@/, /a*/, /e*/).

As the words were produced in isolation for the dictionary, it is difficult to ascertain whether the considerable word-final aspiration in short words is the result of lexical or phrasal stress. However, whether lexical or phrasal, short words still exhibited a considerably different stress realisation from that of long words in respect to F1 and intensity. This may suggest that stress is lexically encoded, at least for the class of short words.

While classes of words may exhibit a different stress pattern from the general pattern of the language (e.g. Polish cf. Dogil et al., 1999), an alternative explanation is that the foot in Kaytetye is binary trochaic and the initial vowel extrametrical, e.g. <a>.rouch) (Goedemans, 1998; Turpin et al., 2014). The minimal word is thus disyllabic but less than a foot, e.g. <a>.rouch. This supports Garrett's (1999) finding of a connection between word minimality and stress patterns, though not necessarily foot structure.
Word examples

Unstressed vowels from short and long words are denoted /@/ and /a/ respectively. Stressed vowels are denoted with an asterisk.

(1) Long words (V)CVCV e.g. akarre 'nectar'
Citation: [ɐˈkærǝ]
Reduced: [ɐˈkæɾǝ], [ɐˈkæɾǝ]

(2) Short words VCV e.g. e.g. ake 'head'
Citation: [ɐˈkǝ]
Reduced: *[ɐ'kǝ], *[ɐ'kǝ]
(* = not permitted)

Duration measurements

Figure 1: Duration of /e*/ was taken at two points. Solid line (—) indicates intensity, dashed lines (--) indicate F0.

References


