

SOUTHWESTERN MANDARIN SPEAKERS' PRODUCTION OF ENGLISH WORD-FINAL /L/ AND /N/

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The study examines how Southwestern Mandarin (SW) speakers pronounce English words with final alveolar nasal or lateral consonants. In addition, the study examines the intelligibility of SW Mandarin speakers' English word reading when heard by non-SW Mandarin Chinese English teachers. Twenty-five SW Mandarin speakers and forty non-SW Mandarin listeners were involved in the study. The results showed that SW Mandarin speakers do not consistently produce either word-final /n/ or /l/, most often deleting the final consonant, although word-final /n/ had a higher pronunciation accuracy rate than word-final /l/. Words that represented the most common mispronunciation, deletion, were played for non-SW Mandarin English teachers who were asked to write down the words that they heard. Results showed that deletions of both final /n/ and /l/ resulted in strong loss of intelligibility, suggesting that final deletions are important for intelligibility in English as a lingua franca interaction.

INTRODUCTION

Chinese refers to a large group of languages that use the same logographic writing system but are not always mutually intelligible. One of these languages, called Standard Chinese or Standard Mandarin, is used as a language of wider communication among different Chinese languages (called dialects in China). Although Standard Mandarin is the language of wider communication, various dialects of Mandarin numerically have a large number of Chinese speakers. Southwestern Mandarin, the most widely used dialect of Mandarin (Li, 2009) with a population of about 270 million, is spoken mainly in nine provinces and regions including all of Sichuan, Chongqing, Guizhou, and Yunnan, and some areas in Hubei, Guangxi, Hunan, Shanxi, and Jiangxi. A distinctive phonetic feature of Southwestern Mandarin is the lack of a phonemic contrast between alveolar nasals and lateral consonants (Li, 2004; Sun, 2011). This is most noticeable when the consonant is initial in the word. The conflation of /l/ and /n/ in non-final position is a distinctive marker of accent in Southwestern (SW) Mandarin. By and large, it does not greatly harm intelligibility since there are relatively few minimal pairs in Standard Mandarin for these two alveolar sounds. However, when transferred into learning English, the lack of distinction between /l/ and /n/ risks loss of intelligibility because of the high functional load of this contrast in English (Brown, 1988).

In regard to final consonants, most varieties of Mandarin generally have a CV syllable structure with a variable final nasal, the only type of consonant that can occur in final position. Thus phonemic contrasts of /l/ and /n/ are rare in final position in Mandarin. However, in English, final /l/ and /n/ both occur with many minimal pairs, and mispronunciations of these sounds may affect intelligibility. The goal of this study was to examine how final /l/ and /n/ are pronounced in English by SW Mandarin speakers, and to examine how mispronunciations of these final consonants affect intelligibility when heard by other Chinese speakers of English.

LITERATURE REVIEW

Previous research on final consonants in second language learning has focused on how L2 learners produce and perceive final alveolar nasal and lateral consonants. Kluge (2004) found that Brazilian Portuguese speakers did not produce English final nasals accurately, and that their nasalization of the vowel and deletions of the nasal consonant were influenced by Brazilian Portuguese's lack of fully realized syllable-final nasals. For final /l/, Barartieri (2006) found that Brazilian EFL learners had three substitution strategies for final laterals: final /l/ could be partially vocalized, fully vocalized, or non-vocalized depending on its phonological environment. In another study, Awad and Al-Baghdady (2014) found that Iraqi EFL college learners had difficulty recognizing and producing final English lateral sounds whether the words were isolated or in sentences.

Other studies have focused on Chinese speakers (Chan, 2007; Hansen, 2001; He, 2014). They all found that lateral consonants in word final position were among the hardest sounds to acquire for all Chinese speakers, and not just for speakers of SW Mandarin. Hansen (2001) found that final lateral consonants in words like *tell* were one of the most difficult for Chinese learners to produce, but the production success of final nasals /n/ and /ŋ/ were easier, with final nasals produced more successfully. He's (2014) study of Standard Mandarin speakers' production of English syllable final /l/ showed that Chinese speakers had major difficulties in producing syllable final /l/, and that they used three pronunciation strategies to produce final /l/: vocalization, deletion, and retroflexion. For Cantonese speakers, voiced obstruents and the lateral /l/ in syllable final position were the most difficult sounds (Chan, 2007). Lack of coda consonants in Chinese English is also attested for speakers of Yunnan dialect (Ao & Low, 2012, 2016), Hong Kong, and other southern areas of China (Deterding, 2006, 2010).

While onsets are most likely to impact successful word recognition (Weber & Cutler, 2004), word-final consonants can also impact intelligibility, especially when they are deleted (Zielinski, 2006). Accent familiarity may be another factor to impact intelligibility (Silveira & Silva, 2018). Since accurate production of alveolar and velar nasal codas in English is consistently difficult for various Chinese dialect speakers (Qian, 2018), it is possible that Chinese L1 English teachers are accustomed to adjusting for deleted final consonants in English. Because Chinese dialects are closer to distinct languages than dialects (unlike English, which has widespread mutual intelligibility for spoken dialects), listeners from non-SW Mandarin backgrounds may provide evidence about the ELF intelligibility of final consonants, especially for words in which final consonants are not pronounced.

In summary, there has been little discussion of how final English /n/ and /l/ are pronounced by SW Mandarin speakers. Standard Mandarin also does not allow /l/ in coda position, allowing only two consonants in word-final position, /n/ and /ŋ/. Because in speech final nasals are often realized through the nasalization of the preceding vowel, and final /l/ is attested as being consistently difficult for Chinese speakers, it is unlikely that /n/ and /l/ will be confused in the coda position in the same way that they are confused in the non-coda position (Richards, 2012). However, coda /n/-/l/ potentially remains a problem in Chinese pronunciation of English because of its high functional load (Catford, 1987). This study was therefore conducted in order to investigate three questions.

- (1) To what extent do Southwestern Mandarin speakers mispronounce word-final /l/ & /n/ such that they are confused for each other ?
- (2) How frequent are /l/ and /n/ word-final errors in SW Mandarin speakers' word reading? What patterns exist for word final errors?
- (3) To what extent do word-final /l/ and /n/ errors affect intelligibility for non-SW Mandarin listeners ?

METHODS

The research questions were answered by two studies. The first study analyzed the production of final /l/ and /n/ by SW Mandarin speakers in a word reading task, and the second asked Chinese English teachers who are from non-SW Mandarin speaking areas (hereafter non-SW Mandarin) to transcribe SW-Mandarin words with deleted final /l/ and /n/.

Study 1

Subjects

Twenty-five native speakers of SW Mandarin, all undergraduate students of Qufu Normal University, China, took part in the first study. They ranged from 18 to 23 years old. Their first oral language was SW Mandarin. It was also their dominant language for daily communication. All had also learned Standard Mandarin as part of their education. Finally, they had all learned English for over 10 years from the 3rd year of elementary school through university. All the subjects reported normal speaking and hearing abilities.

Stimuli

The task for this study was to read a word list (Appendix A). The word list included words with both final /n/ and final /l/. For final /n/, there were words with only final /n/ (e.g., *apportion*), words with initial and final /n/ (e.g., *nation*), and words with initial /l/ and final /n/ (e.g., *lemon*). Words with final /l/ followed the same pattern. Example words include *heal*, *label*, and *nail* (Table 1). Subjects read 56 English words two times each, 28 with word-final /n/ and 28 with word-final /l/. The total possible tokens in the word-list reading task were 2800 (56 words x 25 subjects x 2 times). Not all of the 2800 possible word recordings were successfully recorded, resulting in 2782 successful tokens.

Table 1

Word list numbers for final /l/ and /n/ recordings

Type	Words	Total Tokens	Type	Words	Total Tokens
n# (<i>apportion</i>)	9	221x2=442	l# (<i>heal</i>)	9	224x2=448
#n__n#(<i>nation</i>)	9	222x2=444	#l__l#(<i>label</i>)	9	225x2=450
#l__n#(<i>lemon</i>)	10	249x2=498	#n__l#(<i>nail</i>)	10	250x2=500

Procedure

The word readings were recorded to a computer in a professional recording studio at Qufu Normal University with a random word list, at a sampling rate of 44.1 kHz and 16 bits per sample. Before recording, all speakers were given enough time to become familiar with the words and were provided with phonetic symbols to help them read the correct pronunciation (Chinese students learning English are taught phonetic symbols and thus were familiar with them). Speakers read each word two times. The mono recordings were saved as individual .wav files for evaluation. Recordings that were problematic (e.g., because of subject noise or sitting too far from the microphone) were excluded from the analysis.

The sound files were evaluated by the researchers. Errors were identified as a deletion or as the closest English consonant phoneme. Because each word was read two times, we evaluated them in pairs. If both sounds were correct, the production was rated as correct. If both sounds were incorrect, the production was rated as incorrect. If one was correct and one was incorrect, we rated it as incorrect. If the researchers were not in agreement in their results, additional listening and acoustic analysis was carried out with Praat (<http://www.fon.hum.uva.nl/praat/>) until we came to agreement.

Study 2

For the second study, we chose 30 words from the first study: 12 had a deleted final /n/, 12 had a deleted final /l/, and six other words were included as distractors. These were played for non-SW Mandarin L1 teachers of English, who were asked to transcribe the words. Accuracy of transcription was used as a measure of intelligibility.

Subjects

Forty non-SW Mandarin listeners were recruited to transcribe words with deleted final /n/ and /l/ to evaluate the intelligibility of these words. They were graduate students in English Language Teaching in China, with 1 to 2 years English teaching experience. All were from North China, and all spoke a variety of Mandarin with a phonemic contrast between alveolar nasals and laterals. They all reported normal hearing.

Stimuli

Listening materials were 30 words produced by two of the SW Mandarin speakers from Study 1, which included 12 words with deleted syllable-final /n/ and 12 words with deleted syllable-final /l/. These words were chosen from the 56 words that were used in Study 1 using the Compleat Lexical Tutor Vocabulary Profiler (<https://www.lexutor.ca/vp/eng/>) to control for the relative frequency of the words.

Procedure

The listening sound file was created using the second production recordings used in Study 1. The listeners heard each word once in a random order in a quiet room, and they were asked to transcribe the word. Words that were correctly transcribed were evaluated as being intelligible.

RESULTS

The results for this study include information about the rate at which speakers mispronounced final /l/ and /n/ sounds, the types of mispronunciations that occurred, and the effect of these errors on the intelligibility of deletion errors, the most common type of mispronunciation.

Study 1 - Production results

The first and second sets of results examined how often SW Mandarin speakers mispronounced /l/ and /n/ in codas, and what types of mispronunciation patterns were common for each coda type.

Error rate

Figure 1 shows that SW Mandarin speakers had consistent difficulties in the production of /l/ in coda position with all three types of syllable final /l/ words. The error rate for each was extremely high, averaging above 85%. Although research has shown that SW Mandarin historically had stop codas /-p/, /-t/, /-k/, and /m/, these codas are not used now. The coda /-m/ merged into /n/ and today, as in other Mandarin dialects, only the alveolar and velar nasals are licensed as consonant rhymes (Li, 2004), the alveolar lateral has never been a coda in SW Mandarin, clearly influencing SW-Mandarin speakers' pronunciation of English /l/ codas.

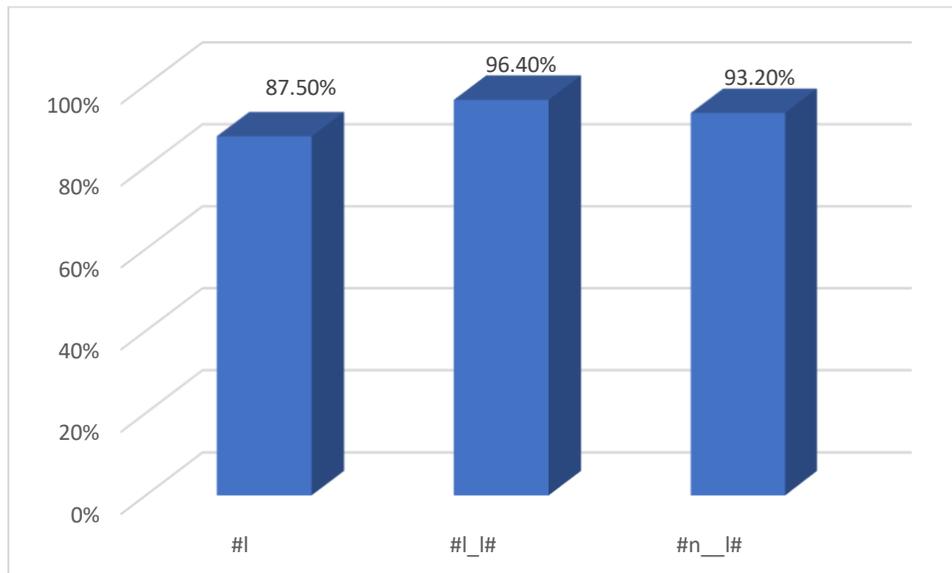


Figure 1. Error rates for production of syllable final /l/.

The Markedness Differential Hypothesis (MDH) builds a bridge between native language transfer and universal markedness rules in language production. The MDH assumes the marked features are more difficult for learners to acquire (Eckman, 2008). Final nasals are an unmarked feature in SW Mandarin consonant codas, but lateral consonants in final position continue to be marked for

SW Mandarin speakers in the pronunciation of English syllables, resulting in a very high rate of mispronunciation.

Unsurprisingly, Figure 2 shows that SW Mandarin speakers were more accurate in producing /n/ in syllable final position with all three types of syllable final /n/ words. The error rate for production of the syllable final /n/ was less than final /l/, with an average error rate of 55%. In Standard Mandarin, as in SW Mandarin, nasal codas do not require a clearly pronounced nasal consonant; instead, the nasal can be realized as a weak nasal articulation or reduced to nasalization of the preceding vowel (Guo, 2011; Ran, 2005; Wu, 1986). The variations in the production of Mandarin final nasals seem to influence the production of English words with final nasals.

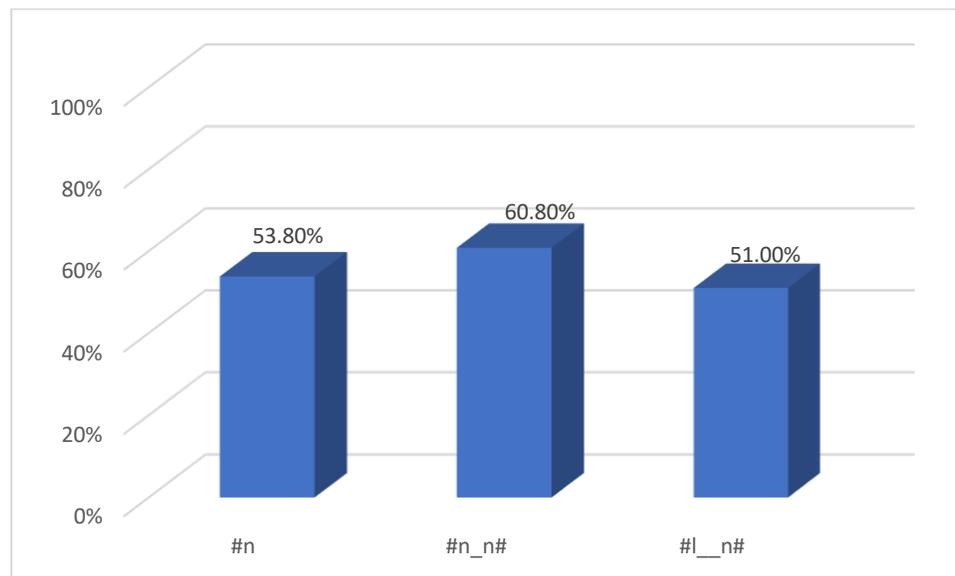


Figure 2. Error rate of production of the syllable final /n/.

Error type

Three main mispronunciations were found for the production of the syllable final /l/: deletion, /r/-like sounds, and /w/-like sounds. Deletion meant there was no consonantal segment in final position. /r/-like sounds refer to the target /l/ being perceived as having a retroflexed quality, and /w/-like sounds, called l-vocalization in the research literature, occur when the tongue tip does not touch the alveolar ridge, and the back of the tongue raises toward the soft palate. Hence, the /l/ sound is heard as /w/, a pronunciation that is also attested for different varieties of English (Borowsky, 2001; Deterding, 2005; Hall-Lew & Fix, 2012; Simo Bobda, 2000).

Deletion was the most frequent mispronunciation, followed by the retroflexed variant and l-vocalization. Even for #n__l# type of words, where the first nasal might be expected to affect the pronunciation of the final /l/, deletion was the most common mispronunciation. The results show that /n/ and /l/ did not substitute for each other in word-final position.

Three main substitutions were found for the production of the syllable final /n/: deletion, /ŋ/, and /r/-like sounds. Deletion again meant that there was no consonantal segment in final position. /ŋ/ means the alveolar target was pronounced as a velar nasal, and /r/-like sounds refer to the target /n/ sound being produced with an oral retroflexed sound.

Deletion was also the most frequent substitution for nasal-final syllable words, followed by /ŋ/ in particular environments. For example, the final /n/ of a word “nystatin” was produced as /ŋ/ sound by more than half of the subjects (14 out of 25). In SW Mandarin, [n] and [ŋ] are not distinguished after a high front vowel (Li, 2004). That can explain, to some extent, why /ŋ/ was a frequent substitution, given the number of word list tokens ending with -in. Figure 3 summarizes the distribution of correctly and incorrectly pronounced final nasals and laterals. Note that errors that were not deletion have been collapsed into a single other category.

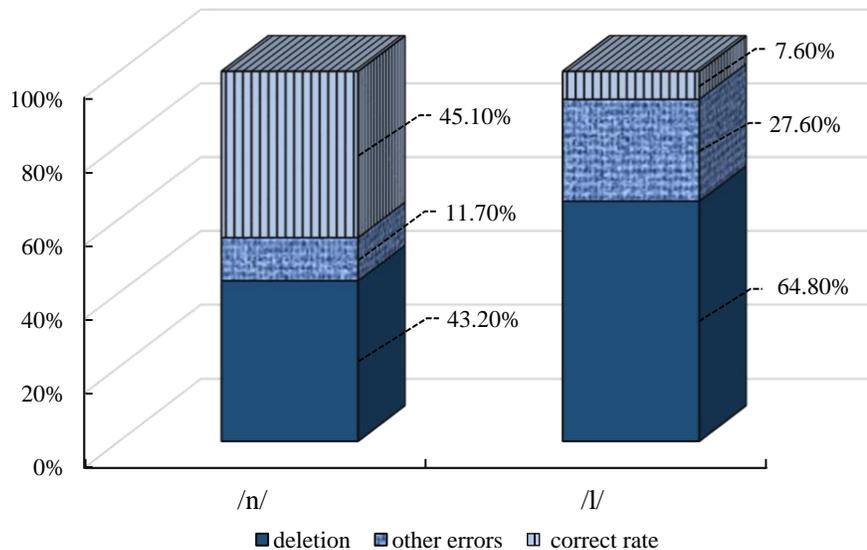


Figure 3. Percentage for production substitution of words with final /n/ or /l/.

Study 2 - Intelligibility results

Segmental production errors in L2 speech are quite common and may lead to loss of intelligibility (Levis, 2018). For this reason, we examined the extent to which the most common mispronunciations based on Study 1 caused listeners to misunderstand English words produced by two SW Mandarin speakers. The listeners were 40 non-SW Mandarin English teachers from a different dialect area in China.

Of the 30 words heard by non-SW Mandarin listeners, 24 had deleted final /n/ or /l/. Figure 4 shows the transcription accuracy for the 24 words with deleted final /l/ or /n/ was also very low, suggesting that mispronunciation of these final consonants made the words unintelligible a majority of the time. Only about one in four final /n/ deletions were successfully transcribed, and only about one in three final /l/ deletions.

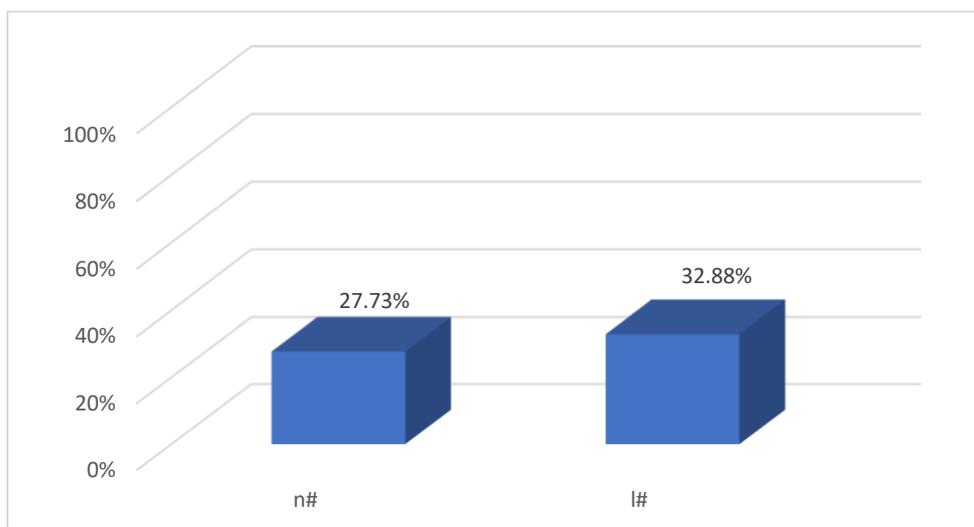


Figure 4. Accurate transcription rate for 24 words with deleted final /n/ and /l/.

DISCUSSION

The study asked three questions. The first concerned the extent to which Southwestern Mandarin speakers' conflation of /l/ and /n/ in non-final position occurs word-finally. We found that it did not. The errors in word-final /l/ and /n/ pattern in a distinct way from how /l/ and /n/ are pronounced in non-final environments (initial and medial). For learners who have trouble hearing/producing /l/ and /n/ in non-final position, teachers should be careful not to use word-final environments to practice the sound contrast because the word-final environment behaves differently.

The second research question asked about the frequency of word-final /l/ and /n/ errors in SW Mandarin speakers' English word reading. Our results showed that word-final errors for both /l/ and /n/ were extremely frequent, with deletion the dominant pronunciation error for both types of coda consonants. This suggests that teaching of these sounds should be part of a more general approach to pronouncing final consonants to promote intelligibility (Zielinski, 2006).

The last question examined whether the deletion of word-final /l/ & /n/ affected intelligibility. The answer to this is yes. Since deletion of final /l/ and /n/ is common in most varieties of Chinese and in Chinese-accented English, we expected that these Chinese English teachers would be relatively successful in transcribing the English words with deleted final /l/ and /n/. However, they struggled to correctly transcribe words with deleted /n/ and /l/. Deletion of final /n/ was, surprisingly, the most damaging to intelligibility, as teachers did not accurately transcribe about three-fourths of the words. Final /l/ deletions were somewhat less damaging to intelligibility, but still were a serious problem, as the teachers unsuccessfully transcribed words two-thirds of the time. Because listeners from different Chinese dialects may in reality be speakers of different languages, these results can be seen as related to issues of intelligibility in English as a Lingua Franca, or ELF. ELF intelligibility involves understanding across language boundaries when both speaker and listener are using English to communicate. In this respect, the listeners and speakers are more similar to

ELF communication rather than EFL, where both share the same L1. Although we do not have evidence from mispronunciations from the listeners' own variety of Chinese, it is possible that the combination of mispronounced final nasals and laterals along with other features of the speakers' home languages affected the ability of listeners to understand the words being spoken. Final consonant deletions of both the alveolar nasal and alveolar lateral were highly damaging to intelligibility despite the teachers' likely familiarity with SW Mandarin pronunciation patterns. In English, which is a foreign language for both the SW Mandarin and non-SW Mandarin speakers, the errors in final /l/ and /n/ seemed to be especially damaging. Jenkins (2000) argued that deletion of sounds was likely to be more problematic to ELF intelligibility than insertions of sounds. These results confirm that deletion is indeed damaging, but we do not have evidence that it is more damaging than substitutions. Nonetheless, accurate pronunciation of both these final sounds should be prioritized in teaching English pronunciation to Chinese learners.

CONCLUSION

The study showed that SW Mandarin speakers did not consistently produce word-final /n/ or /l/, but that word-final /n/ was pronounced more accurately than word-final /l/. We suggest that because mispronunciations of these sounds were both frequent and damaging to intelligibility, the pronunciation of these final consonants should be a priority in teaching English to Chinese learners. Teachers, especially Chinese EFL teachers, should also account for the seriousness of these errors in designing instructional materials.

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APPENDIX A

English Words Table

Please read each word twice

1	apportion /ə'pɔ:ʃ(ə)n/	broaden /'brɔ:d(ə)n/	darken /'dɑ:k(ə)n/	german /'dʒɜ:mən/	impassion /ɪm'pæs(ə)n/
	brown /braʊn/	man /mæn/	pan /pæn/	rain /reɪn/	only /'əʊnli/
2	appraisal /ə'preɪz(ə)l/	approval /ə'pru:v(ə)l/	magical /'mædʒɪk(ə)l/	practical /'præktɪk(ə)l/	painful /'peɪnfʊl/
	fool /fu:l/	heal /hi:l/	pearl /'pɜ:l/	inly /'ɪnli/	neal /ni:l/
3	nation /'neɪʃ(ə)n/	neaten /'ni:t(ə)n/	negation /ni'geɪʃ(ə)n/	neuron /'nju:ərɒn/	norman /'nɔ:mən/
	northern /'nɔ:ð(ə)n/	notation /nɔ:'teɪʃ(ə)n/	enlist /ɪn'lɪst/	nystatin /'nɪs'tætɪn/	lagoon /lə'gu:n/
4	label /'leɪb(ə)l/	lachrymal /'lækɪm(ə)l/	legal /'li:g(ə)l/	lingual /'lɪŋw(ə)l/	lyrical /'lɪrɪk(ə)l/
	labial /'leɪbiəl/	landfill /'lænd(ɪ)fl/	location /lə(ʊ)'keɪʃ(ə)n/	numeral /'nju:m(ə)r(ə)l/	nickel /'nɪk(ə)l/
5	nail /neɪl/	nasal /'neɪz(ə)l/	lintel /'lɪnt(ə)l/	level /'lev(ə)l/	laden /'leɪd(ə)n/
	national /'næʃ(ə)n(ə)l/	natural /'nætʃrəl/	newel /'nju:əl/	noble /'nəʊbel/	normal /'nɔ:m(ə)l/
6	nylon /'naɪlɒn/	legman /legmən/	liaison /li'eɪzn/	lemon /'lemən/	lotion /'ləʊʃ(ə)n/
	enlarge /ɪn'lɑ:dʒ/	enlighten /ɪn'lait(ə)n/	liken /'laɪk(ə)n/	loosen /'lu:s(ə)n/	lumpen /'lʌmpən/
	illness /'ɪlnəs/	unless /ʌn'les/	inline /'ɪn,lain/	ulna /'ʌlnə/	allow /ə'laʊ/
7	bullnose /'bʊl,noz/	unlike /ʌn'laɪk/	malnutrition /mælnju'trɪʃ(ə)n/	usefulness /'ju:sf(ʊ)lnəs/	vulnerable /'vʌlnərəbl/
	anlage /'ænlɑ:gə/	walnut /'wɔ:lnʌt/	fearful /'fiəfʊl/	hello /hə'ləʊ/	enlace /ɪn'leɪs/
8	announce /ə'naʊns/	tennis /'tenɪs/	annoy /ə'nɔɪ/	winner /'wɪnə/	funny /'fʌni/
	challenge /'tʃælɪn(d)ʒ/	swallow /'swɒləʊ/	really /'ri:əli/	beginner /brɪ'gɪnə/	wallet /'wɒlɪt/