

The NURSE - phenomenon¹

An articulatory explanation for the behaviour of the NURSE vowel in different English dialects

1 Introduction

In the following essay, I appeal to articulatory and acoustic phonetics to provide a possible explanation for what I call the “NURSE – phenomenon.” I argue for an analysis, which is based on phonetics but stretches into sociolinguistics as well.

2 The “NURSE – phenomenon”

2.1 Variable rhoticity²

Variable rhoticity is a phenomenon appearing in a number of dialects throughout the English speaking world. It is applied to those dialects that exhibit a strange behaviour concerning the pronunciation of the post – vocalic /r/ (Vr). Speakers of variably rhotic dialects tend to retain the Vr on some occasions while they are likely to drop it in other cases. This is far from being idiosyncratic; however, sociolinguistic studies suggest a systematic pattern by which good estimations can be made as to when speakers are likely to retain the Vr and when they are prone to drop it.

A number of variables were shown to affect Vr in different dialects like, for example, lexical category in Boston English ([Irwin & Nagy, 2007](#)) where likelihood of rhoticity is lexical > functional, or stressing in different dialects of Southern US ([Thomas, 2004](#)) where unstressed syllables proved to be the least prone to be rhotic or age, as in the Southland variety of New Zealand English, where the younger generations pronounced Vr under one circumstance only (see section 2.3) (cited in [Kennedy, 2006](#)). It is also possible to make predictions taking the vowel preceding the Vr under consideration; this proved to be the most important factor in Boston English, for example.

2.1.1 The factor of vowels

In general, good predictions concerning the likelihood of rhoticity are possible to made on the basis of the preceding Pre-R vowels³ like NEAR /ɪə/, NORTH /ɔ:/, START /ɑ:/, lettER /ə/

¹ Throughout the essay, I will use the term *dialect* to denote both the notion of accent and dialect as a means of convenience.

² In this essay, the term “variable rhoticity” is used to describe dialects that are partially rhotic. The term “semi-rhotic” is used to denote a diachronically stable version of the same phenomenon. (see section 2.6.1)

³ I will refer to vowels using Wells (1982)’s “lexical sets.”

or NURSE /ɜ:/, i.e., which of these vowels are more (or most) likely to retain/drop the Vr. Taking the percentage of informants found to pronounce the Vr following one of these vowels as a basis, then, predictions are made as to how (un)likely it is for these vowels to be followed by /r/. For example, in Boston English, CURE is more likely to be rhotic than SQUARE (Irwin & Nagy, 2007), while FORCE seems to have a higher likelihood of being rhotic than START in Educated Jamaican English (Rosenfelder, 2009).

Moreover, there is little consistency across dialects in how vowels behave concerning rhoticity. For example, for the vowel NORTH, only 32 % of the tokens were rhotic in Boston English (Irwin & Nagy, 2007: p4) and approximately 25% proved to be rhotic in Educated Jamaican English (Rosenfelder, 2009: p90), while in Modern New Zealand English, NORTH is the 4th most likely context for Vr (Marsden, 2013: p158). For the vowel lettER, the data are a bit more inconsistent: 31% in Boston English (least likely), almost 3% in Educated Jamaican English (least likely) and it is also the least likely context in Southern US dialects (Thomas, 2004: p13) but it is the second highest in Modern New Zealand English. Observing a larger body of data, which falls outside the scope of the present paper, it would be easy to see that vowels behave differently in different dialects concerning Vr. There is one vowel, however, that shows similarities in its behaviour in a number of dialects.

2.1.2 The NURSE vowel and rhoticity

In RP, which I chose as a reference, NURSE is the open mid – central unrounded /ɜ/ vowel (e.g., *worst*, *curse*, *word* etc.). Within the phonetic boundaries of RP, this is perhaps a not so interesting vowel being no more than the stressed counterpart of the unstressed /ə/. Cross-dialectally, however, an interesting phenomenon can be observed: while there is great variability in how variably rhotic dialects behave concerning rhoticity, most of them seem to retain following the NURSE vowel. In the following sections, I will briefly summarise how this vowel behaves in the phonological system of different dialects that show variably rhotic behaviour.

2.2 Boston English

Previously, Boston English was a non – rhotic dialect (see *The Linguistic Atlas of New England* and *The Atlas of North American English* as cited in Irwin & Nagy, 2007), which was reported to reintroduce rhoticity by Parslow (1969) (cited in Irwin & Nagy, 2007). In BE, the NURSE vowel appears to be the most likely context for rhoticity with 64% of the tokens being rhotic.

2.3 New Zealand English

Bartlett (2002), Kennedy (2006) and Marsden (2013) report sporadic variable rhoticity in the otherwise non – rhotic New Zealand English, especially (but not exclusively) in the region of Southland/Otago. It appears that undergoing a loss of rhoticity (Bartlett, 2002), NURSE remained the *only* rhotic vowel in these regions (for the younger generations, at least) with a significantly lower rate of rhotic LETTER, perhaps. Kennedy (2006) suggests that rhotic NURSE is perhaps becoming an accent marker of Southland identity for the younger generations. This is in accord with Bartlett (1992, as cited in Gordon & MacLagen, 2004) that in the rural areas, while the speakers in the age group 65+ were rhotic, those of the group 20-29 maintained Vr following NURSE only.

2.4 Rural White Southern Accents

This dialect was previously non – rhotic, although rhoticity has always been found among a number of people who migrated here from different rhotic areas (e.g., Ulster Scots in the Southern Appalachians) (Thomas, 2004), now Thomas describes the dialect as increasingly rhotic. NURSE is the most likely context for rhoticity in this dialect as well. Moreover, Thomas goes as far as suggesting that even during World War II, when non – rhoticity was prestigious in the South, there is a possibility that NURSE retained the Vr exclusively.

Bailey and Thomas (1998, as cited in Kennedy, 2006) report 5 White South Alabama female speakers (born between 1890 and 1970) among whom the older speakers pronounce Vr in NURSE only, while the younger informants had Vr in other contexts as well.

2.5 Other occurrences of the rhotic NURSE

Du Plessis & Bekker (2014) report that in the previously non – rhotic White South African English, NURSE was the first vowel to introduce rhoticity. Similarly, Feagin (1990) (cited in Irwin and Nagy, 2007) found NURSE to become rhotic first in the dialect spoken in the S-US city of Anniston (Alabama).

It is a suggestion made by Thomas (2004) that – unlike white southerners – African Americans in the South remain largely non – rhotic, except for the NURSE class. Rosenfelder (citing Childs & Wolfram, 2004 and Sakoda & Siegel, 2004) suggests that this is also true for Bahamian English and Hawai'i Creole.

Wells (1982) also mentions the vowel NURSE in his *Accents of English*: “many Americans whose speech is otherwise non-rhotic retain (or reacquire) /r/ in NURSE and perhaps also in weak syllables (the lettER words).” (p221) He even goes on to mention a spot in East Anglia

where words like *worms* were rhotic but words like *darn* were not, according to the 1978 *Linguistic Atlas of England*. Wells also refer to the 1950-1961 *Survey of English Dialects* in mentioning that R-coloured variants are (were?) used in dialects that are otherwise non – rhotic, such as as Cambridgeshire and north-eastern Lancashire in eastern England and also in Virginia (US), as reported by the *Pronunciation of English in the Atlantic States* (PEAS).

2.6 What is the NURSE – phenomenon?

Judging by the previous data, it seems that those dialects become variably rhotic that undergo a shift of rhoticity, i.e., that start off being rhotic and become non – rhotic or vice versa. This seems logical if we assume that dialects change context by context with greater or lesser pace through generations.

In addition, it seems reasonable to assume that the NURSE vowel is the most likely context for rhoticity. It is also suggested by the data that this vowel is most likely the first to undergo /r/-reintroduction while there is a possibility that it is also the last one to change (as suggested by WWII S-US data and young Southland data), but such a claim requires further study, which falls out of the scope of this paper. This strange behaviour of the NURSE vowel is what I call the “NURSE – phenomenon.”

2.6.1 A footnote: the case of Jamaican English

Although it is somewhat affected by the NURSE – phenomenon, Jamaican English does not fit in the list of dialects previously mentioned. JE is not variably rhotic because of a rhoticity shift in progress, variability has become part of the phonological system creating a “diachronically stable variation” ([Rosenfelder, 2009](#): p177). Since my analysis applies only to *dialects in change*, I will not devote further attention to this dialect in the present essay.

3 Browman and Goldstein’s Articulatory Phonology

I make good use of the theory laid down by Catherine P. Browman and Louis Goldstein given that their approach allows for a very detailed analysis of phonetic reality. In the following section, I will briefly summarise the relevant findings and assumptions made by the theory.

3.1 Articulatory gestures

The basic idea of Articulatory Phonology is that speech units are decomposable into articulatory gestures. These gestures are discrete and physically real events that are created during articulatory trajectories. ([Browman & Goldstein, 1992/a](#)) Each trajectory during speech production has a goal, which is called a constriction in this framework. ([Browman & Goldstein,](#)

1992/a) A constriction is the approximate or total closeness of a given active articulator to the appropriate passive articulator in the vocal tract.

It can be concluded, then, that articulatory gestures are events created during the formation and release of constrictions. Let us take the English voiceless alveolar plosive /t/ as an example. This sound is produced with the tongue blade or tongue tip (active articulator) pushed against the alveolar ridge (passive articulator). When the former touches the latter, a constriction is created as the accumulated air behind the tongue is released when the articulators move away from each other.

3.1.1 The nature of articulatory gestures

Following their investigation on the consonant /l/, [Sprout & Fujimura \(1993\)](#) arrived at the conclusion that it consists of not only one, but two articulatory gestures: a dorsal and an apical one. The dorsal gesture, as they argue, is more vowel – like (vocalic), while the apical one is more consonant – like. They explain this with the introduction of the terms “consonantal gesture” and “vocalic gesture.” In their use, consonantal gestures “produce an extreme obstruction in the vocal tract” (p304), while vocalic gestures “produce no extreme obstruction.” (p304) Sprout and Fujimura further assume that there is a difference in how gestures are articulated concerning syllable position. In their reading, consonantal gestures are stronger, “have greater displacements” (p305) in syllable - initial position, while they are weaker syllable finally (and in the coda in general, see [Gick, 2003](#)). Vocalic gestures, on the other hand, are weaker, “have lesser displacements” (p305) syllable initially, while they are stronger finally.

This is connected to the assumption of intergestural timing, i.e., the idea that these gestures are organised into timing relationships with each other: consonantal gestures have a tendency to occur earlier than (or simultaneously with) vocalic gesture initially, while vocalic gestures prone to precede consonantal ones finally and are preceded by them initially. This is in accord with other findings in the literature (Krakow 1989; Browman & Goldstein 1992, 1995; Wang 1995 as all cited in [Gick, 2003](#)).

3.1.2 C-gesture and V-gesture

Based on Sprout and Fujimura's definition for gestures, [Gick \(2003\)](#) hypothesised that the two gestures found in /w/ (labial and velar) would follow vocalic patterns (i.e., behave similarly) given that both of these constrictions are relatively open. However, he found that these two gestures tend to be organised into the typical timing relationship described above as if one of them would be a vocalic only. Gick, therefore, states that while the labial gesture behaves as a consonantal gesture, the velar gesture resembles to a vocalic one. This is in accord with the findings that the lip gesture is usually weaker in final allophones than in initial ones. ([Campbell et al., 2010](#), p67) This is in contradiction with Sprout and Fujimura's definition, however. To provide a unitary analysis, then, [Gick \(2003\)](#) suggested that it should be the timing relationship of gestures that the definition is based on and not the degree of gestural constriction. Therefore, he proposed the terms C-gesture and V-gesture instead. These terms will be used throughout this essay.

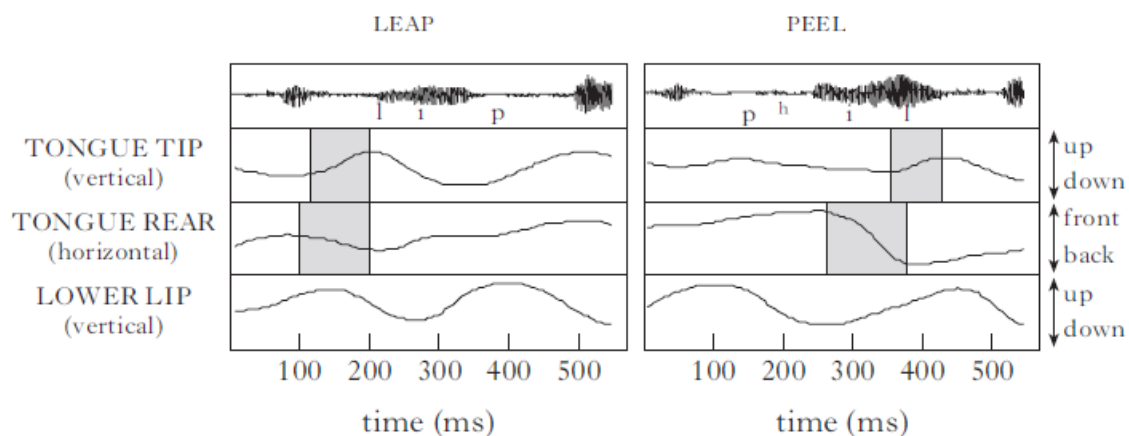


Figure 2. Gestural Composition for /l/ (after Browman and Goldstein, 1995 to appear in Gick, 1999, p39) Notice how the different active articulators move during the course of the utterance and that the movement of the tongue tip creates a gesture showing a typical C-gesture timing pattern, while the gesture formed with the rear part of the tongue behaves as a V-gesture

3.1.3 A word on resyllabification

There is phonological evidence suggesting that word – final consonants are resyllabifiable across word boundaries, an example to this is alveolar flapping (Kahn 1976, as cited in [Gick, 2003](#)). [Gick \(2003\)](#) further notes that when a final consonant is followed by a vowel – initial word, it adopts the characteristics of either a word initial or a word – internal allophone. He also makes a remark that acoustic and articulatory studies seem to support this view for English /l/ and /r/; more specifically, the consonants in question undergo an intermediate gestural weakening followed by a ##V. The magnitude of such gestures, then, is between the positionally strong initial and the positionally weak final allophones. For this essay, however,

the only assumption bearing importance is the one that consonantal allophones are *weaker* finally than initially (regardless of them being resyllifiable or not), which is in accord with this view. Therefore, the intermediate nature of the weakening found in resyllifiable allophones will be disregarded and the notions of both intermediate and “full” weakening will be collapsed under the term final weakening/reduction.

4 The gestures in /r/

Because the pronunciation of Vr is crucial in the “NURSE - phenomenon”, I will concentrate on the R-literature of rhotic dialects (mostly US English) making only slight remarks on non - rhotic dialects.

4.1 /r/ in rhotic dialects

Although [Espy-Wilson & Boyce \(1999\)](#) and [Doherty & Foulkes \(2001\)](#) argue for the assumption that US English is characterised by the presence of three gestures, one the pharynx, one along the palatal vault, and one at the lips, there are findings that seems to contradict this. [Dellatre & Freeman \(1968\)](#) made X-ray studies of 46 speakers who produced different varieties of American English /r/ (both [ɹ] and [ɹ̥], among others). Their findings seem to suggest that American English /r/s consist of two gestures, one in the region of the hard palate and one in the mid – pharynx, not including a lip gesture. [Alwan et al. \(1997\)](#) also found the same constrictions in their four speakers of American English.

The contradiction seems to be dissolved by [Campbell et al. \(2010\)](#) who studied the speech of 10 Canadian English speakers from various parts of Canada and found that for 9⁴ of them, the primary constrictions were those mentioned earlier with the addition of the lip gesture. This gesture, however, undergoes a more significant reduction in final position than any other gesture (p67). Because of this, it may have a significantly weaker influence on the articulation of Vr as well.

Regarding this, there is an interesting remark in [Dellatre & Freeman \(1968\)](#), namely, that the three British speakers they interviewed did not have this gestural composition of the /r/. They had a palatal gesture in initial allophones and they had a pharyngeal gesture in final allophones. It is the opinion of [McMahon et al. \(1994\)](#) that this is connected to the non – rhotic nature of British English; although, lacking further and more general studies, this remains only a possibility.

⁴ One of the subjects was excluded from the analysis based on poor ultrasound image quality.

Given the variety of US /r/ types that [Dellatre & Freeman \(1968\)](#) investigated and the Canadian /r/ types investigated by [Campbell et al. \(2010\)](#), it might be reasonable to assume that in those dialects that pronounce the Vr (at least in some contexts as variably rhotic dialect do), all variants of the /r/ have the same gestural composition.

4.2 The palatal/alveolar gesture of the /r/

4.2.1 Articulation

Among several others, there are two major, (i.e., most frequent) varieties of /r/, the “bunched” variety, in which the dorsum is raised towards the hard palate (Figure 3 upper), and the “retroflex”, in which the tongue tip/tongue blade is raised towards the alveolar ridge (Figure 3 lower). ([Zhou et al., 2008](#)). In both (and all other) varieties, sound production is achieved when air goes through the space between the active and the passive articulators given that they do not touch, only approximate each other normally. Thus, a constriction is created, which is called stricture by [Harris \(2013\)](#).

4.2.2 Acoustics

In perceptual terms, this stricture is responsible for the “rhoticness” of the /r/ - sounds. More specifically, the extent of its width influences the sound in a way that the wider the stricture is, the less rhotic the /r/ sounds and the closer the articulators get (until they touch each other), the more “r-like” (strong) the /r/ becomes. [Doherty & Foulkes \(2001\)](#) cite a number of articles (e.g. Hagiwara, 1995: p12; Stevens, 1998: p540) claiming that the acoustic result of “bunching” and “retroflexion” are the same (p4). However, [Zhou et al. \(2008\)](#) showed that it is true for formants F1, F2 and F3 only, the F4 and F5 of /r/ varieties differ. As far as this essay is concerned, however, only the first three formants are relevant, therefore, this question is not elaborated further. It is clear, then, how articulation generates the percept of rhoticity, as for what exactly is responsible for it in acoustic terms, however, there appears to be a disagreement.

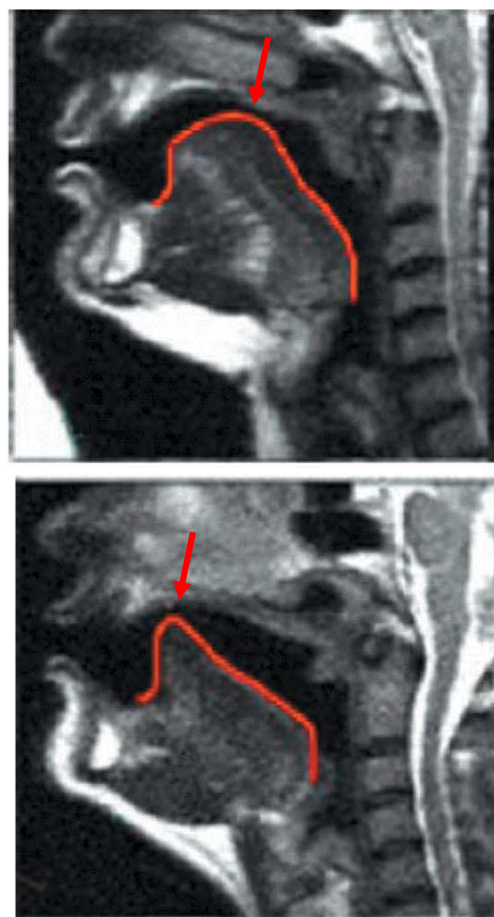
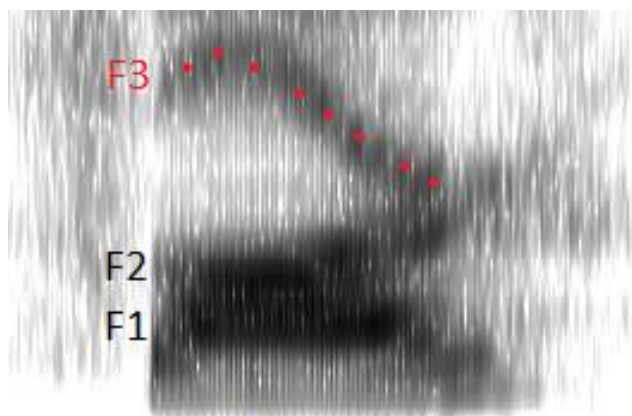


Figure 3. MR images of the palatal gesture in the US bunched [ɹ] (upper) and the alveolar gesture in the US retroflex [ɻ] (lower), [Zhou et al \(2008\)](#), p4467

4.2.3 The role of F3?

It is a commonly held assumption that rhoticity is the acoustic manifestation of a frequency lowering in the third formant (e.g., [West, 2000](#); [Hagiwara et al., 2002](#); [Lawson et al., 2010](#)). [Heselwood \(2009\)](#), however, argues that it is not the lowering of F3 that causes rhoticity. There seems to be a disagreement between the results.



[Heselwood & Plug \(2011\)](#) claims to have found the answer using words such as *fort*, *start*, *hurt* or *fir* in an experiment, in which phonetically trained participants were asked to judge on the “rhoticness” of tokens of the same word organised into word pairs. One in the pair remained intact, while the other one was manipulated: all the acoustic information was removed above F2. The researchers assumed that the manipulated tokens will be judged far less rhotic given that F3 was removed, but the result was the contrary: these tokens were heard more rhotic than those that remained intact. They made the proposal, then, that acoustic rhoticity is rather connected to the dominance in the auditory spectrum of a single peak that they call F_{rho} and this is accompanied by F3 lowering. (see further [Doherty & Foulkes, 2001](#)) All movements of F3 addressed in this paper (even in quotations), therefore, should be viewed in accordance with these findings.

4.3 The pharyngeal gesture of the /r/

The pharyngeal gesture of the /r/ is described as tongue root retraction (TRR) by [Gick \(1999\)](#). This gesture is created by the backward movement of the tongue, which results in a constriction being created in the area of the mid – pharynx. [Browman & Goldstein \(1991\)](#) assume that in a rhotic sound, this gesture does not surface because it is hidden by the palatal/alveolar gesture of the /r/. Thus, there is no direct evidence to cite on how this sound actually sounds in dialects that pronounce Vr, there is only the assumption that this hidden gesture might be the same as the schwa sound heard in non – rhotic dialects instead of the /r/. (see section [5.2.1](#) for more details)

4.4 C-gesture and V-gesture in /r/

4.4.1 The palatal/alveolar gesture as a C-gesture

The description of the /r/ provided by [Harris \(2013\)](#) seems to suggest that the palatal/alveolar gesture might be a C-gesture: “[w]ord-initially before a vowel, the tongue-blade stricture [of the /r/] tends to be tight and closely synchronised with other gestures. Word-finally after a vowel, the blade stricture is looser” (p351). This is in accord with Krakow (1999), Gick *et al.* (2006) (cited in [Harris, 2013](#)) and [Campbell et al. \(2010\)](#) who found typical timing patterns in the speech of their 9 speakers of Canadian English. Given the earlier assumption that all dialects that pronounce the Vr at least in some contexts (i.e., variably) have similar gestural composition, it is perhaps possible to argue that in all these dialects, the palatal/alveolar gesture is a C-gesture.

4.4.2 The pharyngeal gesture as a V-gesture

The characteristic timing pattern of V-gestures was found in American English /r/ by [Campbell et al. \(2010\)](#). In this study, the tongue root (TR) was preceded by the palatal/alveolar gesture and underwent a reduction in magnitude in initial position. In final allophones, the TR preceded the palatal/alveolar gesture. If the assumption that all the (at least partially) rhotic dialects exhibit the same behaviour concerning Vr is true, then, the pharyngeal gesture seems to be a V-gesture.

5 Similarities in /r/ and /ə/

5.1 Basic similarity

My analysis benefits from findings and assumptions suggesting that schwa and /r/ are similar both in articulatory and perceptual terms. ([McMahon et al., 1994](#)) This is especially true for the V-gesture supposedly present during /r/-production. In the following section, I follow the convention of the *Gimson's Pronunciation of English* (2008) that the vowel /ɜ/ found in NURSE words of the reference accent RP is identical in pronunciation to a schwa with the difference being in length only. (see p130) The NURSE and the LETTER vowels have (approximately) the same quality in most dialects that I based my research on:

Dialect	NURSE quality	LETTER quality	Source
Bahamian English	/ɜ:/~ /ə/	/ə/	Childs & Wolfram (2004): p439
Boston English	/ə ¹ /	/ə ¹ /	Nagy & Roberts (2004): p258
Rural White S-US	/ə/ (most freq.)	/ə/	Thomas (2004): p1-2
White South African	cultivated: /ɜ:/ broad: /Ø:/	/ə/ (all varieties)	Bowerman, 2008: p170 and p172
Hawai'i Creole	/ɜr/ (mesolectal)	/ə/	Sakoda & Siegel, (2008): p224

Table 1. The NURSE and the LETTER vowels in different dialects

In Table 1, I added an extra criterion where the status of one of the vowels in question is more complicated. In Rural White South Accents, the NURSE vowel has more realisations, so I adopted only the most frequent one. This is also true for the case of Hawai'i Creole being represented by the NURSE quality of the mesolect, which is spoken by the majority (Sakoda & Siegel, 2008: p217) In White South African, the NURSE is perhaps similar enough to a /r/ to become the first Vr vowel reintroducing rhoticity as R-reintroduction is simpler than R-retention being a matter of similarity *only* in my opinion. For the phonetics of NURSE in New Zealand English, which is a more complicated issue, see section 7.1. Having established the connection between schwa and the NURSE vowel this way, it is possible to argue for the similarity of /r/ and NURSE using schwa.

McMahon *et al.* (1994) remarks that a partial schwa offglide is often present before /r/ even in rhotic varieties of English, but this is rarely perceived given that “schwa and approximant [r] are articulatorily and acoustically rather similar.” (p302) The only distinction between the two sounds, in their opinion, is that “/r/ may also involve tongue tip raising and tongue front bunching, which schwa never does.” (p304) This distinction seems to be the stricture that Harris (2013) is writing about. The importance of the stricture and the articulatory relatedness seems to be echoed by the *Gimson's Pronunciation of English* (2008) in its suggestions on how foreign learners should approach the pronunciation of English [ɹ] in British English:

Any central vowel, either English /ə/ or RP /ɜ:/ or a similar vowel in the learner's own language, may be used as a starting point. An approximation to the correct quality then can be achieved by

maintaining the vowel sound while curling the tip of the tongue backwards. (p224)

In addition to the previous findings, [Gick \(2002/a\)](#) found schwa to have a “significant retraction of the tongue root” (p45) in his 4 speakers of American English. Although this has not been reported in any other dialects nor it was repeated using a larger number of informants, this finding further supports the idea that schwa and /r/ are similar.

5.2 Historical similarity

5.2.1 Non - rhoticity

There is reason to suggest that the similarity of schwa and /r/ is exactly the cause behind speakers of non – rhotic dialects using a schwa (either as long /ɜ/ or as short /ə/) instead of a Vr in their speech. As it was mentioned previously, [Browman & Goldstein \(1991\)](#) assume that the V-gesture of the /r/ is hidden by the C-gesture in dialects that pronounce the Vr. In non – rhotic dialects, however, words like *nurse* or *curse* typically lose the Vr and the pronunciation becomes /nɜ:s kɜ:s/, that is, the vowels of words that previously had Vr undergo the phenomenon of compensatory lengthening. [Browman & Goldstein \(1991\)](#) analyse this not as the lengthening of the vowel, but as a phonetic phenomenon during which the C-gesture of the /r/ (being responsible for the percept of rhoticity) is weakening. Upon extreme weakening, i.e, R-deletion, the C-gesture disappears, but it leaves behind the other gesture, the V-gesture, which surfaces. This is the assumption of [McMahon et al. \(1994\)](#) as well, who, provided that the C-gesture is weakened enough, expect “the pharyngeal gesture [so the V-gesture] [of] the /r/ to be heard as a schwa.” (p304).

It seems, therefore, that schwa and /r/ are related to each other concerning R-loss. It is interesting, however, that such relations can be pointed out in a rhotic dialect, namely, American English, as well.

5.2.2 Rhotacisation in American English

In the case of rhotacisation, the opposite happens. Instead of reduction, the /r/-like pronunciation prevails and is intensified in a way that it starts to absorb the vowel length of the preceding vowel (see Figure 5). It seems that in the case of rhotacisation, the rhotic quality intrudes into the nucleus of the preceding vowel. This is especially true for the /ɜ/ vowel (see

the lower picture in Figure 5). Lodge (2009) go as far as suggesting that “words with [ə] could also be transcribed with [ɹ] instead, and we could interpret it as a syllabic consonant.” (p81)

However, /ɜ:/ is usually not the only rhotacised vowel in American English, as indeed, Ladefoged and Maddieson (1996 as cited in Kennedy, 2006, p25) present evidence to suggest that all vowels can be rhotacised. On the other hand, based on the findings of Dellatre & Freeman (1968), it appears that this might have not always been the case. “[T]he vowel of curb occupies a *privileged* position before the phonemic /r/ in that it has phonetically been nearly absorbed by the /r/.” (p50, emphasis is mine) If schwa and /r/ are indeed similar, this behaviour would not be surprising at all. As for other rhotacised vowels, it is possible that since rhoticity has become culturally important as the most defining characteristic of American English, the rhotic quality “strengthened” and it did not only start to produce rhotacised /ɜ:/s, but in time, rhotacisation “infected” other vowels as well.

6 Hypotheses

6.1 The consequence of similarity

If the supposition that schwa and /r/ are indeed similar, it is possible to account for one half of the data on the “NURSE – phenomenon.” In dialects that were previously non – rhotic but are becoming increasingly rhotic (e.g., White South African English or Boston English), the similarity might explain why speakers introduced Vr in the context of the NURSE vowel.

It is perhaps possible that non – rhotic speakers find it rather difficult to pronounce the /r/ where they normally would not (e.g, in *norm*, *fur*, *car*) and the same is true for rhotic speakers who would like to “drop” Vrs in positions where they have always pronounced them. Given the supposition of schwa and /r/ being similar, however, it is possible to argue that speakers introduce Vr in NURSE contexts because they may find it easier to pronounce Vr here than anywhere else.

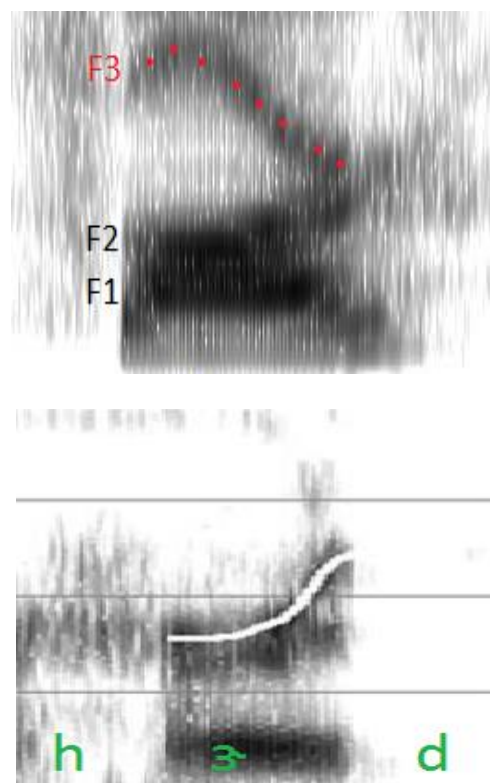


Figure 5. Spectrograms for /fa:r/ far, Lawson et al, 2010, p8 (upper) and rhotacised herd after Ladefoged, 2011, p231 (lower)
Notice the formant transition between the preceding vowel and /r/ in the upper picture and its absence in the lower one signifying the absence (or very limited presence) of schwa before the rhotic part

The basis of this claim is the assumption that, given the similarity of schwa and V-gesture /r/, speakers already have “a part” of the rhotic consonant (that is, schwa) present in their speech exactly where Vr has to be pronounced. Contrary to words like *car* where they have to introduce a schwa – like sound *plus* the raising of the tongue, they only have to raise their tongues to approximate either the palate or the alveolar ridge (see the suggestion of the GPE in section 5.1). Given the wide variety of possible /r/s, most speakers might find it easier to produce sounds that are interpreted as proper Vrs.

This idea may provide a possible solution for why NURSE is the most likely context for R-reintroduction, but it cannot explain how it is possible that Vr may remain in NURSE contexts even when all the other vowels have become non – rhotic (WWII S-US data and young Southland data). To provide a solution, a more complex analysis is needed.

6.2 A remark on R-loss

Given that in NURSE contexts the Vr sits in preconsonantal position, it is highly unlikely that the /r/ would remain in such an “unstable” phonological system as variably rhotic one. For some reason however, to which I hope to propose a possible solution in the next section, the /r/ remains in a variety of dialects. This is highly interesting in the light of what [McMahon \(1996\)](#) writes about historical R-loss in English, namely, that it started preconsonantly.

This was possibly triggered by the combination of two facts: that Vr was subjected to a progressive weakening since at least the Early Modern period ([McMahon et al., 1994](#)) and that weakening is often accompanied by an overlap between the adjacent gestures. ([Browman & Goldstein, 1989](#)) This is supported by [Doherty & Foulkes \(2001\)](#), who argue that “when the [ɹ] is flanked on both sides by other articulations [...] articulatory targets are less likely to be so closely achieved [and this can] cause coarticulatory modification.” (p182) If this is connected to the idea of [Browman & Goldstein \(1990\)](#) that “gestural overlap can lead to apparent assimilations and deletions” (p22), one can have a clear picture of how unlikely it is for the preconsonantal NURSE vowel to retain the Vr.

6.3 Extended Rhoticity Hypothesis

It is the idea of Bartlett (2002, as cited in [Kennedy, 2006](#)) describing New Zealand English that a preference for an R-full pronunciation of the NURSE vowel in Southland is connected to the fact that this vowel can be rhotacised. [Kennedy \(2006\)](#) criticises Bartlett 2002 for his “appeal to an American English model” (p25) or that his claim “does not appear to be borne

out by further research.” (p25) Following in the footsteps of Bartlett (2002), I would like to propose an idea partially related to rhotacisation.

6.3.1 The idea of “non-interaction”

It has been pointed out that rhoticity is the perceptible outcome of the C-gesture, more precisely, how wide the stricture is. It seems

logical, then, to assume that /r/-retention is connected to preserving this constriction. To achieve this goal, many obstacles

have to be overcome. As it was hinted at, the fact that the Vr is flanked by articulatory movements on both sides might intensify weakening. In the case of preconsonantal Vr, this means that it is flanked by a vowel and a consonant (see C-gesture in Figure 6). There is a possibility that the C-gesture will be “overwhelmed” by these other gestures and disappear giving rise to a vocalised variant. (Scobbie *et al.* 2006)

Although the movement of the tongue is gradual, which means that there is transiency between the preceding vowel, the /r/-gestures and the next consonant (see Figure 6), the /r/ articulation would not remain unless there is an external force encouraging the speaker to preserve it (like in the case of American English, where the phonology dictates rhoticity). Since there is no such a force in variably rhotic dialects, the Vr would disappear.

It cannot influence the flanking sequences either. It is unlikely that C₁ might influence C₂ given that C₂ is more dominant in perceptual terms (Zsiga, 2000, p7), which is important in the light of Chitoran *et al.* (2002) who remark that “linguistic effects on the speakers coordination of gestures are likely to be motivated [...] by the need to ensure the best chance at successfully completing the communicative act.” (p420) As for the preceding vowels, the inability of the /r/ to influence them is connected to the partial dissimilarity of /ɔ̃ α/ to /r/. Partial, as Walker & Proctor (2013) indeed argue that the dorsal part of the articulation of these vowels and /r/ (especially that of the alveolar [ɹ]) are similar. More specifically, it is the V-gesture of the /r/ that is similar to them. Different characteristics such as “the extent of jaw opening” (McMahon *et al.*, 1994) for the two vowels, however, make a considerable difference between these vowels the V-gesture of the /r/. Thus, these vowels are not similar enough to the V-gesture to retain the



Figure 6. Gestural composition for the sequence /art/ in cart after B&G's models on articulatory gestures. (TT stands for tongue tip) Notice the gradual colour symbolising gradual tongue movement on the vowel level and overlap on the consonantal level, while the V-gesture is hidden by the C-gesture.

/r/ (as for why similarity is important in my analysis, see the next section). In short, the /r/ is unable to interact with the flanking segments.

6.3.2 The exceptional case of schwa and /r/

The exceptionality of the co-occurrence of schwa and /r/ lies in the similarity of /ə/ and the V-gesture of the rhotic consonant. Instead of a different vowel flanking the /r/ from the vocalic side, a schwa is to be found before the /r/. Since flanking originates from different

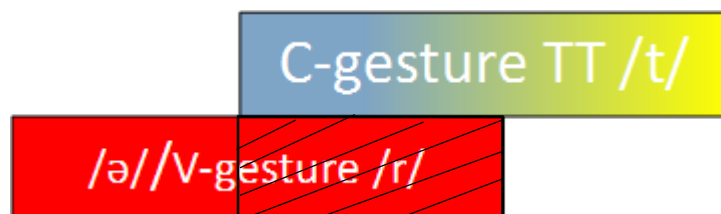


Figure 7. Gestural composition for the sequence /ər/ in curt after B&G's models on articulatory gestures. There is no transiency on the vowel level and the C-gesture is only flanked on the consonantal side, although, it is still weakened.

articulations and the C-gesture, in this case, is adjoined by a similar gesture on the vocalic side, it is only flanked on the side of the consonant (Figure 7). Given the similarity of schwa and V-gesture /r/ and the fact that the V-gesture precedes the C-gesture in the coda, the whole /ər/ sequence might be considered as a longer /r/ consonant in which the V-gesture is elongated.

Since the production of the V-gesture seems to initiate that of the C-gesture, it might happen to some speakers that the C-gesture starts to “move” towards the vocalic side, that is, the stricture starts to occur earlier and earlier during the production of the sequence. This is related to the fact that these gestures are interconnected. [Tilsen & Goldstein \(2012\)](#) argue that gestures composing segments that are not lexicalised items are likely to be selected on an individual basis (p20) thus, the connection between them might be looser. There are studies suggesting, however, that this might not be true for segments that are lexically specified to co-occur.

For example, Saltzman & Munhall (1989, as cited in [Byrd, 1996](#)), report so called “multigestures” that are particularly connected concerning intergestural timing. To this, [Byrd \(1996\)](#) makes the following addition: “it is not just any two gestures that display this tight timing relationship but rather gestures that have long been considered to belong to the same segment.” (p145) She goes on to suggest that the gestures composing the American English /r/ might very well be such “multigestures.”

This is important in the light of [Kelso & Tuller \(1985\)](#) who remark that there is no “external clock” determining the duration of segments, rather, they are synchronised to each other “normalized to the activity being performed.” (p25) In this case, this means that the occurrence

of the articulatory trajectory for the C-gesture is synchronised to the occurrence of the articulatory trajectory for the V-gesture.

6.3.3 Extended Rhoticity

Since there is no change in the articulation (elongated V-gesture, that is, schwa + V-gesture), the articulatory trajectories for the C-gesture might be triggered not only by the V-gesture of the /r/, but by part of the schwa segment as well. As a consequence, the C-gesture occurs earlier and a part of the schwa segment becomes the V-gesture for the /r/ resulting in the schwa segment being absorbed gradually. The C-gesture is “moving” out of coda position and starts to occupy the nucleus of the segment (as in the case of rhoticisation). This gradual change is understood in terms of Saltzman (1995), who suggests that articulatory trajectories “evolve fluidly and flexibly over the course of an ongoing sequence.” (cited in Byrd, 1996: p141)

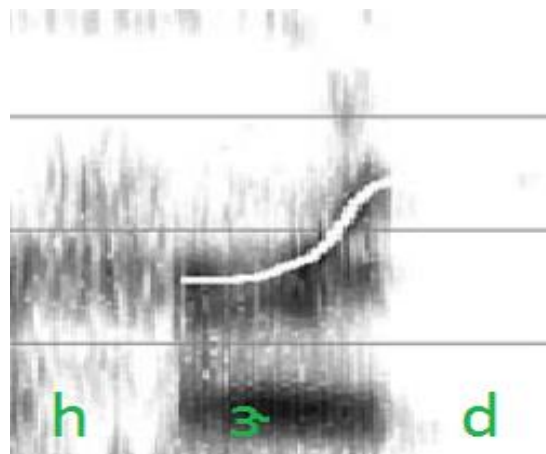
With the vocalic nucleus becoming shorter and the consonantal C-gesture invading the nucleus, the C-gesture has to become perceptually prominent enough to serve as the nucleus. Given that it is a phonetic, that is, gradual change, the C-gesture is assumed to undergo gestural strengthening *before* actually reaching its status as the nucleus. This compensates for the coda weakening that C-gestures are assumed to undergo; hence, it becomes prominent enough to counterbalance the co-articulatory effect of the flanking consonant.

This assumption is, however, based on the sole idea only that in the case of American English rhoticisation, for example, the C-gesture has become so prominent that it became the peak of the syllable (which seems to be suggested by Lodge (2009) who analyses rhoticised vowels as syllabic consonants, see in section 5.2.2).

It is not only the phenomenon of rhoticisation that shows how /r/ can invade into the nucleus of the preceding vowel. Harris (2013) connects the BIRD-TERM-NURSE merger; i.e., that the original Middle English pronunciation with the vowels /ɪ ɛ ʊ/ changed into /ər/, to the assumption that “r has somehow invaded the qualitative space of the vowel to its left.” (p351)



Figure 8. Gestural composition for the sequence /ərt/ from curt showing Extended Rhoticity Hypothesis: the schwa and the V-gesture are the same, which drives the C-gesture towards the nucleus; the C-gesture strengthens enough in the process to counterbalance the flanking effect of the other consonant. Compare this with rhoticisation. (picture cited on p13 of this paper)



Although the merger needed more than a hundred years, the phenomenon involving the NURSE vowel, given the similarity mentioned many times before, may not need even a generation.

6.4 The role of sociolinguistics?

The process described above may affect *some* speakers, but it would not be as general as it is without an external force already mentioned above. I believe, this external force may be possibly found with the help of sociolinguistics.

For New Zealand English, [Gordon & MacLagen \(2004\)](#) claims that although the rhotic realisation of the NURSE vowel decreased in most contexts, urban speakers have increased its use so that “it may be becoming a mark of Southland identity.” (p71) Something similar may be behind the rhoticity of NURSE found in the speech of African Americans in the South as a kind of distancing from fully non – rhotic, increasingly rhotic (not only NURSE, but most frequent) and fully rhotic White South Americans; I know of no study focussing on this particular phenomenon, though. The sociolinguistic status of Bahamian English and Hawai'i Creole is also unclear in this respect (see section 2.5) although, Hawai'i Creole has become the target of heated debates in the past decade giving rise to movements *against* efforts to standardise the language and promote English instead.

It seems logical to assume (and obvious) that speakers *can* modify their pronunciation in conforming to certain sociolinguistic expectations. In case of a norm arising from pure possibilities (e.g., as it seems to be the case for urban New Zealand speakers in Southland), it might serve as an external force to modify expected pronunciation. As the Southland example suggests, this might be a way for speakers to communicate a sense of belonging together. In such a case, rhotic NURSE, which has been only mere possibility, becomes a desired goal. The system of speech production, in turn, can indeed be modified to produce a different acoustic goal: “differential acoustic effects may lead to a *preference* for one kind of [intergestural] organization over the other.” ([Browman & Goldstein, 1992/a](#): p226; emphasis made by the present author)

7 Some problems and suggestions for further research

Given its status as a hypothesis only, my analysis obviously has drawbacks. In this section, I will call attention to two problems in particular and comment on them in detail.

7.1 The phonetic status of the NURSE vowel in Modern New Zealand English

My analysis investigates the ‘NURSE - phenomenon’ through the articulatory properties of the vowel /ə - ɜ/. Although in both rhotic and non – rhotic dialects, the most common variety

of the NURSE is the vowel /ɜ:/ (or /ɝ/), there are areas where a different variant is used. Such a one is found in New Zealand and thus (since no article highlight any special difference) in the variably – rhotic Southland region as well.

Hay *et al.* (2008), characterise New Zealand English as being “distinguished by its relative lack of lip – rounding” (p24). This might be important in the light of Bauer & Warren (2004), who list a number of variants for the New Zealand NURSE vowel /ə: ø: œ:/; all of these vowels are rounded (Figure 9), which

is supported by Hey *et al.* as well who remark that “NURSE has acquired marked lip – rounding [and] it’s one of the most characteristic sounds of this variety.” (p24) Although West (1999) connects F3 lowering to lip – rounding of the /r/, previously it has been rejected on the grounds

provided by Campbell *et al.* (2010) namely, that lip – rounding undergoes a considerable reduction in coda /r/

to an extent beyond which I assume it to be unable to affect the NURSE – phenomenon.

Here, however, the vowel preceding the consonant is itself rounded in a system where rounding is not as significant as it is in, say, Standard Southern British English. It is perhaps possible that this affects the following consonant making it able to retain its rhotic value by enforcing a lower F3 for the /r/. Together with labialization, the vowels in question (especially /ə/) might be similar enough to a schwa to possibly trigger the same effect of Extended Rhoticity. Since the /ə/ vowel is most alike to a schwa, it is possible that the Southland region is characterised by the regular occurrence of this vowel. Without the comparison of New Zealand English and Southland NURSE, however, this question remains open. Therefore, this would be a good topic for further study.

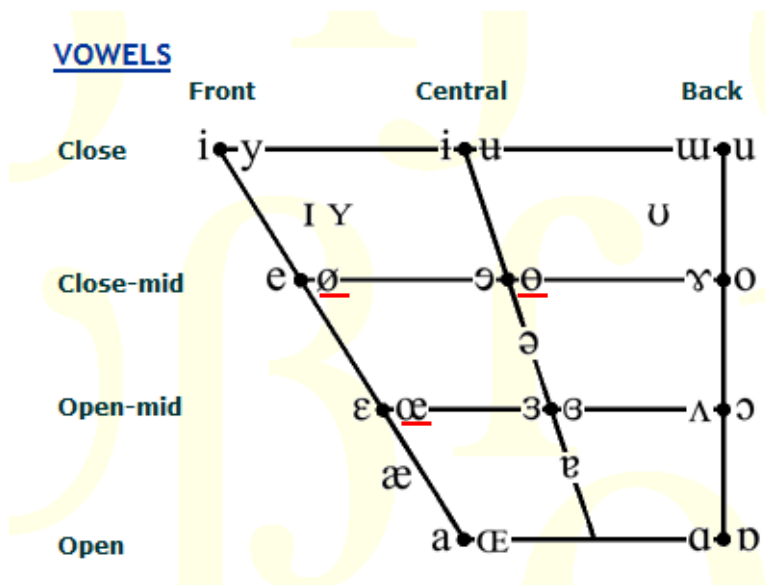


Figure 9. The vowel trapezoid represented by the IPA (where there are pairs, the right one is rounded), University of Victoria, emphasis is mine

Retrieved from

<http://web.uvic.ca/ling/resources/ipa/charts/IPA%20lab/IPA%20lab.htm>

7.2 The behaviour of LETTER and Vr

In [Wells \(1982\)](#), the LETTER vowel is mostly associated with schwa. The NURSE and the LETTER vowels are often said to have approximately the same quality in RP and many other accents and dialects. The *Gimson's Pronunciation of English* (6th edition) states that these vowels might be treated as accented and unaccented allophones of the same phoneme (p130) differing only in length (in RP at least). The idea that the quality of the two vowels are similar in many dialects makes it crucial to my analysis based on phonetic quality to comment on how this vowel treats Vr in different dialects.

I have already noted that there are dialects with Vr appearing only in NURSE contexts (e.g., Bahamian English and Hawai'i Creole), but there are other dialects in which LETTER is not rhotic. In the study of [Irvin & Nagy \(2007\)](#) of Boston English, the LETTER vowel turned out to be the least favoured context of Vr (see their table 1 in I&N: p2). This proved to be the case in [Thomas \(2004\)](#)'s account of rural white dialects in Southern US. (p13) In New Zealand English (as suggested by [Marsden, 2013](#): p256), however, this vowel is rhotic as well (although much less frequently as NURSE).

I assume, this phenomenon has to do with the LETTER vowel being unstressed. It is trivial to mention that in unstressed positions, speakers are less likely to articulate carefully during continuous speech ([Bergem, 1991](#): p1), which might be a reason why an articulatorily motivated phenomenon does not affect LETTER, but of course, this is not a strong argument on its own.

Another argument might be connected to the difference between stressed and unstressed syllables in how they are connected in a gestural level. [Tilsen \(2011\)](#), for example, points out that stressed syllables are composed of gestures with greater activation than unstressed segments (p643), while [Browman & Goldstein \(1990\)](#) remark that stressed segments are usually associated with longer durations due to slower articulatory trajectories. (p27) If greater activation occurs during longer periods of movement, it is perhaps possible that the speech gestures of stressed segments are more firmly connected than unstressed syllables with lesser activation and time span. This might account for why the stressed NURSE behaves the way it does and why LETTER does not behave accordingly: less firm connections between articulatory gestures might mean that the schwa part of lettER is not strongly connected enough

to the /r/ part to trigger an extended rhotacisation, i.e., it cannot attract the stricture to occur earlier⁵. Without further studies, however, this remains only a speculation.

8 Conclusions

Unfortunately, there is no direct evidence to suggest that the described process really applies to the NURSE data. To my best knowledge, there are no data suggesting that in these dialects rhotacisation really happened. To this, the case of White South US dialects is an exception because the younger generation (and also the older one to some extent) is using rhotacised vowels in NURSE contexts (as suggested by Table 1 in [Thomas, 2004](#): p1), but this must be the influence of Northern US English. Given the gradual nature of phonetic changes such as this one, there may be a point between rhotacisation and the starting point of Extended Rhoticity (that is, it is maybe possible that NURSE can retain the /r/ up to a level of development in Extended Rhoticity without the vowel itself becoming rhotacised), but this remains an educated guess until further research data is available.

⁵ The exceptional case of New Zealand English, namely, that LETTER sometimes retains the Vr, might be connected to what has been mentioned in section 7.1, which further emphasises the need to conduct studies targeting questions formulated above. It is also a fact that in rhotic dialects such as American English, LETTER is usually a rhotacised vowel, which further complicates the task of an analysis more detailed than the present one.

List of references

- Alwan, A., Narayanan, S., & Haker, K. (1997). Toward articulatory-acoustic models for liquid approximants based on MRI and EPG data. Part II. The rhotics. *The Journal of the Acoustical Society of America*, 101(2), 1078-1089
- Browman, C. P., & Goldstein, L. (1989). Articulatory gestures as phonological units. *Phonology*, 6(02), 201-251.
- (1990). Tiers in articulatory phonology, with some implications for casual speech. *Papers in laboratory phonology I: Between the grammar and physics of speech*, 341-376.
- (1991). Gestural structures: Distinctiveness, phonological processes, and historical change. *Modularity and the motor theory of speech perception*, 313-338.
- (1992/a). Articulatory phonology: An overview. *Phonetica*, 49(3-4), 155-180.
- (1992/b). Response to commentaries. *Phonetica*, 49(3-4), 222-234.
- (1995). Dynamics and articulatory phonology. *Mind as motion*, 175-193.
- Bauer, Laurie & Paul Warren 2004. New Zealand English: Phonology. In Edgar Schneider, Kate Burridge, Bernd Kortmann, Rajend Mesthrie & Clive Upton (eds.), *A Handbook of Varieties of English*, 580–602. Berlin: Mouton de Gruyter.
- Bergem, D. R. V. (1991). Acoustic and lexical vowel reduction. In *Phonetics and Phonology of Speaking Styles*.
- Byrd, D. (1996). A phase window framework for articulatory timing. *Phonology*, 13(02), 139-169.
- Bowerman, S. (2008). White South African English: phonology. *Rajend Mesthrie (ed.)*, 164-176.
- Campbell, F., Gick, B., Wilson, I., & Vatikiotis-Bateson, E. (2010). Spatial and temporal properties of gestures in North American English/r. *Language and speech*, 53(1), 49-69.
- Childs, B., & Wolfram, W. (2004). Bahamian English: phonology. *A Handbook of Varieties of English*, 1, 435-449.
- Chitoran, I., Goldstein, L., & Byrd, D. (2002). Gestural overlap and recoverability: Articulatory evidence from Georgian. *Laboratory phonology*, 7, 419-447.

- Cruttenden, A. (2008). *Gimson's pronunciation of English*. Routledge.
- Delattre, P., & Freeman, D. C. (1968). A dialect study of American r's by x-ray motion picture. *Linguistics*, 6(44), 29-68.
- Docherty, G., & Foulkes, P. (2001). Variability in (r) production: instrumental perspectives. *Etudes & travaux-Institut des langues vivantes et de phonétique*, (4), 173-184.
- du Plessis, D., & Bekker, I. (2014). 'To err is human: The case for neorhoticity in White South African English. *Language Matters*, 45(1), 23-39.
- Edwards, W. F. (2004). African American Vernacular English: phonology. *A Handbook of Varieties of English*, 1, 383-392.
- Espy-Wilson, C. Y., & Boyce, S. (1999). A simple tube model for American English/r. In *Proc. XIVth Int. Conf. Phon. Sci* (pp. 2137-2140).
- Gick, B. (1999). A gesture-based account of intrusive consonants in English. *Phonology*, 16(01), 29-54.
- , (2002/a). An X-ray investigation of pharyngeal constriction in American English schwa. *Phonetica*, 59(1), 38-48.
- , (2002/b). A gesture-based account of intrusive consonants in English. *Phonology*, 16(01), 29-54.
- , (2003). Articulatory correlates of ambisyllabicity in English glides and liquids. *Phonetic Interpretation: Papers in Laboratory Phonology VI*, 222-236.
- Gordon, E., & MacLagan, M. (2008). Regional and social differences in New Zealand phonology. *Varieties of English*, 3, 64-76.
- Hagiwara, R., Fosnot, S. M., & Alessi, D. M. (2002). Acoustic phonetics in a clinical setting: a case study of /r/-distortion therapy with surgical intervention. *Clinical linguistics & phonetics*, 16(6), 425-441.
- Harris, J. (2013). Wide-domain r-effects in English. *Journal of Linguistics*, 49(02), 329-365.
- Hay, J., MacLagan, M., & Gordon, E. (2008). *New Zealand English*. Edinburgh University Press.

- Heselwood, B. (2009). Rhoticity without F3: Lowpass Diltering, F1-F2 relations and the perception of rhoticity in 'NORTH-FORCE', 'START' and 'NURSE' words. *Leeds Working Papers in Linguistics and Phonetics*, 14, 49-64.
- Heselwood, B., & Plug, L. (2011). The role of F2 and F3 in the perception of rhoticity: Evidence from listening experiments. In *Proceedings of the 17th International Congress of Phonetic Sciences* (pp. 17-21). City University of Hong Kong.
- Irwin, P., & Nagy, N. (2007). Bostonians/r/speaking: A quantitative look at (R) in Boston. *University of Pennsylvania Working Papers in Linguistics*, 13(2), 11.
- Kelso, J. A. 5., & Tuller, B. (1985). Intrinsic time in speech production: Theory, methodology, and preliminary observations. *Haskins Laboratories Status Report on Speech Research*, SR-81, 23-39.
- Kennedy, M., *Variation in the Pronunciation of English by New Zealand school children*. Master's thesis, Victoria University of Wellington (2006).
- Ladefoged, P., & Johnson, K. (2011). *A course in phonetics*. Cengage learning.
- Lawson, E., Stuart-Smith, J., Scobbi e, J.M., Yaeger-Dror, M. and Maclagan, M. (2010) Analyzing liquids. In: De Paolo, M. and Yaeger-Dror, M. (eds.) *Sociophonetics: A Student's Guide* (pp. 72—86). Routledge, London, UK
- Lodge, K. (2009). *A critical introduction to phonetics*. Bloomsbury Publishing.
- Marsden, S. (2012). *Phonological variation and the construction of regional identity in New Zealand English*. Unpublished doctoral thesis, Victoria University of Wellington, Wellington
- McMahon, A. M. (1996). On the Use of the Past to Explain the Present. In *English historical linguistics 1994: papers from the 8th International Conference on English Historical Linguistics (8. ICEHL, Edinburgh, 19-23 September 1994)* (Vol. 135, p. 73). John Benjamins Publishing Co.
- McMahon, A., Foulkes, P., & Tollfree, L. (1994). Gestural representation and lexical phonology. *Phonology*, 11(02), 277-316.
- Nagy, N., & Roberts, J. (2004). New England: phonology. *A handbook of varieties of English*, 1, 270-81.

- Rosenfelder, I. (2009). *Sociophonetic variation in educated Jamaican English: An analysis of the spoken component of ICE-Jamaica* (Doctoral dissertation, Universitätsbibliothek Freiburg).
- Sakoda, K., & Siegel, J. (2008). Hawai 'i Creole: phonology. *Varieties of English: The Pacific and Australasia*. Amsterdam: Mouton de Gruyter, 210-233.
- Scobbie, J. M., Gordeeva, O. B., & Matthews, B. (2006). Acquisition of Scottish English phonology: an overview. *QMU Speech Science Research Centre Working Papers*.
- Sproat, R., & Fujimura, O. (1993). Allophonic variation in English/l/and its implications for phonetic implementation. *Journal of phonetics*, 21(3), 291-311.
- Thomas, E. (2004). Rural Southern white accents. *A handbook of varieties of English*, 1, 300-324.
- Tilsen, S. (2011). Effects of syllable stress on articulatory planning observed in a stop-signal experiment. *Journal of Phonetics*, 39(4), 642-659.
- Tilsen, S., & Goldstein, L. (2012). Articulatory gestures are individually selected in production. *Journal of phonetics*, 40(6), 764-779.
- Walker, R., & Proctor, M. (2013). Articulatory overlap in English syllables with postvocalic/l. In *Proceedings of Meetings on Acoustics*, 19(1), 1-5.
- Wells, J. C. (1982). *Accents of English* (Vol. 1). Cambridge University Press.
- West, P. (2000). Long-distance coarticulatory effects of British English/l/and/r: An EMA, EPG and acoustic study. In *Proceedings of the 5th Seminar on Speech Production: Models and Data, Kloster Seeon, Bavaria, Germany* (pp. 105-108).
- Zhou, X., Espy-Wilson, C. Y., Boyce, S., Tiede, M., Holland, C., & Choe, A. (2008). A magnetic resonance imaging-based articulatory and acoustic study of “retroflex” and “bunched” American English/r. *The Journal of the Acoustical Society of America*, 123(6), 4466-4481.
- Zsiga, E. C. (2000). Phonetic alignment constraints: consonant overlap and palatalization in English and Russian. *Journal of Phonetics*, 28(1), 69-102.

Finished: 06. 01. 2015