

# A Study of Rhythm in London: Is Syllable-timing a Feature of Multicultural London English?

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## 1 Rhythm in Speech

### 1.1 Analyzing Speech Rhythm

It has been shown that speech rhythm in languages cannot be assigned to discrete categories such as stress-timed and syllable-timed (Abercrombie 1967). In fact, there is a continuum from more syllable-timed to more stress-timed languages (Dauer 1983, Miller 1984). Different metrics have been proposed to quantify speech rhythm across languages, focusing on either phonotactic structures or on differences in vowel and consonant phonology (Thomas 2011:195-197). Low et al. (2000) have proposed the Pairwise Variability Index (PVI) which is a measure of the average relative difference between successive pairs of units such as vowels and consonants in adjacent syllables. Duration, which is linked to time, is the most frequent unit to measure (Nolan and Asu 2009). So-called syllable-timed languages will have a near-equal duration of units (e.g. syllables or vowels). Examples of such languages are Mandarin and Spanish. Stress-timed languages, on the other hand, will have larger durational variability of units. Such languages are English, German and Dutch. PVI values for different languages are shown in Table 1 (figures from Grabe and Low 2002):

Mandarin	27.0
Spanish	29.7
French	43.5
Singapore English	52.3
British English (RP)	57.2
German	59.7
Dutch	65.5

Table 1: PVI values for different languages.

In terms of PVI, a low PVI value indicates regularity from unit to unit and the language is considered more syllable-timed. A high PVI value signals lack of regularity from unit to unit and the language is considered more stress-timed. The PVI formula has been modified to allow for differences in articulation rate, as the duration of units is shorter when the articulation rate increases. This is known as normalized PVI (nPVI).

### 1.2 Speech Rhythm and Language Contact

Szakay (2008) examined vocalic nPVI for Maori and Pakeha New Zealand English. Maori New Zealand English was significantly more syllable-timed than Pakeha New Zealand English, most likely due to Maori being mora-timed. This is because mora-timed languages, such as Japanese, are considered more syllable-timed. PVI values for New Zealand English are shown in Table 2.

Maori NZ English	46.4
Pakeha NZ English	57.2

Table 2: PVI in New Zealand English.

The findings suggest an effect of language and dialect contact on rhythmic patterns, as Maori New

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Zealand English was more syllable timed. There was also a correlation between vocalic nPVI and speech rate: speakers with an increased speech rate had a lower vocalic nPVI. This was only shown for Pakeha New Zealand English speakers. A faster articulation rate is a feature of syllable-timed languages (Arvaniti 2009, Dauer 1983, Dellwo 2010).

Similar results for speech rhythm have been found for other varieties of English that may be considered contact varieties: Singapore English speakers were more syllable timed than British English (RP) speakers (Deterding 2001). The reason is most likely long-term contact with syllable-timed Chinese languages. Thomas and Carter (2006) found greater differences in terms of rhythmic structures between older white American English and AAVE speakers born before the American civil war than between younger speakers of the two varieties. This means that, over time, AAVE has become more similar to white American English in having a larger degree of stress timing: recordings with the ex-slaves, born before the American civil war, showed a greater degree of syllable timing. The oldest AAVE speakers had rhythmic patterns like Jamaican English, a variety which was found to be significantly more syllable timed than white American English. The increased syllable timing in Jamaican English may be linked to vowel duration. Wassink (1999, 2001) found that basilectal male speakers of Jamaican English have a lower difference in duration between pairs of short and long vowels than acrolectal female speakers. Similar observations are made for Singapore English (Deterding 2001): there is a reduced difference in duration between short and long vowels, and in addition there is a lower level of reduction of unstressed vowels, which is the suggested reason for the more syllable-timed rhythm in contact varieties. The studies clearly show the effect of dialect contact: where there is long-term contact, rhythmic patterns become more leveled.

## 2 Innovation in London English: Multicultural London English

London has long been regarded as the center of linguistic innovation in British English (Wells 1982). In addition, adolescent speakers are in the lead in language change in urban varieties in the UK (Kerswill and Williams 2000, Stuart-Smith et al. 2007, Watt 2002). In line with this, a number of studies have found that adolescents in an inner city area of London had a number of innovative phonological, discourse and morphosyntactic features in their speech (Kerswill et al. 2008, Cheshire and Fox 2009, Gabrielatos et al. 2010, Torgersen et al. 2011, Cheshire et al. 2011). The speakers who seemed to be in the lead were of recent immigrant background, but had been born in London. The set of innovations found in inner-London form a variety, or set of varieties, termed Multicultural London English (MLE) (Cheshire et al. 2008, Kerswill et al. 2008). There is a high level of dialect contact in south-east England, and the highest levels are recorded in urban areas and London leading to language change (Kerswill and Williams 2000, 2005, Torgersen and Kerswill 2004). The high level of dialect and language contact in inner London is due to its population mix and recent immigration to the area. Many of the immigrants to London are speakers of different varieties of English and the MLE speakers appear to select variants from a 'feature pool' (Mufwene 2001) which contains variants ranging from non-standard to standard. Examples of non-standard features are the reduction in the indefinite article paradigm to *a* found among some young speakers in Hackney (Gabrielatos et al. 2010). On the other hand there is almost no H-dropping among non-Anglo speakers in Hackney, while old Anglo speakers in the same area have a much higher degree of H-dropping, which is a feature of non-standard varieties (Cheshire et al. 2008). Vowel phonologies representing different varieties of English may also be in the feature pool which in turn may have an effect of rhythmic patterns: a realignment in the duration of long and short, and stressed and unstressed vowels may give the impression of a more syllable-timed rhythm. We therefore hypothesized that MLE would have a more syllable-timed rhythm than what has been reported for British English.

The studies on innovation in MLE have so far only dealt with segmental features. Indeed, other studies on multiethnic varieties in Europe have mainly focused on grammatical features (Wiese 2009, Quist 2008). However, some studies state that multicultural varieties have a characteristic prosody and rhythm, and that speakers have a more monotonous and 'staccato' rhythm (Quist 2008, Bodén 2010), although this has not yet been quantified. However, measurements of the duration of phonologically long and short vowels in Copenhagen Danish and Multicultural Copenhagen Danish (Hansen and Phrao 2010) show a leveling in the duration of these vowels before

syllables with a full vowel for Multicultural Copenhagen Danish speakers, but not for Copenhagen Danish speakers. This distinction may contribute to the impression of an alternate speech rhythm in Multicultural Copenhagen Danish (Hansen and Phrao 2010:94). If suprasegmentals in MLE mirror the segmental features, and if MLE behaves like other multicultural varieties in terms of prosody, we should expect to find effects of dialect and language contact on speech rhythm also among the speakers of MLE; possibly a similar type of ‘staccato’ rhythm as the one that has been observed elsewhere.



Figure 1: London map showing the localities.

### 3 Rhythm in London English

#### 3.1 Methodology

The data is taken from sociolinguistic interviews with 100 working-class adolescents (16–19 years old) and 18 working-class elderly speakers (aged 70 or above) in two boroughs, Hackney and Havering. The data was collected as part of the ESRC-funded project *Linguistic Innovators: the English of adolescents in London*. Hackney is an inner London borough in the traditional East End, while the borough of Havering is in the east, and was formerly part of Essex (see Figure 1). Hackney has a diverse population with high levels of immigration and with no particular ethnic group in the majority. Havering is much less diverse with a near-categorical white British population (figures from 2001 Census). The ethnicity of the young speakers was self-defined, but they were assigned to groups of Anglos and non-Anglos. The group of ‘Anglo’ speakers comprised speakers who self-identified as ‘white British’, and who were from families with relatively deep local roots. The speakers in the ‘non-Anglo’ group were children or grandchildren of immigrants, almost all from developing countries. Speakers were also asked to name their closest friends, whether they were male or female, whether they knew them from the college they attended, and their ethnic background. Each speaker was then assigned a score of 1–5 depending on the ethnic makeup of the friendship network:

- 1 = all friends same ethnicity as self
- 2 = up to 20 percent of a different ethnicity than self
- 3 = 21–40 percent of a different ethnicity than self
- 4 = 41–60 percent of a different ethnicity than self
- 5 = 61–80 percent of a different ethnicity than self

The network score analysis revealed that for Anglo adolescents in Hackney a score of 3 was the minimum, whereas for those in Havering, 3 was the maximum. This demonstrates the higher de-

gree of contact across ethnicities in Hackney. In addition to the *Linguistic Innovators* speakers we included 4 older speakers who were born in the 1870s and 1890s (Sivertsen 1960) as baseline for rhythmic structures in inner London. All interviews with the young speakers were carried out by one of the RAs on the *Linguistic Innovators* project. These interviews have very little fieldworker involvement and most are group discussions between the participants. Some of the interviews with the older speakers, 5 in Hackney and 3 in Havering, were carried out by another fieldworker. These interviews were either one-to-one or in pairs. The choice of speakers was ultimately due to the presence of suitable data in the recordings. Table 3 presents an overview of the speakers included in the study.

	Hackney young speakers	Hackney old speakers	Sivertsen speakers (=Very old Anglos)	Havering young speakers	Havering old speakers
Anglo	15	7	4	14	7
Non-Anglo	21				

Table 3: Speakers included in the study.

It is important to control for variation in speaking style in the data as variation affects speech rhythm (Arvaniti 2009). Our solution was to examine personal narratives that all included a great deal of personal involvement: the narratives were about fights, police incidents and family issues. The duration of the narratives varied from 45 to 180 seconds for each speaker. The speech was segmented by forced phonemic alignment (Yuan and Liberman 2008) using the British English Example Pronunciation phonemic dictionary.<sup>1</sup> All segmentation was checked manually and the duration of segments and pauses was corrected as required by comparing the visual information on the spectrogram and the auditory information. Figure 2 shows an example of the segmentation with separate phonemic and lexical tiers. In total, 16,586 vocalic elements were included in the analysis. Measurements of normalized vocalic PVI, as an indicator of rhythmic patterns (Grabe and Low 2002), were calculated using a Praat script. Previous work has found differences in articulation rate between varieties of English in the USA (Jacewicz et al. 2009, 2010) and in New Zealand English (Szakay 2008). As a faster articulation rate is associated with syllable-timed languages, we also calculated the articulation rate for individual speakers (Vrate). It was defined as the number of vocalic elements divided by the duration of all vocalic elements in the particular recording.

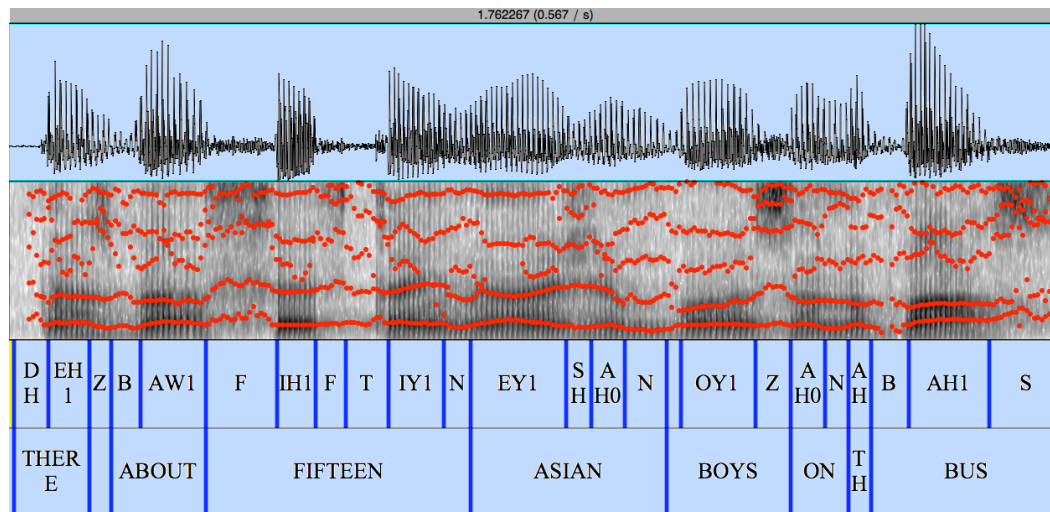


Figure 2: Phonemic and lexical segmentation.

<sup>1</sup><<http://svr-www.eng.cam.ac.uk/comp.speech/Section1/Lexical/beep.html>>.

3.2 Results

Table 4 shows the results for all groups of speakers. It is clear how the young non-Anglos have lower nPVIs than all other groups of young and old Anglo speakers. Male speakers have generally lower values than female speakers, and speakers in Hackney have lower values than those in Havering.

Ethnicity	Age	Gender	Hackney			Havering		
			N	nPVI	Vrate	N	nPVI	Vrate
Anglo	very old	total	4	53.38	9.87			
		female	4	53.38	9.87			
		male						
Anglo	old	total	7	52.86	9.95	7	55.44	9.74
		female	3	56.99	10.44	3	56.14	9.47
		male	4	49.76	9.58	4	54.92	9.94
Anglo	young	total	15	53.70	11.70	14	55.28	11.49
		female	6	54.83	11.12	7	55.67	11.32
		male	9	52.95	12.08	7	54.90	11.65
non-Anglo	young	total	21	51.14	11.46			
		female	8	51.41	10.52			
		male	13	50.97	12.03			

Table 4: nPVI values and vocalic articulation rates for all speakers.

The differences between groups of speakers in terms of nPVI are shown on Figure 3. The young non-Anglos, together with the other Hackney speakers, have the lowest nPVIs and the Havering speakers have the highest nPVI values. Note how the differences are quite small between groups of Anglo speakers in the two localities; however, the nPVI values are generally lower in Hackney than in Havering. When we compare groups of speakers, there is a significant difference between the old speakers in Hackney and Havering (Wilcoxon-test,  $W=4$ ,  $p=0.013$ ), shown on Figure 4. The difference may indicate that inner London English has had a more syllable-timed rhythm than other varieties of British English for a long time.

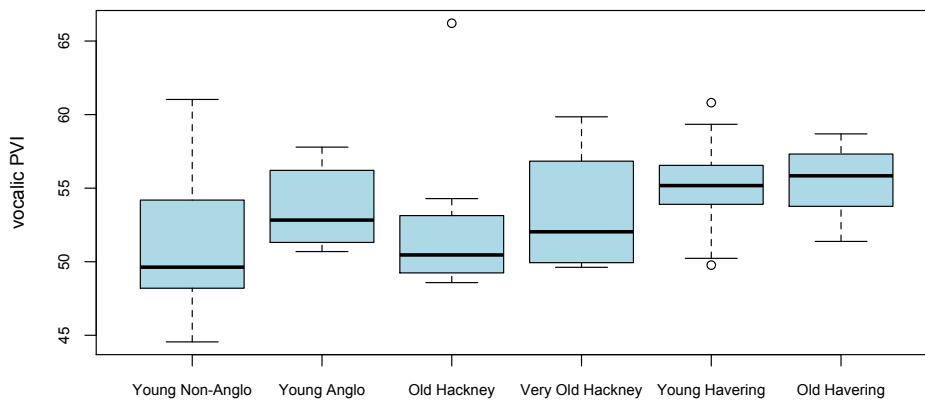


Figure 3: nPVI values for all speaker groups.

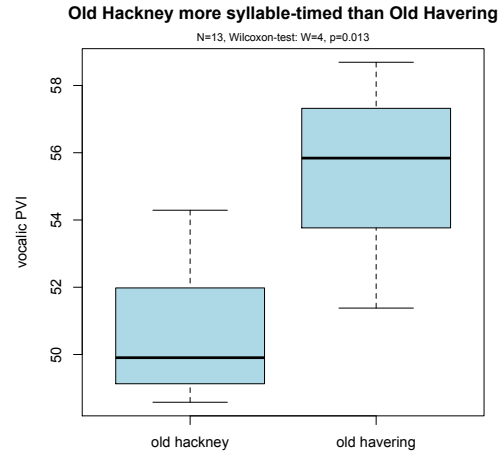


Figure 4: nPVI old speakers in Hackney and Havering.

Figure 5 presents the vocalic articulation rates. The old speakers are generally slower and the young speakers faster. Within the non-Anglo group there is quite a spread, while within the groups of young Anglo speakers there are only small differences in articulation rate between the individual speakers.

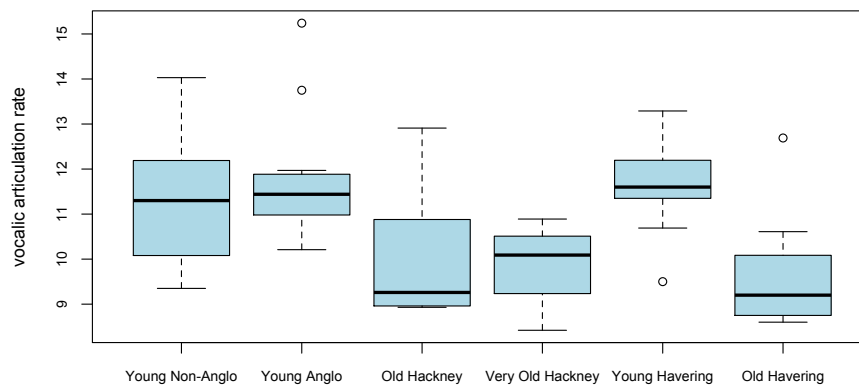


Figure 5: Vocalic articulation rates for all speaker groups.

Tables 5 and 6 show the PVI model. In the ANOVA significant main effects were found for ethnicity ( $p < 0.05$ ), vocalic articulation rate ( $p < 0.05$ ) and geographical location ( $p < 0.05$ ). The coefficients table for the linear regression model for nPVI is shown in Table 6. The significant predictors are ethnicity (non-Anglo ethnicity leads to a reduction in nPVI), geographical location (Havering speakers have a higher nPVI), young age group (young speakers as a whole have higher nPVI than the old speakers) and vocalic articulation rate (increased vocalic articulation rate leads to a decrease in nPVI).

The results also revealed that the young speakers in Hackney of non-Anglo background were significantly more syllable-timed than the young Anglo speakers in Hackney (Wilcoxon-test,  $W = 228$ ,  $p = 0.023$ ), shown on Figure 6. This difference may be an effect of language and dialect contact, which was alluded to above. Some of the non-Anglo speakers have an additional language,

and even though they are more proficient in English, English is not always the home language. This finding may be linked to research on acquisition of rhythm in an L2, which shows that a more native-like rhythm develops with increased proficiency in the L2 (Diez et al. 2008). However, some of them may have transferred rhythmic structures from another language into English. In fact, the substratal influence is one of the most frequently documented effects on speech rhythm (Yaeger-Dror and Fagyal 2011) and has been shown on rhythmic structures in a number of different language varieties and also for L2 speakers of some languages. Elements of vowel phonologies in other languages and other varieties of English may then also be part of the MLE feature pool.

Factor	df	Partial SS	MS	F	p
ethnicity	1	52.63	52.63	4.88	0.0313
sex	1	3.91	3.91	0.36	0.5493
age	2	57.30	28.65	2.65	0.0790
vocalic articulation rate	1	47.85	47.85	4.43	0.0397
location	1	76.65	76.65	7.10	0.0100
REGRESSION	6	284.83	47.47	4.40	0.0010
ERROR	57	615.33	10.79		

Table 5: PVI model.

Variable	Value	SE	t	p
Intercept	59.09	3.45	17.10	0.00000
ethnicity=non-Anglo	-2.35	1.06	-2.20	0.03127
sex=male	-0.54	0.89	-0.60	0.54935
age=very old	1.35	2.04	0.66	0.51016
age=young	2.93	1.28	2.29	0.02558
vocalic articulation rate	-0.71	0.34	-2.10	0.03967
location=Havering	2.83	1.06	2.66	0.01000

Table 6: PVI model.

The findings on speech rhythm mirror those in the various segmental studies on London English. Non-Anglo speakers are in the lead in having near-monophthongal qualities for diphthongs, which are also found in other varieties of English (Kerswill et al. 2008). In addition, a reduction in the indefinite article paradigm to *a* (Gabrielatos et al. 2010, Cheshire et al. 2011) and leveling of past tense BE to *was* in positive polarity and *wasn't* in negative polarity (Cheshire and Fox 2009, Cheshire et al. 2011) are also known in L2 varieties of English and in AAVE (Ash and Myhill 1986, Wolfram 2008). These features are also found among speakers who are in an inter-ethnic friendship network.

In our data there was also a correlation between articulation rate and vocalic nPVI for the non-Anglo speakers in Hackney (Spearman's  $\rho = -0.55$ ,  $p = 0.008$ ), as shown on Figure 7, but not for any of the other speaker groups. For these speakers a faster articulation rate predicts a lower vocalic nPVI. Faster articulation rate was also linked to low nPVI in Szakay's (2008) study of New Zealand English and a faster articulation rate is found in syllable-timed languages (Arvaniti 2009, Dauer 1983, Dellwo 2010).

## 4 Conclusion

We have shown that the Hackney speakers in general have a more syllable-timed rhythm than Havering speakers, and the young non-Anglo speakers are more syllable timed than Anglo speakers. Having a more syllable-timed speech rhythm mirrors the use of MLE segmental features: non-Anglo speakers have a higher degree of use than Anglo speakers. We therefore consider having a more syllable-timed rhythm a feature of MLE. Whereas inner London appears to have a more syllable-timed rhythm than outer London, there is only a small difference in terms of nPVI between

the young Anglo speakers in the two boroughs. Nevertheless, the value for Havering is more similar to the PVI value for RP (Grabe and Low 2002). The data suggests that inner London English has been more syllable-timed for a long time. We also found a correlation between PVI and articulation rate for non-Anglos. Non-Anglo speakers with a fast vocalic articulation rate are more syllable-timed. This may indicate that fast speech is also a feature of MLE. As an increased level of syllable timing is also found in Maori New Zealand English, Singapore English and Jamaican English, a more syllable-timed speech rhythm appears to be a feature of contact varieties of English.

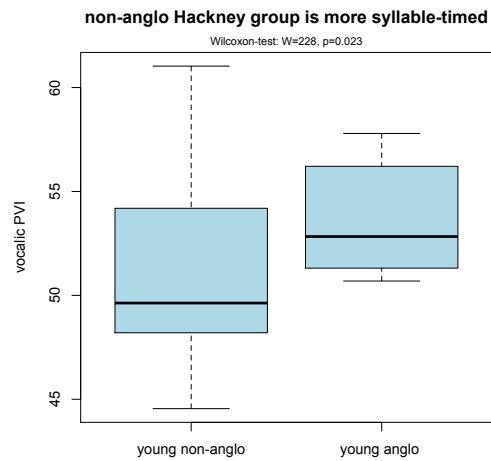


Figure 6: Vocalic nPVI Young Hackney speakers.

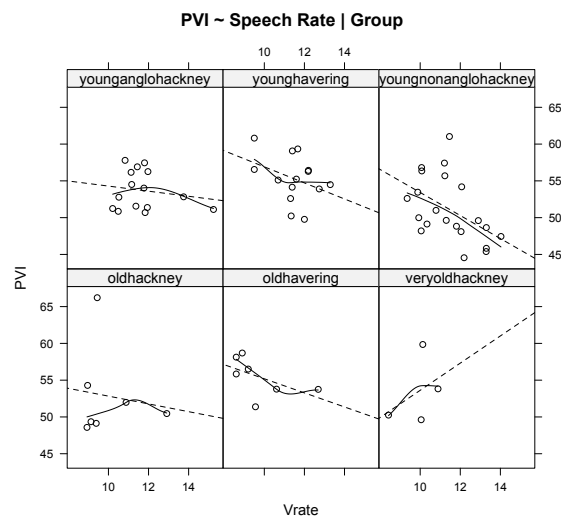


Figure 7: Correlation between vocalic articulation rate and nPVI.

## References

- Abercrombie, David. 1967. *Elements of general phonetics*. Edinburgh: Edinburgh University Press.  
Arvaniti, Amalia. 2009. Rhythm, timing and the timing of rhythm. *Phonetica* 66:46–63.



- Ash, Sharon, and John Myhill. 1986. Linguistic correlates of inter-ethnic contact. In *Diversity and Diachrony*, ed. D. Sankoff, 33–44. Amsterdam: Benjamins.
- Bodén, Petra. 2010. Pronunciation in Swedish multiethnolect. In *Multilingual Urban Scandinavia*, ed. P. Quist and B. A. Svendsen, 65–78. Bristol: Multilingual Matters.
- Cheshire, Jenny, Sue Fox, Paul Kerswill, and Eivind Torgersen. 2008. Ethnicity, friendship network and social practices as the motor of dialect change: Linguistic innovation in London. *Sociolinguistica* 22:1–23.
- Cheshire, Jenny, and Sue Fox. 2009. Was/were variation: A perspective from London. *Language Variation and Change* 21:1–38.
- Cheshire, Jenny, Paul Kerswill, Sue Fox, and Eivind Torgersen. 2011. Contact, the feature pool and the speech community: The emergence of Multicultural London English. *Journal of Sociolinguistics* 15:151–196.
- Dauer, R. M. 1983. Stress-timing and syllable-timing reanalyzed. *Journal of Phonetics* 11:51–62.
- Dellwo, Volker. 2010. Influences of speech rate on the acoustic correlates of speech rhythm: An experimental phonetic study based on acoustic and perceptual evidence. Doctoral dissertation, University of Bonn.
- Deterding, David. 2001. The measurement of rhythm: A comparison of Singapore and British English. *Journal of Phonetics* 29:217–230.
- Díez, Francisco G., Volker Dellwo, Núria Gavaldà, and Stuart Rosen. 2008. The development of measurable speech rhythm during second language acquisition. *Journal of the Acoustical Society of America* 123:3886.
- Gabrielatos, Costas, Eivind Torgersen, Sebastian Hoffmann, and Sue Fox. 2010. A corpus-based sociolinguistic study of indefinite article forms in London English. *Journal of English Linguistics* 38:297–334.
- Grabe, Esther, and Ee L. Low. 2002. Durational variability in speech and the rhythm class hypothesis. In *Papers in Laboratory Phonology 7*, ed. C. Gussenhoven and N. Warner, 515–546. Berlin: Mouton.
- Hansen, Gert F., and Nicolai Pharao. 2010. Prosody in the Copenhagen multiethnolect. In *Multilingual Urban Scandinavia*, ed. P. Quist and B. A. Svendsen, 79–95. Bristol: Multilingual Matters.
- Jacewicz, Ewa, Robert A. Fox, Caitlin O’Neill, and Joseph Salmons. 2009. Articulation rate across dialect, age, and gender. *Language Variation and Change* 21:233–256.
- Jacewicz, Ewa, Robert A. Fox, and Lai Wei. 2010. Between-speaker and within-speaker variation in speech tempo of American English. *Journal of the Acoustical Society of America* 128:839–850.
- Kerswill, Paul, and Ann Williams. 2000. Creating a new town koine: Children and language change in Milton Keynes. *Language in Society* 29:65–115.
- Kerswill, Paul, and Ann Williams. 2005. New towns and koineisation: Linguistic and social correlates. *Linguistics* 43:1023–1048.
- Kerswill, Paul, Eivind Torgersen, and Sue Fox. 2008. Reversing ‘drift’: Innovation and diffusion in the London diphthong system. *Language Variation and Change* 20:451–491.
- Low, Ee L, Esther Grabe, and Francis Nolan. 2000. Quantitative characteristics of speech rhythm: ‘Syllable-timing’ in Singapore English. *Language & Speech* 43:377–401.
- Miller, M. 1984. On the perception of rhythm. *Journal of Phonetics* 19:231–248.
- Mufwene, Salikoko S. 2001. *The Ecology of Language Evolution*. Cambridge: Cambridge University Press.
- Nolan, Francis, and Eva L. Asu. 2009. The pairwise variability index and coexisting rhythm in language. *Phonetica* 66:64–77.
- Quist, Pia. 2008. Sociolinguistic approaches to multiethnolect: Language variety and stylistic practice. *International Journal of Bilingualism* 12:43–61.
- Sivertsen, Eva. 1960. *Cockney Phonology*. Oslo: Oslo University Press.
- Stuart-Smith, Jane, Claire Timmins and Fiona Tweedie. 2007. Talkin’ Jockney: Accent change in Glaswegian. *Journal of Sociolinguistics* 11:221–260.
- Szakay, Anita. 2008. *Ethnic dialect identification in New Zealand: The role of prosodic cues*. Saarbrücken: VDM.
- Thomas, Erik, and Philip M. Carter. 2006. Prosodic rhythm and African American English. *English World-Wide* 27:331–355.
- Thomas, Erik. 2011. *Sociophonetics: An introduction*. Basingstoke: Palgrave.
- Torgersen, Eivind, and Paul Kerswill. 2004. Internal and external motivation in phonetic change: Dialect levelling outcomes for an English vowel shift. *Journal of Sociolinguistics* 8:23–53.
- Torgersen, Eivind, Costas Gabrielatos, Sebastian Hoffmann, and Sue Fox. 2011. A corpus-based study of pragmatic markers in London English. *Corpus Linguistics and Linguistic Theory* 7:93–118.
- Wassink, Alicia B. 1999. A sociophonetic analysis of Jamaican vowels. Doctoral dissertation, University of Michigan.
- Wassink, Alicia B. 2001. Theme and variation in Jamaican vowels. *Language Variation and Change* 13:135–159.
- Watt, Dominic. 2002. ‘I don’t speak with a Geordie accent, I speak, like, the Northern accent’: contact-induced levelling in the Tyneside vowel system. *Journal of Sociolinguistics* 6:44–63.

- Wells, John. 1982. *Accents of English*. Cambridge: Cambridge University Press.
- Wiese, Heike. 2009. Grammatical innovation in multiethnic urban Europe: New linguistic practices among adolescents. *Lingua* 119:782–806.
- Wolfram, Walt. 2008. Urban African American English: Morphology and Syntax. In *Varieties of English: The Americas and the Caribbean Vol. 2*, ed. E. W. Schneider, 510–533. Mouton de Gruyter: Berlin.
- Yaeger-Dror, Malcah, and Zsuzsanna Fagyal. 2010. Analyzing Prosody: Best Practices for the Analysis of Prosody. In *Sociophonetics: A student's guide*, ed. M. Di Paolo and M. Yaeger-Dror, 119–130. London: Routledge.
- Yuan, Jiahong, and Mark Liberman. 2008. Speaker identification on the SCOTUS corpus. In *Proceedings of Acoustics 2008*.

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