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A quantitative study of reduction in English and Polish

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Introduction

1.1. background

to advance our understanding of consonantal reduction and its frequency of occurrence (reduction rate) in selected dialects of English and Polish

to make a step towards a theoretical modelling of reduction processes by challenging their traditional descriptions



Explaining reduction

- *Reduction*: not a very fortunate term
- many synonyms in the literature: *deletion* (consonants), *elision* (vowels), *lenition* (consonants by means of weakening, interchangeable with *fricativization* for stops)
- *Reduction* entails both a categorical process of reduction to zero (complete in the sense of elision) and gradient (e.g. reduction of a vowel to schwa or a consonant cluster in number of consonants) (Trask 1996, Bussmann 1996 and Carr 2008)
- Since the study investigates /w/ deletion and consonant cluster, we adopted the term umbrella *reduction* to cover the process of complete deletion of /w/ and simplification of a consonantal cluster for want of a better term.



Introduction

1.1. background

studies on consonant reduction address t/d deletion in isolation (e.g. Neu 1980, Zimmerer et al. 2014) at the expense of other reduction processes

“there is little or no lenition of the type stop → fricative” (Lodge 1984: 89)

“this process [t deletion] is quite frequent in connected speech” (Shockey 1974: 36)



Introduction

1.2. aims

Aim 1: to provide statistics on the frequency of occurrence of reduction processes by providing reduction rate (Lodge 1984 or Shockey 1974, 2003)

Aim 2: to establish a correlation between vowel and consonant reduction



Introduction

1.2. Aim and hypothesis

We hypothesize that weak consonant reduction may compensate strong vowel reduction as a trade-off strategy, preserving the phonetic form of a reduced word



Introduction

1.3. Terminology

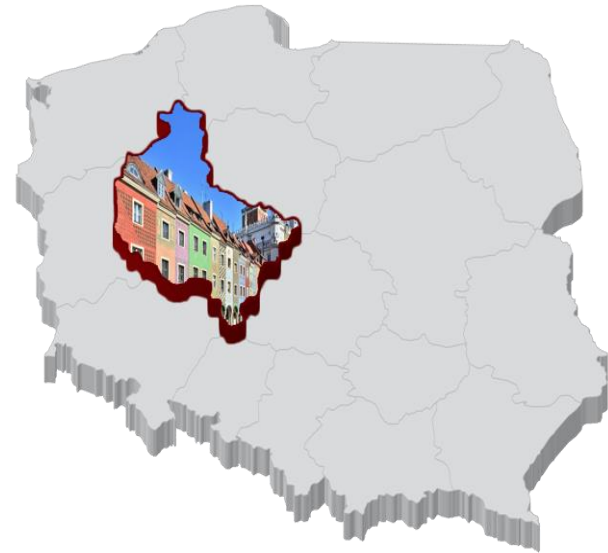
potential against **reduced**

potential: all the possible contexts in which a process may occur (transcript)

reduced: auditory (the speech signal)

1.4. scope

two typologically unrelated languages:
Lancashire and Greater Poland dialects





Introduction

1.4. scope

Reduction processes for English:

- /t, d, h/ deletion
- assimilation of place
- yod coalescence

Reduction processes for Polish:

- intervocalic /w/ deletion
- assimilation of manner
- consonant cluster reduction



Introduction

To sum up:

We counted how often speakers use reduction in comparison with every single potential context for reduction (reduction rate)

We then attempted to correlate reduction of consonants with reduction of vowels.



Introduction

- we measured vowel reduction for the same speakers (as Euclidean distance)
- Vowel reduction is presented as spatial and temporal.



Methodology: corpora and speakers

- A corpus-based study: PAC for Lancashire and Corpus of Modern Spoken Polish in the area of Greater Poland
- 9 speakers of English (female)
- 9 speakers of Polish (4 female and 5 male)



The PAC corpus

- PAC, Phonologie de l'Anglais Contemporain, (Durand and Pukli 2004)
- contains recordings of 9 female speakers of Lancashire
- collected between 2001-2002
- PAC's structure : a list of words, a read passage, formal and informal interview.
- The difference between the two types of interview is only nominal, both were loosely structured and conducted in an informal setting, at informants' homes or workplaces.

The Polish Corpus

- the Corpus of Modern Spoken Polish in the area of Greater Poland
- Research project funded by the Ministry of Science and Higher Education
- 0113/NPRH2/H11/81/2013
- duration: 2013-2016



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The Polish corpus : speakers

- 75-100 speakers
- 50 speakers of standard Polish
- 25 speakers of the Greater Poland vernacular






The Polish corpus: format

- 2+2 interview format
 - 2 interviewers
 - 2 interviewees
- speakers know each other



The Polish Corpus: format

- reading keywords embedded in a carrier phrase (soundproof lab) 
- an informal 40-minute conversation (friendly environment, quiet room at university or in a workplace)
- topics:
 - studies / work
 - living in Poznań
 - culture and entertainment in Poznań 
 - the Internet 
- metadata questionnaire: background information about subjects



Methodology: materials

- English: 4 hs 28 mins, 7264 tokens (both formal and informal interviews)
- Polish: 1 hs 15 mins (pairs of speakers), 789 tokens (research in progress)
- Fieldworker's speech subtracted
- Regardless of the duration of recordings, we compare reduction rate.

marking the orthographic transcripts for potential occurrences of reduction and comparing them with the reduced realization from the recording

PZ: A czy Pamu Panu pomaga ta zna ten kontakt, który Pan miał z rosyjskim jednak, pomaga Panu teraz na starcie studiów?

M33: Tak. Póki co **wszystko** zaliczam, no i jest mi łatwiej pisać cyrylicą, czytać **wszystko** no i jednak widzę tam różnice pomiędzy mną a ludźmi, którzy pierwszy raz mają styczność, ponieważ no czytam płynnie i piszę też szybciej, chociaż już niektórzy [MK: Doganiają.] no coraz szy no doganiają doganiają mnie.

PZ: Mhm. Dobrze. A dla Pani jaka jest największa trudność w r w języku rosyjskim? Czy wszystko idzie gładko i przyjemnie czy...?

M32: Nie no trudności są na pewno. Nie no na pewno jest najtrudniej szybko przeczytać tekst, no bo wymagają teraz już nauczyciele naprawdę szybkiego czytania, już jesteśmy trochę wprawieni w tym, ale jednak no czasami te trzeba się zastanowić nad literką, jednak czy to będzie to czy nie, tak w ten sposób.

MK: Czyli alfabet?

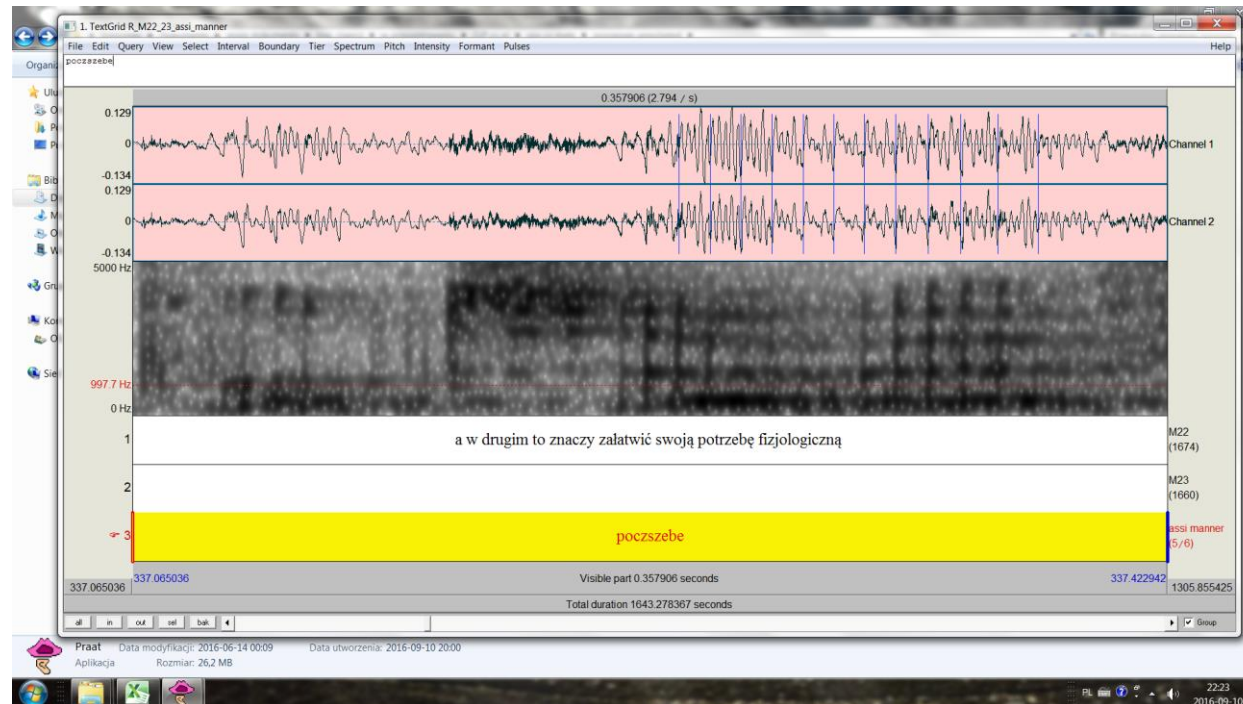
M32: No **znaczy** się pisać to to okej, to mi nie sprawia trudności w ogóle, tak że pisanie okej, ale no czytanie już gorzej.

MK: A proszę powiedzieć po rosyjsku: Dzisiaj jest pochmurna pogoda.

Method

Auditory and acoustic analysis

e.g. M 22 Assimilation of manner *poczszębe* no burst for /t/ visible nor the VOT



Reduction processes for English:

/t, d, h/ deletion








Assimilation of place



Yod coalescence



Reduction processes for Polish:

- intervocalic /w/ deletion *miałem* 'I had'  
- assimilation of manner [t+ʃ becomes an affricate];
potrzebę 'need', *trzeci* 'the third'  
- consonant cluster reduction (CCR)* 
*tak że je**st** fajnie, jes(**t**) blisko* 'so it's cool, it's close'

* We analyzed only frequently reduced clusters (Madelska 2005).

Method

High frequency words were selected from the transcripts of 9 Polish speakers (around 9,000 words)

word	rank	expected cluster reduction
jest	200	/st/ → /t/
właśnie	75	/vw/ → /v/
znaczy	35	/zn/ → /n/
mnie	27	/mj/ → /j/
tylko	22	/lk/ → /k/
wszys-cy, tko, kie, tkimi	15	/fj/ → /j/ and /stk/ → /sk/
przykład	14	/kw/ → /k/
pierw-szy, szym, szego	15	/rfj/ → /rfj/
trzeba	13	/t + ʃ/--/ tʃ/
któr-e	8	/kt/ → /t/
którzy	6	
która, którąś	2	



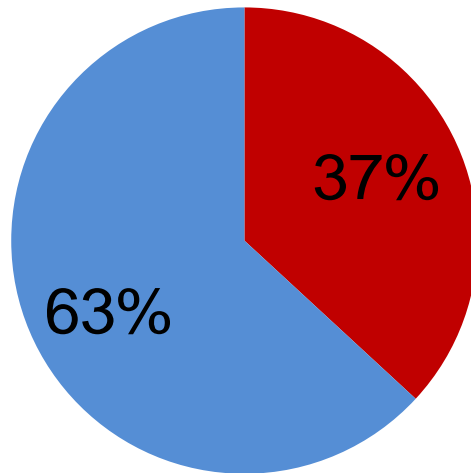
Results



Results for aim 1

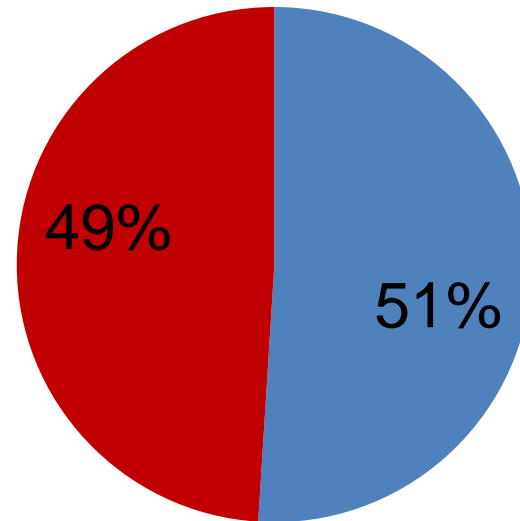
global results (all processes together)

English



■ reduced
■ potential

Polish



■ potential
■ reduced



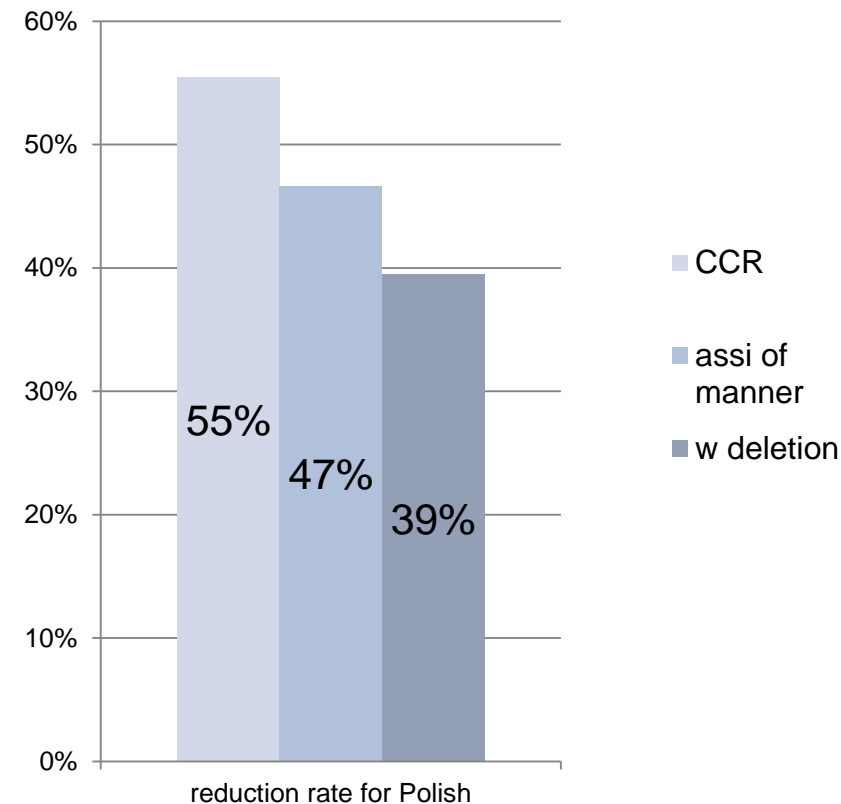
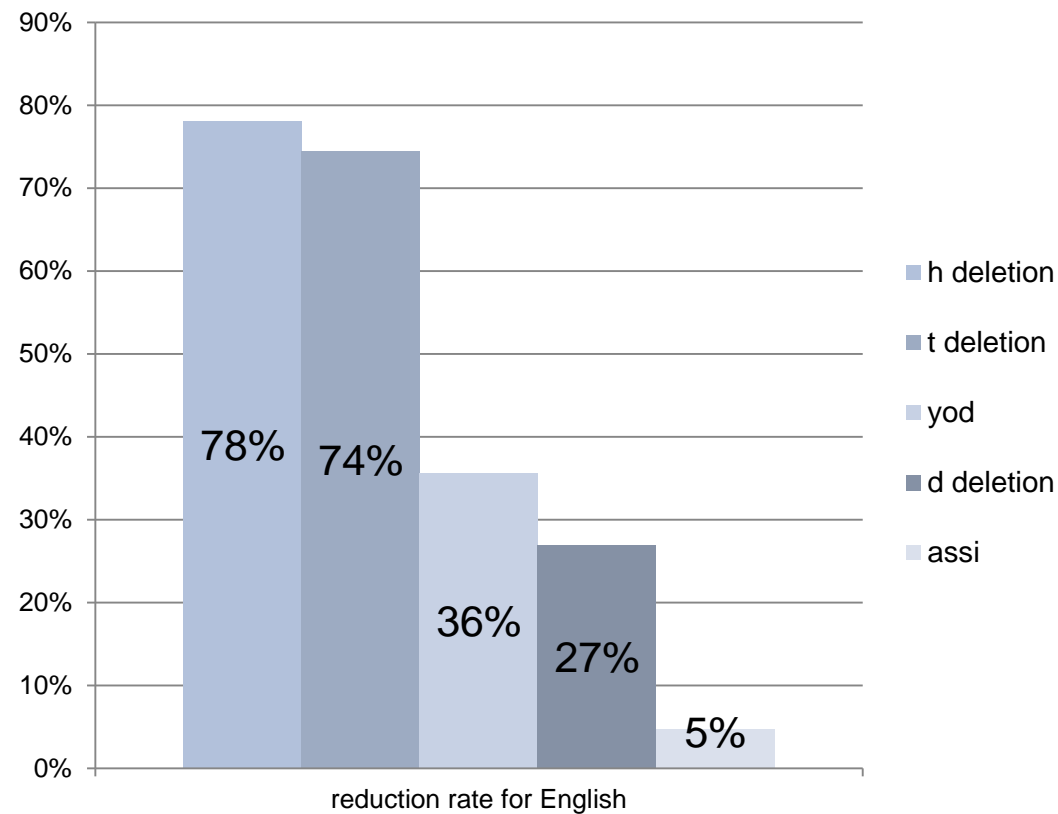
Results for aim 1

English: 37 per cent of potential tokens exhibited reduction

Polish: 49 per cent did so
(BUT only high-frequency cluster reduction)

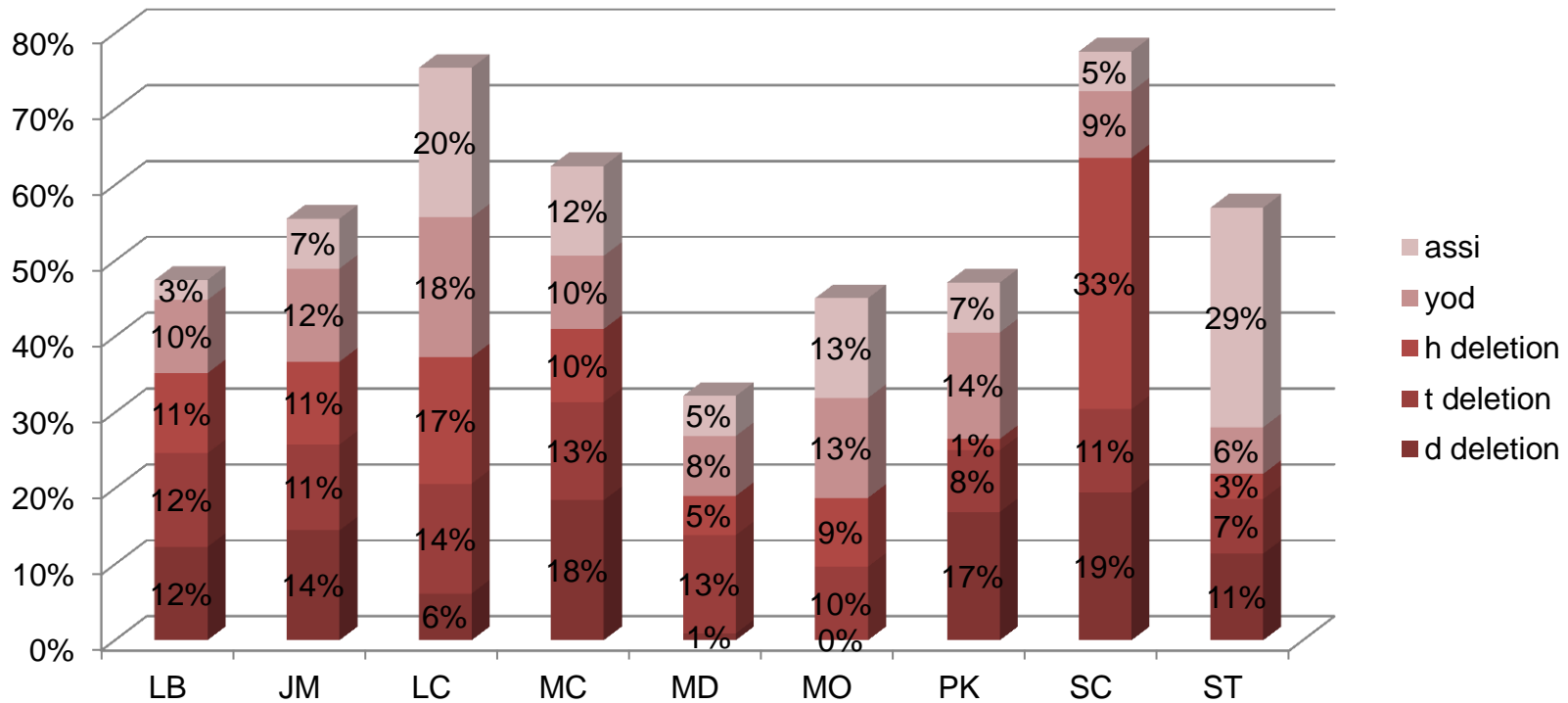
Results for aim 1

- Reduction rate for individual processes



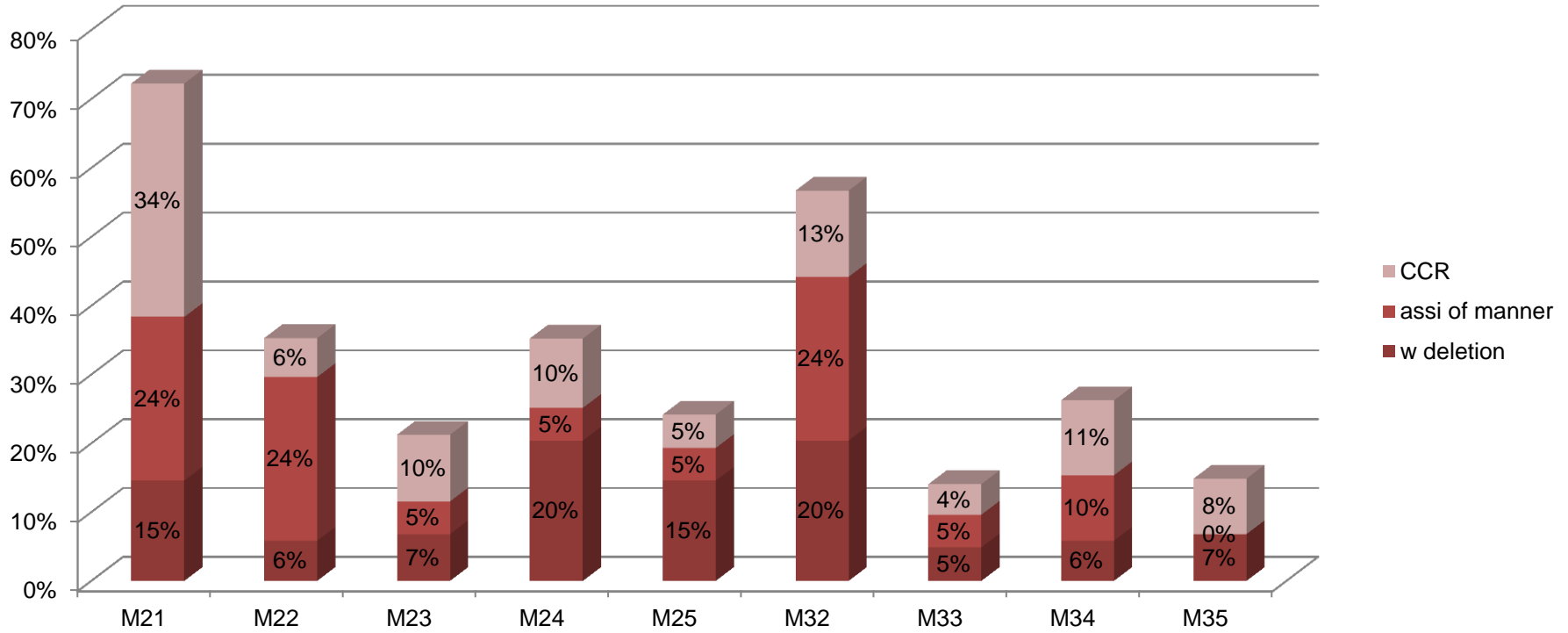
Results for aim 1 (English)

- Interspeaker variability



Results for aim 1 (Polish)

- Interspeaker variability



Results for aim 1

- Speakers of both languages seem to vary greatly for their reduction rates across reduction processes
- It seems that certain reduction processes are favoured over others.



Results for aim 2

Hypothesis: weak consonant reduction may compensate strong vowel reduction as a trade-off strategy, preserving the phonetic form of a reduced word.

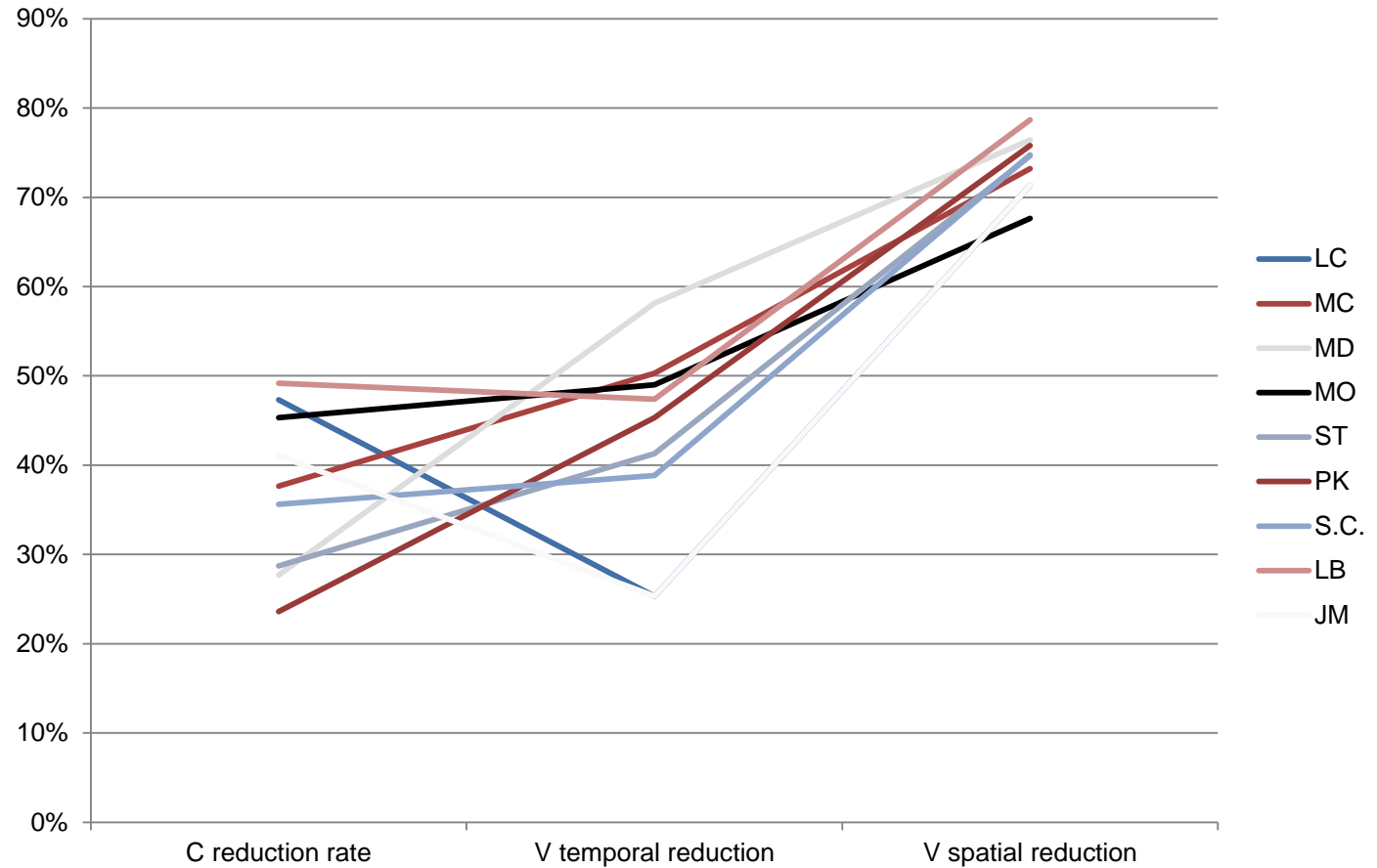
If the hypothesis is correct, high reduction rate for consonants involves low rate of vowel reduction and vice versa.

Results for aim 2 (English)

6 speakers out of 9 have this tendency with respect to **temporal** reduction and **all** of them with respect to **spatial** reduction

	V temporal reduction	V spatial reduction	C reduction rate	V to C temporal (trend)	V to C spatial (trend)
LC	25%	71%	47%	increases	decreases
MC	50%	73%	38%	decreases	decreases
MD	58%	76%	28%	decreases	decreases
MO	49%	68%	45%	same	decreases
ST	41%	75%	29%	decreases	decreases
PK	45%	76%	24%	decreases	decreases
SC	39%	75%	36%	same	decreases
LB	47%	79%	49%	same	decreases
JM	25%	71%	41%	increases	decreases

Results for aim 2 (English)



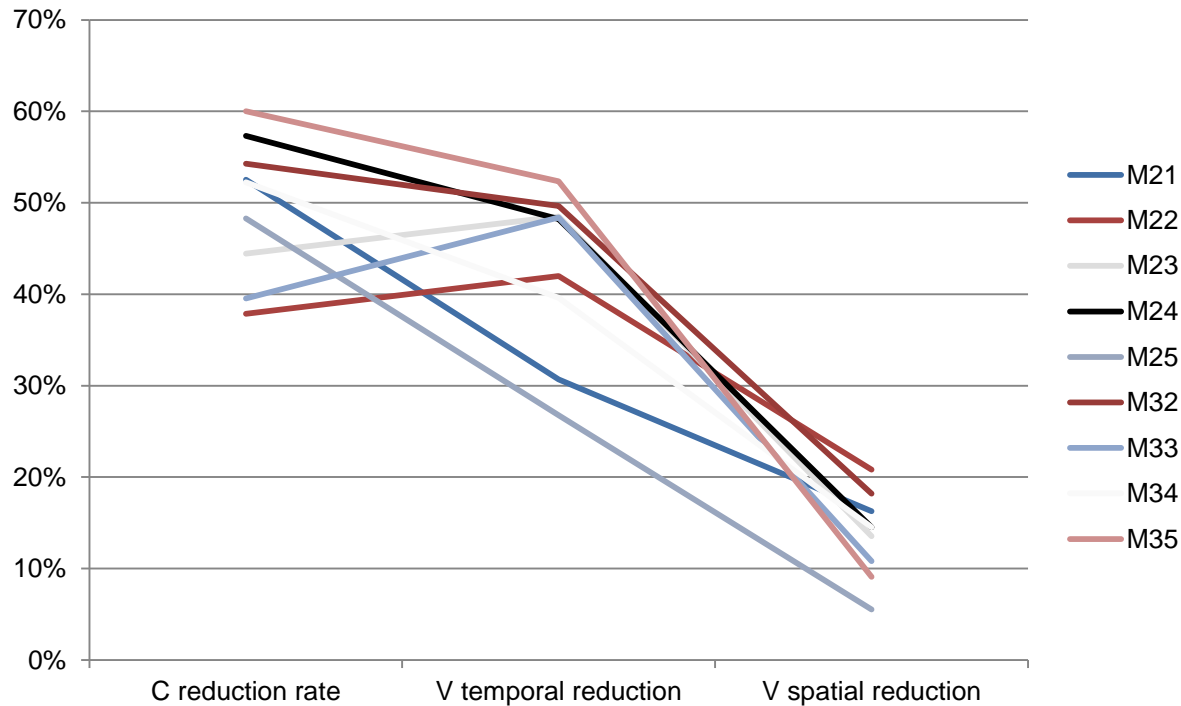
Results for aim 2 (Polish)

- 6 speakers out of 9 have this tendency with respect to **temporal** reduction and **all** of them with respect to **spatial** reduction

Polish	V temporal reduction	V spatial reduction	C reduction rate	V to C temporal (trend)	V to C spatial (trend)
M21	31%	16%	53%	increases	increases
M22	42%	21%	38%	same	increases
M23	48%	14%	44%	same	increases
M24	48%	15%	57%	increases	increases
M25	27%	6%	48%	increases	increases
M32	50%	18%	54%	same	increases
M33	48%	11%	40%	decreases	increases
M34	40%	15%	52%	increases	increases
M35	52%	9%	60%	increases	increases

Results for aim 2 (Polish)

Speakers who demonstrate high rate of consonant reduction have low rate of vowel reduction.





Results for aim 2

- We think that the compensation hypothesis (low rate of consonant reduction entails high rate of vowel reduction) works for most Polish and English speakers.
- Speakers seem to strike a balance between C and V reduction.



Discussion of reduction rate

- Overall reduction rate (37 and 49 per cent respectively) is fairly high in both languages.
- Reduction rate for individual processes is varied, e.g. the reduction rate for place assimilation in English is surprisingly low in comparison to t/d deletion.
- CCR rate in Polish is cluster-sensitive, e.g. anecdotal /fʃ/ vs actual reduction of /stk/ .



Discussion of compensation hypothesis

- Both English and Polish speakers tend to manifest a **trade-off** in vocalic and consonantal reduction.
- The trade-off may be **complete** (both temporal and spatial vowel reduction is inversely related to consonant reduction) or **partial** (either temporal or spatial vowel reduction is inversely related to consonant reduction).



Conclusion

Reduction rate amounts to 37 per cent in English, 49 per cent in Polish, being more varied across processes.

Compensation theory seems worth further investigation.



Limitations of the study

- Polish: CCR measured only within high frequency words, not all potential clusters
- A limited number of speakers and tokens, making the results preliminary
- More research needed; right now, we just point to certain directions rather than discuss definite conclusions



Novel contribution

- Consonant reduction rate has been established against a corpus-based study.
- Traditional descriptions, assumptions and anecdotal evidence has been verified.



Future studies

- A mixed-effects model to test the link between reduction and its variables such as phonetic context, neighborhood density, function vs. grammar word, stress etc.
 - perception of reduced forms by native and non-native speakers (e-prime)
-



Thank you

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