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English interdental fricatives in the speech of Polish learners of English*

1. Motivation

Incorrect rendering of the interdental¹ fricatives /θ, ð/ is one of the most persistent errors made by Polish learners of English whose eradication invites a challenge on the side of both teachers and learners.² In order to work out an effective technique of teaching this aspect of English pronunciation, one should examine the articulatory and perceptual mechanisms underlying the substitution of /θ, ð/ by Poles. It has been pointed out in literature, and noted by the present authors in their teaching practice, that /θ, ð/ are substituted by more than one Polish phoneme; typical replacements may involve 11 possible realizations: 10 monophonemic (dental /t, d/, labio-dental /f, v/, (post)dental /s, z/ and /ts, dz/ and (post)alveolar /č, dž/), and one polyphonemic /tx/. Despite the persistence and wide awareness of the problem, it has not been given sufficient attention in the literature whether the replacements are in any way systematic, i.e. whether the Polish learners of English choose specific replacements for specific positions in the word or specific environmental contexts. It has been our intention to find out if the choices made by Poles are systematic and, if so, what is their conditioning.

2. Articulatory and acoustic properties of /θ, ð/

Let us first review briefly the literature of the subject. According to Gimson (2001) the fricatives should be articulated in the following way: “*The soft palate being raised and the nasal resonator shut off, the tip and rims of the tongue make a light contact with the edge and inner surface of the upper incisors and a firmer contact with the upper side teeth, so that the air escaping between the forward surface of the tongue and the incisors causes friction. With*

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¹ Most sources describe /θ, ð/ as ‘dental’ (e.g: Gimson 2001:183; Gussenhoven and Broeders, 1981) or ‘apico-dental’ (Catford, 1985:85). Gimson (2001:184) notes that “with some speakers, the tongue tip may protrude between the teeth” but he further restricts its occurrence, rather unjustifiably, as predominant in American accent. Yet, in contrastive English-Polish phonetics, the use of the term ‘interdental’ for /θ, ð/ and ‘dental’ for the Polish /s, z/ facilitates reference.

² This error is mentioned as particularly persistent in Gonet (1982:308).

some speakers, the tongue-tip may protrude through the teeth. For /θ/ the friction is voiceless, whereas for /ð/ there may be some vocal cord vibration according to its situation. The lip position will depend upon the adjacent vowel” (pp. 183-184). Gimson emphasizes that “...the difficulty of /θ/ and /ð/ lies not so much in their articulation, which most learners can perform correctly in isolation, as in their combination with other fricatives, especially /s/ and /z/ (p. 185).

In actual fact, the range of suggested replacements concerning the coronal substitutes is a gross simplification because both the native articulations and foreign replacements involve an infinite number of gradients that spread between a truly interdental fricative with the tongue protruding 2,5 mm. between the teeth, and articulations in which the tongue remains behind the upper incisors, all this being subject to intra- and inter-speaker variability, also related to speech tempo and register.³ Hence the terminological inconsistency between ‘dental’ and ‘interdental’ fricative that we propose to resolve in favour of the latter by virtue of it referring to the more extreme articulatory variant.

Jassem (1971) defines the interdental fricative as follows: “*The consonant /θ/ is a fricative pronounced with a central air stream, fortis and voiceless. Non-strident hiss is produced between the rim of the tongue and the back wall of the upper incisors; hence its classification as ‘dental’.*”⁴ Jassem is aware of the difficulties this sound may cause for Poles: “*Many Poles learning English find this sound extremely difficult. It is frequently replaced by Polish /s/ or /ts/. Both these errors are very striking. (...) One should also emphasize the similarity of the Polish /t/ and the English /θ/*” (p. 206). The articulation of /ð/ is defined similarly: “*As /θ/ is similar to Polish /t/, /ð/ resembles the articulation of the Polish /d/, the basic difference lying in that the articulation of the English sound, the front rim of the tongue does not come in contact with the incisors, but is placed close to them. Perceptually, /ð/ resembles /v/, and /θ/ is similar to /ʃ/. One should take care not to use another pair of similar Polish consonants, i.e. /s/ or /z/*” (p. 210).

Thus Jassem (1971) indicates that there are two planes that are relevant in the Polish speaker’s impression of similarity. The first is articulation, in which /θ/ and /ð/ are similar to Polish /t/ and /d/, the only difference being that the blade of the tongue approximates with the upper incisors in the former, and makes a closure with them in the latter. The other plane of

³ Cf. Gonet and Pietron (in preparation) *The gradient nature of coronal articulations. An electropalatographic study.*

⁴ This and the subsequent excerpts from Jassem (1971), originally in Polish, have been translated by the authors.

similarity is perception, in which the English /θ/ and /ð/ are similar to the Polish /f/ and /v/. The strident hiss associated with /s/ and /z/ is regarded to be too strong to consider them as possible replacements.

The importance of correct articulation of /θ/ and /ð/ for an approving impression of Englishmen was acknowledged in a number of experimental studies. In Gonet and Pietroń (2004), the incorrect implementation of the interdentalals was confirmed as one of the major violations of English pronunciation. A similar observation was made in Szpyra-Kozłowska (2004) with regard to both esthetics and intelligibility. For Scheuer (2000), the incorrect articulation of interdentalals was striking to Polish teachers of English, whereas it did not matter much for the native speakers; possible explanation of that may be due to ‘th-fronting’, a spreading feature of Estuary pronunciation (Przedlacka, 2002; Matusik, 2004). The sounds in question also present difficulties for learners of English with native tongues other than Polish. For instance, Dutch learners of English very often replace /θ/ with /s/ or even /t/, /ð/ with /d/ and /z/ (Gussenhoven and Broeders, 1981:85). German learners also have problems with the articulation of /θ, ð/ and most often replace them with /s, z/: *“Im Deutschen, sind sie nicht vorhanden. Die im Deutschen am weisten vorn in der Mund mit Hilfe der Zunge gebildeten Reibleute sind [s, z].* (Schrerer and Wollman (1972:95), cf. also Arnold and Hansen, 1982).

In acoustic terms, /θ, ð/ are characterized by the presence of the noise component – alone for /θ/, and superimposed on the quasi-periodic vibration for /ð/ (Fig. 1).

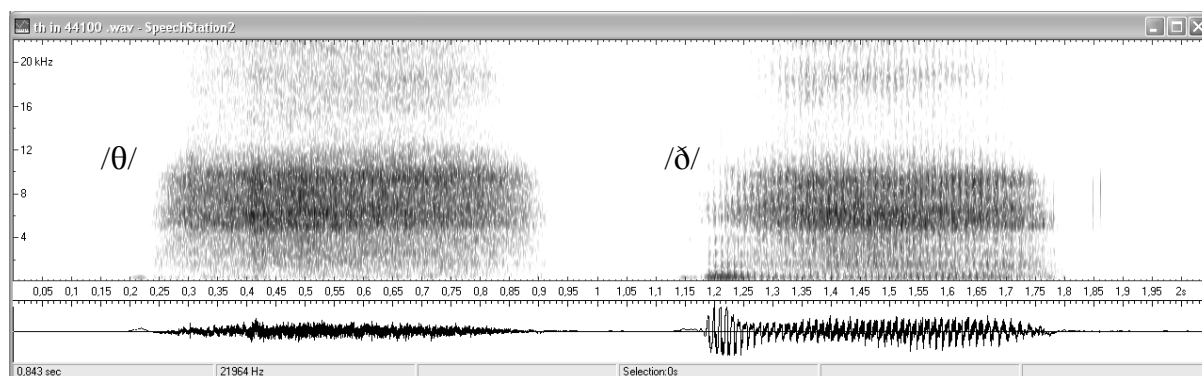


Figure 1. Spectrograms of /θ/ and /ð/

The higher amplitude of noise (30-40 dB) extends between 4 and 9 kHz, cf. Fig. 2:

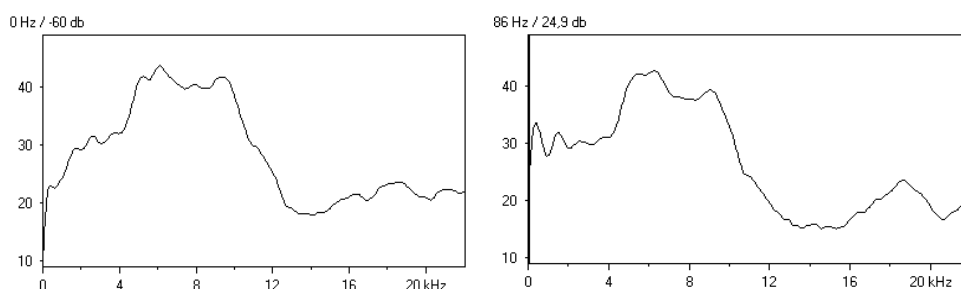


Figure 2. Average spectra of /θ/ (left) and /ð/ (right)

3. Experimental procedure

The study of the substitutions of {th}⁵ by Polish learners of English was carried out as an experimental project based on recordings. The recording material used in the present experiment consisted of 80 words and phrases where {th} occurred in different contextual positions. The choice of words was dictated by their frequency of occurrence; only such words were selected which occur in common secondary school textbooks, cf. Table 1. The designations ‘Initial’ and ‘Final’ in Table 1 refer to absolute initial and final positions in an utterance (hence the definition of context with reference to ‘silence’), which coincides with the position in the word, while the designation ‘Medial’ stands for ‘utterance medial’, rather than ‘word-medial’ occurrence of the fricative. Measures had to be taken to secure an orthogonal design of the contingency table in which there is the same number of voiceless and voiced fricatives. The difficulties implied above sprang from a defective distribution of the voiced vs. voiceless fricatives with regard to clustering possibilities in certain word positions. Thus the context specifications for /θ/ do not mirror those for /ð/, and the smaller number of contexts for /ð/ resulting from missing mirror context lines was augmented by adding material with repetition of words in other contexts. For instance, although both /θ/ (line 1) and /ð/ (line 9) occur word-initially, /ð/ cannot occur as the first element of a word-initial cluster such as /θr/ (line 2), which lends line 10 empty. Similarly, of the two word-final contexts of /θ/ (lines 7 and 8), only line 7 (after a vowel before silence) is mirrored by line 16 (*wreath, with, clothe, etc.*), which forces one to add one more context line for /ð/. This explains the existence of two lines (13 and 14) with the same context (after a homorganic consonant before a vowel), and an additional line with non-homorganic clusters across word boundary.

⁵ Braces ‘{ }’ denote spelling.

VOICELESS	1	Initial	after silence	before vowel	thank	thief	think	third	thought
	2		after silence	before cons.	throw	three	throat	threw	thrill
	3		after vowel	before vowel	everything	sympathy	anything	nothing	she thinks
	4	Medial	after vowel	before cons.	faithful	maths	worth listening	both Peter	faith for
	5		after cons.	before vowel	bad thought	great thief	mad Thursday	wet thaw	make theatre
	6		after cons.	before cons.	bad thrill	great three	wet throat	lead through	sick throbb
	7	Final	after vowel	before silence	growth	bath	death	breath	both
	8		after cons	before silence	health	strength	length	tenth	wealth
VOICED	9	Initial	after silence	before vowel	this	these	that	those	than
	10		after vowel	before vowel	gather	father	mother	brother	weather
	11		after vowel	before cons.	with me	clothes	with love	breathe by	with Peter
	12	Medial	after glide	before vowel	so this	oh though	so these	oh that	may those
	13		after hom.c	before vowel	on them	widen this	on the	at the	in those
	14		after hom.c.	before vowel	but this	not these	in them	broaden them	tell them
	15		after n/h c.	before vowel	take that	make this	sing that	take this	of these
	16	Final	after vowel	before silence	with	wreath	clothe	breathe	loathe

Table 1. The contingency table used for ordering the material

For use in the recording session, the items were randomized and presented to 14 intermediate students of English. After a short period of time used by the subjects to get acquainted with the words, they were asked to read them in portions. The utterances were recorded with a stereo SONY ECM-MS907 microphone connected to a SONY MZ-R700PC minidisk. The recording session was conducted in a secondary school in Lublin (VII Liceum Ogólnokształcące im. Marii Konopnickiej) during regular English lessons taught by one of the authors. The subjects were 17-year-old second-grade students who constituted a relatively homogenous sample of intermediate learners of English who have four English lessons a week. The final material consisted of 80 words recorded by 14 subjects, which yielded 1120 occurrences of /θ/ or /ð/.

4. Analysis

The first attempt to identify the substitutions was made by the authors. However, it was not always easy to recognize by auditory inspection what sound was used as a substitute, especially when /f, v/ were used. It would have been quite uneconomical to refer to spectrographic analysis of each of the 1120 tokens, especially that an initial acoustic scrutiny was not always helpful, either. Therefore, a panel consisting of 2 expert teachers and 5 graduate students of English was employed to identify the realizations of /θ/ and /ð/. The experts were provided with a questionnaire in the form of a table in which 80 lines stood for each word containing the sound studied, and 11 columns, for the potential substitutes. The questionnaire table contained thus 880 slots for each speaker, and the perceived choices were

tacked in appropriate slots. The matrix for all 14 speakers contained 12320 slots, and the overall matrix on which all experts' judgements were plotted was made up of 86240. The experts' scores were then summed in for each of the 12320 choices. This figure indicates that the results of the present study are highly reliable.

Ideally, for a univocal expert judgement, the score for a substitute was 7 'points' placed in one slot. The experts' judgements were quite uniform, as 39% of the judgements were quite univocal (7, 6, and 5 points for a word).

Let us now analyze the details of the substitutions. The distribution plot in Fig. 3 presents the relative frequency of different realizations of the fricatives:

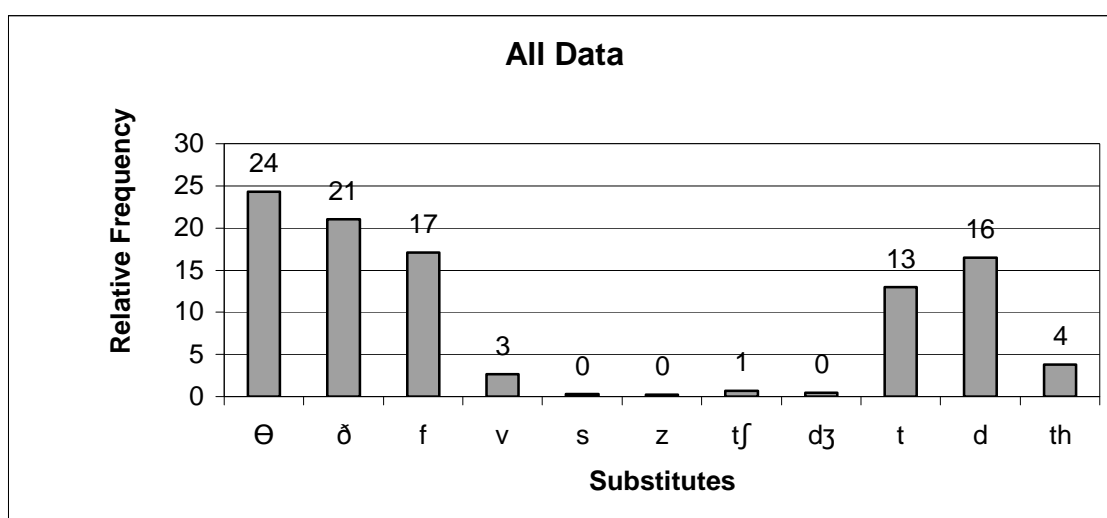


Figure 3. Relative involvement of each realization of /θ/ and /ð/ in all studied words⁶

The histogram in Fig. 3 allows to draw the following generalizations:

1. Most frequent (45%) were the correct realizations, in which the voiceless fricative seems slightly easier to pronounce (24%) than its voiced counterpart (21%).
2. This 3% difference appears to be reflected in the frequency of substitutions by the plosive: /t/ is less frequent by 3% than /d/.
3. When viewed against the frequency of the replacements by the labio-dental fricative, /f/ is used far more often (in 17% of the data) than /v/ (only 3% of the data).
4. /θ/ is more often replaced by /f/ than by /t/
5. /ð/ is more often replaced by /d/ than by /v/.
6. Replacements by other sounds (/s, z, tʃ, dʒ/) are negligible (less than 1%), and there is a small percentage of spelling pronunciations /th/.

⁶ /ts/ and /dz/ are omitted because they have not been encountered in the material studied

The overall picture of replacements based on expert scores for 16 context classes captioned by representative words in the legend for each of the 11 potential substitutes (176 data points) at first sight looks difficult to disentangle; cf. Fig. 4:

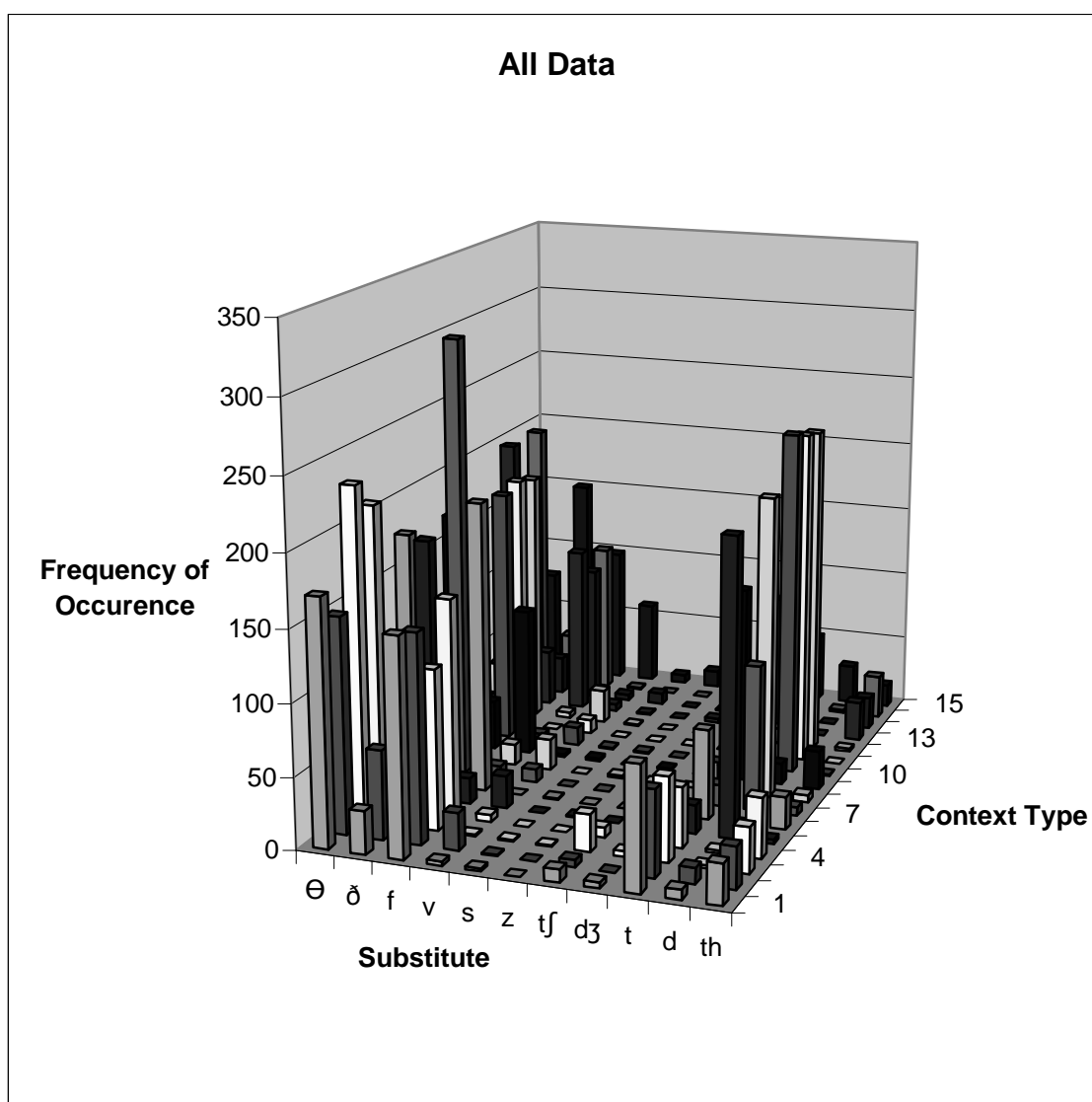


Figure 4. Overall sum of scores of each substitute in every context class; the values on the ordinate represent the sum of experts' judgements for {th} in a given context class: 1 growth; 2 with; 3 health; 4 thank; 5 this; 6 everything; 7 gather; 8 so this; 9 bad thought; 10 but this; 11 on them; 12 take that; 13 throw; 14 faithful; 15 bad thrill; 16 with me.

4.1. The effect of voicing

The distribution in Fig. 4 can be disentangled if the data are sorted by voicing; this is shown on the subsequent illustrations on which a more coherent image emerges. Let us first view the image presenting the substitutions of the voiced fricative:

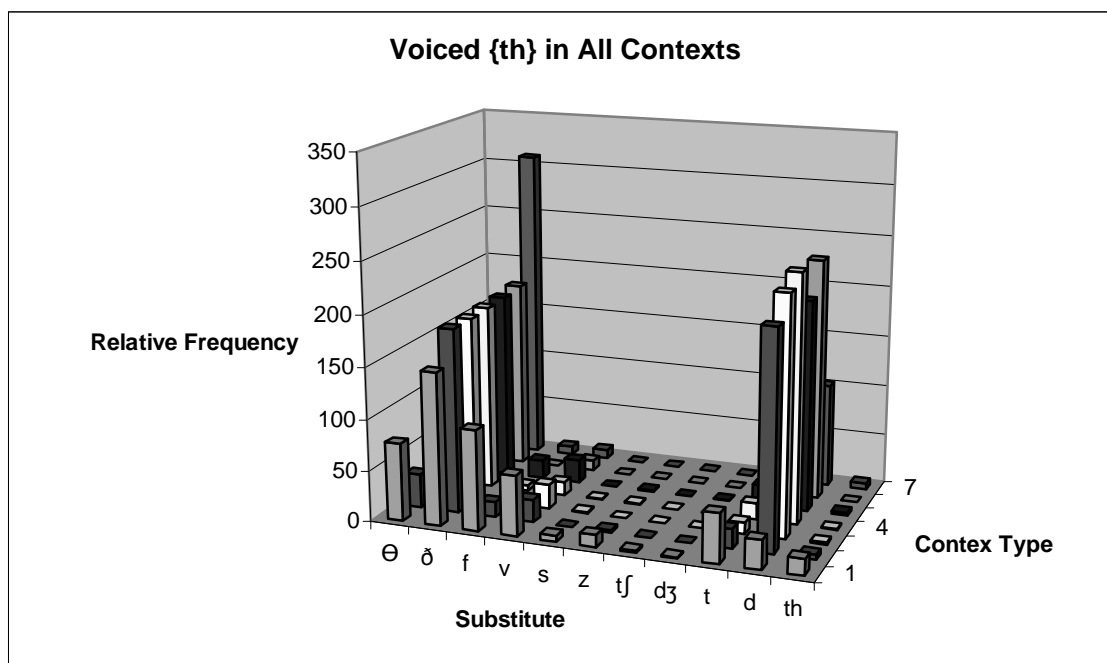


Figure 5. Sums of expert scores for each substitute in 7 context types of /ð/ (the word final /ð/, by virtue of the devoicing of most of the tokens is included amongst /θ/). Legend of Context Types: 1 with me; 2 so this; 3 take that; 4 but this; 5 this; 6 on them; 7 gather.

One can see in the illustration above that the substitute labeled /d/ much higher frequency than any other. This means that /ð/ is replaced predominantly by /d/; the relative participation of each possible realization, averaged across the contexts, is shown in Fig. 6:

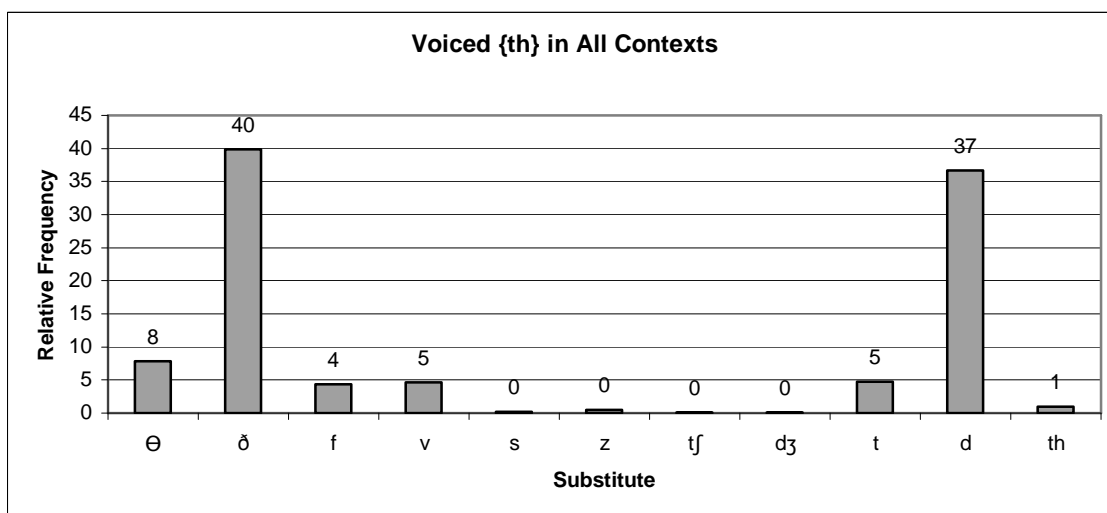


Figure 6. Distribution of realizations of the voiced interdental fricatives

When the four negligible substitutes /s, z, tʃ, dʒ/ are omitted, a clear picture emerges in Fig. 7, showing the predominance of replacements of /ð/ by /d/:

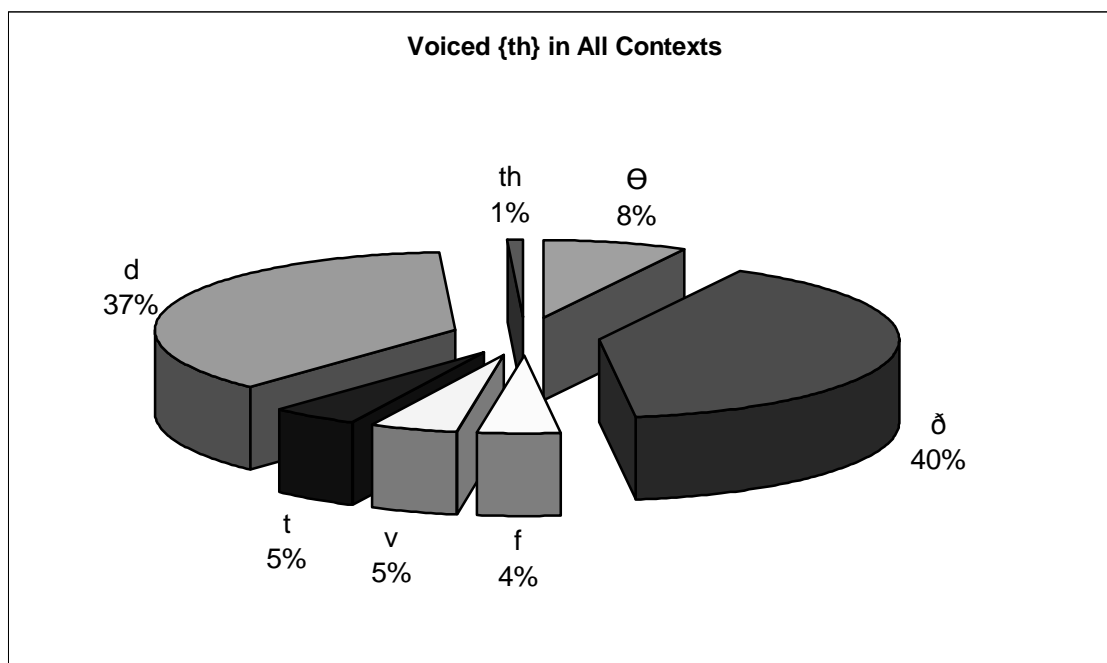


Figure 7. Relative involvement of more frequent realizations of /ð/⁷

Let us now view, in Fig. 8, the realizations of the voiceless fricative, the devoiced word-final /θ/ being included here as well:

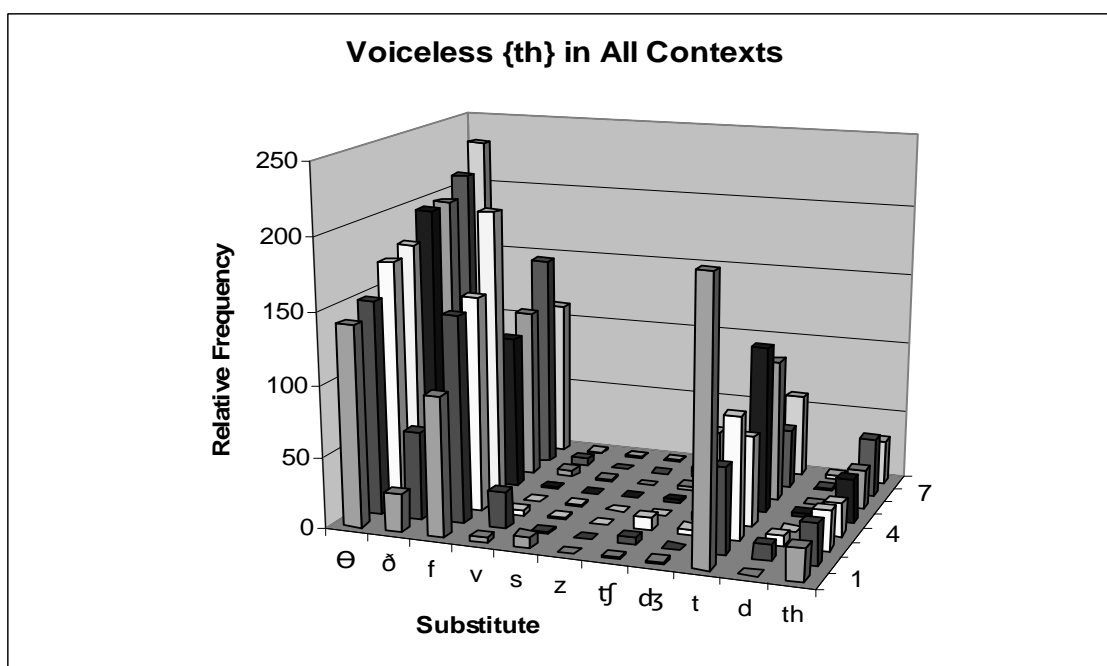


Figure 8. Sums of expert scores for each substitute in 8 context types of /θ/: 1 growth; 2 with; 3 health; 4 thank; 5 everything; 6 throw; 7 faithful; 8 bad thrill

As can be seen in Fig. 8, the distribution of the realizations of the voiceless interdental fricative is more complex than that of /ð/, in that /θ/ is replaced both by /f/ and, less frequently, by /t/,

⁷ The negligible substitutions by /s, z, tʃ, dʒ/ have been omitted in this and the subsequent illustrations.

with a regular pattern of possible infrequent substitutions by /th/; let us now view the relative participation of each realization averaged across the context types (Fig. 9):

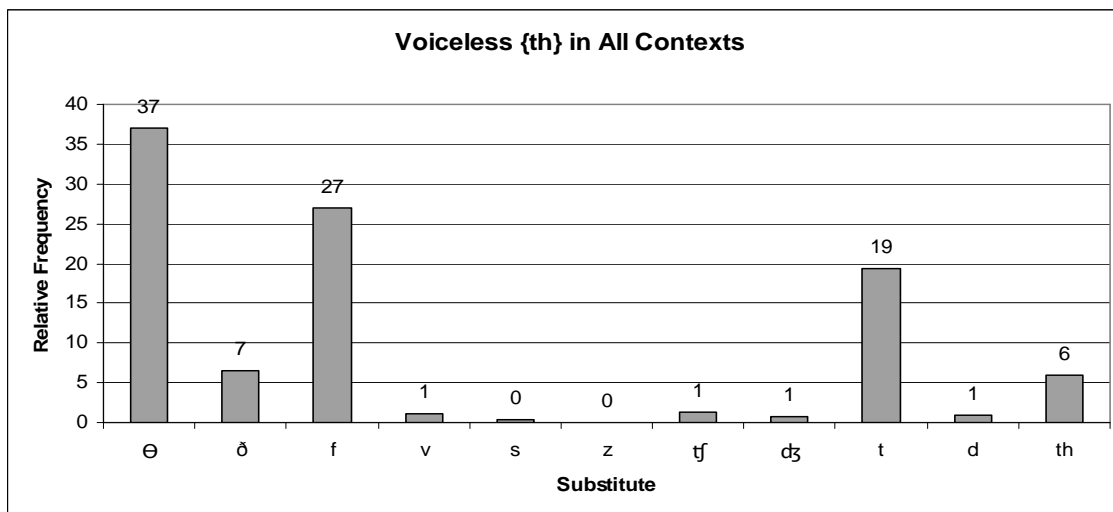


Figure 9. Relative involvement of realizations of the voiced interdental fricative

It is now easy to see that /θ/ is most often replaced by /f/ (27%) and less so by /t/ (19%). Yet, to clarify the distribution further, let us separate in Fig. 10 and 11 the contexts in which each of these two substitutions is more frequent. Thus, when /θ/ occurs word-finally (growth, with), if it stands before a vowel (thank, everything) or if it occurs in a cluster with a sonorant (health), more frequent is the substitution by /f/ (32%) than by /t/ (13%):

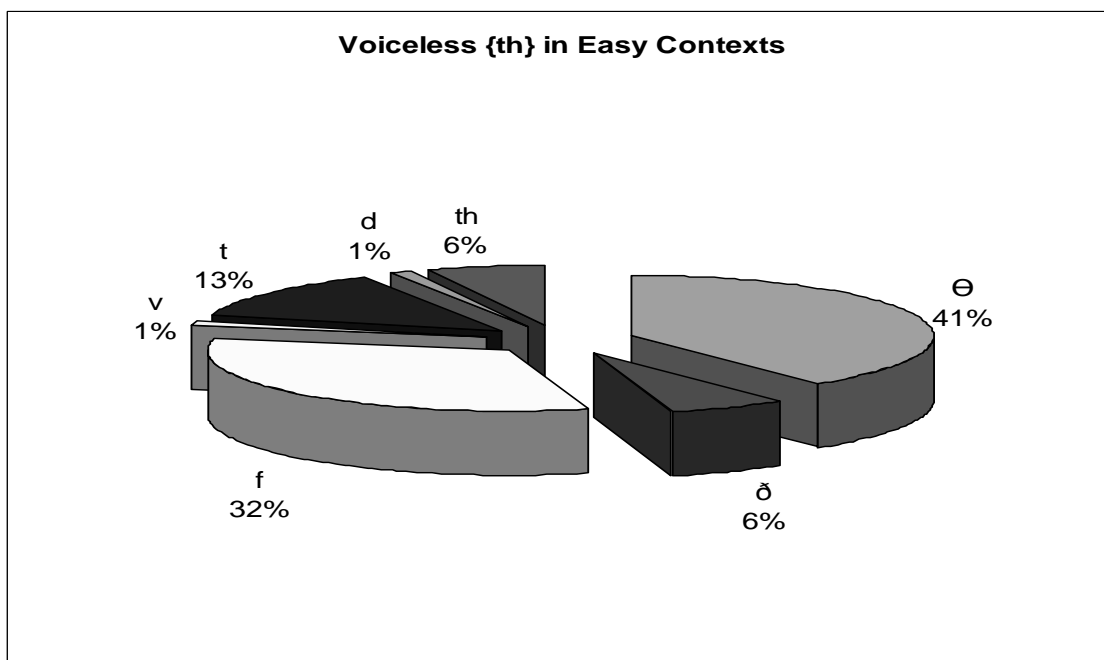


Figure 10. Relative involvement of realizations of /θ/ in easy contexts

In clusters that are more difficult to pronounce (*throw, faithful, bad thrill*), /θ/ is more frequently replaced by /t/ (28%) than by /f/ (22%); cf. Fig. 11:

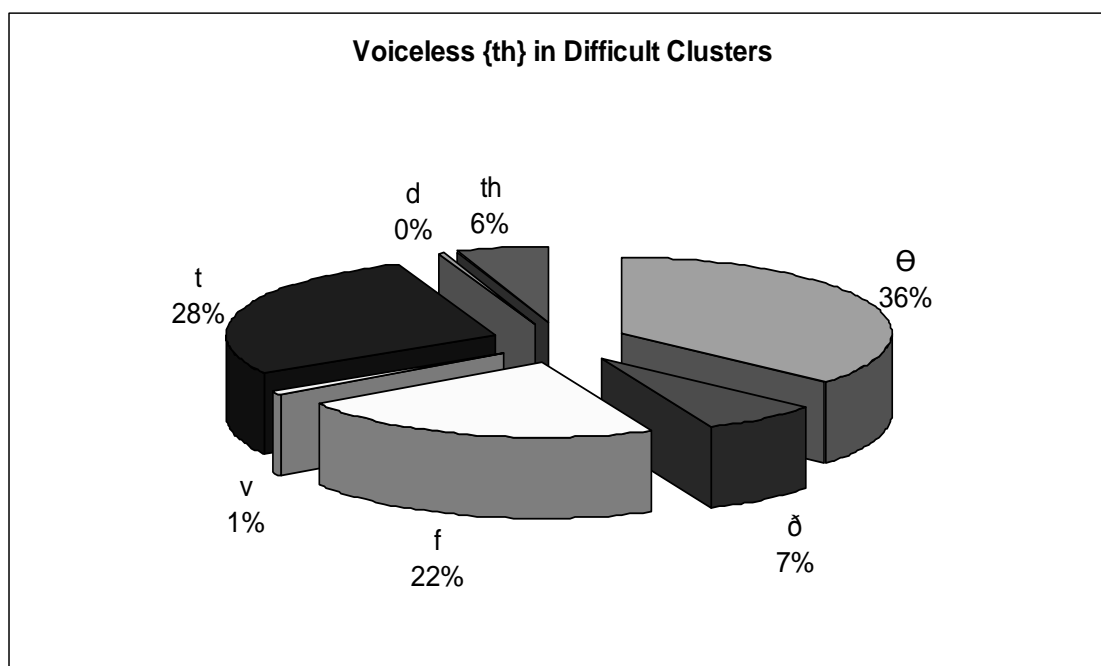


Figure 11. Relative involvement of realizations of /θ/ in difficult contexts

4.2. The effect of the position in the word

So far we have viewed the variability in the substitutions of /θ, ð/ in relation to voicing. Let us now analyze the interaction of the frequency of the occurrence of substitutes with the position in the word. First the utterance-final occurrences of /θ, ð/ are presented in Fig. 12:

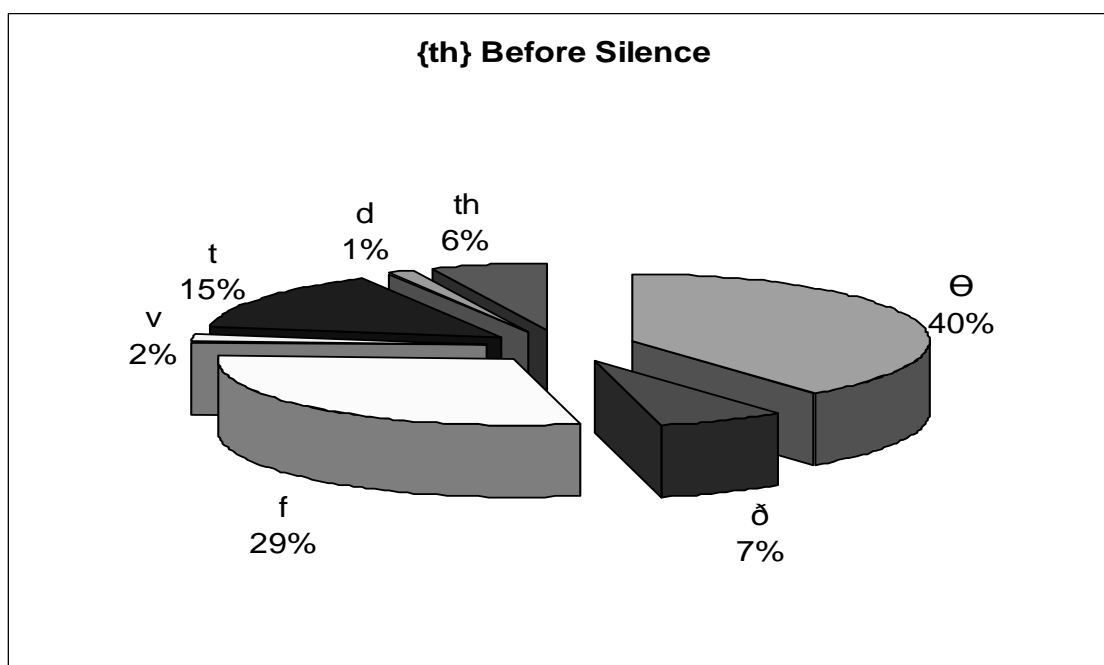


Figure 12. Realizations of {th} in absolute word-final position

In this context, besides /θ/, we find occurrences of /ð/ devoiced by applying the word-final rule of obstruent devoicing (Gonet, 2001, Nawrocki and Gonet, in print). Quite the same replacement pattern occurs in pre-vocalic contexts (Fig. 13):

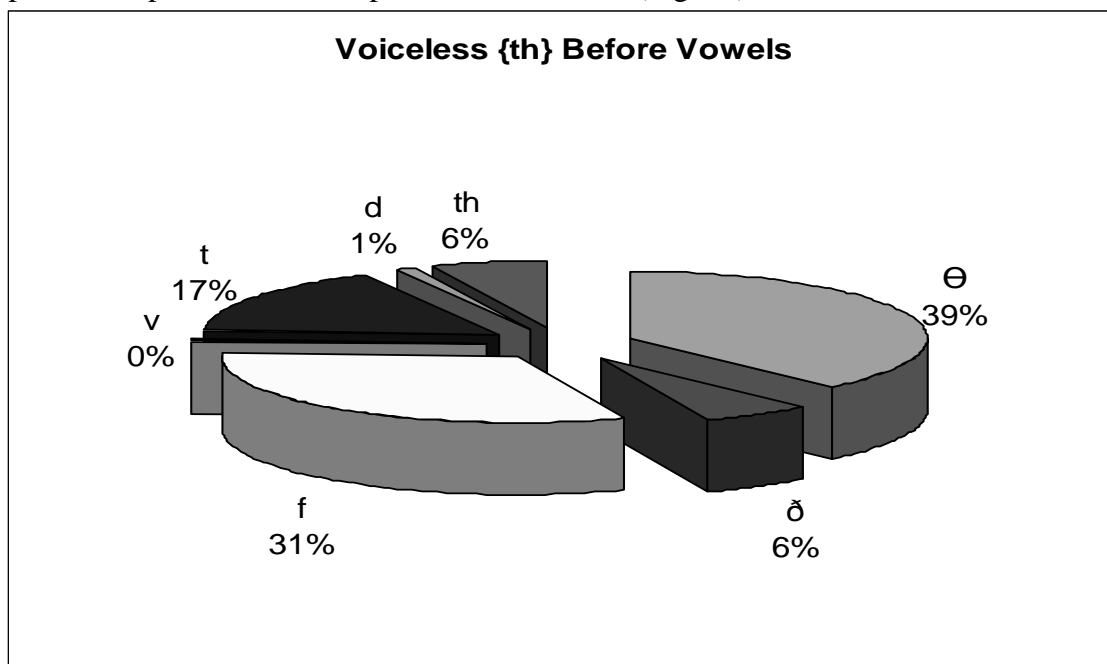


Figure 13. Realization pattern of /θ/ in prevocalic contexts

Before vowels, the voiceless /θ/, if pronounced incorrectly, is mostly realized as /f/ (31%) and, about half of the times, as /t/ (17%). The substitution of the voiced fricative before vowels follows a drastically different pattern; this is shown in Fig. 14:

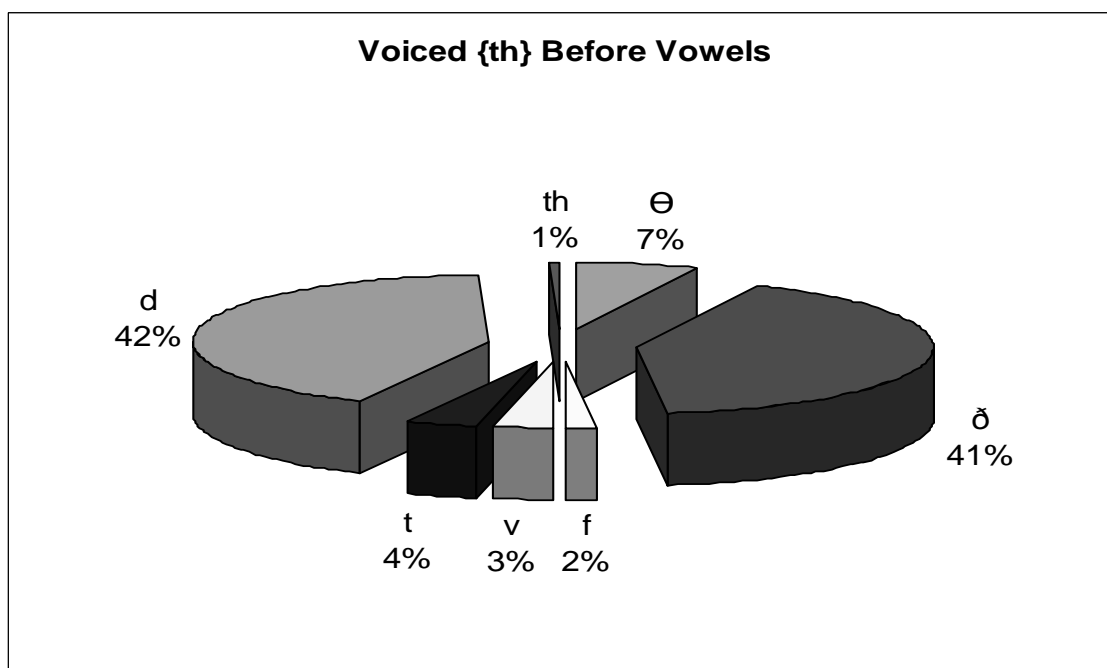


Figure 14. The realization of /ð/ before vowels

Before consonants (i.e. in clusters), the incorrect substitutions of /θ/ involve /f, v/ almost as frequently as /t, d/; thus, for example, ‘throat’ will be more often realized as *[trəʊt] than as **[frəʊt]⁸ cf. Fig. 15:

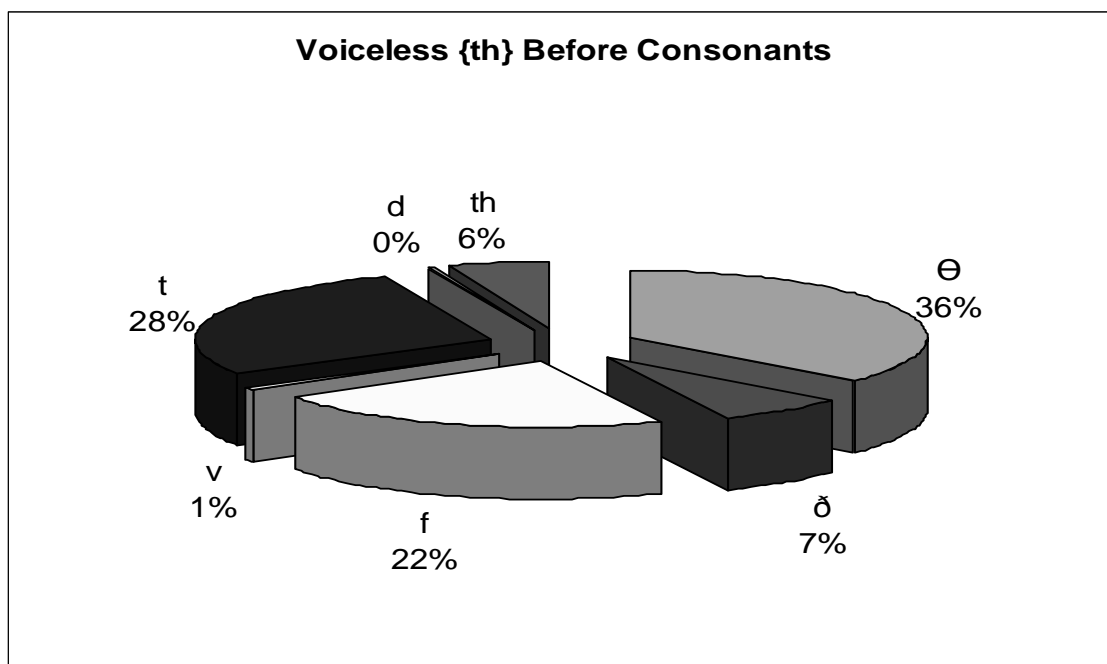


Figure 15. Relative involvement of different realizations of /θ/ before consonants

Let us now compare the realizations of /ð/ in the same context (Fig. 16):

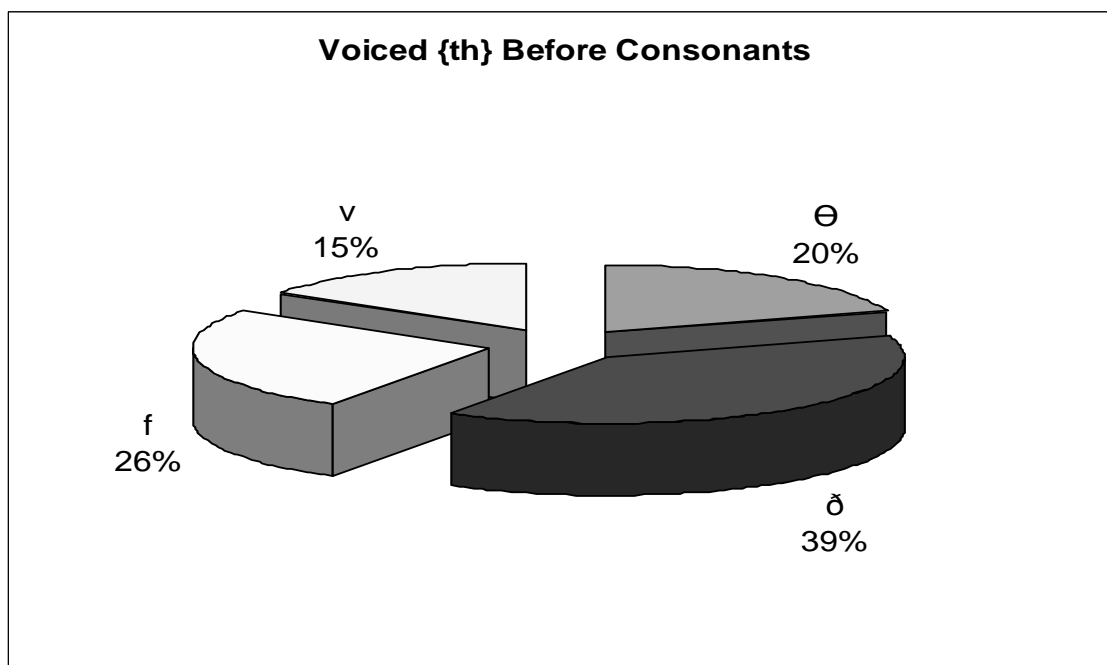


Figure 16. Relative involvement of different realizations of /ð/ before consonants

⁸ The growing number of asterisks indicates the drop off in the probability of substitution.

As is shown in Fig. 17, /ð/ in phrases such as ‘with me’ will be predominantly realized as *[wifmi:] or **[wivmi:], and very seldom as ***[widmi:]. This shows the strength of the interference caused by the rule of word final devoicing despite the fact that the fricative is followed by a sonorant.

4.3. The interactive effect of voicing and position: summary

As follows from the observations made in 4.1. and 4.2., the replacements abide by a cross-over pattern:

/ð/ before vowels is realized mostly as /d/ (e.g. *[deɪ])

/θ/ before vowels, sonorants and word-finally is replaced mostly by /f/ (e.g. *[fʌm] *[wɜ:fʌs], *[bɑ:f], respectively)

/ð/ before consonants is realized mostly as /v/ (e.g. [wivmi:])

/θ/ before consonants is realized mostly as /t/ (e.g. *[frəʊ])

This can be schematically presented as in Fig. 17:

$$\begin{array}{cc} \text{ðV} \rightarrow \text{dV} & \text{θV} \rightarrow \text{fV} \\ \text{ðC} \rightarrow \text{vC} & \text{θC} \rightarrow \text{tC} \end{array}$$

Figure 17. Schematic representation of interactive cross-over replacements

5. Phonological implications

Let us now consider, in Tab. 2, the distinctive feature specifications for the interdental fricatives and their possible monosegmental substitutions; the rightmost column shows the number of features in which the specifications differ from the target consonant.

	Anterior	coronal	continuant	strident	Difference
/θ, ð/	+	+	+	-	TARGET
/f, v/	+	-	+	-	1
/t, d/	+	+	-	-	1
/s, z/	+	+	+	+	1
/c, dz/	+	+	-	+	2
/č, dž/	-	+	-	+	3

Table 2. Distinctive feature specifications for English interdentals and their Polish potential substitutes

The specifications are in agreement with the classical SPE framework (Chomsky and Halle 1968), with one exception motivated by acoustic grounds. In SPE and approaches directly derived from it, the main motivation for the introduction of the feature [strident] is the need to distinguish between the English [+anterior] and [+coronal] /θ, ð/ vs. /s, z/, by pointing out that /s, z/ are produced with a very prominent noise component, while the hissing sound characteristic of /θ, ð/ is much less prominent. The remaining fricatives were specified as [+strident], without any empirical motivation and consequences bearing on the rule component. Yet inspection of spectrograms clearly shows that the noise patterns of the remaining fricatives fall into two categories clearly differing in the level of noise, with the pair /f, v/ having a markedly lower level noise as compared to the palato-alveolar fricatives; this is shown in Fig. 18:

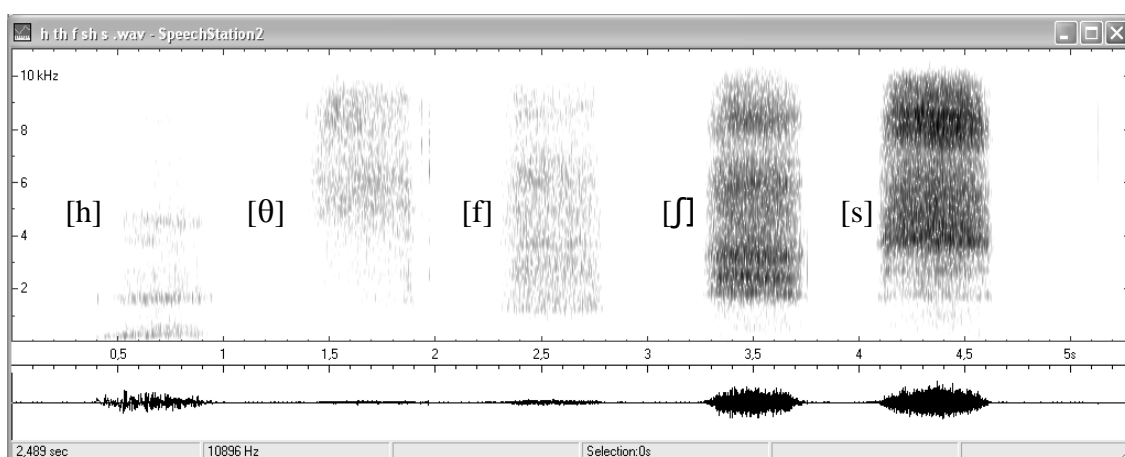


Figure 18. The intensity of the noise component in the series of fricatives /h, θ, f, ʃ, s/

This rectification of the SPE feature framework by treating the labio-dental fricatives as [-strident] will not exert any impact on the rules specified in SPE; it will, however, simplify the explanation in Tab. 2:

A glance at Table 2 explains which substitutions are more, and which less, preferable. As substitutions take place only within the [+anterior] region, the [-anterior] /č, dž/ (that also differ in two other feature specifications) will not be selected to replace the English interdental. By the same token, the (post)dental affricates, differing in two features, are no more likely to be used as substitutes of /θ, ð/. The remaining three pairs of phonemes, namely /s, z/, /t, d/ and /f, v/, each differ from the target in one feature specification. The closest articulatory approximation are /s, z/; yet they are seldom used as they perceptually differ in stridency. Within the class of the non-strident sounds there are two pairs, viz. /t, d/ and /f, v/; the former is [-continuant] and [+coronal] like /θ, ð/, while /f, v/ are continuants and differ

from /θ, ð/ in coronality. Thus, basing only on distinctive features, it is impossible to predict which of the three non-strident sounds will be chosen to replace the English interdental. Yet the observations relating to actual substitutions render interesting information about the interplay between the feature hierarchy, position in the word, and voicing. Owing to the actual empirical data, it is possible to establish the hierarchy of importance of the preservation of individual features or a reverse hierarchical strength of inhibitions offered by individual features relating to the position in the word and the voicing of the substitute. Such a hierarchy is presented in Table 3: the feature in the top line is the one that can be violated with least possible harm to the output; hence a high probability of substitution, while the feature in the bottom line is the one whose violation is not allowed. Note that the ordering of the features differs between the columns:

CONTEXT:		Before vowels		Before consonants		Word-finally
VOICING:		Voiced	Voiceless	Voiced	Voiceless	Only voiceless
EXAMPLE:		[ðis]	[θɪŋk]	[wɪð mi:]	[θri:]	[bɑ:θ]
PROBABILITY OF OCCURRENCE	High	[dis] <i>continuant</i>	[fɪŋk] <i>coronal</i>	[wɪv mi:] <i>coronal</i>	[tri] <i>continuant</i>	[baf] <i>coronal</i>
	Medium	[vis] <i>coronal</i>	[tɪŋk] <i>continuant</i>	[wid mi:] <i>continuant</i>	[fri] <i>coronal</i>	[bas] <i>strident</i>
	Small	[zis] <i>strident</i>	[sɪŋk] <i>strident</i>	[wɪz mi:] <i>strident</i>	[sri] <i>strident</i>	[bat] <i>continuant</i>

Table 3. Explanation of the choice of the substitute depending on voicing and position

Having designed Table 3, we can now account for the distribution of the Polish substitutes of the English interdental fricatives:

1. The substitutions of the voiced fricatives before vowels (e.g. [ðɪs], Fig. 19) are governed by the same principles as those of voiceless fricatives preceding consonants (e.g. [θri:], Fig. 20); the hierarchy of possible violations being *[continuant]* – *[coronal]* – *[strident]*.

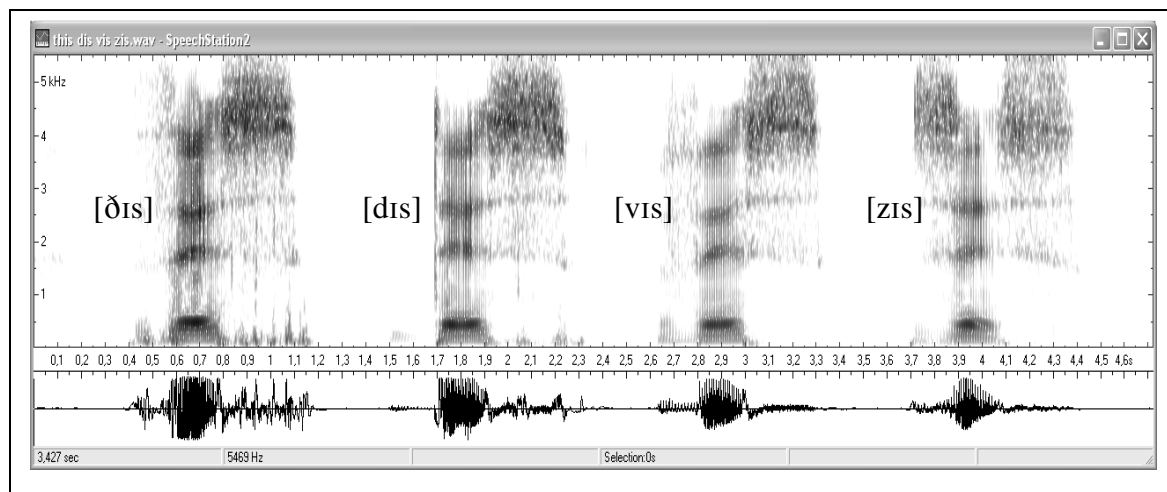


Figure 19. Substitutions of [θis] by [dis], [vis], and [zis]

It is apparent that the strong noise component in the fourth element makes it conspicuously different from the first three words.

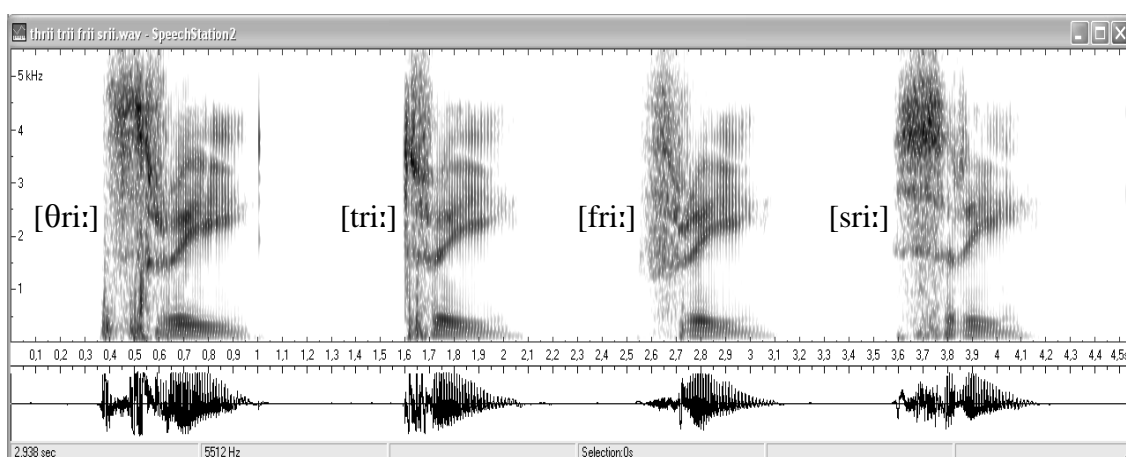


Figure 17. Substitutions of [θri:] by [tri:], [fri:], [sri:]

Similarly to what was said about Fig. 19, the fourth element is clearly different from the first three.

The substitutions of the voiceless fricatives preceding vowels (e.g. [θɪŋk], Fig. 21) are implemented according to the same principles as those controlling the replacements of the voiced fricatives before consonants (e.g. [wið mi:], Fig. 22), the hierarchy of allowed violations being [coronal] – [continuant] – [strident]. This stipulation can be strengthened by the frequency of occurrence of clusters in which /-r/ is the second element: clusters /tr/ are

much more frequent both in English and in Polish (hence *[tri:] is felt more natural than *[fri:]).

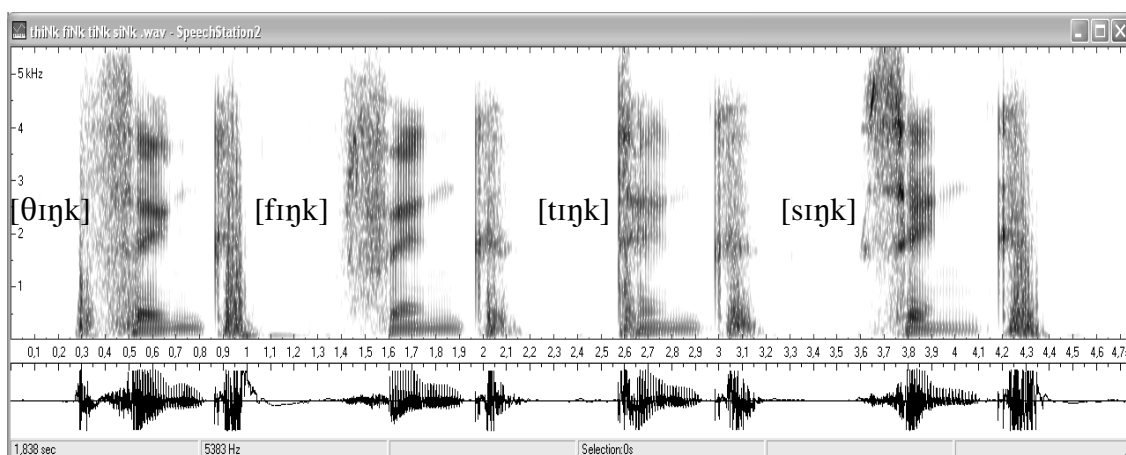


Figure 18 Substitutions of [θɪŋk] by [fɪŋk], [tɪŋk] and [sɪŋk]

Word final position provides a very clear picture of the growing differences between the target (leftmost) and the substitutes (second, third and fourth words). Particularly well manifested difference is between the rightmost word ([sɪŋk] and the rightmost target [θɪŋk]. Similar relations obtain between the elements in Fig. 22.

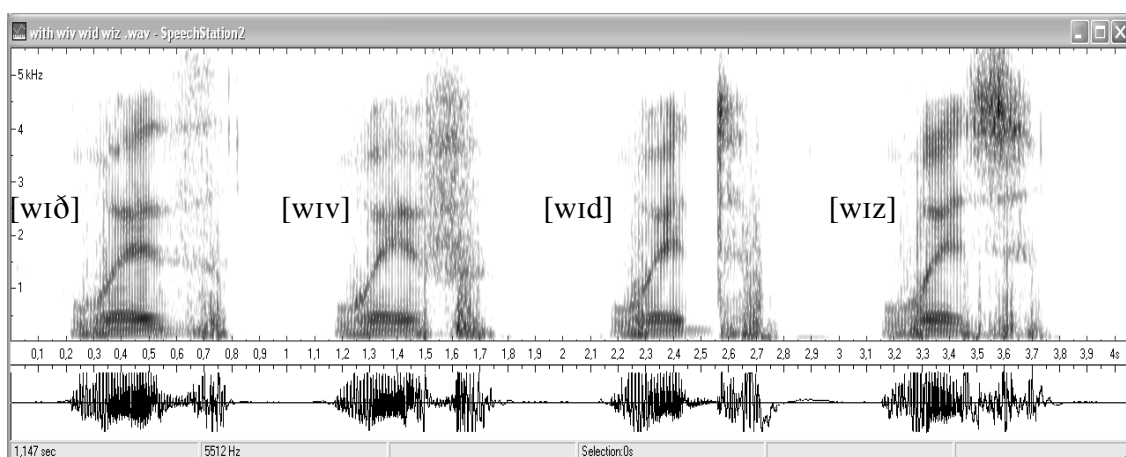


Figure 22 Substitutions of [wið] in 'with me' by [wɪv], [wid] and [wɪz]

The substitutions of the voiceless (or fully devoiced) fricatives in word-final positions (e.g. [bɑ:θ]) are governed by a still different hierarchy of violations, viz. [coronal] – [strident] – [continuant]. Thus, the most important feature to preserve in word-final replacements is [+continuant]. Consider now Fig. 23 showing close similarity of [bɑ:f] (second item) to the target word [bɑ:θ] (leftmost), and the two-dimensional difference between [bɑ:s] (the third

item) differing in stridency, and [ba:t] (the rightmost word) clearly displaying the word-final consonant markedly shorter than the other three.

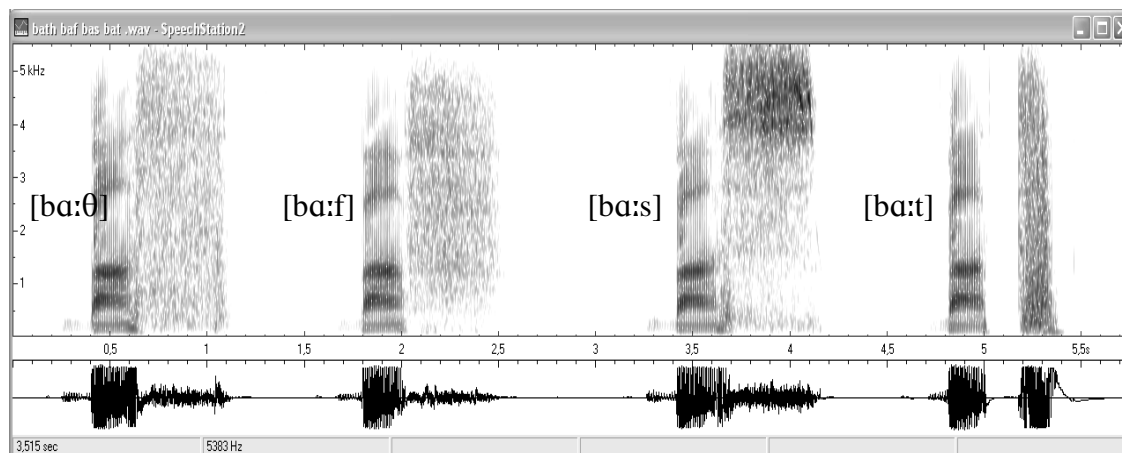


Figure 19. Substitutions of [ba:θ] by [ba:f], [ba:s] and [ba:t]

In future, it will be interesting to relate our findings to syllable structure. In replacements of the English interdental fricatives, syllable onsets favour plosives: voiced in simple onsets, and voiceless in complex onsets, while syllable coda admits fricatives.

6. Summary and pedagogical implications:

The results of the present experimental study of the replacements of the English interdental fricatives show that the identity of the element used by Polish students of English to replace it depend on two factors: the voicing of the target sound, and the position in which it occurs in the utterance. The voiced interdental fricative /ð/ is most often replaced by /d/ before vowels, and /v/ before consonants. while the voiceless /θ/ can be replaced either by /f/ in contexts easy to pronounce, and by /t/ or /f/) in consonantal clusters. In word-final positions, /ð/ is often devoiced to /θ/, and both are realized as /f/.

These substitutions have been accounted for by reference to the distinctive feature specifications, that allow to form a generalization that for /ð/ the use of a voiced consonant is perceptually more important than similarity in the place of articulation; thus /d/ is chosen as the substitute before vowels, and /v/, before coronal consonants for ease of production. Similarly, the presence of mild noise and the lack of voicing is perceptually more important than implementing the coronal articulation. Utterance-finally, the continuancy of the voiceless fricative is more important than adjusting place of articulation.

Realizing this mechanism, it is easier for the teacher to identify the replacements made by students and to design methods of eliminating the faulty articulatory gestures – most

frequently, the contact between the lower lip and the upper teeth ridge for /f, v/, and the incorrect manner of articulation if /t, d/ are used as substitutes.

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