

The incomplete phonologization of the non-sibilant dental fricatives in American English

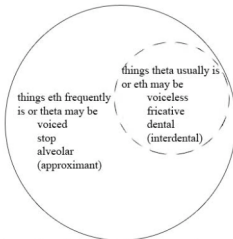
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Eth /ð/ and theta /θ/, then and now

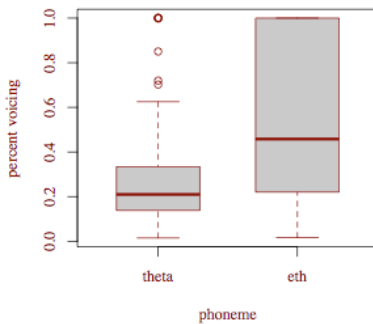
- OE: /θ/ is the only interdental fricative phoneme; /ð/ is an allophone found between voiced sounds (Lass 1994: 71-72)
- ME Phonologization of voicing contrast of fricatives about 1250-1400
- 1556, First mention in print of 2 separate <th> phonemes (Bullock 1556)
- Orthography complicates situation --
 - <v> and <z> were imported from French to represent voiced counterparts of /f/ and /s/
 - but OE thorn <þ> and eth <ð> characters were replaced in ME by a single digraph <th> to represent both the voiced and voiceless dental fricative (Hogg 1992: 76-7)
- Although minimal pairs exist, it is unclear just how distinct these sounds were for most speakers

Modern eth /ð/ and theta /θ/ in production

- /θ/ and /ð/ share common characteristics, and have an overlapping distribution
- Voicing is predictable from environment
- Word-initial /ð/ only in function words, more likely to be reduced
- Word-initial /θ/ in content words, more likely to be stressed
- Loanwords take /θ/, but over time, can be reduced to /ð/
- Also display wide variation in place and manner



Voicing in (inter)dental fricatives



• /θ/ is subject to more variation, perhaps because of its variable position in stressed and unstressed words.

• /ð/ displays overall more assimilatory voicing, more reduction, more deletion

Data from Smith 2007.

Prototypicality and frequency

- /θ/ is the primary sound correspondence for <th>
- /θ/ has a higher type frequency than /ð/
- /ð/ has a lower type frequency, but higher token frequency from a few high-frequency function words
- Prototypical /θ/ could be described as an interdental, primarily voiceless fricative
- It is unknown which form best represents /ð/ because of the wide amount of variation and uneven distribution

Research Questions

1. What is the perceptual status of the voicing contrast between /θ/ and /ð/?
2. Has the voicing contrast between eth and theta been successfully phonologized?
3. Does the variation indicate that the two sounds are in a state of change, or stable variation?

Experiments

2 experiments were conducted to try to determine if eth and theta are perceptually contrastive, and if they are similarly contrastive to /s/ and /z/

- Phoneme monitoring

- Do listeners respond equally quickly to both phonemes? - gets at dominance
- Can listeners reliably distinguish between two phonemes? - gets at perceptual contrastiveness

- (Word) Identification and Discrimination

- Can listeners reliably distinguish between two words in a minimal pair? gets at functional perceptual contrastiveness

Experiment 1

Participants were instructed for each block to listen for one of the following: the sound of *s* as in *sun*, the sound of *z* as in *zen*, the sound of *th* as in *thin*, and the sound of *th* as in *then*.

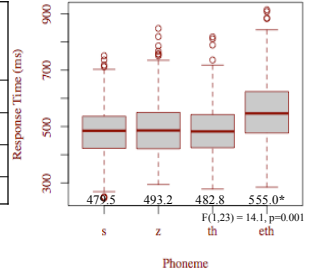
Response times indicate how quickly they responded when they heard the correct sound.

Results

Accuracy rates by target block

Target block	Hit rate %	Correct rejection %	Overall accuracy %	Correct rejection minus /f/, /v/, and /ʃ/ %	Overall accuracy minus /f/, /v/, and /ʃ/ %
th	94.1	43.1	66.6	90.5	92.3
eth	79.5	63.6	76.8	92.8	86.2
s	95.5	81.6	88.4	94.6	95.1
z	97.9	97.6	97.7	97.6	97.7

Phoneme Monitoring Task RT



- Error rates higher for /θ/ and /ð/
- Response Time (RT) longer for /ð/

Experiment 2

• 7-step voiceless to voiced continua using a synthesis of *sue* and *zoo* and *thigh* and *thy*.

• Identification - Participants were played one sound at a time and asked to decide if the word was *thigh* or *thy* for the th-blocks or *sue* or *zoo* for the s-z blocks.

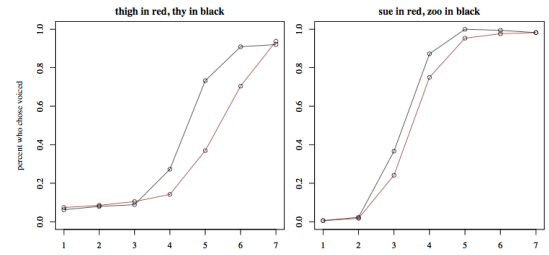
• Discrimination - stimuli were presented in 2-step AX pairs. Participants answered 'same' or 'different'.

Results

Identification

• More than 50% of tokens at 66.7% or less voiced were judged to be instances of /θ/

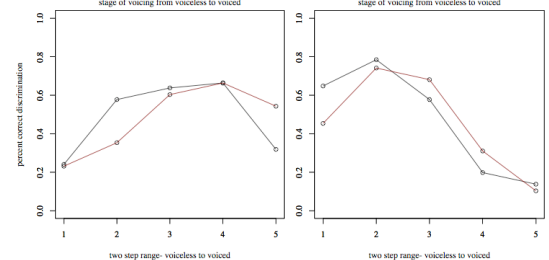
• To be judged /s/ 33.3% or less voice was required



Discrimination

• /θ/ and /ð/ boundary is significantly to the right of the boundary for /s/ and /z/.

• No significant difference in total percent discriminated



Discussion

1. /θ/ and /ð/ are perceptually fuzzy

- High error rates in exp. 1 show poor phoneme discriminability.
- Exp. 2 shows some discriminability for words, but remains around 50%
- Slower RT for /ð/ in exp. 1 suggests less strong mental representation
- Identification is biased toward /θ/ as conceptually primary representation of <th>

2. When one sound dominates the conceptual space, and the other sound is usually classified by language users as an instance of the dominant sound, the relationship is typically one of allophony.

- The phonologization is, at best, incomplete.

3. That boundaries in identification and discrimination tasks do occur, indicates that there are two distinct mental representations for the words *thy* and *thigh*.

- Since the phonologization of /θ/ and /ð/, little has changed.
- Greater reductive processes in words with /ð/ allow it to be further reduced and deleted more than /θ/, resulting in differences in accumulated exemplars
- Slow drifting apart continues for tokens in some words
- High literacy rates allow interference of orthography, further linking the two sounds, and further complicating their relationship

References

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