Constructing features: The example of Dutch and German labiodentals

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What's available to the learners

- auditory information
- meaning

but not:
innate categories
(1, 2, 3)

What they have to learn

Phonetics:
- the relevant perceptual cues
- and articulatory gestures

Phonology:
- segments
- features

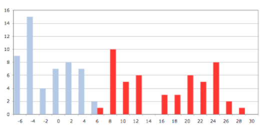
Connections between these

Learning from auditory information

1. Infants store statistical distribution of auditory information (4).

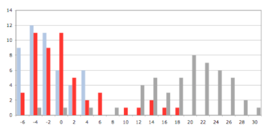
   Example: distribution along the auditory dimension of periodicity (5), measured as harmonicity median in dB, for labio-dentals (6):

German



/f/ much frication no voicing — /v/ little frication more voiced

Dutch*



/f/ frication not voiced — /v/ frication voiced — /ʋ/ no frication voiced

* Speakers from the area of Nijmegen, who make a contrast between /f/ and /v/ in intervocalic position.

Assumption that only those auditory dimensions that show distinct distributions are used as reliable perceptual cues.

2. At the age of 6 - 8 months, infants form phonetic categories on the basis of these distributions (7).

   Phonetic category formation has been modelled with neural networks (8) and with OT (9).

   In OT, this is first a mapping of values onto more often occurring values, the latter being eventually replaced by a phonetic category.

Learning from meaning

1. Infants start at the age of 8 months to store word forms holistically, together with their meanings (10).

   They cannot use the phonetic categories to distinguish similar words before 17 months of age (11).

2. Semantics guides the learner in constructing abstract categories (phonemes and features).

   Alternations like final devoicing in German:

   brave [v] – *brav* [f] 'good'
   /v/
   [+X] [–X]

   Abstract (can combine allophones that are not phonetically similar)
   Does [±X] have to be used for all obstruents?

   And in Dutch:

   kloofde [v] – *kloof* [f] 'to split' vs. *water* [ʋ] 'water'
   /v/
   [+X] [–X] [Y]

   /ʋ/ does not occur in final position, though some phonologists (12) argue:

   water [ʋ] 'water' – *nieuw* [niu̯] 'new'
   /ʋ/

   But there are no alternations that provide learners with a motivation for this.

Problems with universal features

1. How do infants acquire the connection between the language-specific use of auditory dimensions (perceptual cues) and universal features?

2. How to account for ambiguous behaviour of so-called natural classes?

   Example of German /v/ and Dutch /ʋ/ that share restrictions with both fricatives and sonorants

Features for further phonological processes?

Dutch has

- progressive voice-assimilation:
  fricative is devoiced after a voiceless obstruent

opvallend	'remarkable'	/pv/	[pf]
afval	'trash'	/fv/	[f]
asvat	'ashbin'	/sv/	[sf]

- regressive voice-assimilation:
  voiceless obstruent becomes voiced before /b/ or /d/

afbellen	'to ring off'	/fb/	[vb]
stofdoek	'duster'	/fd/	[vd]

Does this involve other features than [±X] (either labiodental-specific or for all voiced fricatives)?

Features for phonotactic restrictions?

Dutch /ʋ/ occurs

- after obstruents in onset (like sonorants):
  kwaad [kʋ] 'mad', *zwaar* [zʋ] 'heavy'
- in the few words with /ʋr/ clusters (like fricatives):
  wraak [ʋr] 'revenge', *wrijven* [ʋr] 'to rub'

German /v/ occurs

- after obstruents in onset (like sonorants):
  Quark [kv] 'curd', *zwei* [tsv] 'two', *schwer* [ʃv] 'heavy'
- in the few words with /vr/ clusters (like fricatives):
  Wrack [vr] 'wreck', *wringen* [vr] 'to wring'

How abstract is our phonotactic knowledge?
It is more than the transitional probabilities learned with statistical distribution, since the language-specific restrictions are applied to loanwords and in L2 acquisition.

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