Corpus studies of mouth behaviour

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The Obama feeling:

Yes we can!

Corpus sign linguistics

- Larger data sets than ever before
- (Semi) spontaneous language use
- Data are not collected to answer a specific linguistic question
- Use and re-use of the same data set

- Highly welcome: tradition of working with little data, few informants; highly variable (socio)linguistic situation
- Downside: it may not always be the most appropriate way to approach a research question.

  But at least we can choose now.

Mouth activities

Emotional signals
- laughing, spluttering
- show surprise

Sign language signals
- Phonological elements (BEAT-A-COMPETITOR)
- Adverbs (WALK *in different ways*)

Spoken words
- HARE + 'haas'
- TURTLE + 'schildpad'

What are the spoken language elements?

Important components of the sign language itself

vs.

A clear case of code mixing

E.g. Heßmann & Ebbinghaus 1998; Hohenberger & Happ 2001

Influence of spoken Dutch on NGT

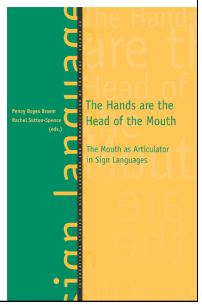
Schermer 1990

- Spoken components: derived from spoken language
- Oral components: not derived from spoken language

- Functions: disambiguate and specify meaning
- Oral components can also carry meaning themselves (and act as independent lexical items)
- Lexicon: spoken components accompany only 16% of the signs in the earliest two NGT lexicons
- The influence of Dutch is most invasive in Dutch function words and verb inflections that do not have a place in the manual grammar of NGT

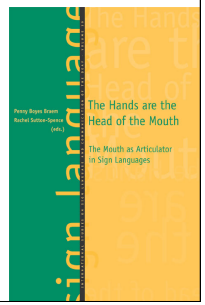
Some other previous research

- Vogt-Svendsen (1981, 2001), Norwegian SL: asserted the primacy of the hands over the mouth. Mouthings are mainly nouns and uninflected verbs
- Bergman & Wallin (2001), Swedish SL: pioneered notation of mouth actions based on visual contrasts. Also found that borrowed patterns are reconstructed to native patterns
- Sutton-Spence & Day (2001), British SL: documented heterogeneity in the use of mouth actions, highlighting both register issues and sociolinguistic factors as important to future research in this area



Some other previous research, cont.

- Woll (2001); coined the term 'echo phonology' to describe a subset of mouth actions that are driven by and parallel the movements of manual signs
- Schermer (1990), Happ & Hohenberger (2001), Boyes Braem (2001), and others: noted that mouthings tend to associate to open-class rather than closed-class items
- Mouth actions can extend over two or more manual signs: Schermer (1990), Nespor & Sandler (1999), Happ & Hohenberger (2001), Sutton-Spence & Day (2001), Vogt-Svendsen (2001), Boyes Braem (2001)



Study 1

1. *How often do different types of mouthing occur in different signed languages?*
2. *What patterns do we see in different language with respect to the spreading of mouth actions over multiple signs?*

O. Crasborn, E. van der Kooij, D. Waters, B. Woll & J. Mesch (2008) Frequency distribution and spreading behavior of different types of mouth actions in three sign languages. *Sign Language & Linguistics* 11-1:45–67.

ECHO 'corpus'

ECHO
European Cultural Heritage Online

- Five fable stories narrated in three sign languages (Dutch, British and Swedish) by two signers each
- Average of 7.5 min./signer

Other available data in ECHO (open content)
- SL poetry (NGT, SSL)
- Basic lexicon, 300 items
- Brief interviews

www.let.ru.nl/sign-lang/echo

Typology of mouth actions

M **M**outhings

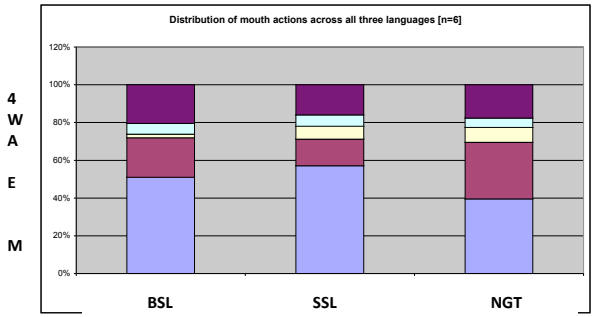
E Semantically **e**mpty mouth actions

A **A**dverbial mouth actions

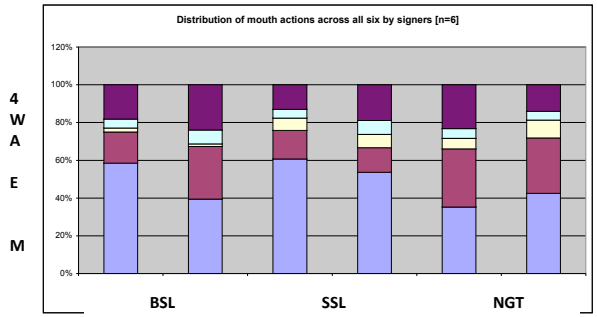
W **W**hole face mouth actions

4 Mouth-**4**-mouth

Different types in different languages



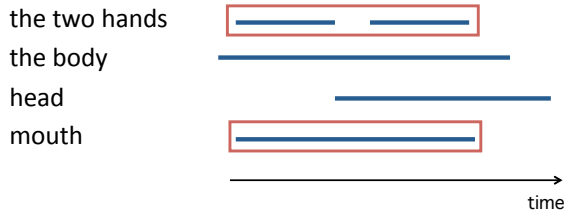
Different types in different signers



The mouth as a separate articulator in SL

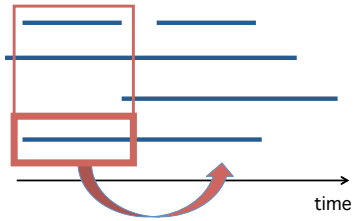
Citation form: all events roughly coincide

The mouth as a separate articulator in SL



The mouth as a separate articulator in SL

the two hands
the body
head
mouth



Spreading of mouth actions

- Definition: synchronisation of one mouth action with multiple manual signs
- Function → marking prosodic domains?

Israeli Sign Language: 'The book he wrote is interesting.'

	[[book-there]$_P$ [he write]$_P$]$_I$	[[interesting]$_P$]$_I$
Mouth	'book'----------	'interesting' ----
Eyes	sqint---	gaze down------
Brows	up----------	low----------
Head	tilt----------	
Torso	forward----------	

Nespor & Sandler (1999)

Research questions

1. Do both mouthings and mouth gestures spread?
2. What is…
   a. the direction of spreading ?
   b. the size of the domain?
   c. the nature of the resulting domain?

Hypothesis 1: both mouthings (M) and mouth gestures (E) spread

- Confirmed; in all three languages there are a few examples of mouth gestures that spread.
  - BSL: 2
  - NGT: 4
  - SSL: 8
- Low frequency of spreading mouth gestures should be seen in the light of the low frequency of mouth gestures in these stories (5-20 times as many mouthings as mouth gestures, depending on the language).

Spreading of mouth gestures (NGT)

_____nod
_____ssjj
PRESENT INDEX
'He is really there.'

Hypothesis 2a: spreading from left to right

Language	No. of fables	Rightwards	Leftwards	L + R
BSL	6	**106**	0	0
NGT	10	**60**	1	0
SSL	10	**74**	22	3

Rightward spreading
NGT example

__ ____dorp _____jongen _____woon
VILLAGE IND BOY PERSON LIVE INDEX

'There was a boy who lived in a village'

Hypothesis 2a: spreading from left to right

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Hypothesis 2a: spreading from content word to function word

Language	No. of fables	C > F	F > C	F > F	C > C
BSL	6	87	3	9	7
NGT	10	50	0	5	6
SSL	10	69	0	5	25

Direction of spreading: hypothesis

- In BSL, mouth actions spread from left to right
- In NGT, mouth actions typically spread from left-to-right and from content word to function word
- In SSL, mouth actions spread from content word to function word

This study: only 15 min. for two signers per language!

Hypothesis 2b: spreading is limited to the neighboring sign

dir.	1 sign	2 signs, 1 dir.	3 signs, 1 dir.	2 signs, both
BSL	100	6	0	0
NGT	56	4	1	0
SSL	91	5	0	3

Hypothesis 2c: source and target form a syntactic constituent

- Only looked at NGT data
- Typically, the two or three signs that are bound together by the spread-out mouth action do indeed form a syntactic phrase:

NP	noun, det	BEAR IND; FRIEND PERSON
VP	verb, object	HELP IND '(I will) help you'
	verb, object	HELP IND 'help me!'

Hypothesis 2c: source and target form a syntactic constituent

- However…. there may be exceptions:

ander hond

IND [OTHER DOG] IND

'There is another dog over there'

Mouth as a prosodic domain marker?

- In spoken languages, strong prosodic boundaries block assimilation; assimilation between words can *indicate* weak prosodic boundary

Nespor & Vogel 1986

- For sign languages, it has been claimed that spreading of mouth action can *mark* prosodic domains

Boyes Braem 2001 on Swiss German SL,
Sandler 1999 on the prosodic word in Israeli SL

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Study 1: conclusions

- Both mouthings and mouth gestures can spread from their source sign to neighbouring signs
- Direction:
  - BSL: rightward
  - SSL: content > function word
  - NGT: rightward (with one exception: F<C)

Study 1: conclusions on spreading

- Size:
  - typically one neighbouring sign
  - sometimes two (or even three) signs on one side
  - sometimes in both directions (SSL, NGT)
- Quite some individual variation in the amount of spreading
- Corpus:
  - 3 languages
  - 2 signers each
  - ±7.5 min. per signer

Study 2

- Is some of the individual variation related to age or education?
- How specific are mouth behaviour for specific registers?

I. van de Sande & O. Crasborn (in press) Lexically bound mouth actions in Sign Language of the Netherlands. A comparison between different registers and age groups. *Linguistics in the Netherlands 2009*.

Research questions

1. Do deaf native signers of different ages and in different registers use other proportions of the five sub-types of mouth actions?
2. Are there differences in the frequency of occurrence of spreading of lexically bound mouth actions between registers or ages?
3. Over how many signs and in which direction do lexically bound mouth actions spread?

Signers

Six younger early learners
- <40 yrs
- Started learning NGT from birth
- NGT used by at least the parents

Six older late learners
- >50 yrs
- Started learning NGT at a later age (av. 4.5 y)
- NGT not used by their parents

Both groups
- Born deaf
- First language is NGT
- Member of the Deaf community

NGT acquisition:
early
late

www.corpusngt.nl

Selection from the larger corpus

- Two signers recorded in dialogue setting
- Task: re-tell fable after seeing it told on video
  ⇒ Total of 1263 mouth actions
- Discussion about deaf issues and sign language in the Netherlands
  ⇒ Total of 1843 mouth actions

Hypotheses

Register difference
- Little studied
- Ebbinghaus & Hessmann (2001), Sutton-Spence & Day (2001):
  - Most mouthings with objects, events, abstract concepts
  - Fewer mouthings with actions, expressive behaviour, and relations between objects

  → **fables: fewer mouthings**

Influence of age
- No clear differences in earlier research (but: small no. of subjects)
- General idea: use of mouthings dependent on the experience with oral education

  → **late learners: more mouthings**

Proportions of types of mouth actions per register

	Fable	Discussion
M	48	78
E	2	1
A	9	4
W	30	12
4	4	1
Unclear	6	3
Invisible	1	1
Total	100	100

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Proportions of types of mouth actions per age group

	Young early learners	Old late learners
M	64	67
E	2	2
A	6	6
W	21	17
4	2	2
Unclear	4	5
Invisible	1	1
Total	100	100

Hypotheses

Register difference

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- Ebbinghaus & Hessmann (2001), Sutton-Spence & Day (2001):
  - Most mouthings with objects, events, abstract concepts
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'Solo mouthings'

Mouthings without a manual sign
- Schermer 1990: ± 5% of all tokens!

More by older late learners?

	Young early learners	Old late learners
M-solo among mouthings	7%	16%

M-solo as code switching

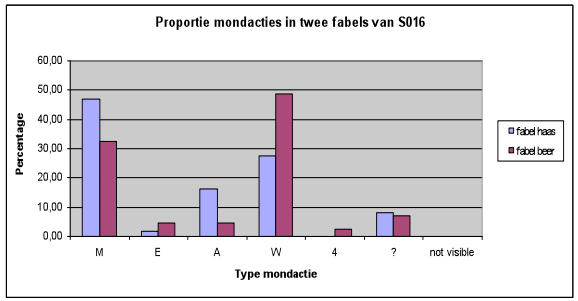
- *"Last night's diner was délicat!' (insert French in English)*
- Bimodal code switching: alternation between speech and gesture
  Speech speech pantomime speech
  "I was like [pantomime: duh], you know."
- M-solo: bimodal code switching
  signing speaking signing signing
  "MAN INDEX NAME mouth:Schembri"

Conclusion on types of mouth actions

- We find more mouthings in discussions, and more whole face actions in fables
- Old late learners use more solistic mouthings than young early learners
- No other differences found between age groups
  - Perhaps difference in age of acquisition or age per se is too small to see a difference: <40 vs. >50
  - Too large inter-personal and intra-personal differences?

Example of intra-personal variation

Two fables signed by the same person:



Conclusion on types of mouth actions

- We find more (solo) mouthings in discussions, and more whole face actions in fables
- Late learners use more solistic mouthings than early learners
- No other differences found between age groups
  - Perhaps difference in age of acquisition or age per se is too small to see a difference
  - Large inter-personal and intra-personal differences?
  - Or: no influence of age on types of mouth actions because they are all equally part of NGT production

Research questions

1. Do deaf native signers of different ages and in different registers use other proportions of the five sub-types of mouth actions?
2. Are there differences in the frequency of occurrence of spreading of lexically bound mouth actions between registers or ages?
3. Over how many signs and in which direction do lexically bound mouth actions spread?

Results: spreading

- Frequent occurrence of spreading over >50% of a neighbouring sign:
  - 12% of all mouthings (236/2043)
  - 13% of all mouth gestures (8/61)
- No differences between registers or age groups
- Direction: not only rightwards from the source
  - 85% rightwards
  - 8% leftwards
  - 7% in both directions
- Mostly over one neighbouring sign; 10% over two signs or more

Conclusion: spreading

- Spreading itself is quite frequent; no difference between ages or registers
- Contrary to the findings in Study 1, mouth activity also spreads leftwards and both ways in NGT
- Potentially a rich source of evidence for prosodic domains in NGT: may mark many small domains (prosodic words? phonological phrases?)
- But: we have not yet analysed the resulting domains yet. Would a mere articulatory explanation suffice?

  Influence of the number of syllables in a spoken word? Influence of the type of syllable or final segment?

Study 2: answers to research questions

1. Do deaf native signers of different ages and in different registers use other proportions of the five sub-types of mouth actions? → no, yes
2. Are there differences in the frequency of occurrence of spreading of lexically bound mouth actions between registers or ages? → no
3. Over how many signs and in which direction do lexically bound mouth actions spread? → mostly 1, not only rightwards

Study 2: overall conclusion

- Importance of looking at different registers
- It may be difficult to distinguish age groups in signed languages given the many factors correlating with age (old news); this makes the 'apparent time' method of studying language change more difficult to apply
- Corpus data can be useful in studying signed languages

Open questions

- Is there really no influence of the age of acquisition of sign language on the use of Dutch-derived mouth actions?
- Is there an influence of the age of acquisition of spoken language or the type of speech therapy/education?
- What is the nature of spreading of mouth actions (M, E) over other signs? To what extent do mouthings 'mark' prosodic domains?
  (Alternative: they are only a correlate of prosodic structure in *not* spreading across certain prosodic boundaries, but the source of the spreading is in the articulatory phonetics.)
- To what extent are mouthings an obligatory phonological component of certain lexical items?
  How frequent are they in more recent lexicons? (1990: 16%)

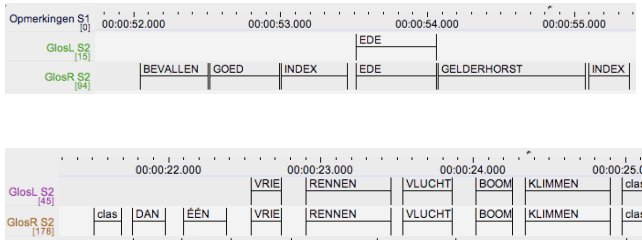
(Possible) problems

- The corpus is only as good as the annotations that are made
- Corpus may be theory-neutral; but are the annotations?

Crucial for prosody: when does an event start or end?

- Mouthings are often small and hypoarticulated
  - Mouthing vs. other small non-speech movements
- We can only lipread 30% of our speech to begin with
  - Start/end of a mouthing can be hard to determine
- When does a manual sign start or end?

Aligning glosses



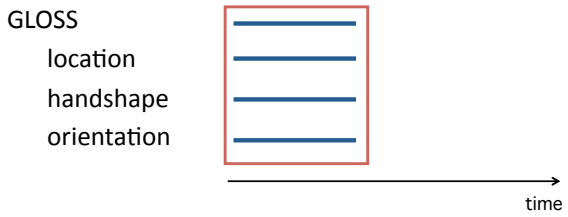
Aligning glosses

A sign starts:

- at the first frame in which the hand starts to move away from the initial location of the sign to the final location of the sign;
- or, in case the hand does not move through space: at the first frame in which the handshape starts to change;
- or, in case the hand does not move through space **and** the handshape does not change: at the first frame in which the orientation of the hand starts to change.

corpusngt_annotationconventions.pdf @ www.ru.nl/corpusngtuk

Phonetic alignment



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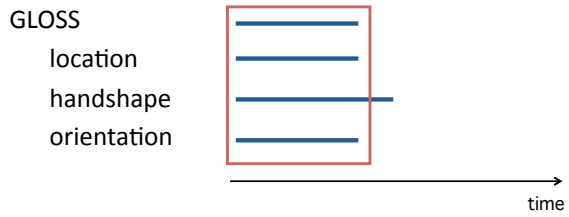

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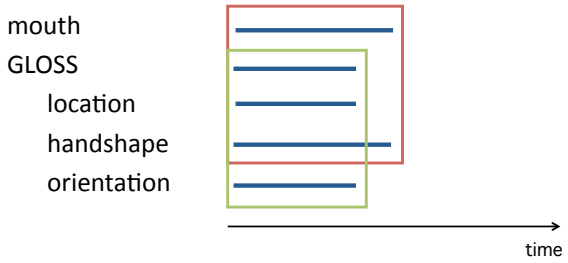

Implication for corpus work

- Need for very explicit annotation conventions (esp. with multiple annotators)
- Not forget the limitations of (25 fps) video
- We cannot see phonology in a corpus: we only see phonetic events – which may be less synchronised than we would have wished. Large numbers of phonetic instantiations do not change this key distinction.

Acknowledgments

Study 1: ECHO data
- Els van der Kooij
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Study 2: Corpus NGT
- Inge van de Sande

Thank you!

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