Showing and telling in Finnish Sign Language

Evidence for a hybrid system

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Overview

- Theoretical framework
- A corpus perspective on constructed action (2017 paper)
- Focusing on the form of constructed action (2020 paper)
- Processing the meaning of constructed action (ongoing work)
- Discussion and conclusion
Theoretical framework

From ontology to the varying ways of signalling meaning
What is there in the world?

- Physical activity and interaction between individuals and environment.
- Individual(ly entrenched) conceptual activity.
- Shared conventions formed on the basis of individual actions and conceptions.

- Physical facts
- Cognitive schemas
- Social norms

Interaction
Where is language in the world?

- Traditional grammar
- Functional grammar
- Generative grammar
- Cognitive grammar

Shared conventions formed on the basis of individual actions and conceptions.

Individual(ly entrenched) conceptual activity.

Physical activity and interaction between individuals and environment.
Where is language in the world?

Cognitive-Functional approach

Physical activity and interaction between individuals and environment.

Shared conventions formed on the basis of individual actions and conceptions.

Individual(ly entrenched) conceptual activity.

Possibility to develop a specific theory
Cognitive-Functional (CF) approach

• A framework, not a theory – but theory building
• Combines ideas of Cognitive grammar and Functional grammar
• Physical facts, cognitive schemas, social norms – (d)emergence
• Exploits a variety of methods – from corpora to experiments
• Accepts gradience and unconventionality in language.
A CF view on signed and spoken utterances

FinSL (left) and Finnish (right) utterance ‘The snowman and the boy sit in a car [in a manner that is showed]’.
Some theory behind the proposed CF view

How is showing the meaning connected to telling the meaning in language?
Showing and telling with constructed action and regular telling

- A discourse strategy based on enacting: signers show the actions, thoughts, feelings and sayings of characters from a full or partial character perspective

- A discourse strategy based on reporting: signers tell about the events and characters in the discourse from a full narrator perspective with lexical units

For more, see e.g. Cormier & al. (2015), Jantunen (2017), Ferrara & Hodge (2018), and Hodge & Cormier (2019).
From (a) the most overt constructed action to (d) regular telling – the case of ’shouting’

a) Overt CA
- No lexical units
- All articulators enact
- Full character perspective

b) Reduced CA
- Lexical units
- Most articulators enact
- Emphasized character perspective

c) Subtle CA
- Lexical units
- A few articulators enact
- Emphasized narrator perspective

d) Regular telling (RT)
- Only lexical units
- No enacting articulators
- Full narrator perspective

A corpus (form and meaning) perspective on constructed action

Sample (Jantunen 2017)

- *Frog, where are you?*
- 5 native FinSL signers (4 female; ages between 20–60 years)
- Total duration 13 minutes and 18 seconds
- 1473 signs tokens
- 537 structurally annotated (verbal centered) clauses
- 198 tokens of (overt and reduced) constructed action

Questions

• Q1: How does the presence of constructed action affect the use of different **verbal predicate types** in FinSL clauses?

• Q2: How does the presence of constructed action affect the use of **flat clausal linkage** in FinSL?

• Q3: How does the presence of constructed action affect the use of **hierarchial clausal linkage** in FinSL?

• Q4: How does the presence of constructed action affect the occurrence of **core argument omission** in FinSL clauses?
Background Q1: The main sign types and gloss types

- **Fully lexical**
- **Partly lexical (indicating)**
- **Partly lexical (depicting)**
- **Non-lexical**

**TO-KNOW**

Meaning gloss

**TO-TEACH**

Depiction gloss

'Drive bicycle over the hill.'

"Shout."
Q1: Effect of constructed action on the clause’s verbal predicate type

Clauses with no constructed action

- Meaning gloss: 84%
- Depiction gloss: 16%

Clauses with constructed action

- Meaning gloss: 66%
- Depiction gloss: 34%

p=0.07

Background Q2–Q3: Examples of flat and hierarchial clausal linkages

1. Flat clausal linkage (coordination):
   BOY  DOG  CARRY  FROG  '  TOGETHER  GO-HOME
   [A  ]  Vr1  P  x  (S) Vr2
   'The boy and the dog carry the frog and they all go home together.'

2. Hierarchial clausal linkage (complement clause):
   BEE+HIVE:up / DOG  THINK  '  FROG  point:up
   TOP  A  Vm  P[N  Nk  ]
   'The dog thinks that the frog is in the beehive up in the tree.'
Q2: Effect of constructed action on the occurrence of flat clausal linkages (1)

Q2: Effect of constructed action on the occurrence of flat clausal linkages (2)

Q3: Effect of constructed action on the occurrence of hierarchical linkages

Background Q4: Constructed action and structurally incomplete clauses

- The face and other nonmanual bodily activity: Agentive information (typically coded by A-core argument) concerning the boy and the dog.

- Context: The signer is telling about the boy and the dog who stare at the frog in a jar on the floor.

- Clause-level: A transitive clause with no A and P-core arguments, comprising only a verbal predicate.

- The direction of the gaze and verbal orientation and movement: Patient-like information (typically coded by P-core argument) referring to the frog in the jar.

Q4: Effect of constructed action on the structural completeness of clauses

- Structurally complete clauses with constructed action
- Structurally **incomplete** clauses with constructed action
Discussion (Jantunen 2017)

Clauses with (strong non-referential) CA

• Preference for depictive or non-lexical predicates
• Only flat relations between clauses
• Omission of core arguments is very typical
• (Free constituent order)

Clauses with no CA

• Preference for lexical and indicating predicates
• Also hierarchical relations between clauses
• Core arguments are typically overt
• (Fixed constituent order)

Focusing on the form of constructed action

Motion capture data (Jantunen et al. 2020)

1. Signers
   • 5 native FinSL signers
   • Ages between 30–60 years
   • MoCap & eyetracker

2. MoCap
   • Optical 8-camera Qualisys Oqus system
   • Recording speed 120 Hz with 25 markers
   • Simultaneous video

3. Content
   • Textless Ferd’nand comic strips
   • 3 strips per a signer
   • "Sign as vividly as you can."

4. Statistics
   • Altogether 15 stories
   • Total video duration 10 min and 45 sec.
   • Ca. 500 million characs. of num. data

ELAN processing and forming the sample

Cormier et al. (2015), Burger et al. (2018), Salonen et al. (2018)

Analysis of MoCap data for kinematic variables in Matlab

Synchronization

MoCap data

Full HD video

Basic annotation

CA annotation

CA type

CA role

CA articulators

Extraction of frame numbers from MoCap data

No CA

n=56

Subtle CA

n=19

Reduced CA

n=34

Overt CA

n=28
Data processing and analysis in Matlab and SPSS

Markers

Joints

Selected joints

Investigated variables

- **Horizontal movement area** of the joint (bounding rectangle)
- **Speed** of the joint movement (velocity magnitude)
- **Acceleration** of the joint movement (acceleration magnitude)
- Across all CA types

Burger & Toiviainen (2013), Jantunen et al. (2020)
Questions

• Q1: How does the increase in constructed action affect head and torso movements (in the investigated variables)?

• Q2: Is there a kinematic continuum between regular telling and overt constructed action (in terms of the head and torso movements and the investigated variables)?
## Results

<table>
<thead>
<tr>
<th>No CA (RN)</th>
<th>Horiz. mov. area of the head (m²) *</th>
<th>Horiz. mov. area of the upper-torso (m²) *</th>
<th>Speed of the head movement (mms) *</th>
<th>Speed of the upper-torso movement (mms) *</th>
<th>Accel. of the head movement (mms²) *</th>
<th>Accel. of the upper-torso mov. (mms²) *</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,0014</td>
<td>0,0007</td>
<td>127,0</td>
<td>93,2</td>
<td>1085,8</td>
<td>986,3</td>
<td></td>
</tr>
<tr>
<td>Subtle CA</td>
<td>0,0011</td>
<td>0,0006</td>
<td>136,2</td>
<td>88,1</td>
<td>1174,0</td>
<td>886,6</td>
</tr>
<tr>
<td>Reduced CA</td>
<td>0,0048</td>
<td>0,0023</td>
<td>213,8</td>
<td>133,6</td>
<td>1782,1</td>
<td>1160,1</td>
</tr>
<tr>
<td>Overt CA</td>
<td>0,0040</td>
<td>0,0027</td>
<td>237,7</td>
<td>165,3</td>
<td>1877,5</td>
<td>1561,8</td>
</tr>
</tbody>
</table>

Low value | High value

Discussion (Jantunen et al. 2020)

- Overt CA
- Reduced CA
- Subtle CA
- Non-CA

Strong CA
- The head and the torso move on a large area
- Head and torso movements are fast
- The head and the torso move and stop a lot

Weak CA
- The head and the torso move on a small area
- Head and torso movements are slow
- Head and torso movements are continuous

More on the kinematics of constructed action:

What Comes First: Combining Motion Capture and Eye Tracking Data to Study the Order of Articulators in Constructed Action in Sign Language Narratives

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Abstract
We use synchronized 120 fps motion capture and 50 fps eye tracking data from two native signers to investigate the temporal order in which the dominant hand, the head, the chest and the eyes start producing overt constructed action from regular narration in seven short Finnish Sign Language stories. From the material, we derive a sample of ten instances of regular narration to overt constructed action transfers in ELAN which we then further process and analyze in Matlab. The results indicate that the temporal order of articulators shows both contextual and individual variation but that there are also repeated patterns which are similar across all the analyzed sequences and signers. Most notably, when the discourse strategy changes from regular narration to overt constructed action, the head and the eyes tend to take the leading role, and the chest and the dominant hand tend to start acting last. Consequences of the findings are discussed.
Processing the meaning of constructed action

EEG pilot data

1. Signers
   • 2 deaf L1 and 2 hearing L2 FinSL signers
   • Ages between 30–45 years
   • “Sit in the chair and look at signed videos.”

2. EEG
   • 64 electrode EEG recording system
   • EGI with NetStation software, Bittium NeurOne
   • N400 ERP

3. Stimulus material
   • 5-sentence set x 50
   • In each set: 1 control and 4 violated sentences
   • Violations: 1 lexical only, 3 lexical with CA
N400

• The most widely used ERP (Event-Related Potential) in language context.
• A negative-going deflection that peaks around 400 ms after the stimulus onset.
• The typical task used to record the N400 involves a sentence and a semantically violated, but syntactically correct, word.
• N400 is believed to reflect the brain’s response to the processing of meaning.
• The amplitude of the response seems to be proportional to the degree of incongruity of the violation.

Questions

• Q1: Is the underlying brain processing of meaning (the amplitude and the latency of the N400 ERP) in native FinSL signers different in RT and CA and its three degrees, and if so, how?

• Q2: Are the three degrees of CA processed as a continuum with RT in the brain?
Selected pilot results
Discussion (Hernández et al., in progress)

- **Violation is difficult or very difficult to process**
- **Violation is relatively easy to process**
- **Violation is relatively difficult to process**
- **Violation is difficult or very difficult to process**

HERNÁNDEZ, D., Puupponen, A. & Jantunen, T. (in progress). The brain processing of meaning in constructed action and regular telling – An ERP study [a working title].
Discussion and conclusion

Showing and telling in a hybrid system
A hybrid system

- The term encapsulates the idea that language comprises mixed parts.
- Here: Some parts are discrete/conventional, other gradient/unconventional.
- The parts cannot be distinguished from each other.
- Cf. Enfield’s (2009) claim that utterances are multimodal composites.
- Floyd (2016): Spoken language grammar is a modally hybrid entity.
- Dingemanse (2018): Ideophones are a unimodally hybrid word class.

A tentative heatmap of FinSL as a hybrid system

[Heatmap diagram showing varying shades from blue to red across categories of form and meaning, showing, telling, overt CA, reduced CA, subtle CA, and no CA.]
Conclusion

• Showing the meaning and telling the meaning are connected.
• The connection between showing and telling is a complex one.
• Different methods bring out different aspects of the connection.
• The nature of the connection speaks for the hybrid system interpretation.
Thank you!

The author wishes to thank collectively all the wonderfull people who have participated in the studies presented either as participants or co-authors.