On the rhythm of head movements in Finnish and Swedish Sign Language sentences

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Abstract

This study is based on 16 declarative sentences (8 for FinSL and 8 for SSL) produced by 8 (4+4) signers. The sentence boundaries were always layered with a clause-boundary annotation, the boundary was counted as occurring simultaneously with a clause-boundary annotation; the boundary was counted as occurring simultaneously with the movement of the head change direction. The general finding that FinSL and SSL sentences were investigated both qualitatively (via visual observation) and with the linear correlation coefficient (r).

The authors also gratefully acknowledge the financial support of Emil Aaltonen Foundation, and SSL, and, in the future work on rhythm, also articulators other than the head must be dealt with.

Results – Question 1

i. The signs of both languages similarly and quite often were found to associate clause-boundaries with instances when the movement of the head changed direction (see Table 1).

ii. None of the three dimensions (yaw, pitch, roll) were particularly favored or avoided in the marking.

The sentence boundaries were always layered with a clause-boundary annotation, the boundary was counted as occurring simultaneously with the movement of the head change direction.

Results – Question 2

i. The results show both similarities and differences (see Figure 4).

ii. A notable similarity in the results was that, in both languages, the roll movement of the head was larger in the opening section of sentences than in the closing section (a perfect positive correlation).

iii. In the yaw and pitch dimensions the results show big differences between FinSL and SSL (yaw r=-0.09, i.e. a near perfect negative correlation, pitch r=0.19, i.e. no linear correlation).

Methodology – General issues

- The research material also includes 3D numerical data on the head movements of signers describing the stories and head movements (see Figure 1).

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- The 3D data has been obtained with computer-vision technology implemented in SLMotion software.

Methodology – Research question 1

i. How do the moments when the movement of the head changes direction contribute to the marking of clause-boundaries in FinSL and SSL?

ii. How are the movements of the head distributed in terms of their amplitude in FinSL and SSL sentences?

On the interpretation of the results

- If the results show valid correlation differences between FinSL and SSL, we consider the rhythm of the movement of the head in the sentences of the two languages to be different; otherwise, we interpret the rhythm to be similar in terms of the investigated parameters.

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Table 1. The absolute and relative percentages of clause-boundaries annotated in a moment when the movement of the head changes direction in the productions of four FinSL and four SSL signers.

<table>
<thead>
<tr>
<th>Language</th>
<th>Opening Section</th>
<th>Middle Section</th>
<th>Closing Section</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FinSL</td>
<td>50%</td>
<td>50%</td>
<td>45%</td>
<td>48%</td>
</tr>
<tr>
<td>SSL</td>
<td>40%</td>
<td>45%</td>
<td>50%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Discussion – Question 1

- The general finding that FinSL and SSL tend to align the moments when the movement of the head changes direction with clause-boundaries at a similar frequency is not surprising given that both languages have been reported to be marked by a direction change in the movement of the head in the sentences (Figure 1).

- However, the results indicate a potential rhythmic difference between FinSL and SSL in the degree to which the languages employ the head movements in marking the roll dimension of the clause-boundary annotations: the fact that FinSL signers associated the direction change moments in the roll dimension with clause-boundaries more effectively than SSL signers did may imply a deeper underlying rhythmic difference between FinSL and SSL and, in the future work on rhythm, also articulators other than the head must be dealt with.

Discussion – Question 2

- The results show that there are more differences than similarities in the rhythmic movements of the head in FinSL and SSL sentences.

- However, the differences may not be genuine examples of language-wide rhythmic differences but simply the result of an individual variation in the data, or even deviations caused by the head tracking technology.

- In contrast, the results concerning the roll dimension may indicate that, in this dimension, there is a rhythmic similarity between the two languages – a fact that has not been previously attributed for FinSL and SSL.

General discussion & Conclusion

- We interpret the results of both questions together as suggesting that it is perhaps particularly the roll dimension of the head movement that expresses the most profound rhythmic similarities and differences between FinSL and SSL.

- Consequently, we suggest that in future work on the rhythm of head movements in sign languages the roll dimension should be given particular attention.

- The head is only one articulator involved in the creation of linguistic messages in sign languages and, in the future work on rhythm, also articulators other than the head must be dealt with.

Methodology – Research question 2

i. Each of the in-sentence was divided automatically in FinSL and SSL in three sub-sequences (see I, II and III in Figure 3).

ii. After this, the numerical ranges (R; see Figure 3) of the amplitude of the head movement for yaw, pitch and roll were calculated for each sub-sequence on the basis of the highest and lowest yaw, pitch and roll values in each sub-sequence (see the red and green dots in Figure 3).

iii. Signer-specific range values were employed to calculate language-specific averages for the change in the amplitude of the head movement in the sentences (A1, A2, and A3 in Figure 3).

iv. The similarities and differences between the two languages were investigated both qualitatively (via visual observation) and with the linear correlation coefficient (r).

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