Simultaneous signing and speaking - what happens to prosody?

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Abstract
The present paper makes some preliminary hypotheses about the prosodic restrictions on simultaneous speaking and signing in TSS, sign as support for speech reading.

1 Introduction
The work discussed in this paper is done within the TSS-project. In this project different aspects of signing used as support for speech reading and/or auditive speech perception by adult deafened or hearing-impaired persons, are studied. The project is financed by Hörselskadades riksförbund (the Swedish society of the hearing impaired). The first report from the project will be published this spring.

TSS stands for Tecken Som Stöd (Eng. Sign as support). In TSS, signs borrowed from the Swedish-Sign-Language are used together with spoken Swedish. The relation between the signs and the words are described as simultaneous and redundant. Only content words are accompanied by signed equivalents. No grammatical morphemes are accompanied by signed equivalents. No Swedish-Sign-Language grammar is used. This means that inflected Swedish words are pronounced synchronous with uninflected signs, or signs in citation form (Wolf 1991).

Example
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English: one   gets so fine friends
Speech:  man   får  så fina vänner
Sign: .  .PEK  FÅ   SÅ FIN  VÄN
English:.POINT GET  SO FINE FRIEND
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Comments: Signs are written as Swedish glosses in capitals. Differently directed points are the sign-language equivalents to spoken pronouns. English: is a word by word translation of the Swedish, uppermost line, and the SSL-signs, bottom line.

2 The demand for synchrony
To produce signs and words with similar meaning simultaneously is reported to be difficult to learn and much time is dedicated to this in TSS-training.

It is not just when signs and words with similar meaning are written down that they appear to be of different length. Also when they are articulated they are of different length. This is part of the explanation of the difficulty to obtain perfect synchrony in TSS. Another explanation is that not all the Swedish morphemes have signed equivalents. Not only inflectional endings and many grammatical morphemes are left out but also some other words of different word classes are left out, especially short words.

Example
```
Eng: and also  stand so here alone / which one  never did   before
Sp:  å   även  stå   så här ensam / vilket man aldrig gjorde förut
Si:       OCKSÅ… STÅ         ENSAM / VILKET      ALDRIG GÖRA  FÖRUT
Eng:      ALSO  STAND        ALONE / WHICH       NEVER  DO    BEFORE
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Comments: '/' = short pause, Sp: = speech, Si: = sign, Eng: = English

Therefore, even if the equivalent signed and spoken morphemes took exactly the same time to pronounce, one would expect synchrony problems.

Manual articulation is as a rule slower than oral articulation (Klima & Bellugi 1979) and this also constitutes a problem for the synchronous articulation.

It may seem that the fact that not all morphemes have signed equivalents could compensate for the slower manual articulation. This is not the case, though. Sometimes the word takes longer to pronounce than the equivalent sign, and sometimes the sign takes longer to pronounce than the equivalent word. There is no phonological equivalence or even similarity between the signs and the Swedish words (Bergman 1977). There is not even equivalence on word level. Sometimes one sign corresponds to a whole spoken phrase and sometimes one word must be translated by a complete signed phrase. The latter case is as a rule avoided in TSS, though, by stipulating new meanings of borrowed signs or by inventing new signs.

Beginners' TSS is typically very much non-fluent. The Swedish prosody is much interrupted and one word-plus-sign at a time is produced with clear junctures in between. Frequent users seem to sign and speak simultaneously in a fluent way and to obtain this they use different types of adaptations of signs and prosody. Adaptations are thus made both in speech and sign. Since Swedish explicitly is the primary code and signing is just supportive in TSS, one would expect that most adaptations be done in the signed part. And this also seems to be the case.

3 Adaptations made in TSS in order to obtain synchrony
When making adaptations one relies much on speech rhythm in order to match sign and speech temporally and semantically. This is noticeable in speech as enhanced rhythm in the spoken part of TSS.

I will take my point of departure in a concrete example, to show how sign and speech can be synchronised in TSS.

Example
```
Eng: /// ye TSS have  given the possibility to dare communicate / in group
Sp:  /// ja TSS har   gett   den möjligheten å  våga kommunicera / i  grupp
Si:  ///    T-S-S-h… GE-r…………  MÖJLIGHET-h…………VÅGA KOMMUNICERA……
Eng: ///    T-S-S-h… GIVE-r………  POSSIBILITY-h…….DARE COMMUNICATION GROUP………
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Comments: -r = repeated, -h = hold, '……' = the temporal extension of the word or sign.

The bold-faced words are content words and have more prosodic prominence in the text than the other words, which are unstressed. One can easily see that there are signed semantic equivalents to all the bold-faced words.

In the example T-S-S is manually spelled. The last sign S is held out, i.e. the hands remain in the S-position and are not lowered until the end of the auxiliary *har* (Eng. have), which is part of the verb phrase. Then follows the main verb of that verb phrase and another content sign GE (Eng. give). GE is repeated and lasts as long as the spoken words <u>gett den</u> (Eng. give the). That is, it accompanies not only the verb but also the definite article of the noun. The

sign MÖJLIGHET (Eng. possibility) is also held out during the pronunciation not only of the definite ending –en but also during the infinitive marker of the following verb. The sign GRUPP begins at the same time as the phrase i grupp (Eng. in group) and lasts as long as the phrase. In the signed part there is no equivalent to the pause in the spoken part, but the sign KOMMUNICERA covers that pause.

The duration of the signs in relation to the spoken morphemes is not at all delimited by grammatical boundaries. In that case it would have looked something like the below:

Example

```
Eng: ye TSS    have given the possibility to dare   communicate / in group
SP:  ja TSS    har  gett  den möjligheten å  våga    kommunicera / i grupp /
Si:     T-S-S  GE.................. MÖJLIGHET.............. VÅGA............... KOMMUNICERA GRUPP.........
Eng:    T-S-S  GIVE-r............ POSSIBILITY-h...... DARE............ COMMUNICATION GROUP.../
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Comments: -r = repeated, -h = hold, '......' marks the temporal extension of the word or sign.

That is each content sign would have the duration of the corresponding verb phrase or noun phrase to which it corresponds. Instead we find that a new sign always seems to begin at the same time as the main morpheme of each phrase, regardless of phrase boundaries. In prosodic terms this means that a sign does not begin at the same time as an unstressed syllable. Rather it seems that the onset of the stressed syllable somehow triggers the signs. To test this hypothesis one needs to study the temporal relations in great detail. Unfortunately this has turned out to be technically problematic, but I hope to be able to do it eventually. It seems obvious, though, that stress-pattern and syllable structure rather than semantic and grammatical grouping determine the temporal relationship between signs and spoken morphemes.

Frequent and fluent signers themselves report that they master the synchrony without difficulty. It is important to compare both perceivers' and producers' experiences of synchrony in TSS with the actual temporal properties of it, and I plan to continue with this line of research.

4 Discussion

I can at present only speculate about the theoretical significance of this type of temporal matching between signed and spoken in TSS. The pattern may depend on language production constraints and/or be an adaptation to the needs of language perception.

It probably also has to do to with general rhythmic constraints. That is, one cannot easily perform two different types of motor activity in different rhythm and therefore one tends to co-ordinate the beats of the two activities, in this case speaking and signing. If this is the case one would expect to find a resemblance in ordinary spoken face-to face interaction which includes non-verbal gestures. Non-verbal gestures in ordinary spoken interaction have a different function in the interaction, though, than the signs of TSS. The non-verbal gestures are used in contexts where also the parts of speech, which are not stressed, can be perceived by the listener and this is not the case with TSS. However, the issue of prominence is important in both cases. From my study of TSS, it seems that prominence rather than word class is the deciding factor for which words ought to be accompanied by signed equivalents (Nelfelt forthcoming).

The results are very important for TSS-teaching. It indicates that one should train rhythmic and prosodic performance at least much as content relations and grammatical structure. The results are also theoretically interesting with regard to language planning and language perception.

References

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