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 Hörskekadades riksförbund (the Swedish society of the hearing impaired). The first report from the project will be published this spring.

TSS stands for Teeken Som Stod (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

English: one gets so fine friends
Speech: man får så fina vänner
Sign: . . PEK FÅ SÅ FIN VÄN

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 så här ensam / vilket man aldrig gjorde förut
Si: OCKSÅ STÅ ENSAM / VILKET ALDRIG GöRA FÖRUT
Eng: ALSO STAND ALONE / WHICH NEVER DO BEFORE

Comments: 'r' = 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 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-signs 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 kommunicera i grup
Si: /// T-S-S-h, GE-r- h... MÖJLIGHET-h... KOMMUNIKERA...
Eng: /// T-S-S-h, GIVE-r- POSSIBILITY-h... DARE COMMUNICATION GROUP-

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 interrupted and one word-plus-sign at a time is produced with clear junctures in between.
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 & våga kommunicera / i grupp /
SI: T-S-S GETTTEN MÖJLIGHE--EN & VÅGA KOMMUNICERA / I GRUPP/
Eng: T-S-S GIVE-r-- POSSIBILITY-h-- DARE-- COMMUNICATION GROUP.../ 

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 with general rhythmic constraints. That is, one cannot easily
perform two different types of motor activity in different rhythm and therefore one tends to
coo-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**