

Experimental evidence for stroke-to-stroke turn-boundary prediction in signed conversations

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In spoken interactions, interlocutors carefully plan and time their utterances, minimising gaps and overlaps between consecutive turns (Sacks, Schegloff & Jefferson 1974). Cross-linguistic comparison has indicated that spoken languages vary only minimally in terms of turn-timing, with mean overall turn transition times of 229ms, and language-specific average turn transition times within ranging from -31 to 479ms (Stivers et al. 2009). Pre-linguistic vocal turn-taking has also been attested in the first half year of life (Hilbrink, Gattis & Levinson under review). These observations suggest that the turn-taking system may provide a universal basis for our linguistic capacities (Levinson 2006). It remains an open question, however, whether this precisely-timed turn-taking is a sole property of the spoken modality.

It has been suggested that signers may show greater tolerance for overlapping turns at talk due to the characteristics of the visual modality. In signed conversation, visual feedback does not interfere with sign-production in the same way that auditive feedback does when speaking (Emmorey, Bosworth & Kraljic 2009). This suggests that if overlap avoidance during turn-taking is motivated by channel limitations (the difficulty of hearing and speaking at the same time), then signed turn-timing should be characterized by a higher proportion of overlapping turns. Additionally, Coates & Sutton-Spence (2001) argue that, unlike speakers, signers do not attend to the one-at-a-time principle, and instead form a collaborative floor with their interlocutors, thus having a higher degree of social tolerance for overlap.

Recent corpus analyses of spontaneous conversation in Sign Language of the Netherlands (Nederlandse Gebarentaal; NGT) have revealed that, although simultaneous signing is more frequent in NGT than overlapping speech in many spoken languages, the additional overlap may come as a consequence of having larger and slower articulators (de Vos, Torreira & Levinson, in press). For spoken languages, which rely on quick oral articulations, the start and end of a turn is clear: approximately when vocalization begins and ends. But for signed utterances, the beginnings and ends of utterances are bookended by preparatory and retractive movements—movements that don't bear turn-related content (Kita, van Gijn & van der Hulst 1998).

De Vos et al. (in press) hypothesized that, because of this, signers might perceive their turns as starting and ending with the content-bearing movements (stroke-to-stroke) and not with all movements altogether (preparation-to-retraction). When they calculated the timing of turn transitions in NGT with stroke-to-stroke turn boundaries instead of preparation-to-retraction boundaries, they found that NGT transition timing and turn overlap were consistent with the documented averages for spoken turn taking. Stroke-to-stroke boundary perception is then a potentially critical mechanism for linking signed to spoken turn-taking behaviors. But there is currently no experimental evidence that supports the psychological reality of stroke-to-stroke turn boundaries for sign language users.

Several studies have now shown that, when asked to listen to a conversational turn, spoken language users can precisely indicate the moment just before that turn ends (by pressing a button; de Ruyter, Mitterer & Enfield 2006). The present study uses this same experimental technique to explore whether sign language users can predict the upcoming end of ongoing turns when the “end” is defined as the end of the last stroke (the stroke-to-stroke hypothesis) rather than the end of the last movement (the preparation-to-retraction hypothesis).

We asked 52 deaf signers to watch 80 short video sequences. Each experimental item was presented as a sequence containing the context and a target-turn video clips segmented from

spontaneous NGT conversation. An example stimulus item can be viewed at: <http://hdl.handle.net/1839/00-0000-0000-0020-6C0D-C@view> Participants were asked to watch the context and then, when one signer disappeared, to focus on the remaining signer and try to press the button at the moment they anticipated that the turn would end. They were told that, if they saw the screen freeze at the end to press the button as quickly as possible because they had already reached the end of the turn. This gave us a measure of their predictive and reactive button-presses across the stimuli. The task lasted approximately 20 minutes.

Our results indicate that signers indeed anticipated turn boundaries at the ends of turn-final strokes. Signers often responded early, even at potential turn-ends that preceded the actual turn end, mirroring findings from experimental and naturalistic turn-end anticipation with spoken language users (de Ruiter et al., 2006; Holler & Kendrick, 2015). They also responded later for questions than for non-questions, though younger signers and signers who received earlier linguistic input were less likely to show this difference. These results are the first to experimentally support the idea that signers use something like stroke-to-stroke turn boundaries to coordinate their turns in conversation. They also suggest that linguistic processing, here represented by participant age and age of sign acquisition, plays a role in the ability to use precisely-timed turns in conversation.

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