Eye gaze as a predictor for multimodal alignment

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Interactive language use inherently involves a process of coordination, which often leads to matching behaviour between interlocutors at different semiotic channels: speakers align in terms of lexical choice (Garrod & Anderson 1987, Brennan & Clark 1996), prosodic features (Giles & Powesland 1975, Lewandowski 2012, Szczepek Reed 2010) or syntax (Branigan et al. 2007, Gries 2005). Also at many non-verbal levels alignment has been demonstrated: mannerisms such as nose rubbing and foot shaking (Chartrand & Bargh 1999); headshakes, nods, laughter and eyebrow raising (Louwerse et al. 2012), posture (Shokley et al. 2003), and even heart rates (Konvalinka et al. 2011). Which factors, now, might enhance how often and when interlocutors copy each other's behaviour? In two case studies we demonstrate the role of eye gaze in enhancing lexical and gestural alignment.

Studies by Postma et al. (2013) and Wang et al. (2011, 2014) show that eye contact between interlocutors increases or speeds up alignment in terms of (resp.) intonation and hand gestures. In this paper, we take these observations from 'clean' lab conditions to the 'messiness' of spontaneous face-to-face interaction. Moreover, we not only study the role of eye contact (viz. fixating the face of the conversational partner), but also the role of gesture fixations.

Using data from head-mounted eye-trackers in a corpus of face-to-face conversations (Brône & Oben, in press), we measure the effect of gaze on alignment. For lexical alignment, we found that if addressees are being looked at, they align more than when they are not being looked at. At the gestural level, there was no such effect, but gaze still played a significant role in explaining alignment: if addressees fixate on a gesture by the speaker, they significantly align more often to that gesture in subsequent gesture production, compared to if they don't fixate on the initial gesture. Mixed effects models with alignment as dependent variable, gaze behaviour as independent variables and speakers as random factor, confirmed these effects are significant.

Our results are relevant, because they show that even in face-to-face conversation, where gaze serves many different functions at the same time, it still systematically correlates with higher alignment rates. Furthermore, the results indicate that both social aspects of gaze ('being looked at') as well as perception-tied, cognitive aspects (fixating on a gesture) shape interactional alignment. From a methodological point of view, we show how mixing techniques from corpus linguistics and experimental psycholinguistics can be useful in accounting for complex phenomena such as alignment.

References

Branigan, H., Pickering, M., McLean, J. & Cleland, A. (2007). Participant role and syntactic alignment in dialogue. *Cognition* 104, 163-197.

Brennan, S. & Clark, H. (1996). Conceptual pacts and lexical choice in conversation. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 22, 1482–93.

Brône, G. & Oben, B. (in press). InSight Interaction. A multimodal and multifocal dialogue corpus. *Language Resources and Evaluation*, doi: 10.1007/s10579-014-9283-2.

Chartrand, T. & Bargh, J. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology* 76, 893–910.

Garrod, S. & Anderson, A. (1987). Saying what you mean in dialogue: A study in conceptual and semantic co-ordination. *Cognition* 27, 181–218.

Giles, H. & Powesland, P. (1975). *Speech styles and social evaluation*. New York: Academic Press.

Gries, S. (2005). Syntactic Priming: A Corpus-based Approach. *Journal of Psycholinguistic Research* 34, 365-399.

Konvalinka, I., Xygalatas, D., Bulbulia, J., Schjødt, U., Jegindø, E., Wallot, S., Van Orden, G. & Roepstorff, A. (2011). Synchronized arousal between performers and related spectators in a fire-walking ritual. *Proceedings of the National Academy of Sciences of the United States of America* 108, 8514-8519.

Lewandowski, N. (2012). *Talent in nonnative phonetic convergence* (Unpublished doctoral dissertation). Universität Stuttgart, Stuttgart.

Louwerse, M., Dale, R., Bard, E. & Jeuniaux, P. (2012). Behavior matching in multimodal communication is synchronized. *Cognitive Science* 36, 1404-1426.

Postma, M., Brunninkhuis, N. & Postma, E. (2013). Eye Gaze Affects Vocal Intonation Mimicry. *Proceedings of the 35th Annual Conference of the Cognitive Science Society,* 1139-1144.

Shockley, K., Santana, M. & Fowler, C. (2003). Mutual interpersonal postural constraints are involved in cooperative conversation. *Journal of Experimental Psychology: Human Perception and Performance* 29, 326–332.

Szczepek Reed, B. (2010). Prosody and alignment: A sequential perspective. *Cultural Studies of Science Education* 5, 859-867.

Wang, Y., Newport, R. & Hamilton, A. (2011). Eye contact enhances mimicry of intransitive hand movements. *Biology Letters* 7, 7–10.

Wang, Y. & Hamilton, A. (2014). Why does gaze enhance mimicry? Placing gaze-mimicry effects in relation to other gaze phenomena. *The Quarterly Journal of Experimental Psychology* 67, 747-762.