EARLY PREPARATION IN QUESTION-ANSWERING: HOW MUCH DO SPEAKERS ACTUALLY PREPARE?

Ruth Corps, Laura Lindsay, & Martin Pickering (University of Edinburgh)
Ruth.Corps@ed.ac.uk

Conversation is a puzzle: Even though formulating an utterance takes at least 600 ms [1], interlocutors' turns are so finely coordinated that there is often little gap between their contributions [2]. Most theories agree that interlocutors achieve such timing by predicting what the current speaker is likely to say (a content prediction), so that they can prepare their response (an early-planning hypothesis; [3]). In other words, comprehension and production overlap. But how much of their response do listeners actually prepare in advance?

One possibility is that listeners prepare all aspects of their complete response (e.g., a complete sentence) early, as soon as they can predict the content of the speaker's utterance [4]. Preparing in this way will facilitate the timing of turn-taking because the timing burden of response preparation is removed from the language production system: Listeners will have prepared all aspects of their complete response, and so will only need to time articulation. But this benefit may be outweighed by the cognitive demands associated with preparing and buffering a response while simultaneously comprehending [5]. Listeners could minimise interference between production and comprehension by preparing incrementally, so that they prepare part of their response prior to articulation but postpone the rest until the end of the incoming turn [6].

We test between these two possibilities in two question-answering experiments, one of which we are still collecting data for. In both experiments, the critical information necessary for response preparation was available either early or late in the question (see Table 1; [7]), and so we manipulated whether participants could prepare their answer early, well before the end of the speaker's question, or late, towards the end of the question. Importantly, we also manipulated the length of these answers, so they were either short (*M* word length=1.01) or long (*M*=2.27), and so we could determine how much of their answer participants prepared before articulating. We analysed answer times using linear-mixed effects models, with maximal random structure.

In Experiment 1, participants (N=42) answered more quickly when the critical information necessary for preparation was early (*M*=357 ms) rather than late (*M*=797 ms; *t*=-5.06), replicating previous findings [7] and suggesting that listeners prepared their response as early as possible. Participants also answered more quickly when answers were short (*M*=557 ms) rather than long (*M*=596; *t*=-1.96), suggesting it took more time to prepare a longer answer. There was a marginally significant interaction between these two predictors (*t*=1.92), and follow-up analyses suggested participants were affected by the length of the to-be-prepared answer when they prepared late (*t*=-2.69; Table 1), but not when they prepared early (*t*=-0.66).

Experiment 1 provides some evidence that participants prepared their complete response early. But this interaction was not significant, and the length effect was relatively weak (*t*=1.96). As a result, we are conducting a follow-up experiment (N=48, current sample N=12), in which there is a greater difference in the word length of answers in the short (*M*=1.01) and long (*M*=3.64) conditions to determine whether participants adopt a non-incremental strategy even when answers are longer, multi-word phrases. We will analyse these data using the same strategy employed for Experiment 1. But if the interaction is again null, we will additionally compute Bayes factors for this null result.

These findings will provide insight into how interlocutors manage the timing demands of concurrent response preparation and comprehension in conversation. If next-speakers prepare incrementally, then it would suggest that they are sensitive to the cognitive demands of overlapping comprehension and production, and use incremental planning as a strategy to avoid interference between these two processes. Alternatively, if next-speakers prepare completely, then it would suggest they value timing over minimising processing load.

References

[1] Ferreira, F. (1991). Effects of length and syntactic complexity on initiation times for prepared utterances. *Journal of Memory and Language, 30,* 210-233.
[2] Stivers, T., Enfield, N. J., Brown, P., Englert, C., Hayashi, M., Heinemann, T., . . . & Levinson, S. (2009). Universals and cultural variation in turn-taking in conversation. *Proceedings of the National Academy of Sciences, 106,* 10587-10592.
[3] Garrod, S. & Pickering, M. J. (2015). The use of content and timing to predict turn transitions. *Frontiers in Psychology, 6,* https://dx.doi.org/10.3389/fpsyg.2015.00751.
[4] Levinson, S. C. & Torreira, F. (2015). Timing in turn-taking and its implications for processing models of language. *Frontiers in Psychology, 6,* https://dx.doi.org/10.3389/fpsyg.2015.0073.
[5] Fairs, A., Bögels, S., & Meyer, A. S. (2018). Dual-tasking with simple linguistic tasks: Evidence for serial processing. *Acta psychologica, 191,* 131-148.
[6] Konopka, A. E. (2012). Planning ahead: How recent experience with structures and words changes the scope of linguistic planning. *Journal of Memory and Language, 66,* 143-162.
[7] Bögels, S., Magyari, L., & Levinson, S. C. (2018). Neural signatures of response planning occur midway through an incoming question in conversation. *Scientific Reports, 5,* https://dx.doi.org/10.1038/srep12881.

Table 1. Example stimuli for both Experiments 1 and 2. The critical information for preparation for the short conditions is *Barks*, while the critical information for the long conditions is *Harry Potter*

Answer Length	Critical Information Availability	Question	Mean RT
Short	Early	Which animal barks and is also a common household pet?	396 ms
	Late	Which animal is a common household pet and also barks?	701 ms
Long	Early	Which platform, that appears in Harry Potter, can be found at Kings Cross Station?	301 ms
	Late	Which platform can be found at Kings Cross Station and appears in Harry Potter?	889 ms