

Early preparation during question-answering: Speakers prepare content but not form

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Conversation is a puzzle: Formulating an utterance takes at least 600 ms [1], but 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, so that they can prepare a response early while still comprehending (the early-planning hypothesis; [3]). But do speakers prepare as much of their response as they can?

One possibility (an *early-form* account; [4]) is that speakers complete all stages of formulation early, and so they prepare both the content and the form of their turn while still comprehending. Preparing in this way removes the timing burden of response preparation from language production: Speakers know what they will say and how they will say it before articulating. But dual-tasking production and comprehension is cognitively demanding [5] and preparation may interfere with concurrent comprehension [6]. As a result, speakers may minimise these cognitive demands by preparing the content of their turn early, but the form late (a *late-form* account).

We tested between these hypotheses in two experiments using a verbal question-answering task using questions with high answer agreement (as determined by pretest). In both experiments, the critical information necessary for response preparation was available either early, so that participants could prepare their answer before question end, or late, so that they could not (see Table 1; [7]). To determine whether participants who prepared their answer early did so all the way up to form, we manipulated the length of to-be-prepared answers, so that they were either short (single word) or longer (multi-word) answers. 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 occurred early ($M=388$ ms) rather than late ($M=824$ ms; $t=-4.85$), suggesting they prepared the content of their answer early. Participants also answered more quickly when their answer was short ($M=578$ ms) rather than long ($M=631$; $t=-1.93$), and there was some evidence that this effect depended on when participants prepared the content of their answer ($t=2.11$): They were affected by answer length when they prepared late ($t=-2.83$), but not when they prepared early ($t=-0.54$).

Experiment 1 provides some evidence that participants prepared the form of their answers early, supporting an early-form account and suggesting participants completed all stages of formulation. However, the effect of answer length was small and the effect was only marginally significant. This weak effect could have occurred because the difference in the average word length of answers in the short-answer and long-answer conditions was also quite small ($M^{\text{difference}}=1.26$). In Experiment 2, we therefore increased the word length of answers in the long-answer condition (from M of 2.27 words in Experiment 1 to 3.64 words in Experiment 2).

In Experiment 2, participants (N=92) again answered more quickly when the critical information necessary for preparation occurred early ($M=252$ ms) rather than late ($M=852$ ms; $t=-8.68$). Participants also answered more quickly when answers were short ($M=405$ ms) rather than long ($M=698$; $t=-2.79$). Unlike Experiment 1, however, there was no interaction ($t=0.07$): The difference between the two answer conditions was 270 ms for early questions and 297 ms for late questions. The Bayes Factor for this interaction was 0.49, providing no evidence for the alternative hypothesis.

Together, our findings are consistent with a late-form account and suggest that participants prepared the content of their answers early, but prepared the length late. These results provide insight into how speakers manage the cognitive demands of overlapping production and comprehension. In particular, speakers adopt a strategy that enables partial, but not complete, preparation, so that they can still allocate resources to comprehension.

References

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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	Question	Mean RT E1 (ms)	Mean RT E2 (ms)
Short	Early	Which animal barks and is also a common household pet?	427	109
	Late	Which animal is a common household pet and also barks?	711	701
Long	Early	Which platform, that appears in Harry Potter, can be found at Kings Cross Station?	330	379
	Late	Which platform can be found at Kings Cross Station and appears in Harry Potter?	933	998