

### PRO beats gap, revisited: Eyetracking evidence

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Several early results in the literature on filler-gap processing (Frazier, Clifton and Randall, 1983; Crain & Fodor, 1985; Clifton & Frazier, 1986) suggested that in the course of incremental comprehension, the null pronominal PRO is initially posited in preference to a gap corresponding to a previously encountered *wh*-filler. Using methods such as self-paced reading and RSVP, these studies found an RT or comprehension advantage for sentences like (1a) compared to (1b). These results were interpreted as suggesting that in (1b) readers initially assumed a control structure, in which *begged* is followed by PRO, then had to reanalyze upon reaching the end of the sentence. To explain this phenomenon, Clifton and Frazier (1989) suggested that in fact a gap is initially posited, but is rapidly replaced by PRO when the reader obtains evidence (e.g., from the words *to sing* in (1)) of the beginning of an embedded clause. The two current experiments used eyetracking to assess readers' on-line preference for PRO over gap, and to investigate the role of verbal subcategorization restrictions.

In Experiment 1 (N = 42), we obtained evidence consistent with the claim that PRO is initially preferred over the gap. Participants read sentences like (2a-b); the matrix verb was always either *want* or *need*. In (2a), the gap is after the embedded verb (*ask*); in (2b), the gap is earlier, after the matrix verb. There was evidence of processing difficulty in (2b) compared to (2a), in the form of highly significant reading time differences, by mixed-effects models, on both on the penultimate region (*about*; go-past time 583 ms vs. 342 ms; regressions out 17% vs. 8%) and the final region (*the textbook*; go-past time 1177 ms vs. 939 ms). Consistent with prior findings, readers initially misanalyzed (2b) as a control structure, and were later forced to reanalyze.

Previous evidence is equivocal, however, as to whether comprehenders posit a control structure even when the verb does not allow one; Crain and Fodor (1985) argued that they do not, while Clifton and Frazier (1986) found evidence for processing difficulty even when, e.g., *begged* in (1b) is replaced with *forced*. In Experiment 2 (N = 32), participants read sentences like (3a-b) and (4a-b), differing in whether the matrix verb was *help*, which allows a control complement, or *make*, which does not. There was significant processing difficulty in (3b) compared to (3a), on the final region of the sentence (*in most cases*; go past time 1662 ms vs. 980 ms; regressions out 48% vs. 31%). Notably, the difference between (4b) and (4a) in the final region was in the opposite direction (go past time 1130 vs. 1284 ms). Thus, it appears that PRO is posited only when the verb does permit a control complement. In addition, this experiment demonstrates that the PRO analysis is adopted even in the absence of the word *to* as a cue to the beginning of an embedded clause. In sum, the two experiments confirm that PRO is preferred to a gap in on-line processing, but also demonstrate the parser's sensitivity to subcategorization restrictions imposed by the verb.

1. a. Everyone liked the woman who the little child begged PRO to sing those stupid French songs for \_\_\_\_.  
b. Everyone liked the woman who the little child begged \_\_\_\_ to sing those stupid French songs.
2. a. Who do you need PRO to ask \_\_\_\_ about the textbook?  
b. Who do you need \_\_\_\_ to ask Tim about the textbook?
3. a. The students that the professors help PRO advise \_\_\_\_ graduate on time, in most cases.  
b. The students that the professors help \_\_\_\_ graduate on time, in most cases.
4. a. The machines that the technicians make \_\_\_\_ operate run efficiently on solar power.  
b. The machines that the technicians make \_\_\_\_ run efficiently on solar power.