Task effects on the processing of predicate ambiguity: Distributivity in the Maze

Some behavior in sentence processing experiments can be modulated by features of the task [1, e.g.]. But these interactions have limitations: for instance, question difficulty modulates re-reading, but not first-pass reading [2]. Here we examine the limitations of a recently-documented task effect in comprehension, **early semantic commitments in the Maze task** [3].

In (A-)Maze tasks [4, 5], participants proceed through a sentence by choosing between correct continuations and high-surprisal distractors. Incorrect choices result in early termination of the sentence, and optimal performance requires incremental comprehension. [3] used the Maze to investigate the comprehension of polysemes, lexical items with multiple related senses—e.g., *newspaper* as printed object or organization. While polysemes usually remain underspecified until the end of a sentence, [6, *i.m.a.*], [3] found that in the Maze, participants commit to a sense early, and face reanalysis costs for later revision. They concluded that, faced with a task where specification is strategic, participants commit to meanings earlier.

How early do Maze participants commit? We use the task here to examine an ambiguity that can be anticipated in sentences with plural subjects. In (1), *taught two classes* can admit either a **collective** reading true for the subject as a whole, or a **distributive** reading true of each member of the subject [7]. Adverbs *together* and *each* can disambiguate, respectively. Dominant theoretical accounts [e.g. 8] suggest distributivity involves additional implicit structure. [9] and [10] observe that in reading, late (post-predicate) *each* is associated with a slowdown on following words. They conclude that predicates with plural subjects receive a default collective reading at the predicate, such that late *each* triggers costly reanalysis.

Given that verbal meaning is predicted online from features of preceding arguments [11-12], and plural subjects regularly introduce collective/distributive ambiguities, collective readings could in principle be decided upon before the predicate itself, at the subject. But neither eye-tracking [9] nor SPR [10] find evidence of reanalysis when *each* appears before the predicate.

We might predict a different pattern in the Maze. A **powerful task effects** hypothesis, where strategic demands can motivate even anticipatory commitments, could predict reanalysis costs for *each* and following words even when it occurs early. On the other hand, a **restricted task effects** hypothesis, where anticipatory commitments are impossible despite strategic value, would predict reanalysis only for post-predicate *each*, as observed in other tasks.

METHODS Prolific and (ongoing) student participants read 32 critical items (1) based on those used in [9], crossing Position (EARLY/LATE) and Meaning (TOGETHER/EACH) of a critical adverb. We analyze residualized log response latencies summed over two regions of interest, the predicate and a three-word spillover. LME models will be fit over complete samples in `brms`, taking a positive Meaning x Position interaction as critical evidence for **restricted task effects**.

Our **SPR** (*n* = 40 of 48) results are so far visually consistent with previous findings, suggesting we will find an interaction in at least the spillover region such that LATE *each* prompts reanalysis in particular. LATE conditions are also numerically read faster than EARLY across the board, as noted by [9]. This provides a baseline for evaluation of our Maze results.

Our **MAZE** (*n* = 23 of 48) results are less clear at present: LATE conditions again appear faster in general. We see no evidence of an interaction, but surprisingly, *each* seems to be associated with faster reading in the spillover, contrary to predicted reanalysis costs. 81% of trials were completed without errors, and at the moment we see no notable relationships between particular conditions and the error rate in any region of interest.

DISCUSSION This study contributes towards a broader understanding of task effects on the resolution of different types of semantic ambiguity. In particular, we hope to resolve whether task pressures of the Maze can induce anticipatory commitments to the structure of verbal meaning. If the patterns in the current sample are borne out in full, they could suggest that task-based

early commitment is indeed strikingly **powerful**: comprehenders in the Maze are not only more likely to commit to lexical meanings upon encountering a word, but they will even resolve predictable ambiguities in advance. On the other hand, if further data reveals the predicted interaction holds in both SPR and the Maze, this task effect, like others, could be shown to be **restricted** in its ability to impact linguistic processing.

What remains puzzling is the direction of comprehenders' apparent online bias in the Maze. In the current sample, Maze participants seem to default to a distributive interpretation. While certain predicates have been shown to bear a distributive bias that can surface online [10], norming of our items (n = 36) reveals a stable offline preference for collective readings. Should the online distributive bias persist, it would seem to be somehow related to performance in the Maze task, an unexpected possibility that would merit additional investigation.

(1)   Reportedly, Burt and Sierra…
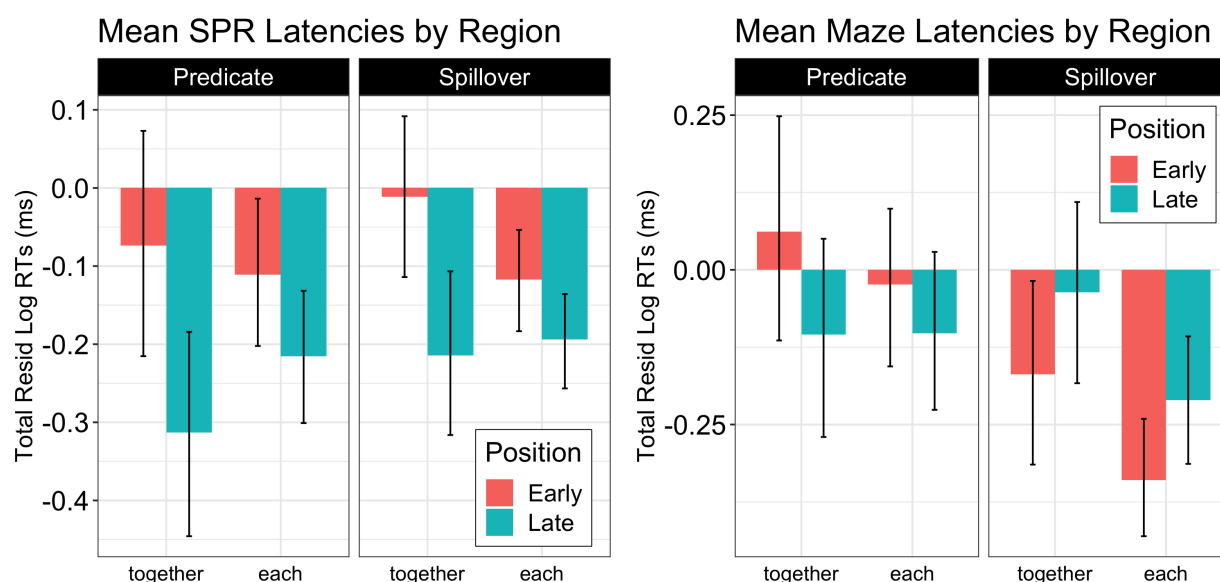
FIGURES 1 & 2: Partial results from the self-paced reading and Maze tasks. Error bars represent bootstrapped 95% CIs. Log RTs were residualized by length and position of words with a random intercept for subjects.

REFERENCES [1] Hammerly et al. (2019) *Cog Psych* 110. **[2]** Weiss et al. (2018) *QJEP* 71(1). **[3]** Duff et al. (2021) *CUNY* Short Talk. **[4]** Forster et al. (2009) *Behav Res Meth* 41(1). **[5]** Boyce et al. (2020) *JML* 111. **[6]** Frazier & Rayner (1990) *JML* 29. **[7]** Landman (1995) "Plurality" in *The Handbook of Contemporary Semantic Theory*, Blackwell. **[8]** Lasersohn (1995) *Plurality, Conjunction and Events*, Kluwer. **[9]** Frazier et al. (1999) *Cognition* 70. **[10]** Dotlačil & Brasoveanu (2021) *Glossa* 6(1). **[11]** Konieczny & Döring (2003) *Proc. of ICCS 4*. **[12]** Levy & Keller (2013) *JML* 68.