One star, two star, red star, blue star: Subsequent memory reveals both lexical and discourse influences on prosodic reduction

Rachel Peters & Scott Fraundorf (University of Pittsburgh)
sfraundo@pitt.edu

Words vary in their prosodic *prominence*, a percept realized acoustically with variation in intensity, duration, and F0 [1]. For instance, words are typically reduced in prominence the second time they are mentioned in a discourse [2]. Several explanations of this reduction have been proposed, including lexical activation [3], discourse-level availability [4], or a combination thereof [5]. Determining the source such variation may be facilitated by converging evidence from tasks other than the scene description used in most experimental studies of prominence. Here, we investigate the sources of variation in prominence by testing its relation to subsequent memory (see also [6]). If reduction in prominence partially reflects *activation* in the speaker's mind, then we might expect those items that are reduced to also be better remembered later.

     Method. Unacquainted dyads (*N* = 44 dyads) completed a version of the map task [7]. One participant, the *director*, viewed a display on the computer indicating a route through a grid of pictures. The director was audio-recorded as s/he described the route to the other participant, who drew the route on a paper copy of the display (Fig. 1; 12 directions on each of 7 maps).

     Critical pictures appeared twice in the display, allowing us to assess the degree of reduction between the first mention and the second mention. (Either 0, 1, or 3 other instructions intervened between mentions; this number varied so that second mentions were not fully predictable.) Half of the referents were in the **same-referent** condition, in which the two mentions of the same lexical item referred to the same referent in the display (e.g., *blue star* and later the same *blue star*; see example 1), a repetition at both the *lexical* and *discourse* level. The other half were in the **different-referent** condition, in which the two mentions of the same lexical item referred to different referents in contrasting colors (e.g., *red star* and later *blue star*, see example 2), a repetition at only the *lexical* level, not the *discourse* level.

     Following the last map, the director completed a free-recall task and attempted to write down the names of as many referents as possible (disregarding their color).

     Results. We measured the prominence of the critical referring expressions as a whole (e.g., *blue star*) to control for any shift of prominence within the referring expression (e.g., contrasting accenting of the color adjective). We used mixed-effects logit models (with the maximal random effects structure justified by the data) to test whether the degree of reduction predicted eventual recall—and whether this relation differed between the same- and different-referent conditions.

     For acoustic **duration** (Fig. 2, left panel), prosodic reduction predicted a higher probability of recall; recalled items had more reduction (i.e., more activation) in the earlier map task (Wald z = 3.25, p < .001). This effect did not vary across the same- vs. different-referent condition (interaction with condition: z = 0.50, p = .62), suggesting a lexical basis for the effect.

     But for acoustic **intensity** (Fig. 2, right panel), there was *no* main effect of prosodic reduction in predicting memory (z = 0.18, p = .86). Rather, reduction in intensity interacted with condition (z = 2.04, p = .04) such that recalled items had greater reduction *only* in the same-referent condition, suggesting a discourse-level effect.

     Discussion. Reduction in prosodic prominence across repeated mentions of a word predicted whether the speaker later remembered that item. As in [6], this suggests that prosodic reduction stems at least in part from cognitive activation. Further, reduction appears to reflect both *lexical* and *discourse* activation: Duration reduction predicted recall regardless of referent status and thus appeared driven by lexical repetition, but intensity reduction predicted recall only when the referent was also repeated. This is consistent with past work contrasting intensity and duration [8] and with a *multiple-source view* [5] in which reduction—and prosodic prominence more broadly—stems from multiple sources, including both lexical and referential repetition.

REFERENCES
[1] Terken & Hermes (2000), in M. Horne (Ed.), *Prosody: Theory and Experiment.* [2] Fowler & Housum (1987), *JML*. [3] Bell, Brenier, Gregory, Girand, & Jurafsky (2009), *JML*. [4] Fowler (1988), *Language and Speech*. [5] Watson (2010), in B. Ross (Ed.), *The psychology of learning and motivation.* [6] Fraundorf, Watson, & Benjamin (2015), *LCP*. [7] Anderson, Bader, Bard, Boyle, Doherty, Garrod, ...Weinert, *Language and Speech*. [8] Lam & Watson (2014), *JEP:LMC*.

EXAMPLE SENTENCES
(1a) Go from the blue star to the grey hinge.
(1b) Go from the blue star to the brown drum.　　　　[Same-referent condition]

(2a) Go from the red star to the grey hinge.
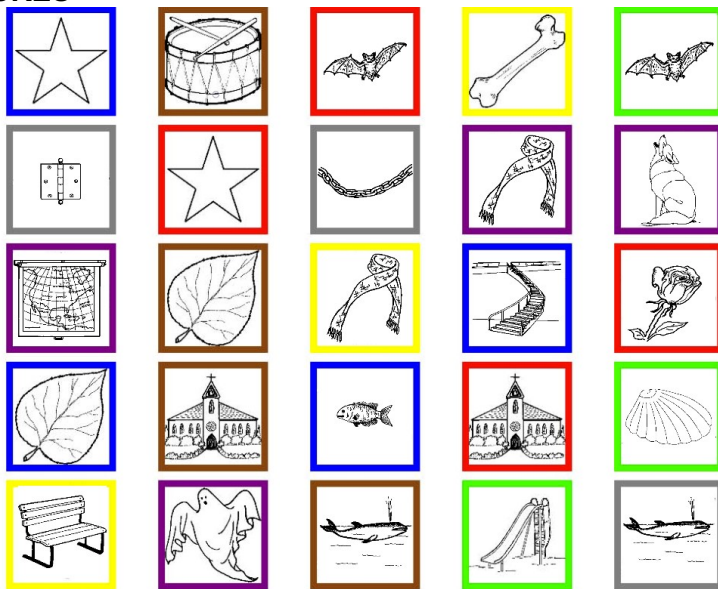(2b) Go from the blue star to the brown drum.　　　　[Different-referent condition]

FIGURES
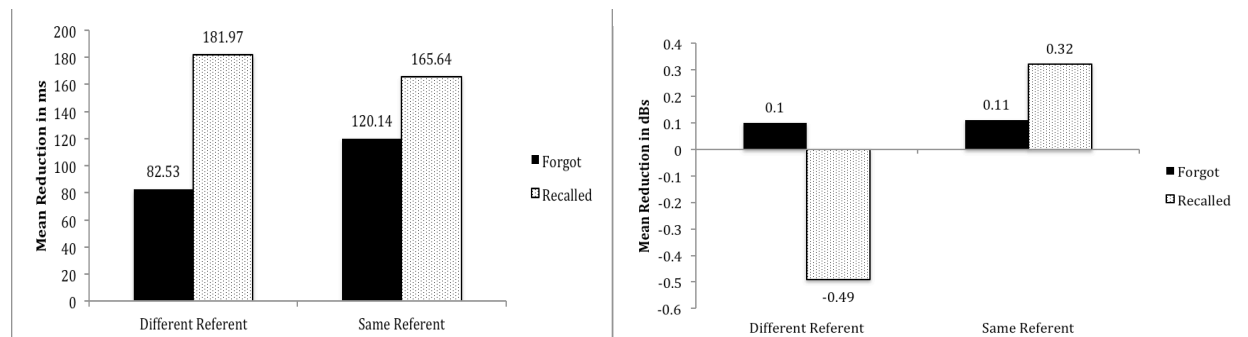

Figure 1. Example display.

Figure 2. Mean reduction in prosodic prominence as a function of subsequent recall and of referent repetition, for reduction in duration (left panel) and in acoustic intensity (right panel).