Prosodic Phrasing in English and the Processing of Agreement Attraction

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Intro – English speakers occasionally produce erroneous subject-verb agreements when a subject NP has a singular head noun and a plural noun in some lower syntactic phrase (i.e. local noun) (Bock 1991,Bock et al. 2001). Evidence from production (Eberhard 2005) and comprehension (Badecker 2007, Wagers 2009) studies have conflicting accounts for the mechanisms at play in these errors (i.e. *Marking and Morphing* and *cues-based retrieval*). As of yet, however, neither account has incorporated prosody into our understanding of agreement despite what is known about prosody's role in sentence processing (Frazier 2006). This study bridges these areas of processing by investigating the role of phrasing in the processing of subject-verb agreement. Additionally, grammatical differences between participants were considered ("standardized" vs. "non-standardized" subject-verb agreements).

Methods – The experiment was a 2x2x2 design crossing the morphological number of the local noun and verb, and presence/absence of an intonation phrase break between the local noun and verb (e.g. "The key to the cabinets (L-H%) were placed...). A ToBI trained linguist produced the 64 critical items and 64 distractor items. Participants (N = 106) listened to sentences and had 3sec to judge whether it sounded "acceptable" or "unacceptable" in a 2AFC task. Following this task was a short 2AFC task that gauged their sensitivity to the acceptability of default singular verb agreement (i.e. *was*-leveling). A dprime score was calculated for each participant from their responses in this survey.

Results – Both data were modeled using Bayesian mixed effects models. Ratings were modeled using a Bernoulli distribution and RTs with a shifted log-normal distribution. The fixed effects were the aforementioned factors with all interactions. Random effects included maximal intercepts and slopes for both participant and item. Rating data replicate findings that with a singular head noun and local noun, a plural verb drastically reduces acceptability (β=-2.72, CrI= -3.21,-2.24) but that with a local plural noun instead, acceptability increases (β= 1.85, CrI=1.30,2.41). The model for RTs shows that a mismatch in number of the head and local nouns resulted a slow-down in RT (β= 0.104, CrI=0.028,0.049) relative to number matched conditions. As for main effects of grammaticality and phrasing, there is weak evidence of a small to negligible effect that ungrammatical sentences resulted in slower RTs (β= -0.044, CrI= -0.102, 0.014) than grammatical sentences and that a prosodic break resulted in slower RTs (β=-0.045, CrI= -0.096, 0.006) than when no break was present. The model also shows that there is strong evidence that the slowdown in RT for mismatched number is dimished when there is a prosodic break (β=-0.106, CrI= -0.212, 0.001). In a three-way interaction between local noun, verb number, and response type, an effect of agreement attraction was found such that *unacceptable* responses were much slower in the presence of a plural local noun and plural verb (β=0.248, CrI=0.034,0.461) than when the local noun was singular. The insertion of a prosaic break reduced the difference in RTs between response types in match and mismatch conditions, as compared to when no break was present (β=-0.106, CrI= -0.212, 0.001).

Discussion – The results show that a mismatch in morphological number results in a processing penalty for agreement, as shown by Staub (2009). This is across both grammatical and ungrammatical sentences. However, this effect only appears when the local noun and verb are prosodically phrased into the same intonational phrase. When phrased separately, the interference of the plural local noun is ameliorated. This is seen by comparing the difference in RTs for acceptable and unacceptable responses for agreement attraction sentences based on the presence or absence of a prosaic break. The RT for correct rejections (i.e. *unacceptable*) is much faster when a break is present. One explanation is that the local noun is less accessible as a source of agreement because of the prosodic hierarchical distance between it and the verb. I propose this mediates its interference in a similar way to syntactic depth.

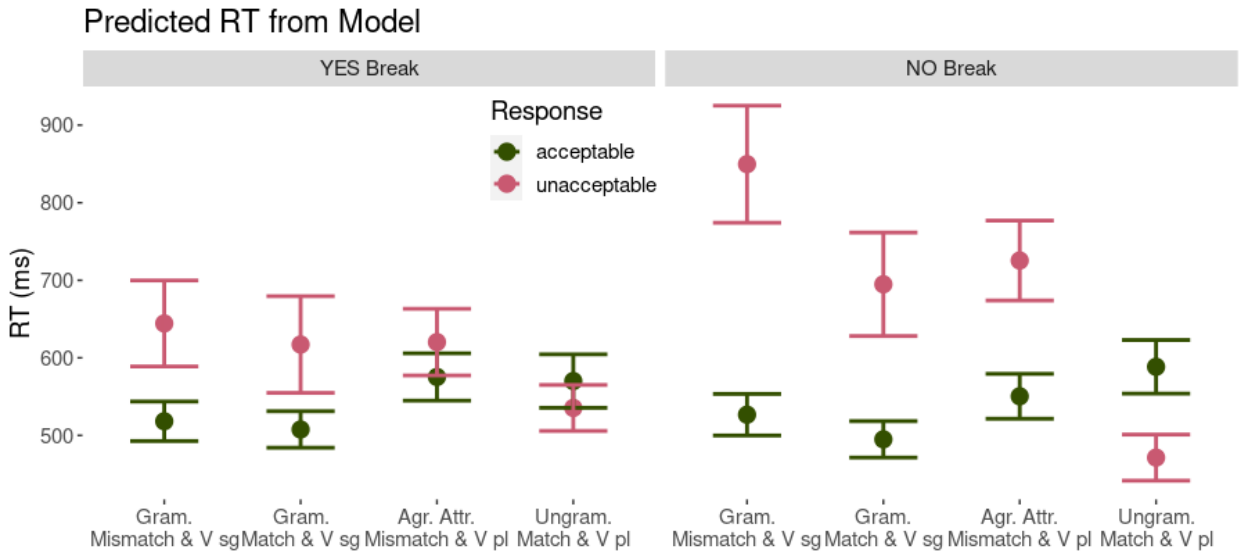

Fig 1. Mean estimated values and standard error bars. *Match* condition is when head noun and local noun are both singular, whereas *Mismatch* is when the local noun is plural. The *Grammatical* sentences have a singular verb and the *Agreement Attraction* and *Ungrammatical* conditions have a plural verb.

	Head-Local #		
Grammatical	*Match*	The actor in the film (%) was	popular with both young and old fans
	Mismatch	The actor in the films (%) was	
Ungrammatical	*Match*	The actor in the film (%) were	
	Mismatch	The actor in the films (%) were	

Table 1. Quartet of critical items.

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