Attraction Effects in the Processing of Long-distance Chinese Classifiers: An Eye-tracking Study

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This study investigated memory retrieval processes during the online processing of the classifier-noun agreement in Chinese, using the eye-tracking method. Previous studies suggested that the retrieval processes involved in the processing of an agreement are affected by an illicit antecedent (hereafter *distractor*) as well as a licit antecedent (Dillon et al., 2013; Kwon & Sturt, 2016). These results were taken to suggest that memory retrieval processes are parallel and content-addressable such that a distractor with matching features to the retrieval cues could be mis-retrieved (McElree et al., 2003; Lewis and Vasishth, 2005; Van Dyke and McElree, 2006) as a last resort to save the sentences particularly when they are ungrammatical (Wagers et al., 2009). However, these studies were based on binary features, and thus do not provide information on the effect of the degree of semantic overlap between the distractor and a retrieval cue.

Design: Native speakers of Chinese (n=40) read the sentences (n=160) consisting of four conditions. Four conditions are created to manipulate the semantic distance between the classifier and the distractor (Table 1). Semantic relatedness is determined by animacy, and lexical effects are counterbalanced. The Grammatical condition included a classifier matching its licit noun. The Distractor-Matching condition included a classifier matching the distractor. The Distractor-Related condition included a classifier related to the distractor. The Distractor-Unrelated condition employed a classifier unrelated to the distractor. Note that all these conditions are ungrammatical except for the first condition. Analysis of linear-mixed effects regression was done within all regions and two regions of interest are reported: R1(distractor “flower”) and R9 (classifier spill-over “is”).

Predictions: Based on previous findings mentioned in the preceding section, we predict that a distractor will be mis-retrieved when it shares features with a retrieval cue. Thus, there will be a stronger distractor effect for the Distractor-Matching condition than for the Distractor-Related condition. On the other hand, the Distractor-Unrelated condition will not show any distractor related effect, as the distractor does not share any feature with a retrieval cue.

Results: The results found a significant grammaticality effect at R9: the Grammatical condition was processed faster than the remaining three conditions for two reading measures for first pass multi fixation and total reading times. Additionally, the results indicated the distractor-related effects (Fig.1): At R9, Distractor-Unrelated condition elicited significantly longer reading times than the Grammatical Condition. Both Distractor-Matching and Distractor-Related conditions did not differ from the Grammatical condition. The distractor-related effects were also found at R1 (Fig.2), both Distractor-Matching and Distractor-Related conditions did not differ from the Grammatical condition.

Discussion and Conclusion: To summarize, these results suggested that (i) the parser is sensitive to the grammatical constraints of the classifier-noun agreement, and (ii) the retrieval processes during the processing of the agreement are also sensitive to semantic features, given that processing difficulty was reduced as the parser is sensitive to the overlapping features or even partial between the retrieval cue and the distractor. Our study provides crosslinguistic evidence that memory retrieval process is parallel and content-addressable.

Table 1 Sample Experimental Sentences

Region	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Grammatical condition	花儿	吸引	了	很多	小狗	其中	一	只	是	金毛
Distractor-Matching	花儿	吸引	了	很多	小狗	其中	一	朵	是	金毛
Distractor-Related	小草	吸引	了	很多	小狗	其中	一	朵	是	金毛
Distractor-Unrelated	食物	吸引	了	很多	小狗	其中	一	朵	是	金毛
Gloss	Flower/flower/grass/dog	attract	PFV	many	dog	among	one	CL	is	Golden retriever
Trans.	'Flower/flower/grass attracts many dogs, among which one is a golden retriever'									
Question	"Is there a dog?" Yes/No									

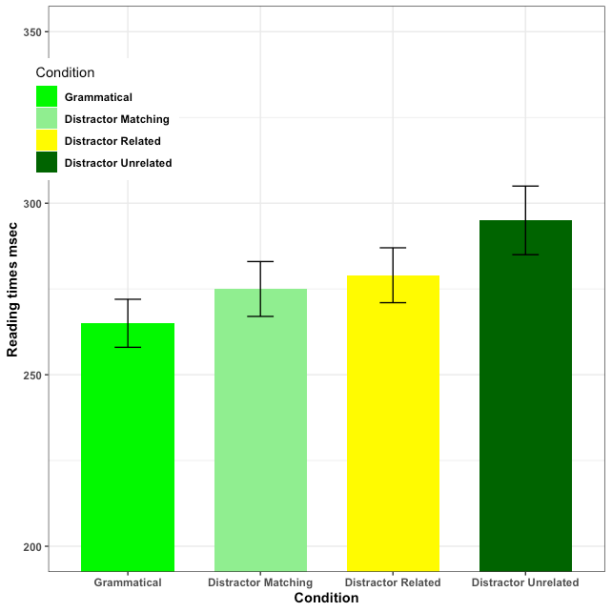

Fig.1 Gaze duration at classifier-spillover (R9)
(Error bars shows standard errors)

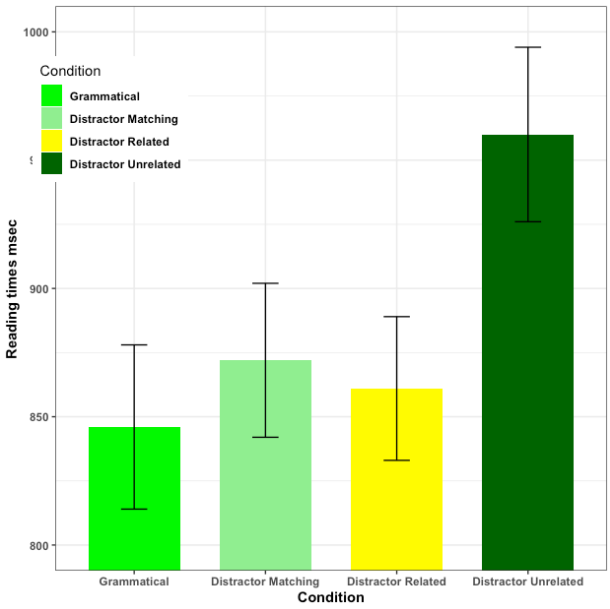

Fig. 2 Total reading times at distractor (R1)
(Error bars shows standard errors)

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