From Local to Non-Local: The Role of Chinese Classifiers in Predictive Sentence Processing

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Research shows that comprehenders predict upcoming words based on contexts [1-3], with both global and local contexts shaping the processing of target words [4]. In Mandarin Chinese, noun phrases are strictly noun-final, where modifiers, such as demonstrative-classifier phrases (DeCP), precede the noun [5]. DeCP could provide contextual information and shape the processing of the head noun (HN). When paired with a relative clause (RC), the demonstrative-classifier phrase either directly precedes the noun or is separated from it by the RC. In this sense, within the DeCP, both the RC and the demonstrative-classifier phrase can be positioned locally or non-locally in relation to the HN, making it a great test bed for the influence of global and local context on the predictive processing of the HN. In this ERP study, we employed the two syntactic configurations of DeCP to explore how predictions about the HN are generated or maintained when conflicting information, such as a classifier (CL), arises at either a local (after RC) or a non-local (before RC) contextual level.

Materials. In **Exp1** (*N* = 40), sentences that are each highly predictive of a particular noun followed the pattern of "*RC + demonstrative + CL (here is local to HN) + HN + predicate*". We manipulated the congruency between the RC and the HN (RC+/-) and the congruency between the CL and the HN (CL+/-), building a 2-by-2 factorial design.128 sentences were presented word by word at a fixed pace. In **Exp2** (*N* = 39), the same items were employed but using a different configuration, "*demonstrative + CL (here is non-local to HN) + RC + HN + predicate*". We chose the last word of RC to show the effects of CL congruency in processing the RC.

Results. We mainly analyzed **N400** (300 – 500 ms, centro-parietal electrodes) and late positive component (**LPC**) (600 – 900 ms, parietal electrodes) using linear mixed effects model.
In **Exp1**, at the CL position, incongruent CL elicited larger N400 amplitudes than congruent CL ($\beta = 0.78$, $p = 0.001$). At the HN position, we found the significant main effects of both CL congruency ($\beta = 0.46$, $p = 0.02$) and RC congruency ($\beta = 1.76$, $p < .001$). However, the interaction effect was not significant ($\beta = 0.39$, $p = 0.52$). No potential LPC effects were found at the two positions. In **Exp2**, the last word within the RC that immediately followed an incongruent CL elicited larger N400 ($\beta = 0.58$, $p = 0.01$) than those that followed congruent CL. At HN position, the main effect of RC congruency was significant ($\beta = 1.50$, $p < .001$), while the effect of CL congruency was not significant ($\beta = 0.32$, $p = 0.10$). For LPC, only the main effect of CL congruency was marginally significant ($\beta = 0.53$, $p = 0.097$).

Conclusion. The two syntactic configurations allowed us to test the scenarios where CL was positioned locally and non-locally to HN. When the CL was placed immediately before the HN as in Exp 1, larger N400 showed that when an incongruent CL is encountered, it prompted the comprehenders to update their predictions, but the original prediction based on the RC could not be totally filtered out by the CL. When a classifier is at the beginning of the sentence as in Exp 2, it can build some kind of coarse prediction to exclude or include some nouns. The CL congruency effects persisted until the last word of the RC showing that comprehenders were waiting for the semantic features to be checked. It showed that the information based on classifiers is coarse but robust, guiding the parser to search within the RC for compatible elements.

Example Stimuli

Exp1

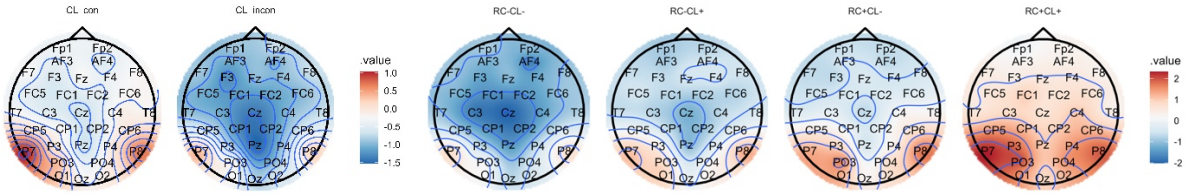
RC+CL+	小李早晨为了提神喝	的	这	杯	咖啡	香气浓郁。
RC-CL-	小李早晨为了提神喝	的	这	杯	手套	香气浓郁。
RC+CL-	小李早晨为了提神喝	的	这	副	咖啡	香气浓郁。
RC-CL+	小李早晨为了提神喝	的	这	副	手套	香气浓郁。
Gloss	Xiaoli.morning.for.refresh himself.drink	complimentizer	demonstrative	classifier	coffee/gloves	very.tasty
	RC			CL	N	
Trans	This coffee/gloves that Xiaoli drunk in the morning to refresh himself was/were very tasty.					

Exp2

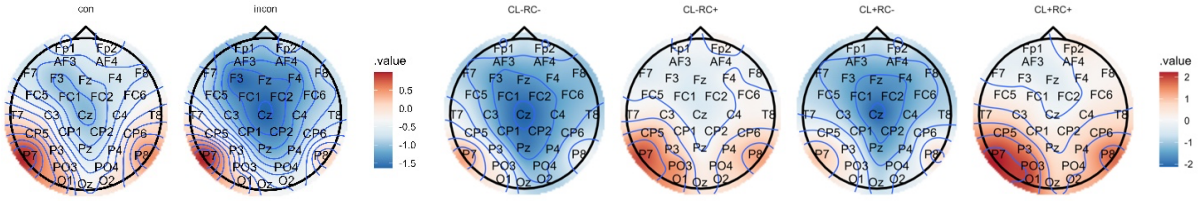
CL+RC+	这	杯	小李早晨为了提神	喝	的	咖啡	香气浓郁。
CL-RC-	这	杯	小李早晨为了提神	喝	的	手套	香气浓郁。
CL-RC+	这	副	小李早晨为了提神	喝	的	咖啡	香气浓郁。
CL+RC-	这	副	小李早晨为了提神	喝	的	手套	香气浓郁。
Gloss	the	classifier	Xiaoli.morning.for.refresh himself.drink	drunk	complimentizer	coffee/gloves	very.tasty
		CL	RC			N	
Trans	This coffee/gloves that Xiaoli drunk in the morning to refresh himself was/were very tasty.						

N400 Topography of the target words under different conditions

Exp1 from left to right: the CL position (congruent/incongruent classifiers); the HN position (CL+/-RC+/-)



Exp2 from left to right: the last word of the RC followed a congruent/incongruent CL; the HN position (CL+/-RC+/-)



References:

[1] DeLong et al. (2005). Nature Neuroscience

[2] Van Berkum et al. (2005). Journal of Experimental Psychology

[3] Kwon et al. (2017). Cognition

[4] Boudewyn et al. (2015) Cognitive, Affective, & Behavioral Neuroscience

[5] Li & Thompson. (1981). Mandarin Chinese: A functional reference grammar.