Incremental prediction updating through consecutive cues: Evidence from ERPs

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INTRODUCTION

Comprehenders can predict upcoming language based on global context [1-2] and use disconfirming evidence or informative cues to update their predictions rapidly [3-4].

A recent visual-world eye-tracking study [5] investigated comprehenders' ability to use consecutive cues to update predictions for an upcoming noun.

The old house's courtyard is full of greenery, and in its centre, there is …
(a) Specific classifier (incompatible with initial prediction "*tree*")
   one **CL$_{zhang}$** *{chess-playing / good-looking} table*
(b) General classifier (compatible with initial prediction "*tree*")
   one **CL$_{xie}$** *{chess-playing / good-looking} table*

Expected   Distractor

Target   Competitor
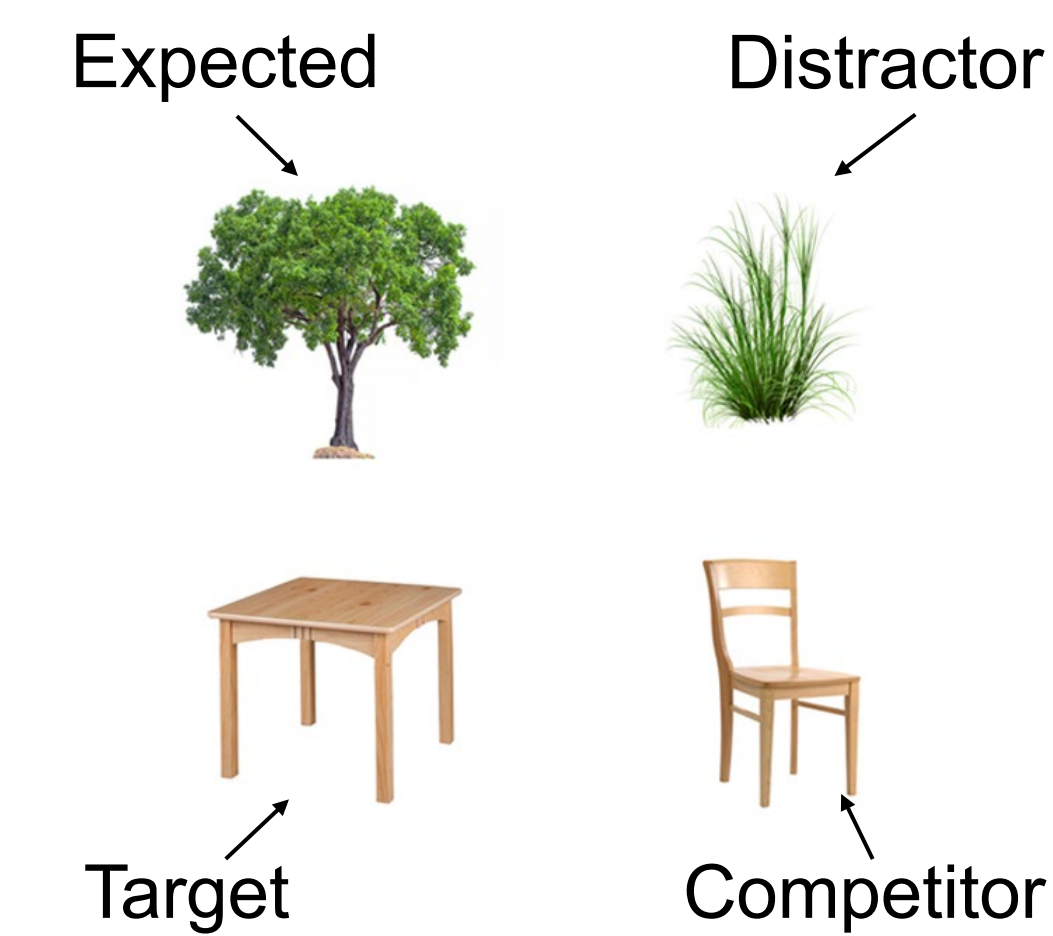
Mandarin Chinese listeners were equally quick to use an informative modifier (*chess-playing*) to update their noun prediction, regardless of whether they had just encountered a classifier that contradicted their initial prediction (*CL$_{zhang}$*) or not (*CL$_{xie}$*).

➡ The process of prediction updating is both incremental and rapid and may not incur measurable processing costs from conflict detection and resolution [cf.6].

THE PRESENT STUDY

The present ERP study, adopted the design of [5], aimed to corroborate the hypothesis that comprehenders can use consecutive cues to update prediction incrementally even in the absence of an accompanying visual display.

METHOD

We recorded EEG data from 38 participants as they read Chinese sentences presented word by word at a fixed rate.

The sentential context was predictive of a particular noun ("*light*") but always ended with a relatively unexpected noun ("*candle*").

Since the night was so dark, to read the words in the book more clearly, Jack brought over ...
(a) Specific classifier (incompatible with initial prediction "*light*")
   one **CL$_{zhi}$** *{burning / spare} candle …*
(b) General classifier (compatible with initial prediction "*light*")
   one **CL$_{ge}$** *{burning / spare} candle …*

Classifier. The specific classifier (*CL$_{zhi}$*) was compatible with "candle" but not with "light", while the general classifier (*CL$_{xie}$*) was compatible with a variety of nouns, including "candle" and "light".

Modifier. The informative modifier (*burning*) distinctly suggested "candle" and was incompatible with "light", while the uninformative modifier (*spare*) was compatible with both the nouns.

ANALYSIS

We analysed the mean amplitude at the critical noun (*candle*) using linear mixed effects models with fixed effects of classifier, modifier, and the interaction between classifier and modifier.
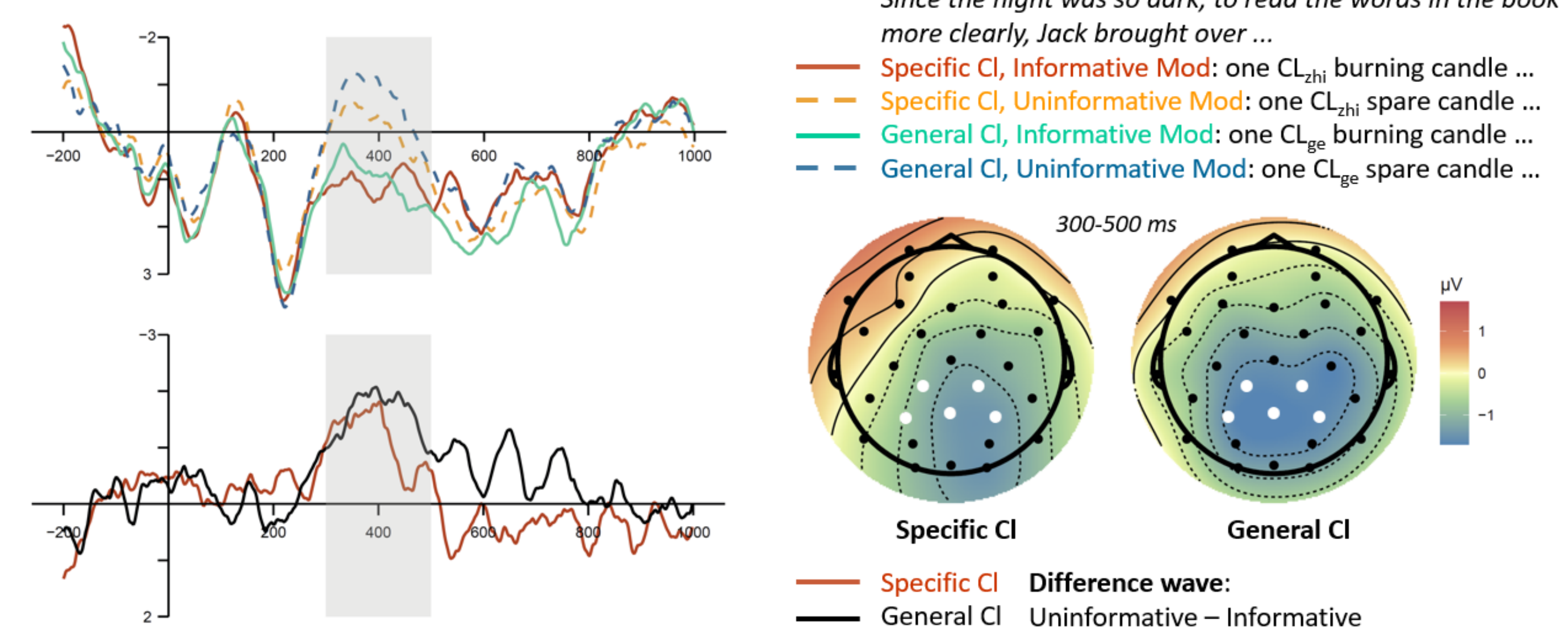
N400: 300-500ms, five centro-parietal electrodes [7].

fPNP: 500-800ms, seven frontal electrodes.

RESULTS

Centro-parietal Cluster

Since the night was so dark, to read the words in the book more clearly, Jack brought over …
— Specific Cl, Informative Mod: one CL$_{zhi}$ burning candle …
— Specific Cl, Uninformative Mod: one CL$_{zhi}$ spare candle …
— General Cl, Informative Mod: one CL$_{ge}$ burning candle …
— General Cl, Uninformative Mod: one CL$_{ge}$ spare candle …

300-500 ms

Specific Cl   General Cl

— Specific Cl   **Difference wave:**
— General Cl   Uninformative − Informative

N400. Significant main effects of classifier and modifier, but no interaction. ➡ Informative modifiers reduced the N400 at the noun regardless of classifier type.

Frontal Cluster

fPNP. A marginal main effect of modifier only.

500-800 ms

Specific Cl   General Cl

— Specific Cl   **Difference wave:**
— General Cl   Uninformative − Informative

CONCLUSION

We found that comprehenders' N400 response to the critical noun was reduced when it followed an informative modifier, no matter whether the preceding classifier disconfirmed the comprehenders' initial prediction or not. ➡ Comprehenders can use consecutive cues to update their predictions rapidly, without incurring significant costs associated with earlier prediction disconfirmation.
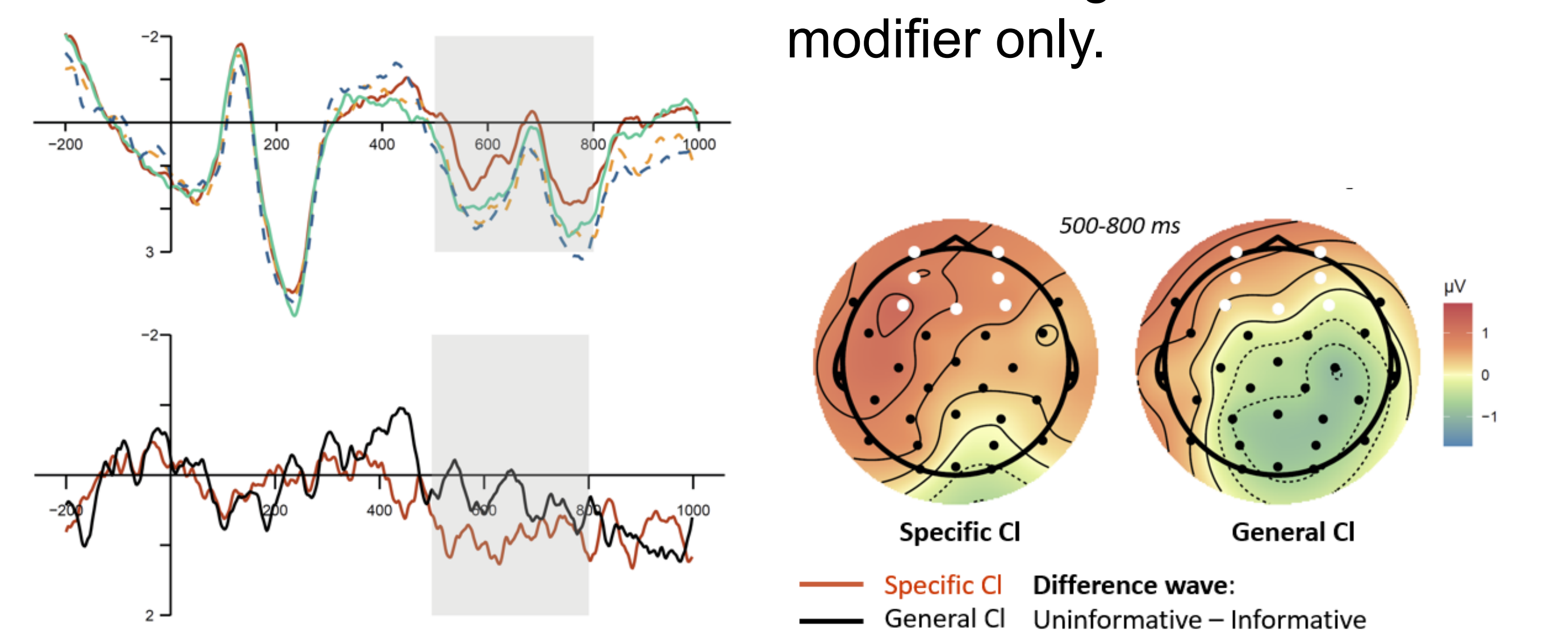
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