Contextual effects on Chinese idiom processing: an ERP study

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Context referring to the words or sentences surrounding any part of a discourse can determine the meaning of the lexical items during language processing. There is general agreement that a context that biases towards a certain interpretation can either facilitate or inhibit the recognition and semantic integration of metaphorical meanings in alphabetic idioms that also have plausible literal interpretations. However, the impact of a biasing context on the processing of metaphorical meanings in logographic idioms, such as Chinese idiom that has a high literal plausibility, is not as well-understood.

The present study used brain event-related potentials (ERP) to measure brain activities during language processing to investigate whether Chinese four-character idioms (also known as chengyu) with high potential for literal interpretations are processed differently when they are presented in semantically congruent and incongruent sentence contexts.

Forty literally plausible Chinese idioms with high frequency, familiarity and semantic transparency were presented in three sentence contexts: metaphorical-bias context (MC), literal-bias context (LC) and unrelated context (UC). Participants (native Chinese speakers) were requested to judge whether the idiom was semantically congruent or incongruent with the sentence context. Figure 1 illustrates the overall sequence of events for one trial.

Our behavioral results found longer reaction times for the Chinese idioms presented in the MC than those in the LC. The idioms that followed the UC had the shortest reaction times. ERPs results obtained using parameter-free cluster permutation statistics showed larger negativity at 280–500 ms (see Figure 2), a typical time window for the N400 response reflecting semantic processing, for the idioms in the MC compared to those in the LC. The N400 effect generated by the idioms in the UC was larger than those in the MC or in the LC at the parietal brain areas bilaterally. Additionally, the P600 response, reflecting further context processing, was larger for the idioms presented in the UC compared to those in the MC at the right centro-parietal brain areas (see Figure 3).

Our results showing faster reaction times and smaller semantically related brain response (N400) for the idioms presented in the LC than those in the MC, suggesting that less processing effort is required for the idioms following the LC. Furthermore, our results propose that a biasing context can facilitate the access to the literal interpretation of a Chinese idiom compared to its metaphorical equivalent.

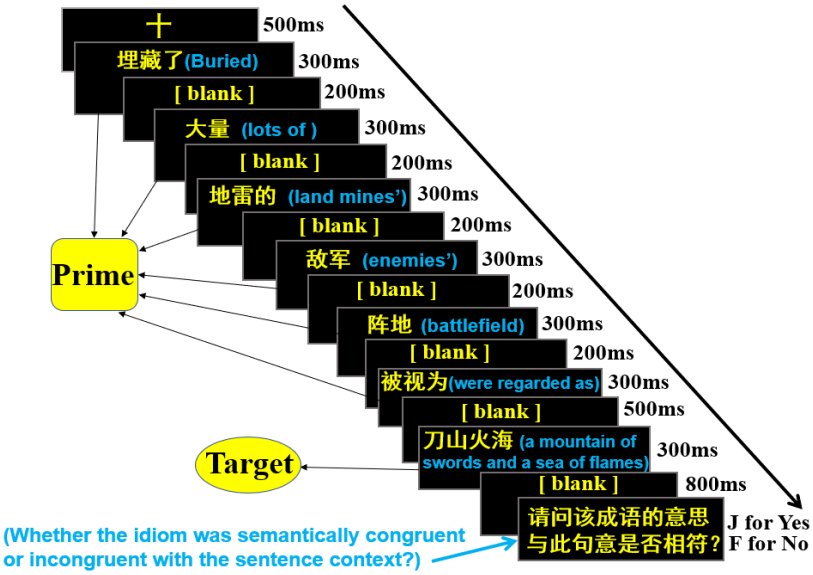

Fig. 1 Overall sequence of one trial in this ERP experiment [Note: Only yellow texts-Chinese characters were presented at the center of the screen during the experiment; (blue texts) are corresponding word-by-word English translations, which were displayed here only for the purpose of comprehension.]

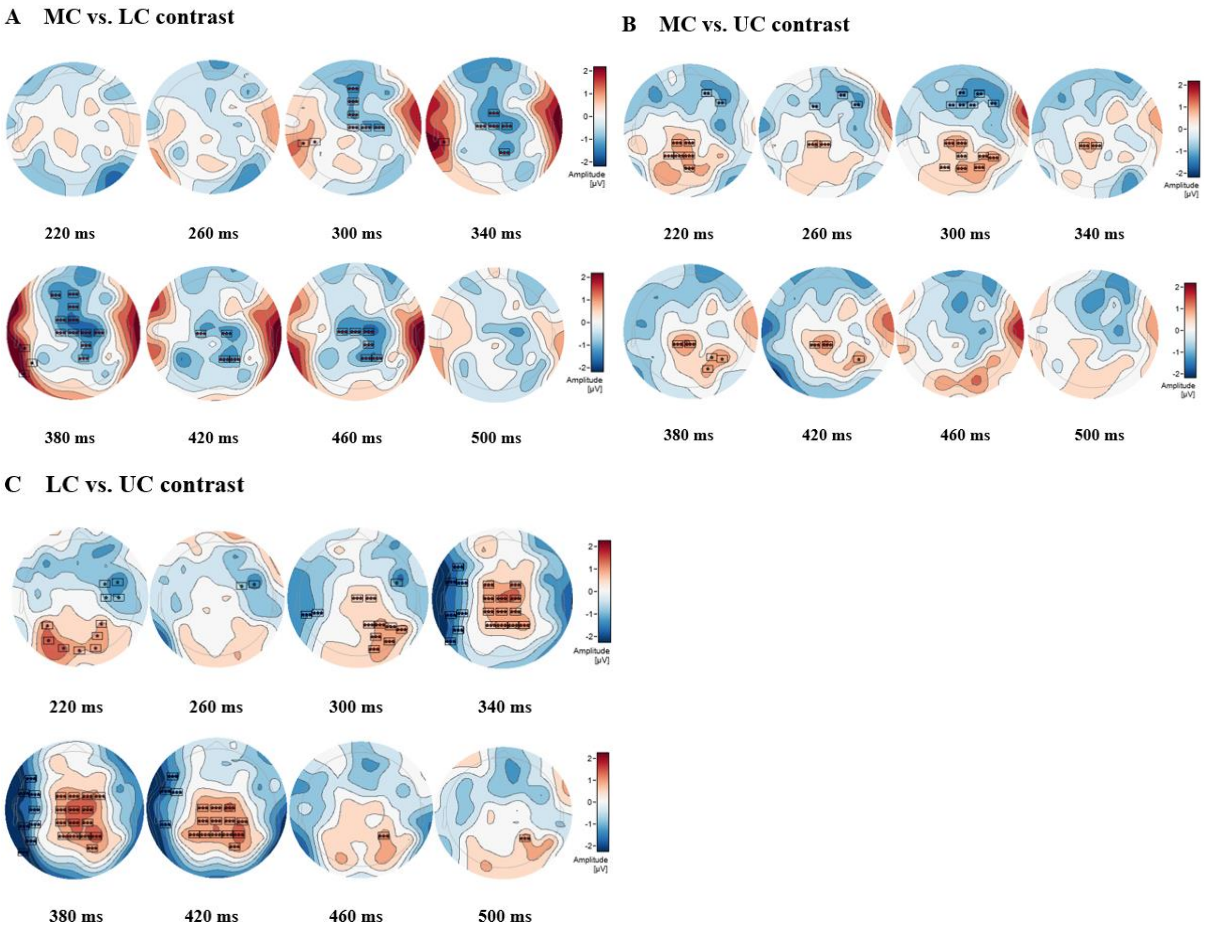

Fig. 2 Cluster-based permutation topographies between the brain responses for the idioms in the MC and LC (A), MC and UC (B), LC and UC (C) for the time points: 220 ms, 260 ms, 300 ms, 340 ms, 380 ms, 420 ms, 460 ms, and 500 ms. The stars denote significant clusters for the ERP differences with negative distributions at frontal-central-parietal regions for the brain responses between the MC-LC contrast, MC-UC contrast, and LC-UC contrast (2 stars = p <.005; 3 stars = p <.0005).

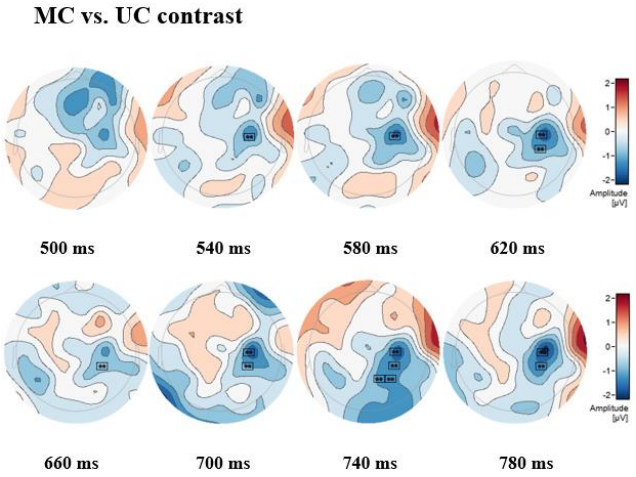

Fig. 3 Cluster-based permutation topographies between the brain responses for the idioms in the MC and UC for the time points: 500 ms, 540 ms, 580 ms, 620 ms, 660 ms, 700 ms, 740 ms, and 780 ms. The stars denote significant clusters for the ERP differences with negative distributions at the centro-parietal regions for the brain responses between the MC-UC contrast (2 stars = p <.005).