

Not all the pasts are the same: An ERP study of the temporal constraints of the Mandarin aspectual markers *-le* and *-guo*

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In the past years, the way time reference is neurologically processed caught the attention of many researchers. An important distinction is to be made between time at (i) the cognitive level, which seems to be universal, and (ii) at the linguistic level, characterized by many crosslinguistic differences. Time can be semantically encoded with devices such as (i) tense (grammatical localization of time; past, present, future) and (ii) aspect (the internal viewpoint of a situation; (im)perfective, perfect), among others. While the link between time and tense seems obvious (despite exceptions), the one between time and aspect does not seem as straightforward, notably for aspect-prominent languages. For example, Mandarin is said to be a tenseless language, but it possesses a great variety of aspectual markers: *-le* as a perfective marker, denoting the entirety/completion of a situation; *-guo* as a perfect(ive) marker, denoting the experience and discontinuity of a situation; *zai* and *-zhe* as imperfective (progressive and durative) markers. It has long been remarked that even if these morphemes cannot be considered as tense markers *per se*, they show temporal constraints: *-le* and *-guo* are linked with past time and generally cannot be used with future time reference in a simple sentence [1-2].

However, linguists' analyses differ regarding the reason behind the temporal constraint: some state a *similar/unified* explanation for both *-le* and *-guo* (by adding a relative past tense component to both markers [1] or by adding a principle of boundedness locating the situation in the past by default with perfect(ive) aspect [2]), while others propose a *separate* explanation, considering *-le* and *-guo* as different viewpoints of past time [3].

The online processing of *-le* and *-guo* has already been tested in previous ERP studies, but these two markers have never been directly compared for a violation of similar type: while it was shown that the *aspectual violation* of *-le* elicited a P600 [4], the *temporal incongruity* of *-guo* also led to a P600 [5]. Therefore, the aim of this study was to test whether the perfective markers *-le* and *-guo* are related to past time in a similar fashion, by placing the two markers with a congruent or incongruent past/future time adverbial in the same sentence (see Table 1). If *-le* and *-guo* are related to past time for the same reason, then the violation of their temporal constraint is expected to elicit a similar ERP component (P600 for both of them). If not, then a P600 is expected for *-guo* (as in [5]), and a component of different nature should be found for *-le*.

Twenty-six native speakers of Mandarin (6 male, age = 23.2 y.o.) took part in the ERP experiment and were asked to judge the acceptability of the sentences. The ERP data revealed different patterns for the temporal processing of *-le* and *-guo*. *-le* in an incongruent future context (i.e. following *mingtian*, 'tomorrow') elicited a frontal negativity at the 300-500 ms time window when compared to its congruent counterpart (i.e., following *zuotian* 'yesterday'). On the other hand, *-guo* elicited a P600 during 500-700 ms in the incongruent condition, when compared to its congruent counterpart (see Figure 1). These results were statistically verified.

Overall, our results showed different ERP patterns for the temporal processing of *-le* (early frontal negativity) and *-guo* (P600). The larger P600 found at *-guo* is similar to the ones found for aspectual violation in previous studies, suggesting that the temporal incongruity of *-guo* might be due to its aspectual semantics. The negativity found at *-le* is different from the ERP component elicited by pure aspectual violations (i.e. P600); instead, it is similar to (i) tense violations in Indo-European languages [6], as well as (ii) violations of non-linguistic sequences [7]. The link between *-le* and past time may therefore be due to a sequencing operation (be it at the linguistic level (relative past tense) or at the cognitive level) that is not found with *-guo*. In sum, the present results do not support the linguistic analyses stating similar explanations for the relation between (i) *-le*, (ii) *-guo*, and (iii) past time.

References

- [1] Lin, J.-W. (2006). Time in a language without tense: The case of Chinese. *Journal of Semantics*, 23(1), 1–53.
- [2] Smith, C. S., & Erbaugh, M. S. (2005). Temporal interpretation in Mandarin Chinese. *Linguistics*, 43(4), 713–756.
- [3] Bhat, D. N. S. (1999). *The prominence of tense, aspect and mood*. Amsterdam: Benjamins.
- [4] Zhang, Y., & Zhang, J. (2008). Brain responses to agreement violations of Chinese grammatical aspect. *Neuroreport*, 19(10), 1039–1043.
- [5] Qiu, Y., & Zhou, X. (2012). Processing temporal agreement in a tenseless language: An ERP study of Mandarin Chinese. *Brain Research*, 1446, 91–108.
- [6] Baggio, G. (2008). Processing temporal constraints: An ERP study. *Language Learning*, 58(s1), 35–55.
- [7] Hoen, M., & Dominey, P. F. (2000). ERP analysis of cognitive sequencing: a left anterior negativity related to structural transformation processing. *Neuroreport*, 11(14), 3187–3191.

Table 1. Sample items from the ERP experiment (total number of 198 items; 33 items per condition + fillers with acceptable future time sentences/unacceptable past time sentences, to avoid predictions). The experimental materials have been controlled for their naturalness, the aspectual category of the verb (non-stative verbs), and the agency of the subject.

Condition	Example			
(1) -le condition	Yufu fisherman	zuotian / #mingtian yesterday / #tomorrow	diao-le fish-LE	guiyu. salmon
	'Yesterday/#Tomorrow, the fisherman fished salmon.'			
(2) -guo condition	Yufu fisherman	zuotian / #mingtian yesterday / #tomorrow	diao-guo fish-GUO	guiyu. salmon
	'Yesterday/#Tomorrow, the fisherman fished salmon.'			

Figure 1. ERP waves of the conditions at -le and -guo (black = congruent, red = incongruent), and topographic maps of the difference wave (incongruent minus congruent; mean amplitude from -2.5 μ V (blue) to +2.5 μ V (red)) for both markers.

