

Introduction

Relative Clauses (RCs) have been a widely-studied topic in language processing in recent years. Subject-extracted RCs (SRCs) and object-extracted RCs (ORCs) has been reported to differ in processing difficulty cross-linguistically (Frazier, 1987; Gibson, 1998). An advantage in SRC has been reported in English, but studies in Mandarin Chinese yield mixed results (Hsiao & Gibson, 2003; Lin & Bever, 2006).

Some studies attribute the RC processing asymmetry in Chinese to readers' syntactic expectations (e.g. Jäger, Chen, Li, Lin, & Vasishth, 2015; Vasishth, Chen, Li, & Guo, 2013). Expectation-based theories attribute processing difficulty to the expectation for complicated syntactic structures. Nevertheless, such expectation-based theories may not have exhausted all possible expectations by readers. It has been pointed out in Lin and Bever (2010) that a temporary expectation for pro-dropped sentences might exist when parsing SRCs. Such effect has never been tested experimentally.

Chinese RCs

(Chinese SRC) [yao mao de]_{RC} gou taoyan xiangchang
bite cat REL dog dislike sausage
"The dog that bites the cat dislikes sausages."
(Chinese ORC) [mao yao de]_{RC} gou taoyan xiangchang
cat bite REL dog dislike sausage
"The dog that the cat bites dislikes sausages."

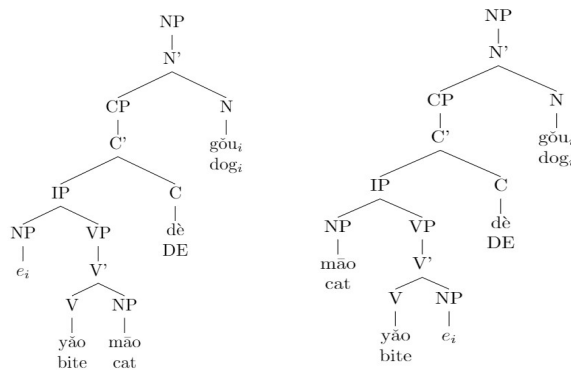


Figure 1 Chinese RCs Tree Structure

Methods

This study uses the electroencephalogram (EEG) technique to study syntactic expectations when readers are processing Chinese RCs.

1. **Stimuli:** The following 4 conditions are tested, along with 2 grammatically violated conditions for SRCs and ORCs that serve as sanity checks. For each structure, there are 38 sentences tested, with a total of 228 sentences. Sentences are pseudorandomized for presentation.

Conditions	Example Sentences
Subject relative clause	小明说：追猫的大黑狗确实胖胖的。 Xiaoming shuo: zhui mao de daheigou qieshi pangpangde. Xiaoming say: chase cat REL big black dog indeed fat Xiaoming said: "The big black dog that chases the cat is fat indeed"
Imperative (pro-drop)	小明说：追猫去吧。 Xiaoming shuo: zhui mao qu ba. Xiaoming say: chase cat go BA Xiaoming said: "Let's go chase the cat."
Object relative clause	小明说：猫追的大黑狗确实胖胖的。 Xiaoming shuo, mao zhui de daheigou qieshi pangpangde. Xiaoming say cat chase REL big black dog indeed fat Xiaoming said: "The big black dog that the little white cat chases is fat indeed"
SVO	小明说：猫追了大黑狗。 Xiaoming shuo, mao zhui le daheigou. Xiaoming say: cat chase ASP big black dog Xiaoming said: "the cat chased the big black dog."

The critical regions for the conditions are the RC relativizer position, the aspect marker in SVO sentences, and QU in imperative sentences.

2. **EEG Parameters:** EEG data are recorded using a 32-electrode cap with electrodes placed at the following locations based on the International 10-20 system: FP1, FP2, F7, F3, FZ, F4, F8, FC5, FC1, FC2, FC6, T7, C3, CZ, C4, T8, M1, CP5, CP1, CP2, CP6, M2, P7, P3, PZ, P4, P8, O1, OZ, O2. Two mastoid electrodes serve as reference. Two extra electrodes are used to record eye-movement. The sampling rate will be at 500Hz, and a low-pass filter at 100Hz will be applied. Epochs comprised the 100ms preceding and 1000ms after the onset of the critical word. P600 component is looked for 500ms to 800ms after onset of critical word.

3. **Participants and Task:** 20 Native Chinese speakers from the greater Chicago area are tested. Stimuli are presented word-by-word on a computer screen, and participants are asked to judge the acceptability (yes-no task) after each sentence is presented. Data of the first 9 participants are included as preliminary results.

Preliminary Results

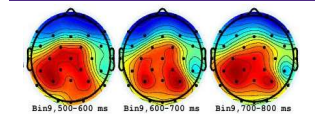


Figure 2 SRC Subtracted from Violated-SRC

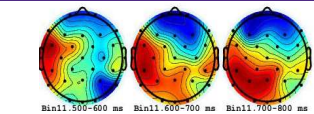


Figure 3 ORC Subtracted from Violated-ORC

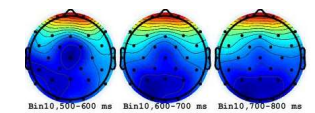


Figure 4 Pro-drop Subtracted from SRC

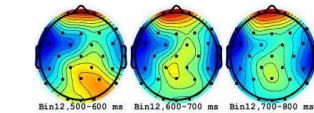


Figure 5 SVO Subtracted from ORC

Discussion

Based on preliminary data of the first 9 participants, the following four observations can be made:

- There is a syntactic violation effect observed in the comparison between grammatical and violated SRCs (Figure 2): P600 component and early negativity is visibly stronger in violated-SRCs at relativizer.
- Similar violation effect is also observed in violated-ORC sentences compared to ORC sentences (Figure 3).
- In the pro-drop and SRC comparison, the SRC sentences induce a lower voltage than pro-drop sentences throughout 500ms to 800ms (Figure 4), suggesting a possible greater P600 component existing in pro-drop sentences.
- In the SVO and ORC comparison, a larger P600 component is visible on the central electrodes in ORC sentences (Figure 5). This suggests a possible default expectation for SVO rather than ORC.

These preliminary results suggest that SVO structure is a preferred expectation over ORC. However, pro-drop sentences, despite being canonical in word order, is less expected by readers compared to SRC structure.

This study examines and challenges the view put forward in Lin and Bever (2010), and thus contributes to the discussion of whether expectation-based theories can explain the asymmetry in Chinese RC processing difficulties.

References & Acknowledgements

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