

# Effect of thematic order on the comprehension of Chinese relative clauses

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## Abstract

This paper investigates the comprehension of relative clauses in Mandarin Chinese, where noun phrases are head-final and both an object-relative advantage and a subject-relative advantage have been previously reported. Two self-paced reading experiments are reported, suggesting that the comprehension of Chinese relative clauses is sensitive to the thematic role orders both in the relative clauses and in the preceding discourse context. Experiment 1 showed that the PATIENT-action-AGENT order of a passive sentence in the context did not facilitate either the action-PATIENT-AGENT order of a subject relative clause or the AGENT-action-PATIENT order of an object relative clause. Experiment 2 showed that only the canonical SVO sentence (not the *bǎ* sentence) in Mandarin Chinese, which had full thematic order overlap with the object relatives induced sustained faster reading times of an object relative clause. Taken together, these findings suggest that Chinese object relative clauses were read faster than subject relative clauses only when the preceding discourse contexts presented a thematic order consistent with these object relatives. The comprehension of Chinese relative clauses, therefore, is sensitive to the thematic order consistency between the discourse context and the relative clauses.

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## 1. Introduction

A long-standing issue in the sentence processing literature has been whether and why relative clauses involving subject extraction ('subject relative clauses' or 'SRCs' henceforth) are comprehended differently from those involving object extraction ('object relative clauses' or 'ORCs' henceforth). In languages like English where the head noun precedes the relative clause, it has been consistently reported that SRCs such as (1a) are easier to comprehend than ORCs such as (1b).

- (1) a. the composer<sub>i</sub> who ( ) adored the musician  
b. the composer<sub>i</sub> whom the musician adored ( )

This easier comprehension of subject relative clauses has been attested in various languages, including Brazilian Portuguese (Gouvea, 2003), Dutch (Frazier, 1987), English (Ford, 1983; Gibson et al., 2005; King and Just, 1991; King and Kutas, 1995; Traxler et al., 2002), French (Cohen and Mehler, 1996; Frauenfelder et al., 1980; Holmes and O'Regan, 1981), and German (Mecklinger et al., 1995; Schriefers et al., 1995). Moreover, this result has been obtained with a wide

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variety of experimental methodologies (e.g., self-paced reading tasks, phoneme/click-monitoring tasks, event-related potentials, continuous lexical decision tasks, eye tracking, and functional magnetic resonance imaging). In languages where the head noun follows the relative clause, however, the findings have been much less consistent. Easier comprehension of SRCs has been reported in Japanese (Miyamoto and Nakamura, 2003; Ueno and Garnsey, 2008), Korean (Kwon et al., 2010), Mandarin Chinese (Lin and Bever, 2006; Jäger et al., 2013), and Turkish (Kahraman et al., 2010), while easier comprehension of ORCs has been reported in Basque (Carreiras et al., 2010), Japanese (Ishizuka et al., 2006) and Mandarin Chinese (Gibson and Wu, 2013; Hsiao and Gibson, 2003; Lin and Garnsey, 2011; Packard et al., 2011; Qiao et al., 2012).<sup>1</sup> Notably, conflicting results have been reported in different studies for Japanese and Mandarin Chinese (henceforth, ‘Chinese’). Examples of Chinese relative clauses are provided in (2)–(3):

- (2) SRC in Chinese:  
 [ (̀<sub>i</sub>) àimù yīnyuèjiā ] de zuòqǔjiā<sub>i</sub>  
 (̀<sub>i</sub>) adore musician REL composer<sub>i</sub>  
 ‘the composer who adored the musician’
- (3) ORC in Chinese:  
 [ zuòqǔjiā àimù (̀<sub>i</sub>) ] de yīnyuèjiā<sub>i</sub>  
 composer adore (̀<sub>i</sub>) REL musician<sub>i</sub>  
 ‘the musician whom the composer adored’

Such divergent results among head-final relative clauses are a stark contrast to the consistent results obtained in the comprehension of head-initial relative clauses. The conflicting results within the same languages (such as Chinese and Japanese) are especially perplexing. The goal of this article is to reconcile these divergent results by examining the processing factors underlying the comprehension of Chinese relative clauses. More specifically, this article provides empirical evidence that points to *thematic order* as a factor responsible for differences in how easily relative clauses are comprehended in Chinese, suggesting that the conflicting results in previous studies may have resulted from not having paid enough attention to this variable.

Before discussing the factors that are relevant to the comprehension of Chinese relative clauses, a brief overview of the typological characteristics of Chinese noun phrases and relativization is in order. While verb phrases in Chinese are generally head-initial (verb + object), noun phrases in Chinese are exclusively head-final (modifier + noun), with nominal modifiers such as stative verbs or subordinate clauses appearing in prenominal position. As can be seen in (2)–(3), most prenominal modifier phrases in Chinese end with *de*, a function word that serves as the syntactic head of the modifying phrase.<sup>2</sup> Crucially, since *de* appears between the modifying phrase and the head noun, it simultaneously indicates the right edge of a modifying phrase and the left edge of the head noun. It is worth noting that there is no overt morphosyntactic marking that indicates the beginning of a relative clause in Chinese. Since Chinese relative clauses are prenominal, when a noun phrase with a relative clause appears in a sentence, the relative clause can be mistaken as the matrix clause in the initial parse. (Examples of such misanalyses will be provided in (7) below.)

The following subsections introduce four types of factors and their predictions on the comprehension of Chinese relative clauses. We start with the thematic order effect, which has been largely ignored in previous research on Chinese relative clause processing. We then discuss other factors relevant to relative clause processing, including parsing uncertainty and garden path in prenominal relative clause processing, integration cost, storage cost, and locality, and structural probability. Two self-paced reading experiments will then be presented, which point to thematic ordering as an important factor for comprehending Chinese relative clauses.

### 1.1. Thematic orders

Since the early days of sentence processing research, much attention has been paid to the basic word order of a language (Bever, 1970). In English, the dominant SVO order, hence the resulting NVN sequence, is taken to serve as a perceptual strategy that guides sentence comprehension. Sentences with word orders that fit this canonical order have been found to be easier to comprehend; lexical inputs that fit this NVN sequence are also preferably parsed as complete

<sup>1</sup> See also Polinsky et al. (2012) for relative clause processing in Avar, an ergative language with prenominal relative clauses, where no processing difference was found between subject and object relatives.

<sup>2</sup> *De* in Chinese is often referred to as a modification marker (Cheng and Sybesma, 2005) or a linker (Ou, 2007; see also den Dikken and Singhapreecha, 2004). In this paper, we focus on its function in Chinese relative clause constructions and use the term relativizer (REL) to refer to it.

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