Lexical effects on quantifier scope processing in Chinese

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Language is a complex adaptive system with multiple factors interacting with one another for linguistic comprehension and production. When one says 'Every man loves a woman', does it mean every man loves a *different* woman (i.e., the surface universal quantified reading), or the same woman (i.e, the inverse existential quantified reading)? Doubly quantified sentences in English can express either the surface or the inverse scope thus denoting both universal and existential readings (e.g., May, 1985). One may wonder what factors contribute to scopal preferences in reading similar sentences in Chinese, a language that is typologically different from English.

Three approaches have been taken to understand English sentences like these. Kurtzman and MacDonal (1993) report in an acceptability task that active sentences prefer the surface scope. In an ERP study, Dwivedi et al. (2010) report that sentences are ambiguous initially, and the structural computation occurs later. However, both studies showed that stimuli did not behave uniformly, suggesting that certain verb-lexical biases exist. Although the scope preference was not the focus of their picture-priming study, Raffray and Pickering (2010) report that the surface reading was preferred.

Unlike English, it has been argued in the literature of generative syntax that Chinese only allows the surface scope (e.g., Huang, 1982; Aoun and Li, 1993). Nonetheless, it is reported that "sometimes" the inverse scope is available (e.g., *Mei ge xuesheng dou pa yi wei nan laoshi* 'Every student is afraid of a male teacher). Concerning Chinese sentence processing, some report that no inverse scope is available (Scontras et al., 2013; Tsai et al. 2014); some others report that the inverse scope is available, but there is no consensus on what kind of condition licenses what type of scope (Zhou and Gao, 2009; Hsu and Lin, 2014). Thus, we attempt to study whether the inverse scope is available in Chinese doubly quantified sentences and what lexical effects contribute to which scope preference.

This paper report results from two online reading experiments. Assuming that verbs within each verb type are the same, we looked at the effects of different aspectuality and of verb types (action, locative, perception, psych verbs), separately.

Experiment 1 examined different types of aspecuality paired with the same action verb 'attack': perfective *le*, durative *zhe*, experienced *guo*, progressive *zai*, and the zero form. It is generally assumed that *le* indicates the end result of an event, and *guo* indicates an event has been experienced and no longer exists at the speech time. As denoting the imperfective type of aspect, *zai* indicates an action in progress, and *zhe* indicates a static durative state (Smith 1991). The mean reading time shows that the inverse reading is preferred when it is marked with imperfect durative *zhe*, and no preference is shown with the zero form, unlike aspect *le*, *guo*, and *zai*, which prefer the surface reading.

Experiment 2 used a new linguistic context to examine two different surface word orders of doubly quantified sentences. Previous studies usually used the '*Every … a …*' order. In Chinese such quantifier order in a declarative sentence requires a marker *dou* 'all', which expresses a semantic function that is still controversial (e.g., as a distributive operator in Lee 1986, or as a maximality operator in Xiang 2008). In light of the fact that the inverse scope of *Every > a* sentences entails the surface scope (Reinhart 1978), but that in sentences like *A kid climbed every tree*, the reading of multiple kids climbing trees is only possible when the inverse reading is available, we examined two quantifier orders (*Every … a …*. vs. *A… every….*) in conditional SVO sentences marked by *yaoshi* 'if', i.e., an environment that can naturally accommodate both existential quantified subject without the definite-marker *you* 'exist', and *every*-quantified subject without *dou* 'all'. The results suggest that, for perception verbs such as *hear* and *watch*, in the order *Every … a …*, the preferred interpretation is the existential reading, and in the order *A… every…*, the preferred interpretation is the universal reading. This suggests that the inverse reading can be available in Chinese. For action and psych verbs, no obvious preference was found, a result more in line with the report in Dwivedi et al. (2010) for English, that is, quantifier sentences may remain ambiguous during processing.