

Relative clause processing, structural and linear distance matter - Evidence from Mandarin, Cantonese and English Visual World experiments

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Relative Clause (RC) processing confronts three major theories: linear distance theories, frequency and structure based theories (Hsiao & Gibson, 2003; Chen et al, 2011; Gibson & Wu, 2011; MacDonald & Christiansen, 2002; Reali & Christiansen, 2007; O'Grady, 1997). Languages like English don't allow to decide between them since all three predict a Subject Relative (SR) preference. For Mandarin and most Cantonese RCs, on the other hand, linear distance predicts an Object Relative (OR) preference since both are SVO languages with prenominal RCs (Dryer, 2013). Structural Distance and frequency, however, predict an SR preference. RC Processing could actually be explained by the competition between all factors which could finally cancel each other out (Vasishth et al, 2013). We decided to study subject and object relatives in Visual World experiments in Mandarin and Cantonese. English RC processing was analyzed as a control.

The design was the same for all experiments in the three languages. Participants listened to a sentence while viewing a pair of pictures with the same three characters each performing different actions (see figure 1). The task was to find the correct picture corresponding to the sentence. One of the pictures was only compatible with an SR interpretation, the other one only with an OR interpretation (see table 1).

In three Visual World Eye-Tracking experiments for Mandarin Chinese, we found either a slight SR preference or no preference at all (figures 2, 3, 4), consistent with the proposition that RC processing involves a competition between linear distance and frequency/structure based factors cancelling out any clear preference (Vasishth et al, 2013). Cantonese is an interesting case because it has prenominal RCs as Mandarin but is different in that it has two major RC-types: one similar to Mandarin with a relativizer (*ge3*), and one without relativizer. It has been argued that linear distance plays no role in structures without relativizer which may be analysed as adjoined (Yu, 2006). The two structures have also been argued to be semantically different (Cheng & Sybesma, 1999) since RCs without relativizer (demonstrative + classifier) are more restrictive and definite whereas RCs with relativizer can be non-restrictive (the relativizer *ge3* will then be interpreted as indefinite). However, in our experimental design, the context only favoured a restrictive interpretation (and a definite reading). The *ge3* RCs used in our experiments were judged highly natural by 4 native Cantonese speakers.

As for the results, Cantonese RCs with relativizer show a slight (marginal) SR preference (figure 5), however for Cantonese RCs without relativizer, we found a strong (significant) advantage for SRs (figure 6). Moreover, RCs without relativizer were generally easier to process than RCs with relativizer (meaning that participants fixated the correct picture earlier). Since for RCs without relativizer, only frequency/structure based factors should be at work (since the structure wouldn't contain a gap), the significant SR advantage is predicted, and so is the lack of difference between SRs and ORs in RCs with relativizer, in which the factors are in competition. The hypothesis of the combination of the factors is meaningful since it also explains the clear and robust difference between SRs and ORs in languages such as English where the two factors are confounded and predict the same pattern in processing, that is to say an SR preference (figure 8).



Figure 1. Example of items used in the experiment

Languages	Subject relative	Object relative
Mandarin	请找出相对应的公主，也就是画击剑者的漂亮公主。 Please find correct princess, that is to say draws fencer _{obj} de beautiful princess	请找出相对应的公主，也就是击剑者画的漂亮公主。 Please find correct princess, that is to say fencer _{subj} draws de beautiful princess
Cantonese (relativizer)	請搵出相對應嘅公主，亦即係畫擊劍者嘅靚公主。 Please find correct princess, that is to say draws fencer _{obj} ge3 beautiful princess	請搵出相對應嘅公主，亦即係擊劍者畫嘅靚公主。 Please find correct princess, that is to say fencer _{subj} draws ge3 beautiful princess
Cantonese (dem+class)	請搵出相對應嘅公主，亦即係畫擊劍者嗰個靚公主。 Please find correct princess, that is to say draws fencer _{obj} dem CI beautiful princess	請搵出相對應嘅公主，亦即係擊劍者畫嗰個靚公主。 Please find correct princess, that is to say fencer _{subj} draws dem CI beautiful princess
English	Please find the right princess, that is to say the beautiful princess that is drawing the fencer on the picture.	Please find the right princess, that is to say the beautiful princess that the fencer is drawing on the picture.

Table 1. Example of sentences used for the Eye-Tracking experiments in each language tested.

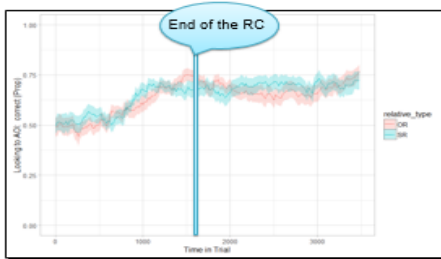


Figure 2. Proportions of correct fixations every 20ms in Mandarin starting at the beginning of the RC (exp 1)

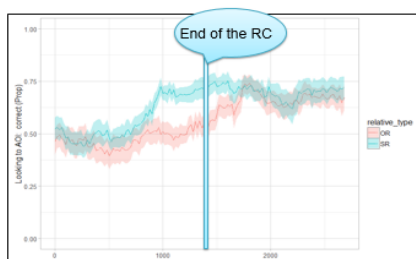


Figure 3. Proportions of correct fixations every 20ms in Mandarin starting at the beginning of the RC (exp 2)

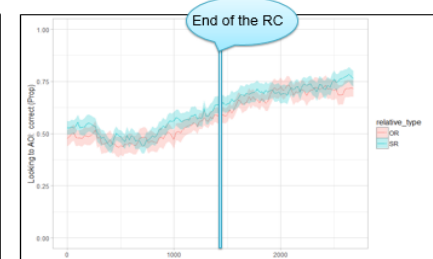


Figure 4. Proportions of correct fixations every 20ms in Mandarin starting at the beginning of the RC (exp 3)

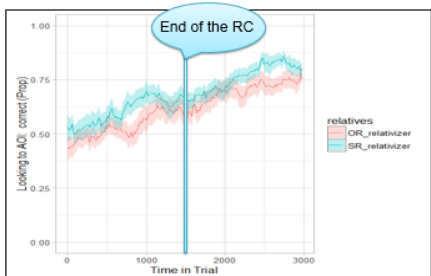


Figure 5. Proportions of correct fixations every 20ms in Cantonese starting at the beginning of the RC. (RCs with relativizer)

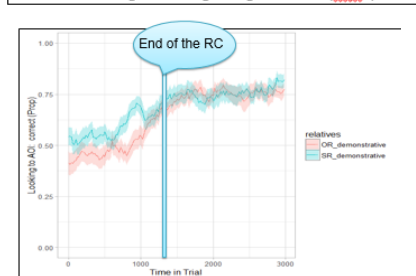


Figure 6. Proportions of correct fixations every 20ms in Cantonese starting at the beginning of the RC (RCs with demonstrative + classifier)

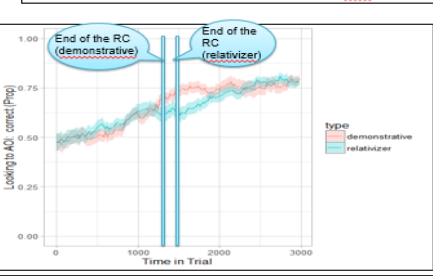


Figure 7. Proportions of correct fixations every 20ms in Cantonese starting at the beginning of the RC. (all types)

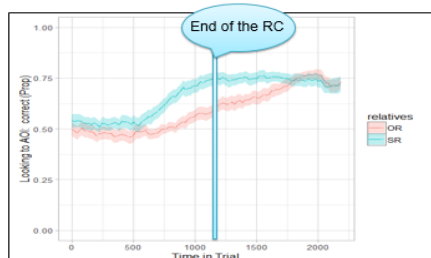


Figure 8. Proportions of correct fixations every 20ms in English starting at the beginning of the RC.

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