

ABSTRACT

RC processing confronts three major theories: linear distance theories, frequency or structural distance based theories (Hsiao & Gibson, 2003; Chen et al., 2011; Gibson & Wu, 2011. Jäger et al., 2015; Yun et al., 2015). However, languages like English don't allow to decide between them since all three predict a Subject Relative preference. For Mandarin and most Cantonese RCs, on the other hand linear distance predicts an Object Relative preference. RC Processing could actually be explained by competition between all factors which could finally cancel each other out (Vasishth et al, 2013). Previous experiments cannot decide between these factors because of ambiguity in materials. Moreover, as far as we know, no studies have compared RCs in different languages with exactly parallel experiments. Therefore, we decided to study subject (SRs) and object relatives (ORs) in fully parallel Visual World experiments in Mandarin and Cantonese. English RC processing was also analyzed as a control.

SPECIFICITY OF RCs IN MANDARIN AND CANTONESE

Mandarin and Cantonese are SVO languages with prenominal RCs (Dryer, 2013).

Mandarin

Subject Relative
[画 击剑者 的] 公主
[Draws fencer that] princess
The princess that draws the fencer

Object Relative
[击剑者 画 的] 公主
[Fencer draws that] princess
The princess that the fencer draws

Cantonese

Subject Relative (relativizer)
[画 击剑者 嘅] 公主
[Draws fencer that] princess
The princess that draws the fencer

Object Relative (relativizer)
[击剑者 画 嘅] 公主
[Fencer draws that] princess
The princess that the fencer draws

Subject Relative (demonstrative + classifier)
[画 击剑者] 嗰个公主
[Draws fencer] this princess
The princess that draws the fencer

Object Relative (demonstrative + classifier)
[击剑者 画] 嗰个公主
[Fencer draws] this princess
The princess that the fencer draws

PREDICTIONS FOR RELATIVE CLAUSE PROCESSING

Linear distance-based theories : Dependency Locality Theory (Gibson, 2000)

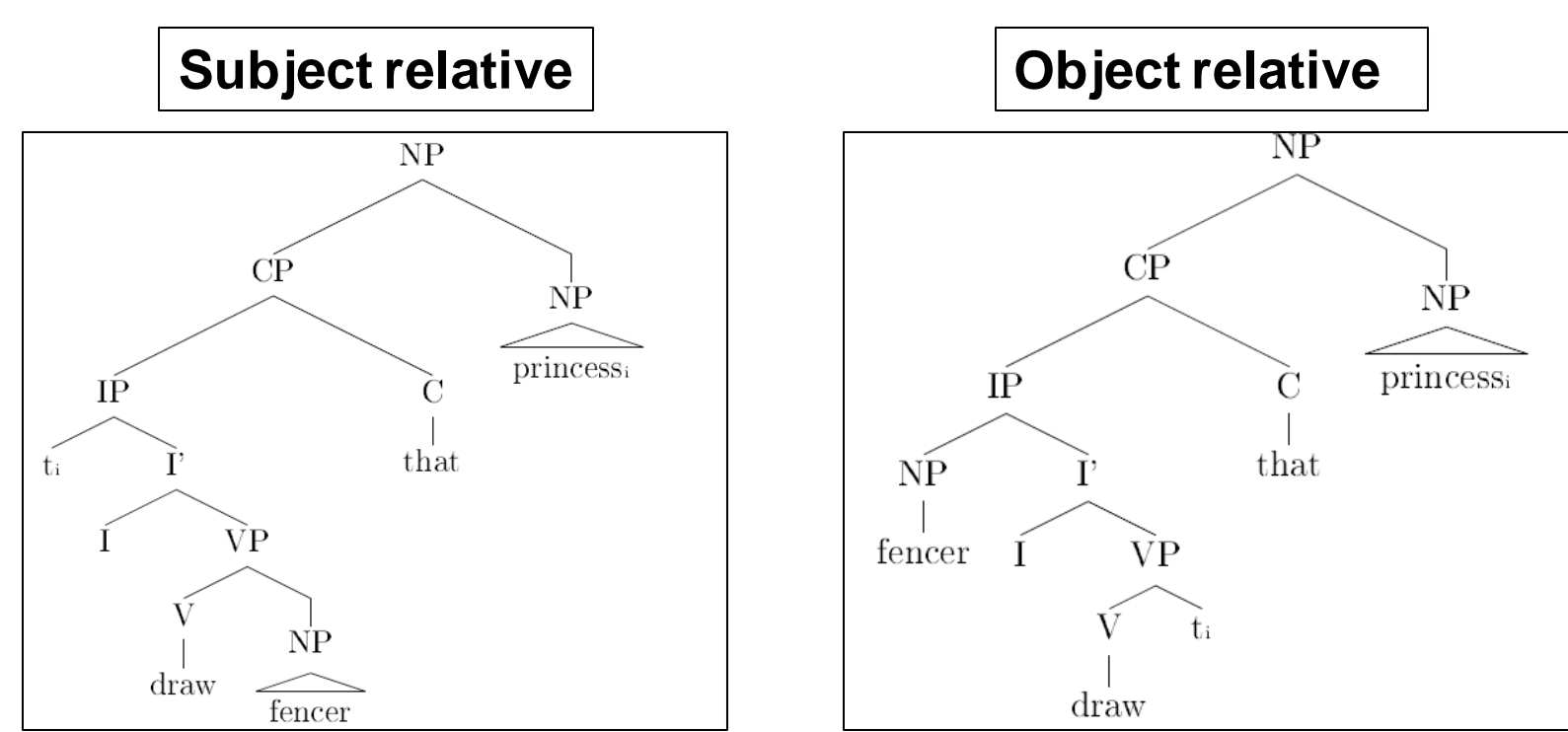
- Shorter linear distance in ORs than in SRs
- ORs easier to process than SRs

Frequency-based theories (MacDonald & Christiansen, 2002; Reali & Christiansen, 2007)

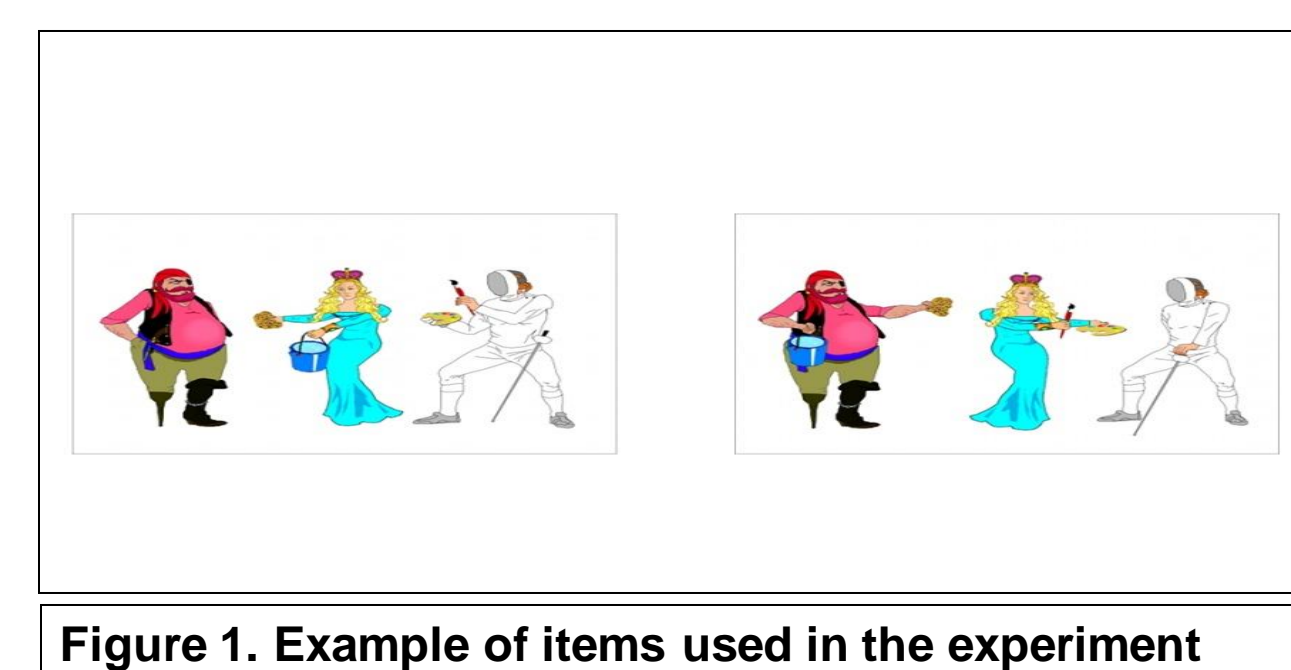
- SRs more frequent than ORs
- SRs easier to process than ORs

Phrase-structural distance hypothesis (O'Grady, 1997)

- Shorter structural distance in SRs
- SRs easier to process than ORs



VISUAL WORLD EXPERIMENTS : DESIGN



Materials

- 2 conditions: SR and OR (4 for Cantonese because of the two types of RCs)
- Position of correct image counterbalanced
- Position of the head of the RC (here: princess) counterbalanced
- Reversible relative clauses
- Context preceding each item (presentation of characters) forcing restrictive reading

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 [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]

MANDARIN

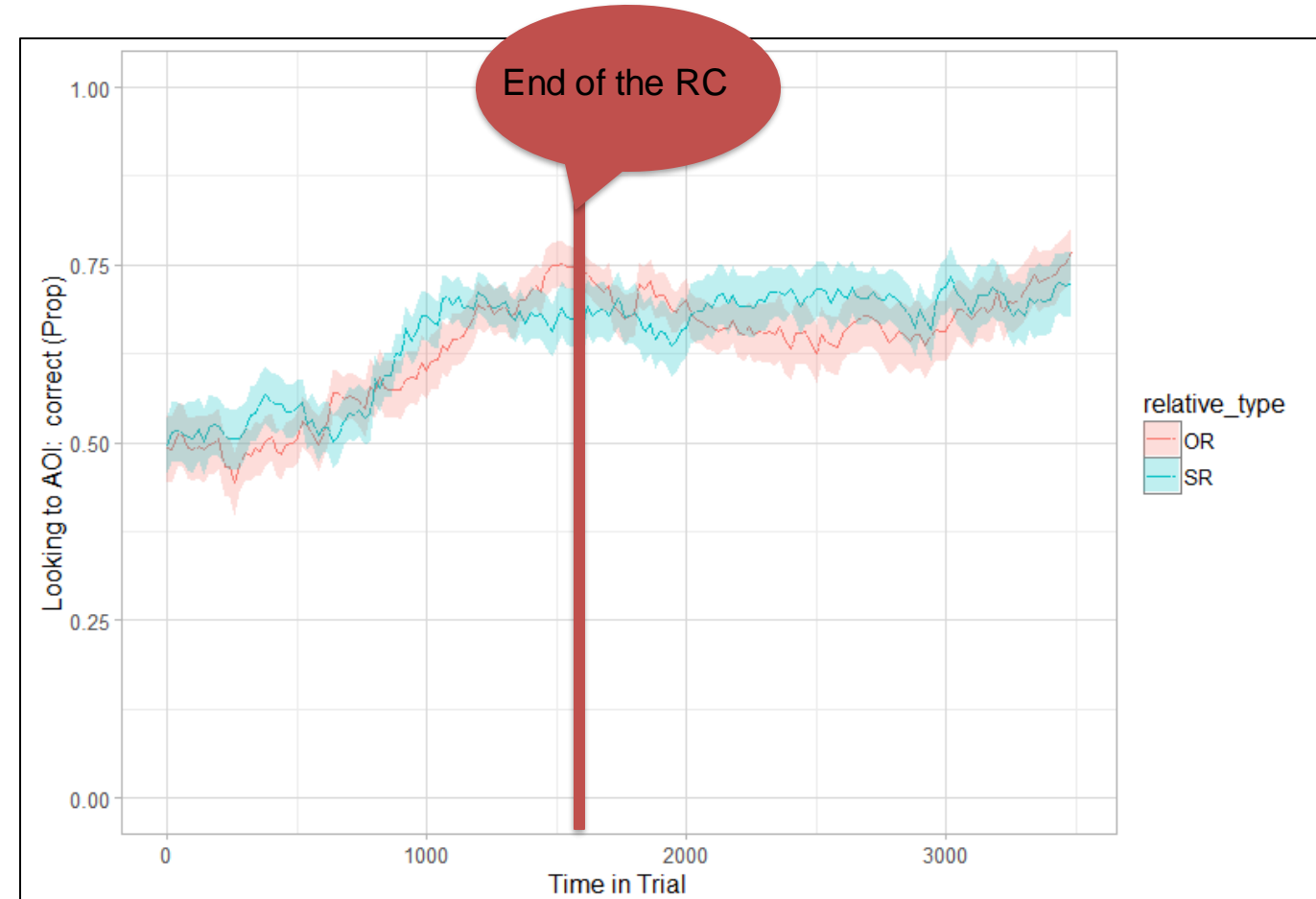


Figure 2. Proportions of correct fixations every 20ms in Mandarin starting at the beginning of the RC.

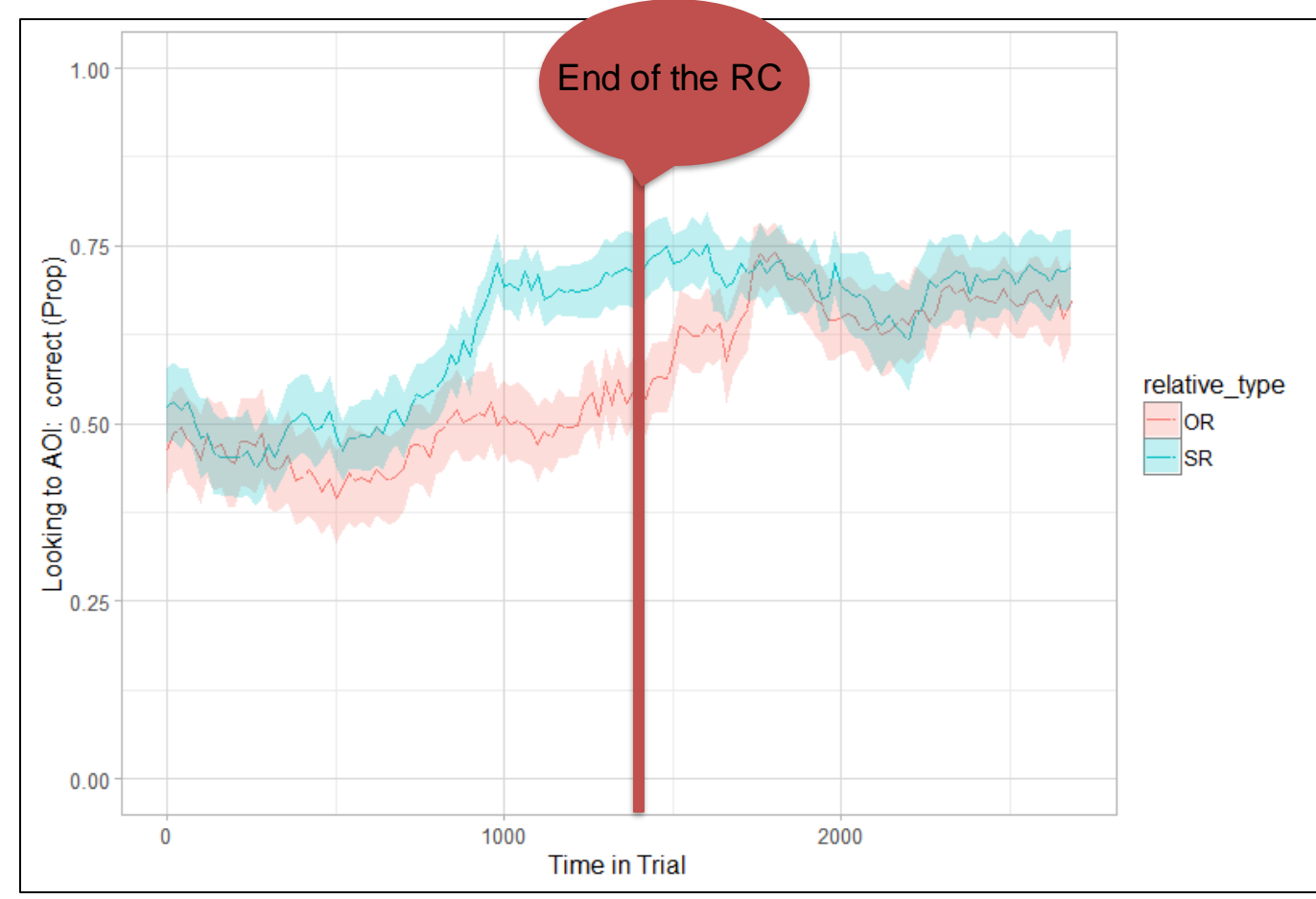


Figure 3. Proportions of correct fixations every 20ms in Mandarin starting at the beginning of the RC.

Participants

- 41 native Mandarin speakers living in Paris, France, proficient in French (Exp1, Figure 2)
- 23 native Mandarin speakers living in Paris, speeded up presentation (Exp2, Figure 3)
- 35 native Mandarin speakers living in Nanjing, China, presentation speed as in Exp2 (Exp3, Figure 4)

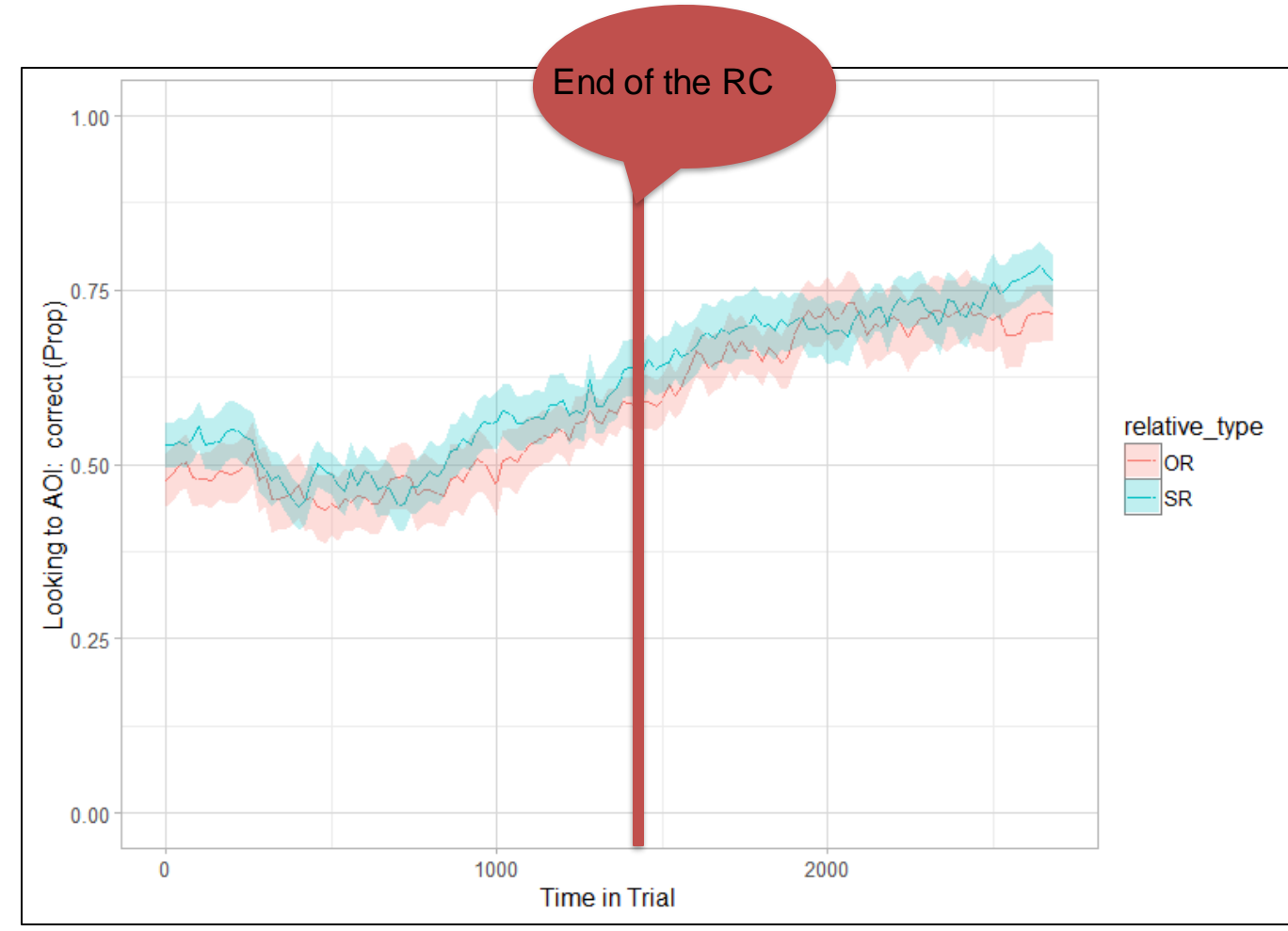


Figure 4. Proportions of correct fixations every 20ms in Mandarin starting at the beginning of the RC.

Using linear mixed models, we found :

Exp1 (Figure 2)

- No significant difference between SRs and ORs in Exp1.
- No systematic significant interaction with skills in French as a Second Language in terms of usage, proficiency and age of acquisition.

Exp2 (Figure 3)

- Presentation of the linguistic input was speeded up to enhance processing load (PRAAT, factor .80).
- Significant SR advantage: $p < .01$ (1000-1600ms).

Exp3 (Figure 4)

- No significant difference between SRs and ORs in Exp3.
- Faster presentation does not seem to be enough to induce processing difficulty for ORs in a monolingual environment.

CANTONESE

Participants

- 23 native Cantonese speakers living in Paris (Exp4)

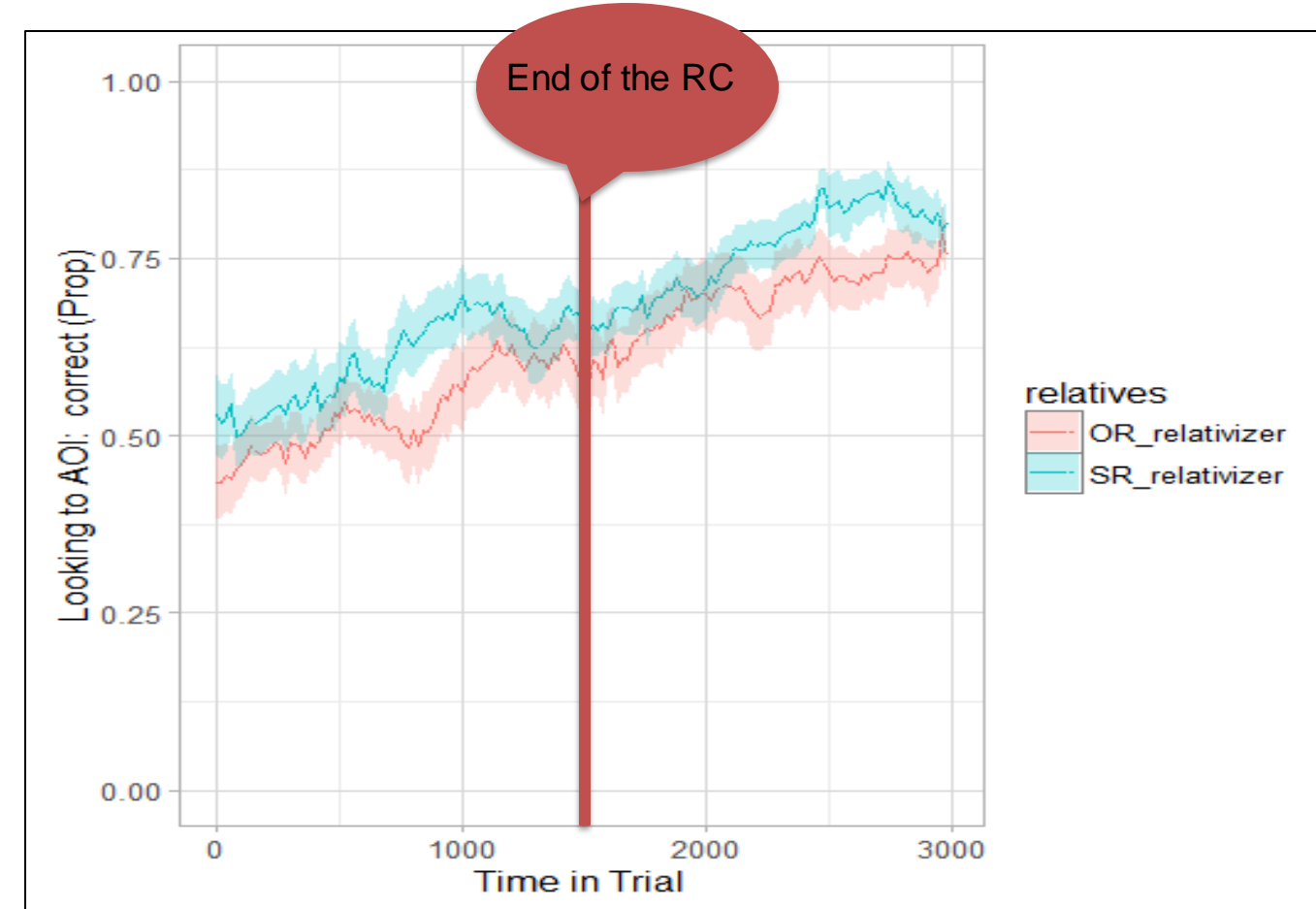


Figure 5. Proportions of correct fixations every 20ms in Cantonese starting at the beginning of the RC (RCs with relativizer).

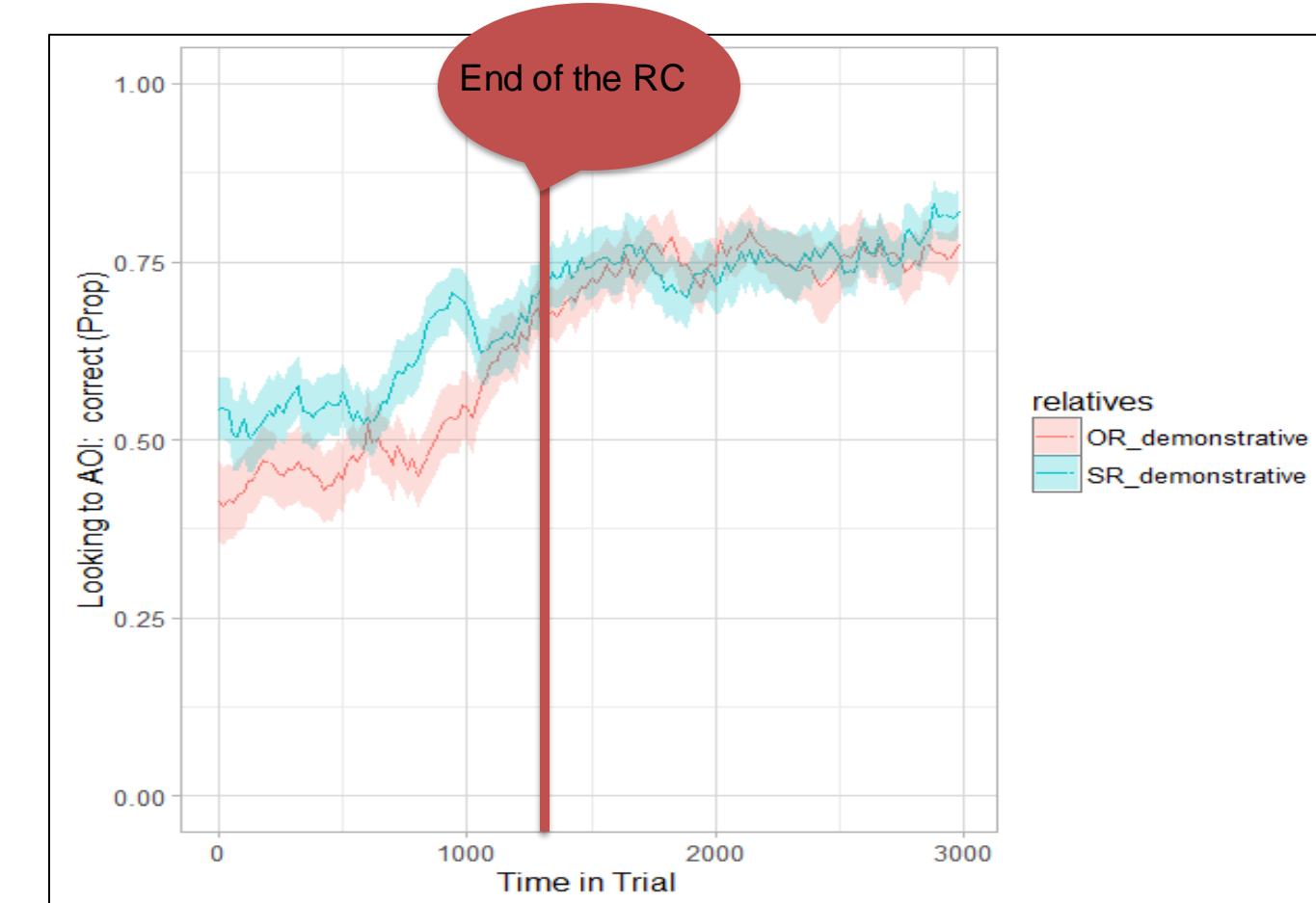


Figure 6. Proportions of correct fixations every 20ms in Cantonese starting at the beginning of the RC (RCs with demonstrative + classifier).

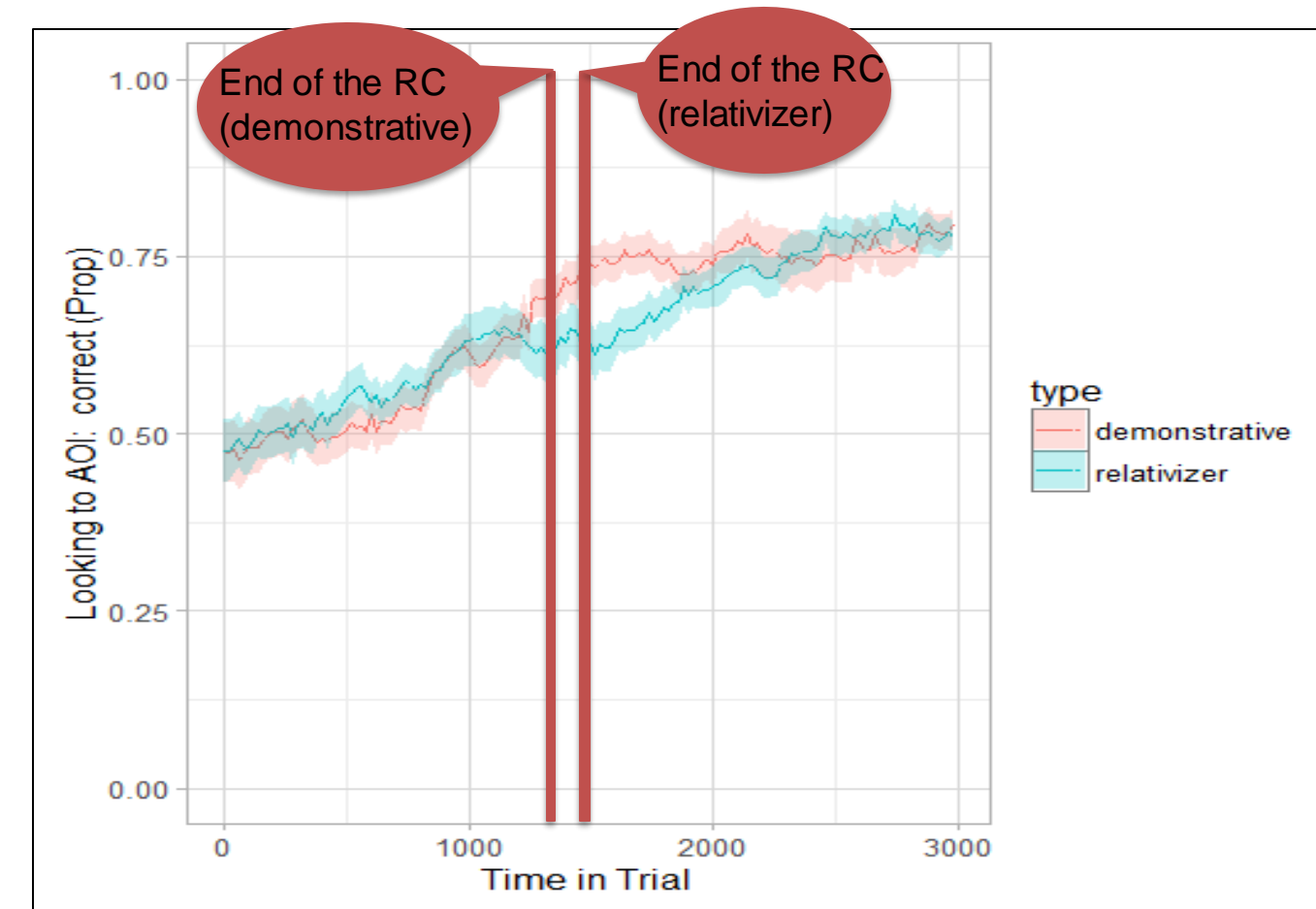


Figure 7. Proportions of correct fixations every 20ms in Cantonese starting at the beginning of the RC (all types confounded).

Using linear mixed models, we found :

- A slight SR advantage for relative clauses with a relativizer (fig. 5) : $p < .05$ (700-1000ms) and $p < .05$ (2500-2800ms).
- A strong SR advantage for RCs with a demonstrative and a classifier (fig 6) $p < .01$ (700-1000ms).
- RCs with relativizer harder than RCs with demonstrative and classifier: $p < .05$ (1500-1800ms).

ENGLISH (CONTROL GROUP)

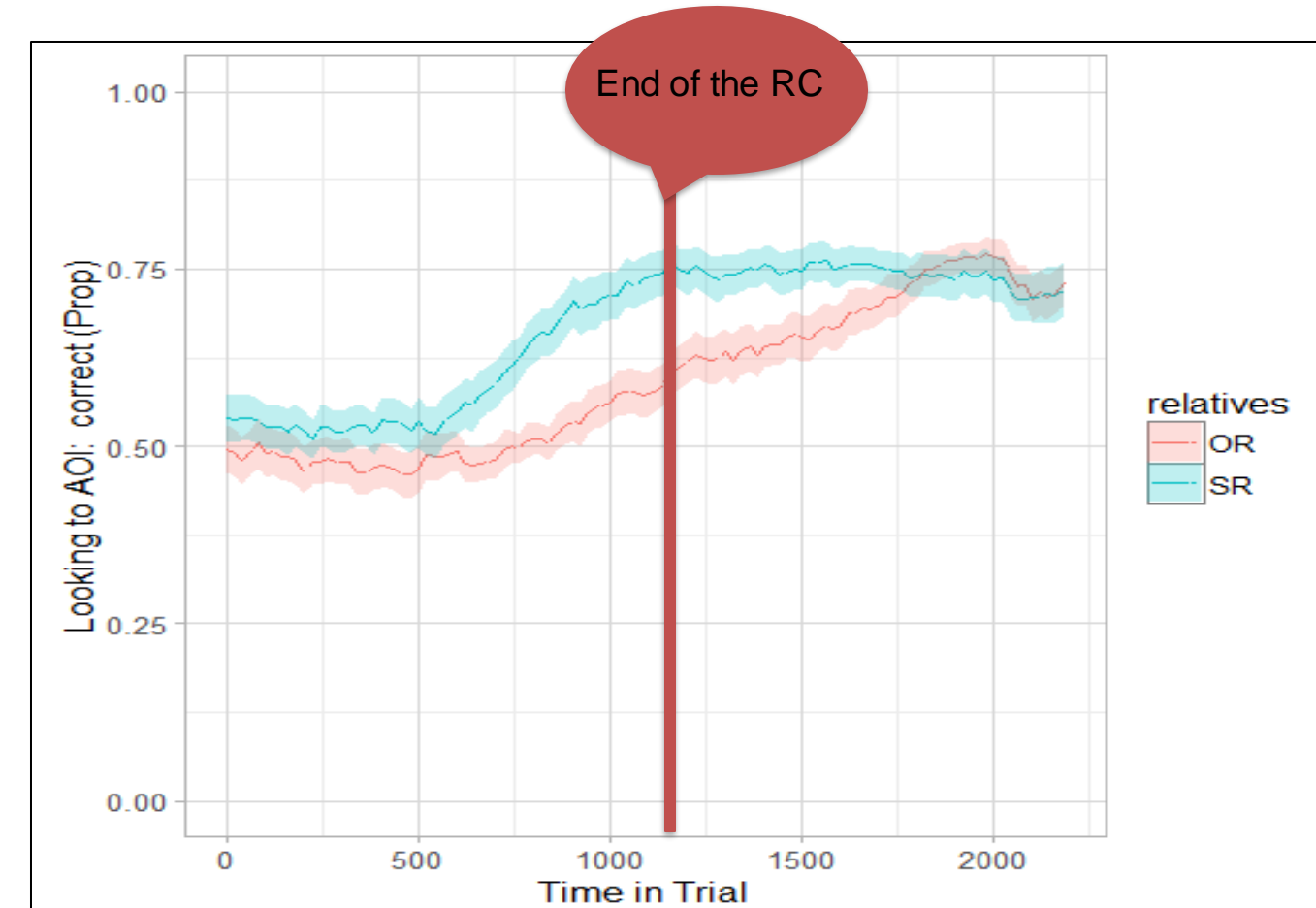


Figure 8. Proportions of correct fixations every 20ms in English starting at the beginning of the RC.

Participants

- 24 native English speakers, living in Glasgow, Scotland

Using linear mixed models, we found :

- A significant difference between SRs and ORs: $p < .01$ (500-1600ms).

CONCLUSION

- Experiments in Mandarin showed a slight but not robust SR advantage consistent with the proposition that RC processing involves a competition between linear distance and frequency/structure based factors.
- The two structures with relativizer in Mandarin and in Cantonese have also been argued to be semantically different (Cheng & Sybesma, 1999). However, in our experimental design, the context only favored a restrictive interpretation (and a definite reading).
- Cantonese relative clauses with relativizer are syntactically similar to Mandarin relative clauses and the results are in line with the hypothesis of competition between the factors.
- However, Cantonese relative clauses without relativizer showed a strong advantage for SRs, and appear to be easier to process than relatives with relativizer (especially at the end of the relative, before the head noun).
- It could be argued that this structure is analyzed as an adjunct (Yu, 2006). In this case, only frequency/structure based factors are at stake leading to a strong difference between SRs and ORs.
- The hypothesis of the combination of the factors 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 (see Figure 8).

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