

**Gap-filling vs. filling gaps: Event-related brain indices of subject and object relative clauses in Japanese**

Using event-related brain potentials (ERPs), we investigated the processing of Japanese subject versus object relative clauses (SRs /ORs). ORs in English have been reported to take longer to read (King & Just, 1991) and to elicit left-lateralized or bilateral anterior negativity (LAN) between a filler and its gap (King & Kutas, 1995), which is said to index working-memory load for holding a filler (cf. Gibson, 1998, 2000). However, in Japanese relative clauses, gaps precede their fillers, and the gap-filler distance is longer in SRs than in ORs (1). Despite the shorter linear distance, recent reading time studies (Ishizuka et al., 2003; Miyamoto & Nakamura, 2003) show that the processing costs of Japanese ORs are still higher than those of SRs. Structural (rather than linear) distance may explain the preference for SRs in both languages (O'Grady, 1997).

We investigated whether LAN effects reflecting filler-gap association in English would replicate with gap-filler association in Japanese, and whether these effects in Japanese would correlate with linear/structural distance. Stimuli included singly-embedded SRs and ORs (2), intermixed with filler sentences. Following Ishizuka et al. (2003), potential confounding effects of perspective-shift (MacWhinney, 1982) and case-mismatch (Sauerland & Gibson, 1998) were controlled by using dative-topic-marking on the head-noun.

In comparison to SRs, ORs (a) did not elicit any significant difference during the relative clause (b) but elicited a continuous centro-posterior positivity from the head-noun to sentence-end. The lack of apparent ERP effect in the relative clause itself may be due to the possibility of mono-clausal completion in that region, as gaps could simply be interpreted as pro-drop. Conversely, the positivity starts at the head-noun (which clearly indicates the relative clause construction) and might be an index of syntactic integration costs (Kaan et al., 2000), in that the object gap position was more deeply-embedded and thus more structurally distant from the head-noun.

Overall, different ERP components were elicited by English and Japanese relatives, suggesting different parsing operations for filler-gap and gap-filler dependencies in relative clauses. Filler-gap association in English relatives is indexed by LAN (often tied to working-memory storage costs), while gap-filler association in Japanese relatives is indexed by positivity (often tied to integration costs). Additionally, both reading time and ERP data seem more consistent with a structural distance account than a linear distance account, at least for Japanese relatives.

## Examples

(1) SR [ \_\_\_i 新任の 議員を 非難した] 記者が<sub>i</sub> 過ちを 認めた。  
new senator-A attacked reporter-N error-A admitted

‘The reporter [who \_\_\_ attacked the new senator] admitted the error.’

OR [ 新任の 議員が \_\_\_i 非難した] 記者が<sub>i</sub> 過ちを 認めた。  
new senator-N attacked reporter-N error-A admitted

‘The reporter [who the new senator attacked \_\_\_ ] admitted the error.’

(2) SR [ \_\_\_i 新任の 議員を 非難した] 記者には<sub>i</sub> 長年の 相棒が いた。  
new senator-A attacked reporter-D-T long-term colleague-N existed

‘(For the reporter who attacked the new senator, a long-term colleague existed →)  
The reporter who attacked the new senator had a long-term colleague.’

OR [ 新任の 議員が \_\_\_i 非難した] 記者には<sub>i</sub> 長年の 相棒が いた。  
new senator-N attacked reporter-D-T long-term colleague-N existed

‘The reporter who the new senator attacked had a long-term colleague.’

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