Gap-filler dependencies are sensitive to islands: The case of Japanese relative clauses

Maho Takahashi, Grant Goodall (University of California, San Diego)
mtakahas@ucsd.edu

In filler-gap dependencies, gaps within certain structural environments (known as "islands") are severely degraded. Does the same phenomenon arise in gap-filler dependencies, which are common in head-final languages? Here we address this question by examining relative clauses (RCs) in Japanese. RCs are known to be islands in many languages **[1]**. For instance, relativization out of another RC in English (i.e., a filler-gap dependency across an RC boundary) is not allowed (=1b).

(1) a. The professor that [$_{RC}$ _ wrote a novel] is very proud. *filler-gap*
b. *This is the novel that [$_{RC2}$ the professor that [$_{RC1}$ _ wrote _]] is very proud.

RCs in Japanese are head-final, as shown schematically in (2a), thus exemplifying a gap-filler dependency. If this dependency is sensitive to islands, further relativization out of the RC, as in (2b), should not be possible (cf. 1b).

(2) a. [$_{RC}$ _ a novel wrote] the professor is very proud. *gap-filler*
b. This is [$_{RC2}$ [$_{RC1}$ _ _ wrote] the professor is very proud] the novel.

Such structures have been often thought to be grammatical **[2, 3]**, but here we explore this rigorously by means of an acceptability experiment using a factorial design, looking for the super-additivity that signals the presence of an island effect **[4]**.

Experiment 1: 36 native speakers of Japanese participated in an online sentence acceptability experiment using a 7-point scale. The experiment had a 2x2 design, crossing EMBEDDED CLAUSE (RC vs. non-island) and EXTRACTION (relativization) out of the embedded clause (+ vs. -). The non-island clause is headed by *koto* 'the fact (that),' known not to induce an island effect **[5, 6]**. Participants saw 5 tokens of each condition (20 in total), together with 40 filler items of widely varying acceptability. Each of the 4 lists was fully counterbalanced and pseudorandomized. Sample stimuli are displayed in (3).

***Results/Discussion*:** A linear mixed-effect model with random effects of subject and item reveals a significant main effect of EXTRACTION ($p < 0.001$), and importantly, a significant interaction between EMBEDDED CLAUSE and EXTRACTION ($p = 0.002$) (Figure 1). This interaction shows the super-additivity that defines an island effect, thus suggesting that gap-filler dependencies are indeed sensitive to islands. However, is the effect here specific to gap-filler dependencies, or could it occur with any "backwards" dependency? Exp. 2 explores the latter scenario with an anaphor that can precede its referent.

Experiment 2: A new group of 36 speakers participated in an online experiment consisting of the same number of stimuli as Exp.1 (20 critical + 40 fillers = 60 total) and a similar 2x2 design crossing EMBEDDED CLAUSE and ANAPHOR DEPENDENCY (+ vs. -), the latter replacing the gap-filler dependency (EXTRACTION) of Exp. 1. The anaphor *zibun* 'self' was used, forming a backwards dependency with its referent *gakusha* 'professor.'

Results/Discussion: A linear mixed-effect model with random effects of subject and item shows a significant main effect of EXTRACTION ($p < 0.001$), but the interaction effect between EMBEDDED CLAUSE and ANAPHOR DEPENDENCY is not significant ($p = 0.78$) (Figure 2). The absence of an interaction here suggests that the island effect observed in Exp. 1 is specific to gap-filler dependencies and is not a property of backward dependencies in general.

Conclusions: On a par with filler-gap dependencies, then, gap-filler dependencies seem to be sensitive to islands (though the relatively high acceptability of the island violation suggests this may be a "subliminal island" effect **[7]**). Our results are in accord with the general findings in the literature that the processing of head-initial and head-final structures is much more similar than one might expect **[8, 9, 10]**. The source of island effects in filler-gap dependencies has of course long been hotly contested, but the current results suggest that any account that attributes the effect solely to the rightward search for a gap would appear to be incorrect.

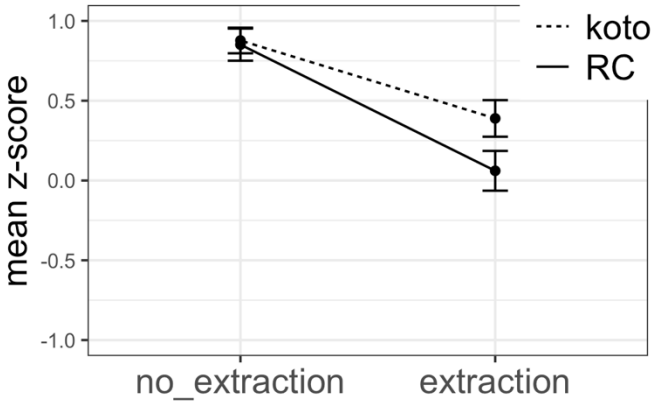
(3) **Sample items:** Exp.1 with a sentence-initial gap, Exp.2 with the anaphor *zibun*

a. [-RC] [-extraction] (Exp.1) / [-anaphor] (Exp.2)
[$_{koto}$ Gakusha-ga SF-shousetsu-o] kai-ta-koto-ga saikin shoten-de
professor-NOM Sci-Fi novel-ACC write-PST-fact-NOM recently bookstore-at
tokusyu-sa-re-ta.
feature-do-PASS-PST
"The fact [$_{koto}$ that a professor wrote a sci-fi novel] was recently featured in a bookstore."

b. [-RC] [+extraction] (Exp.1) / [+anaphor] (Exp.2)
[$_{RC}$ [$_{koto}$ __ / Zibun$_i$-ga SF-shousetsu-o] kai-ta-koto-ga saikin
(self-NOM) Sci-Fi novel-ACC write-PST fact-NOM recently
shoten-de tokusyu-sa-re-ta] gakusha$_i$-wa hokorashige-da.
bookstore-at feature-do-PASS-PST professor-TOP looks.proud-COP
"The professor$_i$ [$_{RC}$ who the fact [$_{koto}$ that __ / self$_i$ wrote a sci-fi novel] was featured in a bookstore] looks proud."

c. [+RC] [-extraction] (Exp.1) / [-anaphor] (Exp.2)
[$_{RC}$ Gakusha-ga __ kai-ta] SF-shousetsu-ga saikin shoten-de
professor-NOM write-PST Sci-Fi novel-NOM recently bookstore-at
tokusyu-sa-re-ta.
feature-do-PASS-PST
"The sci-fi novel [$_{RC}$ that the professor wrote __] was featured in a bookstore."

d. [+RC] [+extraction] (Exp.1) / [+anaphor] (Exp.2)
[$_{RC2}$ [$_{RC1}$ __ / Zibun$_i$-ga __ kai-ta] SF-shousetsu-ga saikin shoten-de
(self-NOM) write-PST Sci-Fi novel-NOM] recently bookstore-at
tokusyu-sa-re-ta] gakusha$_i$-wa hokorashige-da.
feature-do-PASS-PST professor-TOP looks.proud-COP
"The professor$_i$ [$_{RC2}$ who the sci-fi novel$_j$ [$_{RC1}$ that __ / self$_i$ wrote __] was recently featured in a bookstore] looks proud."



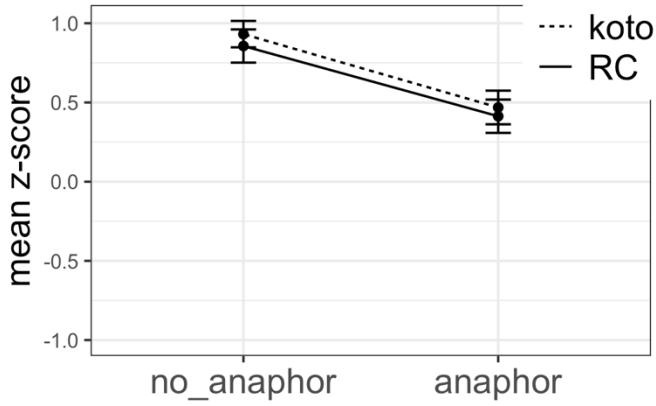


Figure 1: Mean acceptability from Exp. 1 (in z-score). **Figure 2**: Mean acceptability from Exp. 2 (in z-score).

References: **[1]** Ross (1967). *Constraints on variables in syntax*. **[2]** Ishizuka (2009). CNPC Violations and Possessor Raising in Japanese. ICEAL 2. **[3]** Nakamura & Miyamoto (2013). The object before subject bias and the processing of double-gap relative clauses in Japanese. *L&CP*. **[4]** Sprouse et al. (2011). Reverse island effects. *Syntax*. **[5]** Fukuda & Sprouse (2019). *Islandhood of Japanese Complex NPs and the Factorial Definition of Island Effects*. **[6]** Omaki et al. (2020). Subextraction in Japanese and subject-object symmetry. *NLLT*. **[7]** Almeida (2014). Subliminal wh-islands in Brazilian Portuguese. RdA 13. **[8]** Kahraman et al. (2011). Incremental processing of gap-filler dependencies. TCP 12. **[9]** Aoshima et al. (2004). Processing filler-gap dependencies in a head-final language. *JML*. **[10]** Omaki et al. (2015). Hyper-active gap filling. *Frontiers*.