Island effects and scrambling: an on-line self-paced reading study

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Korean is a scrambling language that allows a relatively free word order. Certain types of word order permutation, however, lead to fatal unacceptability even in Korean. In particular, the *Island Constraint* (Ross 1967) is known to be one of such restrictions that regulates scrambling in syntax (see Saito 1985, Hoji 1985, Y Lee 1993, J Cho 1994, Miyagawa 1997 for earlier works). As theories of islands develop, however, two competing approaches to the nature of islands emerge. One line of approaches claims that the island constraint works at the syntax proper, deepening Ross's original insight, whereas the other line of approaches claims that ill-formedness obtained with dependencies across an island is attributed to extra-linguistic processing difficulties (Sprouse and Hornstein 2013 for comprehensive overviews).

The goal of this paper is to contribute to this on-going debate on the nature of scrambling and islands, using on-line measures as well as judgment experiments on two different types of islands in Korean. In particular, by adopting the factorial definition of island effects (Sprouse 2007, Sprouse et al. 2011, Sprouse et al. 2016), we examine whether the effect size of unacceptability/delay in processing caused by scrambling is comparable to that of other types of long movement reported in the literature such as *wh*-movement in English and Italian. Unlike previous studies, we employ a self-paced reading experiment, which makes it possible to understand the time course shift of island effects. The current study also allows us to control the potential floor and ceiling effects, which could downscale the effect size of unacceptability in Likert scale judgment tests (cf. Ko et al. 2018, Kim and Goodall 2016 for off-line studies)

Following Sprouse et al. (2016), we assume that a violation of an island constraint yields a decrease in acceptability over and above length of dependency and island structure, which results in significant *super-additive interaction* between the two. We employed a 2x3 factorial Latin Square design [*structure*: island vs. non-island, *length of scrambling*: matrix- vs. embedded- vs. no-scrambling]. Two types of islands were tested, which are known to be theoretically distinct: strong (relative clause) island and weak (*wh*-)island. None of the tokens of target conditions were lexically related in each list; each list contained 48 sentences (24 experimental items and 24 fillers). A total of 60 native Korean speakers participated (30 for relative clause islands, 30 for *wh*-islands). The schematic representations of the 6 target conditions are given in (1). (2a) and (2b) exemplify the crucial stimulus (1f) with island violation for each islands.

(1) 6 Target Stimuli Types

Non-islands with No-, Matrix-, Embedded-Scr(ambling)

a. [[DP-Top [DP-Nom **DP-Acc** V] (ADV) DP-Dat V]: Non-Island | No-Scr.

b. [**DP-Dat** [DP-Top [DP-Nom DP-Acc V] (ADV) __ V]]: Non-Island | Matrix-Scr.

c. [[**DP-Acc** [DP-Top [DP-Nom __ V] (ADV) DP-Dat V]]: Non-Island | Embedded-Scr.

Islands with No-, Matrix-, Embedded-Scr(ambling)

d. [[DP-Top [$_{Island}$ (ADV)/DP-Nom **DP-Acc** V] (DP-Acc) DP-Dat V]: Island | No-Scr.

e. [**DP-Dat** [DP-Top [$_{Island}$ (ADV)/DP-Nom (DP-Acc) V] (DP-Acc) __ V]]: Island | Matrix-Scr.

f. [**DP-Acc** [DP-Top [$_{Island}$ (ADV)/DP-Nom __ V] (DP-Acc) DP-Dat V]]: Island | Embedded-Scr.

(2)a. 선거자금을 다희는 [최근에 __ 받았던] 국회의원을 검찰에 고소했다고 한다: Rel

b. 범인을 철수는 [누가 _ 도왔는지] 경찰관에게 진술하였다고 한다.: Wh

Each word counted as a region of interest (R1~R8) in the analysis. Figures 1 and 2 present mean residual RTs (log-transformed) for each region for the relative clause island experiment and the *wh*-islands experiment, respectively.

Figure 1

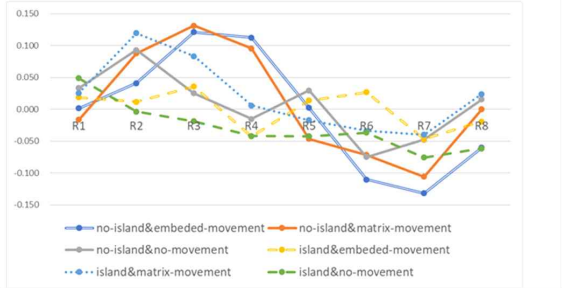
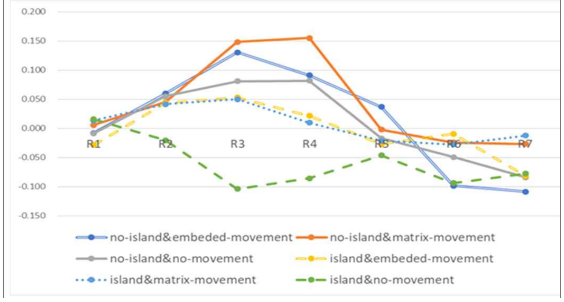


Figure 2



Participants read the island-embedded condition (e.g. (2a/b)) particularly longer in R6. To examine a super-additivity island effect in this region, we created a linear mixed-effects model, with the fixed effects of length and structure, with random effects of participant and item. For relative clause islands, the model yielded a main effect of structure (p<.01) and yielded a marginal super-additivity interaction effect (p<.10). For *wh*-islands, the model revealed a super-additivity interaction effect (p<.05), with no main effect of structure (p>.10) or length (p>.10).

Our results show that scrambling out of islands exhibits super-additive island effects as in *wh*-movement, supporting the view that island effects are not a linear sum of processing difficulties. Moreover, the spill-over effect in R6 indicates that there exists a super-additive island effect both in strong and weak islands in real time processing.

This is surprising given that *wh*-islands, as a weak island, do not yield unacceptability against scrambling in off-line tests (Lee 1993, Ko et al. 2018). Even weak islands show temporary super-additivity effects, which disappears in off-line tests. Our experiment thus presents novel evidence that the theoretical distinction of weak vs. strong islands can be mapped into the strength and duration of superadditvity in scrambling out of islands.