

Losing access to the second language and its effect on executive function development in childhood: the case of 'returnees'

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Research on effects of bilingualism on executive function (EF) has yielded mixed findings, calling for a closer investigation of the specific aspects of bilingualism and its underlying mechanisms that may influence different aspects of EF (Bialystok, 2016, Marton, 2016). In order to do so, a particularly promising approach consists of examining individual variability in bilingual influences on EF through longitudinal designs where change in bilingualism and EF as well as its interactions can be documented over time (Woumans & Duyck, 2015).

This study examined how relative language proficiency and exposure influence the development of executive function (EF) in 7–12 year-old bilingual 'returnee' children. Returnees are children of immigrant families who were immersed in an environment where their second language (L2; English) was the majority societal language and returned to their native language (L1; Japanese) environment after the period of prolonged, naturalistic L2 exposure. Targeting this population allows us to address the question of how the loss of opportunities to engage in bilingual activities may longitudinally affect EF development. It is especially promising that the returnee situation makes a longitudinal approach more viable, where we can capture the point of return as the baseline and follow individuals over time as distance from default active bilingualism increases.

The participants were 36 Japanese-English bilingual children, who acquired English as a second language in a foreign country and had recently returned to Japan. The summary of the language background of the returnee children is provided in Table 1. We administered inhibition (Simon) and monitoring/updating (N-back) tasks shortly after the children's return to their L1 environment and again one year later. The results from the language background questionnaire (BiLEC; Unsworth, 2016) showed that the average L2 English exposure decreased by 42.3% (from 46.8% to 4.5%) after a year of re-immersion in the L1 Japanese environment (Table 2). Critically, the findings from the mixed effect models showed that the *amount of reduction in L2 exposure* (i.e., the difference in L2 exposure when they lived in an L2 majority language environment vs. back in the L1 environment) affected children's monitoring and updating abilities. The greater reduction the children experienced in L2 exposure, the smaller their improvement was on the updating task in the second interval. This pattern was observed for both reaction time (Figure 1a) and accuracy (Figure 1b) on the N-back task. Children who experienced around 55% of reduction in L2 exposure for reaction time, and 40% of reduction in L2 exposure for accuracy, appear to show no improvements over time. This suggests that children who experienced more than 40% of reduction in L2 exposure may no longer be able to benefit from the EF boost provided by bilingualism (at least in the context of updating and monitoring abilities). However, *relative proficiency* (as well as *L2 exposure* and *Age of L2 onset*) did not influence children's development in inhibition ability. Since most of the children in the current study were either Japanese-dominant or balanced bilinguals at the onset of return to the Japanese environment, inhibiting their less-dominant language, English (in the case of Japanese dominant bilinguals) or equally proficient language (in the case of balanced bilinguals) may not have been cognitively challenging enough to confer a boost in EF performance.

The finding suggests that losing access to one's L2, that is, less active bilingualism is associated with attenuated effects in EF development. Our findings are among the first to show that losing access to one's L2 in childhood has consequences for EF development, just like how learning another language may promote enhancement of EF.

Table 1

Summary of bilingual participant information; Incubation period indicates the time elapsed between when the children returned to Japan and the first test session.

	Mean	SD	Min	Max
Age at Time 1	9.8	1.42	7.6	13.0
Age at Time 2	10.8	1.42	8.6	14.0
Age of L2 onset	5.0	2.5	1.2	9.7
Length of L2 residence (in years)	4.1	2.0	2.0	9.74
Incubation period (in years)	0.3	0.1	0.1	0.5

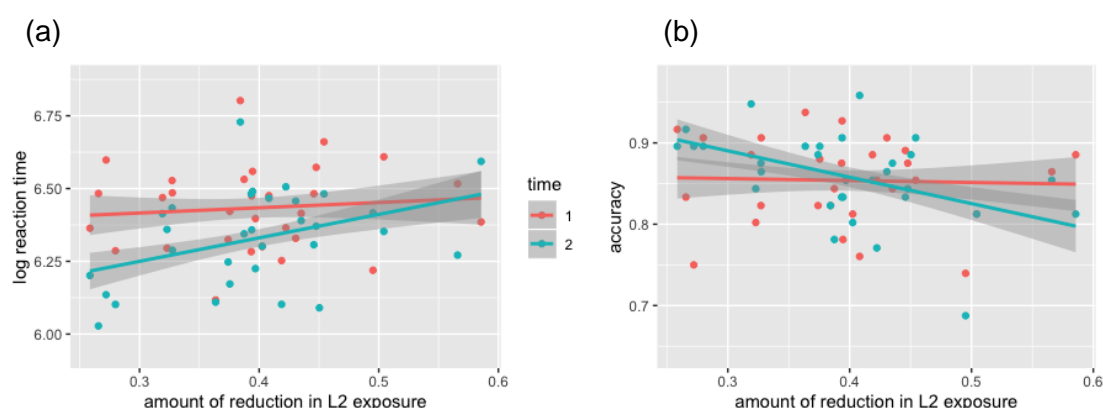
Table 2

Summary of BiLEC variables split by language and time; 'Abroad' indicates language exposures of when the children lived in a L2 majority language environment and 'Japan' indicates exposures of when the children returned to Japan; 'Difference' indicates the difference in exposure between foreign and Japanese environment (the numbers are in percentages)

	Abroad	English (L2) Japan	Difference	Abroad	Japanese (L1) Japan	Difference
Mean	46.8	4.5	-42.3	53.2	95.5	+42.3
SD	12.1	3.2	10.0	10.8	8.5	5.5
Min	26.5	0	-26.5	17.5	28.0	+15.0
Max	82.4	20.5	-58.0	61.0	92.4	+38.5

Figure 1

(a) Interaction between Time and Amount of reduction in L2 exposure on reaction time for N-back
(b) Interaction between Time and Amount of reduction in L2 exposure on accuracy for N-back



Note. error bars = standard error; Time 1 indicates first test session (immediately after returning to Japan) and Time 2 indicates the second test session conducted a year after

References

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