

## Abstract

English is regarded as an internationally universal language, or lingua franca, throughout the world, and more than 10 billion people use it. Nevertheless, it is difficult for Japanese people to acquire universally common English. There could be some reasons for that. First, the Linguistic Distance (LD) between Japanese and English is the most distant in terms of linguistic elements, which makes it difficult and time-consuming for Japanese people to acquire English. Also, Japan is an EFL (English as Foreign Language) environment, which means that Japanese people do not have to use English in their daily lives unlike in an ESL (English as a Second Language) environment where people use English as a public language in their daily lives. The dichotomy between EFL and ESL environments must have a huge impact on acquiring English. The purpose of this doctoral dissertation is to examine the Second Language Acquisition (SLA) mechanisms of Japanese learners of English. To achieve this objective, two studies were conducted.

Study 1 examined the effectiveness of a newly developed teaching method, that is to say, the “read-aloud instruction package”, which includes translating English (L2) into Japanese (L1). The instruction package includes an aspect of TILT (Translation in Language Teaching), and is composed of four major activities: slash/chunked reading practice, repeated read-aloud practice, cloze tests, and simultaneous read-aloud and write-out practice. The convergence of the four activities is cognitively burdensome on learners because the instruction package requires much simultaneous input (listening and reading) and output (speaking and writing) with kinetic elements. In order to recognize whether or not this instruction is effective in improving English proficiency of Japanese college EFL students, thirty-two participants with an elementary level of English proficiency took part in a class using the instruction method as a behavioral experiment. They completed a pretest and posttest using the Test of English for International Communication (TOEIC Bridge®), Strategy Inventory for Language Learning (SILL) and a motivation survey before and after the instruction class. The results showed that the participants’ scores on the posttests of TOEIC Bridge® improved significantly, but no change was found in their motivation. As for EFL learning strategy, the study found that the participants used more mental processes but less learning-with-others strategies after the instruction. In this study, the participants were required to translate English into Japanese in order to more easily understand the English. The “read-aloud instruction package” contributed to improved English skills for Japanese learners of English. One of the benefits of the instruction package might be TILT because participants might find English more understandable from a Japanese perspective. Therefore, with regard to the translation activity, brain activation patterns during translation were investigated based on English proficiency level in the second study.

Study 2 focused on cortical activation during word translation with functional Near-Infrared

Spectroscopy (fNIRS) (ETG-4000, Hitachi, Japan). Forty-three healthy and right-handed advanced and elementary Japanese learners of English participated in this study. The effects of translation direction and word familiarity were also examined as within-subject factors. The study revealed that different cortical activation patterns occurred depending on English proficiency. For the advanced group, there was no significant activation region while translating high-familiarity words from Japanese (L1) into English (L2) and vice versa; however, some regions were activated while translating low-familiarity words. The advanced group elicited greater cerebral hemodynamic responses in one channel (45) registered at the Brodmann area, the pars triangularis Broca's area, while translating English (L2) words with low familiarity into Japanese (L1). On the other hand, the advanced group elicited greater activation in twelve channels registered six regions at the Brodmann area: 10, the frontopolar area; 22, the superior temporal gyrus; 40, the supramarginal gyrus part of Wernicke's area; 44, the pars opercularis part of Broca's area; 45, the pars triangularis Broca's area; and 46, the dorsolateral prefrontal cortex, while translating Japanese (L1) words with low familiarity into English (L2). For the elementary group, there was significantly or marginally significantly activated regions while translating both from Japanese (L1) into English (L2) and vice versa regardless of word familiarity. When the elementary group translated English (L2) words with high familiarity into Japanese (L1), one channel (22) registered at the Brodmann area, the superior temporal gyrus, was activated. Also, when the elementary group translated English (L2) words with low familiarity into Japanese (L1) words, one channel (22) registered at the Brodmann area, the superior temporal gyrus, was marginally significantly activated. For the opposite translation direction, when the elementary group translated Japanese (L1) words with high familiarity into English (L2), four channels registered three regions at the Brodmann area were significantly or marginally significantly activated: 2, the primary somatosensory cortex; 22, the superior temporal gyrus; and 43, the subcentral area. When the elementary group translated Japanese (L1) words with low familiarity into English (L2), one channel (22) registered at the Brodmann area, the superior temporal gyrus, was significantly activated. Taken together, the cognitive demand, activation patterns and activation areas were totally different depending on English proficiency and translation direction. Response time (RT) revealed that translating L1 into L2 is cognitively demanding, resulting in taking a longer time than translating L2 into L1, irrespective of English proficiency. Also, the advanced group had a higher accuracy rate than the elementary group.

In conclusion, the two studies described above provide new insights into SLA for Japanese learners of English. First, the “read-aloud instruction package” could improve elementary level English proficiency. In addition, the Strategy Inventory for Language Learning (SILL) indicated that because of this instruction, the learners used more mental processes, which means that they came to perform more cognitively demanding language processing. Also, this instruction could shed light on struggling Japanese learners of English at an elementary level, which could contribute to the

advancement of English education in Japan. Second, a huge difference in brain activation patterns between advanced and elementary levels of English proficiency was observed during translation activities and depended on word familiarity and translation direction. The results of the behavioral experiment in study 1 and the neuroscientific results in study 2 could imply that English education, especially when dealing with a large LD, should properly adjust to the learner's level of English proficiency. This implies that English tasks should not be too highly demanding or too easy for learners in order for them to further improve their English proficiency.