Project number　37

The Neural Mechanism of L2 Metaphor Processing

［１］**Research group**

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Expenditure report of research funds：
　　Consumables 1,000YEN
　　Remuneration 99,000YEN

［２］**Research setup**

Frequency of the joint research meetings: once a week

**Research Purpose & Significance**

The ultimate goal of this study is to investigate the neural mechanisms underlying the influence of foreign language metaphors on people's moral decision-making. However, it is currently unclear whether the presentation of non-metaphorical literal stimuli in a foreign language will alter moral decision-making for Japanese native speakers learning English as a second language. Therefore, as a preliminary behavioral pilot study for the fMRI investigation, this study recruits Japanese participants into both native and foreign groups to compare their moral decision-making outcomes. This will confirm whether a foreign language effect exists under English-Japanese conditions.

Research Methods & Design

To verify the foreign language effect, we recruited 43 native Japanese speakers and required them to have a minimum TOEFL ITP score of 480 to ensure that participants could understand and successfully complete English tasks.

Each participant needs to complete two sets of English stimuli and two sets of Japanese stimuli, with the presentation order (English-Japanese / Japanese-English) counterbalanced (English-Japanese n=22, Japanese-English n=21). In each stimulus trial, participants are required to first read a scenario, followed by the presentation of two options on the next page. Participants need to use a 1-9 scale to indicate their inclination towards one of the options (in moral decision-making, 1 represents a highly deontological option, whereas 9 represents a highly utilitarian option). Subsequently, participants need to provide emotional ratings and readability ratings for the scenario. Again, they will use a 1-9 scale for selection.
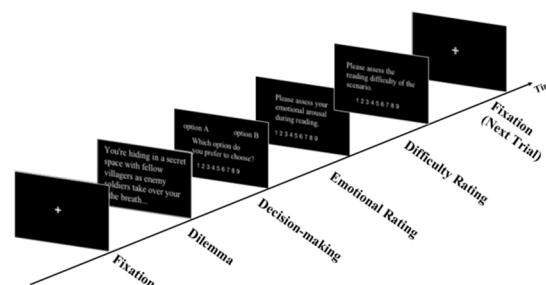

To enhance participants' focus during the experiment, we incorporated a filler of non-moral dilemmas into the stimuli, constituting half the total number of experimental stimuli. For the experiment, we prepared 48 moral dilemmas and 24 non-moral dilemmas. Dilemmas are presented in a pseudo-randomized sequence. In the English-Japanese group, participants first complete two sets of English dilemmas (each consisting of 12 moral dilemmas and 6 non-moral dilemmas), followed by the remaining two sets presented in Japanese. Conversely, in the Japanese-English group, participants first complete two sets of Japanese dilemmas, with the remaining two sets presented in English.

［３］**Research outcomes**

(3-1) Results

To assess the overall effect of foreign language on participants' moral judgments, we first compared the average scores between the Japanese (n=21) and English (n=22) groups in the first two sessions. We conducted a two-tailed Mann-Whitney test to compare the medians of the two sample groups. The results are as follows:
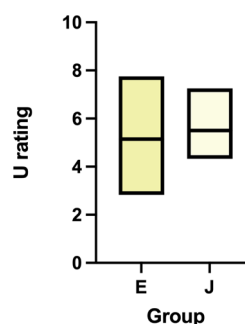
Based on the results, the effect of foreign language on participants' moral judgments does not appear to be significant ($p=0.2020$, $p > 0.05$). In both the English and Japanese native language groups, we observed scores indicative of utilitarian tendencies (Median of E=5.146 > 5; Median of J=5.500 > 5).

To test whether the scoring system (1-9 scale) and the dichotomy (utilitarian/deontological) influenced our results, we conducted a reanalysis by categorizing options greater than 5 as utilitarian and options less than 5 as deontological.
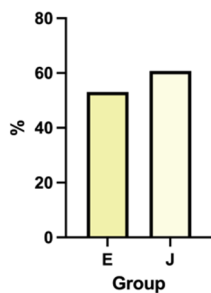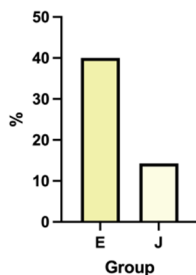
In the English group , the proportion of utilitarian choices was 53.13% (U=263, D=232); in the Japanese group, the proportion of utilitarian choices was 60.78% (U=282, D=182).

We then conducted a chi-   ve, revealing a significant difference in choice proportions between the English and Japanese groups ($\chi2$=5.705, p=0.0169<0.05). The utilitarian tendency in the English group was significantly lower than that in the Japanese group. After conducting the analysis using the dichotomy, we obtained the foreign language effect. However, the effect observed in this study is contrary to the effect observed in previous studies, where foreign language was found to promote utilitarian choices (Costa et al., 2014).

In the native language condition, we observed an excessively high utilitarian tendency compared to the original study: in Costa et al., 2014, only 18% of individuals chose the utilitarian option in the native language condition, whereas in our study, this proportion was 60.78%.

Taking into account the possibility of differences between dilemmas, we conducted separate analyses for each dilemma. Below are the results for the Footbridge dilemma, which was used in Costa's study:

In the English group, the proportion of utilitarian choices was 40.00% (N=20, U=8, D=12); in the Japanese group, the proportion of utilitarian choices was 14.29% (N=21, U=3, D=18).

Although we observed a trend of foreign language effect similar to previous experiments, chi-square analysis showed that the effect was not significant ($\chi2$=3.450, p=0.0632>0.05).

(3-2) Future perspectives

The purpose of this study was to verify the existence of the foreign language moral effect in both Japanese and English contexts. The original design intended to incorporate a metaphorical component after verification, utilizing fMRI to study the related neural mechanisms. However, contrary to previous studies, our findings revealed a reverse foreign language moral effect, where the foreign language environment inhibited utilitarian choices. Although a trend of increased utilitarianism was observed in some dilemmas (such as the footbridge dilemma), the effect was not statistically significant.

However, it should be noted that this is only for preliminary result analysis. Subsequently, we will analyze the participants' emotional rating and difficulty rating in each dilemma and use their personality rating and vocabulary score as variables to analyze whether they have an effect on the foreign language effect.

Subsequent research requires two adjustments: 1. Investigating why certain dilemmas among the 48 personal dilemmas exhibited lower utilitarian choices in the native language and increased utilitarian choices in the foreign language. 2. In this experiment, we utilized the option paradigm proposed by Shenhav et al. (2014), which included information about the consequences of each option. While this design facilitated better understanding of participants' choices, it might have increased utilitarian choices, thus potentially inflating the baseline utilitarian tendency in the native language context compared to previous research findings.

［４］List of research achievements

(1) 2024.02.16 Oral Presentation at Sugiura Lab Cognitive Meeting