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Effect is sure, but explanation is unsure:
Closer investigation of the foreign language effect with Japanese participants

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Abstract

The foreign language effect (Costa et al., 2014) refers to a phenomenon in which the response to a moral dilemma depends on whether it is asked in a native or second language. This study explored this effect with Japanese participants using various types of moral dilemmas. Study 1 adopted twelve variations of trolley dilemmas from Mikhail (2007). Study 2 used seven types of moral dilemmas from Greene et al. (2001). The dilemmas required permissibility and understandability judgments. Results of the two studies demonstrated the following two points. (1) Interactions between types of dilemmas (switch/footbridge) and language (native/foreign) were significant in both studies, indicating that the foreign language effects were replicated consistent with Costa et al. (2014). (2) Evidence that contradicts the theoretical explanation of the foreign language effect was also found.

Keywords: foreign language effect, moral dilemmas, mental representation, dual process theory

Introduction

The idea that language changes people's ways of thinking has attracted attention from many researchers. This idea was first proposed by nineteenth century thinkers. In the twentieth century, the famous Sapir-Whorf hypothesis (Carroll, Levinson, & Lee, 2012; Sapir, 1921) posited that the structure of a language affects the ways in which its speakers conceptualize their world. This hypothesis has been tested by many empirical studies and its validity remains under discussion (as a review, see Kay & Kempton, 1984; Takano, 1989).

Recent work on the foreign language effect (Costa, Foucart, Arnon, Aparici, & Apesteguia, 2014; Costa, Foucart, Hayakawa, Aparici, Apesteguia, Heafner, & Keysar, 2014; Keysar, Hayakawa, & An, 2012) provide interesting examples that support the idea that language affects human thinking. In a series of their studies, Keysar and his colleagues required participants to solve framing effect tasks (e.g., Kahneman, & Tversky, 1984) known to lead people to irrational decisions in either their native or a foreign language. Results of the experiments consistently demonstrated that irrational decisions in the framing effect tasks are reduced when choices are presented in a foreign language, indicating that language affects decision making (see also Costa, Foucart, Arnon, et al., 2014).

Keysar, Hayakawa, and An (2012) explained the foreign language effect in terms of dual process theory (e.g., Kahneman, 2003; Sloman, 1996; Stanovich & West, 2000).

Human cognition is composed of two systems; one that is analytic, rule governed, and systematic, employing many mental resources, and the other is intuitive, affective, and heuristic. According to Keysar et al. (2014, p661), there are reasons that foreign language use moves people from the immediate affective system to a more deliberate, analytic mode of thinking. A foreign language is less grounded in the emotional system than a native language. It is typically processed less automatically than a native language, which could lead to more deliberate processing. Thus, such a deliberate mode could affect processing in general and result in more systematic decisions. Additionally, foreign languages are difficult to process resulting in more analytic decision-making processes.

On the basis of the foreign language effect in decision making and the dual process theory explanation, Costa, Foucart, Hayakawa, et al. (2014) also explored the foreign language effect in moral thinking. Intuitively, moral judgments about "right" and "wrong" are the result of deep thought and should therefore be consistent and unaffected by irrelevant aspects of moral reasoning, such as language. However, recent studies (e.g., Greene, Sommerville, Nystrom, Darley, & Cohen, 2001) indicate that moral judgments are highly context dependent. Engagement of the analytic and affective processes is the key to understanding this contextual dependency. Costa, Foucart, Hayakawa, et al. (2014) demonstrated the foreign language effect in moral thinking, and their results appeared to be explained by dual process theory. In what follows, I argue this point more precisely.

The most prominent example of this contextual dependency is the difference between the switch and footbridge dilemmas. The switch dilemma assumes that a runaway trolley is headed for five people who will be killed if it proceeds on its present course. The only way to save these people is to hit a switch that will turn the trolley onto an alternate set of tracks where it will kill one person instead of five. Should you turn the trolley in order to save five people at the expense of one? Most people answer yes to this dilemma (Greene et al., 2001). In the footbridge dilemma, a trolley threatens to kill five people (as before). You are standing next to a large stranger on a footbridge that spans the tracks between the oncoming trolley and the five people. Conversely, in this scenario, the only way to save the five people is to push this stranger off the bridge and onto the tracks below. He will die if you do this but his body will stop the trolley from reaching the others. Should you save them by pushing this stranger to his death? Most people will answer no to this problem. The discrepancy

between the responses to the two problems clearly demonstrates the contextual dependency of moral reasoning.

Dual process theory explains this discrepancy in terms of the relative weight of affective and analytic processes in moral judgments. That is, affective processes generally support judgments that favor the essential rights of a person (deontological judgments). On the other hand, rational controlled processes support judgments favoring the greater good (utilitarian judgments), regardless of whether they violate an individual's rights. The switch dilemma requires greater engagement of the analytic processes whereas the footbridge dilemma involves more affective processes. Brain imaging data support this explanation (Greene et al., 2001).

Costa et al. (2014) found that this discrepancy would vary depending on whether the moral dilemmas were presented in a native or foreign language. They required participants to solve moral dilemmas, including the switch and footbridge dilemmas, using either their native or a foreign language. Throughout the three studies, using a foreign language induced more utilitarian judgment than the native language. This supported the position that affective processes played an important role in moral reasoning and foreign language decreased engagement of affective processes. Additionally, Costa et al. (2014) found an interaction between type of dilemma and language. The differences between languages in moral judgments were significant for the footbridge dilemma but not for the switch dilemma. Costa et al. (2014) speculated that this interaction reflected that a foreign language increased utilitarianism by increasing emotional distance.

Although Costa et al.'s (2014) findings that moral reasoning might differ depending on the language were impressive, their validity should be examined with a critical eye. Therefore, this study focused on the following two problems.

The first problem with Costa et al. (2014) was that the variations of moral dilemmas were limited; they used only two moral dilemmas: the switch and footbridge dilemmas. However, as some researchers have called it, "trolleyology," there are many other variations of trolley-related moral dilemmas to investigate moral thinking. Table 1 shows various types of moral dilemmas used in previous studies (Mikhail, 2007). Additionally, there are other types of moral dilemmas that can also be used to explore engagement of the affective and analytic systems in moral reasoning (e.g., see Greene et al., 2001). Thus, Costa et al. (2014) used limited variations of both trolley-like and other moral dilemmas.

Second, how participants understood the moral dilemmas used in Costa et al. (2014) remains unclear. A comparison between native and foreign language in moral reasoning makes sense under an assumption that the meanings of moral dilemmas are the same between native and foreign languages. If participants understood the same dilemma differently between the native and foreign language, then the foreign language effect is not evidence that language changed the way of thinking. Rather, participants solved two different problems separately. Although Costa et al. (2014) explored this issue in terms of foreign language abilities, interpretations of the meanings of moral dilemmas remain unclear. A key assumption of the foreign language effect has not been tested.

Thus, this study explored the foreign language effect from the following two aspects: (1) variations in moral dilemmas and (2) understanding the meanings of moral dilemmas. To address these points, this study employed various types of moral dilemmas from the existing studies (Greene et al., 2001; Mikhail, 2007) and explored interpretations of the dilemmas by analyzing correlation structures in moral judgments.

Study 1

Method

Participants

218 Japanese undergraduates participated in Study 1. 111 participants were allocated to the foreign language condition and the remaining participants to the native language condition.

Materials and procedure

Twelve trolley dilemmas, including the switch and footbridge dilemmas, were adapted from Mikhail (2007, pp. 32–35). Table 1 shows summary descriptions of the twelve dilemmas.

Participants in the foreign language condition read the twelve dilemmas, which were virtually identical to those in Mikhail (2007). In the native condition, participants read the twelve dilemmas translated into Japanese. All Japanese scenarios were reviewed by a native Japanese speaker as to whether they contained natural Japanese scenarios.

In both conditions, the dilemmas and measurement of the independent variables were presented in booklets. I prepared four types of booklets (differing only in the order of presentation) with one dilemma on each page. Each of the booklets comprised 12 pages.

Participants rated the permissibility of an act described in the moral dilemmas on an eight-point scale, from 0 (*morally impermissible*) to 7 (*morally permissible*). Participants were randomly provided with one of the six types of booklets to make choices in various situations without a single correct answer.

Participants in both conditions read the permissibility judgment sentences in Japanese to increase comparability of results. That is, some doubts remained whether the meaning of the phrase "permissibility" was the same in English and Japanese. To address this concern, Study 1 required participants to make all permissibility judgments in Japanese.

Table 1 Dilemmas used in this study

		Content	Action
Study 1			
	Switch (S)	Kill one man to save five workmen	Throw switch to turn the train to the side track
	Footbdidge (F)	Kill one heavy man to save five workmen	Throw the man from the bridge
	Expensive equipment (E)	Kill one man to save equipment	Throw switch to turn the train to the side track
	Implied consent (IC)	Kill one weak man to save five workmen	Throw the man from the bridge
	Intentional homicide (H)	Kill hateful man to save five workmen	Throw switch to turn the train to the side track
	Loop track (LT)	Kill one heavy man to save five workmen	Throw switch to turn the train to the side track
	Man-in-front (MiF)	Kill one man in front of the heavy object to save five workmen	Throw switch to turn the train to the side track
	Costless rescue (CR)	No sacrifice	Throw switch to turn the train to the side track
	Better alternative (BA)	Kill one man to save five workmen instead of taking another alternative that can save five workmen without any sacrifice	Throw switch to turn the train to the side track
	Disproportinal death (DD)	Kill five men to save one men	Throw switch to turn the train to the side track
	Drop man (DM)	Kill one man to save five workmen	Throw switch to drop a man to the track
	Collapse bridge (CB)	Kill one man to save five workmen	Throw switch to collapse the bridge on which a man is standing
Study 2			
	Donor	Kill one young man to save five patient	Transparent young man's organs to five patient
	Hospital	Kill one patient to save five	Hit a certain switch, which will cause the fumes to bypass the room containing the three patients
	Baby	Kill your baby to save tonwpeople	Smother your child to death
	Sculpture	Destroy the sculpture to save one man	Push the sculptures into the valley so that it will roll onto the tracks and block the trolley's passage
	Boat	Lie to the guard to save the toursits	Lie to the guard to borrow a nearby speedboat

Results and discussion

Figure 1 shows average permissibility judgment estimates for all twelve dilemmas. Multivariate t-tests demonstrated that the effects of language were significant in all twelve dilemmas, indicating that foreign language effects were found (Figure 1). Additionally, I examined the interaction between type of dilemma (switch/footbridge) and difference in language (Japanese/English) by two-way ANOVA. Results showed a significant main effect of dilemma type, $F(1, 194) = 28.92$, $p < .01$, language, $F(1, 194) = 38.65$, $p < .01$, and interaction, $F(1, 194) = 18.02$, $p < .01$. Costa et al.'s (2014) main result was replicated in the Japanese participants.

However, Figure 1 demonstrates another interpretation for the foreign language effect. As the dotted line in Figure 1 indicates, most of the mean estimates in the foreign language condition were near 3.5 (median between 0 and 7). Additionally, most of 95% confidence intervals of the permissibility judgments contains 3.5. These suggest the possibility that results in the foreign language condition might reflect a central tendency of participants not understanding the dilemma in the foreign language and using values near the median as a "don't know" response.

Additionally, permissibility judgments were higher in the foreign language condition compared to the native language condition for the disproportional death dilemma that required killing five men to save one. Costa et al. (2014) explained that utilitarian judgment was enhanced in the foreign language condition because consideration in the
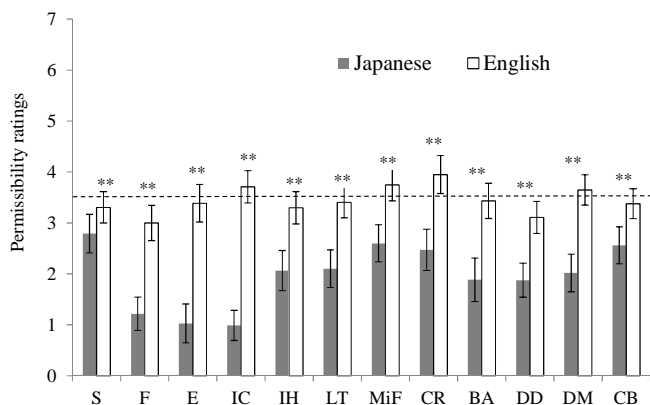
Figure 1 Results of Study 1: Error bars indicate 95% confidence intervals, and the dotted line indicates median of the permissibility judgment.

Table 2 Results of factor analysis in Study 1

Dilemmas	Native		Foreign	
	Factor 1	Factor 2	Factor 1	Factor 2
Switch (S)	**0.75**	0.07	**0.47**	0.07
Footbdidge (F)	**0.63**	0.00	0.22	**0.43**
Expensive equipment (E)	**0.37**	-0.06	**0.95**	-0.28
Implied consent (IC)	**0.45**	0.01	-0.04	**0.46**
Intentional homicide (H)	**0.43**	0.01	0.01	**0.42**
Loop track (LT)	**0.96**	-0.22	0.31	0.29
Man-in-front (MiF)	**0.82**	0.02	**0.46**	0.13
Costless rescue (CR)	0.02	-0.05	-0.24	**0.48**
Better alternative (BA)	0.27	0.29	0.29	-0.06
Disproportinal death (DD)	-0.03	**1.02**	**0.65**	0.07
Drop man (DM)	**0.76**	0.15	0.21	0.22
Collapse bridge (CB)	**0.37**	0.45	0.30	**0.47**
Factor correlation	0.71		0.42	

foreign language activated rational thinking. However, the utilitarian judgment in the disproportional death dilemma is "not switch." Thus, use of the foreign language appeared to prohibit rational thinking in the disproportional death dilemma.

I also performed factor analyses by promax rotation with maximum likelihood estimation on the results of both language conditions. Eigenvalues for one-, two-, three-, and four-factor solutions were 5.23, 1.20, 1.05, and 0.95 for the native condition, respectively, and 3.30, 1.536, 1.26, and 0.95 for the foreign language condition, respectively. On the basis of the eigenvalues, two-factor solutions were adopted in both the native and foreign language conditions. Factor loads shown in Table 2 indicate that the factor patterns of the twelve moral dilemmas were different between the native and foreign language conditions. While the six dilemmas from switch to man-in-front were affected by

Factor 1 in the native language condition, these six dilemmas were not affected in the foreign language condition. Specifically, factor patterns for the switch and footbridge dilemmas were different between the two conditions.

To scrutinize the differences in the factor patterns between the two conditions, I also performed multidimensional scaling on both conditions (Figure 2) by treating the correlation matrix as a distance matrix. Alignments of the twelve dilemmas in the two dimensional mapping were different between the two conditions. For example, variations in the dilemmas that surround the switch and footbridge dilemmas were different between the native and foreign language conditions. Additionally, alignment of the costless rescue dilemma was also different between the two conditions. In the native language condition, this dilemma was positioned separately from the other eleven dilemmas. However, in the foreign language condition, this dilemma was relatively near the implied consent and intentional homicide dilemmas. Considering the nature of the dilemma, isolation of the costless rescue dilemma in the native language condition is natural because this is the only dilemma that requires no sacrifice. Similarly, multidimensional scaling alignments suggested that participants' understandings of the twelve moral dilemmas were different between the two conditions.

To summarize, results of Study 1 revealed the following three points. First, the interaction found in Costa et al. (2014) was replicated; differences in permissibility judgments between the native and foreign language conditions were larger in the footbridge dilemma than the switch dilemma. Second, there is a possibility that this interaction was due to a central tendency in the foreign language condition. Third, multidimensional mappings from the correlation matrices were different between the native and foreign language conditions. The dilemmas used in Study 1 might change semantically with language.

Study 2

The purpose of Study 2 was threefold. First, Study 2 aimed to replicate the interaction between dilemma type (switch/footbridge) and language (Japanese/English) in Japanese participants. Second, it examined whether dilemma comprehension would affect moral judgment in either the native or foreign language condition. As Figure 1 demonstrates, Study 1 suggested a possibility that the participants in the foreign language condition did not fully comprehend the contents of the moral dilemmas, resulting in participants answering points around the middle as an implication of "don't know." Third, Study 2 tried to explore more profoundly how participants interpreted moral dilemmas both in the native and foreign language.

To address these concerns, Study 2 employed moral dilemmas from Greene et al. (2001). They used 64 types of moral dilemmas classified into three categories: moral-personal dilemma, moral-impersonal dilemma, and non-moral dilemma. Moral-personal dilemmas involve the
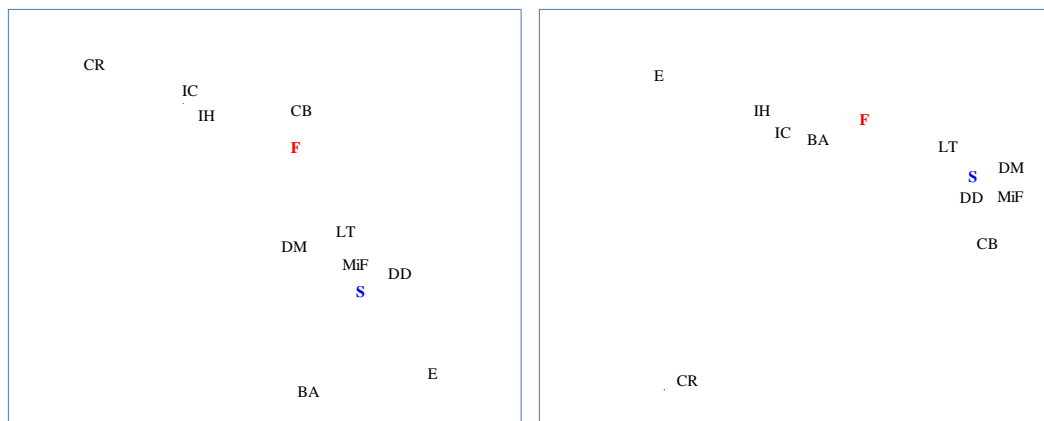
Figure 2 Results of multidimensional scaling in Study 1: left panel shows alignments of moral dilemmas in the foreign language condition, and the right panel shows those in the native language condition.

affective system more than moral-impersonal or non-moral dilemmas. This proposition is based on brain-imaging studies and Nakamura (2013) also supported this classification. Thus, using the moral-personal and moral-impersonal dilemmas enabled exploration of how the two systems contributed to moral judgment. In addition, analyzing the correlational structure between the moral-personal and moral-impersonal dilemmas in both the foreign and native language conditions also informed participants' considerations when responding to the moral dilemmas.

Materials and procedure

Study 2 adopted seven moral dilemmas from Greene et al. (2001), including the switch and footbridge dilemmas. In addition to those dilemmas, Study 2 chose two moral-personal dilemmas (transparent and crying baby) and three moral-impersonal dilemmas (standard fume, sculpture, and speedboat). Table 1 showed summary of the dilemmas .

The procedure of Study 2 was virtually identical to Study 1. Participants in the foreign language condition read the seven dilemmas (Greene et al., 2001). In the native condition, participants read the seven dilemmas translated into Japanese. All Japanese scenarios were reviewed by a Japanese native speaker as to whether they contained natural Japanese scenarios.

After reading each dilemma, participants rated the permissibility of the acts in the seven moral dilemmas, from 0 (*morally impermissible*) to 7 (*morally permissible*).

Results and discussion

Figure 3 shows the mean permissibility judgments for the seven dilemmas. Consistent with Study 1, I examined the interaction between type of dilemmas (switch/footbridge) and differences in language (Japanese/English) by two-way ANOVA in Study 2. Results showed a significant main effect of type of dilemma, $F(1, 163) = 92.10$, $p < .01$, language, $F(1, 163) = 10.18$, $p < .01$, and interaction, $F(1, 163) = 5.99$, $p < .01$. Study 2 also replicated the main finding of Costa et al. (2014).

I also performed multivariate *t*-tests on the seven types of moral dilemmas to examine the differences in permissibility

judgments between the native and foreign language conditions. Results (Figure 3) indicated that six of the seven types of dilemmas showed significant differences between the two conditions. However, differences in the language condition did not affect the permissibility judgment in the baby dilemma. According to Greene et al. (2001), this dilemma was considered a moral-personal dilemma assumed to reflect the affective system. Costa et al. (2001) suggested that use of a foreign language inhibits the affective system, resulting in a reduction of utilitarian judgments. Additionally, utilitarian judgments are stronger in the two moral impersonal dilemma (sculpture and speed boat) in the native language condition. Thus, the results for the baby dilemma contradicted the explanation by Costa et al. (2014).

The central tendency in the foreign language effect appear to be replicated in Study 2. Mean permissibility judgments of the seven dilemmas in the foreign language conditions were nearer to the median of the scale than the native language conditions.

I also performed factor analyses by promax rotation with maximum likelihood estimation on the results of the native and foreign language conditions. Eigenvalues for one-, two-, three-, and four-factor solutions were 2.50, 1.70, 0.89, and 0.76 for the native condition, respectively, and 2.50, 1.40, 0.96, and 0.70 for the foreign language condition, respectively. Based on the eigenvalues, two-factor solutions were adopted in both the native and foreign language conditions. Table 3 shows factor loads from the two factors.

Results of factor loads also indicated that factor patterns were different between the native and foreign language conditions. While the moral-personal and moral-impersonal dilemmas were classified into separate factors in the native language condition, the factor pattern did not clearly classify moral-personal and moral-impersonal dilemmas in the foreign language condition. Additionally, factor correlations were also different between the conditions. Thus, the results of Study 2 supported implications from Study 1: it found that the interaction between types of dilemmas and language, but it also provides a possibility that the explanation by Costa et al. (2014) is not adequate.
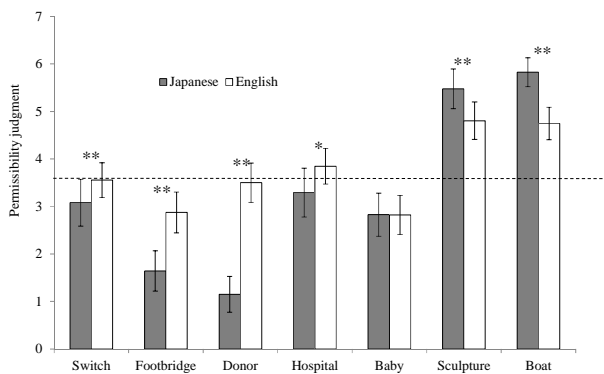
Figure 3 Results of Study 2: Error bars indicate 95% confidence intervals, and the dotted line indicates median of the permissibility judgment

Table 3 Results of factor analysis in Study 2: blue fonts show the moral impersonal dilemmas and red fonts show the moral impersonal dilemmas.

Dilemmas	Native		Foreign	
	Factor 1	Factor 2	Factor 1	Factor 2
Switch	**0.73**	0.16	0.27	**0.54**
Footbdidge	**0.85**	0.08	**0.94**	-0.05
Donor	**0.64**	-0.06	**0.63**	-0.17
Hospital	**0.57**	-0.36	0.20	**0.44**
Baby	0.30	0.26	0.18	**0.48**
Sculpture	0.03	**1.00**	-0.16	**0.54**
Boat	0.02	**0.47**	-0.27	**0.59**
Factor correlation	-0.07		0.49	

General discussion

This study investigated the foreign language effect that moral reasoning differed depending on whether reasoning is done in a native or foreign language. In these two studies, I found that the foreign language effect itself is robustly replicated in the same way as Costa et al. (2014). The difference between the native and foreign language conditions was larger in the foreign language condition than it was in the native language condition, and this difference is larger in case of the footbridge dilemma than the switch dilemma. This finding is important because this is the first case that demonstrated the foreign language effect in Japanese participants, and thus provides another empirical support for the foreign language effect.

However, this study also indicates that evidence for the theoretical explanation of the foreign language effect was not as clear as Costa et al. (2014) purported. Participants' interpretations of the moral dilemmas themselves might differ between the foreign and native language conditions. The alignments of moral dilemmas in multidimensional scaling were different between the two conditions.

Additionally, permissibility judgment of the baby dilemma that is assumed to reflect engagement of the affective system did not differ significantly between the two conditions. These findings are inconsistent with the explanation by Costa et al. (2014) that reduction of emotionality elicited by foreign language promote utilitarian judgments, and pose a question about an assumption that meanings of the moral dilemmas are the same between the native and foreign language conditions.

In sum, the take home message of this study is as follows: the effect is sure, but the explanation is unsure. The explanation by Costa et al. (2014) surely appears to fit the foreign language effect within a scope the switch and footbridge dilemmas. However, when the other types of moral dilemmas are considered, the foreign language effect takes on a new aspect: meanings of the dilemmas themselves might change between the two conditions, and the central tendency in permissibility judgment might work in the foreign language condition. These possibilities are important alternative explanations to the foreign language effect. Thus, the future research should include various types of moral dilemmas other than the switch and footbridge dilemmas, and analyze natures of the dilemmas in terms of the affective and analytic systems.

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