Our morals really depends on our language: The foreign language effect within participants

Kuninori Nakamura (knaka@seijo.ac.jp)
Faculty of Social Innovation, Seijo University
6-1-20, Seijo, Setagayaku, Tokyo, 155-0081, Japan

Abstract

Recent research has suggested that using a foreign language to present hypothetical moral dilemmas increases the rate of utilitarian judgments about those dilemmas (e.g., Greene et al, 2001) and decreases incoherency between judgments in framing effect tasks (e.g., Tversky & Kahneman, 1981; see Costa, Foucart, Arnon, Aparici, & Apesteguia, 2014; Costa, Foucart, Hayakawa, Aparici, Apesteguia, Heafner, & Keysar, 2014; Keysar, Hayakawa, & An, 2012). However, existing research has mainly investigated this effect using between-participants designs (i.e., different participants in the foreign and native language conditions). Such designs are unable to exclude non-equivalent conditions as a confounding variable. In contrast, this study examined the foreign language effect using a within-subjects design (i.e., all participants responded to moral dilemmas (Greene et al, 2001) and framing effect tasks (Tversky & Kahneman, 1981) in both their native and foreign languages. The "foreign language effect" was replicated, excluding semantic non-equivalence between language conditions as a potential confound. This result supports the hypothesis that the foreign language effect is independent of meaning.

Keywords: foreign language effect; moral dilemmas; framing effect; individual differences

Introduction

Language may affect individuals' manner of thinking. This possibility has attracted many researchers' attention since the famous Sapir-Whorf hypothesis was first advanced (Carroll, Levinson, & Lee, 2012; Sapir, 1921). Languages' effect on thinking has received much empirical study; however, the discussion remains ongoing (for reviews, 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) provides interesting data suggesting that languages affect human cognition. In these studies, participants completed various types of reasoning tasks including framing-effect tasks (Tversky & Kahneman, 1984) and moral dilemmas (e.g., Greene et al, 2001) in either their native or foreign languages.

The framing effect provides an initial demonstration of the foreign language effect in reasoning (Costa, Foucart, Arnon, Aparici, & Apesteguia, 2014; Keysar, Hayakawa, & An, 2012). The framing effect causes equivalent descriptions of a decision problem to elicit systematically different decisions. This effect is robust and common; however, it is reduced or disappears in decision tasks not presented in participants' native language. (Tversky & Kahneman, 1981). For example, read the following vignette known as the Asian disease problem (Tversky & Kahneman, 1981);

> Recently, a dangerous new disease has been going around. Without medicine, 600,000 people will die from it. In order to save these people, two types of medicine are being made.
>
> Gain framing:
> If you choose Medicine A, 200,000 people will be saved.
> If you choose Medicine B, there is a 33.3% chance that 600,000 people will be saved and a 66.6% chance that no one will be saved.
>
> Which medicine do you choose?
>
> Loss framing:
> If you choose Medicine A, 400,000 will die.
> If you choose Medicine B, there is a 33.3% chance that there was a 33.3% chance that "no one will die and a 66.6% chance that "600,000 people will die..
>
> Which medicine do you choose?

As you see, the Gain and Loss vignette describe the same contents. However, participants who read the Gain framing tend to choose Medicine A, whereas those who read the Loss framing tend to choose B (Tversky & Kahneman, 1981). This indicates peoples' coherence in risky choice. Keysar,et al. (2012) demonstrate that this coherence in risky choice decrease when people read and answer the framing task in their foreign language.

Costa et al. also explored the foreign language effect in moral thinking (2014). Intuitively, moral judgments about "right" and "wrong" are the result of deep thought and should therefore be consistent and unaffected by factors irrelevant to moral reasoning such as language; however, recent studies (e.g., Greene, Sommerville, Nystrom, Darley, & Cohen, 2001) indicate that moral judgments are highly context dependent. 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 activate a switch that will turn the trolley onto an alternate set of tracks where it will kill one person instead of five. Respondents must decide whether to divert the trolley in order to save five people at the expense of one. Most respondents indicate believing that one should

activate the switch (Greene et al., 2001). In the footbridge dilemma, a trolley threatens to kill five people (as before); respondents imagine themselves standing next to a large stranger on a footbridge that spans the tracks between the oncoming trolley and the five people. 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 would die in that case, but his body would stop the trolley from reaching the others. Respondents must thus decide to push the stranger off the bridge or to refrain; most respond that one should refrain. Assuming that the imagined loss of life is morally significant and the means to that loss is insignificant, this discrepancy between the two problems' response tendencies illustrates the contextual dependency of moral reasoning.

Costa et al. (2014) found that this discrepancy varied if the dilemmas were presented in a foreign language: participants solved moral dilemmas, including the switch and footbridge dilemmas, using either their native or a foreign language; across three studies incorporating several different languages, using a foreign language elicited more utilitarian judgments than using one's native language did. This supported the hypotheses that affective processes importantly affect moral reasoning and that using foreign languages decreases affective engagement.

These studies' results indicate systematic differences between cognitive processing in native and foreign languages; specifically, irrational decisions are reduced in framing-effect tasks when choices are presented in a foreign language (see also Costa et al., 2014) and moral dilemmas more frequently elicit utilitarian judgments when dilemmas are presented in a foreign language. Keysar, Hayakawa, and An (2012) used dual process theory to explain the foreign-language effect (e.g., Kahneman, 2003; Sloman, 1996; Stanovich & West, 2000). The dual-process model proposes that human cognition is composed of an analytic, rule-governed, and systematic system that employs many mental resources, and an intuitive, affective, and heuristic system. Keysar et al. proposed that using a foreign language moves people from the immediate affective system to a more deliberate, analytic mode of thinking (2014). Foreign languages are less grounded in speakers' emotions than their native language is (e.g., Pavlenko, 2005), and are typically processed less automatically than speakers' native language; this may lead to more deliberate cognition (Favreau & Segalowitz, 1983). Such deliberate cognition might more frequently elicit rational decisions. Additionally, foreign language is more difficult to process (Alter, Oppenheimer, Epley, & Eyre, 2007), possibly eliciting more analytic decision-making. The foreign language effect aligns with this suggestion (Costa, Foucart, Arnon, et al., 2014; Costa, Foucart, Hayakawa, et al., 2014; Keysar, Hayakawa, & An, 2012; see also Nakamura, 2015).

Previous studies have examined this effect indirectly using between-subjects designs; however, such designs cannot exclude the possibility that their results partly reflect differences between individual participants. Within-subjects designs yield results that do not reflect individual differences, confining comparison to the different languages' effect on each participant. This study therefore aimed to examine the foreign language effect using a within-subjects design.

Renderings of moral dilemmas in different languages may not have equivalent meaning or significance. In Nakamura (2015), Japanese participants responded to various moral dilemmas either in their native language (Japanese) or a foreign language (English) in two experiments. Nakamura used factor analysis of participants' responses to test the dilemmas' semantic equivalence between the two languages, and directly compared responses to the moral dilemmas between the two languages. In both experiments, a foreign language effect resembling that of Costa et al. (2014) was observed in participants' responses; however, factor structures varied between the native and foreign languages, indicating that the moral dilemmas' meaning varied between the two languages. This result implies that between-subject designs may not fully capture the foreign language effect: individual differences in cognition between the foreign and native language may be large enough to change participants' interpretation of the dilemma between the language conditions. Earlier research has consistently used between-subject designs; hence, their results may simply reflect non-equivalent dilemmas between language conditions, rather than language-dependent differences in moral judgment. Given this possibility, demonstrating the foreign language effect requires the ensured preservation of semantic equivalence between moral dilemmas in native and foreign languages.

Differences in factor structure may not reflect individual differences in the dilemmas' interpretation; however, it remains significant that differences between participants might affect responses to the foreign and native language conditions. Experimental design should therefore separate language effects from individual differences to clarify the foreign language effect.

Individual differences also affect interpretation of the foreign language effect in framing-effect tasks; additionally, the foreign language effect is apparent in comparison of risk-averse responses between native and foreign-language conditions: the difference in the risk-averse response rate between gain- and loss-framed conditions in a foreign language condition was smaller than that in a native language condition (Costa et al, 2014). This latter result led Costa et al. to conclude that using foreign languages enhances rational decision-making (2014). Nonetheless, attributing rationality to a participant requires that participant's judgment remains coherent throughout equivalent gain- and loss-framed scenarios; hence, comparison between participants does not directly indicate framing effect-induced irrationality.

Excluding individual differences is thus crucial to the examination of a possible relationship between language and thought (e.g., Kay & Kempton, 1984; Takano, 1989). To the authors' knowledge, previous studies examining this

Table 1 Moral dilemmas used in this study

	Content	Action
Switch	Kill one man to save five workmen	Throw switch to turn the train to the side track
Footbdidge	Kill one heavy man to save five workmen	Throw the man from the bridge
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

topic have not adequately determined if foreign and native language differentially affect modes of cognition.

In sum, examining the foreign language effect using a within-subject design would be fruitful for both practice and theory. This study therefore centrally aimed to examine the foreign language effect using a within-subjects design. In this study, Japanese participants responded to moral dilemmas and framing tasks in both foreign and native languages.

Method

Participants

One hundred and thirty-two undergraduates participated; participants were compensated with course credits.

Materials and procedure

Seven moral dilemmas (including the Switch and Footbridge dilemmas) and two types of framing task were used. The framing task included gain and loss framing conditions. Participants thus responded to 22 problems ((7 moral dilemmas + 2 framing tasks (Asian disease and financial crisis) * 2 framing conditions (gain and loss)) * 2 language conditions (native and foreign)). All materials and response scales were presented using booklets; participation was compensated with course credits.

Following Nakamura (2015), moral dilemmas were adopted from Greene et al. (2001). Dilemmas were composed of three moral-personal dilemmas (viz., footbridge, transplant, crying baby) and four moral-impersonal dilemmas (viz., switch, standard fume, sculpture, and speedboat) (Greene et al., 2001; cf. Nakamura, 2013). Table 1 summarizes the dilemmas.

Framing tasks were adopted from Costa et al. (2014). Regarding the Asian disease problem, this study used the problem described in the introduction section. Regarding the financial crisis problem, this study used the following scenario:

> A serious financial crisis has started recently. Without any action, the company you manage will lose 600,000 euro. In order to save this money, two types of actions are possible.

In the gain condition, participants made a choice between the following two options:

> If you choose Action A, 200,000 euros will be saved.
> If you choose Action B, there is a 33.3% chance that 600,000 euros will be saved and a 66.6% chance that no money will be saved.

The loss version was identical, except that regarding Action A, “200,000 euro will be saved.” was exchanged for “400,000 euro will be lost,” and regarding Action B, “600,000 euros will be saved” was exchanged for “400,000 euro will be lost.”

Japanese versions of the moral dilemmas and framing tasks were translated from the above English versions. Regarding the moral dilemmas, participants rated the permissibility of available acts on an eight-point scale (0 = *morally impermissible*, 7 = *morally permissible*.) Regarding the framing tasks, participants chose between the risk-averse and risk-seeking options. Participants were randomly provided with one of six types of booklet to record their choices.

Results and discussion

Moral dilemmas

Figure 1 presents mean estimates of permissibility judgments for the seven moral dilemmas in the foreign and native language conditions. Permissibility judgments in the foreign language condition were higher than in the native language condition for the Switch, Footbridge, and Donor dilemmas. Multivariate t-tests between the languages indicated significant differences between conditions in mean

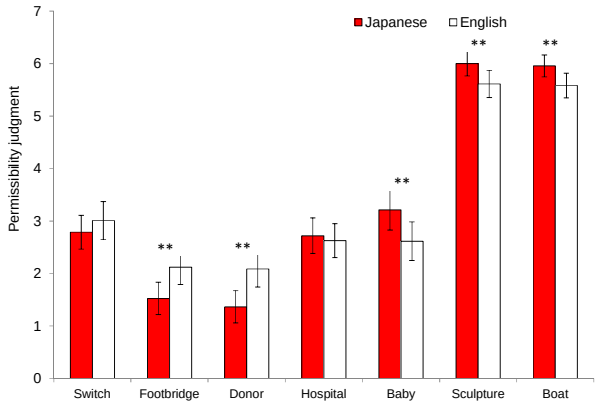

Figure 1. Permissibility judgments in moral dilemmas: error bars indicate 95% confidence interval; *: p<.05, **: p<.01

responses to the dilemmas except Switch and Hospital dilemma (p >.20). Although this study could not found significant difference in Switch dilemma, this trend was also found in Costa et al. (2014). Thus, as a whole, the foreign language effect was replicated in the same way as Costa et al (2014). Notice that directions of the effect of language on moral reasoning are the opposite in Baby, Sculpture, and Boat dilemmas. Costa et al. (2014) proposed that using foreign language would enhance engagement of the rational system. However, these results did not match the prediction by Costa et al (2014). These results suggest that direction of the foreign language effect might depend on moral dilemmas.

The following analysis was subsequently performed to determine if the foreign language effect would persist following control of individual differences. First, factor analysis with promax rotation was performed using maximum likelihood estimation. Table 2 presents eigenvalues, information criteria, and fit indexes for one-, two-, three-, and four-factor solutions. The data best supported the four-factor model; however, that model contained a factor without a significant load, and used a somewhat complex structure. In contrast, the three-factor model used a simple structure (Table 3): the first factor only significantly affected responses in the Switch, Footbridge, and Donor dilemmas; the second factor was only significant in the Baby dilemma; and the third factor was only significant in the Sculpture and Boat dilemmas. Additionally, factor loads were significant for all items. In sum, the four-factor model offered better data fit in the exploratory factor analysis; however, the pattern of factors appeared to support the three-factor model. The three-factor model was therefore adopted.

Two types of confirmatory factor analysis were subsequently performed (Table 4). One model assumed that all dilemmas were affected by only one of the three factors but that factor loads were not equal between the foreign and native languages. This model represents non-equivalence of the dilemmas' meaning between language conditions. The other model constrained values of factor loads to equality between the native and foreign language. This model represents the dilemmas' semantic equivalence between the two languages. The latter model fit the data better than the former, indicating that the moral dilemmas' meaning was equivalent in each language.In sum, the foreign language effect was replicated using moral dilemmas and a within-subjects design; this design excludes individual differences from potentially explaining the language effect; utilitarian judgment was promoted in the foreign language condition.

Table 2. Factor loads in the three-factor model

Dilemma		Factor		
		F1	F2	F3
Switch	Foreign	**0.644***	-0.043	0.069
	Native	**0.646***	-0.068	0.002
Footbridge	Foreign	**0.787***	-0.153	0.01
	Native	**0.866***	0.051	-0.053
Donar	Foreign	**0.460***	0.006	-0.059
	Native	**0.394***	0.018	-0.094
Hospital	Foreign	**0.699***	0.005	-0.012
	Native	**0.614***	0.045	0.014
Baby	Foreign	0.065	**0.636***	-0.01
	Native	-0.002	**0.893***	0.153
Sculpture	Foreign	0.008	0.043	**0.474***
	Native	-0.084	0.03	**0.445***
Boat	Foreign	-0.029	0.073	**0.643***
	Native	0.116	-0.009	**1.013***
	F1	1.000		
	F2	-0.099	1.000	
	F3	0.185	0.103	1.000

Framing tasks

Figure 2 presents results indicating the foreign language effect in the framing-effect task. Differences in risk-averse response rates between the gain- and loss-framed conditions were reduced when participants answered the framing tasks in their foreign language in Financial crisis problem Chi-square tests indicated significant differences between the

Table 3 Fit indexes of the exploratory factor analysis.

	Eigen value	AIC	BIC	Adj. BIC	CFI	RMSEA
1 factor	4.00	6954.16	7074.27	6941.44	0.60	0.15
2 factors	2.49	6831.88	6989.11	6815.21	0.83	0.11
3 factors	1.43	6794.26	**6985.87**	6773.97	0.92	0.09
4 factors	1.00	**6768.51**	6991.58	**6744.89**	**0.98**	**0.05**

Table 4. Fit indexes of the confirmatory factor analysis.

	AIC	BIC	Adj. BIC	CFI	RMSEA
No constraint	6769.633	6898.324	6756.004	0.921	0.069
Constrained	**6765.416**	**6885.528**	**6752.696**	**0.924**	**0.067**

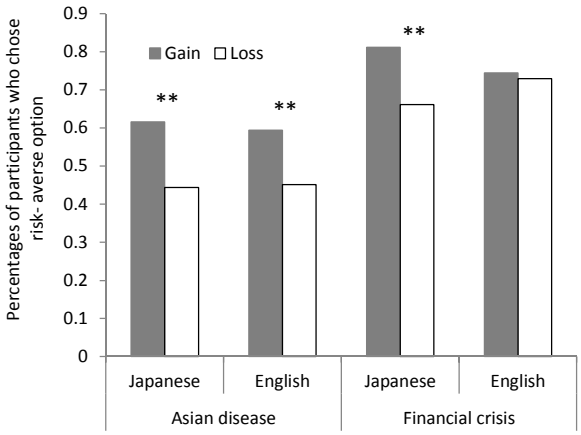

Figure 2. Risk-averse response rates in framing tasks

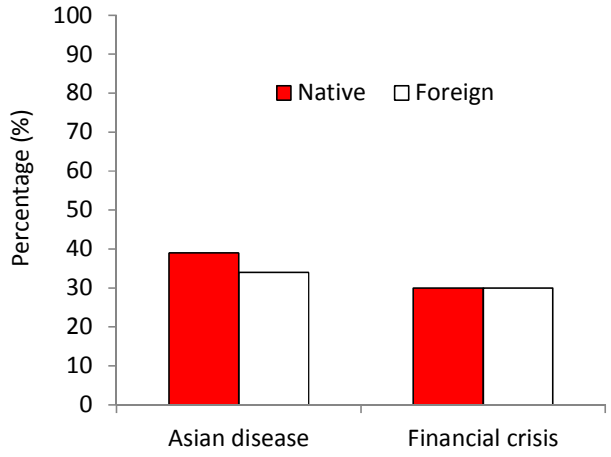

Figure 3. Response coherence in framing tasks

foreign and native language conditions in Financial crisis problem, but not in Asian disease problem. The foreign language effect was thus partly replicated using a within-subjects design.

Analysis also examined differences in coherence between the gain and loss conditions in the foreign and native language conditions (Figure 3). To accomplish this, the percentages of participants who chose the same option throughout the gain and loss conditions were calculated; no significant differences were detected in participants' percentage coherence between the foreign and native language conditions in either the Asian disease or financial crisis problem (Figure 3), indicating that using foreign language do not reduce tendency for incoherence in risky decision making .

Conclusion

The foreign language effect persists in within-subject experimental designs. Existing studies have commonly used between-subject designs, which cannot exclude differences between individuals; in contrast, this study's design excludes the possibility that the replicated foreign effect reflects differences between individuals by controlling for individual differences. Specifically, the results of this study are important because it found the difference between the native and foreign language conditions confirming the equivalence in the moral dilemmas between the two conditions. This study's results are thus more robust of those obtained using between-subjects designs.

Notice that this finding can be positioned as a first example that demonstrated the foreign language effect in its purist form. The foreign language effect indicates, lending words from Costa et al. (2014), that the way of thinking "depends on language." This statement clearly implies that use of language would affect way of thinking in the same person. However, existing studies did not examine this statement directly because of their use of between subject design. Thus, we might say that this study is the first study that showed the "true" foreign language effect.

Additionally, this study's results imply that the foreign language effect contains individual differences within participants between conditions. This implication importantly suggests that the interpretation of earlier results apparently illustrating the foreign language effect may be

seriously confounded (e.g., Costa, Foucart, Arnon, et al., 2014; Costa, Foucart, Hayakawa, et al., 2014; Keysar, Hayakawa, & An, 2012). Further, this study detected no change in participants' response coherence between the language conditions in the framing tasks. This result does not support the proposition that foreign language reduces the framing effect; instead, it suggests that the language effect may itself be dependent on other factors, such as task type or content.

Finally, this study's results indicate that the foreign language effect is unstable between decision-making tasks. The foreign language effect persisted in moral dilemmas following controlling for individual differences by using a within-subjects design; however, the effect's appearance seems to vary between within- and between-subject designs in judgment and decision making tasks, such as the framing task. Additionally, results of the framing tasks indicate that an existence of the foreign language effect depend on how to define the effect. Hence, foreign language's effect on reasoning and decision-making appears to partly depend on task type. Future research should therefore aim to determine the relationship between the foreign language effect and task type and illuminate the mechanism underlying that relationship.

References

Costa, A., Foucart, A., Arnon, I., Aparici, M., Apesteguia, J. (2014). ''Piensa'' twice: On the foreign language effect in decision making. *Cognition, 130*, 236–254.

Costa, A., Foucart, A., Hayakawa, S., Aparici, M., Apesteguia, J., Heafner, J., & Keyser, B. (2014). Your morals depend on you language. *PLoS ONE, 9*, e94842.

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science, 293*, 2105–2108.

Kahneman, D. (2011). *Thinking: fast and slow*. Farrar, Straus & Giroux

Kay, P., & Kempton, W. (1984). What is the Sapir-Whorf hypothesis? *American Anthropologist, 86*, 65–77

Keysar, B., Hayakawa, S. L., An, S. G. (2012). The foreign-language effect: Thinking in a foreign tongue reduces decision biases. *Psychological Science, 23*, 661–668.

Nakamura, K. (2013). A closer look at moral dilemmas: Latent dimensions of morality and the difference between the trolley and footbridge dilemmas. *Thinking and Reasoning, 19*, 178–204.

Nakamura, K. (2015). Effect is true, but explanation is untrue: A closer investigation to the foreign language effect by Japanese participants. *Proceedings of the Thirty-seventh Annual Conference of the Cognitive Science Society*, pp.1697-1702.

Sapir, E. (1921). *Language: An Introduction to the Study of Speech*, New York: Harcourt, Brace.

Sloman, S. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, 119, 3-22.

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *Behavioral and Brain Sciences*, 23, 645-665.

Takano, Y. (1989). Methodological problems in cross-cultural studies of linguistic relativity. *Cognition, 31*, 141–162.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*, 453–458.

Whorf, B., J. B. Carroll (Ed.) (1956). *Language, Thought, and Reality: Selected Writings of Benjamin Lee Whorf*. Massachusetts: MIT Press.