The Auditory Foreign Language Effect in Moral Decisions of Simultaneous Bilinguals

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The use of a foreign language has been observed to increase deliberative thinking, favoring utilitarian decisions when making decisions involving moral dilemmas. Previous investigations of the foreign language effect have been heavily limited to written stimuli, and very few have observed simultaneous bilinguals. In the current study, the impact of the auditory foreign language effect on moral decision-making in simultaneous English/Mandarin bilinguals is investigated using a participant group with ages ranging from 14-19. A survey containing audio recordings of 8 moral dilemmas was presented entirely in Mandarin or in English, and after listening to the dilemma participants were instructed to indicate whether they felt the specified action was appropriate or not. The results showed no significant decision-making differences between the two language groups which may be attributed to the high level of cultural immersion of the participants. The findings also suggest limitations to the foreign language effect attributed to high proficiency in listening for both languages.

Introduction

In the 2009-2013 sampling survey conducted by the U.S. Census Bureau (2015) on languages spoken at home, Chinese had the second largest population of speakers after English and Spanish in the United States of America (U.S.A.), with approximately 2.9 million speakers, including Cantonese and Mandarin. Mandarin alone accounted for 487,250 speakers ages 5 and older (U.S. Census Bureau, 2015). With the rise of globalization, rising importance has been placed on foreign language programs and the fostering of a second language in American citizens. A 2017 report by the American Councils for International Education presented survey data that showed approximately 20% of the total school population in 2014-15 was enrolled in a foreign language class in the formal education system; the report also found that 227,086 students from K-12 in all 50 states were enrolled in Chinese as a foreign language (American Councils for International Education, 2017).

As a result of the increasing significance of bilingualism in the United States, there are more opportunities for foreign languages to be in effect while conducting day-to-day activities. This is especially true for simultaneous bilinguals, bilinguals who pick up their L2 during formative childhood years, acquiring two languages simultaneously. This use of a foreign language may result in the Foreign Language Effect (FLE), where situations presented in a foreign language result in increased deliberative thinking by reducing decision biases in certain contexts (Vives, Aparici, Costa, 2018). This can be seen with the framing effect, a phenomenon where changes in the presentation of the option can affect the choices people make (Kim, Goldstein, Hasher, & Zacks, 2005). The impact of the FLE is also apparent in moral decision making, as found by a study conducted by Costa et al. where sequential bilinguals (bilinguals who learn a foreign language after the critical period) made more utilitarian decisions when confronted with a moral dilemma (Costa, Foucart, Hayakawa, Aparici, Aposteguia, Heathner, & Keysar, 2014). Increased understanding of the FLE can have implications regarding the manipulation of language environments to foster increased deliberative thinking when confronted with situations requiring a moral decision, which could be utilized in therapy and medical fields. While many studies concerning the FLE have been conducted using written stimuli, there have been few studies that employed the use of auditory stimuli, especially concerning simultaneous bilinguals, despite auditory exposure being a crucial part of language. In order to address this gap, this study investigates the question, “To what extent does auditory stimuli presented in Mandarin impact moral judgment in simultaneous English/Mandarin bilinguals in the United States?” It is hypothesized that the use of auditory stimuli presented in Mandarin will result in a significantly greater count of utilitarian decisions from simultaneous English/Mandarin bilinguals in comparison to auditory stimuli presented in the dominant language, English, when confronted with a moral dilemma.

Literature Review

The idea that the use of a foreign language could potentially impact decision-making was initially investigated in a 2012 article by Keysar, Hayakawa, & An., who found that people were more likely to use systematic processes to make decisions when using a foreign language. The study used the Asian disease problem in a gain-frame and loss-frame to analyze framing effect and a gambling scenario to analyze loss aversion. In the framing effect, people’s decisions change as a result of whether the choice is presented in positive (gain-frame) or negative (loss-frame) connotations. With loss aversion, people are more averse to loss despite being presented an opportunity for equal gain. The results found that the use of a foreign language reduced the impact of a framing effect when the Asian disease problem was presented in a gain- or loss-frame. Additionally, using a foreign language caused participants to be more likely to take risks in the gambling scenario compared to participants who completed the experiment in a native language, showing decreased loss aversion. The effect observed in the study was termed the foreign language effect (FLE), where use of a foreign language encourages cognitive-controlled processes, promoting logical thinking when making decisions.

While Keysar et al. (2012) found that the use of a foreign language encouraged systematic processes in the context of the framing effect and loss aversion, it was Costa et al. (2014) that studied the FLE on moral judgment in English-Spanish, Korean-English, English-French, and English-Hebrew and Spanish-Hebrew participants using two versions of the trolley dilemma: the footbridge dilemma and the switch dilemma. The footbridge dilemma, in which a person must choose whether or not to push a man off a footbridge to stop a runaway trolley from hitting five workers, was classified as a personal dilemma, while the switch dilemma, in which a person must choose whether or not to push a switch to divert a runaway trolley onto a different track with one worker, was classified as impersonal. In personal dilemmas, the subject is directly inflicting harm upon someone; in impersonal dilemmas, the subject is indirectly harming another. They found that the FLE was only found in the personal rather than impersonal dilemma, leading to their conclusion that the FLE was caused by psychological distance due to using a foreign language, which the researchers concluded was possibly caused by the foreign language increasing the emotional distance that allowed the participant to act more rationally. The hypothesis that the FLE is caused by increased emotional distance is addressed in this study, which tests participants with cultural ties to their second language in contrast to classroom learning alone.
However, some evidence has been raised against the conclusion drawn by Costa et al. (2014). Geipel, Hadjichristidis, & Surian (2015) found that using a foreign language reduced distress for both personal and impersonal dilemmas. Their research consisted of three experiments. In Study 1, the footbridge and trolley (switch) dilemmas were used, along with two non-moral dilemmas which were used as a negative control to ensure that the participants understood the dilemmas in the foreign language (English or German). Participants whose native language was Italian were asked to choose “Yes” or “No” with respect to whether they thought the proposed action in the dilemma was appropriate. Utilitarian decisions were found to increase for the personal dilemma (footbridge) but not the impersonal dilemma (trolley) under the foreign language condition. In Study 2, Chinese-English participants who learned English as a foreign language were subjected to the same task and dilemmas as in Study 1, but were also asked to rate their acceptance and distress on a 7-point scale after being presented with the dilemmas, with a higher acceptance rating indicating more utilitarian judgment. A significant FLE was once again observed for the footbridge but not the trolley dilemma, and the acceptance ratings also reflected more consequentialist ratings by participants subjected to the foreign language condition than the native language condition. Study 3 replicated the method in Study 2 but an extra personal (crying baby) and impersonal (lost wallet) dilemma was included. The results reflected those of Study 2, but the additional impersonal dilemma (lost wallet) also showed the FLE, while the personal dilemma (crying baby) did not. Analyzing the results, Geipel et al. pointed towards the possibility that a foreign language diminished the usage of social and moral norms when making a moral judgment, and that participants could explain for what reason the answers were refused for the footbridge dilemma. The impersonal dilemma, in which a FLE was apparent involved a socially unacceptable action, stealing, while the impersonal dilemma that didn’t show the FLE involved an action (flipping a switch) that was not directly violating any social or moral norms. The absence of a FLE in the second personal dilemma, the crying baby, was concluded to have possibly been due to the inevitability of the scenario, in which the baby would have died no matter which action was taken.

While the former studies that drew conclusion on the FLE were conducted using written stimuli, currently, only a few studies have been conducted that assess the FLE in an auditory setting. In one of these studies, in order to assess the boundaries in which the FLE is apparent, Brouwer (2019) conducted a study modeled after Costa et al. (2014), examining whether the FLE was still applicable for highly proficient bilinguals and whether the results of Costa et al. (2014) could be replicated if conducted in an auditory setting. The latter aspect of the study was chosen due to there being a difference in emotional intensity experienced by a person when hearing something communicated in an L1 or L2. Six moral dilemmas were presented along with three filler dilemmas designed to assess the participants’ understanding of the foreign language materials. Her study found that decisions made by highly proficient Dutch-English bilinguals did not show the FLE when written stimuli was used. However, she reported an auditory FLE that showed no bias towards personal or impersonal dilemmas, contrasting with the result of the Costa et al. (2014) study and supporting the results found by Geipel et al. (2015), which also determined emotional attenuation as not contributing significantly to the FLE. Testing for the FLE in an auditory setting for the simultaneous English-Mandarin group of this study is also expected to see increased emotional intensity, although this study differs in that emotional intensity for the two languages is not expected to have a significant difference that would show the FLE.

There are also very few studies on the FLE that involve early bilinguals. A study by Wong & Ng (2018) examined early English-Chinese bilinguals from Singapore who acquired both languages before the age of 3. Five paired moral dilemmas were used, with five phrases to make the dilemma personal and five phrases to make it impersonal. Participants were asked to rate their agreement to making the decision proposed in the dilemma on a 7-point utilitarian scale, where higher ratings reflected more utilitarian decisions. The dilemmas were presented with a 7-point scale to rate the distress they felt from the scenario. The study found no main effect of language on the utilitarian ratings of the participants for any of the five dilemmas, while three of the dilemma pairs showed significance of dilemma type on utilitarian ratings. Wong & Ng (2018) also found that the more dominant a participant was in a language, the greater the difference in the means between personal and impersonal choices for a dilemma tested in that language. Results showed that an individual’s attitude towards the language and culture of the tested language condition also contributed to their acceptance towards utilitarian decisions in personal dilemmas, being less likely to accept a utilitarian choice the closer they felt towards the language and culture. While some aspects that Wong & Ng (2018) accounted for were not addressed in this study, namely attitude towards language and culture, their study points towards the importance of an emotional connection with the language in how it affected participants.

From the results of Costa et al. (2014), Geipel et al. (2015), Brouwer (2019), and Wong & Ng (2018) there is still the question of whether the FLE is driven by reduced emotionality, reduced use of social and moral norms, or other reasoning. Additionally, there is still more to be discovered regarding the limitations of the FLE and the populations it occurs in, especially as most studies have used groups that learned a second language in a formal classroom setting; therefore, there is a gap in existing studies and knowledge on the observation of an auditory FLE for simultaneous bilinguals that have English as a dominant language and Mandarin as a non-dominant language. Based on these studies, it is hypothesized that the FLE will be observed through the form of a significantly higher count of utilitarian decisions in an auditory setting for participants in the Mandarin condition compared to the English condition, as Mandarin is the non-dominant language.

Method

The chosen participant group consisted of English-Mandarin bilinguals with ages ranging from 14-19. For all participants in the study, English was their dominant language, while the levels of Mandarin proficiency varied. Two surveys created through Google Forms were sent out to the students. The first survey was sent to participants from both language conditions and served the purpose of collecting general information that would serve to compare language proficiency and age between the groups. The form provided a section that detailed what participants were asked to complete prior to the decision-making experiment, which would serve to compare language proficiency and age between the groups. The latter survey was also followed by a question that asked them to rate their understanding of the question on a 5-point scale, with 1 corresponding to “I understand nothing,” 2 to “I barely understand,” 3 to “I moderately understand,” 4 to “I understand,” and 5 to “I fully understand” (see Appendix C).

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In determining the method of data analysis, Susanne Brouwer from the Dutch Language and Culture Department at Radboud University, Wilma Sims from the Department of Statistics at the University of South Carolina, and Amy Taylor, Coordinator of Mathematics at District 5 of Lexington and Richland Counties, were consulted. It was determined that an Analysis of Variance of Means (ANOVA) would be used to compare mean differences with a dependent variable of moral decision made (deontological or utilitarian), with the factors being type of moral dilemma and language. Self-rated proficiency scores based on the 5-point Likert scale for reading, writing, speaking, listening and overall proficiency in Mandarin and English were averaged, and any responses that reported an understanding of less than 3 for any of the moral dilemmas were excluded from the analysis.

**Results**

Data in the study was collected from 34 participants from a random general sample consisting of participants aged 14-20. Two of the participants did not meet the requirements of being simultaneous bilinguals and thus were excluded from the analysis, leading to a total of 32 participants ($M_{AGE} = 16.41, SD = 1.66$). Of the 32 participants, 16 received the Mandarin audio survey (see Table B1), while 16 received the English audio survey (see Table B2). All 32 filled out the general information survey which was administered in English (see Appendix C).

Participants in the Mandarin language condition gave mean ratings of 4.19 ($SD = 0.63$) for Mandarin listening and 3.56 ($SD = 0.70$) for overall Mandarin proficiency. Participants in the English language condition gave mean ratings of 4.75 ($SD = 0.33$) for English listening and 4.81 ($SD = 0.24$) for overall English proficiency. Several independent samples t-tests were conducted to analyze the difference in mean language proficiency for both language conditions between the two groups. No significant difference was found for the self-rated categories of listening and overall proficiency for both language conditions. Table 3 displays the results of the t-tests for Mandarin and English listening and overall, as well as the p-values. Table 4 displays the mean values for all of the categories for self-rated proficiency.

<table>
<thead>
<tr>
<th>t-value</th>
<th>p-value</th>
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<tbody>
<tr>
<td>tMANDARINLISTENING = -.23</td>
<td>p = .409</td>
</tr>
<tr>
<td>tMANDARINOVERALL = 1.29</td>
<td>p = .104</td>
</tr>
<tr>
<td>tENGLISHLISTENING = -.33</td>
<td>p = .371</td>
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<td>tENGLISHOVERALL = -1.02</td>
<td>p = .159</td>
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<table>
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<tr>
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<th>Mean Age</th>
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<th>Writing</th>
<th>Speaking</th>
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<tr>
<td>English</td>
<td>16</td>
<td>16.06</td>
<td>English</td>
<td>4.75</td>
<td>4.81</td>
<td>4.56</td>
<td>4.69</td>
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<td></td>
<td></td>
<td></td>
<td>Mandarin</td>
<td>4.25</td>
<td>2.75</td>
<td>2.63</td>
<td>4.19</td>
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<tr>
<td>Mandarin</td>
<td>16</td>
<td>16.69</td>
<td>English</td>
<td>4.69</td>
<td>4.75</td>
<td>4.5</td>
<td>4.56</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Mandarin</td>
<td>4.19</td>
<td>2.69</td>
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<td>4.69</td>
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<tr>
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<td></td>
<td></td>
<td>Mandarin</td>
<td>4.25</td>
<td>2.75</td>
<td>2.28</td>
<td>4.09</td>
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The number of utilitarian responses, organized by type of moral dilemma and language condition (Figure 1), showed a higher number of utilitarian decisions made by the Mandarin condition group for personal dilemmas, and a higher number of utilitarian decisions from the English condition group for impersonal dilemmas, for a total of 83 utilitarian decisions from the Mandarin group (personal and impersonal) and 82 utilitarian decisions from the English group. The data was entered into a ANOVA.

**Data Analysis**

The ANOVA was conducted on Minitab 18 with the dependent variable “moral decision” as the number of recorded utilitarian decisions and the factors being language (Mandarin and English) and type of moral dilemma (personal and impersonal) (see Figure 2).

A significance level of 0.05 was chosen for a 95% confidence interval. There was no statistically significant difference in the relationship between language or type of moral dilemma on moral decision (utilitarian), as $p > .05$ for language ($p = .924$) and type of moral dilemma ($p = .315$). S (standard error of the regression) was 2.73078, greater than 2.5, indicating that the model was not precise enough to produce a 95% prediction interval. Additionally, R-squared was 9.22%, indicating that only 9.22% of the variation in the model could be accounted for by language condition and type of moral dilemma. This signifies a weak fit of the model and low confidence in the p-value.
Figure 1. Frequency count of utilitarian choices by type of moral dilemma

General Linear Model: Moral decision versus Language, ... ral dilemma

Method
Factor coding (-1, 0, +1)

Factor Information

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<tr>
<th>Factor</th>
<th>Type</th>
<th>Levels</th>
<th>Values</th>
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<tr>
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<tr>
<td>Type of moral dilemma</td>
<td>Fixed</td>
<td>2</td>
<td>Impersonal, Personal</td>
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Analysis of Variance

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<th>Adj MS</th>
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<th>P-Value</th>
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<td>0.07143</td>
<td>0.01</td>
<td>0.924</td>
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<td>8.25714</td>
<td>1.11</td>
<td>0.315</td>
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<tr>
<td>Total</td>
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<td>90.3571</td>
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Model Summary

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<th>R-sq</th>
<th>R-sq(adj)</th>
<th>R-sq(pred)</th>
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<tr>
<td>2.73078</td>
<td>9.22%</td>
<td>0.00%</td>
<td>0.00%</td>
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Coefficients

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<th>P-Value</th>
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<td>15.04</td>
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<td></td>
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</tr>
<tr>
<td>English</td>
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<td>0.730</td>
<td>-0.10</td>
<td>0.924</td>
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<td>Type of moral dilemma</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Impersonal</td>
<td>0.850</td>
<td>0.808</td>
<td>1.05</td>
<td>0.315</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Regression Equation

\[ \text{Moral decision} = 12.150 - 0.071 \cdot \text{Language}_{\text{English}} + 0.071 \cdot \text{Language}_{\text{Mandarin}} + 0.850 \cdot \text{Type of moral dilemma}_{\text{Impersonal}} - 0.850 \cdot \text{Type of moral dilemma}_{\text{Personal}} \]

Figure 2. Results of ANOVA with the factors Language and Type of moral dilemma
The main effects plot shows the difference in mean for number of utilitarian decisions was greater between the types of moral dilemmas than between the two language conditions. While the mean was slightly greater for Mandarin, the $p$-value for language, 0.924, indicated that this difference was not significant. Additionally, the difference in mean for type of moral dilemma was greater than the difference for the language conditions, as reflected in the lower $p$-value 0.315, although neither type of moral dilemma or language showed a significant difference.

The interaction plot shows the difference in means for number of utilitarian decisions made for the type of moral dilemma was greater in the English condition than the Mandarin condition. English had a greater mean score for utilitarian decisions than Mandarin for impersonal dilemmas and a lower mean score than Mandarin in personal dilemmas, but the difference was small, no greater than 2.

**Discussion**

There was no statistically significant difference in the amount of utilitarian decisions between the two language groups, which supported the hypothesis as well as previous studies that found that higher proficiency correlated with a decrease in the FLE. The present study showed that a participant group with high cultural interaction and high proficiency in the targeted area of Mandarin auditory stimuli did not show a significant FLE. This reflected the results of Wong & Ng (2018) who conducted the experiment in a written setting. Brouwer (2019) found that the FLE was found when highly proficient Dutch-English bilinguals were exposed to auditory stimuli and not when exposed to written stimuli. In her study, the Dutch-English bilinguals were, on average, less proficient overall and in listening than the English/Mandarin bilinguals that participated in this study. This may have contributed to the lack of statistically significant differences in utilitarian moral decisions between language decisions observed with audio stimuli, while other factors could have been cultural immersion and the status of participants as simultaneous bilinguals. In the current study, participants had a high degree of cultural immersion, similar to the Singaporean English-Chinese participants who participated in the study by Wong & Ng (2018). In the study by Brouwer (2019), although the participants had the opportunity to be exposed to the foreign language
The ANOVA also found no statistically significant difference in number of utilitarian decisions as a result of moral dilemma type (personal or impersonal). This differs from the results of Costa et al. (2014) but follows the results of Geipel et al. (2015) and Brouwer (2019). A possible explanation would be the inevitability of some personal dilemmas such as the cruise ship and crying baby dilemmas, in which the victim would die regardless of whether the subject chose to kill them. The crying baby dilemma was found to produce no FLE under written settings (Geipel et al., 2015), which was suggested to be a result of how the baby would die regardless of what choice the subject made. Due to this setting, the submarine, cruise ship, and crying baby dilemmas may have resulted in increased utilitarian responses in both language conditions despite being classified as personal dilemmas. The crying baby dilemma was included in this study to mimic the procedures of previous studies (Geipel et al., 2015; Brouwer, 2019).

The current study may bring about a new understanding of the FLE by suggesting that cultural immersion and age of language acquisition play an important role in the presence of the FLE, perhaps even more than proficiency. The results of this study found that language had no significant effect on the number of utilitarian choices made by participants with, on average, high proficiency in Mandarin and English listening. As simultaneous bilinguals, participants reported early exposure to the non-dominant language, Mandarin. This early exposure may signify that an emotional connection to the language built from an early age was more significantly impactful on the observance of the FLE as was suggested by Costa et al. (2014), although other factors regarding environment that the general survey did not account for, such as any possible discrimination or lack of usage of the Mandarin language may have posed other impacts on the emotionality participants had towards the non-dominant language.

Limitations of the study include the limited participant pool. Previous studies used participant pools numbering 70 and above which would reduce the impact of any outliers in data. However, as a result of time limitations and restrictions caused by COVID-19 as well as the selective nature of the study, only 32 suitable participants were gathered and only 16 participants were able to be assigned to each language condition. Another limitation of the study was the number of moral dilemmas used in the study. Although this study used more moral dilemmas than several previous studies (Costa et al., 2014; Brouwer, 2019), as mentioned before there were fewer participants, which would have warranted the need for more moral dilemmas. There was an uneven distribution of personal and impersonal dilemmas, although the current study sought to replicate the situation presented in previous studies on the auditory FLE which also had more personal than impersonal dilemmas. Additional personal and impersonal dilemmas may have yielded different results. Limitations of the moral dilemmas used in the study included certain dilemmas that may have induced utilitarian decisions due to the victim having an inevitable death, which could have skewed the results by encouraging higher numbers of utilitarian decisions in the language conditions.

Another limitation of the study was the use of a self-rated proficiency scale rather than an official proficiency test. This was used in order to limit the time participants had to spend on the survey, making it more convenient to administer as contact with participants had to be limited. As proficiency was self-rated, the resulting numbers were subjective rather than objective, and may not have accurately portrayed the proficiency of each participant on an equal level.

Conclusions

The current study examined the FLE in moral decisions made by simultaneous English/Mandarin bilinguals. The implications of this study concern the applicability of the FLE in political and medical settings. Situations in which an increased level of rational and consequentialist thinking in decision making would have a major effect include medical settings and international organizations such as the United Nations (UN). However, in these professional settings generally a high level of proficiency and being well-versed in different languages would be required, and previous studies as well as the current study have shown minimal or no FLE in those conditions. Additionally, this study involved English/Mandarin simultaneous bilinguals, a situation applicable to the U.S. with an estimated 2,455,000 Chinese immigrants in 2018 (Echeverria-Estrada & Batalova, 2020). While many simultaneous bilinguals in the U.S. would have opportunities to be exposed to languages other than English, many daily interactions occur in auditory settings. For this particular study, simultaneous bilinguals on average reported high self-rated proficiency in Mandarin listening and had sufficient understanding of the moral dilemma presented in the non-dominant language, and subsequently showed no FLE despite low mean proficiency in Mandarin reading and writing. For the participant group used in this study, the FLE does not appear to have a significant impact on deliberative thinking in moral dilemmas, and is likely not potent enough to have a significant impact on daily interactions.

Future directions involve studies that could investigate the FLE in simultaneous bilinguals using different language groups that would help determine the role of culture in the boundaries of the FLE. This could include comparison of number of utilitarian decisions made between Spanish/English and Mandarin/English simultaneous bilinguals, with English being the commonality between the two groups. Another step would be to replicate the study using moral dilemmas that do not induce a utilitarian choice (i.e. crying baby, submarine, cruise ship) which may affect the number of utilitarian decisions made by participants. Additional information regarding participants’ age of language acquisition as well as specific details about their cultural immersion and attitude towards each language could also be collected to determine more specifically what factors impact the presence of the FLE.

References


Appendix A: Description of Moral Dilemmas

Table A1

Print version of moral dilemmas used in survey

<table>
<thead>
<tr>
<th>Moral Dilemma</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td></td>
</tr>
<tr>
<td>Footbridge</td>
<td>A runaway trolley is heading down the tracks toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the tracks below where his body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved. Is it appropriate for you to push the stranger onto the tracks in order to save the five workmen?</td>
</tr>
<tr>
<td>Cruise Ship</td>
<td>You are on a cruise ship when there is a fire on board, and the ship has to be abandoned. The lifeboats are carrying many more people than they were designed to carry. The lifeboat you’re in is sitting dangerously low in the water—a few inches lower and it will sink. The seas start to get rough, and the boat begins to fill with water. If nothing is done it will sink before the rescue boats arrive and everyone on board will die. However, there is an injured person who will not survive in any case. If you throw that person overboard the boat will stay afloat and the remaining passengers will be saved. Is it appropriate for you to throw this person overboard in order to save the lives of the remaining passengers?</td>
</tr>
<tr>
<td>Submarine</td>
<td>You are the captain of a military submarine traveling underneath a large iceberg. An onboard explosion has caused you to lose most of your oxygen supply and has injured one of your crew who is quickly losing blood. The injured crew member is going to die from his wounds no matter what happens. The remaining oxygen is not sufficient for the entire crew to make it to the surface. The only way to save the other crew members is to shoot dead the injured crew member so that there will be just enough oxygen for the rest of the crew to survive. Is it appropriate for you to kill the fatally injured crew member in order to save the lives of the remaining crew members?</td>
</tr>
<tr>
<td>Crying Baby</td>
<td>It is war time. Enemy soldiers have taken over your village. They have orders to kill all remaining civilians. You and some of your neighbors hide in the cellar of a large house. Outside you hear the voices of soldiers who have come to search the house for valuables. A baby with no parents begins to cry loudly. You cover her mouth to block the sound. If you remove your hand from the baby’s mouth her crying will get the attention of the soldiers who will kill you and the others hiding out in the cellar. To save yourself and the others you must smother the child to death. Is it</td>
</tr>
</tbody>
</table>
Junior Academy Research Article

Crying Baby
(Lee & Gino, 2015)

It is war time. Enemy soldiers have taken over your village. They have orders to kill all remaining civilians. You and some of your neighbors hide in the cellar of a large house. Outside you hear the voices of soldiers who have come to search the house for valuables. A baby with no parents begins to cry loudly. You cover her mouth to block the sound. If you remove your hand from the baby’s mouth her crying will get the attention of the soldiers who will kill you and the others hiding out in the cellar. To save yourself and the others you must smother the child to death. Is it appropriate for you to smother the child in order to save yourself and the other neighbors from being killed?

Driving
(Hayakawa et al., 2017)

You are driving through a busy city street when all of a sudden a young mother carrying a child trips and falls in front of your car. You are going too fast to stop in time; your only hope is to move out of the way. Unfortunately, there is a little old lady walking in the only place you can move to. If you move out of the way to avoid the young mother and baby, you will seriously injure or kill the old lady. Is it appropriate to move out of the way and hit the old lady in order to avoid the young mother and child?

Impersonal

Switch
(Geipel et al., 2015)

You are at the wheel of a runaway trolley quickly approaching a fork in the tracks. On the tracks extending to the left is a group of five railway workmen. On the tracks extending to the right is a single railway workman. If you do nothing the trolley will proceed to the left, causing the deaths of the five workmen. The only way to avoid the deaths of these workmen is to hit a switch on your dashboard that will cause the trolley to proceed to the right, causing the death of the single workman. Is it appropriate for you to hit the switch in order to save the lives of the five workers?

Watchman
(Greene et al., 2008)

You are the late-night watchman in a hospital. Due to an accident in the building next door, there are deadly fumes rising up through the hospital’s ventilation system. In a certain room of the hospital are three patients. In another room there is a single patient. If you do nothing the fumes will rise up into the room containing the three patients and cause their deaths. The only way to avoid the deaths of these patients is to hit a certain switch, which will cause the fumes to bypass the room containing the three patients. As a result of doing this the fumes will enter the room containing the single patient, causing his death. Is it appropriate for you to hit the switch in order to avoid the deaths of the three patients?

Wallet (Geipel et al., 2015)

You are walking down the street when you come across a wallet lying on the ground. You open the wallet and find that it contains several hundred dollars in cash as well as the owner’s driver’s license. From the credit cards and other items in the wallet it’s very clear that the wallet’s owner is wealthy. You have been hit by hard times recently and could really use some extra money. You consider sending the wallet back to the owner without the cash, keeping the cash for yourself. Is it appropriate for you to
**Table A2**

*Print version of moral dilemmas translated into Mandarin used in survey*

<table>
<thead>
<tr>
<th>Personal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Footbridge</strong>&lt;br&gt;(Geipel et al., 2015)</td>
<td>一个不受控制的车厢正沿着轨道冲向五个工作人员，如果不立即阻止车厢工作则将会被撞死。你站在车厢和工作人员之间的轨道上，你旁边有一个身体壮硕的陌生人。要想救下那五个工作人员的唯一方法是把这个陌生人推到桥下的轨道上从而阻止冲来。你这样做的目的是希望会死但会挽救五个工作人员的生命。你认为你把陌生人推到轨道上来的这五个工作人员是合适的吗？</td>
</tr>
<tr>
<td><strong>Cruise Ship</strong>&lt;br&gt;(Greene et al., 2008)</td>
<td>你正在一艘邮轮上，船上着火了，人们需要弃船逃生。救生船上坐着的人数比规定的人数多。你坐的救生船现在已经进入了水中。如果再降低几个冗余救生船就会沉没。海上浪涛开始变大，船里进了水。如果什么也不做救生船会立即沉没，船上所有人都会掉在水中。船上有一个受伤的乘客，无救是否被救上都不会活下来。如果你把这个人从救生船上扔出去，他不会沉没所有人都会得救。那你为了救船上其他所有乘客的生命而把这个受伤的乘客扔下船去是合理的吗？</td>
</tr>
<tr>
<td><strong>Submarine</strong>&lt;br&gt;(Greene et al., 2008)</td>
<td>你是一艘正在一个巨大的冰山下穿行的潜水艇的船长。船上发生的一个爆炸砸坏掉了你的船上的大部分氧气，你的一个船员也受伤流了很多的血。在你的潜水艇浮出水面之前剩下的氧气不足以维持所有的船员的需要。可以解救其他船员的唯一的方法是打死受伤的那个船员，这样氧气可以保证剩下的船员存活。那你认为你杀死那个受了致命伤的船员来挽救其他船员是合适的吗？</td>
</tr>
<tr>
<td><strong>Crying Baby</strong>&lt;br&gt;(Lee &amp; Gino, 2015)</td>
<td>现在是战争时期。敌人攻占了你的村庄。他们命令杀死所有的平民。你和你的一些邻居藏在一个大房子的地下室。你听见外面有士兵来到这个房子寻找财物。一个没有家长的婴儿开始大声的哭泣。你要堵住他的嘴不让他发出声音。如果你把你的手握住婴儿的哭声会引起士兵的注意。你和藏在地窖里的邻居们都会被杀死。为了救你和别人你要堵住婴儿的嘴直到他死去。那你为了救你和你的邻居们的生命而让小孩子死去是合适的吗？</td>
</tr>
<tr>
<td><strong>Driving</strong>&lt;br&gt;(Hayakawa et al., 2017)</td>
<td>你正在城市里一条繁忙的街道上开车，突然一个抱着孩子的年轻妈妈在你的车前摔倒。你的车的速度已经来不及停下来。你唯一的方法是转到别的方向上去。可是你可以转的唯一的方向上有一个老太太正在走路。如果你选择的方向避开年轻的妈妈和孩子那你会撞到老太太造成</td>
</tr>
</tbody>
</table>
Appendix B: Results of Surveys

Table B1: Compiled results from English forms

<table>
<thead>
<tr>
<th>Version</th>
<th>Participants</th>
<th>Footbridge</th>
<th>Cruise Ship</th>
<th>Submarine</th>
<th>Crying Baby</th>
<th>Driving</th>
<th>Switch</th>
<th>Watchman</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>10</td>
<td>Utilitarian</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deontological</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>V2</td>
<td>6</td>
<td>Utilitarian</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deontological</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16</td>
<td>Utilitarian</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>14</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deontological</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Table B2

Compiled results from Mandarin forms

<table>
<thead>
<tr>
<th>Version</th>
<th>Participants</th>
<th>Footbridge</th>
<th>Cruise Ship</th>
<th>Submarine</th>
<th>Crying Baby</th>
<th>Driving</th>
<th>Switch</th>
<th>Watchman</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>12</td>
<td>Utilitarian</td>
<td>6</td>
<td>11</td>
<td>11</td>
<td>8</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deontological</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>V2</td>
<td>4</td>
<td>Utilitarian</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deontological</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16</td>
<td>Utilitarian</td>
<td>8</td>
<td>14</td>
<td>13</td>
<td>9</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
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<td>Deontological</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Appendix C: General Survey and Surveys for Language Conditions

Survey 1

The purpose of this study is to determine the impact of the auditory foreign language effect on moral judgment of English-Mandarin bilinguals. Participation in this research study is completely voluntary. You may decide to not participate. If you decide to participate in this research survey, you may choose to withdraw from the study at any time. By participating, you will be asked to complete two surveys that will take approximately 15 minutes in total. Potential risks of the study include emotional discomfort due to moral dilemmas that involve death, war, etc. To help maintain confidentiality, the surveys will not collect data regarding email addresses, phone numbers, or specific birth dates (ex. month and day). The data collected from this study will be used for scholarly purposes only. This study has received approval from the Institutional Review Board for AP Research at Chapin High School.

* Required

By clicking “Agree,” you are attesting that you have read and understand the information above, and are consenting to participating in this study. *

- Agree

Next

Name (first name and last initial ex. Ella M). This information is being collected purely in order to match up the data collected from the first and second survey. In the second survey, there will also be a question asking for your name. For that question, please input the exact same response as the one you put here. *

Your answer

What age are you currently? *

- 14
- 15
- 16
- 17
- 18
- Other:

How long have you been learning Mandarin? (Please include # of years). Also include what age you began learning at (ex. 3), as well where you primarily learned the language (ex. elementary school, high school, at home etc.) *

Your answer
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Have you been in an immersive Mandarin environment before? If so, for how long (# years, #months)? An immersive Mandarin environment would be considered an environment in which you are constantly exposed to the language in your daily activities, and may involve you actively using the language frequently. An example would be living in China or any other Mandarin-speaking area for an amount of time, or staying in a neighborhood that predominantly functions in Mandarin.

Your answer

How would you rate your Mandarin listening ability? 1 = No knowledge; 2 = beginner; 3 = average; 4 = advanced; 5 = native-like

1  2  3  4  5
No knowledge  ○ ○ ○ ○ ○ Native-like fluency

How would you rate your Mandarin reading ability? 1 = No knowledge; 2 = beginner; 3 = average; 4 = advanced; 5 = native-like

1  2  3  4  5
No knowledge  ○ ○ ○ ○ ○ Native-like fluency

How would you rate your Mandarin writing ability? 1 = No knowledge; 2 = beginner; 3 = average; 4 = advanced; 5 = native-like

1  2  3  4  5
No knowledge  ○ ○ ○ ○ ○ Native-like fluency

How would you rate your Mandarin speaking ability? 1 = No knowledge; 2 = beginner; 3 = average; 4 = advanced; 5 = native-like

1  2  3  4  5
No knowledge  ○ ○ ○ ○ ○ Native-like fluency

How would you rate your overall Mandarin proficiency? 1 = No knowledge; 2 = beginner; 3 = average; 4 = advanced; 5 = native-like

1  2  3  4  5
No knowledge  ○ ○ ○ ○ ○ Native-like fluency
How would you rate your English listening ability? 1= No knowledge; 2= beginner; 3= average; 4= advanced; 5= native-like *

1 2 3 4 5

No knowledge 〇 〇 〇 〇 〇 Native-like fluency

How would you rate your English reading ability? 1= No knowledge; 2= beginner; 3= average; 4= advanced; 5= native-like *

1 2 3 4 5

No knowledge 〇 〇 〇 〇 〇 Native-like fluency

How would you rate your English writing ability? 1= No knowledge; 2= beginner; 3= average; 4= advanced; 5= native-like *

1 2 3 4 5

No knowledge 〇 〇 〇 〇 〇 Native-like fluency

How would you rate your English speaking ability? 1= No knowledge; 2= beginner; 3= average; 4= advanced; 5= native-like *

1 2 3 4 5

No knowledge 〇 〇 〇 〇 〇 Native-like fluency

How would you rate your overall English proficiency? 1= No knowledge; 2= beginner; 3= average; 4= advanced; 5= native-like *

1 2 3 4 5

No knowledge 〇 〇 〇 〇 〇 Native-like fluency
Survey 1

* Required

Regarding the second survey

In Survey 2, you will be asked to listen to 8 moral dilemmas. After listening, please choose either “Yes” to show that you agree with the action presented in the dilemma, or “No” to show that you disagree. Try not to spend too much time deliberating over your response, as this survey seeks to collect information regarding your initial response. Remember that there is no right answer to the moral dilemmas, so please do not feel any discomfort regarding your responses. After choosing “Yes” or “No” for each dilemma, you will be asked to rate your understanding of that dilemma. To show that you have read and understand the information above, please click “I understand.” *

☐ I understand

Back  Submit
Examples of the Mandarin Form

调查 2
* Required

名字 (ex. Ella M) *

Your answer

Next

https://drive.google.com/file/d/1EJHx9SyZjLAtg9gGaXOjincyhun_rSUN/view?usp=sharing *

○ Yes 是的
○ No 不是

你明白这个问题吗? Do you understand this question? 1= I understand nothing, 不明白；2= I barely understand, 只有一点明白；3= I moderately understand, 明白一部分；4= I understand, 大部分都明白；5= I fully understand, 完全明白 *

1 2 3 4 5

不明白 〇 〇 〇 〇 〇 完全明白

Back  Next
Examples of the English Form

Survey 2

* Required

Name (ex. Ella M) *

Your answer

Next

Survey 2

* Required

https://drive.google.com/file/d/1Ow9inhTdCmPM0rehYf9RNnSlgRnA2uYH/view?usp=sharing *

☐ Yes

☐ No

Did you understand the question? 1=I understand nothing; 2= I barely understand; 3= I moderately understand; 4= I understand; 5= I fully understand *

1 2 3 4 5

I understand nothing ☐ ☐ ☐ ☐ ☐ I fully understand