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How Foreign Language Influences Subjective Judgments of Future Events

By

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Abstract

A wealth of studies has supported the influence of language on decision making. Meanwhile, researchers are also keen on the mechanisms behind the Foreign Language Effect. There is growing literature revealing the relationship between emotionality and language as well as the link between psychological distance and language. The present study investigates how foreign language influences subjective probability judgment of future events and whether such effect is influenced by the valence of the events (positive and negative). Previous research suggests that reduced emotionality in a foreign language explains language effects on decision making. Therefore, we further tested whether foreign language reduces anticipated feelings of future events and consequently decreases probability judgments. Results based on 281 native Chinese speakers with a good comprehension of English as a foreign language confirmed our hypothesis. Subjective probability judgments of positive and negative future events was reduced when using foreign English than native Chinese. However, foreign English did not reduce anticipated emotion, nor did it explain the foreign language effect on probability judgments. One possible explanation is that foreign language increases a subjective feeling of distance, which increases hypotheticality and hence reduces the probability that positive and negative future events will occur.

Key words: foreign language effect, probability judgment of future events, anticipated emotion, optimism, willingness to pay

Introduction

In our everyday life, people often need to make subjective assessments of how likely a future event will happen and rely on their probability judgments to make daily decisions. For instance, if people think the likelihood to contract an infectious disease is high, it is more probable that they will get vaccinated; if people anticipated there is a higher chance of them developing cancer, it is more likely that they might follow a balanced diet and exercise regularly.

Then what factors may influence probability judgment of future events? Imagine reading a news article discussing a future scenario for the COVID-19 pandemic. After reading it, you make your subjective probability assessment of such a scenario. Now imagine you read the exact same article in a language that you are proficient in, but nevertheless cannot call a native language. Would your probability assessment of the same future events differ depending on the language in which you make your assessment?

There are reasons to predict that probability assessments of future events systematically differ depending on the language—native or non-native—in which people make them. One reason is that processing information in a non-native language might reduce affective reactions towards the information (Caldwell-Harris, 2015; Pavlenko, 2005, 2017). Another reason is that the use of a non-native language might increase a psychological distance from the information (Shin & Kim, 2017). I will unpack these two accounts in more detail down below in the literature review.

The Role of Emotion in Subjective Probability Judgments

When people judge the probability of future events, their judgments can be influenced by anticipated emotions. Simonson (1992) discovered that consumers who anticipate the regret they will feel due to the purchase of a malfunctioning product are more likely to purchase familiar, easily justifiable products. According to Ritov and Baron (1990), people who anticipate the regret they will feel if their children become ill or die because of taking vaccinations are less likely to vaccinate their children. Bar-Hillel and Neter (1996) identified that students who were given a lottery ticket and asked whether they would swap it for a new one with objectively greater chances tended not to do so because they anticipated the remorse they would feel if their original ticket won. Moreover, studies have revealed that people's likelihood estimations for valenced events are skewed by their moods. The presence of a positive mood, in particular, has been found to raise frequency estimates for positively valenced events, whereas the presence of a negative mood has been shown to increase frequency estimates for negatively valenced events (Johnson & Tversky, 1983; Mayer et al., 1992). Thus, it is suggested that anticipated emotions can influence people’s probability judgments of future events.

Language and Emotion

It has been highlighted that language nativeness influences emotionality. Considerable studies show that linguistic stimuli presented in a foreign language as compared to a native language can reduce emotional reactions ; for a review, see Caldwell-Harris, 2015; Pavlenko, 2005, 2017). Theories suggest that this emotional difference might stem from differences in the context of learning a foreign than native language. While the native language is learned in a naturalistic and emotionally rich environment, the foreign language is typically learned in a classroom setting, which is more emotionally neutral. Languages that were learned

naturalistically, via social interactions, were judged to feel more emotional (Caldwell-Harris, 2015). In particular, negative words are at risk of emotional disembodiment during foreign language processing compared to native language processing (Sheikh & Titone, 2016), which is caused by a universal human tendency to use evaluatively positive words more frequently and diversely than evaluatively negative words in communicating (Boucher, J., & Osgood, C. E. (1969).

A recent study investigating affective anticipation in immersed Polish–English bilinguals adds more evidence to this claim and reveals that when compared to neutral native word cues, negative valence native word cues enhanced the magnitude of the stimulus preceding negativity, an electrophysiological sign of affective anticipation (Jończyk, R., Korolczuk, I., Balatsou, E., & Thierry, G., 2019). This impact was noticed in both bilinguals whose native language was Polish and monolinguals who spoke English. When Polish subjects were assessed in English, the difference between neutral and negative words was not significant, suggesting a probable decline in affective sensitivity in the foreign language. This study concluded that language may act as a modulating factor of affective anticipation (Poli et al., 2007; Brunia et al., 2011a; Swannell et al., 2016; Kotani et al., 2017). This suggests that a foreign language may reduce the anticipation of future emotion. Taken together this account predicts that the use of a foreign language will reduce anticipated future emotion, which in turn might reduce subjective probability judgments.

Language and Psychological Distance

Another possible mechanism behind the influence of foreign language on the subjective judgment of future events is related to psychological distance. According to the Construal Level theory (Trope, & Liberman, 2010) "psychological distance is a subjective experience that something is close or far away from the self, here, and now." (Trope & Liberman, 2010, p. 1). Psychological distance centers from self, now and here and it can be on four different dimensions: social, temporal, spatial and hypothetical. These four dimensions are interrelated to one another. An event is psychologically distant if it is less associated with the self, happens at a time far from the current moment or in a place geographically far away, or is less likely to happen. Another fundamental argument of the Construal Level theory is that if an event is psychologically distant, it is construed in a more abstract way and vice versa.

There is substantial evidence that a higher construal level results in a decrease in probability estimation. For example, participants adopting a higher level of construal mindset made lower probability assessments than did those adopting a lower level of construal mindset (Wakslak & Trope, 2009; for a replication see Lermer et al., 2016). The construal effect on probability judgment is also consistent with research suggesting that vivid (typically concrete) events are judged as more likely than pallid events (cf. Johnson et al, 1993; Sherman et al., 1985).

Research provides indirect support for the claim that a foreign language might increase psychological distance, and hence to more abstract representations of information in a foreign than native language. The studies of Ivaz, Griffin and Duñabeitia(2019) and Shin and Kim's (2017) suggest that the use of a foreign language as compared to a native language increases distance from the self, as it reduces the focus on self-related stimuli than others-related stimuli.

This is also known as the self-reference effect, or the tendency for people to better remember information when it has been encoded in reference to the self (Kesebir & Oishi, 2010; Rogers et al., 1977; Turk et al., 2008). This self-related bias is typically measured with a perceptual matching task that requires participants to form associations between geometric shapes (rectangles, ellipses and triangles) and three labels ("me," "friend," and "other") (Sui et al., 2012). For example, the triangle might represent "friends" while the ellipse might represent "me". Different trials show either a matching (me—ellipse) or a mismatching (friends—ellipse). Participants' task is to decide whether the presented pair matches or mismatches and reaction time is measured. Research shows that participants carrying out this matching task in a foreign language react slower when the shapes and labels mismatch (Shim & Kim, 2017; Ivaz et al., 2018; Ivaz et al., 2016). This finding suggests that the self-bias is reduced when using a foreign than native language, which in turn can be interpreted as foreign language use induces more psychological distance (Ivaz et al., 2016; 2018).

Based on this research suggesting that foreign language increases psychological distance, and research suggesting that increased psychological distance increases hypotheticality, which reduces probability judgments, we predict that foreign language will increase a subjective feeling of psychological distance, which will increase hypotheticality and hence lower subjective probability of positive and negative future events.

Aim of the Present Study

The current study aims to investigate the effect of a foreign language on subjective probability assessment of future events. The study also aims to investigate whether the use of a foreign language influences subjective probability judgments by reducing anticipated emotion.

Furthermore, the study tests whether a possible foreign language effect is stronger for negative than positive future events.

Based on the existing literature, two theories are considered that both predict a reduction in probability judgments when using a foreign than native language. One theory suggests that foreign language use will reduce anticipated emotions of future events, which in turn will lower subjective probability judgments of future events. Furthermore, this theory suggest that the effect might be stronger for negative events as an emotional reduction in a foreign language is especially strong for negative feelings.

The other theory suggests that a foreign language will reduce a subjective feeling of psychological distance, which will increase hypotheticality and hence lower subjective probability of future events. This should lead to a foreign language effect in positive and negative events. Therefore, we put forward following hypotheses:

Hypothesis 1: Reading future events in a foreign language will reduce subjective probability judgments as compared to reading the same events in a native language.

Hypothesis 2: This foreign language effect is more pronounced for negative future events.

Hypothesis 3: This foreign language effect is associated with reduced anticipated emotions in a foreign than native language.

Methods

Participants

We recruited 281 native Chinese speakers (after exclusions as preregistered; 65.8% female, 33.8% male, M_{age} = 20.1 years, age range: 18 to 28 years). Of these, 152 participants were randomly assigned to the native Chinese condition (66% female, M_{age} = 20 years) and 128 to the foreign English condition (65% female, M_{age} = 20 years).

Experimental Design and Procedure

We tested whether language influences subjective probability judgments of future events with language as the between-participants factor and event type as within-participants factor. The independent variable is language and future event type (negative or positive). The dependent variables are subjective probability judgments of future events and anticipated positive and negative emotion ratings. Subjective probability judgments of future events means a person's estimation of the probability of certain future events. For example, participants were asked to judge the chance of them being not affected by future disease outbreaks. Anticipated emotion is defined as the feelings a person expects to sense when certain future events happen.

Before the formal test, as prescreening, participants needed to answer questions about their English learning experience and proficiency. Only native Chinese speakers who were born and raised in China and currently lived in China were permitted to take part in the study. The questions were as follows: "*Did you speak English at home with your family as a child? Have you lived in an English-speaking country for more than 12 months (excluding university education)?".* Since participants were asked to judge probability related to future job hunting, only participants who were University students were allowed to participate.

Participants were randomly assigned to receive the materials either in their native Chinese or foreign English. We presented participants with 12 positive and negative future events (6 positive, 6 negative). See Table 1 for the descriptions of the events in English and Chinese. Participants were asked to judge the probability of each of the 12 future events on a 7-point scale: "What is the chance [future event]?"; (0 = *Not at all possible* to 6 = *Highly possible*). The events were presented in a randomized order for each participant.

In a different block, following the probability judgments, participants were once more presented with the 12 future events and asked to assess their anticipated emotion. For negative events, participants were read "Imagine you will [negative future event], how would this make you feel?" *guilty, proud, remorseful,* uncomfortable, ashamed, sad (1 = *Not at all* to 7 = *Very much*). For positive events, participants read "Imagine you will [positive future event], how would this make you feel?": satisfied, confident, accomplished, happy (1 = *Not at all* to 7 = *Very much*). The presentation order of positive and negative events was counterbalanced and the presentation order for each event within positive and negative events was randomized for each participant. The anticipated emotion scales were accompanied by colors of increasing intensity to prevent the tendency to report more intense emotions when responding on a scale in a non-native than native language (i.e., anchor contraction effect see De Langhe et al., 2011). We used the color red for negative emotion and green for positive emotion.

Then, participants were also given the Life Orientation Test Revised (LOT-R) measure. Two example items are as follows: "In uncertain times, I usually expect the best" and "If something can go wrong for me, it will." Participants indicated their extent of agreement on a 5-point scale (1 =*strongly disagree* to 5 = *strongly agree*) (Chiesi et al., 2013). This measure assesses individual differences in optimism. We aimed to test whether individual differences in

optimism influences a possible foreign language effect on subjective probability judgments of future events. This measure was presented to all participants in their native Chinese to avoid any possible language differences.

At the end of the study, to make sure participants of the English condition understood each item of the probability judgment task, participants were asked to translate each item of this task into Chinese. Following this task, participants were asked some general demographic questions including: gender and age at which started to learn English. All translated materials were translated, back-translations and checked for consistency by three independent native Chinese speakers with a high level of English proficiency.

Exploratory Task

As an exploratory task, participants also saw a scenario describing a future risk (outbreak of future diseases) and a policy that could reduce this risk (early warning system). We measured willingness to pay (0 = *No*, 1 = *Yes*) and amount of payment (¥0 to ¥600 with ¥50 increments).

Table 1.

English and Chinese versions of the 12 positive and negative future events used in the study

English	Chinese
Positive	
What is the chance that you will write a book one day and that the book will get published?	**你**觉得有多大可能性有一天你会写书并且出版？
What is the chance that you will get the job you really want to have?	**你**觉得有多大可能性你会拿到你很心仪的工作机会？
What is the chance that you will find the love of your life and have a long-lasting and happy relationship?	**你**觉得有多大可能性你会找到一生所爱，并与之发展一段长久幸福的关系？
What is the chance that you will travel around the world?	**你**觉得有多大可能性你会周游世界？
What is the chance that you will remain cancer free?	**你**觉得有多大可能性你不会得癌症？
What is the chance that you will not be affected by future outbreaks of new infectious diseases?	**你**觉得有多大可能性未来发生的新型传播性疾病不会影响到你？
Negative	
What is the chance that you will die alone?	**你**觉得有多大可能性你会独自一人离开人世？
What is the chance that you will trip and break a bone?	**你**觉得有多大可能性你会绊倒并摔断骨头？
What is the chance that you will feel that you have chosen the wrong career?	**你**觉得有多大可能性你会意识到自己选择了错误的职业？
What is the chance that you will be in bed ill for two weeks?	**你**觉得有多大可能性你会因病卧床两周？
What is the chance that you will have a mental health problem?	**你**觉得有多大可能性你会患上心理疾病？
What is the chance that a decayed tooth has to be extracted?	**你**觉得有多大可能性你会有颗蛀牙必须被拔掉？

Table 2.

Life Orientation Test-Revised (LOT-R)

No.	items
1	In uncertain times, I usually expect the best.
2	It's easy for me to relax.
3	If something can go wrong for me, it will. (R)
4	I'm always optimistic about my future.
5	I enjoy my friends a lot.
6	It's important for me to keep busy.
7	I hardly ever expect things to go my way. (R)
8	I don't get upset too easily.
9	I rarely count on good things happening to me. (R)
10	Overall, I expect more good things to happen to me than bad

Scoring: Items 3, 7, and 9 are reverse scored (or scored separately as a pessimism measure). Items 2, 5, 6, and 8 are fillers and should not be scored. Scoring is kept continuous – there is no benchmark for being an optimist/pessimist.

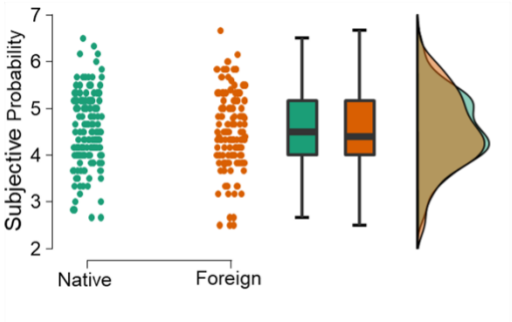
Results

Optimism (LOT-R)

Participants of both foreign language condition (M = 3.41, SD = 0.41) and native language condition (M = 3.45, SD = 0.46) share similar level of optimism, Welch's t (260.16) = 0.79, p = .432, d_{Cohen} = 0.09, U = 9479.50, p = .632, r =.03. Meanwhile, Cronbach's alpha for 12 items of the Life Orientation Test Revised (LOT-R) scale was α = .628, thus we used the average score across the 12 items for calculation.

Subjective Probability Judgments

As predicted, foreign language use (M = 4.10, SD = 0.51) make participants judge future events to be significantly less likely to happen, as compared to native language use (M = 4.24, SD = 0.47; Welch's F(263.50) = 6.04, p = .015, d_{Cohen} = 0.30; Welch F test; U = 11346.50, p = .023, r = 0.16; Mann–Whitney U test). A 2 (Language) × 2 (Valence) mixed analysis of variance (between-subject: language; within-subjec: valence), revealed a main effect of valence, F(1, 279) = 67.25, p < .001, η^2 = 0.14. and a signficant main effect of language, F(1, 279) = 5.313, p = .022, η^2 =.007.



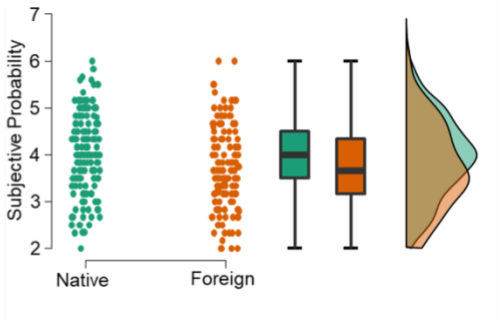


Figure 2. *Plotting subjective probability by language condition.*

The main effect was not qualified by a Language × Valence interaction, $F(1, 279) = 2.65$, $p = .105$, $\eta^2 < 0.01$. Planned paired comparisons showed that the language effect was not significant for positive events, $F(279) < 0.01$, $p_{bonf} = .951$, $d_{Cohen} < 0.01$. But there was a significant language effect for negative events, $F(279) = 6.56$, $p_{bonf} = .011$, $d_{Cohen} = 0.32$.

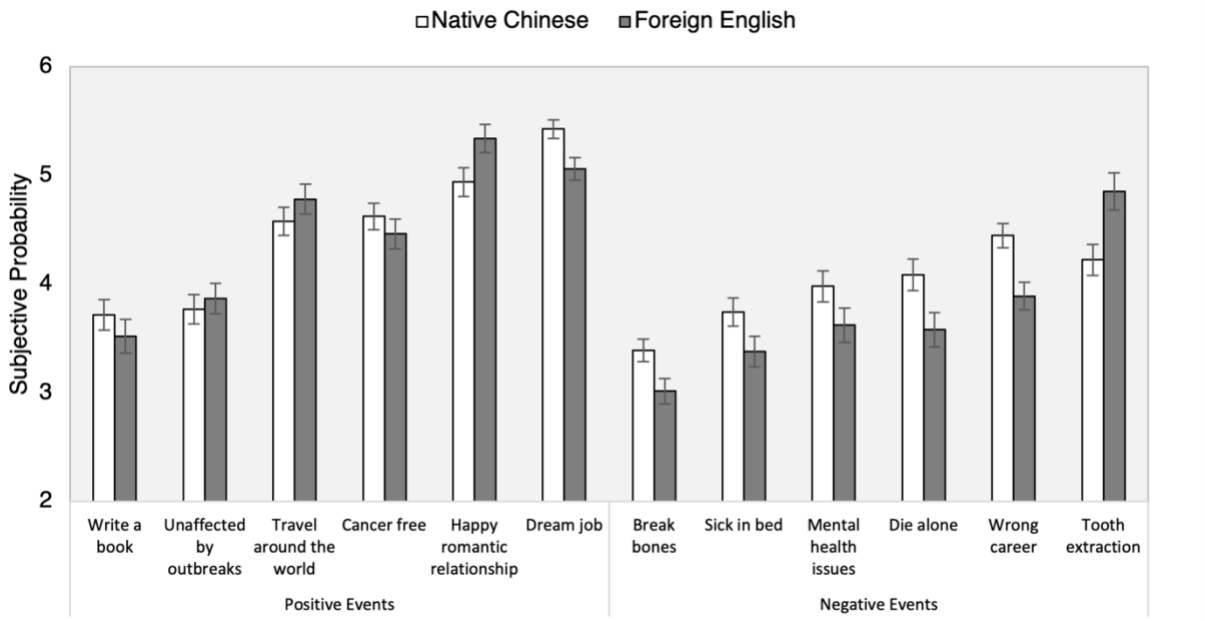


Figure 3. *Mean subjective probability by language and item type.*

Anticipated Emotion

Participants of both foreign language condition ($M = 5.21$, $SD = 0.61$) and native language condition ($M = 5.07$, $SD = 0.71$) anticipated to feel similar intensity of emotion when imaging future events (Welch's $F(278.99) = 3.46$, $p = .064$, $d_{Cohen} = 0.22$; Welch F test). A 2 (Language) × 2 (Valence) mixed analysis of variance (between-subject: language; within-subjec:

valence), revealed a main effect of valence, $F(1, 279) = 866.27$, $p < .001$, $\eta^2 = 0.52$. Positive events were judged as more emotional ($M = 6.01$, $SD = 0.61$) as compared to negative events ($M = 4.25$, $SD = 1.03$). However, no significant main effect of language was found, $F(1, 279) = 3.220$, $p = .074$, $\eta^2 = .007$. The main effect of valence was not qualified by a Language × Valence interaction, $F(1, 279) = 0.21$, $p = .644$, $\eta^2 < 0.01$.

Does Optimisim Influence the Foreign Language Effect on Subjective Probability Judgments?

We tested whether individual differences in optimism influence the effect of language on subjective probability estimates with a moderation analysis using 5,000 bootstrap samples. There was no significant Language × Optimism interaction, $F(1, 277) = 2.27$, $p = .132$. The present results suggest that optimism does not influence the foreign language effect on subjective probability judgments of future events.

Do Anticipated Emotion Explain the Foreign Language Effect on Subjective Probability Judgments?

We also tested whether anticipated emotion influence the language effect on probability estimates, with a mediation analysis using 500 bootstrap samples. There was no significant indirect effect ($b = 0.01$, 95% CI [–0.010, 0.025]). The effect of language on probability remained significant once controlling for anticipated emotion ($b = –0.14$, 95% CI [–0.26, –0.03] and $b = –0.15$, 95% CI [–0.27, –0.03]), suggesting that anticipated emotion does not explain the effect.

Exploratory Task – Disease Outbreak.

To investigate whether the language effect on subjective probability judgement would lead consequent behavior change, we design an exploratory task. First, we tested whether language influences probability for the future event describing a disease outbreak. In a foreign language participants judged the probability that they will be affected by future disease outbreaks similarly (M = 3.87, 95% CI [3.59, 4.15]) as participants in the native language condition (M = 3.77, 95% CI [3.50, 4.04]); Welch's $F(1, 273.89) = 0.25$, $p = .620$, $d_{Cohen} = 0.06$; Welch F test). We also found no significant effect of language on willingness to pay for a warning system to reduce future risks ($\chi 2$ (1, N = 281) = 0.29, $p = .593$, $\phi = 0.03$; Chi-squared test). Furthermore, participants in the foreign language condition were willing to pay a similar amount of money (M = 2.97, SD = 2.00) as participants in the native language condition (M = 3.05, SD = 1.77), $F(1, 257.75) = 0.12$, $p = .734$, $d_{Cohen} = 0.04$.

Discussion

In this study, we examined the effect of foreign language on subjective probability judgment of positive and negative future events. The result revealed that people perceive future events to be more likely to happen when reading them in a foreign language, compared with in their native language. Also, regardless of language, people perceive negative events to be less likely to happen, as compared with positive events. However, the language effect did not interact with the valence of future events. Foreign language reduced probability judgments of both positive and negative future events. Thus, we were not able to confirm the prediction that the foreign language effect on subjective probability judgment is stronger for negative events.

Previous work has demonstrated that foreign language users with low English proficiency show a reduced optimism bias (Oganian, Heekeren and Korn, 2019), which is the err belief that one's own chances of experiencing a negative future event is lower (or a positive event higher) than that of others. This effect was explained by foreign language reducing negative feelings associated with the future events. For the present study, a reduced optimism in a foreign language should result in higher probability judgments of negative future events and lower probability judgments of positive future events. Overall, our findings do seem to support an optimistic view, as the probability score for positive events was higher than that for negative events (M = 3.86, SD = 0.89). However, since we found a reduction in probability judgments in the foreign language for both negative and positive future events, our result cannot be accounted by a reduced optimistic bias.

Furthermore, we tested whether the foreign language effect on probability judgments is moderated by individual differences in optimism but found no support. It is possible that participants of our study hold relatively low and similar level of optimism (M= 3.4; 3 = neutral),

which seems consistent with the finding that people from interdependent culture (e.g. China) display less optimistic bias, as compared with independent culture (e.g. the U.S.; Heine & Lehman, 1995).

We also investigated whether the foreign language effect on probability judgment is explained by a reduction in anticipated emotion. Overall, participants anticipated to feel similarily emotionally when reading future events in both foreign and native language. Additionally, participants anticipated to feel more emotionally for positive events than negative events. Notwithstanding, there was no robust evidence supporting the mediating role of anticipated emotion. This explains why we were not able to find support for a strong foreign language effect for negative events, since this hypothesis is based on the theory that foreign language reduces emotionality, especially for negative events. Therefore, our results seem more in line with the theory that foreign language increases psychological distance, which increases hypotheticality and hence reduced probability judgments of positive and negative future events.

However, it is also possible that the foreign language effect on probability judgments stems from differences in how language influences memory retrieval (Marian & Neisser, 2000; Marian & Fausey, 2006). It has been found that balanced bilinguals retrieve more salient memories about a specific life experience if the language used in an interview matches the language of the specific life experience (Marian & Neisser, 2000; Marian & Fausey, 2006). These findings suggests that memory retrieval can be language dependent. Other research has shown that people judge an event to be more likely to occur when they are able to access their associated memories more easily (MacLeod and Campbell, 1992). Because participants in the present study likely have encoded memories associated with the positive and negative future events using their native Chinese context, it is possible that when reading the future events in their foreign language their

associated memories were less salient and hence they judged them as less likely. In other words, when using their native Chinese, participants' associated memories are more salient and readily available and hence they judge the events as more likely.

In terms of the exploratory part of our study, we were not able to draw conclusion on the consequent effect of probability judgment influenced by language. In fact, there was even no significant effect of language on probability judgment. It is possible that since the COVID pandemic is still ongoing and has a current peak in mainland China, it might be too concrete and present for people in both the foreign and native language. Hence it makes it difficult to interfere how people hypothesize future outbreaks of diseases.

Conclusion

In sum, the present study finds that people would judge future events as less likely to happen when reading in a foreign language and their corresponding anticipated emotion would also be less emotional. However, there remain several possible explanations for this language effect, which await future research to find out. The findings of this study extends current theories on the Foreign Language Effect and proves the impact of language on subjective probability judgment of future events. Furthermore, this study also validates the relationship between language and emotionality and tested the role of anticipated emotion in probability judgments. This study has practical implications for future-related policy-making or product-devising in bilingual populations. For instance, when policy-makers are devising air pollution regulations, they should take into consideration that slogans and appeals set in different languages may be more persuasive and effective than versions in a single unified language.

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