

## Pragmatically (ir)rational: Loss aversion bias in L2 speakers of English

Zoe Schlueter, Chris Cummins & Antonella Sorace (University of Edinburgh)  
zoe.schlueter@ed.ac.uk

People are predictably irrational in their decision-making (Kahneman 2011), but some recent studies suggest they are less prone to irrational decision-making in their second language (L2) than in their first language (L1) (Costa et al. 2014, Keysar et al. 2012). This “foreign language effect” has been argued to be due to lower emotional weight associated with the L2, reducing the impact of decision-making heuristics in L2 reasoning. However, the materials in these experiments are susceptible to multiple interpretations and a decision that is irrational under one interpretation is perfectly rational under another interpretation (as shown in monolinguals by Mandel 2014). In Tversky and Kahneman’s (1981) classic Asian Disease Problem (ADP), the paradigm used in these studies, participants are presented with a situation framed either in terms of **gain** or **loss** and have to choose between a **safe** and a **risky** option with equal expected value, as in (1). However, although the options are supposed to be extensionally equivalent across frames, the optimal choice from a utilitarian perspective depends on whether the number term is interpreted as exact, upper-bounded or lower-bounded (Mandel 2014). Therefore, the difference between L1 and L2 speakers might be due to subtle differences between native and non-native interpretations affected by proficiency. We explore this by examining loss aversion bias in native Chinese and native Italian speakers of L2 English and do not replicate the finding that L2 users in general are “more rational” in their decision making.

In our study, we used two distinct versions of the ADP, one with a disease scenario and one with an economic scenario (following Costa et al. 2014, who found the “foreign language effect” in both). In previous work, L1 speakers exhibited a loss aversion bias by more frequently choosing the safe option in the gain compared to the loss frame (framing effect), but L2 speakers were not affected by the framing. In our study, we found that both the Chinese group (N=51) and the Italian group (N=44) exhibited a clear framing effect: logit mixed models show that participants were more likely to choose the safe option when it was framed in terms of gain rather than loss (Chinese group:  $p=.004$ ; Italian group:  $p=.04$ ), as illustrated in Figure 1. This suggests that these L2 speakers are not immune to loss aversion bias, just like L1 speakers.

Whereas the Italian group’s data was consistent with L1 data from previous studies and showed a framing effect for both scenarios (interaction frame x scenario:  $p=.89$ ), there was a significant interaction between frame and scenario for the Chinese group ( $p=.04$ ). The L1 Chinese participants exhibited the framing effect only in the economic scenario but not the disease scenario. We suggest that this is due to the materials: the economic scenario used much larger numbers than the disease scenario (hundreds vs. hundred-thousands). Future research will explore how this might have induced different interpretations of the number terms and how this is related to number interpretation in their L1.

To examine the effect of L2 proficiency and emotionality, participants also completed a proficiency test and rated 30 words with positive, negative and neutral emotional valence in both English and their L1 (Warriner et al. 2013). While there was a numerical trend towards a stronger framing effect for L2 speakers who attached more emotional weight to their L2, this was not statistically significant for either group (Chinese group: emotionality x frame  $p=.08$ ; Italian group: emotionality x frame:  $p=.06$ ). We also found no significant effects of proficiency or any significant interactions of proficiency with frame and/or scenario for either of the groups. However, our participants all lived in an English-speaking country and effects of proficiency might be seen at lower levels. Our failure to replicate the foreign language effect on loss aversion might be because our participants were more proficient than those in previous studies, so their decision-making might have been based on more native-like interpretations of the number terms. This would have important implications for the idea that L2 decision-making is generally preferable on account of its superior rationality (Costa et al. 2014; Keysar et al. 2012).

(1) Asian Disease Problem (ADP)

Recently, a dangerous new disease has been going around. Without medicine, 900 people will die from it. In order to save these people, two types of medicine are available. They would have the following consequences:

**Gain frame:** If you choose Medicine A, 300 people will be saved. (**safe** option)  
If you choose Medicine B, there is a 33.3% chance that 900 people will be saved and a 66.6% chance that no one will be saved. (**risky** option)

**Loss frame:** If you choose Medicine A, 600 people will die. (**safe** option)  
If you choose Medicine B, there is a 33.3% chance that no one will die and a 66.6% chance that 900 will die. (**risky** option)

Which medicine do you choose?

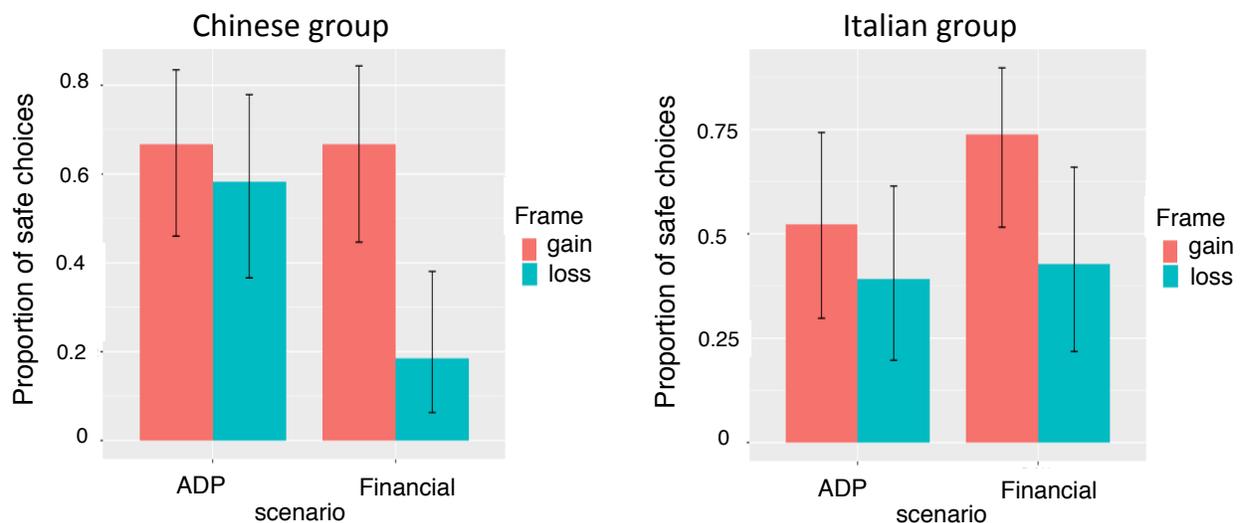


Figure 1. Proportion of safe choices in the gain frame and loss frame by the Chinese group and the Italian group.

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