How information is framed matters not only in L1 reasoning but also in L2 reasoning

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People are predictably irrational in their decision-making, but recent research suggests that L2 reasoning is less prone to cognitive biases than L1 reasoning (Costa et al. 2014, Keysar et al. 2012). This "foreign language effect" has been argued to show that decision-making heuristics are less dominant in L2 reasoning due to reduced emotionality associated with the L2 (Costa et al. 2014). However, an alternative explanation is that the materials in these studies are susceptible to multiple interpretations: a decision that is irrational under one interpretation is perfectly rational under another (as shown in monolinguals by 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 present data from three experiments that examine loss aversion bias in non-native speakers of English and do not replicate the finding that L2 users in general are "more rational" in their decision making.

We use two distinct versions of the Asian Disease Problem (Tversky & Kahnemann 1981), as in (1), with a disease and an economic scenario (following Costa et al. 2014, who found the "foreign language effect" in both). Participants see either the gain or the loss frame and choose between a safe and a risky option. In previous research, L1 speakers showed a loss aversion bias, reflected in a higher proportion of safe choices in the gain compared to the loss frame (framing effect), but this effect was reduced in L2 users (Costa et al. 2014, Keysar et al. 2012). 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).

In two online experiments with native Spanish speakers of L2 English, we find that high proficiency L2 speakers behave like L1 speakers in respect to loss aversion bias, both with materials susceptible to pragmatic enrichment and with materials inducing exact interpretations. Experiment 1 uses the traditional materials susceptible to multiple interpretations: we find a significant framing effect not only for the L1 speakers (N = 48) but also for the L2 speakers (N = 47) (L1: $p = .04$; L2: $p < .01$), as illustrated in Figure 1, with no significant interaction between language group and frame ($p = .86$). However, the framing effect is stronger for more proficient L2 speakers ($p < .05$). In Experiment 2, we manipulate the numbers to promote exact interpretations (e.g. 633 instead of 600), so the options really are extensionally equivalent across frames. This should reduce the framing effect and its interaction with L2 proficiency. L1 speakers (N = 46) and L2 speakers (N = 43) again exhibit the same patterns (framing x language: $p = .55$). Although we find an overall framing effect ($p < .01$), this is driven by the economic scenario (frame x scenario: $p = .01$). For both groups the framing effect is significant for the economic scenario (L1: $p < .05$; L2: $p < .001$) but not the disease scenario (L1: $p = .77$; L2: $p = .98$). We posit that this is due to the much larger numbers in the economic scenario (e.g. 633,000) admitting inexact interpretations.

In Experiment 3, we explore the impact of the similarity between L1 and L2. We test native Chinese (N = 51) and native Italian (N = 44) speakers of English in-lab, using the classic materials. We find a clear framing effect for both L2 groups: participants are more likely to choose the safe option when it is framed in terms of gain rather than loss (Chinese group: $p = .004$; Italian group: $p = .04$), replicating Experiment 1. Interestingly, while the Italian group's data is consistent with L1 data from previous studies in that it shows a framing effect for both scenarios (interaction frame x scenario: $p = .89$), there is a significant interaction between frame and scenario for the Chinese group ($p = .04$): the Chinese speakers of English exhibit the framing effect only in the economic but not the disease scenario. We suggest this is due to the much larger numbers in the economic scenario. 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.

(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)
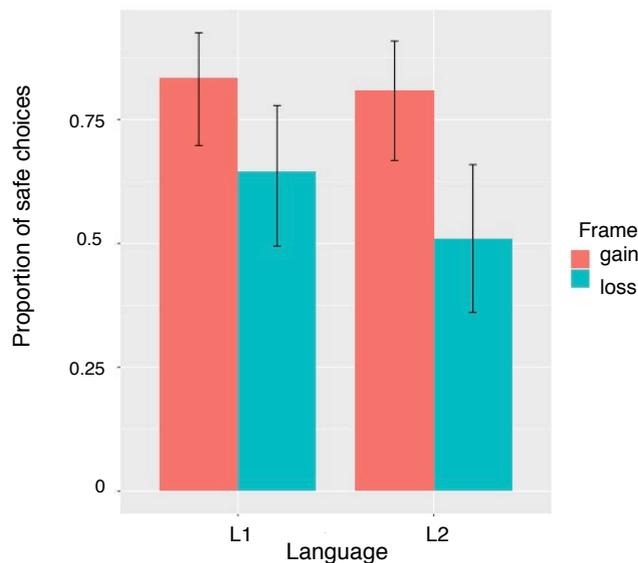
Which medicine do you choose?

Figure 1. Proportion of safe choices in the gain frame and loss frame by the L1 group and the L2 group in Experiment 1.

References

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