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The Effect of Foreign Language in Judgments of Risk and Benefit: The Role of Affect

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Abstract

As a result of globalization, policy makers and citizens are increasingly communicating in a foreign language. This article investigates whether communicating in a foreign language influences lay judgments of risk and benefit regarding specific hazards such as "traveling by airplane," "climate change," and "biotechnology." Merging findings from bilingual and risk perception research, we hypothesized that stimuli described in a foreign language, as opposed to the native tongue, would prompt more positive overall affect and through that induce lower judgments of risk and higher judgments of benefit. Two studies support this *foreign language hypothesis*. Contrary to recent proposals that foreign language influences judgment by promoting deliberate processing, we show that it can also influence judgment through emotional processing. The present findings carry implications for international policy, such as UN decisions on environmental issues.

Keywords: risk perception; judgment and decision making; affect heuristic; bilingualism; foreign language.

The Effect of Foreign Language on Judgments of Risk and Benefit: The Role of Affect

Lay perceptions of risk and benefit underpin personal decisions, such as whether to reduce energy consumption and water use, which have long-term implications for individuals and society (Leiserowitz, 2005). Lay perceptions of risk and benefit also affect public policy and spending at national level. For instance, the United States Environmental Protection Agency has found that its policies depend more on lay perceptions of risk rather than on expert assessments (Sunstein, 1999, p. 8). Policy making and regulation at an international level, such as by the United Nations, the Organization for Economic Co-operation and Development, or the International Risk Governance Council, frequently involve communication and distribution of official documents in a foreign language, mostly English. Here we ask whether judgments of risk and benefit about a stimulus, such as “nuclear power plant,” vary as a function of the language in which the stimulus is described. Merging findings from two distinct areas of psychology, we expect that they will. Research on risk perception suggests that subjective assessments of risk and benefit are influenced by the overall affect, positive or negative, that the verbal description of a stimulus activates (e.g., Slovic, Finucane, Peters, & MacGregor, 2002; see also Zajonc, 1980). Research on bilingualism suggests that reading words in a foreign language activates less affect—predominantly less negative affect—than reading their translation equivalents in the native language (e.g., Caldwell-Harris, 2014; Pavlenko, 2012; Wu & Thierry, 2012).

The Role of Affect in Judgments of Risk and Benefit

Theories on the perception of risk and benefit, and judgment and decision making at large, emphasize a dual process route (e.g., Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004). One route is analytic and slow (*risk as analysis*), while the other is emotional and automatic (*risk as feelings*). The analytic route is believed to involve calculations of the probability and magnitude of desirable and undesirable outcomes, and the integration of this information based on normative rules, such as probability calculus. The emotional route is believed to rely instead on the affective valence of a stimulus, through a process known as the *affect heuristic* (e.g., Slovic et al., 2002). Specifically, the verbal description of a stimulus is believed to automatically trigger mental images and thoughts that are associated with affect, positive or negative (see also Damasio, 1994). Judgments depend on the overall affect that a stimulus activates, especially when judgments are complex and/or the mental resources of the judge are limited. If the overall affect is positive, this signals safety and the stimulus is judged as high-benefit and low-risk. If it is negative, this signals alarm and the stimulus is judged as low-benefit and high-risk.

In support of the affect heuristic, Alhakami and Slovic (1994) have shown that risk and benefit judgments are inversely related in people's minds, even if they may be positively associated in the environment. Follow-up research by Finucane and colleagues (Finucane, Alhakami, Slovic, & Johnson, 2000, Study 1) demonstrated that such an inverse relation is strengthened under time pressure, which supports that the underpinning mechanism is fast, emotional processing, rather than slow, analytic processing (see Maule & Svenson, 1993). A second study by Finucane and colleagues (2000, Study 2) demonstrated that information about risks influences judgments about benefits and vice versa, which further supports the idea that risk and benefit judgments are tied together and based on an overall affective evaluation. Inverse relations between judgments of risk and benefit have also been shown in experts' judgments (see Ganzach, 2001, for evidence with financial analysts, Slovic, MacGregor, Malmfors, & Purchase, 1999, for evidence with toxicology experts, and Savadori et al., 2004, for evidence with biotechnology experts). The effect of emotions on risk perception seems pervasive as it is also found in randomly sampled behaviors from everyday life (Hogarth, Portell, Cuxart, & Kolev, 2011). In summary, empirical evidence suggests that perceptions of risk and benefit are related to the overall affect that a verbal description of a stimulus activates.

Kahneman and colleagues (e.g., Kahneman, 2003; Kahneman & Frederick, 2002) offer a slightly different conceptualization of the affect heuristic. According to them, people do not simply consult their feelings when judging the risk and benefit of a stimulus, but rather use these feelings as a direct substitute for risk and benefit judgments. Kahneman and colleagues hold that heuristics involve an attribute-substitution process whereby a *target attribute*, such as the *riskiness* of having nuclear power plants, is substituted by a readily mentally accessible *heuristic attribute*, such as the *affective valence* of “nuclear power plants.” To the extent that the affect heuristic involves an attribute substitution process, one should expect an extremely high correlation between judgments of affective valence and risk/benefit judgments.

Foreign Language and Affect

Bilingual research suggests that emotional words and phrases have less emotional force when printed in a foreign language as opposed to the native language (e.g., Caldwell-Harris, Tong, Lung, & Poo, 2012; Harris, Gleason, & Ayçiçeği, 2006; for reviews see Caldwell-Harris, 2014; Pavlenko, 2012). For example, Harris and colleagues (Harris, Ayçiçeĝi, Gleason, 2003; see also Harris et al., 2006) demonstrated that native Turkish speakers who learned English after age twelve (late Turkish-English bilinguals), respond with lower autonomic arousal to childhood reprimands such as “Shame on you!” when these are presented in their native language (Turkish) than a later learned language (English). In the same vein, Caldwell-Harris and Ayçiçeĝi-Dinn (2009) found that late Turkish-English bilinguals report feeling their lies less strongly in a later learned language than in their native language.

Recent studies suggest that the emotional gap between a foreign and a native language is more pronounced for negative than for positive words. For example, Sheikh and Titone (2013) using eye-tracking methodology have found that while abstract positive words in a foreign language are processed in a similar manner to their native language translations (they are processed more quickly in comparison to neutral words), negative abstract words do not show such a processing advantage. Similarly, Wu and Thierry (2012) found that while reading a positive or neutral word in a foreign language activates its native language equivalent, reading a negative word does not. Wu and Thierry attributed this finding to automatic emotional processes that inhibit access to distressing content. As these authors eloquently put it, reading in a foreign language protects your heart. Reading in a foreign language might also protect your heart for a different reason: in comparison to positive words, negative words have less opportunity of being emotionally grounded because adult social interaction, such as that experienced while acquiring a language in a classroom context, has a positivity bias (Sheikh & Titone, 2015; as cited in Caldwell-Harris, 2015).

The Foreign Language Hypothesis for Judgments of Risk and Benefit

We hypothesized that presenting a target stimulus such as “nanotechnology” in a foreign language as opposed to the native language might also protect your heart—its overall affect might become more positive. To the extent that this is true, on the basis of the affect heuristic we predicted that foreign language would prompt higher judgments of benefit and lower judgments of risk. This prediction rests on the assumption that judgments of risk and benefit in a foreign language would also rely on automatic, emotional processing. However, it could be that the attenuation of emotions that accompanies processing information in a foreign language might instead promote analytical thinking (see Costa, Foucart, Hayakawa, et al., 2014; Keysar, Hayakawa, & An, 2012). That is, a switch from a native to a foreign language might trigger a switch from emotional to analytic processing. If this happens, then the correlations between risk/benefit judgments and affective evaluations should be weaker in a foreign than in a native language. However, if risk and benefit judgments are underpinned by the affect heuristic, and if the affect heuristic involves an attribute substitution process, then the absolute value of such correlations should be extremely high in both language conditions (see Kahneman & Frederick, 2002).

In brief, if our foreign language hypothesis is correct, then we should observe a cross-over interaction between language condition and risk/benefit judgments: In relation to the native language, foreign language should prompt higher judgments of benefit and lower judgments of risk. We tested this hypothesis in Studies 1 and 2. Furthermore, the association between language and risk/benefit judgments should be mediated by affect and the correlations between risk/benefit judgments and affect ratings should be significant and high in both language conditions. Instead, if foreign language prompts analytic processing, then the impact of affect on judgment might be reduced (see Shiv & Fedorikhin, 1999). Thus, we should observe weaker correlations between risk/benefit judgment and affect ratings in the foreign versus the native language. We tested these hypotheses in Study 2.

Study 1

We presented participants with 26 activities, substances, technologies, and environmental issues, asking them to rate each one in terms of perceived risk and perceived benefit (we used 21 stimuli from Finucane et al., 2000, Study 1, and introduced 5 novel stimuli; for the full list of items see Appendix A). Half of the participants received the entire questionnaire in a foreign language (English), whereas the other half in their native language (Italian). We anticipated a cross-over interaction: In relation to the native language condition, we expected that foreign language would induce lower judgments of risk and higher judgments of benefit.

Methods

Participants. A sample of 92 Italian students (77 female, 14 male, 1 unknown; M_{age} = 22.91 years, age range: 20–30 years) from the Department of Languages and Literature of the University of Verona voluntarily participated at the beginning of an English lesson.[1] All participants were English majors and were tested in three different classes. Preliminary analyses revealed no main effect of class, and thus the data were collapsed across this factor. Participants were randomly assigned either to the foreign language condition (n = 46) and received a questionnaire entirely written in English, or to the native language condition (n = 46) and received the same questionnaire in Italian.

The *Common European Framework of Reference for Languages: Learning, Teaching, Assessment* (CEFR; Council of Europe, 2001) identifies six reference levels of foreign language proficiency: A1 (basic user – *breakthrough*), A2 (basic user – *waystage*), B1 (independent user – *threshold*), B2 (independent user – *vantage*), C1 (proficient user – *effective operational proficiency*), and C2 (proficient user – *mastery*). The qualification level of the majority of participants assigned to the foreign language condition was C1 (range: B1 – C2). On average, participants in the foreign language condition began English education at age 8.87, 95% CI [8.28, 9.39]. These participants were also asked to self-rate their English proficiency in terms of conversational fluency, reading, writing, and understanding, on a 5-point scale (1 = *almost none*, 2 = *poor*, 3 = *fair*, 4 = *good*, 5 = *very good*). Averaging across the four measures (Cronbach's α = .79), these participants rated their English skills as *good* (M = 4.14, 95% CI [3.99, 4.29]).

Materials and procedure. Participants were asked to rate 26 specific hazards such as "travelling by airplane," "pesticides," and "nanotechnology," in terms of risk and benefit for *Italian society as a whole* (instructions adapted from Finucane et al., 2000, Study 1). For each item, participants had to rate its risk (benefit) on a 7-point scale (1 = *absolutely not risky* [*beneficial*], 2 = *not risky* [*beneficial*], 3 = *slightly risky* [*beneficial*], 4 = *moderately risky* [*beneficial*], 5 = *fairly risky* [*beneficial*], 6 = *very risky* [*beneficial*], 7 = *extremely risky* [*beneficial*]). The risk and benefit judgments were presented in separate blocks, and the order of their presentation was counterbalanced. Block order did not affect the results (all *p*s > .29) and thus was dropped from analysis. Within each block, the 26 target items were presented in a different random order, which was kept fixed for all participants. Following these tasks, participants completed a set of demographic questions. Participants in the foreign language condition additionally responded to questions concerning their English proficiency.

Results

Judgments of risk and benefit. The main results are illustrated in Figure 1 and support the cross-over interaction predicted by the foreign language hypothesis: In relation to the native language, foreign language triggered lower judgments of risk and higher judgments of benefit.

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Insert Figure 1 about here

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We ran two 2 (language condition: foreign language vs. native language) × 2 (type of judgment: risk vs. benefit) analyses of variance, one treating subjects as a random factor (F_1), the other treating items as a random factor (F_2). The ANOVA by subjects revealed no main effect of language condition, $F_1(1, 90) = 0.25$, $p = .616$, $\eta^2 < .01$, 90% CI [.00, .045]. There was a main effect of type of judgment, $F_1(1, 90) = 8.44$, $p = .005$, $\eta^2 = .08$, 90% CI [.016, .186]. Overall, ratings of risk (*M* = 4.13, 95% CI [4.02, 4.24]) were higher than ratings of benefit (*M* = 3.84, 95% CI [3.71, 3.97]). Importantly, as predicted by the foreign language hypothesis, there was a significant judgment × language interaction, $F_1(1, 90) = 5.14$, $p = .026$, $\eta^2 = .05$, 90% [.003, .144]. Overall, participants in the foreign language condition (FL) gave similar ratings of risk as participants in the native language condition (NL) ($M_{FL} = 4.03$, 95% CI [3.88, 4.19]; $M_{NL} = 4.23$, 95% CI [4.08, 4.38]), $F(1, 90) = 3.15$, $p = .079$, Cohen's $d = 0.37$, 95% CI [-0.04, 0.78], but significantly higher ratings of benefit ($M_{FL} = 3.97$, 95% CI [3.79, 4.16]; $M_{NL} = 3.71$, 95% CI [3.53, 3.89]), $F(1, 90) = 4.04$, $p = .047$, Cohen's $d = 0.42$, 95% CI [0.01, 0.83].

The ANOVA by items revealed similar results. There was no main effect of language, $F_2(1, 25) = 0.75$, $p = .396$, $\eta^2 = .03$, 90% CI [.00, .189], but here also no effect of type of judgment, $F_2(1, 25) = 0.32$, $p = .576$, $\eta^2 = .01$, 90% CI [.00, .149]. As predicted by the foreign language hypothesis, there was a significant judgment × language interaction, $F_2(1, 25) = 26.23$, $p < .001$, $\eta^2 = .51$, 90% CI [.257, .652]. With respect to the native language, items in the foreign language condition received lower ratings of risk ($M_{FL} = 4.04$, 95% CI [3.48, 4.59]; $M_{NL} = 4.23$, 95% CI [3.69, 4.76]), $t(25) = -3.83$, $p = .001$, 95% CI [-0.29, -0.09], Cohen's $d = -0.75$, 95% CI [-1.18, -0.31], and higher ratings of benefit ($M_{FL} = 3.96$, 95% CI [3.40, 4.53]; $M_{NL} = 3.71$, 95% CI [3.16, 4.26]), $t(25) = 3.98$, $p = .001$, 95% CI [0.12, 0.39], Cohen's $d = 0.78$, 95% CI 0.33, 1.22].[2] In sum, the only robust effect across the analyses by subjects and items was the cross-over interaction.

Risk-benefit correlations. One kind of evidence that has been used to support the affect heuristic is the high negative correlation between risk and benefit judgments (see Finucane et al., 2000). Here, the correlation between risk and benefit judgments across the 26 items (item means on item means) was high and negative within each language condition, -.91 for the foreign language condition and -.91 for the native language condition. We also computed separate correlations across the 26 items, one for each participant. The mean of these correlations was -.68 for the foreign language condition (range: -.94 to -.34) and -.72 for the native language condition (range: -.94 to -.12), $t(82) = 1.15$, $p = .252$, 95% CI [-.03, .11], Cohen's $d = 0.24$, 95% CI [-0.17, 0.65]. Importantly, the correlations between risk and benefit judgments were negative for *all* participants (see ranges), which is consistent with the view that risk and benefit judgments were underpinned by the affect heuristic.

In sum, the results of Study 1 are consistent with the proposed foreign language hypothesis. With respect to the native language, foreign language decreased judgments of risk (this effect was significant only in the analysis by items) and increased judgments of benefit. Moreover, in both language conditions risk and benefit judgments were strongly and inversely associated, which is consistent with the view that they are underpinned by the affect heuristic.

Study 2

The foreign language hypothesis rests on the assumption that a stimulus triggers overall more positive affect when described in a foreign language as opposed to the native language (see Wu & Thierry, 2012). The primary aim of Study 2 was to assess this assumption directly by gathering measures of affect. In the case it did, a more specific aim was to determine whether the foreign language effect on judgments of risk and benefit is mediated by affect. We presented a new sample of participants with the 26 items of Study 1 and asked them for judgments of risk and benefit, either in their native language (Italian) or a foreign language (English). We additionally asked participants to rate each item in terms of positive and negative feelings. We expected that the overall affect ratings would be more positive in the foreign language than in the native language condition, and that this difference would mediate the effect of foreign language on risk and benefit judgments. Moreover, to the extent that in both language conditions affect acts as a direct substitute for judgments of risk and benefit we expected extremely high correlations between risk/benefit judgments and affective ratings.

Methods

Participants. A total of 123 adults (60 female, 63 male; M_{age} = 25.33 years, age range: 19 – 43 years) were recruited by e-mail distribution lists of the University of Trento and voluntarily took part in the online survey.[3] Of those, 59 were randomly assigned to the foreign language condition (English) and 64 to the native language condition (Italian). Three participants assigned in the foreign language condition self-rated their English skills as very poor, and thus were excluded from subsequent analyses (including these participants does not alter the pattern of the findings). We report results from the remaining 120 participants. The qualification level in English of the majority of the participants assigned to the foreign language condition was B2 (independent user – *vantage*), with a range from A2 (basic user – *waystage*) to C2 (proficient user – *mastery*). On average, these participants began English education at age 10.95, 95% CI [10.05, 11.90]. As in Study 1, participants in the foreign language condition were also asked to self-rate their English proficiency in terms of conversational fluency, reading, writing, and understanding, on a 5-point scale (1 = *almost none*, 2 = *poor*, 3 = *fair*, 4 = *good*, 5 = *very good*). Averaging across these dimensions (Cronbach's α = .84), participants rated their English skills as *good* (M = 4.00, 95% CI [3.86, 4.15]).

Materials and procedure. The materials for the risk and benefit judgment tasks were similar to those of Study 1. Participants were presented with the same 26 items and assessed each one in terms of risk and benefit on the same 7-point scale ranging from 1 (*absolutely not risky* [*beneficial*]) to 7 (*extremely risky* [*beneficial*]). However, in Study 2 participants in the foreign language condition were also offered the option, “I don’t understand this item,” to ensure that eventual findings are not due to a lack of understanding. The questions about risk and benefit were presented in separate blocks. In addition, as a third block, participants were asked to rate their *positive* and *negative* feelings (in that order) towards the 26 items. For example, participants read: “Thinking about nuclear power plants, I have…” followed by “positive feelings” and then “negative feelings.” Participants had to rate each type of feeling on a 5-point scale (1 = *not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, 5 = *extremely*; from Watson, Clark, & Tellegen, 1988). In each of the three blocks, the items were presented in a different random order. The order of the items within a block was the same for all participants.

Within each language condition participants received these three tasks in one of four counterbalancing orders (risk judgments followed by benefit judgments and emotion ratings, benefit judgments followed by risk judgments and emotion ratings, emotion ratings followed by risk and benefit judgments, emotion ratings followed by benefit and risk judgments).[4] Finally, participants responded to a set of demographic questions. Those in the foreign language condition additionally responded to questions about their foreign language proficiency.

Results

Judgments of risk and benefit. The main findings are illustrated in Figure 2 and show the cross-over interaction predicted by the foreign language hypothesis. Replicating the findings of Study 1, foreign language triggered lower judgments of risk and higher judgments of benefit. As in Study 1, we ran two 2 (language) × 2 (type of judgment) ANOVAs, one by subjects (F_1) and another by items (F_2). The analysis by subjects revealed no main effect of language, $F_1(1, 118) = 0.24$, $p = .628$, $\eta^2 < .01$, 90% CI [.00, .035], or type of judgment, $F_1(1, 118) = 0.13$, $p = .718$, $\eta^2 < .01$, 90% CI [.00, .029]. However, as predicted, there was a significant judgment ×

language interaction, $F_1(1, 118) = 7.56$, $p = .007$, $\eta^2 = .06$, 90% CI [.009, .139]. Participants in the foreign language condition gave lower ratings of risk than those in the native language condition ($M_{FL} = 3.96$, 95% CI [3.81, 4.12]; $M_{NL} = 4.22$, 95% CI [4.09, 4.35]), $F(1, 119) = 6.56$, $p = .012$, Cohen's $d = 0.47$, 95% CI [0.11, 0.83], but similar ratings of benefit ($M_{FL} = 4.16$, 95% CI [3.98, 4.33]; $M_{NL} = 3.97$, 95% CI [3.84, 4.10]), $F(1, 119) = 3.13$, $p = .08$, Cohen's $d = 0.33$, 95% CI [-0.03, 0.69].

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Insert Figure 2 about here

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The results from the items analysis were similar. There was no main effect of language, $F_2(1, 25) = 1.24$, $p = .275$, $\eta^2 = .05$, 90% CI [.00, .22] or type of judgment, $F_2(1, 25) = 0.08$, $p = .931$, $\eta^2 < .01$, 90% CI [.00, .024], but a significant judgment × language interaction, $F_2(1, 25) = 25.87$, $p < .001$, $\eta^2 = .51$, 90% CI [.253, .649]. Overall, with respect to the native language, in the foreign language items received lower ratings of risk ($M_{FL} = 3.97$, 95% CI [3.51, 4.46]; $M_{NL} = 4.22$, 95% CI [3.79, 4.71]), $t(25) = -4.69$, $p < .001$, 95% CI [-0.36, -0.14], Cohen's $d = -0.92$, 95% CI [-1.37, -0.45], and higher ratings of benefit ($M_{FL} = 4.13$, 95% CI [3.62, 4.62]; $M_{NL} = 3.97$, 95% CI [3.45, 4.45]), $t(25) = 3.07$, $p = .005$, 95% CI [0.06, 0.28], Cohen's $d = 0.62$, 95% CI[0.19, 1.04].[5]

Risk-benefit correlations. Based on the results of Study 1, we expected high negative correlations between risk and benefit judgments in both language conditions. This is what we found. The correlation between risk and benefit judgments across the 26 items (item means on item means) was -.89 in the foreign language condition and -.91 in the native language condition. We also computed separate correlations across the 26 items, one for each participant. The mean of these correlations was -.63 (range: -.94 to -.11) in the foreign language condition, and -.68

(range: -.96 to -.08) in the native language condition, $t(118) = -1.59$, $p = .115$, 95% CI [-.12, .01], Cohen's $d = -0.28$, 95% CI [-0.65, 0.07]. As in Study 1, the correlation between risk and benefit judgments was negative for *all* participants, which is consistent with the view that such judgments are underpinned by the affect heuristic.

Positive and negative feelings. Our foreign language hypothesis rests on the assumption that a stimulus triggers less negative overall affect when described in a foreign language than in the native language. The main results are illustrated in Figure 3 and are broadly consistent with this prediction. They point to a cross-over interaction: mean negative feelings were lower in the foreign language than in the native language condition, while the reverse was true for positive feelings. We analyzed the data with two 2 (language) × 2 (type of feelings) ANOVAs, one by subjects (F_1) and another by items (F_2). The analysis by subjects revealed no effect of language condition, $F_1(1, 118) = 3.19$, $p = .077$, $\eta^2 = .03$, 90% CI [.00, .089]. Participants in the foreign language condition gave similar ratings ($M_{FL} = 2.78$, 95% CI [2.69, 2.87]) as those in the native language condition ($M_{NL} = 2.67$, 95% CI [2.58, 2.75]). There was a significant main effect of type of feelings, $F_1(1, 118) = 9.04$, $p = .003$, $\eta^2 = .06$, 90% CI [.014, .154]. Overall, participants rated the items as evoking more positive feelings ($M = 2.79$, 95% CI [2.72, 2.87]) than negative feelings ($M = 2.65$, 95% CI [2.57, 2.73]). Importantly, there was a significant type of feelings × language interaction, $F_1(1, 118) = 27.96$, $p < .001$, $\eta^2 = .18$, 90% CI [.094, .291]. Overall, participants in the foreign language condition gave significantly higher ratings of positive feelings than participants in the native language condition ($M_{FL} = 2.97$, 95% CI [2.85, 3.10]; $M_{NL} = 2.61$, 95% CI [2.52, 2.71]), $F(1, 118) = 22.33$, $p < .001$, $\eta^2 = .16$, 90% CI [.070, .257], and similar ratings of negative feelings ($M_{FL} = 2.59$, 95% CI [2.48, 2.70]; $M_{NL} = 2.72$, 95% CI [2.60, 2.84]), $F(1, 118) = 2.54$, $p = .113$, $\eta^2 = .02$, 90% CI [.00, .081].

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Insert Figure 3 about here

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The item analysis yielded similar results. There was a significant main effect of language condition. Overall, items received higher ratings when described in the foreign language (M_{FL} = 2.78, 95% CI [2.72, 2.84]) than in the native language (M_{NL} = 2.67, 95% CI [2.60, 2.73]), $F_2(1, 25) = 24.27$, $p < .001$, $\eta^2 = .49$, 90% CI [.236, .637]. In this analysis there was no main effect of type of feelings, $F_2(1, 25) = 0.19$, $p = .670$, $\eta^2 < .01$, 90% CI [.00, .130]. Importantly, there was a significant type of feelings × language interaction, $F_2(1, 25) = 32.58$, $p < .001$, $\eta^2 = .57$, 90% CI [.319, .691]. Overall, with respect to the native language, in the foreign language items received significantly higher ratings of positive feelings (M_{FL} = 2.98, 95% CI [2.59, 3.36]; M_{NL} = 2.61, 95% CI [2.28, 2.95]), $t(25) = 7.39$, $p < .001$, 95% CI [0.26, 0.46]), Cohen's $d = 1.45$, 95% CI [0.89, 1.99] and significantly lower ratings of negative feelings (M_{FL} = 2.59, 95% CI [2.25, 2.93]; M_{NL} = 2.72, 95% CI [2.41, 3.03]), $t(25) = -2.67$, $p = .013$, 95% CI [-0.23, -0.03], Cohen's $d = -0.52$, 95% CI [-0.93, -0.11].

In sum, consistent with the foreign language hypothesis, the target stimuli were rated overall more positively when described in the foreign language than in the native language. However, this effect was not driven by the mechanisms suggested by bilingual research, that is, an attenuation of negative feelings (this attenuation was significant only in the analysis by items). Instead, it was mostly driven by an amplification of positive feelings. We discuss reasons for this apparent inconsistency in the General Discussion.

Correlations between judgments-feelings. On the basis of our foreign language hypothesis we expected highly *positive* correlations between risk judgments – negative feelings and benefit judgments – positive feelings, and highly *negative* correlations between risk judgments – positive feelings and benefit judgments – negative feelings. This is what we found. The correlation between risk judgments – negative feelings (item means on item means) in the foreign language and the native language conditions were respectively, .95 ($p < .001$) and .92 ($p < .001$). The correlation between risk judgments – positive feelings in the foreign language and the native language conditions were respectively, -.87 ($p < .001$) and -.88 ($p < .001$). The corresponding correlations between benefit judgments – positive feelings were, .92 ($p < .001$) and .93 ($p < .001$). Finally, the corresponding correlations between benefit judgments and negative feelings were, -.93 ($p < .001$) and -.92 ($p < .001$). These extremely high correlations are consistent with the view that in both language conditions affect acted as a proxy for risk and benefit judgments.

We also computed separate correlations across the 26 items, one for each participant. The mean correlation across participants between risk judgments and negative feelings in the foreign language and the native language conditions were respectively, .67 (range: .21 to .94) and .63 (range: -.21 to .92). The mean correlations between risk judgments and positive feelings in the foreign language and the native language conditions were respectively, -.60 (range: -.92 to -.25) and -.58 (range: -.94 to .16). The corresponding mean correlations between benefit judgments and negative feelings were -.65 (range: -.95 to .11) and -.61 (range: -.93 to .22). Finally, the corresponding mean correlations between benefit judgments and positive feelings were .69 (range: .14 to .92) and .67 (range: -.37 to .95).

Multiple mediation analysis. To test the hypothesis that affect mediates the foreign language effect in risk and benefit judgments, we ran two multiple mediation analyses using the INDIRECT macro by Preacher and Hayes (2008), one for judgments of risk and another for judgments of benefit. In both, the predictor was language (foreign language = 1, native language

= 0), and the mediators were positive/negative feelings (5-point scales, with higher ratings indicating more positive/negative feelings). We used a bootstrapping procedure based on 5000 bootstrapped samples.

Risk judgments. The main findings are illustrated in Figure 4 (see models *a* and *b*). As predicted, taken together, positive and negative feelings mediated the effect of language on risk judgment. The total and indirect effects of language on risk judgment were respectively, -0.25 ($p = .012$) and -0.06 ($p = .557$). The total indirect effect through the mediators (positive and negative feelings) had a point estimate of -0.19 and a 95% BCa bootstrap CI of -0.34 to -0.06. As Figure 4 illustrates, foreign language was associated with increased positive feelings and decreased negative feelings, which in turn were related with lower ratings of risk. An examination of the specific indirect effects indicated that only positive feelings was a significant mediator, since its 95% CI does not contain zero, -0.29 to -0.03.

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Insert Figure 4 about here

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Benefit judgments. The main findings are illustrated in Figure 5 (see models *a* and *b*). As was the case with risk judgments, together positive and negative feelings mediated the effect of language on benefit judgments. The total and indirect effects of language on benefit judgment were respectively, 0.19 ($p = .079$) and -0.11 ($p = .295$). The total indirect effect had a point estimate of 0.30 and a 95% BCa bootstrap CI of 0.18 to 0.48. Figure 5 shows that foreign language is associated with greater positive feelings and lower negative feelings, which in turn are related to higher judgments of benefit. An examination of the specific indirect effects indicates that only positive feelings was a significant mediator, since its 95% CI does not contain zero, 0.14 to 0.43.[6]

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Insert Figure 5 about here

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Multiple-step multiple mediator models. We next ran multiple-step multiple mediator models, one for judgments of risk and another for judgments of benefit, which take into consideration that questions about positive feelings preceded the questions about negative feelings. These models were identical to those presented above but included a path from positive to negative feelings (see model *c* in Figures 4 and 5). We used the MEDTHREE macro for SPSS (Hayes, Preacher, & Myers, 2010), which is based on a nonparametric bootstrapping procedure (we used 5000 bootstrapped samples). If there is a sequential mediation effect, then we should find that the bias-corrected CI for the specific indirect effect of language on risk/benefit judgments through first positive and then negative feelings (see Figures 4 and 5, model *c*, path $a_1a_3b_2$) does not include zero (see e.g., Preacher & Hayes, 2008). In relation to the mediation analyses presented above, the total effect (path c′) and the specific indirect effect through positive feelings (path a_1b_1) remain the same. However, the specific indirect effect through negative feelings (path a_2b_2) might vary. In the previous analyses a_2 represents the regression weight for language in a model predicting negative feelings from language, whereas here a_2 stands for the regression weight for language in a model predicting negative feelings from *both* language and positive feelings.

Risk judgments. The main findings are illustrated in Figure 4 (see models *a* and *c*). There was a sequential mediation effect: The indirect effect of language condition on risk judgments through first positive and then negative feelings (path $a_1a_3b_2$) had a point estimate of .07 and a bias-corrected 95% CI between .017 and .138. The specific indirect effect of language on risk judgments through positive feelings (path a_1b_1) had a point estimate of -.12 and a biased corrected CI between -.261 and -.010, while the indirect effect through negative feelings (path a_2b_2) had a point estimate of -.14 and a bias-corrected 95% CI between -.291 and -.039. So, in this analysis both positive and negative feelings mediated the association between language and risk judgments.

Benefit judgments. The main findings are presented in Figure 5 (see models *a* and *c*). Again, there was a sequential mediation effect: The indirect effect of language condition on benefit judgments through first positive and then negative feelings (path $a_1a_3b_2$) had a point estimate of -.05 and a bias-corrected 95% CI between -.098 and -.009. The specific indirect effect of language on risk judgments through positive feelings (path a_1b_1) had a point estimate of .25 and a biased corrected CI between .123 and .400, while the indirect effect through negative feelings (path a_2b_2) had a point estimate of .10 and a bias-corrected 95% CI between .022 and .191. So, in this analysis both positive and negative feelings mediated the association between language and risk judgments.[7]

In sum, Study 2 replicated the main findings of Study 1 and provided direct evidence that foreign language influences risk and benefit judgment through affect. With respect to the native language, foreign language attenuated negative feelings and amplified positive feelings, and this net increase in positive affect mediated the foreign language effect in judgments of risk and benefit. In the mediation models that consider the presentation order of positive and negative feelings, both types of feelings mediated the association between language and risk/benefit judgments.

General Discussion

The language in which a stimulus is described influences its judged risk and benefit. In two studies we found a cross-over interaction whereby hazards were rated as less risky and more beneficial when described in a foreign than in a native language. Furthermore, in both language conditions judgments of risk and benefit appear to be underpinned by the affect heuristic. The correlations (item means on item means) between risk/benefit judgments and positive/negative feelings were not only statistically significant but exceptionally high. This finding is consistent with the hypothesis that participants judged the risk/benefit of a stimulus by using as a proxy its affective valence (see Kahneman & Frederick, 2002). Importantly, the effect of foreign language on judgments of risk and benefit was mediated by affect and specifically by a net increase in positive feelings (Study 2). To the best of our knowledge, Study 2 is the first to show that affect mediates the association of an experimental manipulation (language) on risk/benefit perceptions. The present hypothesis is novel and was predicted by merging evidence on the affect heuristic with evidence from bilingual studies: Target stimuli elicit overall more positive affect when printed in a foreign language as opposed to the native language, which leads to comparatively lower risk and higher benefit judgments.

We also considered an alternative hypothesis: foreign language prompts analytical thinking. This hypothesis predicts that foreign language would lead to weaker associations between risk/benefit judgments and feelings. But all such associations were extremely strong in both language conditions. This alternative hypothesis has been proposed to account for evidence showing that foreign language reduces several decision biases (see Costa, Foucart, Arnon, et al., 2014; Costa, Foucart, Hayakawa, et al., 2014; Keysar et al., 2012). Specifically, foreign language reduced framing effects (participants were less swayed by whether outcomes were described in terms of gains or losses), and increased risky choice (participants selected more often risky options over safer options in a context where risky options had a higher expected value). Moreover, foreign language promoted utilitarian moral choices (participants accepted more often actions that involved sacrificing one person to save five), which has been linked to a controlled mode of thinking (e.g., see Greene, Morelli, Lowenberg, Nystrom, & Cohen, 2008). In respect to existing literature, a novelty of the present research is that it shows that foreign language can influence judgment through emotional processing.

Curiously, all types of judgment that foreign language has been shown to influence (framing effects, risky choice, moral judgment) are associated with the *negativity bias*: a tendency in humans and animals to weigh negative events more than positive events (for excellent reviews see Rozin & Royzman, 2001, and Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Consider people's tendency to prefer safe bets with lower expected values to riskier bets with higher expected values. This tendency can be explained in terms of overweighting negative outcomes (e.g., maximum loss) with respect to positive outcomes (e.g., maximum win). A similar explanation can be offered for people's reluctance to sacrifice one person (negative outcome) to save five other persons (positive outcome). Could it be that foreign language reduces the negativity bias or, equivalently, triggers a positivity bias?

The present findings support this claim by showing that foreign language increases overall positive feelings. We offer two possible mechanisms that do not implicate controlled processes. First, a foreign language might increase overall positive affect through automatic processes that block access to distressing content while allowing access to positive content (Wu & Thierry, 2012). Second, a foreign language might preferentially activate positive than negative associations, because positive associations have more opportunities of being emotionally grounded than negative ones. The assumption is that adult social interaction, such as that experienced in the context of acquiring a foreign language at a later age, has a positivity bias (Sheikh & Titone, 2015; as cited in Caldwell-Harris, 2015). Future studies could address the proposed link between foreign language and negativity bias by investigating, for example, whether foreign language diminishes other instances of this bias such as magical thinking (e.g., people's reluctance to eat fudge cake that looks like feces, see Rozin, Millman, & Nemeroff, 1986).

A surprising finding in our studies was that foreign language increased positive feelings. This runs counter to bilingual research, which suggests that foreign language either diminishes positive feelings or leaves them unaltered (for a review see Pavlenko, 2012). For instance, Dewaele (2008) using introspective reports found that the phrase "I love you" is felt more intensely in the native language than in a foreign language. The cause of this inconsistency might be traced to the different stimuli used. Most bilingual studies used stimuli that are *all-positive* (e.g., "love"), *all-negative* (e.g., "death"), or *non-emotional* (e.g., "theorem"). In contrast, we used *complex* stimuli (e.g., "travelling by airplane"), which have both positive associations (e.g., vacations) and negative associations (e.g., plane crashes). For such stimuli, foreign language should increase overall positive affect either by blocking access to distressing content (e.g., Wu & Thierry, 2012) or by activating fewer negative associations (e.g., Sheikh & Titone, 2015, as cited in Caldwell-Harris, 2015). Here, we assume that when people judge positive (negative) feelings, they take into consideration not only the positive (negative) associations but also the negative (positive) associations that a stimulus activates.[8] In our view, the results from the positive/negative emotional scales should be taken only as a general indication that foreign language sways the balance of feelings toward the positive side.

A related reason why foreign language increased overall positive affect can be traced back to the negativity bias. Complex stimuli, such as the hazards we studied, are particularly vulnerable to this bias. Rozin and Royzman (2001, p. 299) state that when positive and negative entities are “blended” together one might observe an extreme case of negativity bias, *negative overassimilation*, in which an entity that is judged negatively in isolation (e.g., “irresponsible”) is judged even more negatively when combined with a positive entity (e.g., “irresponsible father”). Thus, the participants who read the hazards in their native language were likely to be exposed to the negativity bias, whereby the negative associations of a hazard might have dominated the positive ones. Those who read them in the foreign language might have been less vulnerable to this bias, as the negative associations might have been blocked or downplayed. In sum, in comparison to the native language, a foreign language might have increased overall positive affect either by reducing the ratio of negative to positive affective associations and/or by reducing the relative impact of negative associations in estimations of affect.

But why was the increase in positive feelings higher than the decrease in negative feelings? Recent research has shown that when the endpoints of emotional scales are described in a foreign language, as opposed to the native language, they support more extreme ratings (*the anchor contraction effect*, de Langhe, Puntoni, Fernandes & van Osselaer, 2011). The idea is that the anchors of emotional scales (e.g. “extremely happy”) are less intensely experienced when they are described in a foreign language (see, e.g., Pavlenko, 2012). Because of that, judges compensate by selecting higher ratings. In relation to the present studies, such a tendency would promote higher ratings in the foreign language condition for both negative and positive feelings. In the case of negative feelings this tendency works against our hypothesis (we predict a decrease in negative feelings). Thus the observed decrease in negative feelings might have been an underestimation, whereas the increase in the positive feelings an overestimation. Future research could circumvent this problem by representing emotional states via pictograms that are less susceptible to such tendencies (see de Lange et al., 2011, Study 8), or by measuring emotions more directly through electrodermal responses or facial affect.

A possible limitation of the present studies concerns the languages used. It is likely that the foreign language (English) was perceived as less emotional than the native language (Italian) (see Puntoni, de Langhe, & van Osselaer, 2009). Differences in language emotionality should pull both positive and negative feelings toward the same direction. However, foreign language *increased* ratings for positive feelings and *decreased* ratings for negative feelings (at least in the analysis by items). In general, we do not believe that the present findings are language specific. Bilingual research has registered systematic differences between a later learned language and the native language, using a wide array of language combinations, as well as balanced designs (for a review, see Pavlenko, 2012). The effects of foreign language on judgment and decision making have similarly proven robust across a variety of languages and cultures (e.g., Costa, Foucart, Arnon, et al., 2014; Costa, Foucart, Hayakawa, et al. 2014; Keysar et al., 2012; Puntoni et al., 2009).

In conclusion, we have shown that hazards printed in a foreign language rather than in the native language are perceived as less risky and more beneficial. Communicating in a foreign language is a commonplace activity in international organizations, such as UN, NATO, and EEC, and multinational companies. Such organizations make decisions pertaining to managing and communicating risk, which have global-reaching consequences. Consider UN agreements on climate change, such as the Kyoto Protocol, or NATO decisions on how to tackle perceived threats. Can foreign language also influence such decisions? It might, since experts' judgments of risk also rely on feelings (e.g., Slovic et al., 1999; Sunstein, 1999). Communication in a foreign language might promote a more positive affective impression of a hazard and hence decrease impetus toward corrective measures.

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Footnotes

[1]To estimate the appropriate sample size, we ran an a-priori sample size calculation using the software package *G*power* (Faul, Erdfelder, Lang, & Buchner, 2007). We used the following settings: statistical power = .80, effect size $f = .25$ (medium effect) $p = .05$ (traditional criterion of statistical significance), number of groups = 2 (foreign language, native language), number of measurements = 2 (risk, benefit), correlation between repeated measures $\rho = -0.4$ (estimated). The total sample size suitable to detect effects of a within by between participants factors interaction under these conditions would be 90.

[2]For risk judgments 19 out of 26 items showed the expected pattern of means ($M_{FL} < M_{NL}$), while for benefit judgments 20 out of 26 items showed the expected pattern of means ($M_{FL} > M_{NL}$) (see Appendix A, Table A.1). In each case the percentage of hits is higher than what would be expected by chance (for both $p < .05$, by binomial test).

[3]We ran an a-priori sample size calculation using the software package *G*power* (Faul et al., 2007). We used the following settings: statistical power = .80, effect size $f = .24$ (medium effect, based on Study 1), $p = .05$ (traditional criterion of statistical significance), number of groups = 2 (foreign language, native language), number of measurements = 2 (risk, benefit), correlation between repeated measures $\rho = -0.7$ (based on Study 1). The total sample size suitable to detect effects of a within by between participants factors interaction under these conditions is 118.

[4]For risk/ benefit judgments, there was a main effect of order, $F(3, 112) = 6.15$, $p = .001$, $\eta_p^2 = .14$, 90% CI [.040, .219]. However, order did not interact with the factors of interest (language and judgment), and excluding it from the analysis had no difference on the main

results. For emotion ratings, there was no order effect, and no interactions with language or judgment. Therefore, we omitted order from the analyses.

[5]For risk judgments 20 out of 26 items showed the expected pattern of means ($M_{FL} < M_{NL}$), while for benefit judgments 18 out of 26 items showed the expected pattern of means ($M_{FL} > M_{NL}$) (see Appendix B, Table B.1). In each case the percentage of hits is higher than what would be expected by chance (for both $p < .05$, by binomial test).

[6]As a test of the specified models, we also ran reverse multiple mediation models examining whether risk and benefit judgments mediated the relationship between language condition and positive/negative feelings. Risk and benefit judgments did not mediate the relationship between language and positive feelings, 95% CI between -.043 and .150. However, they mediated the relationship between language and negative feelings, 95% CI between -.189 and -.016. Under closer scrutiny, this result seems to be driven by a carry-over effect. We ran two separate mediation analyses based on whether participants received the risk/benefit judgments before or after the emotion task. The reverse mediation was present only in the analysis in which participants received the risk/benefit judgments *before* the emotion task.

[7]As a test of the proposed models, we ran two alternative multiple-step multiple mediator models in which the link between positive and negative feelings was reversed (now from negative to positive feelings), one for risk judgments and another for benefit judgments. We found no sequential mediation effects. For risk judgments, the indirect effect of language through first the negative and then the positive feelings had a 95% CI of -.003 and .042; for benefit judgments, it had a 95% CI of -.074 and .005. These results support the proposed dependency between the mediators, which was due to experimental design.

[8]This is supported by the extremely high negative correlations between negative and positive feelings (foreign language: $r = -.95$; native language: $r = -.92$, item means on item means).

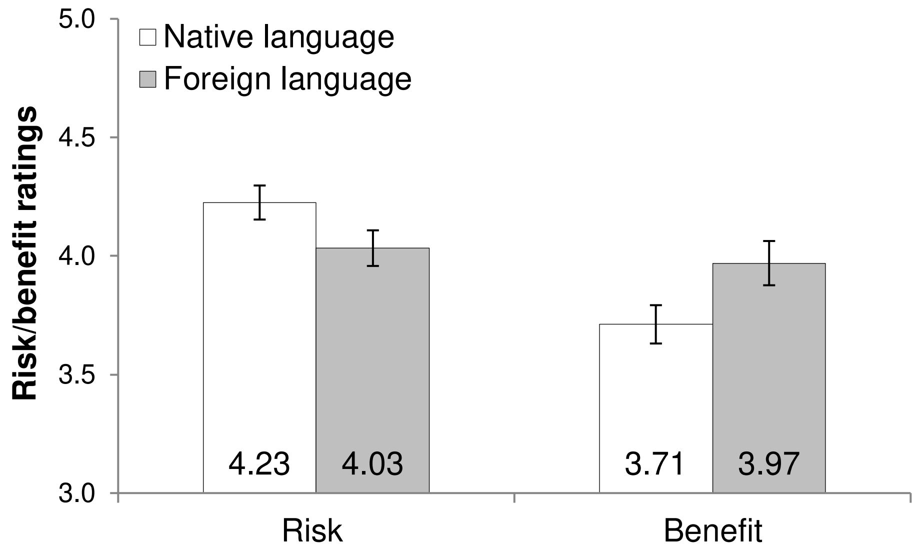

Figure 1. Mean ratings of risk and benefit by language condition (Study 1). Higher ratings indicate higher risk/benefit judgments. Error bars indicate standard error of the means.

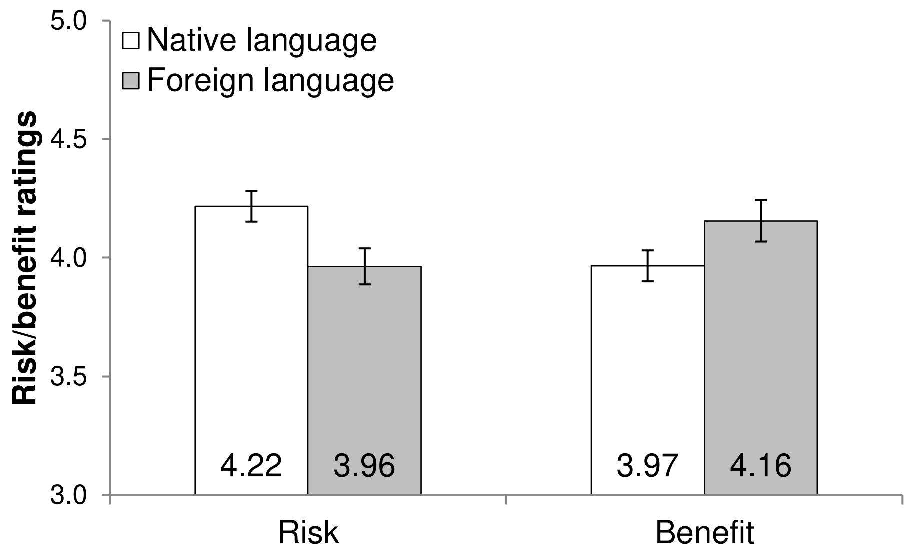

Figure 2. Mean ratings for risk and benefit judgments by language condition (Study 2). Higher ratings indicate higher risk/benefit judgments. Error bars represent standard error of the mean.

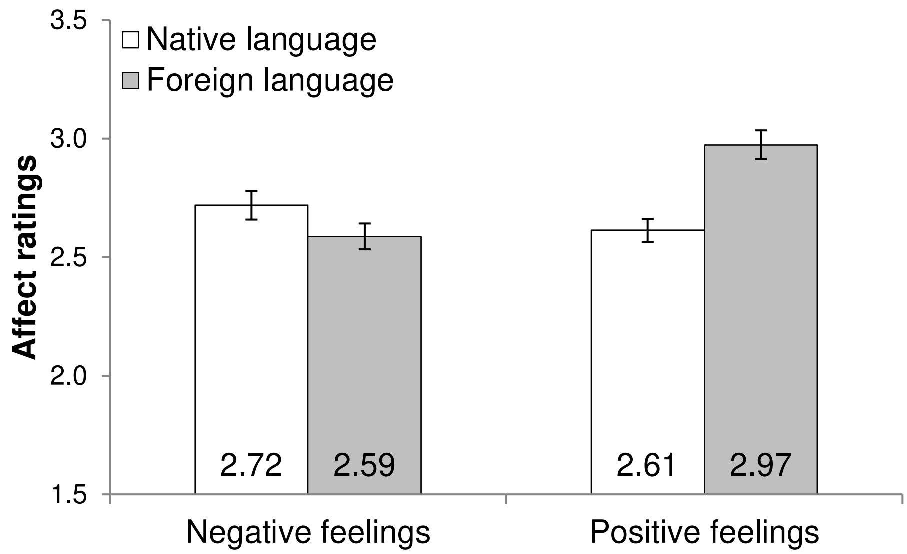

Figure 3. Mean ratings of negative and positive feelings by language condition (Study 2). Higher ratings indicate more negative/positive feelings. Error bars represent standard error of the mean.

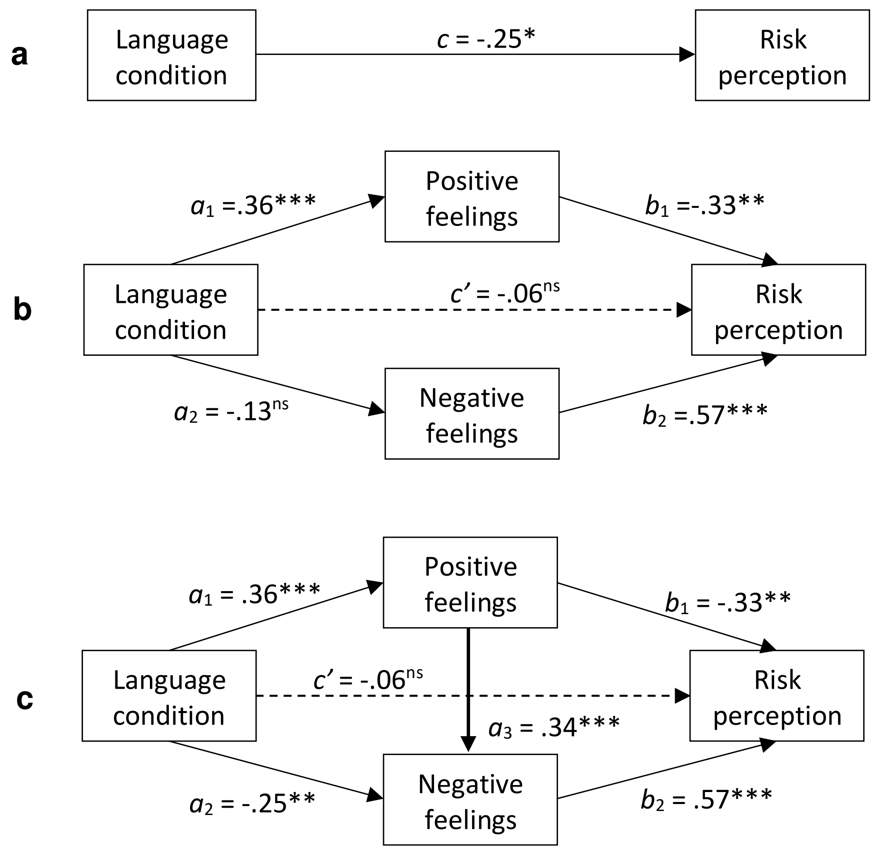

Figure 4. Mediation models for the association between language condition and risk judgment: (a) represents the direct effect, (b) the multiple mediation model through positive and negative feelings and (c) the multiple-step multiple mediator model first through positive feelings and then through negative feelings. $^*p < .05$, $^{**}p < .005$, $^{***}p < .001$.

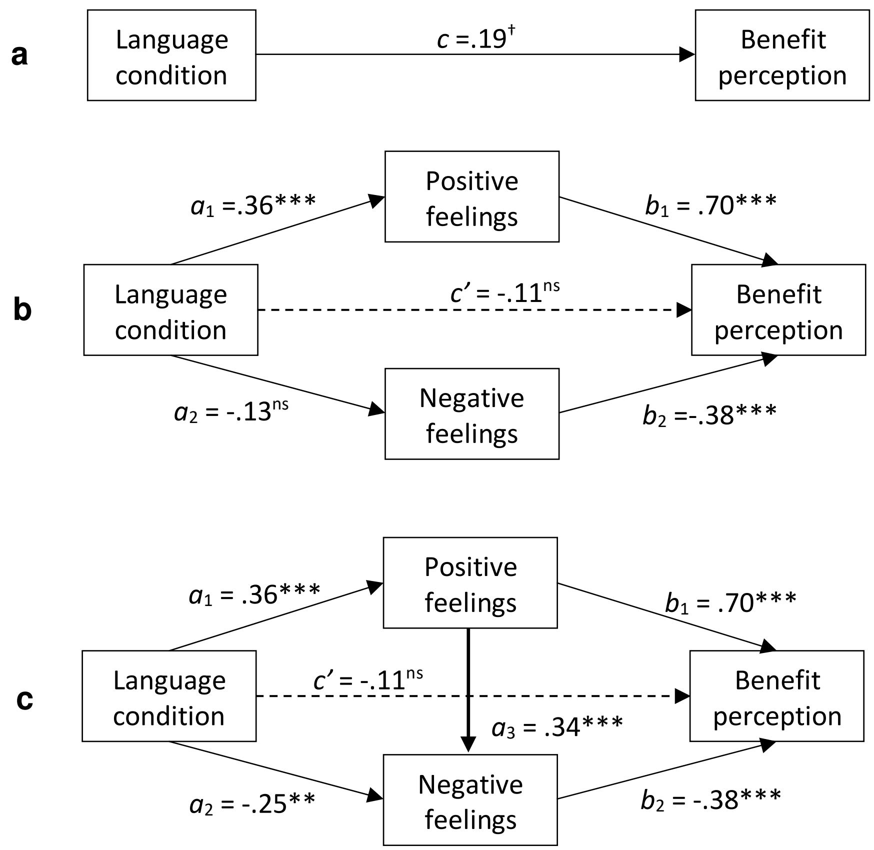

Figure 5. Mediation models for the association between language condition and benefit judgment: (a) represents the direct effect, (b) the multiple mediation model through positive and negative feelings and (c) the multiple-step multiple mediator model first through positive feelings and then through negative feelings. †$p < .08$, $^{**}p < .005$, $^{***}p < .001$.

Appendix A

Table A.1

Mean Ratings of Risk and Benefit Judgments for Each Item by Language Condition in Study 1. Pairs of Means that are Consistent With our Hypothesis are Highlighted in Boldface.

ITEMS English	Italian	RISK Foreign L. *M* (*SD*)	RISK Native L. *M* (*SD*)	BENEFIT Foreign L. *M* (*SD*)	BENEFIT Native L. *M* (*SD*)
Food preservatives	Conservanti alimentari	**3.57 (1.29)**	**3.78 (0.96)**	**3.72 (1.38)**	**2.83 (1.16)**
Cars	Automobili	**4.43 (0.98)**	**4.67 (1.06)**	**4.85 (1.41)**	**3.96 (1.61)**
Incinerators	Inceneritori	5.09 (1.29)	5.09 (1.13)	**3.20 (1.52)**	**2.93 (1.45)**
Alcoholic beverages	Bevande alcoliche	**5.17 (1.22)**	**5.26 (1.14)**	**2.59 (1.28)**	**2.24 (0.95)**
Industrial production plants	Impianti di produzione industriale	**4.71 (1.25)**	**5.59 (1.07)**	**3.11 (1.56)**	**2.80 (1.41)**
Eating beef	Mangiare carne di manzo	**2.72 (1.22)**	**3.04 (1.33)**	**4.39 (1.44)**	**4.13 (1.31)**
Cigarettes	Sigarette	6.26 (0.95)	6.13 (1.00)	**1.46 (0.91)**	**1.27 (0.58)**
Pesticides	Pesticidi	**5.41 (1.20)**	**5.52 (1.26)**	**2.83 (1.24)**	**2.39 (1.04)**
Explosives	Esplosivi	**6.17 (1.08)**	**6.37 (0.77)**	**1.91 (1.11)**	**1.87 (0.83)**
Cellular phones	Telefoni cellulari	**4.22 (1.50)**	**4.35 (1.10)**	**4.96 (1.53)**	**4.50 (1.41)**
Roller blades	Pattini in linea	**2.42 (1.01)**	**2.93 (1.37)**	3.93 (1.34)	4.17 (1.25)
Nuclear power plants	Impianti nucleari	**5.76 (1.06)**	**6.35(0.90)**	2.56 (1.46)	2.70 (1.65)
Food irradiation	Irradiazione di alimenti	5.69 (1.38)	5.66 (1.28)	**2.51 (1.47)**	**2.23 (1.29)**
Traveling by airplane	Viaggiare in aereo	**3.30 (1.28)**	**3.50 (0.91)**	**5.22 (1.43)**	**4.89 (1.34)**
Windsurfing	Fare windsurf	**3.15 (1.12)**	**3.28 (1.13)**	4.54 (1.44)	4.78 (1.17)
Swimming pools	Piscine	**2.33 (0.94)**	**2.67 (0.97)**	**5.74 (1.20)**	**5.43 (1.09)**
Solar energy	Energia solare	**1.70 (0.92)**	**2.09 (1.03)**	**6.41 (0.88)**	**6.11 (0.88)**
Railroads	Ferrovie	3.17 (1.18)	2.96 (0.92)	5.11 (1.42)	5.20 (1.11)
Motorcycles	Motociclette	**4.41 (1.20)**	**4.63 (1.16)**	**3.83 (1.24)**	**3.54 (1.15)**
Chemical fertilizers	Fertilizzanti chimici	**4.93 (1.18)**	**5.24 (1.15)**	**2.93 (1.20)**	**2.43 (0.91)**
Nanotechnology	Nanotecnologie	**2.62 (1.42)**	**2.98 (1.14)**	**5.40 (1.39)**	**4.59 (1.41)**
Microwave ovens	Forni a microonde	3.74 (1.34)	3.50 (1.07)	**3.89 (1.61)**	**3.87 (1.20)**
Bicycles	Biciclette	**2.20 (0.86)**	**2.54 (1.24)**	6.02 (1.27)	6.09 (0.84)
Biotechnology	Biotecnologie	**2.46 (1.22)**	**2.67 (0.99)**	**5.72 (1.17)**	**5.04 (1.21)**
Climate change	Cambiamento climatico	5.61 (1.54)	5.46 (1.26)	1.87 (1.22)	2.11 (1.04)
Natural gas	Gas naturali	3.65 (1.65)	3.61 (1.15)	**4.37 (1.58)**	**4.29 (1.36)**

Appendix B

Table B.1

Mean Ratings of Risk and Benefit Judgments for Each Item by Language Condition in Study 2. Pairs of Means that are Consistent With our Hypothesis are Highlighted in Boldface.

ITEMS English	Italian	RISK Foreign L. *M* (*SD*)	RISK Native L. *M* (*SD*)	BENEFIT Foreign L. *M* (*SD*)	BENEFIT Native L. *M* (*SD*)
Food preservatives	Conservanti alimentari	**3.73 (1.36)**	**4.06 (1.13)**	**3.98 (1.69)**	**3.23 (1.27)**
Cars	Automobili	4.66 (1.08)	4.47 (0.91)	4.71 (1.50)	4.86 (1.48)
Incinerators	Inceneritori	4.93 (1.27)	4.92 (1.38)	3.49 (1.51)	3.38 (1.60)
Alcoholic beverages	Bevande alcoliche	4.84 (1.29)	4.78 (1.03)	2.80 (1.31)	2.89 (1.21)
Industrial production plants	Impianti di produzione industriale	**4.74 (1.32)**	**5.37 (1.13)**	**3.49 (1.67)**	**3.22 (1.41)**
Eating beef	Mangiare carne di manzo	**2.94 (1.22)**	**3.25 (1.27)**	3.94 (1.31)	4.14 (1.46)
Cigarettes	Sigarette	**5.77 (1.22)**	**6.06 (0.91)**	1.52 (0.71)	1.61 (0.90)
Pesticides	Pesticidi	**5.43 (1.14)**	**5.61 (1.06)**	**3.18 (1.43)**	**2.61 (1.29)**
Explosives	Esplosivi	6.04 (1.18)	5.75 (1.37)	**2.78 (1.50)**	**2.67 (1.36)**
Cellular phones	Telefoni cellulari	**3.73 (1.23)**	**4.55 (1.17)**	**4.75 (1.31)**	**4.59 (1.55)**
Roller blades	Pattini in linea	**2.54 (0.93)**	**2.92 (1.21)**	**4.94 (1.34)**	**4.45 (1.72)**
Nuclear power plants	Impianti nucleari	**5.57 (1.25)**	**5.94 (1.27)**	**2.94 (1.86)**	**2.59 (1.49)**
Food irradiation	Irradiazione di alimenti	**5.09 (1.0)**	**5.88 (1.09)**	**2.49 (1.39)**	**2.23 (1.14)**
Traveling by airplane	Viaggiare in aereo	**3.05 (0.96)**	**3.44 (1.14)**	**5.32 (1.56)**	**5.14 (1.40)**
Windsurfing	Fare windsurf	**2.67 (1.07)**	**3.16 (1.18)**	**5.07 (1.44)**	**4.95 (1.47)**
Swimming pools	Piscine	**2.36 (0.91)**	**2.61 (0.97)**	**5.44 (0.95)**	**5.37 (1.18)**
Solar energy	Energia solare	**2.05 (0.94)**	**2.13 (1.25)**	6.25 (1.01)	6.41 (0.81)
Railroads	Ferrovie	**2.93 (1.16)**	**3.02 (1.09)**	**5.70 (1.21)**	**5.41 (1.24)**
Motorcycles	Motociclette	**4.75 (1.25)**	**5.02 (1.22)**	**4.00 (1.36)**	**3.94 (1.10)**
Chemical fertilizers	Fertilizzanti chimici	**4.82 (1.22)**	**5.16 (1.13)**	**3.29 (1.42)**	**2.72 (1.27)**
Nanotechnology	Nanotecnologie	**2.59 (1.14)**	**2.84 (1.14)**	**5.56 (1.25)**	**5.03 (1.26)**
Microwave ovens	Forni a microonde	**3.63 (1.34)**	**4.05 (1.35)**	3.38 (1.34)	3.81 (1.34)
Bicycles	Biciclette	**2.55 (1.09)**	**2.75 (1.36)**	**6.22 (0.94)**	**6.16 (1.10)**
Biotechnology	Biotecnologie	2.73 (1.17)	2.69 (1.17)	**5.73 (1.20)**	**5.23 (1.18)**
Climate change	Cambiamento climatico	**5.34 (1.39)**	**5.55 (1.25)**	2.00 (1.04)	2.03 (1.20)
Natural gas	Gas naturali	3.73 (1.24)	3.67 (1.30)	**4.52 (1.44)**	**4.42 (1.41)**