

# Would you rather be injured by lightning or a downed power line? Preference for natural hazards

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## Abstract

Past research has shown that many people prefer natural foods and medicines over artificial counterparts. The present study focused on examination of aversive events and hazards. Preferences were compared by having subjects consider pairs of scenarios, one natural and one artificial, matched in negative outcome and severity. Pairings were also rated along several dimensions of risk perception such as dangerousness, scariness, likelihood, and fairness. As hypothesized, natural hazards were consistently preferred to functionally identical artificial ones. Additionally, natural hazards tended to be considered less scary and dangerous, but not necessarily more unfair or unlikely than equivalent artificial counterparts. Results are discussed in terms of risk perception, and how that can lead to people diminishing risks associated with natural hazards.

Keywords: preference, natural-artificial, comparison, risk-perception.

## 1 Introduction

According to the Biophilia hypothesis, humans share an instinctive bond with other living systems (Wilson, 1984). Kellert (1993) outlined nine different values associated with biophilia. These include the practical and material exploitation of nature (utilitarian), satisfaction from direct contact with nature (naturalistic), appreciation of the beauty of nature (aesthetic), affection and emotional attachment to nature (humanistic), and a fear of nature's dangers (negativistic). On the whole, the notion of biophilia suggests that we are drawn to nature and tend to see it as an inherent good.

Accordingly, the word “natural” is often associated with positive connotations in Western cultures (Rozin, 2005). Indeed, many marketers emphasize the “naturalness” of their products in an attempt to make them more attractive. Several studies have systematically examined preferences for natural items. For instance, Rozin et al. (2004) found that subjects typically preferred foods or medicines described as natural over their artificial counterparts, even when the two were described as being chemically identical. Explanations attempting to explain this preference often include instrumental and ideational themes. Instrumental arguments suggest that natural items might taste or look better, or be more healthful or better for the environment. Ideational arguments are based on a more intuitive foundation; natural objects simply seem inherently better for moral or aesthetic

reasons (Rozin et al., 2004). Rozin (2005) succinctly sums this up, writing “natural is preferred just because it is inherently better—more moral, more aesthetic, or simply right” (Rozin, 2005, p. 652). Support for the ideational approach can be found in research on people's concerns with genetic engineering of food. Reservations are often described in moral terms, with concerns relating these technologies being immoral, unnatural, and unethical (Frewer, Howard, & Shepherd, 1997; Sjöberg, 2000a).

Past research on natural preferences has typically focused on appetitive items such as food and medicine. Little research has examined whether natural preferences extend towards aversive events or hazards. Examining aversive events is useful for two reasons. First, Rozin et al. (2004) raise the concern that preferences for natural objects may be the result of positive associations which they generate, but aversive or hazardous events are unlikely to generate any positive associations. More importantly, an understanding of possible preferences for natural hazards could benefit the field of risk analysis. In particular, it could help explain why people minimize risks associated with natural events (e.g., sun-tanning).

Lowenstein, Weber, Hsee, and Welsh (2001) described two possible approaches to risk perception—analytical and affective. An analytical approach objectively weighs costs and benefits according to their probabilities. Accordingly, risk assessment would be sensitive to changes in probabilities. However, many studies suggest that this is rarely the case. Consequently, Lowenstein et al. suggested that risk assessment is predominantly based on feelings elicited by potential costs and benefits, independent of probabilities, an approach they labeled “risk

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as feelings". Finucane, Alhakami, Slovic, and Johnson (2000) used this perspective to hypothesize an "affect heuristic" which mediates the relationship between risks and benefits. According to this heuristic, "good" and "bad" judgments are automatically given to items or events. Good events elicit positive affect and are seen as beneficial and safe, while "bad" items elicit negative affect and are seen as riskier and less beneficial.

Since natural items are often perceived as good, they would be expected to elicit positive affect. Application of the affect heuristic would result in these natural items being seen as having high benefit and low risk. In fact, several studies do show decreased perceived riskiness for natural relative to artificial phenomena. For example, Kraus, Malmfors, and Slovic (1992) reported that 45% of their subjects reported that natural chemicals are generally less harmful than man-made chemicals. Conversely, elevated risk ratings of riskiness for artificial phenomena can be found in attitudes towards genetic modification of food or animals (Brendahl, 1999; Frewer, Howard, & Shepherd, 1997), forms of energy (Flynn, Slovic, Mertz, & Carlisle, 1999), chemicals (Kraus, Malmfors, & Slovic, 1992), or food production (Williams & Hammitt, 2001). Additional studies have found that people report being more upset when environmental emergencies are caused by human as opposed to natural events (Kahneman, Ritov, Jacowitz, & Grant, 1993).

In the present study, we focused on examination of aversive events and hazards. The preferences for natural versus artificial events were compared by having subjects consider pairs of scenarios matched in negative outcome and severity. For each pairing, one scenario was predominantly natural, while the other was predominantly artificial. Pairs of scenarios were also rated along several dimensions of risk perception such as dangerousness, scariness, likelihood, and fairness. It was hypothesized that subjects would prefer the natural version of the negative events or hazards over the artificial versions, and that the artificial versions would score higher on measures of risk.

## 2 Method

### 2.1 Subjects

One hundred and eighty five subjects (55 male, 126 female, 4 no identification) with a  $M$  age = 20.97 ( $SD$  = 3.80) years completed the surveys. Ninety three percent of the subjects were Caucasian-American. Subjects were primarily undergraduate students, and approximately half received course research credit for participating.

Table 1: Summary of the aversive/hazardous events and their respective natural or artificial causes.

Event	Natural	Artificial
Breaking leg	hiking	car accident
Food Poisoning	organic restaurant	fast food
Electrical Burns	lightning	power line
Lung Cancer	genetic influence	smoking
Severe sunburn	day at the beach	tanning bed
Severe rash	poison ivy	formaldehyde
Puncture wound	dog bite	stabbing
Municipal evacuation	volcano	power plant accident
30 elderly deaths	heat wave	CO poisoning
Paralysis	dart frog	nerve gas

### 2.2 Materials and procedure

We created a survey in which people compared 10 pairs of scenarios. Each pair of scenarios presented a possible aversive outcome (e.g., severe rash) which could be caused by a predominantly natural (e.g., poison ivy) or predominantly artificial (e.g., exposure to formaldehyde) event. After each pair, subjects were given several questions assessing the scariness, dangerousness, likelihood, fairness, and severity of the scenario. For each question, subjects could select between the natural or artificial option for each using a 5-point Likert-type scale, with the natural version being the low anchor (i.e., "1"), the artificial version being the high anchor (i.e., "5"), and a selection of "3" indicating no preference. Subjects were also asked to indicate which of the options, natural, artificial, or no preference, they would prefer using the same scale. A sample item was: "You suffer electrical burns from... 1) lightning hitting several feet away from you. *versus* 2) stepping on a downed electrical power line. Both burns are equally severe. Use the following answer key to indicate your choices for the following questions related to the above scenario (1= lightning, 3= neutral, 5= power line). a) Which, if any, seems like the scarier event? b) Which, if any, seems like the more dangerous event? c) Which, if any, seems like the more likely event? d) Which, if any, seems like the more unfair event? e) Which, if any, seems like the worse event? g) Suppose one of these two events were to happen to you, which, if any, would you prefer?" The 10 scenarios are summarized in Table 1. They were presented in the same order to all subjects.

The survey was posted online using Zoomerang.com, and subjects were recruited through sign-up sheets, classroom visits, and e-mail solicitations to professors request-

ing that they disseminate the link to their students. Subjects completed the survey at a time and location of their convenience.

### 3 Results

In order to assess preferences for the versions of the scenarios, responses were recoded as indicating a natural preference (selection of “1” or “2”), no preference (selection of “3”), or an artificial preference (selection of “4” or “5”). The numbers of subjects with natural or artificial preferences were then compared with a Sign Test, for each scenario. The number of subjects falling into each of these classifications is summarized in Table 2.

For each of the 10 scenarios except the electrical burn scenario (caused by lightning versus a downed power line), which had no significant difference, significantly more subjects perceived the artificial version as being more dangerous. The artificial versions were also significantly more likely to be seen as scarier, with two exceptions when the natural versions were more often selected. These were the cancer (genetic causation versus smoking) and electrical burns scenarios.

For seven of the scenarios, more subjects rated the artificial version as being worse than the natural ones. Once again the cancer and electrical burn scenarios served as exceptions, with the natural version being significantly more often seen as worse. Also, no significant difference was seen between versions of the food poisoning scenario.

The number of subjects rating the different versions on the dimension of unfairness followed no consistent trend. Artificial versions were significantly more likely to be considered unfair in five of the scenarios, natural versions in four of the scenarios, and there was no significant difference in one scenario. Similarly, no consistent pattern was found for ratings of likelihood; the artificial version was chosen significantly more often for five scenarios, the natural version for four scenarios, and a similar amount of time for one scenario.

It is possible that some subjects prefer artificial over natural causes; throughout much of human history people have sometimes seen nature as a malevolent force that needed to be subdued, and some vestiges of this attitude may remain. To test this possibility, we did t-tests for each of the 185 subjects, across the 10 scenarios. No subject showed a “significant” reversed effect for preference at  $p < .05$  (uncorrected for multiple comparisons), although 97 of the subjects showed significant effects in the hypothesized direction (artificial less preferred), far greater than the 9 expected by chance. Similar results were found for the other measures that showed an effect of artificial vs. natural; the one exception was found

for ratings of scariness, where two of the subjects were significant at  $p < .05$  in the opposite direction, well within chance expectation. In sum, individuals did not seem to differ in the direction of the effect of artificial vs. natural.

In order to examine the relationship between the preferred version (i.e., natural or artificial) and the measures associated with risk (e.g., scariness, dangerousness, etc), we created a composite score for each of the six questions by averaging their responses on the 10 scenarios. Spearman’s correlations indicate that preference for natural hazards was significantly correlated with artificial hazards seeming scarier ( $\rho = -.401, p < .001$ ), more dangerous ( $\rho = -.38, p < .001$ ) and worse ( $\rho = -.45, p < .001$ ), but not with them appearing more likely ( $\rho = .13, p = ns$ ) or more unfair ( $\rho = .02, p = ns$ ).

We can ask whether the questions about ratings of scariness, dangerousness and worseness could mediate the basic preference effect for artificial over natural. (The questions about likelihood and unfairness could not because they do not show the same bias.) Mediation would require that these answers correlate with the preference effect. We tested these correlations across subjects (aggregating over the 10 scenarios). All three correlations were significant ( $r = .36, .42, \text{ and } .49$ , respectively, all  $p < .0001$ ; the correlations of preference with likelihood and unfairness were not significantly different from zero). Thus, mediation is possible. To determine whether it could be complete, we regressed preference on all three significant predictors, using 0 to indicate no bias for all variables.<sup>1</sup> The intercept at this point of neutrality was still positive ( $.27, t(181) = 4.20, p < .0001$ ). Thus, a preference effect still exists after all three of these predictors are taken into account, so we cannot conclude that these three effects are sufficient to account for the preference effect.

It is possible that natural and artificial events might also differ along several other dimensions. For instance, artificial events might reflect a greater degree of intention, control, or responsibility on the part of the perpetrator or victim, which may in turn affect risk judgments. Similarly, natural and events may differ in terms of the outrage they elicit. Consequently, we asked a second group of subjects ( $N=91$ , demographics similar to the initial sample) to repeat the above procedure to rate their perceptions of choice/responsibility/negligence on the parts of the victim and the perpetrator, as well as of their outrage. Data were recoded as described above, and natural versus artificial judgments were again compared with sign tests (Table 3).

For 6 of the 10 scenarios, significantly more subjects rated the artificial version as reflecting greater victim choice/responsibility. Significant differences in pat-

<sup>1</sup>The regression included random effects for subjects and scenarios, as described by Baayen, Davidson, and Bates (2008).

Table 2: Summary of the number of subjects selecting artificial, neutral, or natural options for questions on preference and other variables related to the hazards.

Event	Artificial	Equal	Natural	Event	Artificial	Equal	Natural
<b>Which do you prefer?</b>				<b>Which is worse?</b>			
Breaking leg **	30	30	125	Breaking leg **	117	44	24
Food Poisoning **	37	69	79	Food Poisoning	49	97	39
Electrical Burns **	28	71	86	Electrical Burns *	40	84	61
Lung Cancer **	44	60	81	Lung Cancer **	28	74	83
Severe sunburn **	13	36	136	Severe sunburn **	70	87	25
Severe rash **	9	42	131	Severe rash **	118	55	10
Puncture wound **	26	42	114	Puncture wound **	132	36	14
Municipal evacuation **	9	58	115	Municipal evacuation **	111	54	16
30 elderly deaths **	31	71	79	30 elderly deaths **	124	42	16
Temporary Paralysis **	21	87	71	Temporary Paralysis **	89	76	15
<b>Which is scarier?</b>				<b>Which is more likely?</b>			
Breaking leg **	159	8	18	Breaking leg	76	35	72
Food Poisoning **	68	78	39	Food Poisoning **	38	29	17
Electrical Burns **	27	31	127	Electrical Burns **	137	28	20
Lung Cancer **	17	46	122	Lung Cancer **	118	34	33
Severe sunburn **	76	74	35	Severe sunburn **	29	45	111
Severe rash **	146	23	14	Severe rash **	7	10	166
Puncture wound **	140	21	21	Puncture wound **	13	27	142
Municipal evacuation **	112	43	26	Municipal evacuation **	84	64	34
30 elderly deaths **	148	17	16	30 elderly deaths **	38	42	101
Temporary Paralysis **	110	42	29	Temporary Paralysis **	81	65	35
<b>Which is more dangerous?</b>				<b>Which is more unfair?</b>			
Breaking leg **	125	30	30	Breaking leg **	104	58	22
Food Poisoning **	79	94	12	Food Poisoning **	19	64	102
Electrical Burns	72	56	57	Electrical Burns **	24	43	117
Lung Cancer **	115	54	16	Lung Cancer **	3	7	174
Severe sunburn **	120	46	18	Severe sunburn **	27	73	85
Severe rash **	144	31	8	Severe rash **	66	78	37
Puncture wound **	129	28	25	Puncture wound **	76	65	40
Municipal evacuation **	116	48	18	Municipal evacuation	78	48	55
30 elderly deaths **	144	28	10	30 elderly deaths **	115	38	29
Temporary Paralysis **	112	49	20	Temporary Paralysis **	73	65	43

Note: \* p< .05; \*\* p< .01

terns of responsibility ratings were not observed for 3 of the scenarios (breaking one's leg, puncture wound, elderly deaths), and a pattern of greater responsibility was ascribed to natural causes for the temporary paral-

ysis choice. For all comparisons with the exception of food poisoning (no difference), patterns of greater perpetrator responsibility were found for the artificial versions. Finally, greater outrage was more likely to be assigned to

the artificial event in 7 of the 10 choices—the exceptions being the cancer and food poisoning situations (greater outrage was chosen more often for the natural versions) and the sunburn situation (no difference).

Although we could not carry out the full analysis of effects, taking both subjects and scenarios into account, we the scenario means on each of the three new questions, as well as the preference question from the original data. Across the 10 scenarios, the correlations with preference were .42, .17, and .42, respectively for victim responsibility, perpetrator responsibility, and outrage, respectively; with only 10 scenarios, none of these was significant, and the three together were not significant in a multiple regression of the preference means on the three measures. Of interest, however, the intercept at 0 (indicating neutrality of the predictors) was significant ( $t(6) = 3.17, p = .015$ ), suggesting that the preference for naturalness was still present when these predictors were at their neutral level.

#### 4 Discussion

Past research has found that people tend to prefer natural over artificial foods and medicines. In the present study, this preference for natural items was also found for aversive situations and hazards. Additionally, natural hazards tended to be considered less scary and dangerous, but not necessarily more unfair or unlikely than equivalent artificial counterparts. These differences were found despite the fact that the natural and artificial versions of our scenarios were described as having objectively similar outcomes. Moreover, the preference for the natural versions still exists after the influence of worseness, unfairness, and scariness are taken into account, and apparently also after the influence of victim and perpetrator responsibility, and outrage, are considered.

More than two decades of research in cognitive and social psychology has established that people utilize two ways of thinking, experiential and rational/analytic. The rational mode of thinking can be summarized as being reason oriented, logical, analytical, and requiring justification via logic and evidence. Conversely, the experiential mode has been described as being intuitive, holistic, emotion-based, mediated by vibes, and self-evidently valid (Epstein, Lispon, Holstein, & Huh, 1992). Although both of these forms of thinking may be involved in people’s decisions related to preference or risk assessment, past research and the current results suggest that the experiential form of thinking is of particular importance.

Consider the research on natural preferences. These preferences can possibly result from instrumental or ideational considerations described earlier (Rozin et al., 2004). Instrumental arguments tend to utilize analytic

Table 3: Summary of the number of subjects selecting artificial, neutral, or natural options for questions on control/responsibility and outrage.

Event	Artificial	Equal	Natural
<b>Which seems more the result of the victim’s choice/responsibility?</b>			
Breaking leg	31	25	35
Food Poisoning **	44	44	3
Electrical Burns **	69	16	6
Lung Cancer **	86	2	1
Severe sunburn **	61	26	3
Severe rash **	40	38	13
Puncture wound	15	52	24
Municipal evacuation **	27	54	10
30 elderly deaths	27	42	20
Temporary Paralysis **	13	41	37
<b>Which seems more the result of the perpetrator’s choice/responsibility?</b>			
Breaking leg **	36	47	8
Food Poisoning	29	41	29
Electrical Burns **	33	46	12
Lung Cancer *	33	39	17
Severe sunburn **	30	54	6
Severe rash **	30	51	9
Puncture wound **	51	35	5
Municipal evacuation **	58	27	5
30 elderly deaths **	56	26	6
Temporary Paralysis **	50	33	7
<b>Which if any, makes you feel more outrage?</b>			
Breaking leg **	63	20	8
Food Poisoning **	18	25	48
Electrical Burns **	55	20	16
Lung Cancer **	26	10	53
Severe sunburn	36	28	36
Severe rash **	40	32	18
Puncture wound **	59	23	8
Municipal evacuation **	74	14	2
30 elderly deaths **	61	20	8
Temporary Paralysis **	54	26	10

Note: \*  $p < .05$ ; \*\*  $p < .01$

thinking, while ideational reasons fit well within an experiential mode. Results from past research suggest that natural preferences are more closely linked to ideational reasoning. For instance, many people prefer natural to artificial foods and medicines even when they are described as being chemically and functionally identical (Rozin et al., 2004). Moreover, Rozin (2005) reported that if a natural object undergoes two manipulations, it is less preferred to an object which undergoes one manipulation. This isn't surprising, but, when the second manipulation is described as undoing the effect of the first manipulation rendering the item identical to its initial natural state, this second manipulation is still less preferred. These two findings suggest that people are not basing their preferences on analytical bases, but what simply feels more right—the more humans intervene with a natural item, the less preferred it becomes. Rozin et al (2004) have speculated that this is related to perceived human contagion possibly introducing impurities into an object.

The present results also suggest an ideational approach to influences on natural preferences—natural versions were more often selected even when careful consideration would suggest a preference for the artificial version of several of our scenarios. For instance, subjects tended to prefer death by heat-wave to death by faulty furnace/carbon monoxide poisoning, even though the latter is a much more peaceful way of passing. Similarly, help is more likely to arrive quickly after a car accident than a hiking accident, but more people reported a preference for breaking their leg in the latter version. Despite these considerations, significantly more subjects rated the artificial versions of these versions as being more dangerous. Although these results might reflect a general consideration of natural events being less risky or dangerous, they may also reflect subjects' expectancies with regard to the typical severity of an event. For instance, there are ample reports of fatal car accidents, but reports of hiking fatalities of hiking fatalities are quite rare. Similarly, many people have personally lived through heat waves, thus diminishing their perceived dangerousness, but reports of carbon monoxide poisoning suggest that it is often fatal. However, this alternative explanation in terms of generalized expectations is unlikely to account for greater perceptions of severity stemming from events such as burns from power-lines relative to lightning strikes (e.g., lightning was more likely to be rated as "scarier"), yet the general preference for lightning was preserved.

The rational/analytic-experiential divide also provides a useful frame to discuss past and present findings related to risk perception. When deliberating risk, people can analytically consider the information and statistics relating to risks and benefits. In fact, expert knowledge of various technologies has been shown to improve accuracy in cost-benefit risk estimates (e.g., Kraus, Malm-

fors, & Slovic, 1992; Savadori, Savio, Nicotra, Rumiata, Finucane, & Slovic, 2004). However, a review of the literature also shows that risk perception is rarely altered by changes in statistical probability, sensitivity to which indicates an analytical approach to risk perception (Lowenstein et al., 2001). Research on the affect heuristic provides additional support for an experiential influence; people often base their cost-benefit assessments of risk on an emotion-derived, intuitive foundation (Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic & Peters, 2006).

Additional evidence for experiential thinking influencing risk perception comes from a closer examination of the various elements comprising risk. Factor Analytic studies of risk reveal two higher order dimensions (Peters & Slovic, 1996). The first, "dread", is characterized by feelings of fear, catastrophic potential, and mortality. The second, "unknown" is characterized by unfamiliarity and newness. Multiple studies have found that risk estimates are predominantly linked to feelings of dread (e.g., Alhakami & Slovic, 1994; Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Leikas, Lindeman, Roininen, & Lähteenmäki, 2007; Slovic, 1987), at least in laypeople. In the current study, ratings of "scariness" and "dangerousness" reflect aspects of dread, while likelihood could be arguably linked to the unknown through the availability heuristic (i.e., ease of recall and perceived likelihood are related; well known events are easily recalled). Current results are consistent with past findings; artificial hazards tended to be perceived as scarier and more dangerous (i.e., dread risk), but were not consistently rated as being more likely. Additionally, the degree of subjects' preferences for natural versions of hazards was significantly associated with indices of dread, but not with likelihood.

Although past research has linked risk to degree of negative affect or dread (e.g., scariness, dangerousness, outrage), we observed several notable exceptions. For instance, the natural variant of cancer was more often chosen as scarier and eliciting more outrage, despite generally being preferred. Similarly, lightning was more likely to be seen as scarier than stepping on a power-line, and contracting food poisoning from organic food was rated by more people as generating outrage. These exceptions further magnify the dimension of "naturalness" as being integral to preference in the present study.

Typically, perceived risk increases when events are involuntary and uncontrollable (e.g., Fischhoff et al., 1978). Our data are not completely consistent with these general findings. First, natural causes can be described as being beyond anybody's control and require no assignment of responsibility at all (Nerb & Sprada, 2001), yet significantly more of our subjects found natural versions to be riskier. Second, when we examined perceived con-

trol in the various scenarios by having a second sample of subjects evaluate the choices according to perceived choice/responsibility of the victim, subjects assigned greater victim responsibility to the artificial variant in 6 of the 10 choices. Again, if risk is associated with uncontrollability, one might expect that the version coupled with more personal control would be seen as less risky, and in turn more preferred. Despite this, our first sample revealed consistent natural preferences. It is possible that preference may have also reflected a degree of blame; personal control is accompanied by culpability. Nerb and Sprada (2001) suggested that natural hazards often motivate people to mitigate negative outcomes, while human-influenced hazards often bring about blame or outrage directed at the responsible agents. Perhaps preferences for natural versions of hazards can be a way of deflecting blame.

Natural and artificial risks might be further differentiated in terms of the intentions/control on the part of the perpetrator. In some of these scenarios, the perpetrator might be seen as intending to directly harm the victim (e.g., stabbing), or be negligent (power-plant accident). Our second sample indicated that the perpetrators' perceived responsibility was indeed greater in 9 of the 10 scenarios. Kahneman et al. (1993) describe that when human action is the cause of harm, greater intent is linked to greater outrage. We found that in the seven of the nine scenarios in which more subjects reported greater perpetrator choice/responsibility for the artificial version, there were also significantly more subjects expressing outrage.

In much of past research comparing natural and artificial risks, the items and associated outcomes were often qualitatively and quantitatively different. For instance, Brun (1992) had subjects rate natural to artificial risks on several psychometric dimensions. Many of her natural risks were events like floods, hurricanes and forest fires, and they were often seen as unpreventable or acts of nature. These natural risks were also often low in novelty or frequency, and were somewhat different from artificial hazards in terms of predictive factors. Artificial risks tended to be characterized by casualties and dread, but natural hazards were predicted more strongly by novelty and delayed consequences, with dread being a much weaker predictor. In the current study, the simultaneous presentation of natural and artificial hazards allowed them to be equated in a way research similar to Brun's does not. Our comparisons suggested similar time-frames, and we explicitly equated the casualties. By partially controlling for these variables, the present results further isolate the variable of "naturalness" as important for risk perception, and further establish "naturalness" as important for preference.

While our results are consistent with the literature on natural preferences, they are contrary to what might be

expected when considering the negativistic dimension of biophilia, which suggests an innate fear of dangerous aspects of nature. According to research on biological preparedness, humans and other animals are prewired through evolution to find certain stimuli as aversive, or to acquire such aversions with minimal conditioning (e.g., Cook & Mineka, 1990; Mineka & Cook, 1993, see Seligman, 1971). We might expect fear to events such as lightning or genetically-linked cancer to be prewired, thus eliciting greater negative responses than their artificial counterparts. While these two items differed from the other eight scenarios in terms of dread in that the natural versions of the cancer and electrical burn scenario were seen as scarier and more dangerous than the artificial versions—a finding consistent with biological preparedness—the effect was not large enough to shift the preference to the artificial versions.

Rozin et al. (2004) speculated that one reason natural products might be preferred is because they generate positive associations. In the present study, natural scenarios such as being bitten by a dog, being struck by lightning, poison ivy, or fleeing a volcano are unlikely to be associated with much positive, yet subjects still tended to prefer these events to their artificial counterparts. Rozin et al. (2004) also described preference for natural products in terms of ideational themes—natural objects simply seem inherently better for moral or aesthetic reasons. In a factor analytic study, Sjöberg (2000b) identified "unnatural and immoral risk" as a factor that added considerable predictive value to models of risk perception. It would have been interesting to ask our subjects whether the natural or artificial version seemed more "immoral".

The present results are limited in terms of several methodological concerns associated with online research (Azar, 2000). It is also possible that despite our explicitly mentioning that the outcomes from the natural and artificial hazards were equivalent in their severity, subjects may have ignored this proviso, which in turn affected their judgments. However, by starting off with the broken leg comparison, we think we framed the notion of "equal severity" in a straightforward manner which likely carried over to the other items.

While the present study addressed several factors related to risk, many more have been identified. Future research can examine some of these additional factors, such as voluntariness, controllability, surprise, personal likelihood, as well as a more direct question asking directly about perceived risk for each version and scenario. Additional research can be done on the natural-artificial variable; all the present scenarios presented the two versions as a binary, but various degrees of naturalness and artificiality could be examined. It would also be interesting to examine natural preferences, both appetitive and aversive, and their relationships in people from develop-

ing nations, since their interactions with ‘the natural’ may be less benign, often including disease and famine.

In sum, the current results extend the findings on natural preferences, and add to our understanding of why people diminish risks associated with natural phenomena. For instance, the risks of excessive sun exposure contributing to skin damage and increased probability of melanoma are well known to most Americans, yet people often ignore the dangers. The present findings suggest the following interpretation: Since the sun is natural, and natural phenomena are considered good, the affect heuristic may implicitly result in people downplaying the risks associated with this natural form of exposure. However, natural preferences are not solely accounted for by common factors affecting risk perception. Natural versions were still more likely to be preferred when they were seen as scarier, more dangerous, or elicited more outrage, and artificial variants were still less likely to be preferred even when they were perceived as being more controllable.

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