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Preference for natural: instrumental and ideational/moral motivations, and the contrast between foods and medicines

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Abstract

Preference for natural refers to the fact that in a number of domains, especially food, people prefer natural entities to those which have been produced with human intervention. Two studies with undergraduate students and representative American adults indicate that the preference for natural is substantial, and stronger for foods than for medicines. Although healthfulness is often given as a reason for preferring natural foods, even when healthfulness or effectiveness (for medicines) of the natural and artificial exemplars is specified as equivalent, the great majority of people who demonstrate a preference for natural continue to prefer natural. In addition, when the natural and artificial exemplars are specified to be chemically identical, a majority of people who prefer natural continue to prefer it. This suggests that a substantial part of the motivation for preferring natural is ideational (moral or aesthetic), as opposed to instrumental (healthiness/effectiveness or superior sensory properties).

Keywords: Natural; Preference; Food

Modern humans display both a worship or respect for nature, and an urge to conquer or master it. The relative importance of these competing themes varies across culture, history, and across individuals at any time, within a culture. Mastery over nature has generally been considered good for humans, in the sense that it has increased their fitness. However, in the late 20th century, issues such as global warming and depletion of fuel supplies, have raised the possibility that mastery of nature may have its limitations. These realities provide grounds for a 'pro-nature' or 'respect for nature' orientation, for selfish, instrumental concerns having to do with the quality of human life. At the same time, pro-nature attitudes have also grown on a moral base. It is a moral responsibility to preserve the natural world and respect the lives and environments of non-human species.

In recent decades, in the developed world, especially in the United States, a strong desire for things that are natural has appeared. This is perhaps most clear in the domain of food. 'Natural' appears on as many food labels as is possible, and opposition to genetically modified organisms is clearly related to both respect for nature, and fear of human intervention. This preference for natural may be accounted for by some combination of four instrumental and two ideational beliefs (elaborated in more detail in Spranca & Rozin, 2003; Spranca, 1992).

One category of beliefs can be described as instrumental, having to do with the material or functional superiority of natural entities. The first of these is that natural is better because human intervention always or almost always causes damage to nature, sometimes more serious and wide-ranging than might be expected. The second is that natural entities are healthier (or more effective, for medicines, clothing, etc.). This belief may have to do with the inherent superiority of nature, or result from the belief that humans are often malevolent, and deprive natural entities of some of their important virtues. Another potential cause of this belief is omission bias. People are more inclined to assign responsibility and effects to acts of commission, as opposed to omission. Natural entities are, by their nature, not as subject to commissions (human interventions) as are processed entities; hence there may be a tendency to

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attribute more negative properties to non-natural entities just because they have been actively transformed (discussed in more detail in Spranca & Rozin, 2003; Spranca, 1992). A third type of belief, in the instrumental category, is that natural entities are superior because their sensory properties are more pleasant. For example, in the case of foods, the claim is that natural foods taste better. Finally, a fourth type of belief holds that natural entities are purer, and as a result, safer. The second category of beliefs is based on the moral/aesthetic superiority of natural entities. A fifth type involves a preference for the normative order, natural being prior to human intervention. This preference usually has moral connotations (discussed in more detail in Spranca & Rozin, 2003; Spranca, 1992). A sixth type of belief is simply that natural is inherently better, whether or not it is prior. This preference, again, usually has moral connotations.

A mechanism of transformation that may account for some instances of natural preference is the principle of contagion (Mauss, 1902; Nemeroff & Rozin, 2000; Rozin & Nemeroff, 1990). According to the contagion principle, when two objects touch, properties of each pass into the other, and reside there permanently. This accounts, for example, for why people reject a drink after a bug falls in, even after the bug is removed. Contagion is strongly biased to the negative side (Rozin & Royzman, 2001), such that contact with negative entities is much more contaminating than is contact with positive entities purifying. Given that naturalness may be an inherent good, and humans may be thought to be bad in this context, human contact with what is natural contaminates it more powerfully than the human is purified by the contact with nature. Presumably, when human made machines or chemicals contact a food, the human negative essence is transmitted to the food via the machine/chemical vehicle.

There is no substantial support, in the literature, for an overall actual (instrumental) advantage of natural products. The work of Bruce Ames (Ames, Magaw, & Gold, 1987), dealing with natural versus manufactured pesticides, indicates that one cannot assume, in general, that natural entities are safer than human-produced entities. Indeed, Ames and his colleagues argue that the carcinogen load from natural pesticides (pesticides produced by plants as a defensive measure) in the diet is much greater than that from commercially produced pesticides. Even in the late twentieth century, most deaths come from 'natural' causes. Death, itself, is a natural event, and one that has been substantially delayed by human interventions in medicine, diet, and sanitation. There is only one study on the supposed taste superiority of natural foods, and the results show that organically grown products (not so labeled in the study) are not rated superior in taste to commercially grown products (Schutz & Lorenz, 1976).

There is more evidence for an ideational basis for natural preference. There has been a renewed interest in exploring a basic sense of attachment that humans may have to natural things, called biophilia, by Wilson (1984). Impressive evidence has been gathered to indicate that there is a preference for natural environments and other natural things (Kellert & Wilson, 1993). This line of work suggests multiple bases for a preference for natural, including sensory, aesthetic, and moral factors. Indeed, Kellert (1993) has proposed a total of nine bases for positive or negative attitudes to natural.

In the present studies, we explore two issues, with American respondents.

1. What is the relation between natural preference for foods and medicines? We predict that the natural preference for foods will be greater, since medicines are called in, to a large extent, when nature has caused harm.
2. What is the relative importance of instrumental and ideational (moral/aesthetic) reasons for preferring natural foods and medicines? We predict that both are important, but that ideational reasons will be relatively more important for foods and instrumental reasons will be more important for medicines, because medicines are traditionally evaluated in terms of their effectiveness.

Study 1

Method

A questionnaire, approved by the Institutional Review Board, was distributed to all of the students present in an undergraduate introductory psychology course at the University of Pennsylvania in 2000. Participation was voluntary and anonymous. It was completed by 116 females and 57 males. In addition to standard demographic items, the questionnaire contained a list of 19 food or medicinal items (see Table 1). The items were selected to include raw foods (e.g. lettuce), processed foods (e.g. ice cream), medicines (e.g. an antibiotic), and entities that might be considered transitional between medicines and foods (e.g. vitamins, mouthwash; called food/medicines in this paper). Participants were given a definition of a 'natural food' as '…one that had not been changed in any significant way by contact with humans. It could have been picked or transported, but it was chemically identical to the same item in its natural place.' A processed food item was '…one that had been grown with fertilizers or pesticides and that might contain additives or preservatives to enhance its taste.' A natural medicinal item was '…one that had been extracted from plants or animals.' A processed medicinal item was '…one that had been synthesized in a chemical/pharmaceutical laboratory.' Participants were told to assume that the natural and processed product cost the same.

For each of the 19 items, participants were asked to indicate whether they preferred it in its natural form (N), its processed form (P), or were indifferent (I). They were also asked to indicate which form they thought was healthier (foods) or more effective (food/medicines, medicines), with

Table 1
Undergraduates preferences and health-effectiveness judgments for 20 items: study 1

Item (position in questionnaire)[a]	Category[b]	Mean natural preference score (s.d.)[c]	% prefer natural	Mean health score (s.d.)[c]	% rate natural healthier or more effective[d]
Peaches (8)	FR	1.74 (0.61)	84	1.90 (0.36)	92
Lettuce (18)	FR	1.71 (0.67)	83	1.80 (0.57)	87
Water (12)	FR	1.42 (0.88)	69	1.42 (0.86)	67
Meat (1)	FR	1.41 (0.83)	63	1.48 (0.81)	69
Vitamins (7)	FM	1.41 (0.83)	64	1.48 (0.78)	66
Dietary supplements (9)	FM	1.26 (0.77)	46	1.35 (0.76)	53
Ice cream (5)	FP	1.01 (0.90)	40	1.54 (0.72)	67
Thyroid hormone (17)	M	0.89 (0.76)	24	0.98 (0.79)	30
Peanut butter (4)	FP	0.78 (0.86)	28	1.67 (0.63)	76
Skin cream (13)	FM	0.77 (0.86)	28	1.00 (0.90)	40
Cereal (15)	FP	0.72 (0.87)	28	1.49 (0.82)	70
Anti-cancer chemotherapy (16)	M	0.71 (0.79)	21	0.70 (0.80)	21
Antacid (14)	M	0.67 (0.74)	16	0.84 (0.82)	27
Shampoo (19)	FM	0.54 (0.77)	17	0.84 (0.87)	31
Analgesic (10)	M	0.53 (0.78)	18	0.73 (0.87)	28
Antibiotic (3)	M	0.51 (0.76)	16	0.59 (0.80)	20
Decongestant (6)	M	0.45 (0.72)	13	0.63 (0.82)	21
Mouthwash (2)	FM	0.34 (0.57)	5	0.58 (0.73)	14
Deodorant (11)	FM	0.26 (0.57)	7	0.57 (0.83)	22

$n = 166$ participants with complete set of ratings.
[a] Items listed in order of decreasing natural preference.
[b] FR: foods raw, FP, foods processed, FM: food/medicines, M: medicines.
[c] Scored as 0 for processed, 1 for indifferent, and 2 for natural.
[d] Healthiness for FR and FP, effectiveness for FM and M.

the same N, I, and P alternatives. A twentieth item stipulated: 'Two chemically identical pure drugs, N extracted from a plant leaf, and P synthesized in a chemical laboratory.' The same N, I, P choices were offered, for both the preference and effectiveness item.

Results

Preferences were recorded by respondents as Processed, Indifferent, or Natural, and were coded, respectively, as 0, 1, and 2. Hence, a higher score means a stronger natural preference. Table 1 displays the results for each of the 19 substances, in terms of both mean natural preference (0–2 range) and percent of respondents who chose the natural choice. The substances are listed in Table 1 in decreasing order of mean natural preference. Mean scores for four categories of substances (four raw foods, three processed foods, six food/medicines, and six medicines) are presented in Table 2. There is a clear pattern evident in both tables: natural preference is greatest for raw foods, and decreases steadily through the categories of processed foods, food/medicines, and medicines. The same sequence is seen for healthiness/effectiveness. On the basis of Bonferroni corrected dependent *t*-tests of all pairs of the four categories, using a $p < 0.01$ criterion for natural preference, all pairings are significantly different except processed foods versus food/medicines. For health/effectiveness, all pairings are significantly different except raw foods versus processed foods.

There is one noticeable difference between the healthiness/effectiveness and preference results, as indicated in the fact that it is a different pairing that is not significantly different in the two analyses above. For natural preference, processed foods (32%) fall well below raw foods (75%). But for healthiness, there is only a minimal difference (raw 79%, processed 71%). With respect to healthiness/effectiveness, processed foods are much more similar to raw foods than to food/medicines, but with respect to natural preference, the processed foods are much more similar to the food/medicines. It is possible that respondents believe that there is a substantial taste advantage for processed as opposed to

Table 2
Mean natural preference for and health/effectiveness ratings for four categories of entities: study 1

Category (abbreviation) (*n*)	Mean natural preference (s.d.)	Mean health/ effectiveness (s.d.)	Mean % natural preference	Mean % natural healthier/more effective
Raw foods (FR) (4)	1.58 (0.51)	1.65 (0.43)	75	79
Processed foods (FP) (3)	0.84 (0.66)	1.56 (0.56)	32	71
Food/medicines (FM) (6)	0.76 (0.42)	0.96 (0.52)	28	38
Medicines (M) (6)	0.62 (0.53)	0.75 (0.59)	18	24

$n = 166$ participants with complete set of ratings.

natural foods, which overwhelms health beliefs that incline toward the natural choice.

There is a particularly wide range of scores for the category we constructed, which we call food/medicines. Two of the substances, vitamins and dietary supplements, show among the highest natural preference, while two others, mouthwash and deodorant, show the lowest natural preference (Table 1). There are comparable differences in effectiveness ratings (Table 1). This disparity makes sense in terms of the contrast we have demonstrated in natural preference for foods versus medicines; vitamins and dietary supplements are the two exemplars of food/medicines items that have the most marked properties of foods; they are taken by mouth and have nutritional value. The fact that mouthwash has one of the two lowest natural preferences suggests that 'taken by mouth' or 'tasted' may be less important than 'nutritional.'

There is a 0.86 Pearson correlation, across the 19 substances, between the rated health/effectiveness of substances and the natural preference for them. This suggests that perceived healthiness/effectiveness is a major determinant of natural preference.

There was one different, additional substance that we have not yet considered in the results. This was a contrast between a natural and a commercially synthesized drug that were explicitly stipulated to be chemically identical. Surprisingly, 63% of respondents preferred the natural alternative (versus 19% indifferent, and 18% processed; $X^2[2] = 63.987$, $p < 0.001$). In parallel, 53% of respondents rated the natural form as more effective (versus 28% indifferent and 19% processed; $X^2[2] = 30.830$, $p < 0.001$). Overall, 76% of respondents gave the same rating (e.g. natural-natural, indifferent-indifferent, processed-processed) for preference and effectiveness. Of the 24% that distinguished between preference and effectiveness, about half of the cases (24/37, or 15% of the total number of respondents) show a preference for natural while acknowledging that the two alternatives are equally effective or the synthesized alternative is more effective. For this distinct minority of respondents, it may be that naturalness is perceived as desirable in itself, independent of any instrumental values.

We created a natural preference score, which is simply the mean natural preference across the 19 exemplars. The questionnaire for this study happened to include items about weight concern. For each participant, there are data on Body Mass Index (BMI), frequency of food control behaviors and reactions (dieting, feeling guilty, concern about weight, and holding back at meals) and a measure of dissatisfaction with body image (current versus ideal figures rated on a 9-figure scale). There are no significant correlations between the three food/body scores (body image dissatisfaction, food behaviors and attitudes, BMI) and the average natural preference score. Females show a numerically higher natural preference score (0.92–0.84 for males), but this difference is not significant ($t[162] = 1.343$, $p = 0.18$).

Study 2

The results of the first study raise a number of questions. One has to do with the generality of the findings; was the rather clear natural preference distinction between food and medicines in any way related to the undergraduate status of the respondents? The students were both young and high academic performers. This concern is dealt with in study 2 by comparing a roughly equivalent new sample of undergraduates with representative adult Philadelphians. A second question has to do with the interpretation of the natural preference results. To what extent is healthiness/effectiveness perception causally linked to natural preference, and does it account (whether cause or not) for most of the variance in natural preference, as suggested by some of the results from Study 1? As suggested by the data from processed foods and from chemically identical drugs, other contributors to natural preferences may be expected, including sensory properties and/or a pure, ideational natural preference. Study 2 evaluates the role of instrumental (health/effectiveness or sensory properties) and ideational foundations for natural preference.

Method

The data were collected during the winter–spring of 2001. Two groups of participants were recruited for this study. The student group was undergraduates taking introductory psychology at the University of Pennsylvania. Student participation was voluntary and anonymous, and was an optional way of completing a research involvement requirement. Altogether, a total of 144 students, 55% female and 45% male, with a mean age of 19.0 years completed the questionnaire. On a religiosity scale where 0 indicated not religious at all, and 4 indicated extremely religious, the mean score for the student participants was 1.46.

The jury group was recruited from the Philadelphia County Jury Pool. A few hundred potential jurors are summoned, by random selection of adult citizens residing in the city, to a jury pool room each day. The jury pool is a reasonably representative sample of Philadelphians; however, those who complete our questionnaire are probably a somewhat biased subsample of this group. People who agree to do so were rewarded with a candy bar or a pen for about 10–20 min of their time. The sample of 144 jurors consisted of 57% females and 43% males, with an average age of 39.2 years and a mean religiosity of 1.96. The mean level of education of the jurors was 13.8 years, with 12 years corresponding to graduation from high school.

Standard demographic information was obtained. All participants were asked: 'Do you think NATURAL is generally a good thing? YES NO' and then 'Why?' For people who circled 'YES, (almost all participants), we coded the responses to the why question, with particular attention to the ideational/instrumental distinction'.

There were four versions of the questionnaire. Each respondent was probed about preferences for natural in four types of substances, in the following order: raw foods, medicines, processed foods, and food/medicines. There were four exemplars of each of the four categories, such that each subject received one of each category. The groupings were: Form 1: apple, antibiotic, ice cream, toothpaste; Form 2: carrot, pain reliever, peanut butter, antacid; Form 3: meat, anti-cancer drug, bread, breath freshener; Form 4: peanuts, thyroid hormone, sausage, vitamins. There are two notable changes in the choices with respect to Study 1. First, all of the food/medicines were taken by mouth. Second, antacid, which was considered a medicine in study 1, was, on further reflection, reclassified as a food/medicine in study 2.

The questionnaire began with a definition of natural, as follows:

> By a NATURAL item we mean one which has not been changed in any significant way by contact with humans. It could be picked or transported, but it is chemically essentially identical to the same item in its natural place. For drugs or medicines, natural usually means extracted from plants or animals, and processed usually means synthesized in a chemical/pharmaceutical laboratory.

This was followed by a set of probes for each of the target substances. The probe model for raw foods, processed foods, and food/medicines (all things taken by mouth with a taste, as opposed to a pill) was the same, and is illustrated here for APPLE. The choices for each item were:

NATURAL, COMMERCIAL, or INDIFFERENT (SAME)

'Think of a natural APPLE and a commercially grown APPLE, that cost the same.

Which would you prefer to eat (circle your preference)?:

Now assume that both the natural and commercial APPLES TASTE exactly the same. Now, which would you prefer to eat?.

Now assume that both the natural and commercial APPLES are equally HEALTHY, containing exactly the same nutrients, whether or not they have the same taste. Now, which would you prefer to eat?

Now assume that both the natural and commercial APPLES are CHEMICALLY IDENTICAL, and thus taste the same and have the same health value. Now, which would you prefer to eat?'

The format was varied for the medicines, since they had no taste. The taste question was replaced by a question that stipulated that both forms of medicine have the same side effects. The health question in this form refers to efficacy of the medicine to accomplish its primary goal. The questions on processed foods were identical to those for raw foods. The questions for food/medicines were identical to those for the foods, except that the third question was about effectiveness rather than healthfulness.

Results

Natural preference. There is a tendency for participants to prefer the natural versions averaged across all four types of substances (Table 3). For the jury, 63% of preferences are for natural, as opposed to only 9% for commercial. Corresponding numbers for the students are 47 and 18%. By substance type, 70% of jurors preferred the natural raw food, as compared to 52% of students ($X^2[2] = 9.183$, $p < 0.01$), 74% of the jurors preferred natural processed foods, as opposed to 61% of students ($X^2[2] = 5.235, p > 0.05$); 59% of jurors preferred the natural food/medicine as opposed to 37% of students ($X^2[2] = 19.946$, $p < 0.001$); and 58% of jurors preferred the natural medicine, as opposed to 38% of students ($X^2[2] = 13.610, p < 0.001$). Twenty-three percent of the jurors preferred the natural choice for all four exemplars, while 15% of the students did ($X^2[2] = 6.374$; $df = 1$, $p < 0.05$). Thus, overall the jurors show a higher natural preference, and this is particularly clear for the food/medicines and medicines.

In accordance with the results from Study 1, natural preferences for the two types of food items were higher than the corresponding preferences for the medicines and food/medicines. However, particularly for the jurors, the differences between the item types were quite small, such that, for the jurors, there is no case where the natural preference for any type is significantly different from any other by a dependent *t*-test at a $p < 0.01$ (Bonferroni corrected). There is one case, processed foods versus food-medicines where the Bonferroni corrected difference is less

Table 3
Mean natural preference by category for students and jurors in studies 1 and 2 mean (s.d.)

Category (abbreviation)	Students study 1	Students study 2	Jurors study 2	Significance ind *t*, $p < 0.01$
Raw foods (FR) (4)	1.58 (0.51)	1.42 (0.65)	1.65 (0.58)	
Processed foods (FP) (3)	0.84 (0.66)	1.52 (0.66)	1.67 (0.61)	$s1 < s2$, $s1 < j2$
Food/medicines (FM) (6)	0.76 (0.42)	1.12 (0.80)	1.46 (0.70)	$s1 < s2$, $s1 < j2$, $s2 < j2$
Medicines (M) (6)	0.62 (0.53)	1.08 (0.81)	1.49 (0.67)	$s1 < s2$, $s1 < j2$, $s2 < j2$

The substances sampled are identical for jurors and students in study 2, but are more numerous and somewhat different for students in study 1. For students in study 1, $n = 166$. For students in Study 2, $n = 157–162$, and for jurors in Study 2, $n = 124–133$.

than 0.05. On the other hand, the differences were more substantial for the students, with all differences between food categories (raw, processed) significantly different from all medicine categories (food/medicines, medicines), at $p < 0.001$, Bonferroni corrected (dependent-t tests). However, although in Study 1 raw food natural preference was significantly higher than processed food natural preference, for the students for Study 2, the processed food natural preference was actually higher (non-significantly) than the raw food preference.

As noted, the preference findings on students are at some variance with the findings reported in study 1. For the three food (raw or processed) items that overlapped in the two studies (meat, ice cream, and peanut butter), the mean natural preference was 52% for study 1 and 48% for study 2, almost identical. But for the five medicine-related items (antacids, antibiotics, anti-cancer drugs, thyroid hormone, and vitamins), natural preference was 28% in Study 1, and 37% in study 2. Hence, the food-medicine difference for the comparable items is 24 percentage points for study 1 and only 11 points for study 2. The most striking differences for what should be virtually identical samples are 16% antacid natural preference in study 1 versus 50% in study 2, and 24% natural thyroid preference in study 1 versus 44% in study 2. We have no account for these differences on comparable foods or the different reactions to processed versus raw foods, for items that were virtually identical in studies 1 and 2, presented in only modestly different contexts, and on samples from the same population (University of Pennsylvania introductory psychology students).

Effects of equalization of natural and commercial exemplars. The results of Study 1 suggested, weakly, that natural preference was supported in large part by ideational factors. This suggestion is tested directly in study 2. The fourth question for each substance clearly stipulates that the natural and commercial alternatives are chemically identical, and hence have the same taste (or side effects) and healthiness/effectiveness. A continued preference for natural under these conditions implies what we will call an ideational natural preference; that is, a preference based on the desirability of natural per se (for moral or ideational/aesthetic reasons) in the face of physical identity. Strikingly, the 63% preference of the jurors for natural without any equalizing stipulations drops only slightly, to 57%, when identity is stipulated. The effect of equalizing physical properties is greater for the student group, with natural preference dropping from 47% in the original form to 32% when equalized. But, even among the students, a majority of the natural preference participants hold to this preference in the face of a stipulated physical identity. The results of equalization by substance type are presented in Table 4. For all four types, equalization influences a substantially higher percentage of students than jurors. The largest effect of equalization was for students with medicines, with 50% of natural preferers moving away from that stance. The smallest effects was for jurors and food/medicines, with only 14% moving away from their initial natural preference.

As would be expected (Table 4) equalization of health/effectiveness or taste/side-effects had a smaller effect than equalization on all variables (stipulating chemical identity). The equal healthiness/effectiveness stipulation was effective in shifting participants away from natural preference in 12% of juror cases and 29% of students cases. The equal taste stipulation (now with three cases per person, since equal taste was not stipulated for medicines) shifted 5% of jurors and 15% of students. Hence, we can conclude that beliefs about differences in taste or health/effectiveness of natural vs. commercial entities have some influence on natural preference, but a majority of natural preferers do not abandon their preference even when chemical identity is stipulated.

Demographic factors. The simplest measure of an overall natural preference is the total number of natural preferences recorded by each participant across the 16 questions (four for each substance type). A total natural preference would score 16, while no natural preference would score 0. Using this measure, the jurors (mean = 9.88) are more pro natural than the students (mean 6.47; $t = 5.738$, $p < 0.001$). For both groups, there was a full range of scores from 0 to 16. The gender difference, combining across the two samples (means: 7.51 for males, 8.20 for females) is not significant.

The higher natural preference for jurors cannot be explained in terms of religiosity ($r = 0.05$, n.s.), or educational level ($r = 0.00$ among jurors). However, there is a significant age effect across the whole sample ($r = 0.26$,

Table 4
Effects on natural preference of stipulation of equal healthiness/effectiveness, taste/side effects, or physical identity

Type	Jurors ($n = 124–128$)				Students ($n = 160–162$)			
	#nat prefs	= health/effect	= taste/side	Identical	#nat prefs	= health/effect	= taste/side	Identical
Raw	92	19 (21)	5 (5)	27 (29)	84	21 (25)	14 (17)	36 (43)
Processed	93	8 (9)	6 (6)	14 (15)	96	31 (32)	14 (15)	42 (44)
Food/med	72	7 (10)	2 (3)	10 (14)	61	20 (33)	8 (13)	29 (48)
Medicine	76	7 (9)	9 (12)	14 (18)	60	15 (25)	19 (32)	30 (50)

Number (%) of participants who shift from natural preference under stipulated conditions.

$p < 0.001$), such that older people are more likely to show a natural preference. There is virtually no overlap in age between jurors and students (only 10 of 162 students are over 20 years old, whereas only six of 146 jurors are under 21 years old). However, the correlation of age with summed natural preference within the juror sample is only 0.02, suggesting that age is *not* the critical distinction between jurors and students.

Accounts for natural preference by participants

The actual question we asked was why people thought 'natural was a good thing', for those (almost all) that agreed with this statement. The question was posed at the beginning of the questionnaire, before exposure to various exemplars and manipulations of naturalness. Ideational reasons predominated. We classified 30% of the juror reasons as instrumental (almost all referring to health) and 34% as ideational. For the students, 19% were instrumental and 45% ideational (20–40% of all accounts were not easily classified as instrumental or ideational, e.g. 'no additives,' 'purity').

General discussion

Both studies indicate that there is a substantial natural preference. In study 1, with college students, the natural preference existed only for foods, and not for medicines. In study 2, with college students and representative Americans, a natural preference appeared for both foods and medicines, but the preference was larger for foods. There is some suggestion in the results that items that are transitional between foods and medicines, such as vitamins, fall between foods and medicines in natural preference.

The food–medicine distinction makes some sense, in terms of either instrumental or ideational-moral construals of natural preference. On the instrumental side, study 1 clearly shows that while natural foods are considered healthier than commercial/processed foods, natural medicines are considered less effective than commercial equivalents. The results of study 1 suggest a strong, perhaps, causal link between perceived healthiness/effectiveness of natural entities and the preference for them. However, the results from the stipulated chemically identical drug in study 1 and the range of identical conditions in study 2 all suggest that the principal basis for natural preference is an ideational/moral belief in some type of superiority of nature.

Roughly equivalent student samples were used in the two studies, yet the degree of natural preference was quite different, as was the relative natural preference for raw and processed foods. We have no account for this difference.

Although it seems that concerns for 'natural' in food are particularly salient in the United States, there is a greater concern about genetically modified organisms (GMOs) in Europe than in the United States. Analyses of reactions to GMOs in Europe, particularly in the UK, by Lynn Frewer and her colleagues (Frewer, Hedderly, Howard, & Shepherd, 1997; Frewer, Howard, & Shepherd, 1995; Sparks, Shepherd, & Frewer, 1994) indicate a mix of what we call instrumental and ideational concerns. We suspect that if the choices are equalized for instrumental effects, the European opposition to GMOs would be only modestly reduced. The studies by the Frewer group also contain suggestions that there is more concern about genetic modification in foods than in medicines, paralleling our results.

Our research on contagion (Nemeroff & Rozin, 1994, 2000; Rozin & Nemeroff, 1990) consistently reveals that when people account for their aversion to objects that have contacted a disgusting entity, they typically refer to issues having to do with health. Thus, the most common response for rejection of juice that was contacted by a cockroach is that cockroaches are disease vectors. We reliably find, in this type of study, that when we follow this response with the example (real, or in questionnaire form) of contact with a heat-sterilized cockroach, the aversion is hardly affected at all, much to the surprise of the participants. We see this set of findings as parallel to the findings in the present studies that reveal the importance of ideational factors when health and sensory properties are equalized. We suggest that this pattern of results reveals a preference, among Americans and perhaps people from developed cultures, to resort to instrumental as opposed to ideational accounts of their preferences. Instrumental accounts have a satisfying, more scientific aura, and seem more rational and easy to defend. It seems likely that both for themselves, and for presentation to others, people find some types of reasons more acceptable than others (Shafir, Simonson, & Tversky, 2000).

Our inference of ideational preferences is just that. First, we did not ask participants directly why they preferred natural. Rather, we inferred it from responses to questions about healthiness or changed preferences when health or sensory effects were equalized or complete identity was stipulated. We adopted this approach because our prior results (see paragraph above) suggested that the reasons people offer for preferences of this sort are not consistent with their preference changes following critical manipulations. Second, the inference of an ideational preference in the face of a maintained natural preference with chemical identity can be questioned. It is possible that participants did not believe there could really be chemical identity. Results from another study (Spranca & Rozin, 2003; Spranca, 1992) suggest that although this may be true for some participants, many participants who accept identity still prefer the natural alternative. It is also possible that the surviving natural preferences could in part be due to preferences for what is 'normal.' Medicines are normally manufactured and foods are perceived to be normally close to nature. But, of course, our jurors showed a preference for natural medicines, so the normality account would not hold in that case.

A more problematic concern is that natural entities might be preferred because of the positive associations they generate. Of course, such associations are not instrumental, but it could be argued, they are not ideational either. Our work on contagion suggests that contact with an undesirable entity can make an object less desirable on three types of grounds: a physical transfer of properties, a transfer of non-physical and hence ideational properties, or negative associations having to do with the contaminant (Nemeroff & Rozin, 1994). Our study has not eliminated this associational account.

In this study, we did not ask for reasons for specific preferences. Based on the outcomes in the contagion studies, we would expect that the actual (as opposed to reported) preferences in this study would be ideational, and that is what we found (Table 4). Inferred ideational accounts (based on failure to shift from natural preference when identity is specified) were higher in the jurors (Table 4); more implicitly 'rationalist' instrumental accounts were apparently more appealing to students. Results on natural preference in Spranca and Rozin (2003) studies also implied principally ideational reasons, with natural preferences for chemically identical choices. Explicit accounts offered by participants in these studies, in the face of chemical identity, were primarily ideational. However, there were still a substantial number of instrumental accounts, primarily based on the view that the processing of the non-natural choice was subject to human error.

We have documented the existence of a natural preference for Americans, with indications that it is stronger for foods than medicines. We have also presented evidence that, in substantial part, this natural preference has an ideational basis. Two important questions are raised by these findings. One is, what is the nature of the ideational basis?, and the second is, to what extent are the findings we have reported representative of the attitudes and beliefs of non-Americans, particularly the majority of humans who currently inhabit what we call the less developed parts of the world?

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References

Ames, B., Magaw, R., & Gold, L. (1987). Ranking possible carcinogenic hazards. *Science*, *236*, 272–280.

Frewer, L. J., Hedderly, D., Howard, C., & Shepherd, R. (1997). 'Objection' mapping to determine group and individual concerns regarding genetic engineering. *Agriculture and Human Values*, *14*, 67–79.

Frewer, L. J., Howard, C., & Shepherd, R. (1995). Genetic engineering and food: what determines consumer acceptance. *British Food Journal*, *97*(8), 31–36.

Kellert, S. R. (1993). In S. R. Kellert, & E. O. Wilson (Eds.), *The biological basis for human values of nature* (pp. 42–69). Washington, DC: Island Press.

Kellert, S. R., & Wilson, E. O. (Eds.), (1993). *The biophilia hypothesis*. Washington, DC: Island Press.

Mauss, M. (1972). *A general theory of magic (R. Brain. Trans.)*. New York: W.W. Norton, Original work published 1902.

Nemeroff, C., & Rozin, P. (1994). The contagion concept in adult thinking in the United States: transmission of germs and interpersonal influence. *Ethos*, *22*, 158–186.

Nemeroff, C., & Rozin, P. (2000). The makings of the magical mind. In K. S. Rosengren, C. N. Johnson, & P. L. Harris (Eds.), *magining the impossible: magical, scientific, and religious thinking in children* (pp. 1–34). New York: Cambridge University Press.

Rozin, P., & Nemeroff, C. J. (1990). The laws of sympathetic magic: a psychological analysis of similarity and contagion. In J. Stigler, G. Herdt, & R. A. Shweder (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 205–232). Cambridge: Cambridge University Press.

Rozin, P., & Royzman, E. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, *5*, 296–320.

Schutz, H. G., & Lorenz, O. A. (1976). Consumer preferences for vegetables grown under 'commercial' and 'organic' conditions. *Journal of Food Science*, *41*, 70–73.

Shafir, E., Simonson, I., & Tversky, A. (2000). Reason-based choice. In D. Kahneman, & A. Tversky (Eds.), *Choices, values, and frames* (pp. 597–619). New York: Cambridge University Press/Russell Sage Foundation.

Sparks, P., Shepherd, R., & Frewer, L. J. (1994). Gene technology, food production, and public opinion: a UK study. *Agriculture and Human Values*, *11*(1), 19–28.

Spranca, M (1992). The effect of naturalness on desirability and preference in the domain of foods. Unpublished master's thesis, University of California, Berkeley, CA.

Spranca, M., & Rozin, P (2003). Some basic psychology behind the appeal of naturalness in the domain of foods. Submitted for publication.

Wilson, E. O. (1984). *Biophilia: The human bond with other species*. Cambridge, MA: Harvard University Press.