# Assessment of Magical Beliefs about Food and Health

MARJAANA LINDEMAN, PERTTI KESKIVAARA, & MAARIT ROSCHIER
*Department of Psychology, University of Helsinki, Finland*

DR MARJAANA LINDEMAN is researcher and lecturer in the Department of Psychology, University of Helsinki. Her major research interests lie in everyday thinking and personality psychology.

PERTTI KESKIVAARA is lecturer of statistics and MAARIT ROSCHIER is a graduate student of psychology at the same department.

ADDRESS. Correspondence should be directed to: MARJAANA LINDEMAN, Department of Psychology, Applied Psychology Division, PO Box 13, FIN-00014 University of Helsinki, Finland.
[Fax +358–9–1912 3379 (office), +358–9–813 4931 (home); email: Marjaana.Lindeman@Helsinki.Fi]

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## Abstract

The Magical Beliefs About Food and Health scale (MFH) was developed to assess individual differences in the tendency to adopt eating and health instructions that many magazines, health care books and food ideologies regard as valid but which obey universal laws of similarity and contagion. In a study of 216 individuals, the total MFH score showed good internal consistency and it was associated with various validity criteria as hypothesized (e.g. vegetarianism and other ideological commitments to food choice, female gender, increased neuroticism, experiential thinking, positive attitudes towards alternative medicine, low sensation seeking and endorsement of universalism values). Factor analysis yielded two factors: General Magical Beliefs and Animal Products as Food Contaminants. In addition, three other items (the Animal Products as Personality Contaminants scale) cross-loaded on the two factors. The factor structure and test–retest reliability were confirmed with separate samples. The results showed that the total MFH score is a reliable and valid measure of magical food and health beliefs, and that the subscales may prove useful when a multidimensional assessment of magical beliefs is needed.

## Keywords

*food, health, magical thinking*



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DURING THE LAST DECADES, interest in proper eating and healthy habits of living has increased dramatically. Surveys indicate a consistent increase in the number of health food consumers and vegetarians (Beardsworth & Keil, 1992; Kandel & Pelto, 1980), and the number of Americans who engage in some daily activity to keep physically fit has increased from 21 percent in 1961 to 67 percent in 1990 (Leichter, 1997). In many western countries the movement is so strong that good health and nutrition have been characterized as modern culture's religion and ultimate goal (Belasco, 1997; Brandt, 1997; Leichter, 1997).

For lay people, the main source of health and nutrition information is the mass media. The information available is, however, very heterogeneous. For example, the magazine *Here's Health* reported in its August 1998 issue an article about Kirlian photography and studies published in *The Lancet* in perfect harmony. In a similar way many other magazines, TV and radio programmes and health care books offer intuitively appealing but unfounded eating and health instructions together with scientifically based directions, as if all instructions were equally valid. Such instructions are vast in number and variety, ranging from empty promises about new medicines for losing weight to warnings that food cooked with electric heat lowers vitality and fragments thinking (Macrobiotics Online, 1998). Because these baseless instructions are typically dressed up with quasi-scientific verbiage and even references to scientific articles, drawing a distinction between well- and ill-founded preconditions to good health may be impossible for the average reader.

A closer look at non-scientific health and food instructions reveals that many of them obey universal laws of magical thinking. Examples include the widespread belief (Hines, 1988) that some impurities or toxins will be stored in the body if no purificatory actions are made to get rid of them (Kushi, 1989) or that we should be eating a diet that has an approximate water content of 70 percent because our bodies are 70 percent water. The last-mentioned instruction, a pure example of the magical law of similarity, comes form Diamond and Diamond's (1985) book *Fit for life* which has sold over 11 million copies in 42 countries (*Your new path to vibrant health*, 1998).

Such instructions raise many questions. How typical are magical beliefs about food and health? How do they affect people's eating habits and health behaviour? What kind of people are especially prone to adopt such beliefs or why do magical health concepts appeal to people? Because communication about health in all its varieties has such a visible role in modern life, it is important to assess empirically the nature and implications of magical beliefs. Therefore, we designed a study to develop a scale that measures modern magical beliefs concerning food and health.

## The laws of magical thinking

The laws of magic assume that things act on each other at a distance through a secret sympathy (Frazer, 1922/1963). There are two laws of sympathetic magic: the law of contagion and the law of similarity. The law of contagion holds that things that have once been in contact with each other continue to act upon each other at a distance after the physical contact has been severed (Frazer, 1922/1963; see also Rozin & Nemeroff, 1990). The assumed contagion may be positive or negative. Illustrations of positive contagion include beliefs that an amulet brings luck to its carrier, that introduction of a small amount of the substance thought to cause a disease will cure the disease (homoeopathy), or that each colour has its own positive energy field, so disharmonies in the vibrational frequencies of organs and cells can be corrected by wearing the right coloured clothes (The beginner's guide to colour therapy, 1998). More often, however, contagion is associated with its negative effects, i.e. contamination and pollution. For example, the Hua people from the highlands of New Guinea believe that a newly married woman is so polluted that no initiated person in her husband's community may eat anything that she has prepared or served (Meigs, 1984). Similarly, nowadays, people tend to believe that even brief contact with an infectious source may transmit a disease, despite sterilization (Rozin & Nemeroff, 1990).

The magical idea of contamination is usually linked to a need for some purificatory actions (Rozin & Nemeroff, 1990). For instance, such rituals of purification as nose bleeding, vomiting and eye washing are performed in some cultures in order to purify the body of contagion effects of



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wrong food (Meigs, 1984). Examples of similar beliefs in our culture include claims that it is because people do not wash out the toxic waste from inside their bodies that three out of four people will develop some form of heart disease or cancer (Diamond & Diamond, 1985), or that headache or nausea while on a raw food diet implies that the body is detoxicating (Billings, 1998). However, whereas health-threatening impurities were previously assumed to originate mainly from witches, demons or women, among others (Frazer, 1922/1963; Meigs, 1984), they are nowadays usually assumed to originate from such things as artificial additives, flavours, colours, preservatives and environmental poisons (Hines, 1988). One further source of contamination in our times is meat: many vegetarians think that even a brief contact of any animal product (e.g. a piece of meat or bone) renders a whole vegetarian dish inedible (Lindeman & Stark, 1999; Rozin, Markwith, & Stoess, 1997). Similar magical beliefs underlie statements made by vegetarians that the consumption of meat 'arouses the animal instinct in people' (Beardsworth & Keil, 1992, p. 273). Thus, animal products are here assumed to contaminate not only vegetarian food but also personality.

Like all magical beliefs, contamination beliefs may sometimes have a real-world basis. Microbiological infection, for example, may harm an individual's health. The main difference between magical and scientific evidence is twofold (for a more detailed description of the real-world basis for magical beliefs, see Rozin & Nemeroff, 1990). First, the power of contamination is largely exaggerated in that there is a notable gap between the real and imagined effects, that is, between belief and evidence (Gilovich, 1991). Second, the contaminating entity is assumed to leave a permanent trace in an object. People think, for example, that if a sterilized cockroach (or meat, among vegetarians) touches food, all of that food is ultimately polluted, whereas a disliked food (beans, for instance) can simply be removed from the dish (Rozin, Ashmore & Markwith, 1996; Rozin & Nemeroff, 1990).

The second law of magical thinking, the law of similarity, holds that superficial resemblance indicates, or causes, deep resemblance. It implies, for example, that the image equals the object, that an effect resembles its cause, that like produces like or that action directed against an image is transferred to the corresponding object (Frazer, 1922/1963; see also Rozin & Nemeroff, 1990). According to the law of similarity, heart-shaped leaves were previously assumed to cure heart diseases, and a drug derived from the lungs of a fox was expected to cure respiratory weakness (Nisbett & Ross, 1980). Likewise, the Hua people, living in the highlands of New Guinea, do not eat any food that is red because the colour is identified with menstrual blood and the vagina (Meigs, 1984). Examples of modern health directions that obey the law of similarity are instructions to drink red drinks because they improve haemoglobin (Hunt, 1992), or that the water content of our food should equal that of our bodies (Diamond & Diamond, 1985).

## Assessment of magical beliefs

To indicate how the present attempt to assess magical beliefs concerning health and food relates to assessment of other closely related constructs, it is first necessary to define the theoretical context and the conceptual boundaries of our target construct. First, magical beliefs are here defined as a subgroup of superstition. Superstitions can be characterized as beliefs or practices groundless in themselves and inconsistent with the degree of enlightenment reached by scientists and the general public (Vyse, 1997). Beliefs that traditionally have been defined as superstitions include beliefs in witchcraft, spiritualism, astrology and extraordinary life forms, among other things.

One theory that explains thinking styles underlying superstitious thinking is Epstein's Cognitive Experiential Self-Theory (CEST; Epstein, 1990, 1994; Epstein, Denes-Raj, & Pacini, 1995; Epstein, Lipson, Holstein, & Huh, 1992; Kirkpatrick & Epstein, 1992). According to CEST, people have two ways of thinking: rational and experiential (for a similar type of distinction, see Sloman, 1996). Rational thinking is intentional, analytic and dispassionate, and is based on logic and evidence. In terms of human evolution, it is assumed to be a mode of thinking that has developed relatively recently as a function of the increasing complexity of our environment and the human capability for abstraction and symbolic representation. Experiential thinking, in contrast, is evolutionarily old, having



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evolved over millions of years. It is intuitive, emotional and holistic, and its function is not to find the correct answer but rather to organize complex, missing or threatening information into a controllable and comprehensible form. As such, experiential thinking, with its own rules of inferences, is the realm of religiousness, emotional coping, cognitive heuristics and formal superstition (Epstein, 1994; Epstein, Pacini, Denes-Raj, & Heier, 1996).

The laws of magical thinking comply fully with the nature of experiential thinking. Accordingly, we assume that the cognitive mechanisms underlying all types of superstitions are those of experiential thinking, and in cases where the inference rules follow the laws of contagion or similarity the superstition may be defined as a magical belief.

Superstitions vary in respect to how widely they are shared culturally (Vyse, 1997). Some superstitions are shared by a majority of people living in the same culture. According to many scientists, many religions include socially shared superstitions (see Vyse, 1997). In the domain of health, a typical socially shared superstition is that if we spit on a glass, our own saliva pollutes the clean glass so that it is disgusting to drink from it (Rozin & Nemeroff, 1990). Some superstitions, including stone therapy, knocking on wood or telepathy, are more personal in that they are shared only by some people. Magical beliefs and other superstitions may also vary in terms of paranormality. Paranormal superstitions differ from other superstitions in their reliance on explanations that contravene some fundamental and well-founded assumptions of science (Hines, 1988; Marks, 1986). For example, belief in faith healing is a paranormal belief whereas belief in megadoses of vitamins is not.

So far, psychological research on superstitious thinking has focused on two main approaches. The first has addressed individual differences and the prevalence of traditional superstitions (e.g. McGarry & Newberry, 1981; Tobacyk & Milford, 1983). For example, in the domain of health, Klonoff and Landrine (1994; see also Furnham, 1994; Landrine & Klonoff, 1994) have examined the role that belief in bad blood or hexes play in lay people's attributions of illness. The second approach, conducted by Rozin and his colleagues, has been explicitly based on the laws of magical thinking. These studies have shown that socially shared disgust items (e.g. cockroaches, faeces or vomit) tend to elicit magical thinking among many people (Haidt, McCauley, & Rozin, 1994; Rozin & Fallon, 1987, Rozin, Millman, & Nemeroff, 1986; Rozin & Nemeroff, 1990). In line with the laws of contagion and similarity, their results indicate, for example, that people regard a juice undrinkable if a sterilized cockroach has been brought into contact with it (Rozin & Nemeroff, 1990) and that people are more reluctant to eat chocolate fudge shaped to appear like dog faeces than the same fudge in the form of a disc (Rozin, et al., 1986). As a whole, these studies have clearly illustrated that in contrast to people's intuitions, the laws of sympathetic magic are typical not only of traditional cultures but are operative among well-educated Western adults as well.

The present assessment method, the Magical Beliefs About Food and Health scale (MFH), aims to tap superstitions that have not been previously addressed. We focus on those magical conceptions of food and health which the mass media or some modern food ideology groups have offered as noteworthy guidance to good health or nutrition during the last years. We believe that among modern people the content of superstitions has shifted from the traditional areas more to health issues but that the psychological mechanisms accounting for magical health beliefs are similar to those accounting for the traditional superstitions. Therefore, research findings from various fields of superstition were utilized in the construct validation of MFH.

## The construct validation of MFH

The rationale for the cross-structure analysis of the MFH was that magical thinking about food and health may be associated with anxiety-based psychopathology, with an intuitive thinking style and with ideological issues. More specifically, the following hypotheses were set. First, we assumed that people prone to magical thoughts about food and health show increased levels of depression, anxiety and neuroticism (hypothesis 1) because these co-occur with traditional superstitions (a review: Vyse, 1997). We also expect that those who endorse magical beliefs about food and health show more disgust sensitivity (hypothesis 2) because, like many superstitions, disgust sensitivity is an anxiety-based, defensive emotion



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which originates from magical thinking (Haidt et al., 1994; Templer, King, Brooner, & Corgiat, 1984). Haidt et al. (1994) have also shown that disgust sensitivity is inversely related to sensation seeking, that is, to interests in unusual experiences that put the body at risk. Moreover, compared with high sensation seekers, low sensation seekers turn more often to vegetarianism and they prefer cognitively simpler structures (Zuckerman, 1994), which also suggests that magical beliefs about food and health are negatively related to experience seeking (hypothesis 3).

Regarding the thinking styles related to magical beliefs, we expect first that endorsement of magical thinking about food and health is positively related to experiential thinking (hypothesis 4). Because rational and experiential thinking are not inversely related but independent and because rational thinking is unrelated to traditional superstition (Epstein et al., 1996), we hypothesize that rational thinking is unrelated to MFH scores (hypothesis 5). Dichotomic, or categorical, thinking can also be understood by the concrete inference rules typical to experiential thinking. For example, Rozin et al. (1996) have shown that health information is sometimes simplified into dichotomic assumptions that foods are either good or bad for health, or that if something (e.g. salt, fat or coffee) is harmful in large amounts, it is also harmful in small amounts. Because Rozin et al. (1996) suggest that dichotomic thinking results from the magical law of contagion, we expect that magical thinking about food and health is positively related to dichotomic thinking about health issues (hypothesis 6).

We also assume that those who score high on the MFH scale have a more positive attitude toward alternative medicine than those who score low (hypothesis 7). This relationship is plausible because representatives of alternative medicine use many of the phrases and arguments that are in accordance to magical thinking and experiential thinking in general (Gilovich, 1991; Lindeman, 1998).

It is also possible that high MFH scores correlate positively with certain philosophies of life. First, those who are interested in humanities, arts and education are typically more superstitious than people interested in natural sciences (Vyse, 1997). Second, in our previous study (Lindeman & Stark, 1999), we found that magical thoughts about food and health were especially typical of individuals who regarded ideological reasons (e.g. values, view of world, etc.) as important factors in their food choice. These individuals were generally vegetarians and they were concerned about questions related to ecological welfare. Because of the preliminary nature of our earlier study, we test here the assumptions that vegetarians (hypothesis 8), those who select food on an ideological basis (hypothesis 9) and those who emphasize values related to universalism and animals' welfare (hypothesis 10) show more magical beliefs about food and health than other people do.

In many respects, food and health belong to women's territory. Compared with men, women prepare and buy food more often, they are more health conscious, they are more attracted by vegetarianism and other food ideologies, they diet more and, accordingly, suffer more from body dissatisfaction and eating disorders (e.g. Amato & Partridge, 1989; Chaiken & Pliner, 1987; Murnen & Smolak, 1997; Pliner & Chaiken, 1990; Steptoe, Pollard, & Wardle, 1995). Moreover, previous studies have shown that women are more superstitious than men (a review: Vyse, 1997), which, together with the above results, suggest that women are more likely to endorse magical food and health beliefs than men (hypothesis 11).

## Method

### *Participants*

Two hundred and sixteen individuals (57.5 percent women), whose ages ranged from 16 to 86 years ($M = 34.4$, SD = 17.5), participated in this study. Thirty-five of them were in senior high school and 107 were students from various fields of study (computer sciences, household sciences, arts and theatre, psychology, economics, health care). Forty-five of the participants were employed, 10 were retired and 1 was unemployed. Eighteen participants did not report their field of study or working status. Of the women, 78 were omnivores, 28 were semi-vegetarians (avoided red meat) and 17 were vegetarians. Of the men, 85 were omnivores, 3 were semi-vegetarians and 3 were vegetarians (2 participants did not report their eating status). Of the 221 individuals who originally took part, 5 were excluded because of missing data.



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## Procedure

The data were collected in the capital city of Finland, Helsinki. The participants were recruited from the University of Helsinki, Helsinki School of Economics, the College of Health Care and Social Work, the private art school Maa, a senior high school, the Finnish Raw Food Association, Finnish Housewives' Association and a Lutheran male circle. The questionnaires were administered to all subjects in group settings, either during their lecture time or during a group's general meeting. The participants were told that the study concerned personality and attitudes towards food and health, that participation would be voluntary, and that all information received would be confidential.

## Measures

***Preliminary scale for assessing magical beliefs about food and health*** A preliminary scale with 30 items on magical thinking was generated based on a consideration of literature on popular health and nutrition instructions and on the basis of work done by Rozin and his colleagues (Haidt et al., 1994; Rozin, Fallon, & Mandell, 1984; Rozin et al., 1986; see also Lindeman & Stark, 1999). Two criteria were used in the construction of the questionnaire items. First, the items should contain either the law of contagion or the law of similarity (including contagion by similarity). Second, to distinguish magical thinking that may apply only to vegetarians, the items should reflect food and health items referring to both animal and non-animal contents.

Thirteen graduate students of psychology assessed the face validity of the items and three items were excluded because of their ambiguity. To obscure the meaning of the test, filler items were added to the scale (e.g. 'Oranges contain a lot of Vitamin C', 'A high fibre diet is healthy', 'By using condoms you can prevent AIDS', 'A one-sided diet may damage your health', 'Vegetable oils are healthier than animal fats', 'Abundant use of salt may increase your blood pressure', ' Influenza viruses are spread easily by shaking hands'). The participants were then administered the Magical Beliefs About Food and Health scale which included 27 5-point items (1 = *Strongly disagree*, 5 = *Strongly agree*) on magical beliefs and 16 filler items.

***Indicator variables.*** *Neuroticism* was measured by the neuroticism factor of the Finnish version of the NEO Five-Factor Inventory (McRae & Costa, 1987; Pulver, Allik, Pulkkinen, & Hämäläinen, 1995). The factor consists of 48 5-point items which form 6 subscales (anxiety, depression, self-consciousness, vulnerability, impulsiveness, hostility). *Disgust sensitivity* to food, animals, envelope violations, death and hygiene was measured by the Disgust Sensitivity Questionnaire developed by Haidt et al. (1994). The 20 5-point items were averaged to a general disgust sensitivity score. To assess *sensation seeking*, Zuckerman's (1994) revised sensation seeking scale was used. This scale includes 40 dichotomic items which form the subscales of thrill seeking, experience seeking, disinhibition and boredom suspect.

Individual differences in *experiential* and *rational thinking* were assessed by the short form of the Rational–Experiential Inventory (Epstein et al., 1996), consisting of 10 5-point items, 5 of which measure experiential thinking and 5 measure rational thinking. *Attitudes towards alternative medicine* were measured by asking the respondent's opinions concerning 10 treatments that have been categorized officially as belonging to alternative medicine in Scandinavia (Alternativmedicinkommitten, 1989). These were: (1) chiropractic treatments; (2) naprapathic treatments; (3) natural vitamins or other nature cures; (4) large doses of vitamins; (5) treatments with magnetic fields or Kirlian photography; (6) eurythmic dance; (7) primal therapy; (8) meditation; (9) stone therapy; and (10) shamanism. Three response alternatives were given to the subjects: 1 = 'I have never tried this treatment/ the treatment is not familiar to me'; 2 = 'I have received this treatment'; 3 = 'I would like to try this treatment some day'. Participants who responded either 2 or 3 received one score for each item.

*Dichotomic thinking* was measured with 8 statements, namely 'the more natural a product is, the healthier it is', 'processing makes food unhealthy', 'additives are unhealthy', 'natural products are healthy', 'artificial preservatives makes food unhealthy', 'industrial food products are unhealthy', 'nutrition received directly from nature strengthens one's health', and 'artificial sweeteners are hazardous to health'. The response alternatives were 'yes' (scored as 1)



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and 'not necessarily' (scored as 0). The scores were summed to compute a total dichotomic thinking score; the reliability (Cronbach's α) of the scale was .76.

*Ideological commitment to food choice* was measured with a scale that we had developed earlier (Lindeman & Stark, 1999). This scale includes 7 5-point items, for example 'because of my view of the world, there are some foods that are inappropriate for me', 'the food I eat tells something about my values and attitudes towards the world' and 'my philosophy of life is manifested in my food choices'. The reliability (α = .91) was the same as in our previous study (Lindeman & Stark, 1999).

*Universalism values* were measured according to the universalism scale in Schwartz's value questionnaire (Schwartz & Bilsky, 1990), which contains 8 single values (e.g. social justice, unity with nature, protection of environment) measured on a 7-point scale. Because *welfare of animals* is not mentioned separately in the items, we added two ideals that have been found to be especially typical of vegetarians (Amato & Partridge, 1989), namely 'decreasing animals' suffering' and 'respect for animals' rights'.

## Results

### Factor analysis of MFH items

The data were first screened by analysing the distributions of the variables of magical thinking and by conducting several preliminary factor analyses. Items with a severely skewed distribution were discarded. Moreover, to avoid overlapping items, one item of each pair of items that correlated strongly was excluded. We also decided to exclude items with a parapsychological content ('Healing with hands is possible') because most people acknowledge that they, more clearly than the other statements, contravene the fundamental and well-founded assumptions of science. Moreover, the parapsychological items did not load on a single factor but rather obscured the content of the factors. The remaining 18 items (Table 1) were reanalysed with a Maximum Likelihood extraction and varimax rotation.

*Table 1.* Factor analysis of the MFH items

| | *Factor 1* | *Factor 2* |
|---|---|---|
| *General magical beliefs* | | |
| 1. An imbalance between energy currents lies behind many illnesses | .75 | .18 |
| 2. Colours change the organism's energy vibration in a direction that is beneficial to health | .75 | .10 |
| 3. Plants are living beings whose energy potentials can be transmitted to human beings | .74 | .10 |
| 4. By massaging a diseased organ's surrogate in the sole of the foot, the organ will be restored | .71 | .05 |
| 5. An incorrect diet makes food rot in the body | .67 | .25 |
| 6. If we don't somehow clean our bodies, unhealthy toxins remain in them | .58 | .21 |
| 7. It is good to detoxify one's body every now and then with a fast | .57 | .06 |
| 8. An illness should be treated with a medicine that has properties similar to those of the illness | .55 | .13 |
| 9. Since our bodies are 70 percent water, we should be eating a diet that has an approximate water content of 70 percent | .47 | .27 |
| 10. The statement that red drinks improve haemoglobin is probably valid | .41 | .26 |
| *Animal products as food contaminants* | | |
| 11. It would bother me if a restaurant served me food that had come into contact with lard, even if it had been totally removed | .09 | .75 |
| 12. It would bother me to eat vegetarian food that had been in contact with a steak | .20 | .73 |
| 13. Animal blood pollutes food | .16 | .70 |
| 14. Vegetarian food is spoilt if it has been in contact with meat | .22 | .67 |
| 15. Animal bones pollute food | .01 | .66 |
| *Animal products as personality contaminants* | | |
| 16. Consumption of meat makes people behave aggressively | .57 | .45 |
| 17. Consumption of meat dulls thinking | .48 | .47 |
| 18. In comparison to vegetarian food, consumption of meat arouses more animal instincts in people | .43 | .45 |



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There were three factors with eigenvalues over 1. However, the interpretability of this solution was weak because there were eight variables that loaded ($> .30$) on more than one factor and because the third factor was not theoretically coherent. Therefore we ended up with a two-factor solution which accounted for 45.8 percent of the total variance.

As can be seen in Table 1, the first factor consisted of items with the idea of contagion and similarity, but none of the items has an animal content. The second factor, in turn, consisted of statements that animal products contaminate food. Three items were complex in that they had cross loadings on both factors. Each of these three items stated that people acquire animal-like attributes if they ingest animal products. Because the items thus tapped a theoretically uniform content, they were separated from the other items for the time being.

On the basis of these results, three subscales of magical beliefs were created: General Magical Beliefs, Animal Products as Food Contaminants and Animal Products as Personality Contaminants. Scores on these subscales were calculated by averaging the unweighted scores of the pure variables on the two factors and the three cross-loading items, respectively. In addition, a total MFH score was calculated by averaging all items. Because the General Magical Beliefs scale contained more items than the scales with an animal content, scores on the General Magical Beliefs scale are weighted in the total score more than the scores on the two other scales. This is justified by the fact that the items in the General Magical Beliefs scale tap a broader content area than the two other subscales and because general magical beliefs were endorsed more often than the beliefs in the Animal Products as Food Contaminants scale ($t = -11.80$, $p < .001$) or in the Animal Products as Personality Contaminants scale ($t = -13.73$, $p < .001$). The reliability (Cronbach's $\alpha$) for the General Magical Beliefs scale was .85, for the Animal Products as Food Contaminants scale .78, for the Animal Products as Personality Contaminants scale .73, and for the Total scale .89. Means and deviations are given in Table 2.

### *Subgroup differences*

Among women, semi-vegetarians scored higher on the total MFH scale than omnivores ($t[104] = -5.16$, $p < .001$) and vegetarians scored higher than semi-vegetarians ($t[43] = -2.66$, $p < .02$). Similar differences ($p < .05$) were found between vegetarians, semi-vegetarians and omnivores on the three MFH subscales with the exception that semi-vegetarians did not differ significantly from vegetarians on the Animal Products as Food Contaminants scale. Because of the low numbers of male vegetarians ($n = 3$) and semi-vegetarians ($n = 3$), these two groups were pooled in the analyses, which showed that male vegetarians and semi-vegetarians scored higher on the total MFH scale than omnivores ($t[89] = 5.53$, $p < .001$). Again, similar differences ($p < .001$) between male vegetarians, semi-vegetarians and omnivores were found on the three MFH subscales. All means are shown in Table 2.

In line with our hypothesis, the results also showed that women were more likely to endorse magical beliefs than men (Table 2). Women scored higher on the total scale ($t[214] = 5.5$, $p < .001$), on the General Magical Beliefs scale ($t[214] = 5.3$, $p < .001$), on the Animal Products

*Table 2*. MFH scale and subscale means and standard deviations (in parentheses)

| | *Total scale* | *General magic* | *Animals as food contaminants* | *Animals as personality contaminants* |
|---|---|---|---|---|
| All ($n = 216$) | 2.41 (.72) | 2.73 (.80) | 1.99 (.92) | 2.00 (.96) |
| Women ($n = 123$) | 2.47 (.77) | 2.96 (.79) | 2.26 (1.00) | 2.20 (1.00) |
| Omnivores ($n = 78$) | 2.34 (.53) | 2.71 (.66) | 1.93 (.76) | 1.78 (.99) |
| Semi-vegetarians ($n = 28$) | 2.91 (.68) | 3.16 (.83) | 2.61 (.95) | 2.60 (.87) |
| Vegetarians ($n = 17$) | 3.46 (.68) | 3.68 (.71) | 3.07 (1.28) | 3.37 (1.07) |
| Men ($n = 93$) | 1.94 (.61) | 2.41 (.70) | 1.63 (.66) | 1.77 (.86) |
| Omnivores ($n = 85$) | 1.84 (.47) | 2.34 (.67) | 1.55 (.59) | 1.66 (.73) |
| Semi-vegetarians and vegetarians ($n = 6$) | 3.08 (.47) | 3.42 (.42) | 2.60 (.59) | 3.22 (1.14) |



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as Food Contaminants scale ($t$[214] = 5.2, $p < .001$), and on the Animal Products as Personality Contaminants scale ($t$[214] = 3.31, $p < .001$). Because magical beliefs were positively related to vegetarianism and because there were more vegetarian women than men in our sample, we also analysed the means among omnivorous men and women. The results remained unchanged, in that omnivorous women scored higher than omnivorous men on all scales except the Animal Products as Personality Contaminants scale. Age differences were not found.

Because the means between men and women and among omnivores, semi-vegetarians and vegetarians differed from each other, it is possible that it was the subgroup variation that contributed most to the factor outcomes. Therefore, within-group correlations were estimated with sex and dietary group as grouping variables, and the correlations were factor analysed. It turned out that the correlation matrices for these components of covariance were not essentially different. These results indicate the validity of the original factor solution and that the factor solutions were sufficiently similar among the subgroups.

### Nomological validity

Next, the correlations between the MFH, its subscales and the indicator variables were calculated. Table 3 shows that all hypotheses about the relationships between the indicator variables and magical beliefs about food and health were supported. The total MFH score correlated positively with all neuroticism scales, disgust sensitivity, experiential thinking, dichotomic thinking, positive attitudes towards alternative medicine, ideological food choice and values, and negatively with sensation seeking. In addition, total MFH scores and rational thinking were not correlated, as expected. Because semi-vegetarians and vegetarians emphasized ideological food choice ($t$[212] = 12.63, $p < .001$), universalism ($t$[212] = 4.94, $p < .001$), and

*Table 3.* Correlations ($n$ = 216) between the MFH scales and the indicator variables

| | *Total scale* | *General magic* | *Animals as food contaminants* | *Animals as personality contaminants* |
|---|---|---|---|---|
| Total scale | | .62*** | .56*** | .71*** |
| General magic | | | .44*** | .65*** |
| Animals as food contaminants | | | | .57*** |
| Neuroticism | .28*** | .16* | .33*** | .21*** |
| Anxiety | .25*** | .15 | .30*** | .16* |
| Self-consciousness | .13* | .05 | .18** | .09 |
| Vulnerability | .29*** | .18** | .29*** | .24*** |
| Impulsiveness | .15* | .11 | .19** | .09 |
| Depression | .26*** | .14* | .26*** | .23*** |
| Hostility | .24*** | .12* | .32*** | .17** |
| Disgust sensitivity | .31*** | .22*** | .34*** | .20*** |
| Disinhibition | −.29*** | −.34*** | −.14* | −.26*** |
| Boredom suspect | −.09 | −.13* | −.04 | −.08 |
| Thrill seeking | -.16** | −.15* | −.17** | −.09 |
| Experience seeking | −.02 | −.02 | −.03 | −.02 |
| Experiential thinking | .24*** | .36*** | .13* | .13* |
| Rational thinking | −.12* | −.05 | −.16** | −.09 |
| Positive attitude towards alternative medicine | .35*** | .39*** | .19** | .31*** |
| Dichotomic thinking | .54*** | .52*** | .37*** | .49*** |
| Ideological food choice | .62*** | .51*** | .49*** | .56*** |
| Values | | | | |
| Universalism | .43*** | .49*** | .27*** | .33*** |
| Welfare of animals | .37*** | .43*** | .22*** | .30*** |

*$p < .05$, **$p < .01$, ***$p < .001$.

*Note.* The correlations between the total MFH scale and the subscales are part-whole corrected.



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animal welfare, ($t$[212] = 4.10, $p < .001$), more than omnivores, we analysed these correlations separately among omnivores. The results were weaker but in the same direction: the total MFH score correlated positively with ideological food choice ($r = .32$, $p < .001$), with universalism values ($r = .28$, $p < .001$), and with animal welfare ($r = .31$, $p < .001$).

The correlations between the indicator variables and the three subscales (Table 3) show that the best predictors for each type of magical beliefs were ideological commitment to food choice and dichotomic thinking. The main differences in the correlates of the three subscales were that, compared with scores on the other subscales, high scores on the General Magical Beliefs scale were more strongly correlated with experiential thinking, and high scores on Animal Products as Food Contaminants scale were more strongly correlated with increased neuroticism.

However, the relationships between the indicator variables and the MFH subscales were quite different among men and women (Table 4). Among men increased neuroticism and disgust sensitivity predicted high scores on each MFH subscale whereas among women neuroticism correlated weakly only with scores on the Animals as Food Contaminants scale. On the other hand, experiential thinking and universalism values were better predictors for women's magical beliefs than for men's. Table 4 also suggests that positive attitudes towards alternative medicine are related only to women's magical beliefs. However, men's scores on the alternative medicine measure were highly restricted, which may have deflated the correlations among men. Correlations for the sensation seeking subscales other than disinhibition, or for the neuroticism subscales, are not presented in Table 4 because the correlations were higher for the disinhibition

*Table 4.* Correlations between the MFH scales and the indicator variables separately among women ($n = 124$) and men ($n = 92$)

| | *Total scale* | *General magic* | *Animals as food contaminants* | *Animals as personality contaminants* |
|---|---|---|---|---|
| *Women* | | | | |
| Neuroticism | .13 | −.01 | .22** | .09 |
| Disgust sensitivity | .14 | .03 | .20* | .10 |
| Disinhibition | −.26** | −.30*** | −.11 | −.25** |
| Experiential thinking | .31*** | .45*** | .16 | .19* |
| Rational thinking | −.02 | −.03 | −.05 | .02 |
| Positive attitude towards alternative medicine | .44*** | .51*** | .21* | .40*** |
| Dichotomic thinking | .48*** | .43*** | .28*** | .48*** |
| Ideological food choice | .64*** | .51*** | .46*** | .61*** |
| Values | | | | |
| Universalism | .48*** | .48*** | .29*** | .43*** |
| Welfare of animals | .26** | .31*** | .12 | .24** |
| *Men* | | | | |
| Neuroticism | .37*** | .24** | .38*** | .30** |
| Disgust sensitivity | .34** | .25* | .40*** | .21* |
| Disinhibition | −.17* | −.26** | .05 | −.18* |
| Experiential thinking | .13 | .26* | .07 | .01 |
| Rational thinking | −.26* | −.03 | −.34** | −.26* |
| Positive attitude towards alternative medicine | −.02 | .00 | −.10 | .02 |
| Dichotomic thinking | .47*** | .46*** | .28** | .42*** |
| Ideological food choice | .45*** | .38*** | .38*** | .37*** |
| Values | | | | |
| Universalism | .16 | .33** | −.03 | .10 |
| Welfare of animals | .36*** | .47*** | .15 | .27** |

*$p < .05$, **$p < .01$, ***$p < .001$.



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scale than for the total sensation seeking scale and, similarly, they were higher for the total neuroticism scale than for the subscales. An exception, however, was that among men the correlation between one neuroticism subscale, hostility, and scores on the Animal Products as Food Contaminants was very high ($r = .53$, $p < .001$).

### *Confirmation of the factor structure*

To examine the stability of the factor structure, the final MFH scale was administered to a separate sample of 281 individuals (aged 16–63, 70 percent women). The participants came from three senior high schools in the Helsinki area (63 percent), from the Open University of Helsinki (28 percent, about half of whom were working), from the Finnish Society for the Prevention of Cruelty to Animals (5 percent) and from a course for cooking vegetarian food (4 percent). Of the women, 57.8 percent were omnivorous, 22.6 percent were semi-vegetarians and 19.5 percent were vegetarians. The percentages for men were 92.6, 2 percent, 1.5 percent, and 1.5 percent, respectively (2 participants did not report their eating status).

A confirmatory factor analysis was based on the two-factor model obtained from the original data. The new two-factor model provided good fit to the data: $\chi^2 = 240.41$, $d.f. = 129$, $p < .00001$, CFI = 0.913, GFI = 0.915 and RMSEA = .056 with a confidence limit 0.044–0.066.

Also in this sample, semi-vegetarian and vegetarian women scored higher than omnivorous women on the total MFH scale ($t[197] = 8.38$, $p < .001$), and omnivorous women scored higher, although only marginally, than omnivorous men ($t[188] = 1.85$, $p < .06$). Semi-vegetarian and vegetarian men ($n = 5$) scored higher than omnivorous men on the Animal Products as Food Contaminants scale ($t[78] = 2.84$, $p < .01$), but the difference on the total MFH scale was not significant ($t[78] = 0.48$, NS).

### *Test–retest reliability*

A separate sample of 36 psychology students (aged 18–30, 64 percent women) filled in the MFH twice within a 2-week interval. The results indicated high stability of the measurement. The test–retest correlations for the total MFH score were .89 ($p < .001$), for the General Magical Beliefs scale .83 ($p < .001$), for the Animal Products as Food Contaminants scale .87 ($p < .001$) and for the Animal Products as Personality Contaminants scale .86 ($p < .001$).

As in the previous samples, female semi-vegetarians and vegetarians received higher total MFH scores than omnivorous women ($t[21 = 2.45$, $p < .03$), and omnivorous women scored, although only marginally, higher than omnivorous men ($t[26] = 1.76$, $p < .09$). The low number of male participants did not allow us to make comparisons between omnivorous and vegetarian men.

## Discussion

In this study we have presented a new method, the MFH, for assessing contemporary magical beliefs about food and health. Thus far, only a few studies have focused on superstitious health beliefs, their primary concern being the relative role that supernatural forces, such as the evil eye or God's punishment, play in lay persons' causal attributions of health and illness (e.g. Furnham, 1994; Landrine & Klonoff, 1994). The present study, on the other hand, aimed to conceptualize a more topical content area by addressing such conceptions of health and nutrition that some of today's magazines, health care books and food ideologies regard as valid but which nevertheless obey the universal laws of contagion and similarity. We have also aimed to trace the theoretical framework for understanding why these shortcomings occur in the first place, a topic that has hardly been addressed at all.

The results showed that the scale has good internal consistency and temporal stability. The total MFH scores were also associated with various validity criteria as expected on the basis of previous studies of traditional superstitions (a review: Vyse, 1997), disgust (e.g. Haidt et al. 1994; Rozin & Fallon, 1987; Rozin & Nemeroff, 1990) and experiential thinking (e.g. Epstein, 1990, 1994). Accordingly, compared with the low MFH scorers, those who endorsed a high frequency of magical food and health beliefs were more often women than men, they showed more anxiety-based psychopathology (e.g. disgust sensitivity and neurotic symptoms, including anxiety and depression), they relied more on an intuitive thinking style (manifested as experiential thinking, dichotomic thoughts about food and health and positive attitudes towards alternative



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medicine), they were less likely to be sensation seekers and they endorsed more values related to universalism and animal welfare.

However, the two variables that showed the strongest relation to magical food and health beliefs were vegetarianism and ideological commitment to food choice. The relationship between vegetarianism and magical beliefs was ordered, in that semi-vegetarians (i.e. those who ate white meat and fish) scored higher on the MFH than omnivores, and vegetarians scored higher than semi-vegetarians.

As in previous studies (Lindeman & Stark, 1999) semi-vegetarians and vegetarians here regarded their personal values and philosophy of life as an important basis for food selection. This ideological commitment to food choice was strongly correlated with magical food and health beliefs, not only among vegetarians but also among omnivores. The results thus indicate that any moralization of food and health-related issues (i.e. inclusion of food and health considerations within the domain of values; Rozin, 1997) may predispose an individual to magical beliefs about food and health.

The most probable reason for the linkage between ideological commitment (and vegetarianism, as a food ideology) and magical food and health beliefs is that ideologies and magical thinking have the same psychological functions and therefore the same individuals endorse them both. Like magical thinking (Vyse, 1997; see also Haidt et al., 1994), ideologies give the world meaning, order and justice, and they thus tend to decrease the anxiety that results from living in a largely uncontrollable universe (Solomon, Greenberg, & Pyszcynski, 1991). Accordingly, as traditional superstitions and ideologies, including religions, have weakened, some people may reclaim a sense of control by identifying with food ideologies (Leichter, 1997) and magical beliefs about food and health.

Whereas the highest MFH scores were found among semi-vegetarians and vegetarians, the MFH scores were very low among omnivores, especially among omnivorous men. This is plausible because the MFH scale measures personal magical beliefs, which by definition, are inconsistent with the conceptions of the general public and scientists (Vyse, 1997). Nonetheless, according to present results and the theory of emotion-based intuitive thinking (Epstein 1990, 1994; Epstein, et al., 1992, 1996), it seems very probable that high scores on the MFH can be found among individuals who are, in one way or another, emotionally involved in eating or health. Thus, it might be useful in future attempts to investigate the prevalence of magical beliefs among, say, vegetarian subgroups (e.g. raw food eaters and vegans), proponents of alternative medicine, various health ideologists, fitness devotees, and even among individuals with eating disorder behaviour which, according to our ongoing research, is also positively related with magical food and health beliefs.

Besides the total MFH score, the study provided results of three MFH subscales. The results were theoretically interesting and they may prove useful when a multidimensional assessment of magical thinking is needed. The first subscale measured general magical beliefs which included themes like positive energy vibrations and the body's detoxification, the second scale concerned beliefs that any contact with an animal product (e.g. meat or bones) renders food inedible, and the third concerned beliefs that eating meat makes people acquire animal-like personality characteristics, such as aggressiveness. The derivation of the scales was based on a factor analysis which yielded two orthogonal factors (General Magical Beliefs and Animal Products as Food Contaminants) with three additional items cross-loading on the two factors (the Animal Products as Personality Contaminants scale). Keeping a scale based on cross-loadings separate from other scales is statistically questionable. However, we ended up separating the scales from each other because the cross-loading items tapped a theoretically meaningful unity ('you are what you eat'; Nemeroff & Rozin, 1989; Rozin & Nemeroff, 1990) and because, due to a lack of previous pertinent research, we did not know whether the three subscales measure different constructs.

The results showed that the three scales were highly correlated and, accordingly, individuals who scored high on one scale tended to score high on the other two scales as well. For example, vegetarians' magical thinking was not limited to animal products but was generalized to overall bodily functions. Moreover, given that the items on the first factor included both the law of contagion and similarity it seems that, although the two laws are different, individuals



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prone to magical thinking in terms of the law of similarity are also prone to magical thinking in terms of the contagion principle. The three types of magical beliefs were, however, related to slightly different sets of validity criteria. Whereas the majority of the correlations between the indicator variables and the three types of magical beliefs were similar, neuroticism and disgust sensitivity contributed especially to the beliefs that animal products contaminate food and experiential thinking contributed especially to the general magical beliefs.

The reasons for these results may only be speculated upon. First, it may be that the Animal Products as Food Contaminants scale contains more explicit references to putting substantial amounts of disgusting material into the mouth (the 'highly charged border between self and nonself'; Rozin & Fallon, 1987, p. 26; see also Rozin & Nemeroff, 1990) whereas the statements on the other scales may contain emotionally less charged issues. Second, it is possible that the relationship between experiential thinking and the scores on the two animal product scales was weak because the range of the scores on these scales was more restricted than on the General Magical Beliefs scale. Moreover, as Epstein et al. (1996) note, there may be specific facets of experiential thinking. Therefore it is not impossible that the scale of experiential processing (Epstein et al., 1996), which contains only statements about intuitions of people (e.g. 'I trust my initial feelings about people'), did not tap those intuitive inference rules which account for the conceptualization of the role that animal products play or do not play in one's diet. Given the preliminary nature of our results, future studies may provide additional insight into the various forms of magical thinking and their psychological correlates.

In addition, the pattern of association between the indicator variables and the three MFH subscales was somewhat different between men and women. First, in women, high MFH scores were more often correlated with reliance on an intuitive-experiential thinking style than in men. Second, neuroticism (especially hostility), disgust sensitivity and low irrational thinking were clearly related to high scores on each MFH subscale among men, whereas among women this relationship was weaker and discernible only on the Animal Products as Food Contaminants scale. These results are in accordance with Epstein et al.'s (1996) findings that experiential processing has different correlates depending on gender and that rational thinking is a more critical factor in coping for men than for women. The present results may also explain why two previous lines of research, one on traditional superstitions and psychopathology and the second on experiential thinking, show contradictory results about magical thinking and psychological well-being. Whereas the studies on traditional superstitions indicate that superstition is related to low psychological well-being (a review: Vyse, 1997), research on thinking styles suggests that superstition is related to experiential thinking which, in turn, is related to psychological adjustment (Epstein et al., 1996). In light of our results, it is tempting to suggest that there may be two paths to magical thinking: whereas some people (especially men) may be inclined to magical thinking because of their emotional instability, others (especially women) may adopt magical beliefs because of their intuitive thinking style.

As a whole, then, our results suggest that the overall MFH score is a valid instrument for a brief screening for magical beliefs about food and health; that the two subscales, General Magical Beliefs and Animal Products as Food Contaminants, may have unique variance associated with experiential thinking style and increased neuroticism; and that the correlates of magical beliefs may be different among men than among women. However, a methodological consideration that limits the conclusiveness of the present findings is the nature of the samples used (predominately Finnish students) and the low number of male vegetarians in particular. Hence, future studies should validate the results by using different types of samples. Moreover, as with any measures related to magical beliefs or food and health, respectively, it must be recognized that MFH is content valid only in modern western cultures, where a wide range of food is easily and constantly available and interest in the problems of health, disease and well-balanced nutrition is high (cf. Brandt & Rozin, 1997; Steptoe et al., 1995).

As Gilovich (1991; see also Brandt & Rozin, 1997; Hines, 1988) has noted, no area is more plagued by questionable and erroneous beliefs than the field of health and medicine. It seems that the rapid growth of scientific knowledge has



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not decreased such beliefs; rather, people's interest in both science and magical beliefs seems to increase side by side. The starting point for this study was that one potential reason for the enchantment of many popular health and nutrition instructions is that they obey the universal laws of magical thinking. As such, the study aimed to extend the pioneering work of Rozin and his colleagues (e.g. Rozin & Fallon, 1987; Rozin et al., 1986; Rozin & Nemeroff, 1990), which has indisputably demonstrated that the laws of contagion and similarity are still in force among well-educated western adults. The results of the present study suggest that our new assessment scale, the MFH, may prove useful in research on the prevalence of magical health and nutrition beliefs among various subpopulations. It may help to identify what kind of people are prone to hold such beliefs, and how magical thinking affects people's health behaviour and their willingness or ability to deal with the more abstract and complex scientific information about health. In addition, the scale might have the potential to help us understand why so many people nowadays are attracted to various health and food ideologies, for example to vegetarianism or specific alternative medical treatments. We also hope that research on magical beliefs will help professionals and lay people to recognize the role that these beliefs may have in the stream of everyday thinking.

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