A Comparative Analysis of Risk Perception in Hungary and the United States

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Abstract

Studies of risk perception attempt to determine how people characterize and evaluate the hazards of daily life. In the present study, questionnaires that have been used to study risk perception in the United States were translated and administered in Hungary, a country with a different hazard ecology and with different social and political processes for managing risks. Although Hungarians were found to classify hazards in ways similar to Americans on qualities such as catastrophic potential, knowability, and dread, there were strong differences in the level of perceived risk. Americans saw a greater degree of risk than Hungarians for 84 out of 90 hazards that were studied. There were also systematic differences between Hungarian and American respondents in the ordering of risks. The Americans were most concerned about the risks from new, high technology hazards associated with the use of radiation and chemicals. In contrast, Hungarians were relatively more concerned about common, everyday hazards such as those associated with cars, trains, electric appliances, home gas furnaces, and childbirth. The social and psychological implications of these results are discussed.

A Comparative Analysis of Risk Perception in Hungary and the United States

Risk is a fact of life. Yet, exposure to risk varies from country to country, depending upon economic conditions, technological infrastructure, public health priorities, and natural hazards, among other things. Perceptions of risk are also likely to vary from one country to another, depending upon what the news media choose to report, what people to choose to discuss, what cultural norms are viewed as important, and what technical and political opportunities exist for control of risk. It is less clear, however, whether the structure of those perceptions will differ between countries. Will "risk" mean something different? Will the importance of different features of risk vary? Will the complexity of people's subjective risk space differ? These questions are explored by a comparative study of risk perception in two countries, the United States and Hungary.

The Psychometric Paradigm

One general strategy for studying perceived risk is the *psychometric paradigm* (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Renn & Swaton, 1985; Slovic, Fischhoff, & Lichtenstein, 1984, 1985; Vlek & Stallen, 1981), which uses psychophysical scaling and multivariate analysis techniques to produce quantitative representations (or "cognitive maps") of risk attitudes and perceptions. Within the psychometric paradigm, people make quantitative judgements about the current and desired riskiness of diverse hazards and the desired level of regulation for each hazard. These judgements are then related to judgements about each hazard's status on characteristics that have been hypothesized to account for risk perceptions and attitudes, including both qualitative aspects (e.g., voluntariness, dread, knowledge, controllability) and quantitative ones (e.g., the number of deaths caused by a hazard in an average or a disastrous year). In the present study, questionnaires that had been administered to a variety of subject populations in the United States were translated and administered in Hungary. In previous studies, this paradigm has provided insight into people's extreme aversion to some hazards, their indifference to others, and the discrepancies between these reactions and experts' opinions. The question asked here is whether this approach will be similarly useful and reveal similar patterns of results in Hungary's rather different risk environment.

Method

Hungarian Data

Two separate questionnaires were administered in Hungary during 1983. The first consisted of a diverse set of 90 hazardous activities (e.g., skiing, mushroom hunting), substances (pesticides, liquid natural gas), and technologies (nuclear power, railroads) that had been studied previously by Slovic et al. (1980; 1985). The Hungarian subjects were 30 college students between the ages of 20 and 25, who rated the risk of dying (across their society as a whole) from each of these hazards. They used a 0-100 rating scale labeled "not risky" to "extremely risky" at the endpoints.

A second questionnaire, containing a 30-item subset of the first set of hazards, was administered to a different group of 29 Hungarian students. These students rated each hazard on nine qualitative characteristics that have been found to be important predictors of perceived and acceptable risk in American samples (Fischhoff et al., 1978). These rating scales are described in Table 1.

Insert Table 1 about here

American Data

The 90-item perceived risk questionnaire was administered to 175 American college students in 1979; the 30-item questionnaire asking for ratings on nine risk characteristics was administered to 76 members of the League of Women Voters, 69 college students, 47 business people, and 15 risk assessment experts during the period 1976-78. The results of the American studies, which have been reported in detail by Fischhoff et al. (1978) and Slovic et al. (1980, 1985) are compared here to the results from the Hungarian students.

Results

Characterizing Risk Perceptions

The American studies have shown that judgements of many of the qualitative characteristics are highly correlated with each other, across sets of diverse hazards. For example, hazards rated as "voluntary" also tend to be rated as "controllable" and "well known." Factor analysis of these interrelationships has shown that the broad set of risk characteristics can be condensed to two or three higher-order characteristics or factors. Factor analysis of the data from the four American samples produced similar two-factor solutions for each group, with the first and second factors accounting for 56-58% and 21-

26% of the variance among the risk characteristics, respectively. No other potential factor accounted for more than 8% of the variance. Factor 1 was primarily determined by the characteristics of being unknown to those exposed and unknown to science and, to a lesser extent, by unfamiliarity, involuntariness, and delay of effect. Factor 2 tended to be determined most strongly by severity of consequences (certainty of being fatal), dread, and catastrophic potential. Controllability contributed to both factors. On the basis of these relationships, Factor 1 was labeled Unknown Risk and Factor 2 Dread Risk.

Factor scores were computed for each hazard by weighting its ratings on each risk characteristic in proportion to the importance of that characteristic for the factor and summing over all characteristics. This weighted score gives a hazard a score on each factor that is an amalgamation of its ratings on the variables that define those factors. Factor scores for the 30 hazards are shown in Figure 1 for the American student group. As one goes from the bottom to the top of the space, the hazards are judged to pose risks that are less well known, less voluntary, less familiar, and more delayed in effect. As one goes from left to right, the risks are increasingly characterized as dread and certain to be fatal, often for large numbers of people.

Insert Figure 1 about here

One striking feature of Figure 1 is the unique and isolated position of nuclear power. Clearly, the risks from nuclear power were seen to be qualitatively different from those of the other hazardous activities. Risks from nuclear power were judged to be extremely catastrophic, fatal, dread, unknown, and unfamiliar.

Hungarian factor structure. Given their different culture, Hungarian subjects were expected to view the world of risk differently. However, their factor structure did not differ radically from that of the Americans. Factor analysis of their data also produced two dominant factors accounting for 45% and 29% of the variance (no other factor accounted for more than 7% of the variance). Factor 1 was determined primarily by the characteristics unknown to those exposed, unknown to science, delayed effects, and nonfatal effects. Factor 2 was determined most strongly by controllability, dread, catastrophic potential, and involuntariness. The Hungarian scores for the 30 hazards on Factor 1 correlated .78 with the American scores for Factor 1. For Factor 2, the Hungarian and American scores correlated .85. It seemed appropriate, therefore to name the Hungarian factors as well, Unknown Risk and Dread Risk.

There was one subtle but important difference in the composition of the Hungarian and American factors. In the American factor space, the characteristic "certain to be fatal" was associated with high scores on the factor Dread Risk. However, in the Hungarian space, "certain to be fatal" was most closely associated with known risks, in the lower portion of the space. Looking at the correlations from which the factor spaces were derived, we see that certainty of being fatal was correlated much more highly with "known to exposed" in the

Hungarian sample (r = .64) than in than American sample (r = .30). In other words, known risks had a relatively more ominous character in the eyes of the Hungarians. We shall see further evidence of this later.

Although the factors and factor scores were similar, there were some notable differences in the location of specific hazards within the factor space (see Figure 2). In the Hungarian data, nuclear power remained high on Dread Risk but was no longer extreme in terms of Unknown Risk. Non-nuclear electric power, home appliances, and pesticides also shifted toward the known end of the space; police work shifted toward the Unknown and Dread Risk quadrant; alcoholic beverages moved toward the unknown pole. Whereas, for the Americans, motorcycles were higher than skiing on Dread Risk, the Hungarians saw skiing as more dread (uncontrollable, catastrophic) than motorcycles. The other hazards were positioned quite similarly in the Hungarian and American factor spaces.

Insert Figure 2 about here

Perceived Risk

Whereas the risk factor space was similar in Hungary and the United States, perceptions of overall risk of death were markedly different. The most striking difference was in the mean judgement of "risk" across the 90 hazards, which was almost twice as high for the American students (39.4) as for the Hungarian students (21.1). The mean risk judgement was higher for the Hungarians for only six of the 90 hazards. Of these six, the biggest difference occurred with non-nuclear electric power (Hungarian mean = 35; American mean = 26). The other hazards rated riskier by Hungarians were solar electric power, caffeine, home appliances, mushroom hunting, and marijuana.

Apart from this overall mean difference in perceived risk, there were also substantial differences in the judgements of the relative riskiness of individual hazards, as reflected in a between-group correlation of only .63 across the 90 hazards. Table 2 presents the 15 riskiest hazards in the eyes of each group. Only eight hazards appeared in both sets: smoking, crime, warfare, handguns, nuclear weapons, national defense, and terrorism. Hazards unique to the Hungarian set were alcoholic beverages, motor vehicles, electric power, surgery, caffeine, and dynamite. Hazards unique to the American set were DDT, pesticides, herbicides, heroin, nerve gas, and barbiturates.

Insert Table 2 about here

Another reflection of the difference between the perceptions of the Hungarian and American students is provided in Table 3, which lists the 30 hazards whose ranks were most discrepant in the two groups. Americans were relatively more concerned about "high-tech hazards" resulting from the use of radiation and chemicals (herbicides, pesticides, prescription drugs). In contrast, Hungarians appeared to be relatively more concerned about common, everyday hazards of life, due to accidents (with cars, bicycles, train, boats, electric appliances, gas furnaces), health risks (pregnancy and childbirth), and substances such as poisonous mushrooms and caffeine. The particularly large differences associated with various forms of electric power may reflect Hungarians' concerns about electrocution. The 220-volt current used in Hungary is, in fact, potentially more dangerous than the lower voltage used in the United States. However, annual mortality rates from electrocution are about equal in both countries.

Insert Table 3 about here

Perhaps some further insight into the nature of Hungarian and American perceptions could be gained by examining in a risk factor space the hazard locations that are associated with the largest rank differences between the two groups. We cannot use the factor spaces in Figures 1 and 2 for this analysis because all 90 hazards were not scaled in the studies that produced those particular representations. However, Slovic et al. (1980) did develop a factor space for these same 90 hazards, based on American college students' judgements of the risk characteristics. A two-factor space similar to those in Figures 1 and 2 was found in that study (see Figure 3). Each hazard in Figure 3 was coded according to whether it showed a discrepancy of 10 ranks or more between Hungarians and Americans. If Hungarians ranked it as riskier, the hazard was coded as an open circle. If Americans ranked it as riskier, the hazard was marked by a filled triangle. If the ranks differed by less than 10, the point representing the hazard was left unchanged. The results, shown in Figure 4, further demonstrate the systematic nature of the differences between Americans and the Hungarians. The Americans saw relatively more risk with hazards falling in the Unknown and Dread regions of the space, whereas the Hungarians saw relatively more risk with the common and well-known hazards. The dread hazards associated with warfare, terrorism and crime were similarly high in the hierarchies of both groups.

Insert Figures 3 and 4 here

Figure 4 also suggests that many of the hazards that the Americans saw as having the highest risk of death (e.g., chemicals, nuclear power) pose the threat of rare catastrophic accidents but, on average, take few lives annually. The Hungarians, however, saw relatively more risk with "common killers" such as motor vehicles, electricity, and smoking. Given these tendencies, Hungarian judgements of risk should correlate more highly than American judgements with estimates of annual mortality from these hazards, whereas American judgements should correlate more highly with estimates of maximum potential mortality. We tested this hypothesis by correlating perceived risk with expert judgements of "average annual mortality" and "maximum credible mortality" (in a single mishap) for 34 of the 90 hazards. These mortality judgements were taken from a compendium developed by Hohenemser, Kates, & Slovic (1983). They were based on mortality in the United States and were expressed in order-of magnitude scales, $1 < S < 9$, with $S = \log_{10}$ Mortality (rounded to the nearest integer). Despite the crudeness of the scales and the fact that the estimates were for the United States rather than for Hungary, the hypothesis received support. The perceived risk judgements of Americans correlated more highly with maximum mortality (r = .38) than with annual mortality (r = .29), whereas Hungarian risk judgement correlated more highly with annual mortality (r = .63) than with maximum mortality (r = .17).

Discussion

In some ways, the risk perceptions of these Hungarian and American students were similar. The two-factor hazard space that has been observed repeatedly in the United States was also observed with the Hungarian students, suggesting that it reflects fundamental aspects of the way that people characterize the hazards in their environment. Nevertheless, there were some subtle differences in the meaning of the factors describing the Hungarian and American perceptions. In particular, the characteristic "certain to be fatal," which has been closely associated with the Dread Risk factor in the American studies, was linked with the known risk pole of the factor labeled Unknown Risk in the Hungarian space.

The Hungarian subjects' perception that hazards whose risks are well known are more likely to have fatal consequences was further illustrated in the analysis of the specific differences between risk orderings in the two groups. The Hungarians saw relatively more risk of death in common hazards that, on average, actully do take more lives, such as motor vehicles, electricity, gas furnaces, and smoking. The American subjects were relatively more concerned with newer, less well understood hazards, such as radiation, chemicals, and nuclear power, which kill few people on average but have the potential for delayed and catastrophic consequences. Whereas Hungarians seem particularly alert to risks associated with the failure of machines and the people who operate them, Americans seem sensitized to the delayed effects of substances released in the environment through the failure of that Vlek & Stallen (1981) called "organized safety," that is, safety that is under the control of government regulators.

The tendency of Americans to fear technological catastrophes and to have relatively less concern about common killers has not gone unnoticed by risk analysts in the United States. For example, physicist Bernard Cohen chastised Americans for concentrating on reducing the risk of rare catastrophes at the cost of increasing annual fatalities. In the context of energy decisions, he argued that ". . . every time a coal plant is built instead of a nuclear plant, something like a thousand people are condemned to an early death . . ." (Cohen, 1985, p. 2). Attacking Americans' growing fears of technology, political scientist Aaron Wildavsky claimed that "Chicken Little is alive and well in America" (1979, p. 32). Some empirical support for this claim might be seen in the fact that American students saw a much higher level of risk associated with almost every hazard, even though statistics indicate that, except for violent crime, life is actually safer and healthier in the United States than in Hungary.[1]

If one believes that Americans are overly concerned about unlikely catastrophies, then the news media seem like obvious culprits (Berger, 1984). For example, Cohen (1983) observed:

> One of journalists' worst sins is overcoverage. Almost every incident involving radiation--a truck carrying radioactive material is involved in an accident, a

radioactive source is temporarily lost, a container leaks radioactivity, a radiation shield is inadvertently left off--receives nationwide coverage. There have been perhaps a hundred such highly publicized incidents over the last thirty-five years, and all of them combined offer something less than a 1 percent chance for a fatality. All the while nearly 300 Americans are killed in other types of accidents each day, but only very rarely do these far more consequential events get wide coverage (p. 70).

On the other hand, perhaps Hungarians are not concerned enough about risks to themselves and their environment. Perhaps the media in Hungary give too little coverage to hazards. We propose a rather speculative hypothesis along this line, based on the fact that Hungary is a much smaller country than the United States. It may be that most news reports of hazards come from outside the borders of Hungary, leading Hungarians to believe that those bad things happen elsewhere. The political border may be seen as a barrier, diminishing the perceived relevance of accidents and diseases to which outsiders are vulnerable. In contrast, the United States is so much larger that most of the reported problems are within its borders.

We are collecting data on newspaper reporting of causes of death in the United States and Hungary that may help us test these speculations. It appears that U.S. newspapers carry about 2-4 times as many articles reporting deaths than does the major Hungarian paper we have examined. Except for motor vehicle fatalities, most (75%) of the deaths reported in the Hungarian paper took place outside of Hungary.

Comparable data on the locations of reported deaths are not yet available for the United States. However, location data similar to those from Hungary seem unlikely, given the paucity of foreign coverage in most American newspapers.

This line of analysis leads us to pose some broader psychological questions that may relate to the observed differences between the risk perceptions of these two samples. Specifically, how do people judge the relevance of other people's experiences for their own lives? To what extent do risks that threaten others, threaten us? What is the role of political, geographic, and social distance in determining the personal message one derives from events that take place in another country, in another region of one's own country, or in another social circle within one's own locale? We hope that future research will bring data to bear on these questions.

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Footnotes

[1] In 1981, the average life expectancy at birth in Hungary was 66.0 years for males and 73.9 years for females; in the United States, it was 70.3 and 77.9 years for males and females. The death rate per 100 people was 13.5 in Hungary and 8.7 in the United States (1982 statistics). Infant mortality was 23.1 per 1000 live births in Hungary compared to 11.5 in the United States (1982 statistics). Hungary's homicide rate is roughly one-fourth that of the United States (1980 statistics).

Table 1

Risk Characteristics Used by Americans and Hungarians to Rate 30 Hazardous Activities, Substances, and Technologies

Voluntariness of risk

Do people face this risk voluntarily? If some of the risks are voluntarily undertaken and some are not, mark an appropriate spot towards the center of the scale.

risk assumed voluntarily	1	2	3	4	5	6	7 risk assumed involuntarily

Immediacy of effect

To what extent is the risk of death immediate — or is death likely to occur at some later time?

effect immediate	1	2	3	4	5	6	7 effect delayed

Knowledge about risk

To what extent are the risks known precisely by the persons who are exposed to those risks?

risk level known precisely	1	2	3	4	5	6	7 risk level not known

To what extent are the risks known to science?

risk level known precisely	1	2	3	4	5	6	7 risk level not known

Control over risk

If you are exposed to the risk, to what extent can you, by personal skill or diligence, avoid death?

personal risk can't be controlled	1	2	3	4	5	6	7 personal risk can be controlled

Newness

Is this risk new and novel or old and familair?

new	1	2	3	4	5	6	7 old

Chronic-catastrophic

Is this a risk that kills people one at a time (chronic risk) or a risk that kills large numbers of people at once (catastrophic risk)?

chronic	1	2	3	4	5	6	7 catastrophic

Common-dread

Is this a risk that people have learned to live with and can think about reasonably calmly, or is it one that people have great dread for — on the level of a gut reaction?

common	1	2	3	4	5	6	7 dread

Severity of consequences

When the risk from the activity is realized in the form of a mishap or illness, how likely is it that the consequence will be fatal?

certain not to be fatal	1	2	3	4	5	6	7 certain to be fatal

Table 2

Hazards with Highest Mean Perceived Risk

Hungarians	Americans
Smoking (61, 68)	Nuclear weapons (41, 78)
Alcoholic beverages (54, 57)	Warfare (43, 78)
Crime (54, 73)	DDT (23, 76)
Motor vehicles (48, 55)	Handguns (42, 76)
Warfare (43, 78)	Crime (73, 54)
Handguns (42, 76)	Nuclear power (32, 73)
Nuclear weapons (41, 78)	Pesticides (23, 71)
National defense (36, 61)	Herbicides (19, 69)
Nerve gas (36, 60)	Smoking (61, 68)
Non-nuclear electric power (35, 26)	Terrorism (33, 66)
Surgery (34, 48)	Heroin (26, 63)
Caffeine (34, 30)	National defense (38, 61)
Dynamite (33, 47)	Nerve gas (38, 60)
Terrorism (33, 66)	Barbiturates (25, 57)

Note: Numbers in parentheses are mean values for Hungarian and American samples, respectively. Scale ranged from 0 (not at all risky) to 100 (extremely risky).

Table 3

Maximum Rank Order Differences

Rank in Perceived Risk Higher for

Hungarians	Americans
Non-nuclear electric power (11, 70)	Diagnostic X-rays (79, 30)
Marijuana (37, 85)	Radiation therapy (67, 21)
Home appliances (24, 72)	Saccharin (86, 44)
Mushroom hunting (32, 79)	Sodium nitrite (81, 40)
Recreational boating (38, 81)	Food preservatives (76, 35)
Caffeine (13, 54)	Power lawn mowers (78, 42)
Bicycles (36, 75)	Fireworks (88, 52)
Railroads (24, 61)	Herbicides (43, 8)
Hydroelectric power (20, 55)	Chemical disinfectants (60, 26)
Solar electric power (56, 90)	Aspirin (84, 50)
Water fluoridation (45, 77)	Microwave ovens (70, 41)
Home gas furnaces (30, 60)	Asbestos (54, 24)
Fossil electric power (9, 38)	Chemical fertilizers (46, 16)
Pregnancy and childbirth (29, 58)	DDT (33, 3)
Skyscrapers (42, 69)	Valium (57, 27)
Christmas tree lights (41, 66)	Pesticides (34, 7)

Note: Numbers in parentheses are rank orders for Hungarian and American samples respectively, lower ranks are associated with higher perceived risk.

Figure Captions

Figure 1. Location of 30 hazards within the two-factor space obtained from American students.

Figure 2. Location of 30 hazards within the two-factor space obtained from Hungarian students.

Figure 3. Location of 90 hazards within the two-factor space obtained form American students in the study by Slovic et al. (1980).

Figure 4. Comparison between risk perceptions of Hungarian and American students for the hazards in Figure 3. Triangles represent hazards that Americans ranked higher in risk than Hungarians. Circles represent hazards that were ranked higher in risk by Hungarians than by Americans.

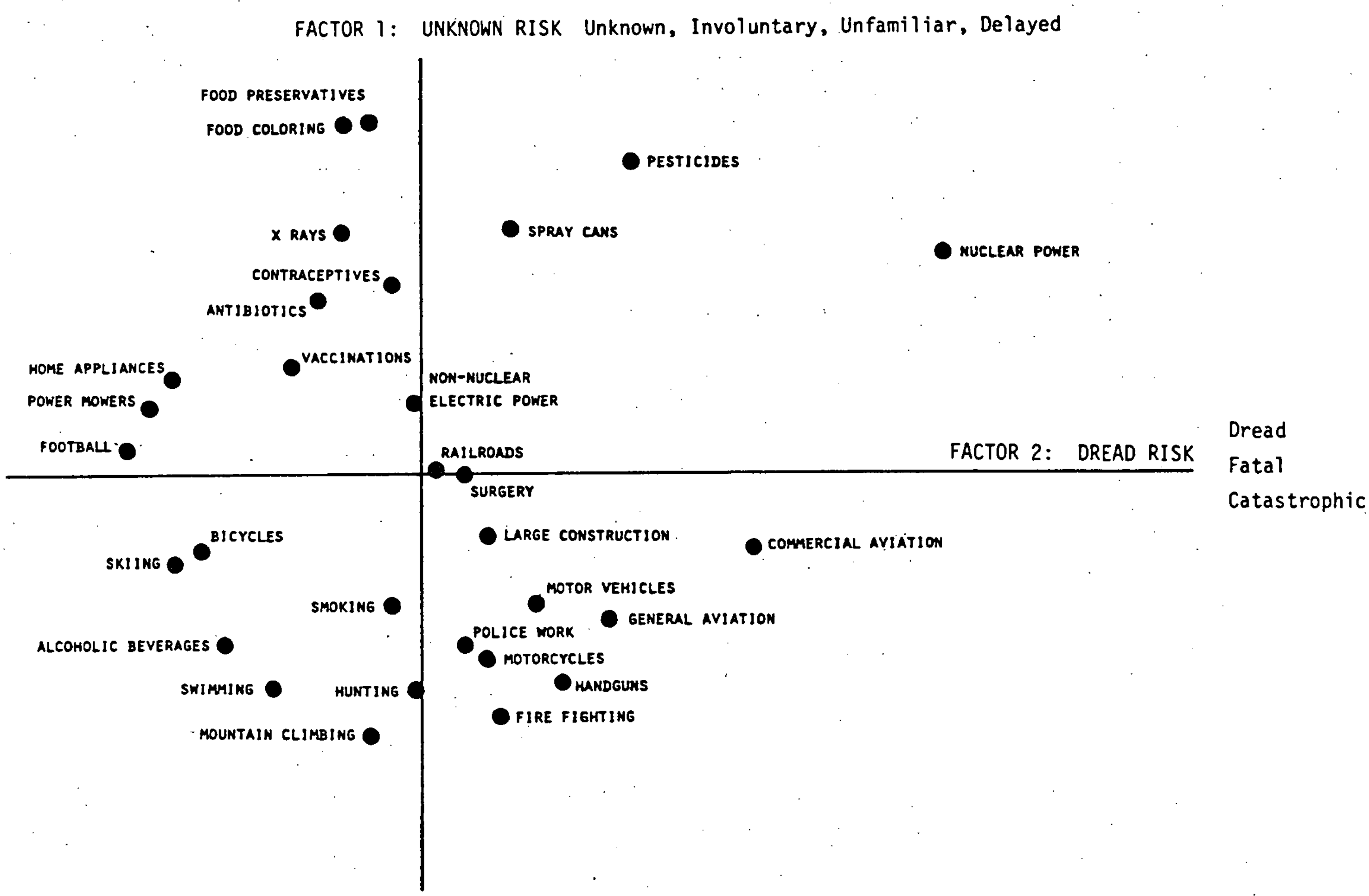


Figure 1. Location of 30 hazards within the two-factor space obtained from American students.

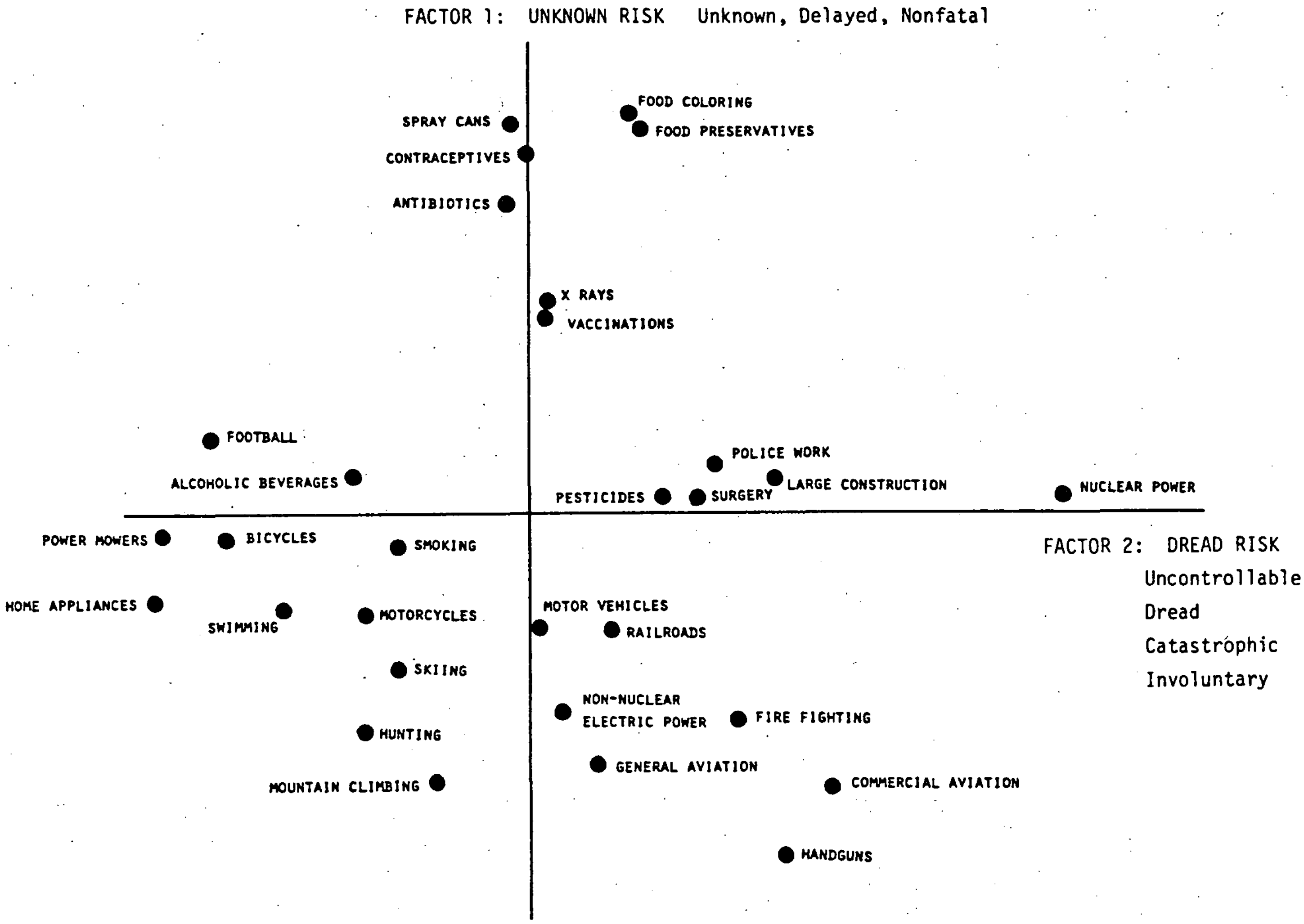
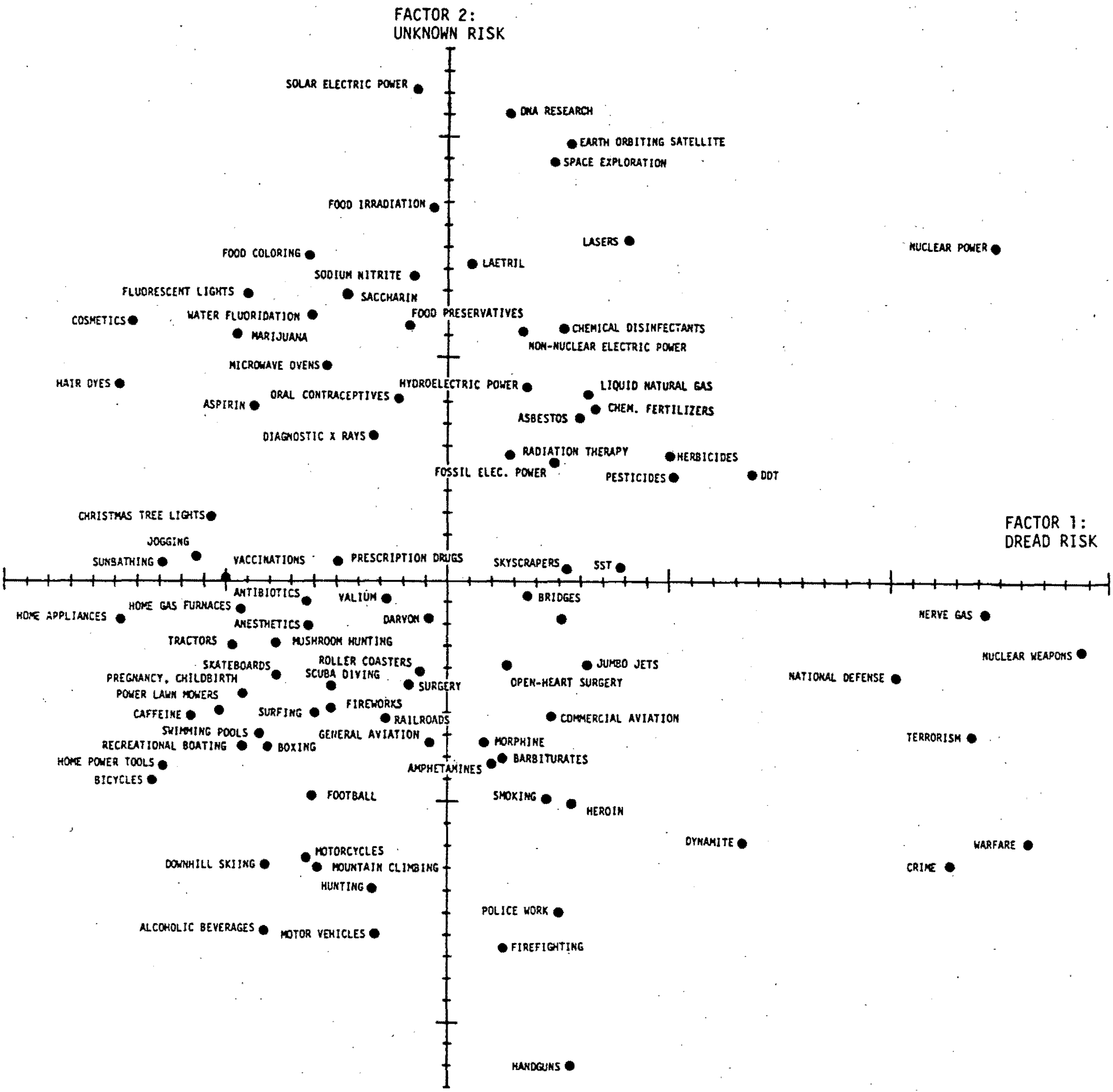


Figure 2. Location of 30 hazards within the two-factor space obtained from Hungarian students.



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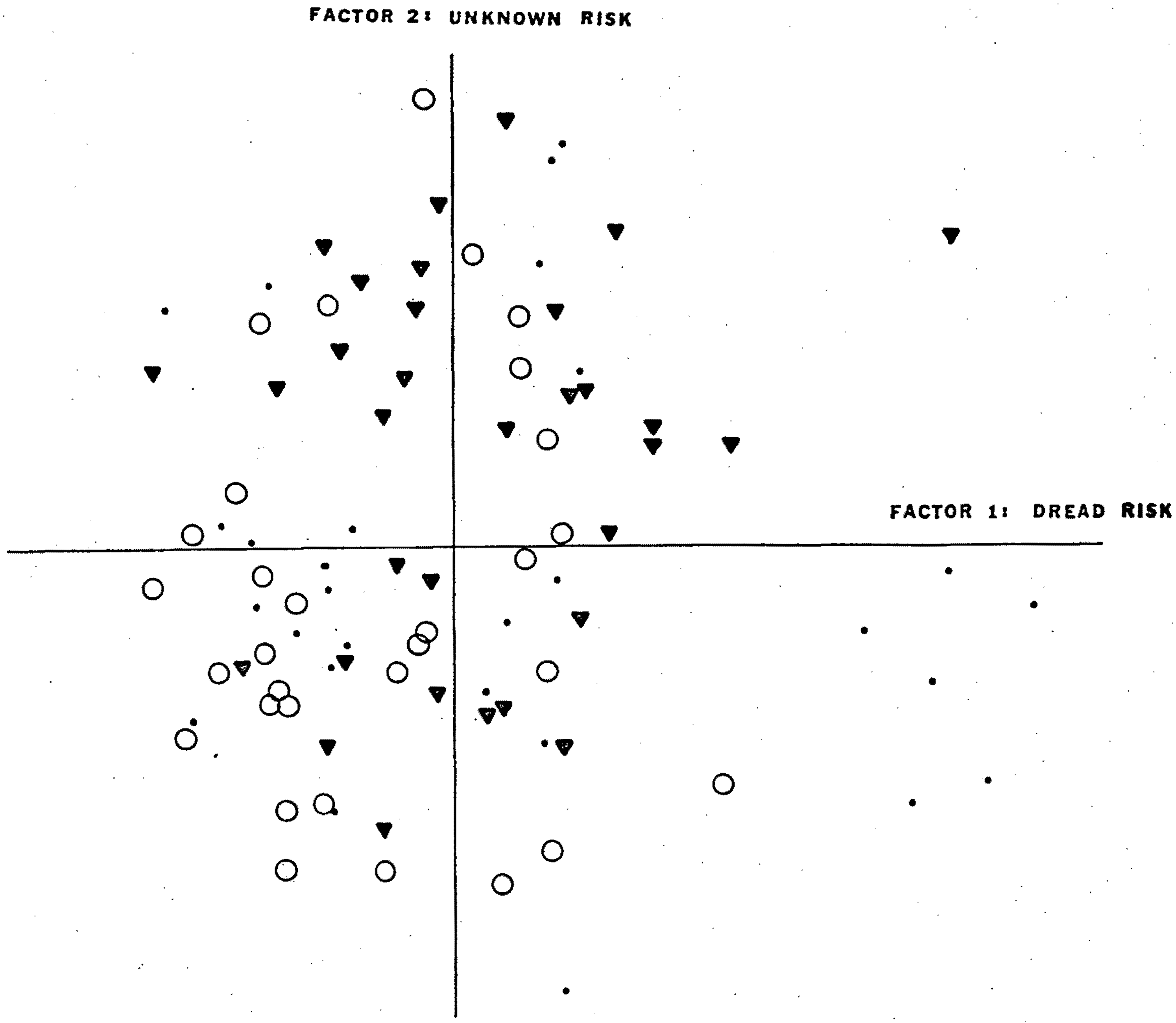

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