Testing the Cultural Theory of Risk in France

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Cultural Theory, as developed by Mary Douglas, argues that differing risk perceptions can be explained by reference to four distinct cultural biases: hierarchy, egalitarianism, individualism, and fatalism. This paper presents empirical results from a quantitative survey based on a questionnaire devised by Karl Dake to measure these cultural biases. A large representative sample ($N = 1022$) was used to test this instrument in the French social context. Correlations between cultural biases and perceptions of 20 social and environmental risks were examined. These correlations were very weak, but were statistically significant: cultural biases explained 6%, at most, of the variance in risk perceptions. Standard sociodemographic variables were also weakly related to risk perceptions (especially gender, social class, and education), and cultural biases and sociodemographic variables were themselves inter correlated (especially with age, social class, and political outlook). The authors compare these results with surveys conducted in other countries using the same instrument and conclude that new methods, more qualitative and contextual, still need to be developed to investigate the cultural dimensions of risk perceptions. The paper also discusses relationships between perceptions of personal and residual risk, and between perceived risk and demand for additional safety measures. These three dimensions were generally closely related, but interesting differences were observed for some risk issues.

KEY WORDS: Risk perceptions; cultural theory.

1. INTRODUCTION

Early studies of risk perceptions investigated differences between experts and laypeople (e.g., Slovic *et al.*, 1979), but did not explore differentiation factors between lay individuals in much depth. Yet different people do perceive risks differently, and this affects how they react to the management of risks. It is therefore of little use to develop policies for average citizens. In order to develop effective risk-management policies and risk communication strategies, it is essential to have information about differences in opinion among the population. In this way, communication messages and decision-making procedures can be adapted to address the preferences and concerns of different sectors of the public.

The traditional approach for investigating individual variations relies on sociodemographic characteristics such as gender, age, occupation, income, and educational level. A more cultural level is approached by using the place of residence (at a local, regional or national level), political orientation, religious belief, and leisure preferences. All of these factors have been used to investigate risk perception, but few consistent relationships have been observed (reviewed in Rohrmann, 1995; Slovic, 1992). Furthermore, even when relationships are observed, such personal characteristics do not offer much leverage for analysis. For example, a common finding is that women rate all risks higher than men. In isolation, this finding provides little insight, since it does not explain what it is about being a woman which makes them apparently more risk averse. Flynn *et al.* (1994), in a study which explored the influence of gender and race on risk perceptions, found that black men rated risks in much the same way as White (or Black) women. Most

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of the gender (and race) difference observed was due to a small subset of White males who perceived risks to be low, and who shared a particular view of the world characterized by "trust in institutions and authorities and by anti-egalitarian attitudes, including a disinclination toward giving decision-making power to citizens in areas of risk management" (Slovic, 1996, p. 17). Thus analysis of personal attributes such as gender need to be accompanied by social, cultural, and political analyses, in order to understand their deeper implications. Cross-national studies have also been used to investigate cultural factors, but the same critique applies to this type of research: measuring differences in opinion between nationals of different countries is of little use if it is not associated with in-depth analysis of the cultural context in those countries (McDaniels and Gregory, 1991).

In order to tap into more ideological factors, some researchers have developed referentials which consist of a set of questions, generally derived from factor analysis and designed to rank respondents on universal scales of psychosocial descriptors, or to sort them into sociological types. The construction of such referentials reflects the researcher's own theoretical representation of social dynamics. Some five referentials are commonly in use in France by market research organizations (Valette-Florette, 1994). Such referentials represent an attempt to identify and describe systematic links between people that may contribute to common interpretations and opinions of survey questions, including, for example, views on societal problems and risk perceptions. To some extent, therefore, they attempt to measure elements of "culture," "worldviews," or "lifestyles," but they have not proved to be very pertinent for studies of risk perceptions (Brenot et al., 1996; Durand et al., 1990; Sjöberg, 1993).

One particular interpretation of "culture" and its relationship with risk perceptions is the so-called "Cultural Theory" developed and promoted primarily by British anthropologists Mary Douglas, Michael Thompson, and Steve Rayner (Douglas and Wildavsky, 1982; Thompson et al., 1990; Rayner, 1992). These authors utilize the term "culture" in a very specific way, which is very different from the concept used in the cross-cultural studies mentioned above. Culture is no longer defined according to adherence to a particular social group. Instead, worldviews (or "cultural biases") reflect adherence to a particular way of life, which, in turn, is reinforced and maintained by the beliefs expressed in those worldviews. These ways of life are defined and described according to two dimensions of social order: grid and group (Douglas, 1982). In addition, Cultural Theory posits that there are only four viable ways of

life, and four corresponding cultural biases: hierarchy, egalitarianism, individualism, and fatalism. It is argued that these four biases can—and indeed usually do—coexist within the same nation, institution, or social group. Attitudes to risk are just one element of worldviews which can be studied within this framework (Douglas and Wildavsky, 1982). Thus, risk perceptions are held to reflect the way in which society itself is perceived, and alternative views about risks (and about the world in general) are expected to flow from patterns of social relations. It must be emphasized that this definition of "culture" used by cultural theorists is very different from that used in other cultural studies, which are usually based on more explicit social categories such as nationality, ethnicity, social class, or gender.

A set of questionnaire items designed to measure the four cultures described by Douglas was developed by Dake and Wildavsky (Dake, 1991, 1992; Dake and Wildavsky, 1991; Wildavsky and Dake, 1990). This instrument and the methodology associated with it has been subject to serious criticism because it measures worldviews at the level of individuals and utilizes a psychometric instrument administered outside of any social context. It therefore tends to reduce cultural biases to psychological stereotypes; and also implies that cultural biases are inherent and stable characteristics of individuals (Boholm, 1996; Johnson, 1991; Marris et al., 1995; Rayner, 1992).

Nevertheless, the results reported by Dake and Wildavsky suggested that their Cultural Biases Questionnaire was a reasonably good predictor of risk perceptions. More recently, other researchers have used Dake and Wildavsky's methodology to analyze risk perceptions in Sweden and Brazil (Sjöberg, 1995), Austria (Seifert and Tongersen, 1995), and in the United Kingdom (Marris et al., 1996), but the results of these studies have been less convincing than for Dake and Wildavsky's original study. This paper presents the results from a study undertaken to evaluate the validity of Dake's cultural theory-grounded referential for risk perception research in the French context. It is the operationalization of cultural theory using this particular instrument, rather than the theory itself, which is tested here and failure of the method need not imply rejection of the theory.

2. METHODOLOGY

A questionnaire was administered through face-to-face interviews in May 1993. A copy of the full questionnaire and details of the sample can be found in IPSN

Table I. Composition of the Sample

Quotas	French population (%)	Sample (%)
Sex		
Male	47.8	48.5
Female	52.2	51.8
Age		
18–24 years	14.0	13.6
25–34 years	21.4	20.6
35–49 years	24.0	28.1
50–64 years	22.0	19.4
65+ years	18.0	18.3
Socioprofessional (head of family)		
Agricultural worker	5.6	4.2
Managerial, professional, self-employed	12.5	18.8
Intermediary professions	13.3	13.6
Nonmanual workers	10.3	11.4
Manual workers	28.0	22.8
Retired or not employed	27.3	29.2
Region		
Ile de France	18.9	19.0
Paris region	18.1	16.7
North	7.0	7.5
East	9.1	10.5
West	13.1	12.4
South-West	10.9	10.4
Center-East	11.7	11.4
Mediterranean	11.2	12.0
Town-size		
−2,000 inhabitants	26.8	26.8
−20,000 inhabitants	15.8	17.4
−100,000 inhabitants	13.0	11.2
+100,000 inhabitants	27.5	28.1
Paris region	15.4	16.5

(1993). Quotas were used for gender, age, occupation, and stratified sampling for region and town-size and the resulting sample ($N = 1022$) was therefore representative sample of the French population according to these variables (see Table I). Risk perceptions were measured by asking participants three separate questions about each of 20 risk issues. The first question was "Do you think that the existence of X endangers you or your relatives?", and was scored on a 5-point scale from "no, not at all" to "yes, absolutely." The second question was: "Existing safety measures are never totally effective. For X, do you consider that the remaining risks are almost non-existent, low, moderate, high, or very high?" The third question was: "Measures to prevent risks and increase safety are expensive. In your opinion, is it urgent to strengthen prevention and safety measures for X?", and was scored on a 5-point scale from "not at all urgent" to "extremely urgent." These three dimensions of risk perception will be referred to, respectively, as "personal risk," "residual risk," and "demand for safety measures."

Twenty items (five for each cultural bias) from the British edition of Dake's Cultural Biases Questionnaire (Dake, 1992), were translated into French and included in the questionnaire.[3] These items are listed in Table II and were scored or a 5-point scale from "disagree strongly" to "agree strongly." The five items for each cultural bias were used to construct, by summation, four separate integer scales, each with a minimum score of 5 and a maximum score of 25 (five items × the 5-point scale).

Relationships between the cultural bias scales and the risk perception scales were measured by linear correlations. The sociodemographic variables were categorical rather than linear, and therefore relationships

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[3] The authors are grateful to Karl Dake for his kind permission to use these items.

Table II. Questionnaire Items Used to Measure Cultural Biases

Egalitarianism

If people in this country were treated more equally we would have
fewer problems.
*On aurait moins de problèmes s'il y avait plus d'égalité dans notre
pays.*

Those who get ahead should be taxed more to support the less fortu-
nate.
*Les plus favorisés doivent payer davantage pour aider les plus dé-
munis.*

The difference between rich and poor nations isn't right.
La différence entre nations riches et pauvres est injuste.

We have gone too far in pushing equal rights in this country. (scoring
reversed)
On est allé trop loin dans l'égalité des droits dans notre pays.

Racial discrimination is a very serious problem in our society.
Le racisme est un sérieux problème de notre société.

Fatalism

There is no use in doing things for people you only get it in the neck
in the long run.
Ça ne vaut pas la peine de faire quelque chose pour les autres.

Cooperating with others rarely works.
Le travail en équipe fonctionne rarement.

I have often been treated unfairly.
J' ai souvent été traité(e) de manière injuste.

A person is better off if he or she doesn't trust anyone.
*La méfiance totale envers les autres est l'attitude qui convient le
mieux.*

I don't worry about politics because I can't influence things very
much.
*Ça ne sert à rien de s'intéresser à la politique, je ne peux rien changer
de toute façon.*

Individualism

In a fair system people with more ability should earn more.
*Dans un système juste, ceux qui sont plus capables doivent gagner
plus.*

In this country, the brightest should make it to the top.
*Dans notre pays, le plus brillant doit pouvoir accéder au sommet de
la hiérarchie.*

If a person has the get up-and go to acquire wealth that person should
have the right to enjoy it.
*Quand on réussit à s'enrichir, on doit avoir le droit d'en profiter
pleinement.*

Social Security tends to stop people from trying harder to get on.
(scoring reversed)
Les aides de l'Etat détruisent l'initiative individuelle.

It is just as well that life tends to sort out those who try harder from
those who don't.
Il est juste et bien que les battants réussissent mieux que les autres.

Table II. Continued

Hierarchy

I think there should be more discipline in the youth of today.
Je pense qu'il faut plus de discipline chez les jeunes d'aujourd'hui.

I would support the introduction of compulsory National Service.
Je suis pour le maintien du service national obligatoire.

People should be rewarded according to their position in society.
Les gens doivent être récompensés suivant leur poste dans la société.

I am more strict than most people about what is right and wrong.
Je suis plus strict que la plupart des gens sur ce qui est bien ou mal.

We should have stronger armed forces than we do now.
Nous devrions avoir une armée plus forte qu'actuellement.

between them and either risk perceptions or cultural bi-
ases were analyzed by one-way analysis of variance.

Two other questions related to trust and compe-
tence. The first was "Do you think that you are told the
truth about the risks that X represents for the popula-
tion?" (rated on a 5-point scale from "no, not at all"
to "yes, absolutely." The second was "In the nuclear
industry sphere, do you think that the following actors
and institutions are technically competent?" (answer
"yes" or "no"): the government, ecologists, Électricité
de France, journalists, the Commissariat à l'Énergie
Atomique, physicians, the Centre National de la Re-
cherche Scientifique, international expert organizations,
consumer organizations, politicians, the Académie des
Sciences, local elected representatives, trade unions,
state regulatory authorities, and the Institut de Protection
et de Sûreté Nucléaire. Relationships between these
questions on trust and cultural biases were measured by
linear correlations.

All statistical analyses were performed with Statis-
tical Analysis System (version 6.10). The model pre-
sented in Table VI was realized by analysis of
covariance (SAS software, GLM procedure). For this
model, the significance of the added power of the cul-
tural or sociodemographic variables was tested using the
formula:

$$R = \frac{(n - r) \, (\text{SSEMR} - \text{SSEFM})}{(r - s)\text{SSEFM}}$$

where SSEFM is the sum of the squares of the residuals
in the full model (using both sociodemographic and cul-
tural variables) and SSEMR is the sum of the squares
of the residuals in a reduced model (using *either* the
sociodemographic *or* the cultural variables alone). In this
case, $n = 1021$, $r = 26$, and $s = 22$ (for sociodemo-
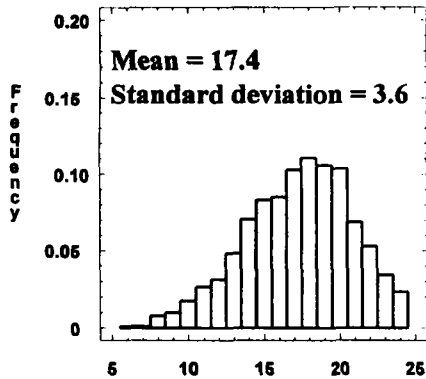graphic variables) or $s = 4$ (for cultural variables). In

Egalitarianism
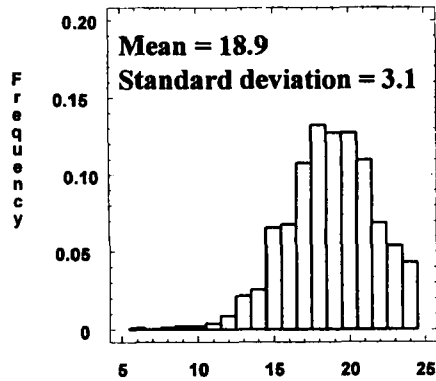
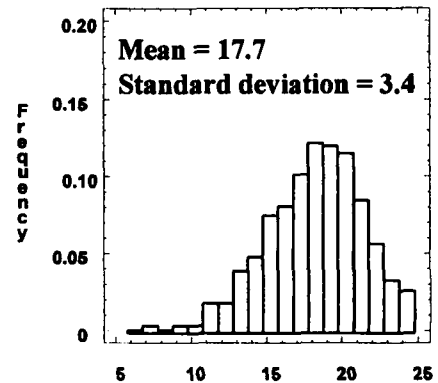# Fatalism
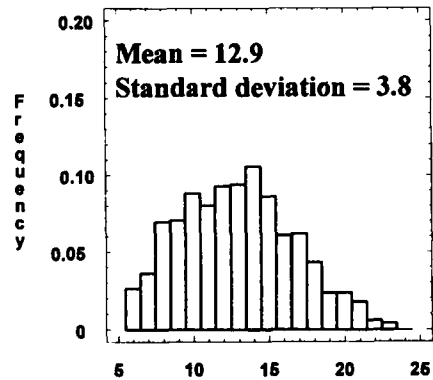
Hierarchy

Individualism

Fig. 1. Distribution of sample according to each cultural bias.

the null hypothesis of nonsignificance of the sociodemographic or cultural variables, this formula follows a Fisher Snedecor F with (22,995) degrees of freedom for the sociodemographic variables and (4,995) degrees of freedom for the cultural variables.

3. THE CULTURAL BIAS SCALES

The distribution of the sample according to each of the four cultural biases is illustrated in Fig. 1 and indicates that the sample tended, overall, to agree fairly strongly with the egalitarian, individualist, and hierar-

chical worldviews and not so much with the fatalist worldview. This might reflect general tendencies among the French population but is more likely to reflect attributes of the instrument used, since similar mean scores were obtained using Dake's Cultural Biases Questionnaire by Sjöberg (1995) from Swedish and Brazilian samples and by Marris et al. (1996) from a British sample.

The cultural bias scales were not independent from standard sociodemographic variables. Table III reveals that they were particularly strongly related to political outlook, social class, level of education, and age. These relationships were particularly strong for the hierarchy,

Table III. Relationships Between Cultural Biases and
Sociodemographic Variables[a]

Cultural bias	Gender	Age	Income	Education	Social class	Political outlook
Egalitarianism	*				*	***
Hierarchy		***		***	***	***
Individualism	*	**			**	***
Fatalism		*	***	***	***	***

[a] Asterisks indicate the statistical significance of the relationship, determined by one-way anova: * $p < 10^{-2}$, ** $p < 10^{-4}$, *** $p < 10^{-6}$.

individualism, and fatalism scales, but weaker for the egalitarian scale.

Correlations between the five items which make up each cultural bias were nearly all contained between 0.1 and 0.4, which is not very strong, but correlations between items from two different cultural biases were even weaker, usually below 0.1. The internal validity of each of the four cultural bias scales was measured using Cronbach's α and the values obtained were 0.44 for egalitarianism, 0.56 for fatalism, 0.57 for individualism, and 0.60 for hierarchy. These values were relatively low, which reflects the fact that individual correlations between items from the same bias were low. These values were however considered to be satisfactory given the small number of items (5), and the fact that the items could not be considered to be repetitive (very high Cronbach α values can be obtained when the items in the scale essentially reformulate the same question). In addition, principal component analysis (with varimax rotation) of the 20 items yielded four factors which correlated strongly with the four cultural bias scales, with individualism loading most heavily on Factor 1 ($r = -0.84$), hierarchy on Factor 2 ($r = -0.85$), fatalism on Factor 3 ($r = 0.95$), and egalitarianism on Factor 4 ($r = -0.88$). This supported the validity of the scales, but individualism also loaded on Factor 2 ($r = -0.33$), and hierarchy on Factor 1 ($r = -0.36$), indicating that these two scales were not independent from each other. Indeed, the hierarchy scale was correlated with the individualism scale ($r = 0.49$), as well as with the fatalism scale ($r = 0.30$). Correlations between the other pairs of scales were lower ($r < 0.19$).

Correlations between the individual items indicated that some of them did not perform as intended. For example, negative responses to the item "We have gone too far in pushing equal rights in this country" were supposed to indicate an egalitarian worldview, but this item was not correlated ($r < 0.10$) with three out of the four other egalitarian items, and was correlated ($r >$

0.10) with all but one of the 15 *non*egalitarian items. In addition, this item correlated with the hierarchy ($r = 0.38$), individualist ($r = 0.26$), and fatalist ($r = 0.37$) scales. Thus, at least in the French context, this item did not seem to be a good indicator for egalitarianism. The four remaining egalitarian items did, however, correlate with each other ($0.10 < r < 0.40$).

Two of the fatalist items "A person is better off if he or she doesn't trust anyone" and "There is no use in doing things for people you only get it in the neck in the long run" correlated negatively with the egalitarian scale ($r = -0.26$ for both items) and positively with the individualist ($r = 0.21$ and 0.13, respectively) and hierarchist ($r = 0.30$ and 0.18, respectively) scales. Thus, these two items, both of which reflect a generally cynical attitude toward other people, did not discriminate much between fatalism, individualism, and hierarchy worldviews, but were contradictory to the egalitarian worldview. Another fatalist item, "I don't worry about politics because I can't influence things much," also correlated positively with the individualist and hierarchy scales ($r = 0.12$ and 0.20, respectively).

All five hierarchy items correlated with each other ($0.10 < r < 0.37$), but also correlated with several (sometimes all five) individualist items ($0.12 < r < 0.33$); as well as with the individualist scale ($0.19 < r < 0.43$). This was consistent with the correlation obtained between the individualist and hierarchy scales ($r = 0.49$). The item "People should be rewarded according to their position in society" actually correlated more strongly with the individualist items than with the hierarchist items, while the supposedly individualist item "Social safety tends to stop people from trying harder to get on" correlated more strongly with the hierarchist items than the individualist items.

4. RISK PERCEPTIONS

Figure 2 shows the percentage of the sample which expressed high levels of concern for the 20 different risk issues (i.e., those who responded using the two highest scale points on each of the three risk perception scales: personal risk, residual risk, and demand for safety measures). Overall, the respondents were most concerned about risks associated with environmental pollution (air and water), chemical and nuclear industries (chemical waste, chemical installations, radioactive waste, nuclear power stations), the transport of hazardous materials, AIDS, city crime and road traffic accidents, but less concerned about natural catastrophes, alcoholism, tobacco smoking, petrol refineries, accidents at work, and accidents in the home.
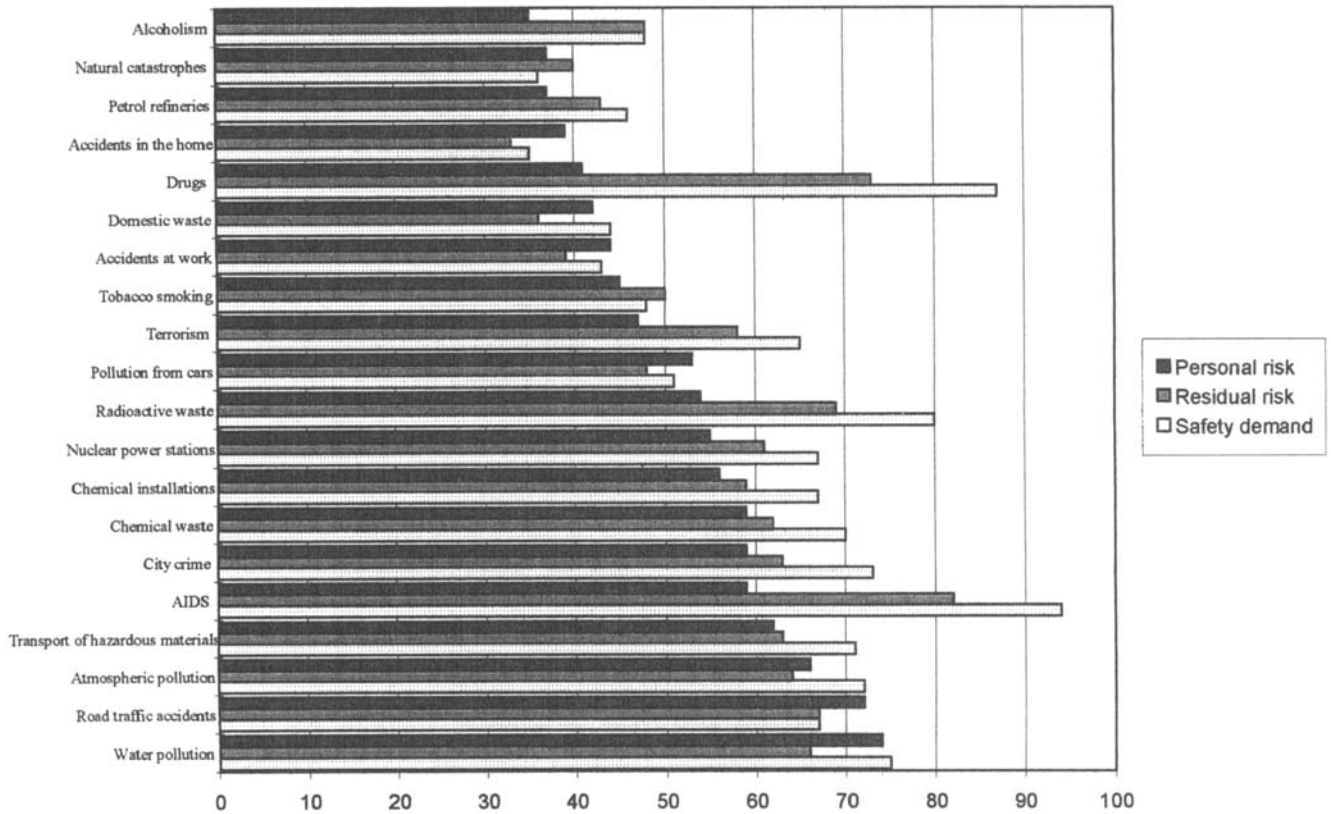
Fig. 2. Three measures of risk performance: Percentage of respondents in the two highest categories.

Responses to the three risk perception questions (personal risk, residual risk, and demand for safety measures) were highly correlated. Thus, correlations between personal risk ratings and residual risk ratings (for the same risk issue) varied between 0.22 and 0.55 depending on the issue (the mean for all 20 issues was 0.42). Correlations between personal risk and demand for safety measures varied between 0.27 and 0.55 (mean = 0.44). Correlations between residual risk and demand for safety measures were even stronger, between 0.47 and 0.66 (mean = 0.53).

Although the broad patterns were similar for each of the three ratings of risk, some significant differences were observed between personal and residual risk perceptions. In most cases, residual risk was rated higher than personal risk, and the increase was particularly striking for drugs (+32%), AIDS (+23%), radioactive waste (+15%), alcoholism (+13%), and terrorism (+11%). Overall, 13 issues were rated higher for residual risk than for personal risk and these appear to fall into two groups. The first group corresponded to health-related risks which people tend to feel they can control personally: drugs, AIDS, smoking, and alcoholism. This

phenomenon is commonly found in risk perception surveys and has been referred to as "optimistic bias" (Weinstein, 1987). The second group, in contrast, seemed to be composed of risks which are more clearly managed by institutions, but the hazards in this group were all localized, either around industrial installations and waste sites (transport of hazardous materials, chemical waste, chemical installations, nuclear power stations, radioactive waste, petrol refineries) or in urban areas (terrorism, city crime). Natural catastrophes also appeared to belong to this "localized" type of risk. The difference between personal risk ratings and residual risk ratings in these cases may therefore reflect the fact that many respondents did not live in areas affected by such localized risks. The seven issues which were rated higher as personal risks than residual risks were, in contrast, either more diffuse environmental risks which affect the whole French population more indiscriminately (water pollution, atmospheric pollution, pollution from cars, domestic waste), or accidents (on the road, in the home, or at work), which are presumably felt to be beyond the victim's control.

Overall, there was a very high demand for additional measures to be taken to reduce risks further. For AIDS, drugs, and radioactive waste, at least 80% of the sample felt that additional measures were "very" or "extremely" urgent. Furthermore, for 14 out of the 20 issues, the percentage of respondents who said that it was "very" or "extremely" urgent to increase safety measures was higher than the percentage of respondents who felt that the risks (personal or residual) associated with that issue were high. Thus, in these cases, demand for safety measures appeared to be higher than risk perceptions. For six issues (road traffic accidents, pollution from cars, tobacco smoking, alcoholism, accidents at work, and natural catastrophes), however, the opposite was the case and perceived risk was *higher* than demand for extra safety. Thus, for these issues, the current risk seemed to be more acceptable. These results also suggest that respondents were reluctant to advocate regulations which can intrude on their personal lifestyle choices (car driving, smoking, and drinking).

The results listed in Table IV reveal that personal risk perceptions were related, to some extent, with standard sociodemographic variables, and especially gender and social class. Women tended to give higher ratings than men for all risk issues and this difference was statistically significant ($p < 0.01$) for eight out of the 20 issues. These included most of the risks with more obvious social dimensions: drugs, AIDS, terrorism, city crime, accidents in the home, and domestic waste (note that the last two refer to the home and domestic domain, often the preserve of women). On the other hand, no significant gender difference was observed for alcoholism or tobacco smoking, even though these are also "social issues." Women also tended to feel more at risk from natural catastrophes, but gender made little or no difference to perceptions of industrial risks, with the exception of nuclear power. Such gender differences are commonly found in risk perception surveys (Slovic, 1996).

Social class and level of education were closely interrelated and revealed similar patterns in relation to risk perceptions. Respondents with higher education levels and social class tended to consider themselves to be less at risk across all 20 issues, and this difference was statistically significant for AIDS, terrorism, city crime, natural catastrophes, chemical installations, and accidents at work ($p < 0.01$). Younger respondents were, unsurprisingly, more concerned about AIDS than older respondents. Supporters of the Green Party and left-wing parties tended to be more concerned about nuclear power and water pollution, but apart from this political affiliations were not closely associated to risk perceptions.

5. RELATIONSHIP BETWEEN RISK PERCEPTIONS AND CULTURAL BIASES

The main aim of this study was to investigate putative relationships between risk perceptions and cultural biases. In order to do this, correlations between each of the four cultural bias scales (egalitarianism, hierarchy, individualism, and fatalism) and each of the three risk perception scales (personal, residual, and demand for safety) were calculated. As shown in Table V, personal risk correlated significantly (with $p < 0.001$) with at least one cultural bias scale for 18 of the 20 risk issues. The results obtained in relation to demand for additional safety measures were similar to those obtained for personal risk (not shown), but only 11 out of 20 issues revealed statistically significant correlations. Residual risk, however, only correlated significantly with the cultural bias scales for four issues (terrorism, natural catastrophes, city crime, and domestic waste).

All the correlations obtained were weak. The highest was only 0.20. In addition, there were very few negative correlations and these were even smaller: the highest negative correlation was 0.07 (and was not statistically significant). On the other hand, a very high *proportion* of the correlations were statistically significant. A total of 80 correlations are listed in Table V, and 24 of these (i.e., 30%) were significant ($p < 0.001$), indicating that the overall pattern of correlations obtained was likely to be consequential.

Most of these significant correlations (14 out of 24) were obtained with the egalitarian scale. The hierarchy and fatalism scales were less closely associated with risk perceptions, and the individualism scale was essentially not related to risk perceptions. Egalitarianism, as predicted by Cultural Theory, was associated with concern for all the industrial risks listed (transport of hazardous materials, radioactive waste, nuclear power stations, chemical waste, chemical installations, petrol refineries, atmospheric pollution); and also for pollution from cars and domestic waste which appear to be perceived, within an egalitarian perspective, as problems linked to industrialization (Marris et al., 1996). Egalitarianism was also correlated with higher risk ratings for the four health-related issues (AIDS, drugs, tobacco smoking, and alcoholism). This relationship is perhaps less easy to interpret in terms of Cultural Theory, but is consistent with other studies using this methodology (Marris et al., 1996; Sjöberg, 1995). The hierarchy scale produced a different pattern to the egalitarian scale. The highest correlations obtained were for city crime, terrorism, and natural catastrophes. This supports Cultural Theory, which argues that hierarchists, in contrast to egalitarians,

Table IV. Relationship Between Personal Risk Perceptions and Sociodemographic Variables

Risk issue	Age	Gender	Social class	Education	Political outlook
Nuclear power stations	•				*
Domestic waste		*			
Accidents in the home		*			
Drugs		*			
AIDS	*	*	*		
Terrorism		*	*	*	
City crime		*	*	*	
Natural catastrophes		*	*	*	
Chemical installations			*	*	
Accidents at work			*	*	
Road traffic accidents					
Water pollution					*
Atmospheric pollution					
Transport of hazardous materials					
Chemical waste					
Radioactive waste					
Pollution from cars					
Tobacco smoking					
Petrol refineries					
Alcoholism					

* Asterisks indicate that the relationship, as determined by χ^2 tests, was statistically significant, with $p < 0.01$.

Table V. Linear Correlations Between Cultural Biases and Personal Risk Perceptions[a]

Risk-issue	Egalitarian	Hierarchy	Fatalism	Individualism
Transport of hazardous materials	**0.15**	0.10	0.06	0.06
Radioactive waste	**0.15**	0.06	0.03	0.01
Nuclear power stations	**0.12**	0.08	0.04	0.00
Chemical waste	**0.14**	0.05	0.03	0.04
Chemical installations	**0.12**	0.08	0.06	0.02
Petrol refineries	**0.13**	0.09	0.07	0.05
Pollution from cars	**0.14**	0.01	−0.01	−0.04
Atmospheric pollution	**0.14**	0.01	−0.03	−0.04
Domestic waste	**0.14**	0.05	0.08	−0.01
Accidents in the home	**0.11**	0.01	0.06	−0.07
AIDS	**0.14**	0.01	0.00	−0.03
Drugs	**0.12**	0.09	0.00	−0.02
Tobacco smoking	**0.12**	0.04	0.03	0.02
Alcoholism	**0.12**	**0.12**	**0.12**	0.00
Terrorism	0.07	**0.20**	**0.14**	0.04
City crime	0.00	**0.18**	**0.12**	**0.11**
Natural catastrophes	0.09	**0.14**	**0.16**	−0.01
Accidents at work	0.08	0.08	**0.12**	−0.04
Road traffic accidents	0.06	0.10	0.02	0.04
Water pollution	0.10	0.02	−0.02	−0.01

[a] $p < 0.001$ when $r > 0.10$. Bold entries denote such correlations.

would be most concerned about risks which disturb the stable order of society.

The pattern of correlations between fatalism and risk perceptions was similar to that for hierarchy. In addition, fatalism was associated with a lack of trust in information about risks. Thus, responses to the question "do you think that you are told the truth about the risks that X represents for the population?" correlated negatively ($p < 0.01$) with the fatalism scale for seven of the risk-issues (drugs, AIDS, terrorism, alcoholism, tobacco smoking, road traffic accidents, and accidents in the home). Furthermore, fatalism was associated ($p < 0.001$) with the belief that, in relation to nuclear power, the following organizations were not technically competent: Commissariat à l'Énergie Atomique, Électricité de France, Institut de Protection et de Sûreté Nucléaire, and international expert organizations (these institutions are all directly involved in the regulation and management of nuclear power in France). No significant relationships were observed with trust and competence for the other three cultural biases.

The results discussed above indicate that both cultural biases and sociodemographic variables are weakly related to risk perceptions (Tables IV and V). Since these two types of variables are themselves interrelated (Table III), a generalized linear model was developed to

examine whether cultural biases provide any added explanatory power compared to standard sociodemographic factors. Table VI lists the percentage of variance in risk perception explained by either sociodemographic variables or cultural biases alone, and by both types of variables together. All the values in Table VI are very low. Thus, sociodemographic variables explained 7.8%, at most, of the variance in risk perception, and cultural biases explained 6.3%, at most, of the variance. And both types of variables, together, could only explain 10.6%, at most, of the variance. But the results do indicate that cultural biases provided additional explanatory power to the model. The asterisks in Table VI indicate the statistical significance of each type of variable. Thus, in the second column, asterisks indicate the p value for the contribution of sociodemographic variables after cultural biases have been taken in to account. And vice versa, in the third column, asterisks indicate the p value for the added contribution of cultural biases after sociodemographic variables have been taken into account. The results reveal that, in most cases (16 out of 20 risk issues), cultural biases provided a statistically significant ($p < 0.001$) contribution to predictions of risk perceptions, even after the contribution of sociodemographic variables had been taken into account. In the fourth column, asterisks indicate the statistical significance of the full model.

Table VI. Percentage of the variance in risk perceptions explained by socio-demographic variables and cultural biases[a]

Risk issue	Sociodemographic	Cultural biases	CB + SD
Terrorism	**7.6***	**6.3***	**10.6***
Natural catastrophes	**7.3***	**5.7***	**10.3***
City crime	**7.8***	**3.9***	**9.9***
Accidents at work	**6.7***	**3.3***	**9.0***
Nuclear power stations	**6.7***	**2.8***	**8.7***
Alcoholism	5.0	**4.9***	**7.8***
Petrol refineries	4.5	**3.2***	**6.8***
Transport of hazardous materials	3.6	**4.1***	**6.6***
Domestic waste	4.6	3.2	**6.6***
AIDS	4.6	**2.1***	**6.5***
Drugs	3.5	**2.9***	**6.3***
Radioactive waste	3.9	**3.0***	**6.2***
Pollution from cars	4.8	2.3	**6.1***
Water pollution	**4.9***	1.1	**5.9***
Atmospheric pollution	3.8	**2.1***	**5.5***
Accidents in the home	3.2	**2.3***	5.1
Chemical installations	3.1	**2.7***	5.1
Chemical waste	2.4	**2.8***	4.9
Tobacco smoking	3.1	2.0	4.7
Road traffic accidents	2.4	1.6	3.9

[a] Bold entries denote significant effects.
* $p < 10^{-3}$.
** $p < 10^{-5}$.
*** $p < 10^{-7}$.

6. DISCUSSION

This study demonstrated that cultural biases, as measured by Dake's Cultural Biases Questionnaire, are weakly related to French public risk perceptions, also measured using psychometric scales. This relationship is statistically significant, but it is very low. This suggests that the instrument used is of limited value for measuring cultural biases, at least in the French context.

A number of studies have been conducted in different countries to explore the utility of Dake's cultural-theory-grounded questionnaire for the study of public risk perceptions. Dake's original study was carried out in California (Dake, 1991, 1992; Dake and Wildavsky, 1991). This was followed by studies in Sweden and Brazil by Sjöberg (1995) and Nyland (1993), in Austria by Seifert and Torgersen (1995) and in the United Kingdom by Marris et al. (1996). Other researchers have also used the questionnaire (or parts of it) in the U.S., including Slovic and his colleagues (Peters and Slovic, 1996; Slovic, 1996; Slovic et al., 1995), Jenkins-Smith (1994), Palmer (1996), and Ellis and Thompson (1997). Comparison between these studies, and with the results presented in this paper, is difficult for a number of reasons.

Firstly, each of the studies has used a slightly different set of items, and in a number of studies the fatalism scale was not included. Furthermore, some researchers re-allocated the items into new categories, based on factor analysis of their results (Peters and Slovic, 1996; Seifert and Torgersen, 1995). Thus, the scales used in those studies do not correspond to the cultural bias categories intended by Dake. Seifert and Torgersen constructed four scales which they named "meritocracy," "fatalism," "egalitarianism," and "privatism"; while Peters and Slovic combined fatalism with hierarchy. Despite these differences, the internal validity of the scales (as defined by Cronbach's alpha) in each of the studies was similar to that reported here, and in most cases the hierarchy scale was, as in this study, highly correlated with the individualism scale. In addition, the studies revealed significant correlations between the cultural bias scales and sociodemographic variables (especially gender, age, and income), and also with political orientations.

Secondly, some of the studies used the scales to measure linear correlations with responses to questions about risk, whereas others use the scales to categorize *individuals* into specific categories (e.g., Palmer, 1996). Jenkins-Smith (1994) and Marris et al. (1996) used a combination of both approaches, and Slovic et al. (1995) report correlations with individual questionnaire items and do not refer to the whole scales at all.

Thirdly, and perhaps most importantly, each of the studies used different criteria to measure "public perceptions of risk." Sjöberg (1995), Marris et al. (1996), and Peters and Slovic (1996) used a method similar to that described in this paper, where respondents are asked to rate a selection of environmental, industrial, technological, and health risks on a scale from "little risk" to "high risk." In each of these cases (and even though the cultural bias questionnaires used were different in each case), the results were similar: the correlations reported were all low, but the patterns were broadly consistent with the predictions of Cultural Theory. Thus, egalitarianism, hierarchy, individualism, and fatalism were associated with concern (or lack of concern) for the particular types of risk issues expected for each of the worldviews. The relationship in all these studies was more convincing for egalitarianism than for the other three worldviews.

Dake (1991; Dake and Wildavsky, 1991) reported somewhat higher correlations, but these were obtained with responses to 36 "societal concerns," most of which refer to social and economical issues and not to environmental risks. It seems that the cultural bias scales perform much better to predict preferences for particular

policies to deal with risks (and other social issues) than to predict risk perception ratings. For example, surveys have yielded higher correlations with items about attitudes toward the environment, about the role of technology in our society, and about who is trusted to make decisions about risks (Marris *et al.*, 1996; Peters and Slovic, 1996; Seifert and Torgersen, 1995). Thus, it appears that Cultural Theory may be more useful to investigate and understand attitudes and responses to differing risk management and communication procedures than for predicting abstract ratings of risks. Indeed it is often difficult to fathom exactly what is measured by the psychometric scales commonly used in risk perceptions surveys, including the one reported here—and why it is being measured. The responses to these questions provide little information about how people react, in a socialized context, to potential or realized hazards and to those who manage them. A more contextual approach to both risk perceptions and to the relevant cultural dimensions should yield more interesting results.

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