Risk target : an interactive context factor in risk perception

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Risk Target: An Interactive Context Factor in Risk Perception

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The effect of specification of the target on risk evaluation was examined. A whole set of hazards, covering most of the domains, were considered: common individual hazards, outdoor activities, medical care, public transportation, energy production, pollutants, sex, deviance, and addictions. Three human targets were introduced: personal health risk (including personal risk of death), health risk for people in the country, and health risk for people in the world. The basic design was a between-subjects design. The first hypothesis was that risk judgments made in the "world" condition should be higher than risk judgments made in the "country" condition, and risk judgments made in this condition should be higher than risk judgments made in the "personal" condition. This is what was observed. The second hypothesis was that the target effect should differ as a function of the kind of hazards considered. This also is what was observed. In two domains— pollutants, and deviance, sex, and addictions—the target effect was important. It corresponded to about one-tenth of the response scale. In the four remaining domains, the target effect was unimportant or absent.

KEY WORDS: Addictions; pollutants; risk perception; sex; target

1. INTRODUCTION

"The risk target is of paramount importance in risk studies. This fairly simple fact seems not to be generally known and many studies still work with nonspecified risk targets. This means that they probably miss out on the need to understand perceived personal risk, and it introduces some uncertainty as to what target they actually do study" (Sjöberg, 2000a, p. 3). The present study examined, in a systematic way, the effect of the specification of the target on risk judgments.

Since the seminal work by Slovic, Fischhoff, and Lichtentein (1985), the effect of many factors that potentially govern risk evaluations has been examined. The perceived catastrophic potential of the hazard and the perceived lack of control over the situation have repeatedly been shown to be major determinants of risk perception. Also, anxiety state, enduring anxiety dispositions, beliefs, and worldviews have been shown to be nonnegligible determinants of risk perception (for a review, see Boholm, 1998; Bouyer *et al.*, 2001; Brenot, Bonnefous, & Marris, 1998; Kouabenan, 1998; Weber & Hsee, 2000).

Context effects have also been shown to be important determinants of risk judgments (Brown & Slovic, 1988; see also Slovic & Gregory, 1999). "The numerous factors that characterize the context of the valuation include response mode, relative magnitudes, order effects, stimulus mixture, informational cues, constituency, iterations of valuation, and social

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setting" (Brown & Slovic, 1988, p. 25). Possible response modes include choice among hazards, ranking of hazards as a function of probability of harm (or severity of risk), rating the riskiness of hazards, expression of willingness to pay to avoid the risk, expression of willingness to donate time to avoid the risk. Response mode has important effects: it has, for instance, been repeatedly shown that, in a choice context, an item A may be preferred over an item B, and in a rating context, the same item A may be rated as less attractive than the same item B (the preference-reversal phenomenon, Slovic & Lichtenstein, 1983).

Informational clues are defined as "the nonessential, ancillary information that accompany a valuation" (Brown & Slovic, 1988, p. 26): the labels used to describe a hazard, and define the anchors of the response scale, reference points on the scale, information suggesting judgment criteria, and information about the opinion of others. Informational clues can matter: it has been shown, for instance, that radiation therapy can be preferred over surgery by either about 20% or about 40% of patients with cancer according to the way information about the effectiveness of the therapy was worded—in terms of survival or in terms of death (McNeil *et al.*, 1982).

The target factor, that is, the precise (human or nonhuman) entity affected by the risk, can be viewed as one of these numerous context factors, possibly located midway between the response mode factor and the informational clues factor. As far as we know, only three studies were—at least partly—aimed at examining the effect of the risk target on risk evaluation. Neil *et al.* (1993) introduced four targets in their study on perceived risk associated with household chemical substances: risk to adults, risk to young children, risk to the elderly, and risk to the environment. More than 700 American participants were to judge the level of risk associated with 47 items (e.g., aspirin, powdered laundry detergents, soaps for baby clothes, nonchlorine bleach). Differences in mean ratings were observed and they formed an intelligible pattern. Between ratings given for the three human targets, correlation coefficients were extremely high (from 0.91 to 0.97). Between these three series of ratings and the environmental one, correlation coefficients were notably lower (from 0.58 to 0.70). Judging the risk to the environment is thus not exactly the same as judging the risk to children, adults, and the elderly.

Schütz and Wiedeman (1998) introduced two targets in their study on perceived risk associated with consumer products: risk to persons (personal risk) and risk to the environment. More than 400 German participants were to judge the level of risk associated with 30 items (e.g., cotton undershirt, microwave oven, butter, home computer, and electric razor). For most items, differences in mean ratings were observed. Risk to the environment was judged higher than personal risk for items like washing powder, synthetic fiber leggings, chemical household cleaners, home computer, and TV set; that is, chemical and electrical products. Risk to the environment was judged lower than personal risk for items like sleeping pills, laxative, birth control pill, pork, and butter; that is, pharmaceutical products as well as food and related products. Spearman rank correlation values between mean values observed on both scales were of the same magnitude as the ones observed in Neil, Slovic, and Hakkinen (1993). When computed item by item, the correlations between individual responses given in the personal risk condition and the environmental risk condition were clearly lower. They ranged from 0.29 (cigarettes) to 0.59 (genetically engineered strawberries). For some hazards, the two series of judgments seemed to have little in common.

Sjöberg (2000a) introduced three targets in his study: personal risk, risk for the family, and risk in general. More than 1,200 Swedish participants—a large representative sample of the Swedish population—were to judge the level of risk associated with 15 items of various types (e.g., AIDS, radon, sedentary life, industrial pollution). Substantial differences were observed between the general risk condition and both other conditions. As an example, the mean rating for radon was close to 3.3 in the general risk condition and close to 1.4 in the other conditions (a 2-point difference on a 7-point scale). Overall, risk ratings in the general risk condition were higher than mean ratings in the family condition and risk ratings in the family condition were higher than mean ratings in the personal condition. The author interpreted this pattern of results as a manifestation of what has been called unrealistic optimism (Klein & Weinstein, 1997).

1.1. The Present Study

The present study was aimed at extending previous studies on the effect of specification of the target on risk evaluation. It mainly differed from previous studies in that a whole set of hazards, covering most of the domains recently found by Bouyer *et al.* (2001) through factor analyses of risk judgments, were considered: Common Individual

Hazards (e.g., cleansers, computer screens, mineral water), Outdoor Activities (e.g., downhill skiing, jogging, power mowers), Medical Care (X-rays, open-heart surgery, anesthetics), Public Transportation and Energy Production (e.g., railroads, buses, power plants), Pollutants (e.g., nuclear waste, giant tankers, chlorofluorocarbon), and Sex, Deviance, and Addictions (e.g., homosexual relationships with many partners, terrorism, tobacco smoking).

It also differed from previous studies in that the basic design was a between-subjects design; that is, different participants were affected to different conditions. As a result, possible undesirable carry-over effects were eliminated. Three human targets were introduced: personal health risk (including personal risk of death), health risk for people in the country, and health risk for people in the world. The three levels of the target variable clearly corresponded to three well-defined population levels. As in Schütz and Wiedeman (1998), the present study took into account some broad characteristics of the participants. Eight age levels were considered, from adolescents to adults and from adults to elderly and very elderly people.

Our first hypothesis was derived from Sjöberg (2000a) and concerned the unrealistic optimism effect. Although this effect was usually found in studies where participants were asked to estimate the probability to be harmed by some hazard (i.e., the probability to have an automobile accident) and not to estimate the severity of the harm (Klein & Weinstein, 1997), the convergent results shown by the three studies reported above strongly suggest that the unrealistic optimism effect could also be at work when judging risk severity. Risk judgments made in the world condition should be higher than risk judgments made in the country condition, and risk judgments made in the country condition should be higher than risk judgments made in the personal condition.

Our second hypothesis was derived from Schütz and Wiedeman (1998; see also Desrichard, Verlhiac, & Milhabet, 2002). These authors showed that the target effect differed as a function of the kind of hazards considered. In the present study, the target effect was expected to be different in strength from one domain to another; that is, a domain × target interaction was expected. More concretely, a considerable target effect was expected on all kind of personally uncontrollable hazards that can affect many people at the same time (eventually the whole country or significant portions of the planet). This could be the case of

hazards composing the Pollutants' domain. A more reduced target effect was expected on hazards that can be viewed as more liable to personal control and personal efforts to avoid them, and having more individual consequences (Common Individual Hazards, Medical Care).

Additional research questions concerned the effect of age and gender on the target effect; that is, they concerned possible age × target and gender × target interactions. Previous studies having already shown that the target effect is present at every age level for females as well as for males (Guppy, 1993; Harris & Middleton, 1994), we expected that the results found in this study should be relatively invariant across age and gender. Additional research questions also concerned more complex interactions involving domains.

2. METHOD

2.1. Participants

The sample was composed of 814 nonpaid participants (411 females and 403 males) recruited on a voluntary basis. They were aged 18 to 84: 131 participants were 18–24 years old, 111 were 25–29, 111 were 30–44, 118 were 45–54, 113 were 55–64, 117 were 65–74, and 113 participants were older than 74.

Participants were contacted during daylight hours in the main streets of several towns in the west of France (the area of Nantes) and in the south of France (the area of Toulouse). The 11 experimenters solicited every third passerby until a total of 55 participants was reached for each age-gender subgroup. The people approached were told that our research team was conducting a survey on risk perception, and were given some examples of the questions or shown the first page of the questionnaire. The acceptance rate was high: 72% of the people contacted participated in the study.

2.2. Material

The questionnaire was composed of 102 items taken partly from Slovic, Fischhoff, and Lichtenstein's risk questionnaire and partly from the Bouyer *et al.* questionnaire. (Some additional items were also devised for the present study.) These items covered six of the domains found in Bouyer *et al.*: Common Individual Hazards; Outdoor Activities; Medical Care; Public Transportation and Energy Production; Pollutants; and Sex, Deviance, and Addictions.

2.3. Procedure

Each participant responded individually. Participants were assigned to three different conditions: personal, country, and world. In the first condition—the personal condition— participants were informed that the term "risk" referred to the risk of being personally seriously ill (wounded, and even of dying). They were invited to ask questions about unfamiliar terms and then to fill out the questionnaire. When an item did not evoke anything concrete, participants were allowed not to respond. Responses were given on an 11-point scale labeled from "No risk" to "Extremely severe risk." As in Slovic *et al*. (1985), the marks on the scale ranged from 0 to 100: 0, 10, 20, . . . , 90, 100. No time limit was imposed.

In the second condition—the country condition— participants were informed that the term "risk" referred to the risk for all people in the country of being seriously ill. In the third condition—the world condition—participants were informed that the term "risk" referred to the risk for all people in the whole world of being seriously ill, wounded, or dying.

Responses were recorded in two successive steps. First, participants were invited to circle, with a black pencil, the number between 0 to 100 that best corresponded to their view. Then the participants were allowed to change their responses using a red pencil. In particular, they were requested to clearly differentiate between risks as much as possible. The main goal of this two-step procedure was to ensure that participants used the entire range of the response scales.

3. RESULTS

3.1. Risk Perception Inventory: Mean Responses and Structure

Mean responses to the risk perception items ranged from 7.99 to 82.77. Items with the lowest means (<20) were mineral water (bottles), vacuum cleaner, phone, homeopathic drugs, jogging, acupuncture, make-up remover, vaccination, and plastic food containers. Items with the highest means (>65) were heroin, nuclear weapons, cocaine, ecstasy, nuclear power plants, nuclear waste dumping, terrorism, warfare, tobacco, and nuclear waste processing plants. Mean values computed for each condition were highly correlated (0.98, 0.98, and 0.99).

A factor analysis was conducted on the raw data. Correlation coefficients were computed between items and across participants, and the resulting correlation coefficients were then factor analyzed. A six-factor solution was retained based on the scree test, and a VARIMAX rotation was performed.

The first factor was called *common individual hazards*. It was moderately loaded by numerous very common activities, substances, or technologies: food preservatives, food colorants, air conditioning in public places, make-up cleansers, computer screens, air conditioning at home, cosmetics, hair dye, plastic food containers, electronic games, packaged foods, Walkman, noise, cellular telephones, divorce, mineral water (bottles), microwave ovens, and oral contraception. A mean score was computed for this factor by averaging the responses obtained for each item. The overall perceived severity was low: 28.29 out of 100.

The second factor was called *pollutants*. It was loaded with items describing the production and large-scale use, diffusion, conservation, and misuse of various substances: nuclear waste dumping, chemical plants, nuclear waste reprocessing facilities, nuclear power plants, nuclear weapons, giant tankers, terrorism, floods, deforestation, food irradiation, warfare, chlorofluorocarbon, and global warming. The overall perceived severity for this factor was high: 64.42.

The third factor was called *urban transportation and home life*. It was loaded with items describing various common public and private modes of transportation, as well as items referring to home life: buses, home power tools, railroads, motor vehicles, bicycles, gas furnaces, and vacuum cleaners. This factor's overall perceived severity was low: 24.36.

The fourth factor was called *outdoor activities*. It was loaded with a series of items involving outdoor activities: skateboards, diving, downhill skiing, jogging, soccer, power mowers, rugby, and motorcycles. The overall perceived severity was one of the lowest: 27.59.

The fifth factor was called *deviance, sex, and addictions*. It was loaded with a series of very risky activities: coke, heroin, ecstasy, amphetamines, cannabis, homosexual relationships (with many partners), morphine, heterosexual relationships (with many partners), handguns, nuclear weapons, alcoholic beverages, and tobacco smoking. The overall perceived severity was the highest: 64.59.

Finally, the sixth factor was called *medical care*. It was loaded with items describing medical interventions: radiotherapy, x-rays, lasers, surgery, vaccination, anaesthesics, open-heart surgery, blood
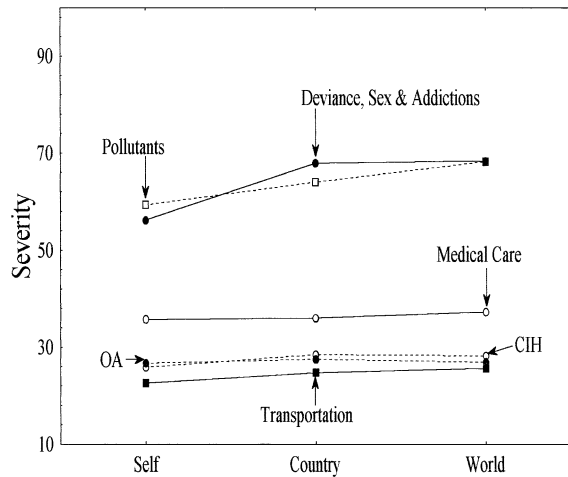
Fig. 1. Effect of the target on each of the six factors (OA = Outdoor Activities, CIH = Common Individual Hazards).

transfusion, and prescription drugs. The overall perceived severity was not very high: 36.75.

3.2. Effect of the Target Variable

Fig. 1 shows the effect of the target variable on the six series of factor scores. On the vertical axis is the judged severity. On the horizontal axis are the three perspectives from which risk severity was judged: self, country, and world. Each curve corresponds to one factor.

The four bottom curves are practically flat. The effect of the target variable on these risk factors

is negligible. By contrast, the two top curves are ascending. When judging from the perspective of the whole world, participants rated the severity of the hazards corresponding to the Pollutants factor higher (68.32) than when judging from the perspective of the country (64.08), and when judging from the perspective of the country, participants rated the severity of these hazards higher than when judging from the perspective of the self (59.41), $F(2, 811) = 11.19$, $p < 0.0001$. Also, when judging from the perspective of the whole world or of the country, participants rated the severity of the hazards corresponding to the deviance, sex, and addictions factor higher (68.15) than when judging from the perspective of the self (56.25), $F(2, 786) = 32.95$, $p < 0.0001$.

Two complementary ANOVAs were conducted with a target × age × gender design on each of the last two series of factor scores. All the interactions involving age, gender, or age × gender were nonsignificant. The effect of the target variable was not significantly different from one group of participants to another (see Fig. 2).

Finally, a set of 102 one-way ANOVAs with Target as the independent factor were conducted, one on each item. Table I shows the results for the 19 items for which the effect was stronger ($p < 0.0001$). Two of these items were not captured by one or another of the six factors: antipersonnel mines and giving birth. These two items were judged notably more risky when considered from the world perspective than from the two other perspectives.
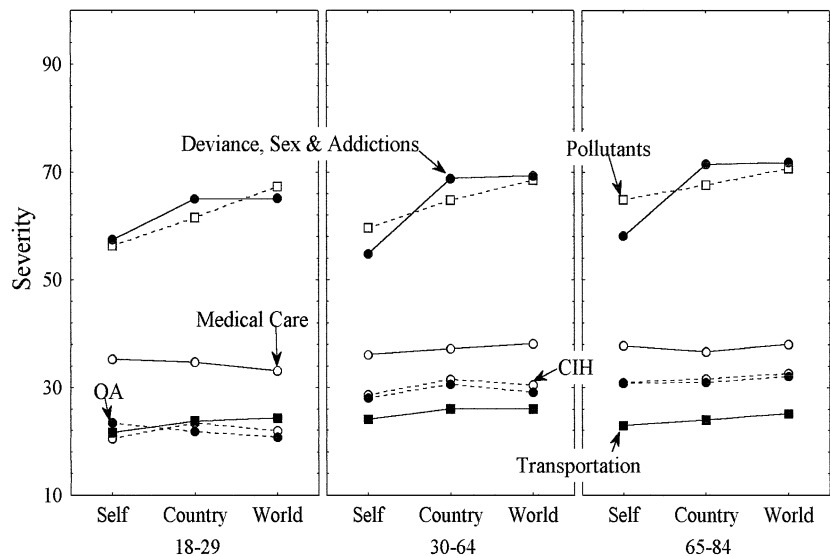

Fig. 2. Effect of the target on each of the six factors and for each age group (OA = Outdoor Activities, CIH = Common Individual Hazards).

Items	Self M	Country M	World M	Overall M	Overall SD	ANOVA F	ANOVA p
Heroin	71.77	87.78	88.71	82.77	29.82	32.22	.0001
Antipersonnel mines	49.33	52.53	66.19	56.01	28.22	31.80	.0001
Carbines	52.59	68.22	7.75	63.86	32.01	29.65	.0001
Cocaine	70.08	86.23	85.59	80.65	30.09	29.04	.0001
Amphetamines	49.30	61.47	63.88	58.22	26.29	27.66	.0001
Crimes	52.74	62.19	65.42	60.12	26.95	18.33	.0001
Warfare	62.48	70.13	78.34	70.32	32.62	18.12	.0001
Homosexual relationships with many partners	52.42	65.92	66.81	61.67	35.35	15.46	.0001
Terrorism	63.77	70.31	78.20	70.76	32.62	14.94	.0001
Alcoholic beverages	51.59	61.01	61.69	58.10	25.57	14.85	.0001
Antidepressants	40.80	50.59	50.00	47.14	27.34	12.22	.0001
Ecstasy	69.94	80.10	80.48	76.85	30.27	11.81	.0001
Giving birth	21.20	26.38	29.80	25.79	22.51	11.18	.0001
Tobacco smoking	63.46	73.47	71.12	69.36	27.43	11.01	.0001
Nuclear weapons	77.33	82.86	87.73	82.64	27.62	10.69	.0001
Motorcycles	39.17	46.40	47.80	44.46	25.32	10.07	.0001
Nuclear power plants	66.45	70.65	77.15	71.41	29.62	9.98	.0001
Global warming	46.64	50.51	57.13	51.42	29.71	9.60	.0001
Morphine	48.56	53.61	57.97	53.38	26.41	9.55	.0001

Table I. Items for which the Target Effect was the Strongest

4. DISCUSSION

The objective of the present study was to examine the effect of specification of the target on risk evaluation. The first hypothesis was that risk judgments made in the world condition should be higher than risk judgments made in the country condition, and risk judgments made in the country condition should be higher than risk judgments made in the personal condition. Overall, this is what was observed. This result is consistent with Sjöberg's findings, and with a whole set of findings in the unrealistic optimism line of investigation (Klein & Weinstein, 1997). Whether these results truly reflect unrealistic optimism or the effect of some informational cue as the number of people corresponding to each target—from one person to the whole world—remains to be examined. As already shown by Sjöberg (2000a), however, the "optimism" effect is present even when the number of people considered remains the same (self or a close friend or the average Swedish) (see also Regan, Snyder, & Kassin, 1995).

The second hypothesis was that the target effect should be different in strength from one domain to another. This also is what was observed. Factor analysis revealed that the assessments of risk structured themselves into six domains, those six that were postulated on the basis of the work by Bouyer *et al*. (2001).

In two of these six domains, pollutants, and deviance, sex, and addictions, the target effect was important. It corresponded to about one-tenth of the response scale (see Fig. 3 for a more detailed illustration of the effect). In the four remaining domains, the target effect was unimportant or absent. In addition, when present, the target effect did not show the same form. In the pollutants' domain, the effect was roughly linear. By contrast, in the deviance, sex, and addiction domain, the effect was nonlinear.

That the target effect for pollutants was roughly linear makes sense. Pollutants are produced and disseminated in the whole world. Their negative effects on health can be controlled only at the state level. Participants can have—quite rightly—judged that in their country, safety policies as regards pollutants were better, and were possibly more strictly followed by industrials than in developing countries around the world, hence the country-world difference. Participants can also have—more disputably—judged that in their home and their personal environment, pollutants are less likely to be present or dangerous for their health than elsewhere in the country.

That the target effect was nonlinear for deviance, sex, and addictions also makes sense. The decision to drink alcohol, to smoke tobacco, and to have sex are mainly personal decisions. Participants can have—rightly for some of them and falsely for

Fig. 3. Effect of the target on the items forming the pollutants' factor.
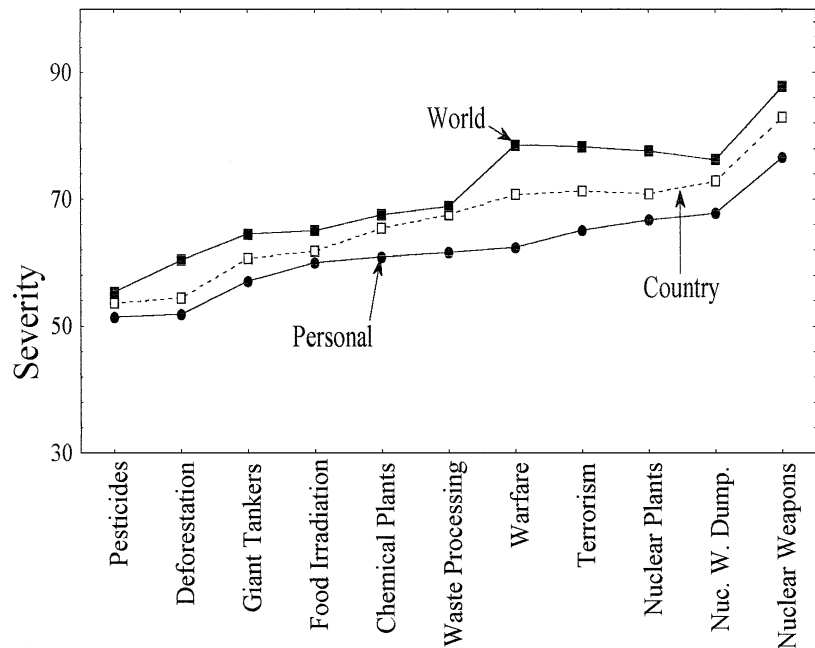
others—judged that their usual behaviors, as regards these substances or activities, are safer than the ones of other people, irrespective of the people considered. In addition, these results held irrespective of the gender and the age of the participants.

4.1. Limitation of the Study

An important limitation of the study resides in the sample studied. Participants were volunteers, and although special efforts were made to contact people from different geographic areas (west and south of France) and from different educational levels, we are unsure about the representativeness of our sample. As a result, the value of the present study is not in precisely estimating risk perception for different substances, activities, or technologies in the general French population (see Sjöberg, 2000b) but in adding evidence on the way age, gender, risk target, risk domain, and risk perception are related to each other.

4.2. Implications for Study Design

The implications of the present results are straightforward. "Experiments to elicit assigned values must be carefully designed to represent the context to which the results are to be generalized" (Brown & Slovic, 1988, p. 29). If the perceived risk assessments are to be used in individual contexts (e.g., for a prevention campaign aimed at changing

individual behaviors), the question asked should be tailored in a way that allows participants to express their personal concern for themselves (threat for personal health or personal well-being). If the perceived risk assessments are to be used in more general contexts (e.g., knowing how people would react to new governmental regulations about some kind of risk), the question asked should be tailored to correspond to the adequate level of generality (the county, the state, or the world).

Finally, if the objective is only to set an agenda of priorities, both kinds of assessments (self-focused or not self-focused) can be used. As shown in this study, and as repeatedly shown in other studies (Neil, Slovic, & Hakkinen, 1993; Schütz & Wiedeman, 1998; Sjöberg, 2000a), even when the precise risk assessments can highly differ as a function of the way they are elicited, their relative order tends to remain the same. As stated 20 years ago by Fischhoff and MacGregor (1983), "People have a consistent and fairly accurate feeling for the relative threat posed by different hazards" (p. 235).

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