

Security or opportunity: the effects of individual and situational factors on risk information preference

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S E C U R I T Y O R O P P O R T U N I T Y
The effects of individual and situational factors on risk information preference

René Lion

S E C U R I T Y O R O P P O R T U N I T Y
The effects of individual and situational factors on risk information preference

P R O E F S C H R I F T
ter verkrijging van de graad van doctor aan
de U n i v e r s i t e i t M a a s t r i c h t ,
op gezag van de Rector Magnificus,
Prof. Dr. A.C. Nieuwenhuijzen Kruseman
volgens het besluit van het College van Decanen,
in het openbaar te verdedigen
op vrijdag 5 oktober 2001 om 14:00 uur

door

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IT'S ONLY IN UNCERTAINTY,
THAT WE'RE NAKED AND ALIVE
- PETER GABRIEL -

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S E C U R I T Y O R O P P O R T U N I T Y
THE EFFECTS OF INDIVIDUAL AND SITUATIONAL FACTORS ON RISK INFORMATION PREFERENCE

INTRODUCTION

We are regularly confronted with risks of which we had hitherto been unaware or which simply did not exist (such as BSE, fireworks storage, nuclear energy, genetic modification). In particular when the media pick up such risks, people are confronted with sheer endless amounts of information. The risk is discussed in news broadcasts, newspapers, magazines, at work and when having a drink in the bar. In addition, our society provides people with countless sources of information, such as the world wide web, health services and so forth. If we are not to be overwhelmed by all this information, we have to select and filter the information that we receive or access. It is this information selection process that is the main subject of this thesis. The central question is what kind of information people desire when they are first confronted with a new risk and what factors can influence this information desire.

An important reason for carrying out this research is that the way people deal with risks can be rather puzzling, particularly from a scientific point of view. Sometimes people worry about risks, although there does not appear to be much reason for this. For example, in some cases mobile phone antennas on rooftops of apartment buildings have led to great worry among tenants about the possible health risks involved, despite strong evidence that the electromagnetic fields around these antennas cannot affect people's health. On the other hand, sometimes people seem to worry too little about a risk. For example, despite being well aware of the dangers of malaria, travellers very often fail to take their prophylaxis as prescribed.

People's way of dealing with risks has generated considerable interest among risk "experts". In most risk perception research people are implicitly approached as passive information processors. Thus, extensive research has been conducted on how risk characteristics and individual differences can influence the way people deal with risks. In these studies risk information is presented to participants in an experiment, and the investigator decides what information is provided to the participants. Consequently, people's risk information *desire* has hardly been investigated. In contrast, in this thesis people are approached as *active* information seekers. The information that people seek about a risk may be a very important determinant of the way in which people deal with it. For instance, someone seeking a lot of information about a risk without an a priori preference for reassuring or disconcerting information will probably judge a risk differently from somebody who seeks little information, and in a selective way at that. Thus, revealing people's information desire is important for shaping theory on the way people deal with risks. In addition, it is also of practical relevance. Risk communicators can probably communicate more effectively by adapting their risk communications to people's information desires.

In addition to investigating people's information desire, this thesis also aims to uncover what factors can influence their risk information desire. Two categories of factors can be distinguished: individual differences and situational factors (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Jacoby, Jaccard, Kuss, Troutman, &

Mazursky, 1987; Payne, Bettman, & Johnson, 1993). *Individual differences* are factors that characterise a person, i.e. personality traits. In this thesis, the main focus is on risk-taking tendency (the extent to which a person tends to avoid or approach risks) but trait-anxiety (the extent to which people tend to be anxious in general) is also considered. *Situational factors* concern the situation or context in which people search and select information about the risks, for example whether one has to justify one's risky decision ("accountability") or whether one has had to express one's opinion about the risk before selecting information. If individual and situational factors can influence people's information desire, this would mean that the way in which people deal with risks can be influenced at an early stage of people's risk perception process.

Research on people's risk information desire is scarce (but see Huber, 1997). Therefore, a variety of research methods have been used to investigate the research questions. In addition to a number of experiments that were conducted in a laboratory setting, a qualitative research method was used (in this case, focus group interviews). Qualitative research is desirable when a research field is so new that important aspects may be overlooked. Furthermore, it was necessary to develop and validate a scale measuring general risk-taking tendency, as such a scale did not yet exist.

A consequence of the fact that this thesis covers relatively new terrain is that there is not much research that this thesis can build on. Two research areas are relevant, to wit risk perception research (e.g., Hendrickx, 1991; Kahneman & Tversky, 1979; Slovic, 1987; Tversky & Kahneman, 1982; Vlek & Stallen, 1981) and research on active information search in decision making in general, for example concerning consumer choice (e.g., Ford et al., 1989; Jacoby et al., 1987; Payne, 1992; Payne et al., 1993). These vast research areas will be discussed in somewhat more detail in the remainder of the introduction, but only to the extent that these are relevant to the current thesis. Furthermore, the work that Huber and his colleagues have recently done on people's active risk information search will also be presented shortly. This sketch of the relevant research areas will be followed by an overview of the studies that make up the remainder of this thesis. However, first "risk" will be defined.

Risk

Risk is a fuzzy word. Consequently, risk research has proposed a disconcerting amount of definitions (see Vlek & Stallen, 1980). Nevertheless, most of these definitions are in line with the dictionary definition risk: "the possibility of loss, injury, disadvantage, or destruction" (Webster's Dictionary, 1971). This definition incorporates the two core aspects of risk, probability and negative consequences (Yates, 1992). Uncertainty is necessary: jumping off the Eiffel tower (i.e., 100% certainty) is not risky (though definitely suicidal), simply because the negative consequences (i.e., dying) are certain. Furthermore, some kind of adverse consequences should be involved. Some researchers also define the absence of gains as negative conse-

quences, but defining risk as the fact that one can *not* win an amount of money after presenting someone with a free lottery ticket is stretching the meaning of what a risk is understood to be. The Dutch lottery organisation has used just this "stretching of the meaning" in a campaign encouraging people to participate in the Lotto with the slogan, "Lotto, the biggest risk of becoming a millionaire".

In this thesis risk is therefore defined as "the possibility of negative consequences". Even with this definition, risk remains an elusive concept. This is probably because this definition leaves open a wide range of incomparable behaviours and situations that can be defined as risky (Byrnes, Miller, & Schafer, 1999), but differ in their severity. These may range from buying a new brand of beer to clearing away landmines, with the latter being seen as more prototypical of the category of risky behaviours than the former.

A SHORT REVIEW OF PSYCHOLOGICAL RISK PERCEPTION RESEARCH

This thesis is concerned with how people deal with risk information. Within (psychological) risk perception research four perspectives can be distinguished. The first is the experimental perspective, which has firm roots in economics and decision-making research. This perspective mostly consists of experimental (laboratory) research in hypothetical risk situations (e.g., Bar-Hillel & Neter, 1996; Kahneman & Tversky, 1979; Schneider & Lopes, 1986; Weigold & Schlenker, 1991). Most of this research has used gambles and lotteries as a way to operationalise risks and it has mainly focused on how differences in probability and value information can lead to different decisions. The second is the psychometric perspective, which has tended to be more interested in large scale, societal risks and has used risk comparison techniques and preference ratings to describe people's risk perceptions (e.g., Slovic, 1987; Vlek & Stallen, 1981). The third is the personalistic perspective's. Its main focus has been to isolate personality characteristics that might explain individual differences in engaging in high risk activities (e.g., Zuckerman, 1979, 1994). Lastly, a social perspective can be distinguished, in that (cultural) anthropologists have studied why different societies feared different risks (Douglas & Wildavsky, 1982). Furthermore, social psychological research has provided evidence that group processes and social contexts can influence risk perceptions (Tetlock, 1989; Tetlock & Boettger, 1994; Wallach, Kogan & Bem, 1962).

The experimental perspective

The experimental perspective has generated a considerable knowledge base about the way people deal with the two central aspects of risk, probability and the negative consequences. The experimental perspective has strong foundations in research in economics and its main focus is on modelling the way people *should* make decisions under risk. The models used in the experimental perspective are therefore mostly normative models on (risky) decision making.

The dominant paradigm in the experimental perspective is the gambling paradigm, and the central notion is 'Expected Value' (EV). The expected value of a gamble is equal to the multiplication of the outcomes with their respective probabilities. Thus, the EV of a .80 probability (p) of winning \$4000 is: $EV = p \times \text{Value} = (.80 \times \$4000) + (.20 \times \$0) = \3200 . The earliest example of the experimental perspective is probably the so-called St. Petersburg paradox. In the eighteenth century, Nicholas Bernoulli offered people the possibility to participate in a bet in which a fair coin was flipped until a head appeared. The individual entering this bet would receive the amount of $\$2^n$, where n is the number of flips of the coin necessary to produce a head. The Expected Value (EV) of this bet is infinite (the EV of the first flip is \$1 [$0.5 \times \2], the EV of the second flip is also \$1 [$0.5^2 \times \2^2] etcetera, and $\$1 + \$1 + \$1 \dots$ adds up to an EV that reaches infinity). One of the basic tenets of EV models and its elaborations (Subjective Expected Utility or SEU models) was that people should make decisions in accordance with the axioms of rationality. One of these was that people should maximise the outcome of a choice situation, i.e., they should choose the option with the maximum expected utility (or minimum disutility). This axiom implies that people should have been very eager to participate. However, even though the potential gains of this lottery were enormous, people were *not* very eager to enter the lottery. The fact that people's risk taking behaviour can differ substantially from what would be expected on rational theoretical grounds has proven to be the main impetus for most of the research conducted in the experimental paradigm.

A gamble or lottery was assumed to be a "laboratory model of the real world" (Lopes, 1983, p. 137). Thus, risk was conveniently formalised in terms of money, that is the choice between a certain amount of money (the riskless choice) and the *chance* of winning an even larger amount of money (the risk seeking choice), for example the choice between \$3000 for sure and 80% chance of winning \$4000. The experimental perspective has spawned a huge amount of research convincingly showing that people very often do not behave in accordance with the rationality axioms. Scientists ascribed these "errors" participants made to a limited information processing capacity. People have difficulty making rational decisions, and these difficulties were largely ascribed to the way people deal with probabilities. People could not or would not always make rational decisions: people were "cognitive misers". Instead of only focusing on people's decision errors, researchers then tried to describe how people used probability and value information in making their risky decisions. Two very influential findings were the result of these investigations. The first was that most "errors" could be traced back to a limited number of

heuristics or cognitive shortcuts (Tversky & Kahneman, 1982). An example is the availability heuristic, or assessing "the frequency of a class or the probability of an event by the ease of which instances or occurrences can be brought to mind" (Tversky & Kahneman, 1982, p.11). Thus, one can estimate the risk of burn-out among young researchers by recalling occurrences from colleagues. Although these heuristics can lead to adequate results from a normative point of view, they can also lead to systematic biases and errors. The second finding was that a seemingly irrelevant aspect of the decision-making context could affect the decisions that people made. Specifically, the by now famous Asian Disease problem showed that people could reverse their choices depending on whether the choices were framed as gains (lives saved) or losses (lives lost). If the options were framed as losses, a majority selected the risky option, but if the options were framed as gains, a majority selected the riskless option (Kahneman & Tversky, 1983).

Expected Value theories have not been able to adequately describe human decision making in most situations. Nevertheless, these models continue to have a tremendous impact on decision making. This is probably largely due to their elegance and simplicity (Neumann & Politser, 1992). Furthermore, debate still exists whether people should behave more in line with SEU models (so that they can make optimal decisions), or that the SEU models should be discarded with or improved so that they are more in line with human behaviour (see Neumann & Politser, 1992).

Research conducted in the experimental perspective tends to use highly simplified and well-defined decision problems. Virtually all decision problems involve gambles. An important benefit of gambles is that they allow for the independent manipulation of Expected Value and probability. Moreover, using money has the advantage of being able to use objectively equivalent gains and losses (i.e., losing or gaining \$1000). However, many of the experiments used gambles that did not offer choices between gains (e.g. \$200 for sure) and losses and gains (e.g., .10 chance of winning \$11,000 and .90 chance of losing \$1000) but only between sure things and probabilities of winning, or between different probabilities of winning. Thus, opting for the sure thing was considered risk avoiding and opting for the probability of winning was considered risk taking. These options were therefore not really risky in the sense that people might be confronted with real losses. Lastly, as will be argued in the following section, the idea of gambles as a laboratory model of the real world has been criticised (Hendrickx, 1991; Huber, 1997). Research has shown that there is more to risk than simply the multiplication of the outcomes with their respective probabilities. Thus, the "risks" used in the experimental perspective lack many features that play an important role in real-life risks, which are usually less well defined.

Not all researchers in the experimental perspective have made use of gambles, however. Hendrickx argued that the use of real-life, or "naturalistic" risks could lead to important new insights. As opposed to gambles, naturalistic risks usually offer some opportunity to control it, either through prevention or reduction of the negative consequences (Hendrickx & Vlek, 1991; Hendrickx, Vlek, & Caljé, 1992). Hendrickx found that people do not only take information about the probability and

(severity of) the negative consequences into account. Scenario information (i.e. information about the process that underlies the occurrence of a risky event) proved to have more robust effects on probability judgements than frequency information. Hendrickx explains these findings in terms of the cognitive availability of accident scenarios and the controllability information scenarios offer. This research shows the importance of using naturalistic risks as opposed to gambles as a means to improve the ecological validity of experimental risk perception research (Hendrickx, 1991; Huber, 1997; Maule, Hockey, & Bdzola, 2000).

The psychometric perspective

The experimental perspective described in the previous section can be criticised for oversimplifying risk. This became particularly eminent when societies were confronted with new (chemical and nuclear) technologies, which had the possibility of creating catastrophic damages. These new technologies made it very important for policy makers to effectively communicate about risks (Slovic, 1987). It quickly became clear that using annual fatality rates as risk estimates (i.e. an expected value approach in which money is substituted for lives lost) did not yield the results they had hoped for. "Lay people" did not deal with risks in the way "experts" thought was rational and "lay people's" risk judgements generally differed from those of experts (Slovic, 1987). For example, from an annual fatality rate perspective, people should be more worried about dying from eating too much fat, than about dying from BSE-infected beef, but the recent BSE-crisis shows that this is not the case. Clearly, probability and severity information are not sufficient to describe people's risk perceptions. The psychometric paradigm has tried to uncover what aspects underlie people's risk perception. Through various techniques, people's evaluations and opinions about risks such as nuclear energy and LPG-tankers were elicited on a number of risk aspects. Slovic and his colleagues originally used nine aspects: voluntariness of the risk, immediacy of effect, knowledge about the risk of those exposed, scientific knowledge about the risk, control over the risk, newness, chronic-catastrophic, common-dread and severity of consequences (Slovic, Fischhoff, & Lichtenstein, 1985). This research revealed that people's risk judgements were not only based on "objective" estimates of annual fatalities, but also on other characteristics of a risk, like a risk's controllability and familiarity (Johnson & Tversky, 1984; Slovic et al., 1985; Vlek & Stallen, 1981). Research in the psychometric paradigm has found a factor space diagram with two main factors or dimensions, Dread risk and Unknown risk. The "Dread risk" factor captured risk aspects such as the risk's controllability, the feelings of dread it arouses and the extent to which it is globally catastrophic. The "Unknown risk" factor captures risk aspects such as its observability, whether it is known to scientists and those exposed, its newness and the extent to which its effects are delayed. This pattern has been found quite consistently (Johnson & Tversky, 1984; Marris, Langford, Saunderson, & O'Riordan, 1997; Slovic, 1987) and a similar factor structure was also found by Vlek and Stallen (1981). In some cases a

third factor (globally catastrophic), related to the number of people that are exposed to the risk, has been found (Slovic, 1987).

The psychometric paradigm has shown that people have a more complex view of risk than "experts" had initially assumed, in the sense that they used more risk aspects in determining risk perceptions than "experts" tended to do. It has also shown how people view risks in relation to one another. The risk aspects used in the psychometric paradigm are based on theoretical work by Starr and Lowrance (Slovic et al., 1985) and all relevant risk aspects appear to have been included in the evaluation set, but it is possible that some have been overlooked. Sjöberg (2000) for example found that "immoral and unnatural/tampering with nature" was also an important aspect in people's risk perceptions. Nevertheless, the studies provide valuable insights into the way people perceive risks. However, the studies give an idea of risk perceptions *after* they have been formed and they are correlational. Although they may appear to indicate an underlying causal risk perception process, any causal explanation is unwarranted. In line with this reasoning, it is unclear whether the aspects used in the psychometric paradigm are actually the aspects that people desire information about when they are confronted with risks.

The personalistic perspective

Personality psychologists have been interested in why people differ in the amount of risk they are willing to take. This has led to a variety of scales that claim to measure people's tendency to take or avoid risk.

The first line of research in the personalistic tradition revolves around sensation seeking or arousal seeking scales, such as the Zuckerman's Sensation Seeking Scale (SSS; Zuckerman, 1979, 1994), the Tension Risk Adventure Inventory (TRAI; Keinan, Meir, & Gome-Nemirovsky, 1984), the Telic Dominance Scale (TDS; Murgatroyd, Rushton, Apter, & Ray, 1978), and the Arnett Inventory of Sensation Seeking (AISS; Arnett, 1994). As it is the most widely used and best validated of these scales, only the SSS will be dealt with in more detail. Zuckerman defined sensation seeking as the "*seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experiences*" (Zuckerman, 1994, p. 27, italics in original). Over the past few decades, research has convincingly shown that sensation seekers take various kinds of risk in their search for novel and intense sensations and experiences (Zuckerman, 1994). However, risk taking is a side effect of sensation seeking rather than that it defines sensation seeking (Zuckerman, 1994). Most of the risk-taking behaviours studied in the sensation seeking literature involve some kind of novel or intense experience. In essence, the sensation seeking scale is not intended as a measure of *risk* taking but of sensation and novelty seeking.

Another risk-taking measure that merits attention is the Everyday Risk Inventory (ERI; Steketee & Frost, 1994). The ERI was constructed to measure the extent to which individuals "avoid potentially harmful everyday activities" which is

said to characterise obsessive-compulsives. The ERI appears to adequately measure everyday risk taking. However, a number of items will hardly be considered risky for non-obsessive compulsives (e.g., "Open a can of soup without wiping the top off"). The ERI does therefore not appear appropriate for the measurement of general risk-taking.

Achievement motivation (Atkinson, 1957), and the related Uncertainty Orientation (Sorrentino, Hewitt, & Raso-Knott, 1992; Sorrentino & Short, 1986) have also been related to people's risk-taking tendency. However, the main focus of this line of research has been people's need for achievement, in the sense that risk taking involved setting risky or cautious targets for oneself in tasks that required some kind of skill, thus changing the size of the possible payoff and losses (i.e., standing further away from the target in a ring tossing game). In essence, this research tested a theory of achievement motivation rather than a theory of risk taking (Kogan, 1972).

Finally, Lopes also proposed that some people were risk averse, whereas others were risk seeking (Lopes, 1984, 1987; Schneider & Lopes, 1986). According to Lopes (1987), "risk-averse people are motivated by a desire for security, whereas risk-seeking people are motivated by a desire for potential" (p. 275). Risk-averse and risk-seeking participants were distinguished by observing their preference for sure things or risky options (e.g., the choice between .80 of \$4,000 vs. \$3,200 for sure). There are two important reasons why this way of measuring differences in risk taking is inappropriate. First, both choices involved winning; the risky choice did not include the possibility of losing. Second, gambles and lotteries are very different from real-life risks (Huber, 1997).

Other personality traits have also been related to risk-taking behaviour, such as anxiety and self-esteem. However, studies on individual differences and risk taking are relatively scarce and most of them have been conducted quite some time ago. Moreover, they are mostly explorative in nature (Locander & Hermann, 1979; Scodel, Ratoosh, & Sayer Minas, 1959; Shanninger, 1976) and they have used individual difference scales that are mostly no longer in use in personality psychology (e.g., the Thematic Apperception Test and the Aniseikonic Lens Measure). Furthermore, the risks used in these studies were either gambles (Scodel et al., 1959) or risks involved in buying a certain product, such as beer, shampoos etc.

Taken together, none of the research on personality traits that are related to risk taking actually deals with theories of risk taking. No research appears to have investigated the aforementioned scales to predict the way people deal with large scale risks typically used in the psychometric paradigm, such as nuclear energy, or more everyday risks such as taking an aspirin. This would have validated the scales for behaviours that do not include novelty or sensation. Also, none of the research conducted has attempted to investigate *how* differences in personality lead to differences in risk taking. The investigations have only looked at the way the people behave (i.e., make risky choices, drive recklessly, use drugs etc.) without investigating what information people use to arrive at those decisions.

The social perspective

The research that has been discussed so far has investigated risk perception on the individual level. However, Douglas and Wildavsky (1982) have argued that what a society considers to be a risk depends on social processes. Thus, for example, few Dutchman would dream of eating raw chicken from fear of a salmonella infection, whereas Japanese have no qualms in presenting raw chicken liver on a tray of ice. The Social Amplification of Risk framework elaborates on this idea, asserting that "the social amplification of risk denotes the phenomenon by which information processes, institutional structures, social-group behaviour, and individual responses shape the social experience of risk, thereby contributing to risk consequences" (Kasperson et al., 1988; Renn, Burns, Kasperson, Kasperson, & Slovic, 1992, p. 181). These sociologically oriented theories may not be directly useful for experimental social psychological research on risk perception, as they focus on a different level of analysis (i.e., the analysis of sociological processes rather than psychological) but they do support the idea that people's social environment should be taken into account when studying the way people deal with risks.

Some research on social processes with regard to risk-taking behaviour has been conducted in social psychology. In the late sixties, early seventies, the finding that people displayed a risky shift when making a risky decision in a group set off a large amount of research investigating group influences on risky decision making (e.g., Madaras & Bem, 1968; Wallach et al., 1962). However, the risky shift turned out not to be about risk, but about a general tendency of groups to be more extreme in their judgements than the average of the individual judgements, and it was consequently subsumed under group polarisation (Kogan, 1972). Henceforth, there has been little or no research about group effects on risky decision making. If anything, social psychology has displayed very little theoretical interest in risk-taking behaviour, with the only exception probably being a few investigations of the effects of accountability on risk-taking behaviour (Tetlock & Boettger, 1989, 1994; Weigold & Schlenker, 1991). These experiments provide strong support for the idea that risk taking can be influenced by the social situation (i.e., being made accountable for one's decisions) in which one finds oneself. Thus, the situational context should be able to exert a considerable influence on the way people deal with risks (Lenderink, Meertens, & Kok, 1994).

In conclusion, risk perception has been studied from many different perspectives, resulting in a large, albeit somewhat scattered knowledge base. Broadly speaking, the following conclusions can be drawn. Few studies have investigated people's information desire with regard to risks. To a large extent this is probably due to the fact that a large base of research on risk perception has made use of gambles. Notwithstanding the insights that this line of research has given, gambles poorly reflect real-life risks. Furthermore, probability and (the severity of) negative consequences are insufficient to describe people's risk perceptions. People take into account many more factors that affect their risk perceptions, for example a risk's

controllability and the amount of knowledge that exists about a risk. Moreover, there is ample evidence from the personalistic research tradition that people can differ substantially in the way they deal with risks. Lastly, (social) psychologists have paid little attention to social influences on risk perception, but what little research there is, suggests that a decision-maker's social context can influence risky decisions.

Research on risk perception has mainly relied on so-called structural models of information processing to investigate how people perceive and deal with risks. Structural models are investigated by describing how variations in the information that is provided to the participants (input) leads to variations in their responses (outcome; Ford et al., 1989). In a typical research setting, the experimenter provides the information that the participants receive (e.g., Bar-Hillel & Neter, 1996; Hendrickx & Vlek, 1991; Hendrickx et al., 1992; Kahneman & Tversky, 1983; Schneider & Lopes, 1986). Although the advantages of such an approach are indisputable, in real life people are usually not offered information on a silver platter and they are usually not just passively waiting for information to come their way (Huber, Wider, & Huber, 1997; Jacoby et al., 1987; Payne, 1992). Moreover, in a complete information presentation such as has been mostly used in risk perception research (and decision making in general, for that matter), participants probably believe that all the information that they are offered is important and relevant to the decision they are to make (Huber et al., 1997). Why else would the experimenter have included this information? This implies that they might use information in laboratory settings that they would normally not use in real decision-making contexts.

.....ACTIVE INFORMATION SEEKING

Cognitive social psychological research has mainly investigated what is inside the black box by systematically varying the input and then observing the output. However, off and on research has been interested in the black box's own input preference. As early as 1957, Irwin and Smith investigated whether people's information seeking would increase if the value that was placed on making a correct decision was increased and if information seeking would decrease if the cost of information was increased. Both hypotheses were supported. Furthermore, Lanzetta and Kanareff (1962) investigated the amount of information people would search before making a decision. They tried to describe the costs and benefits of gathering information in terms of expected utility. In doing so, they assumed that people would try to maximise the information they could gain, but would try to minimise the amount of effort this would entail. This accuracy x effort pay-off is still assumed to determine the strategies that people use to search for information (Payne et al., 1993). Although these studies focused on the extent of information search rather than on the strate-

gies people use, they did demonstrate the importance of viewing people as active information seekers. Initially, these studies have received very little follow-up and the structural models dominated decision-making research.

About two decades ago, however, some researchers proposed that instead of viewing people as "cognitive misers" who are unwilling to spend the effort to make rational decisions, people can be viewed as adaptive decision-makers. It is simply not always possible to process all the relevant information in order to make a rational decision. Therefore, they adapt their decision-making strategy according to the requirements and opportunities of the situation (Jacoby et al., 1987; Payne, 1992; Payne et al., 1993). This raised interest in the strategies people used between the informational input and the consequent decisions. The process-tracing models that were developed, enabled researchers to investigate what strategies people used when gathering information in order to make a decision.

The main paradigm that has been used to trace people's decision-making process is the Information Display Board (IDB). An IDB consists of an alternatives x attributes matrix, in which people can select information about attributes of the available alternatives. For example, in a typical IDB, participants are asked to decide which video-recorder they would prefer buying, to which end they can search information in an IDB providing information about the price, picture quality, sound quality and so forth for a number of video-recorders. By examining the way the participants acquire information (number of information items accessed, pattern of information search), alternative strategies in information search can be identified.

A central notion of process-tracing models is that people's information search is contingent on individual differences, situational factors and task factors (Ford et al., 1989; Payne, 1992; Payne et al., 1993). Individual differences are characteristics that are specific to a person, such as experience and personality characteristics (e.g., a person's tendency to take or avoid risk). Although Payne (1993) contends that individual differences should influence people's information search strategy, effects of individual differences on information search have not received much attention (Ford et al., 1989; Verplanken, 1993). However, some research can be found indicating that person factors can influence people's information search, e.g., prior knowledge (Brucks, 1985), involvement (Billings & Scherer, 1988), tolerance for ambiguity, cognitive style and self-esteem (Schanning & Sciglimpaglia, 1981) and Need for Cognition (Bailey, 1997; Verplanken, 1993; Verplanken, Hazenberg, & Palenewen, 1992). Situational factors refer to factors in the decision environment that affect people's information search, such as time pressure and the social consequences of a decision (Durham, Locke, Poon & McLeod, 2000; Lerner & Tetlock, 1999; Maule et al., 2000; Tetlock, 1992). For the purpose of this thesis, the finding that the social context can affect decision-making is of particular interest (e.g., Lerner & Tetlock, 1999; Tetlock, 1992). Like individual differences, the effects of situational factors on information search have not received much attention (Ford et al., 1989). However, research has shown that accountability can affect people's information search depth (e.g., Billings & Scherer, 1988; McAllister, Mitchell, & Beach, 1979; Verplanken, Aarts, & van Knippenberg, 1997). Compared to the other two factors, task characteristics have

received much more attention. Research has provided ample evidence that aspects such as task complexity (e.g., increasing the number of alternatives and attributes) and display format can affect people's information search depth and the strategies employed (Ford et al., 1989; Verplanken, 1993). For example, in a meta-analysis Ford et al. (1989) concluded that increasing task complexity by increasing the number of options and or attributes led to a decrease in the proportion of information search, an increase in the variability of search patterns and a decrease in mean search time.

Active information seeking about risks

Risk perception research has hardly investigated risk information seeking. Weinstein (1978, 1979) conducted two field studies about New Jersey students' information desire with respect to environmental cancer, New Jersey being a state with a high reported rate of cancer. In the first study, he found that those who appeared to need the information most - those who did not know about the high reported rate of cancer in New Jersey and those who questioned the personal relevance of this high rate (Weinstein calls this "uncertain of existence") - were least likely to seek it. This seemed to be due to unconcern about the risk, rather than denial of the risk. The second study revealed that a majority preferred threatening information although respondents did select the message that supported their own view on the subject.

A few investigations have been conducted using process-tracing methods. Mann and Ball (1994) found that the less people searched for risk information, the riskier their choices were. Furthermore, Payne and Braunstein (1978) varied the number of alternatives and found that this affected participants' information acquisition strategy. Specifically, the proportion of information searched (amount of information searched relative to the total amount of information available) decreased and the variation in information search increased with an increase in alternatives. Lastly, McDougal (1995) investigated the effects of both an individual variable (risk preference, as measured in the way suggested by Lopes [1984, 1987]) and a situational variable (monetary goal) on information search. Findings showed that both variables interacted on people's information search. Risk seekers searched for more risky information than risk avoiders, but only in the no-goal condition. Furthermore, participants overall preferred information about the safe alternatives. At first sight, these findings appear to be highly relevant to this thesis. However, the measure of risk preference used in this study seems to distinguish gamblers from non-gamblers rather than risk avoiders from risk seekers, which sheds a different light on the finding that risk seekers searched for more risky information than risk avoiders. Risk seekers or gamblers seemed to be more interested in risky gambles (smaller probability and larger pay-offs) than risk avoiders (non-gamblers) when no monetary goal was set.

These three studies have made use of the gambling paradigm, which differ from naturalistic decision tasks. As Huber (1997) stated, compared to gambles and bets, "naturalistic tasks are ill-structured problems in knowledge rich domains"

(p.147). This should also have consequences for people's information search. Nevertheless, these findings show that it is useful to study the way people deal with risk using process tracing techniques, as evidence has been found that the three factors that are assumed to influence people's risk information search do so.

Recently, Huber and his colleagues started investigating people's risk information search using both a process tracing technique and naturalistic risks (e.g., Huber, 1997; Huber, Beutter, Montoya, & Huber, in press; Huber et al., 1997). The process tracing method used by Huber and his colleagues, Active Information Search (AIS), is akin to Information Display Board. However, with AIS participants are not presented with attributes that have been pre-selected by the experimenter, but the participant is left completely free to ask questions they want. Thus, this is an open way of investigating information search. Furthermore, the use of naturalistic risks, for example whether or not a director of a centre for allergic children should accept a house in a tick-infested forest, when these ticks can cause meningitis, allows for a broad range of questions to be asked. A practical drawback is that AIS requires extensive pilot testing, in order to be able to anticipate the questions that participants might ask. The risks used were mostly small scale risks, such as the tick-infested forest task, or acquiring a new machine that might be prone to breakdown. The main findings of this line of research are that when people can ask risk information themselves, they desire and use other information than is usually provided in the gambling paradigm. For example, people only desire some vague indication of probability. Furthermore, when negative events are deemed possible people try to find ways to defuse the risk. They search for information about the risk's controllability and whether precautions can be taken, whether there are alternatives, and what can be done in case of a worst-case scenario. The central point relevant to the current thesis is that people's information desire is not limited to simply information about the probability and the negative consequences.

SECURITY OR OPPORTUNITY: THE EFFECTS OF INDIVIDUAL AND SITUATIONAL FACTORS ON RISK INFORMATION PREFERENCE

In the research that is reported in this thesis, we have attempted to integrate the perspectives discussed above. Our aim was twofold. First, the main aim of this research was to find out what kinds of information people desire when they are confronted with (unknown) risks. Second, we wondered what factors could influence people's risk information search. By investigating these issues, we also addressed the dominance of gambles and lotteries in experimental risk research.

Thus, in the experiments conducted for this thesis, the participants could seek and select information about naturalistic risks. Treating participants as active

information seekers should provide additional insights into the way people deal with risks. Information seeking or selecting is also the first step in the process that people go through when they are confronted with a new risk. It is somewhat odd that so little research has been conducted about people's information search in risk perception and we are not the first to suggest that information search is an important aspect of (risky) decision-making (Huber et al., 1997). The main question that will be investigated is to what extent people desire information about the risk aspects that the psychometric paradigm (Slovic, 1987; Vlek & Stallen, 1981) and to a lesser extent the experimental paradigm (Hendrickx, 1991) have shown to be important in the way people deal with risks and whether risk aspects may have been overlooked. In doing so, a variety of risks will be used, with an emphasis on large scale, environmental risks such as radon radiation and genetically modified food.

The second aim of this thesis is to investigate what factors affect people's information desire, as research on decision making has shown that individual differences and social factors can affect people's (risk) information seeking (e.g., Payne et al., 1993; Verplanken et al., 1992).

With regard to individual differences, the main focus will be on differences in people's tendency to take or avoid risk. The personalistic paradigm has shown that individual differences in risk taking can influence people's risk-taking behaviour. Furthermore, both Lopes (1987) and Horvath and Zuckerman (1993) have suggested that risk avoiders (low sensation seekers) and risk takers (high sensation seekers) differ in their focus on the gains and losses that are associated with risks. Risk avoiders value security and risk takers value opportunity. By implication, this should also be reflected in people's information search strategy, i.e. risk avoiders should be more interested in information about the losses associated with risks, whereas risk takers should be more interested in information about the gains associated with risks. As far as we know, no research has investigated whether risk avoiders and risk takers differ in their preference for risk information. However, Schneider and Lopes (1986) provided evidence that risk avoiders and risk takers differed in their focus on gains and losses. Risk avoiders and risk takers were asked to make choices between pairs of lotteries that differed in the distribution of the outcomes. In their study, risk avoiders showed a tendency to focus more on the losses, whereas risk takers focused more on the gains. Furthermore, both Horvath and Zuckerman (1993) and Steketee and Frost (1994) suggest that risk takers as opposed to risk avoiders act more impulsively and plan ahead less. This would suggest that risk avoiders would seek more information than risk takers.

With regard to the situation in which people search for information, people's information seeking process can be influenced by specific goals that are instigated by the (social) context in which a decision is made (e.g., Verplanken et al., 1997). As has been mentioned earlier, there has been little research about social influences on risk-taking, and none on social influences on risk information seeking. Some research exists, however, showing that the social context can influence risky decision making. Research by Tetlock and Boettger (1994) and Weigold and Schlenker (1991) has shown that being held accountable for one's decisions affects

people's risky decision making. Specifically, research on accountability has shown that people tend to think in more complex ways when they are held accountable to an unknown audience. Being accountable to an unknown audience leads people to pre-emptive self-criticism, which in turn leads people to view an issue from different viewpoints (Lerner & Tetlock, 1999; Tetlock, 1992). For example, in a study conducted by Tetlock and Boettger (1994), accountable participants were more likely than non-accountable participants to procrastinate and buck pass making a judgement of the acceptability of a drug in the US pharmaceutical market. Furthermore, accountable participants thought in more integratively complex ways about the matter than non-accountable participants did. These findings suggest that social factors, like accountability, should affect people's risk information selection and their subsequent risky judgement or decision. Thus, the basic idea in this thesis was that accountability would decrease any effects of risk-taking tendency, as this was assumed to be people's default strategy to deal with risk information and risky decisions. Furthermore, research has provided evidence that accountability increases information search depth. Thus, accountability was also expected to increase the amount of risk information that people selected.

Lastly, as has been argued earlier, the scales that have been used to measure risk taking are not appropriate for the general risk-taking behaviour of interest in this thesis. It was therefore necessary to construct a risk scale (RS) that measures *general* risk taking, rather than sensation seeking or risk taking in relation to OCD.

Overview of the research chapters

All in all, the outline given so far has resulted in studies that are described in detail in the following chapters. The chapters report five largely independent studies, which were all conducted to gain more insight into people's information preference and the effects of individual and situational factors on this information preference. The chapters can be read independently from one another, although in particular the experimental studies were developed on the basis of the results of the study that preceded it.

Different research techniques were used to accomplish the goals of this thesis. In chapter 2, a qualitative study into people's desire for risk information is reported. By making use of focus group interviews, a first inventory was made of people's active information search about risks. The findings of this study, combined with the findings of the psychometric paradigm laid the ground for the information that the participants could look up in the other studies, which were laboratory experiments and are reported in chapters 3, 4 and 5.

In chapter 3 an experiment is reported that investigates both the effect of a situational factor (accountability) and an individual factor (risk-taking tendency) on information seeking behaviour using an IDB. The main dependent measures were information search depth and preference for positive and negative information.

In chapter 4 an experiment is reported that again investigated the effect of accountability and risk-taking tendency. This time the main focus was on information preference for positive and negative information, for which a new information selection task was designed.

In chapter 5 an experiment is reported that investigates the effect of two individual difference variables, risk-taking tendency and trait-anxiety. Furthermore, a task aspect was investigated: whether one had made a risky choice before selecting risk information or not. The main dependent measures were preference for positive and negative information. Furthermore, in this experiment participants were also asked to make a final risky choice.

Although some information about the Risk Scale is also provided in the studies reported in chapters 3, 4 and 5, in chapter 6 a more detailed description of the Risk Scale is given. Furthermore, information about the scale's reliability and construct validity is provided, based on the data that has been gathered during the period that the research for the thesis was conducted.

The results of the research are discussed in chapter 7. Furthermore final conclusions are drawn and the results of the thesis are discussed in a broader, risk perception, perspective. In addition, the inevitable suggestions for further research pop up in this chapter.

Please enjoy.

**P R I O R I T I E S I N I N F O R M A T I O N D E S I R E
A B O U T U N K N O W N R I S K S**

A MANUSCRIPT BASED ON THIS CHAPTER HAS BEEN SUBMITTED FOR PUBLICATION AS:
LION, R., BOT, I., & MEERTENS, R. M. (2000). PRIORITIES IN INFORMATION DESIRE
ABOUT UNKNOWN RISKS. MANUSCRIPT UNDER REVISION.

INTRODUCTION

Explaining people's risk perception has been a major focus of risk research, on the assumption that those communicating about risks should understand the way in which people think about them (Slovic, 1987). Most of this research has dealt with choices, judgements, evaluations and the like and the information the participants could use to make a choice or judgement was determined by the experimenter (e.g., Hendrickx, Vlek, & Oppewal, 1989; Kahneman & Tversky, 1979; Schneider & Lopes, 1986; Slovic, 1987; Vlek & Stallen, 1981). In real life, however, people do not always just wait for information to come their way, but they can actively seek information (Huber et al., 1997; Jacoby et al., 1987). Curiously enough, hardly any research seems to have investigated what kind of information people desire when they are confronted with an (unknown) risk, although this question seems to be particularly important if one wants to effectively communicate about risks.

So far, two major paradigms can be identified in psychological risk perception research. Firstly, the psychometric paradigm has investigated how people perceive risks and what dimensions underlie their risk perceptions. These underlying risk dimensions were identified by performing a factor analysis on judgements about aspects (e.g., voluntariness, controllability, probability) that were hypothesised to influence the perceived riskiness of a variety of hazards (for example, hazardous substances, risky behaviours, risky technologies etc.; Slovic, 1987; Vlek & Stallen, 1980, 1981). The main factors that were found were "dread risk" and "new risk" (Slovic, 1987) or "size of potential accident" and "degree of organised safety" (Vlek & Stallen, 1981). Also, when people judge risks, they take into account the benefits associated with these risks (Vlek & Stallen, 1981). Secondly, the experimental paradigm focuses on how experimental manipulation of certain risk aspects (e.g., probability, controllability) may influence people's risk perceptions (Hendrickx & Vlek, 1991; Kahneman & Tversky, 1979; Lopes, 1987).

Both these paradigms appear to imply that people want information about the risk aspects mentioned above in order to appraise risks. Although this seems quite plausible, to our knowledge this has not been specifically investigated. Also, the relative importance of these aspects to the information seeker is unclear. For example, an assumption of risk research appears to be that in order to 'correctly' perceive a risk, people need probability information. In contrast, research has shown that people have difficulty using probability information and it may well be that it does not particularly interest them. Moreover, probability information is not always used by people making a risky decision (e.g., Huber et al., 1997; Mann & Ball, 1994), although this may be more true for small scale than for large scale risks (Hendrickx et al., 1992; Hendrickx et al., 1989).

Although some studies gave participants the opportunity to seek information about risky choices, the risk information provided to the participants had been pre-selected by the experimenters, thus limiting the participants' freedom to ask for any information (Lion & Meertens, 2001 1999; Mann & Ball, 1994; McDougal, 1995;

Payne & Braunstein, 1978; Weinstein, 1978, 1979). Furthermore, the research conducted by Mann and Ball (1994), McDougal (1995) and Payne and Braunstein (1978) dealt with lotteries, and Huber et al. (1997) have convincingly argued that lotteries do not adequately capture the complexity of real life risks, with the most important deficiency probably being the absence of control. A notable exception is Huber et al.'s (1997) study, in which an open information search was used. The risks in that study were small scale (i.e., personally controllable), which limits the generalisability of the results to larger scale risks traditionally investigated in the psychometric paradigm and for which risk communication is probably much more important. All in all, research about people's desire for information seems to be relatively sparse.

Thus, the main aim of the current research was to find out what kind of information people want when confronted with an unknown risk, in a way that captures the idea of an active information seeker. As we did not want to limit participants' information search by preselecting information that they could look up, we used a qualitative research method, focus group interviews, to obtain data (Study 1). Focus group interviews are group discussions, with six to eight participants, guided by a moderator who leads the group through the discussion by means of a loosely structured questionnaire. Originating from marketing research, focus group interviews have proven to be a powerful and cost-effective way to generate new hypotheses and explore new ideas and concepts in need of clarification, and it has been fruitfully used in social research (Brug, Debie, Assema, & Weyts, 1995; Mesters, Pieterse, & Meertens, 1991; Morgan, 1998). A focus group interview can yield a rich set of data because the individuals within the group interact and respond to each other's ideas, remarks, opinions and questions. These characteristics make focus groups an ideal method for explorative research. Drawbacks of focus groups are that the results can have limited generalisability due to selection biases of the population and that data has to be interpreted with care, due to possible personal biases of the moderator(s) (Morgan, 1998). Furthermore, it is possible that the desired interaction can be rather limited if a clear leader emerges, whom the rest of the group follow. Thus, the quality of the focus groups depends to a large extent on the quality of the moderator. In order to deal with some of these drawbacks, the results from the focus groups were used to make a rank ordering questionnaire that was sent to five hundred randomly selected households in the Netherlands (Study 2).

STUDY 1: THE FOCUS GROUP INTERVIEWS

METHOD

Participants

Nine focus groups interviews were conducted. In total, fifty-seven people (6 participants per group on average) participated in the study (17 men and 40 women). They were paid £25 (approximately €11) for their participation. Twenty-five participants were recruited by means of an announcement published in a local weekly newspaper, the other participants were personally recruited: 19 participants were volunteer workers from a neighbourhood association in Maastricht, one group consisted of 5 postmen and one group was made up out of 7 members of the University Choir. Given the aim of the focus groups, a random sample of the population is not the main concern (Morgan, 1998). However, the groups themselves should be relatively homogeneous, so that the participants feel free to interact. The focus groups with the participants from the neighbourhood association were held at the neighbourhood association premises, the remainder were held in a meeting room at the University. The volunteers at the neighbourhood association and the postmen differed in demographic variables from the people who had responded to the newspaper advertisement in that the people responding to the newspaper had a higher degree of education (Bachelor's or Master's degree) than the others (secondary school through to Bachelor's degree). The participants all knew that they were going to talk about people's risk information desire. They did not know what risks they would be presented with, as we did not want people to discuss this in advance. Thus, information was kept to a minimum.

Procedure

Upon arrival at the interview location, the participants were welcomed by the moderator and his assistant. The moderator then explained the aim and procedure of the meeting, after which the participants first introduced themselves to one another. After this introductory round, the moderator started the interview by asking the first question. The interviews lasted approximately 90 minutes. The interviews were audio-taped and notes about the proceedings were taken both by the moderator and by the assistant/observer (these could have been used as a back-up in case any of the tapes proved unusable).

Focus group question route

1. What does the concept of risk mean to you?
 2. Please think back to a situation in which you were confronted with a risk. What risk was that, and what kind of information did you seek?
 3. What risks does [specific risk]* make you think of?
 4. What would you like to know about [specific risk]?
 5. What do you think is most important for you?
 6. If you had to estimate the amount of risk you run, what would you like to know?
 7. If you had to decide whether [specific risk] was acceptable, what would you like to know?
 8. In what way were you ever confronted with a risk, where you thought you did not get the information you wanted?
 9. Are there things that have not been discussed which according to you are important when judging risks?
-

* Specific risks: 1) admission of genetically modified food 2) radon concentrations in houses 3) a new anti-blood clotting medication 4) dioxin emissions by incinerators 5) health consequences of electromagnetic fields (EMF)

Figure 2.1 Focus group coding categories

The focus group interview

The question route used in this study consisted of two parts, comprising nine questions in total (Fig. 2.1). The first part consisted of general questions that introduced the topic to the participants. This generated information about the participants' associations with the concept of risk and about the kind of information they had sought when they had last been confronted with a risky situation. In the second part, specific risks were introduced, enabling the participants to be more concrete about the information they wanted. The specific risks were all relatively unknown environmental or technological risks, save for one, which was a more personal risk and involved taking a medicine. It was important to use unknown risks, so that the participants could genuinely ask for new information about the risks. The five risks were 1) the admission of genetically modified food, 2) radon concentrations in houses, 3) a new anti-bloodclotting medication, 4) dioxin emissions by incinerators and 5) health consequences of electromagnetic fields (EMFs).

Five questions were asked in relation to a specific risk (indicated by indentation in Figure 2.1). After these five questions, time permitting, a new risk was introduced, and the same five questions were asked about the new risk. The second focus group started with the risk following the one where the first group had left off, etcetera. On average, three specific risks were introduced per focus group. For the

last four focus groups, less time was taken for the first two questions, and more time was taken for the information need questions, which enabled us to introduce all five risks. To round off the interview, the participants were asked whether they thought certain important things had been omitted during the discussion.

The participants were invited to react to each the moderator's questions and to each other's answers, remarks, questions and opinions. They were thus left free to interact and react to everything that occurred during the session. The main aim was to generate an open and lively group discussion. Whenever necessary, the moderator asked questions for clarification or elaboration or summarised what had been said so far.

Data analysis

After the tapes had been transcribed, the transcripts were analysed using the computer program QSR Nud•ist, a data analysis tool that allows for flexible categorisation and schematisation of qualitative data. The data was first coded line-by-line by the first author. The initial framework for the analysis was provided by the questions of the question-route, but during the analysis the information was reorganised into three main categories, using open coding. This final coding scheme was then used by a second coder, who again coded the interviews line-by-line. There was a good agreement between the two coders. Differences in coding were resolved through discussion.

The categories were: "Information desire", "Associations with risks" and "Risk concerns". The first category is the most important, given the main aim of this study. This category contained questions (for example, "What is it?") that the respondents had asked about the risks to which they had been introduced (questions 3 to 7). Furthermore, some of the data for this category was obtained from answers to question 8.

In answer to the first two questions of the question route in particular, but also throughout the focus group interview, participants made remarks about how they viewed risks and what they associated with risks. The second category was based on these data and was called "Association with risks". Finally, the participants also made quite a few remarks about how people *deal* with risks and risk information, rather than how they *perceive* risks. These remarks were categorised into "Risk concerns" and were about concerns the participants had about, for example, the trustworthiness of risk communicators. Our main interest was investigating what kinds of information people desired about risks in general. Our general impression was that the questions that the participants asked about the risks were similar, except for those about medication, which enabled us to code information need across the risks, and not for each risk separately. Wherever questions were more specifically related to particular risks, this is indicated. Figure 2.2 provides an overview of the categories and their subcategories.

Interestingly, initial analyses indicated that differences in education did not lead to differences in the data between the two groups, although the members of the neighbourhood association and the postmen (lower education) were more concrete in their examples. Neither did the data reveal any gender differences.

Information seeking

- Not wanting information
- Knowledge (definition): What is it?
- Consequences: What are the effects?
- Controllability: What can you do about it?
- Exposure: Where is the risk? What level of exposure is dangerous?
- Blame: Who is responsible for the risk?
- Knowledge (expertise): What research has been done about the risks?
- What others do: How do others deal with the risk?

Risk association

- Unknown
- Uncertainty/chance
- Negative consequences
- Controllability
- Knowledge
- Breaking new ground
- Pros and cons

Risk concerns

- Individual differences
 - Personal
 - Trust
 - Relevance
 - Relative risk
 - Alternatives
-

Figure 2.2 Categories and subcategories of focusgroup data

RESULTS

Information desire

The category "information desire" consisted of questions that the participants of the focus groups had asked during the interviews. Figure 2.2 gives an overview of the categories of questions that the participants asked. In the following section, more detailed information about the subcategories is given.

Not wanting information: Nicely and peacefully ignorant. An important finding was that quite a few participants indicated that they did not really want to seek

information about risks. Participants thought that there were many people who "... don't want to know about it, who just pretend that nothing's the matter, because then nothing is". Preferring to remain blissfully ignorant may be related to fear: "(...) you may be afraid to live". Another reason was that they did not think themselves capable of making decisions about risks and that it might lead to an information overload: "It's only going to become a bigger muddle". In contrast, some participants said that they would feel betrayed if information were withheld from them. Some simply wanted to know everything " (...) you want information as broadly as possible", i.e., they wanted information about most, if not all, of the subcategories in this section.

Knowledge: What is it? When confronted with an unknown risk, most people wanted to know what the risk meant, and simply asked "Huh?" and "What is it?". They also searched for analogies in risks that were more familiar to them, in an attempt to clarify the meaning. For example, radon immediately reminded people of asbestos.

Consequences: What are the effects? Paramount in the risk information seeking process was information about the consequences of a risk: "One seeks all information to know the consequences". Specifically, they wanted to know about the effects and the damage. Furthermore, they wanted to know the nature of these consequences, whether they were dangerous, and how serious they were. They were also interested in the process underlying the occurrence of the consequences: "(...) how do these substances react with each other?"

Controllability: What can you do about it? Participants wanted to know how to cope with the risk, for example, how to prevent it from occurring, how to protect oneself or how to influence a risk's course of action if it occurred: "(...) what should I do?". If the consequences were not considered personally controllable (e.g., electromagnetic fields) they wanted to know what official agencies (e.g., [local] governments) could do or had done about it.

Exposure: Where? How much? The participants wanted to know where the risk was located and they wanted information about the risk's intensity and duration. They wanted to know what intensity (or concentration) of exposure was acceptable, and they wanted to know if and how one could measure the intensity or concentration of the risk. They also wanted to know how long a source would remain dangerous: "(...) will it take a week or a hundred years before its gone?". For some risks, like electromagnetic fields, radon and dioxin, the participants also wanted to know whether the effects would persist after the cause had been removed. Finally, for substances that could enter the body (for example radon), they wanted to know "Does it accumulate in the body? Is it retained by the body?".

Blame: Who is responsible? In three of the nine focus groups people wanted to know who was to blame. One reason was emotional in nature, "It's kind of nice if you can blame somebody", and the other referred to the possibility of recouping any costs incurred from those responsible.

Knowledge: Research. In this category, there appeared to be a difference between participants with a higher and those with a lower education. Participants

with a lower education were mainly purely interested in the outcome of research. The participants who had followed a higher education usually also asked specific questions about the way in which the research had been conducted and they seemed apprehensive about the credibility of the reports.

What do others do: Everybody says it, so it must be okay. People often asked others about their experiences with a risk: "I asked a couple of family members who owned shares, like, well, does it sound alright to you?". Furthermore, the most common way of being confronted with a risk appeared to be through what other people said to them:

Respondent A: "Yes, so then you have to go with what other people say."

Respondent B: "Yes, but you do that with everything, don't you?"

Associations with risk

The second category, "Associations with risk", is based on the participants' answers to the more general questions about risks at the beginning of the interview. These were mostly meant to make the respondents more comfortable with the rather abstract concept of risk. The answers give a dynamic picture of the way people perceive risks and how, according to the participants, a variety of aspects relate to risks.

Most people viewed risk as the *possibility of negative consequences*, of which they have little knowledge. Risk is related to *uncertainty*, *danger* and *damage* associated with the consequences: "Yes, it's something that you can't overlook (...) a danger (...)". However, they also seemed to be very much aware that risks offered the chance to open up new horizons: "(...) it can break new ground, for yourself". Some found, however, that the term "adventure" was more appropriate in these cases. In any case, they associated risk taking with possible *benefits* (weighing the pros and cons). This holds more for risks with clear benefits, for example, the benefits of microwave ovens, than for risks without perceptible benefits, such as radon. The issue of control, or the lack thereof, also usually quickly came up during the discussions and was central to the way they thought about risk: "(...) it's something you can't control".

Finally, *knowledge* played a central role in people's risk perceptions, with the amount of knowledge influencing a risk's controllability and uncertainty and thus its perceived riskiness: "The more you know, the more you can take it into account, the smaller the chance that something happens."

Risk concerns

Some aspects of risks that came up during the interview sessions were related to how people dealt with risks and risk information.

Without fail, remarks about *individual differences* in people's risk perceptions would surface: "It's (...) very personal what one considers a great risk". A risky

decision was considered to be a personal decision. Riskiness was considered a very subjective judgement, which could be influenced by one's personality (for example, some people were considered risk avoiders and others risk takers, and they also seemed to be able to view themselves in such terms) and by differences in experience.

Trust in the people who communicated about the risk was a salient concern. The participants appeared to be quite suspicious of possible hidden agendas; for example, risk information might be obscured by financial motives, and they did not really expect to always get honest answers. However, they had to trust the agencies that provided the information for lack of alternative sources ("Well, I have hope, but I'm not confident").

Furthermore, something has to happen to them before they become aware of a risk and even consider gathering information: "It's only when you're confronted with it that you think further and gather information (...)".

Some interesting aspects came up in only one or two of the focus groups. A few people were interested in the small extra percentage of risk caused for example by radiation. If they found it to be very small, it was deemed unimportant. Some participants also wanted to know if there were alternatives to a risk. For example, with regard to the incinerators (dioxins), participants asked if it could not be placed elsewhere.

Finally, there was a difference in the questions the participants asked about electromagnetic fields, radon, dioxins, and genetically modified food on the one hand and the anti-blood clotting medication on the other. Although some questions that were posed during the first four risks also came up with the anti-blood clotting medication, questions about the use of medication were difficult to generalise to the other categories (for example, "Was it tested on animals?"). One interesting finding was that a large number of participants had a strong desire for clear, unambiguous information about medication, which they apparently very often did not receive.

Summary

A common finding was that many participants very often did not want any information. However, if participants wanted information about risks, they a) wanted to know what the risk actually was (for example, a definition of the risk), b) what the consequences were, c) whether or not the risk and the possible consequences were controllable, and d) when, where and how one might be exposed to the risk. The participants were less unanimous about the following questions: they asked who could be blamed for the occurrence of the consequences and what scientific research had been done about the risks. Finally, the participants seemed to be influenced by other people's experiences and tried to associate the unknown risks with more familiar ones, which may indicate that they desire information about these aspects as well.

STUDY 2: THE RANK ORDERING QUESTIONNAIRE

The conclusions mentioned above are not based on a representative group of the Dutch population, generalising them is therefore unwarranted. In order to deal with this, the results were backed up by quantitative data by means of a questionnaire. In the questionnaire, the respondents were asked to place in rank order of importance the categories of information that the focus group participants wanted information about (i.e. the questions that the participants had asked about the unknown risks). The main reason for using rank ordering was that we did not expect to gather informative data if we had asked respondents to fill out Likert-scales on the importance of the different categories that were presented. Presumably, none of the categories were totally unimportant, so we would have obtained ceiling effects. Rank ordering would force respondents to make choices. Moreover, as this would yield information about the relative importance of the categories, it might also give us some idea of the process underlying risk information seeking.

METHOD

Participants

The questionnaire was distributed among a random sample of 500 households in the Netherlands. They were promised a small reward for their participation. In total, 124 questionnaires were returned (24.8%). Due to missing data on the rank ordering questions (not all participants completed the rank ordering), 21 questionnaires could not be used for further analyses, so 103 questionnaires (20.6 %) were analysed. Seventy of the remaining 103 questionnaires (68 %) had been completed by men, 32 by women (31.1 %). One participant had not indicated his/her sex. The average age was 47 years, the youngest participant was 19, the oldest 91 years of age. Table 2.1 shows the participants' level of education.

Table 2.1 Highest level of education of the participants.

Level of education	Percentage
Primary school	1.9 %
Lower vocational education (LBO)	28.2 %
Higher vocational education (MBO)	23.3 %
Lower general secondary education (MAVO)	12.7 %
Higher general secondary education (HAVO/VWO)	7.8 %
University	11.7 %
Other	1.9 %

The rank order items

As rank ordering would involve some mental juggling of the categories by the participants, the number of categories was limited to nine. Two groups of categories were made. The first group consisted of the four categories that the focus group participants had been relatively unanimous about, that is most of the focus group participants wanted that information. These were the *definition* of the risk (what the risk actually meant), the *consequences* of the risk, the *controllability* of the risk and the exposure to the risk. The second group consisted of the four categories upon which the focus group participants were in less agreement. These categories (other people's *experience* and *responsibility*¹ for the occurrence of the negative consequences) had either been mentioned less frequently during the interviews, or had been suggested by earlier literature to be important (*advantages* and *probability*), but were hardly addressed during the focus group interviews. One extra question referred to the focus group participants' tendency to try and relate a familiar risk to the unknown risk (association). This could either be an important question for the participants, given that the focus group participants frequently related the unknown risk to a more familiar one, or it could be an unimportant question, given that they never explicitly asked for an equivalent risk with which they were more familiar. The items in the questionnaire were formulated as questions that adequately captured the aforementioned nine categories. We did not include the participants' interest in scientific research that had been done about the risk. One reason for this was to limit the amount of questions to nine. Moreover, the "definition"- question "What a risk was"

could easily include information about scientific research. In addition to the rank ordering of the nine items, the respondents were also asked to indicate on a five-point scale how familiar they were with the risk and how dangerous they thought it was. See appendix 1 for an English translation of the items.

Procedure

The participants had to complete the rank ordering task for the risks used in the focus group interviews (electromagnetic fields, dioxins, genetically modified food, radon and a new medicine). They were asked to rank order four of the categories on how important they thought these were (the most important category, the second most important category etcetera), and four categories on the extent to which they thought the categories were least important (the least important, the second least important etcetera). This left one category, which was neither very important nor very unimportant. In addition to the rank ordering, the participants were also asked to rate how familiar and how dangerous they thought each risk was. There were nine different versions of the questionnaire. The order in which the rank ordering items were presented was rotated over the nine versions, so that presentation order effects were minimalised. The questionnaire ended with a few questions about socio-demographic variables. The analyses given here are only for the data on electromagnetic fields, dioxins, genetic modification and radon, and not about the medication. Although the data about the medication is interesting in its own right, they are too specific to the use of medication. Moreover, the items used in the questionnaire were different from the other risks, as the information that came up during the focus group differed from the other risks.

RESULTS

Mean rank scores for the nine items were computed by assigning a score of nine to the most wanted item, and a score of eight to the second most wanted items etcetera. The item that was in neither ranking, meaning that the item was neither very important nor very unimportant, was assigned the score of five. Except for a significant difference on the first item "What does the risk mean?", $t(98) = 2.62$, $p = .01$ - the average rank score for this item was somewhat higher ($M = 6.5$) for women than for men ($M = 5.5$) - no gender differences were found, all $t_s < 1.6$, ns , so these will not be considered further.

The mean rank scores of the nine questions give a good general idea of the relative importance of the questions. The most important questions were: "How is one

exposed to a risk?", "What are the consequences?", "What does the risk mean?", "What is the probability of the consequences?" and "Is the risk controllable?" (Table 2.2).

Most wanted

The results from the mean rank scores are somewhat attenuated by the number of times a particular question was judged to be the most important (Table 2.3). Summed over all the risks, the most important question to the participants was clearly "What is the risk", with 38.3 % of the participants indicating that they thought this was the most important question. Information about exposure came in second place (22.3 %) and information about the negative consequences came third (17.2 %). However, for the number of times an item was placed in the top three of most wanted information (Table 2.4), exposure was requested the most, with 68.4 % of the participants indicating that they thought this was important information to obtain. Second, 58.7 % of the participants wanted information about the negative consequences and approximately half the participants (51.2 %) wanted information about what the risk actually was.

Correlation analyses showed that there was a negative correlation between familiarity and the mean rank scores of the "Definition" item of the risks, $r = -.32$, $p < .01$, and the "similar to familiar risks" item, $r = -.26$, $p < .01$, indicating that the more the participants knew about the risks, the less interested they were in knowing what the risk actually meant and whether the risk was similar to a more familiar risk. Furthermore, there were some significant correlations between the dangerousness scores and the mean rank scores. Specifically, there were significant negative correlations between the dangerousness scores and the "similar to familiar risks" item, $r = -.26$, $p < .01$, and the "advantages" item, $r = -.20$, $p < .05$. This shows that the more people believe that a risk is dangerous, the less they wanted to be informed about possible similar risks and the less interested they were in the advantages of the risk. Also, there were significant positive correlations between the dangerousness scores and the "controllability" item, $r = .28$, $p < .01$, and the "responsibility" item, $r = .20$, $p < .05$, showing that the more dangerous people thought the risk was, the more they wanted to know what could be done about the risks and who was responsible for the risk. All other correlations between the familiarity/dangerousness scores and the mean rank scores were non-significant.

Table 2.2 Mean rank score of the items (1= least wanted; 9 = most wanted).

Item	Mean rank score
How is one exposed to the risk?	7.0
What are the consequences?	6.5
What does the risk mean?	6.5
What is the probability of possible negative consequences?	5.8
Is the risk controllable?	5.4
What are other people's experiences with the risk?	3.9
Who is responsible for possible negative consequences of a risk?	3.9
What are the advantages of the risk?	3.5
Is the risk similar to other more familiar risks?	2.4

Table 2.3 Percentage of participants that filled out the item on the first rank of most important questions.

Item	Percentage
What does the risk mean?	38.3 %
How is one exposed to the risk?	22.3 %
What are the consequences?	17.2 %
Is the risk controllable?	10.0 %
What is the probability of the negative consequences of the risk?	5.8 %
What are other people's experiences with the risk?	2.9 %
What are the advantages of the risk?	1.9 %
Who is responsible for possible negative consequences?	1.2 %
Is the risk similar to other more familiar risks?	0.2 %

Table 2.4 *Percentage of participants that filled out the item in the top three of the rank ordering of most important questions*

Item	Percentage
How is one exposed to the risk?	68.4 %
What are the consequences?	58.7 %
What does the risk mean?	51.2 %
What is the probability of the negative consequences of the risk?	43.4 %
Is the risk controllable?	38.3 %
What are the advantages of the risk?	14.8 %
What are other people's experiences with the risk?	13.8 %
Who is responsible for possible negative consequences?	11.7 %
Is the risk similar to other more familiar risks?	1.2 %

Least wanted

The results from the least wanted rank scores were more or less the mirror image of the most wanted rank scores. Overall, people were least interested in a) which familiar risk was similar to the unknown risk they had just been confronted with, b) information about the responsibility, and c) information about the advantages of the risk. A similar pattern of results was found for the top three of least important questions.

Overall, these findings are more or less consistent with the results from the focus group interviews, although we did not expect the information about the exposure to the risk to be so desirable. Also, although not the most important information, probability information was requested more than was expected, on the basis of the focus group data, whereas the respondents deemed information about the advantages less important than we would have had expected.

DISCUSSION

Seeking information about risks

The main aim of this research was to find out what information people desire when confronted with an unknown risk. Based on the results from the focus group interviews and the questionnaire, it was concluded that participants were most interested in information about a) how one could be exposed to the risk, b) the meaning of the risks, c) its consequences and d) probability and controllability information in a shared fourth place. This seems to indicate that people first want to know whether the risk is relevant to them: what is it, what are the consequences, and/or is it likely that one will be exposed to it. It may well be that how to control the possible negative consequences only becomes important if those consequences are serious enough to worry about. The finding that the more dangerous people rated the risks, the more they desired information about the controllability of the risk provides some additional support for this idea.

In a way, the notion that personal relevance plays an important role is also supported by the finding that quite a few participants in the focus group interviews were not particularly keen on seeking information on the risks that they were confronted with and arguably seemed to prefer avoiding such information. Three reasons were mentioned during the focus groups for not wanting information. The most important reason was probably a perceived lack of personal relevance or unconcern (Weinstein, 1979): unless it was really necessary, they would rather not know, as they could not take everything into account and did not want to be bothered too much with information about risks, and spend their time worrying about it. A second reason for not wanting information was avoidance. Perhaps, as one of the participants said, not knowing about a risk is a kind of self protection which enables people to keep an optimistic view of a safe world (cf. optimistic bias; Weinstein, 1980). Finally, perceived incapability of making adequate decisions, and fear of becoming even more confused by an overload of information also appeared to be a reason why people did not want information. This latter finding seems to suggest that if people want risk information, they would prefer this information to be simple and clear. However, not all participants agreed with this. Some participants wanted to know everything, so that they could be free to decide how to deal with a risk. This leads to an interesting dilemma for risk communicators, in that some people would rather receive only necessary, unequivocal information, whereas others want as much information about the risks as possible. In addition, these results suggest that when people think they are not directly confronted with a risk, risk communication can prove to be extremely difficult, as people (especially those not particularly keen on gathering information in the first place), are not receptive to information.

Another finding was that very few focus group participants specifically asked how large the probabilities were. In line with this, the results from the questionnaire showed that probability information came in fourth place, in a close tie with controlla-

bility information. Nevertheless, in the second study it was apparently deemed more important than would be expected on the basis of the focus group interviews. This may be a consequence of the different research methods used. In the second study, a complete information presentation was used, in contrast to an active information seeking situation (cf. Huber et al., in press). Thus, given the other options, asking for probability information was more important than the other items. This does not mean that probability information was very important to the participants in the second study. Taken together, it might tentatively be concluded that probability information about risks is not the most important information for people. Given that people have difficulty 'correctly' using probability information (e.g., Tversky & Kahneman, 1982; Tversky & Kahneman, 1986; Verplanken, 1997), this finding is perhaps not surprising. Furthermore, in a study using an active information search paradigm, Huber et al. (1997) found that participants only enquired after vague probability information (high or low) and research has also indicated that people prefer reinterpreting uncertainty information in such a way that the uncertainty disappears, so that probabilities are either so small that the risk becomes negligible, or so large that further action is absolutely necessary (Slovic, 1986). For most people it may be sufficient to know the vague probabilities. It may be that people use information about how and when they are exposed and perhaps also controllability information to deduce some kind of probability estimate. One could argue that a probability estimate that is based on exposure and controllability information is much more useful than an average probability estimate that is usually given in risk communications. Our finding that people do not always desire probability information appears to be in line with that of Sjöberg (1999), who found that people use information about the severity of the consequences of the risk, rather than probability information, when they are out to mitigate a risk. Arguably, people seek information to find out if risk mitigation is necessary. Lastly, the fact that people's active risk information search differs from people's information use in a complete information presentation underlines that results obtained in complete information presentation tasks may not allow for generalization to naturalistic situations.

During the focus group interviews people often tried to relate an unknown risk to a more familiar one. The questionnaire results, however, clearly indicated that people do not think it is important to know what familiar risk is similar to the unknown risk. This latter finding is more consistent with case studies (Woudenberg, 1999) in which people had indicated that they do not like risk comparisons to be made. This is particularly true when the risks that are compared are incomparable in the eye of the risk perceivers. Furthermore, our results suggest that the more dangerous the risks are, the less they desire information about a familiar risk. It would therefore probably be best for risk communicators to be careful with making such comparisons, although they should be aware that people do unwittingly try to associate the unknown risks with more familiar ones, and it would seem that risk communicators should take care that these associations do not interfere with the messages they want to get across.

The participants' risk perceptions generally seemed to be very much influenced by other people. Mostly, they had been confronted with a risk because "they

had heard about it from somebody". In addition, asking others what they do can be of importance when making a risky decision. Sociological and anthropological theories of risk have emphasised that risk is socially constructed (e.g., Douglas & Wildavsky, 1982; Kasperson et al., 1988) but since the late sixties, when social influence on risk perception was experimentally investigated (e.g., Levinger & Schneider, 1969; Madaras & Bem, 1968), experimental research on the effects of social influence on risk perception has withered. The focus group findings beg for more research on the effects of the social environment on risk perception. In contrast, the results from the questionnaire point out that, from an information seeker's point of view, information about other people's experience may not be particularly important, a finding that is consistent with results in a study by McCallum, Hammond, & Covello (1991). A possible explanation for this effect may be that it is not considered "objective" to use other people's experiences when judging and deciding about a risk, so that in a research setting (like a questionnaire) this would become relatively unimportant, whereas in daily life this kind of information may be very influential. It might be interesting to investigate whether risk perception is influenced unobtrusively by what other people say.

Finally, although some of the participants of the focus groups had indicated that they wanted to know who they could blame for the risks, the results from the questionnaire show that few respondents thought this was important information, although people were more interested in this information if the risk was perceived to be more dangerous. Perhaps this is only important for a small number of people, or it is only of concern to people after they have actually experienced the negative consequences of a risk.

Lay perceptions of risk

The data from the focus groups convey a first hand view of the way "lay people" perceive risks. Foremost, the participants viewed risks as an inherent aspect of life, without which it would be rather boring. Risks are the possibilities of (unknown) negative consequences that people accept in order to obtain associated benefits. People most readily associate risk with uncertainty (probability/lack of knowledge) about the negative consequences (and the seriousness of those consequences) and lack of control. Our finding that uncertainty and negative consequences play an important role is in line with Slovic's (1987) findings that the two main factors in risk perception are "unknown risk" and "dread risk". Control was also very important and this concurs with Vlek and Stallen's (1981) findings, who found that the "degree of organised safety" was one of the two main dimensions. Our qualitative data add a dynamic picture of the relation between knowledge, controllability and perceived risk, in that one obviously needs knowledge about the risk in order to be able to control it and that knowledge can thus, through controllability, influence the amount of perceived risk. Furthermore, during the interviews and the consequent analyses it became quite clear that controllability is an important aspect of risk perception, par-

ticularly if the risk is personally relevant. The concept of control is lacking from a large amount of research on risk perception, especially as a lot of research has used gambles, in which there is no control over the outcome. Risk perception research should therefore focus more attention on controllability if it is to adequately study the way people perceive risks, as is also argued by Hendrickx (1991) and Huber (1995, 1997).

A clear finding was that there are individual differences in the way people perceive risks. The participants frequently expressed the feeling that risks were different for everybody, which was also apparent from differences in people's desire for information. Perceiving risks is a subjective activity, which may be influenced by personality factors, in that some people are more inclined to take risks than others. Research on risk perception supports this notion: Vlek and Stallen (1981) found considerable individual differences in the way people rated an activity's riskiness, especially in their secondary dimension "degree of organised safety/degree of personal control" and Lion and Meertens (in press) found that people differed in the amount of information that they wanted. Lastly, differences in experience can influence risk perceptions: people can get used to certain risky situations and consequently perceive them as being less risky. This suggests that it could be important to tailor information to people, depending on the way they tend to deal with risks, if this is feasible. Specifically, people's risk taking tendency, people's need for information (given that some participants wanted to have all the available information, whereas others most certainly did not) and people's previous experiences with a risk appear to be important individual difference factors worth investigating further.

Communicating about risks

People do not really trust the sources that provide information about risks, a finding that is more or less in line with McCallum et al.'s (1991) findings. Most participants believed that information sources could not be really objective in their information. They seemed to be particularly worried about hidden financial agendas, which might lead those providing the risk information to portray the risk as being more safe than it really is. They were least distrustful of independent research institutes, like TNO (a Dutch independent contract research organization). Risk communicators working in the field have to deal with this issue (Slovic, 1986; Woudenberg, 1999). There is anecdotal evidence that people prefer open, truthful information (Slovic, 1986), even though communicators may be fearful of increasing people's perceived risks (MacGregor, Slovic, & Morgan, 1994). In any case, withholding information is not a useful strategy, as indicated by some of the focus group participants who said they would feel betrayed if this were to happen.

CONCLUSION

The data from the focus groups interviews and the rank ordering questionnaire have yielded a rich set of data about people's desire for risk information. A drawback is that in particular for the focus groups, participants with a higher level of education were over-represented in the sample. A further caveat should be made about the low response rate on the rank-ordering questionnaire, which limits the extent to which solid conclusions can be drawn. Nonetheless, the sample included people from very different levels of education and the different education levels were relatively well represented in relation to Dutch statistics. Thus, we believe that the results do give a general idea of how people view risks. A second drawback is that the data are mostly based on self-reports. It remains to be seen whether people are really not as interested in (and influenced) by interpersonal communication, as they themselves appear to believe. Perhaps they are more interested and influenced by what others say than they are consciously aware. Similarly, trust in the communicating agencies appeared to be quite important to the participants in this study, but Sjöberg (1998) has suggested that the influence of trust is only moderate. Experimental research on the effects of these variables on people's risk perception therefore remains quite important, before one makes bold conclusions about what kind of information people really use when confronted with an unknown risk. However, the aim of this study was to find out what information people desire, not how they use this information. A final caveat concerns the risks that have been used in this study. It was necessary to use unknown risks. However, the choice of risks may be reflected in some of the findings. For instance, the fact that they were not particularly interested in information about the risks may in part also have been due to the fact they did not believe the risks were particularly relevant, as they had not or hardly heard about them in the media. This qualification can be deduced from the way the participants talked about the risk (e.g., that they could not very well worry about everything). Thus, the findings may only pertain to risks that do not enjoy a high profile in the media. Furthermore, the finding that people ask different questions about the medication compared to the other risks, indicates that the questions may also be specific to the more large-scale environmental risks used in this study. Further research should investigate whether more categories of risk can be isolated, about which specific questions are demanded (cf. Huber et al., in press).

Keeping these comments in mind, the following conclusions may be drawn. Foremost, people appear to use a specific information seeking process. Although people first want to know what the risk actually entails, this is a somewhat trivial finding. Of more importance is that people first want to find out if one is exposed to a risk. The second step is to find out what and how serious the potential consequences are, which is closely related to the "dread risk" factor (Slovic, 1987). If one is exposed and the consequences are serious, the next step in the information seeking process appears to be to find out what one can do to control the negative consequences, and/or how probable the occurrence of the negative consequences are.

These steps indicate the following information seeking strategy: is the risk relevant to me, and if so, what can be done about it?

The results of this study show that the personal relevance of a risk is important to the way in which people deal with risks. In most of the psychometric research, this finding seems to be somewhat obscured by the large number of aspects that have been found to influence risk perception, although on closer inspection, risk aspects like the delay of effects (Slovic, 1987) and the geographical distribution of consequences in (social) geographical space (Vlek & Stallen, 1980) do point out that personal relevance plays a role in the judgement of risks. The results of this study also show a clear link to health behaviour models, such as the Transaction Model of Stress and Coping (Lazarus & Folkman, 1984) and the Protection Motivation Theory (Rogers & Prentice-Dunn, 1997), both of which suggest an appraisal stage in which people aim to determine whether or not further action is called for. The information that these models assume that people need in order to make that appraisal (e.g., perceived severity, perceived susceptibility) are quite similar to the information that the participants in our studies ask for. This suggests that these models can not only be used for risks that are directly related to health behaviours for which these models have been traditionally used (e.g., safe sex, smoking), but should also be applied to people's behaviour in relation to larger scale risks (cf. Sjöberg's [1999] risk mitigation). Moreover, combining the results of 'traditional' risk perception research with the findings that the research on the models of health behaviour have generated, might provide interesting new insights into ways of communicating about risks.

Footnote

1. "Responsibility" is a more neutral description of the finding that some participants wanted to know who was to blame for the risks.

3

**SEEKING INFORMATION ABOUT A RISKY MEDICINE:
EFFECTS OF RISK-TAKING TENDENCY AND ACCOUNTABILITY**

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INTRODUCTION

On a daily basis, we are confronted with risks of varying magnitude, ranging from the risk of going to a movie that turns out to be extremely boring to the risk of dying from cancer. Not surprisingly, a considerable amount of research has been done on human risk perception and risk behaviour. Basically, this research can be divided into three traditions. First, in the psychometric tradition, different dimensions of risk that are related to risk perception were isolated, e.g. knowledge about the risk (Slovic, 1987) and catastrophicality (Vlek & Stallen, 1980, 1981). Second, the personalistic tradition can be distinguished, which concentrated on defining and measuring personality characteristics that determine risk taking across situations and risks, like sensation seeking (Zuckerman, 1979). Finally, the experimental tradition focuses on determining how changes in risk dimensions, for example voluntariness and controllability, influenced risk taking (e.g., Hendrickx et al., 1992; Kahneman & Tversky, 1979; Lopes, 1987).

In most of this research, the risk information is determined in advance by the experimenters (e.g., Hendrickx et al., 1992; Kahneman & Tversky, 1979; Lenderink et al., 1994; Lopes, 1987; Tversky & Kahneman, 1982). However, when people are confronted with a particular risk in daily life, for example the use of a risky medicine, they have the possibility to seek information about that risk themselves. They may decide not to look for any information at all, they may bias their information search toward reassuring information, or they may try get as clear a picture of the problem as possible. People are usually not passive recipients of information, but rather actively engage in searching information (Jacoby et al., 1987). The idea that people actively search for information has been relatively neglected in risk perception literature (however see Huber, 1995; Huber et al., 1997).

The question then arises what information people want. The following dimensions have been shown to be important in risk perception and risk acceptance. The first and arguably the most important is the controllability of a risky option (see Hendrickx, 1991; Huber, 1995; Slovic, 1987; Vlek & Stallen, 1981). The second is frequency information (Hendrickx, 1991; Vlek & Stallen, 1981) which consists of objective information about the probability that an activity may lead to death, illness, injury, etcetera. Third, research has shown that the advantages and disadvantages of taking a risk also play a role in the risky decision-making process (Hendrickx, 1991). Finally, research about the use of frequency and scenario information in risky judgements suggests that in some situations scenario information (a "story" about how an activity leads to its consequences) is used in favour of more "objective" frequency information (Hendrickx et al., 1989). One of the objectives of this research was to find out whether people seek information on these dimensions when they are confronted with a risk.

If people actively look up information, this information seeking might be affected by systematic factors, like personality traits and social demands. Therefore, in this study we investigated how a personality trait relevant to risk taking – a

person's risk-taking tendency (cf. Zuckerman, 1979) – and a social demand – the need to justify oneself to others (accountability; Tetlock, 1983, 1992) – can influence the extent to which people seek out risk information.

A personality trait might influence information seeking, as people may bias their information search in a way that is consistent with their personality. Having a particular personality may imply that certain constructs (e.g., simple decision rules) are chronically accessible in memory (Bargh, 1989; Bargh & Barndollar, 1996) which people then might use to process information (Chaiken, Liberman, & Eagly, 1989). As such, when confronted with a risky medicine, people who generally avoid risks may use a risk-avoiding information search strategy and bias their information search toward information that is consistent with their risk-avoiding behaviour. Thus, they may focus more on the negative consequences of taking a risk (e.g., the side effects). On the other hand, people who tend to take risks, may bias their information search toward information that is consistent with their risk-taking behaviour and predominantly focus on information about the positive consequences of taking a risk. In fact, it has been suggested that risk takers focus more on the rewards associated with the risks (i.e., positive consequences associated with a risk), whereas risk avoiders are expected to focus more on the costs of risks (i.e., the negative consequences of a risk; Cloninger, 1987; Horvath & Zuckerman, 1993; Lopes, 1987; Steketee & Frost, 1994). Furthermore, Horvath and Zuckerman (1993) and Steketee and Frost (1994) seem to suggest that risk takers act more impulsively and plan ahead less than risk avoiders. This implies that risk avoiders will seek more information than risk takers.

Not only personality characteristics but also demands instigated by a social setting may influence the extent to which people seek information. Accountability, or the need to justify oneself to others, is such a socially instigated demand that is expected to influence the extent to which people seek risk information (Tetlock, 1992). People tend to look at all sides of an issue when they are held accountable, and they use this pre-emptive self-criticism to be best prepared for possible objections from their audience (Tetlock, 1992). Thus we expected that people who are held accountable will look up more information than people who are not held accountable. Evidence for this notion has been found in several domains of decision making, but not in risk-perception research (e.g., Billings & Scherer, 1988; McAllister et al., 1979; Verplanken et al., 1997).

Furthermore, we expected accountability to have a different effect on risk takers compared to risk avoiders (cf. Lenderink et al., 1994; Weigold & Schlenker, 1991). Our predictions were explorative, but we expected that risk avoiders, given the fact that they are relatively more cautious than risk takers, would be more susceptible to accountability manipulations than risk takers. We expected risk avoiders to put more effort in attempts to minimise the risk of not being able to justify their decision and losing face as a consequence. Risk takers may care less about this risk and may consequently be less affected by variations in accountability.

Finally, the accountability manipulation might influence the kind of risk information risk takers and risk avoiders focus on. As mentioned earlier, we expected

risk avoiders and risk takers to focus on different risk-information dimensions, but the accountability manipulation should motivate both to be prepared for any questions that may arise. This explicitly activated information processing goal is then expected to overrule the default heuristic processing that occurs in line with a person's risk-taking tendency (cf. Sedikides, 1990). Therefore, they should look for both positive and negative information, regardless of their risk-taking tendency.

To summarise, we propose the following five hypotheses (in a different order than in the text above).

Hypothesis 1

A main effect for accountability on the amount of information looked up: Accountable subjects look up more information than non-accountable subjects.

Hypothesis 2a

A main effect for risk-taking tendency on the amount of information looked up: Risk avoiders look up more information than risk takers.

Hypothesis 2b

An interaction effect between accountability and risk-taking tendency on the amount of information looked up: Risk avoiders are expected to be more susceptible to the accountability manipulation than risk takers. Therefore we expected the difference between the amount of information looked up by non-accountable risk avoiders and accountable risk avoiders to be larger than the difference between the amount of information looked up by non-accountable risk takers and accountable risk takers.

Hypothesis 3a

A main effect for risk-taking tendency on the type of information (positive vs. negative) looked up: Risk avoiders focus more on information about the losses associated with the risk, whereas risk takers focus more on information about the gains.

Hypothesis 3b

An interaction effect for risk-taking tendency and accountability on the type of information looked up: The accountability manipulation should overrule the information preference of risk avoiders and risk takers, as proposed in Hypothesis 3a. Specifically, only in the non-accountable condition did we expect risk avoiders to focus more on negative information and risk takers to focus more on positive information.

Our aim in the current investigation was to test the aforementioned hypotheses by letting subjects look up information about a risky anti-bloodclotting medicine. This was done by means of an Information Display Board (IDB; Billings & Scherer, 1988; Jacoby et al., 1987; McAllister et al., 1979; Payne, 1992), a process-tracing technique that allows the tracking of subjects' information acquisition (see the method section).

In addition, we wanted to find out what dimensions subjects wanted information about when confronted with a risk.

METHOD

Participants

Seventy-five students of the Faculty of Health Sciences and the Faculty of Economics at Maastricht University (9 men and 66 women, $M_{\text{age}} = 21.4$) participated in the experiment, which lasted approximately forty-five minutes. They were paid f12,50 (approx. €5,50) for their participation.

Materials

Risk scales

In order to measure a person's risk-taking tendency, all participants completed two questionnaires that measured perceived risk taking at the start of the session¹. The questionnaires used in this study were a risk scale we constructed ourselves (RS) and a Dutch translation of the Everyday Risk Inventory ERI (Steketee & Frost, 1994). The main reason for using the ERI was to validate our risk scale. The ERI consists of 32 everyday risk-taking behaviours. Participants rated on a five-point scale how likely they thought they were to engage in the proposed activities. The RS consisted of seven general statements about risk-taking (e.g. "I prefer to avoid risks"; "I do not take risks with my health") that were rated on a nine point scale (1 = *totally disagree* / 9 = *totally agree*) plus an additional item self-rating the respondent's risk-taking tendency (1 = *risk avoider* / 9 = *risk-seeker*; cf. Weigold & Schlenker, 1991). The RS had a good internal reliability, Cronbach's $\alpha = .80$. An English translation of the RS is included in appendix 2. The Dutch translation of the ERI had the same internal reliability as the English ERI, Cronbach's $\alpha = .83$ (Steketee & Frost, 1994). Both scales correlated significantly ($r = 0.54, p < 0.001$), which can be seen as a validation of the RS. As some of the ERI's items may be somewhat unrealistic for Dutch students (e.g. "Go camping in a national park where there are grizzly bears"; probably the most dangerous animals in the Netherlands are wild boars) and as it has no health related items, only the results pertaining to the RS will be reported here². A median-split on the RS ($Mdn = 5.00$) was used to create groups of risk avoiders and risk takers. As there is no criterion independent of the current sample with which the two groups can be defined, "risk avoiders" should be read as "participants with a lower tendency to take risks", and "risk takers" as "participants with a higher tendency to take risks", rather than risk avoiders and risk takers in an absolute sense. However, comparison of the ERI scores ($M = 3.1$) from our sample with those of the two samples reported in Steketee and Frost's (1994) validation study ($M_1 = 3.2$; $M_2 = 3.4$), seem to indicate that our sample was reasonably representative for the general population, which in turn seems to indicate that in our study risk avoiders were indeed risk avoiders, and risk takers were indeed risk takers.

	Trombolan	Becardon	Carozile	Danaparine
Controllability of the negative consequences				
Effectiveness of the medicine				
Advantages of the medicine				
Disadvantages of the medicine				
Likelihood of side effects				
Positive experience with the drug				
Negative experience with the drug				

Ready

Figure 3.3 Screen shot of an Information Display Board

Risk information: the IDB

The risk information was displayed on a computer screen by means of a 4 x 7 (medicines x dimensions) matrix (the IDB). With a mouse, the participants could click on the different boxes in the matrix corresponding to information about an aspect of a particular medicine (see Figure 3.3). If information about a dimension appeared on the screen, the IDB itself was no longer visible; participants had to click a button in order to return to it.

The risk used in the experiment consisted of four fictitious, but realistic anti-clotting medicines (cf. Tetlock & Boettger, 1994) that differed in their perceived riskiness. The medicines were described in such a way that there was not an obvious "best" choice. The least risky medicine had a low probability of creating permanent damage, but was overall not very effective. The riskiest medicine on the other hand, had a high probability of leaving severe permanent damage, but was also very effective in unclotting blood.

Information about these medicines were given on seven dimensions. These were:

1. the "controllability of the side effects" (positive information), e.g. "The side effects can be treated quite well. If they are treated quickly and adequately, 95% of the patients will not experience permanent damage from the side effects".

2. the "*effectiveness of the medicine*" (positive information), e.g. "The medicine is effective for 50% of the people that experience side effects and 65% of the people that do not experience side effects".
3. the "*advantages of the medicine*" (positive information), e.g. "It somewhat halts bloodclotting and can thus prevent heart attacks from occurring. The costs will be refunded by the National Health Service".
4. the "*disadvantages of the medicine*" (negative information), e.g. "Severe internal haemorrhaging can occur, which can be easily treated."
5. the "*probability of side effects occurring*" (negative information), e.g. "Side effects occur in 60% of the cases".
6. a "*positive experience with the medicine*" (positive scenario information), e.g. "In June 1990 Bas' arm started to bother him. Initially he hardly paid attention to it. Toward the end of 1990 he had a heart attack. He was hospitalised for a short period of time at the cardiology department. The cardiologist diagnosed that the heart attack had been caused by a bloodclot that obstructed a blood vessel. An anti-bloodclotting medicine was prescribed to Bas. The cardiologist wanted to try the experimental medicine Trombolan. Bas consented. In the beginning Bas muscles were a bit sore due to the medication, but that passed away after a while. Ever since, Bas has had no complaints about his heart and he feels excellent."
7. a "*negative experience with the medicine*" (negative scenario information), e.g. "Mark had been asked by his cardiologist to participate in an experiment with Trombolan. Mark had earlier survived a heart attack. Some time after he had been administered the medicine, he indicated that he did not feel too well. When he came to the general practitioner feeling ill, the G.P. diagnosed internal bleeding. He was quickly transferred to hospital, where he was immediately administered medication that would stop the bleeding. This medication was not effective and another medicine was administered in an attempt to stop the bleeding. This was to no avail, however, and shortly afterward he died as a consequence of the internal bleeding."

These dimensions were chosen as they have been shown to be of importance in risk perception and risk acceptance literature (see the introduction). Information about the effectiveness and the probability of side effects are operationalisations of frequency information. These were seen as essential to making a choice about medicines in general, and are basically the direct positive and negative consequences of the risk respectively.

Dependent measures

Prior to entering the IDB, the participants were shown all the dimensions that would be used in the IDB. They were given no additional description about the exact informational content of those dimensions. They were asked to indicate which three dimensions they would most like to see information about. We included this dependent variable in order to find out initial preferences for particular dimensions, without the actual information in the IDB influencing this preference.

In order to measure the amount of information looked up by the participants, we recorded the number of times each item of information was accessed. We also measured the amount of time each participant read a particular item, and the amount of time each participant spent searching for information in the IDB (when a participant entered the IDB, a timer was started, which did not stop until the participant had left the IDB).

After the subjects had left the IDB, we asked the participants which medicine they thought was best. As this measure is not the main focus of this paper, results pertaining to the choices made are not presented here, but there did not appear to be significant differences between risk takers and risk avoiders. Also, we asked them whether they had taken into account that they would have to justify themselves later on.

Procedure

The students participated in a computer-controlled experiment in groups of up to four persons per session. They were randomly assigned to one of two conditions (accountable vs. non-accountable) and placed in separate cubicles. After a short explanation about using the computer and after answering some questions about age, sex and study, they were asked to complete the ERI and the RS on the computer. Upon completion of this task, they were told that the aim of this study was to find out how people made decisions about the use of a risky therapeutic medicines. Following an explanation about IDBs, they were offered a practice IDB with different brands of Earl Grey tea. They then continued with the actual task. First they were told that they would be offered an IDB with anti-bloodclotting medicines. This was followed by a screen on which all the dimensions about the medicines were provided. They were asked to choose which three out of seven dimensions they preferred to see information about. It was made clear that this would not affect the type or amount of information they could look up in the IDB. Subsequently, they were given the instruction to choose the one (and only one) anti-bloodclotting medicine that they deemed best, after having studied the information in the IDB. The participants in the *non-accountable* condition were told that their decision would be kept anonymous and confidential. Participants in the *accountable* condition were told that they would have to justify their decisions to a researcher, as the Dutch Central Pharmaceutical Medical Committee (CPMC: the Dutch FDA) was interested in the reasons people had for making a particular choice. They could then click on to the actual IDB and look up information about the medicines in order to make a decision. When the participants were ready they could leave the IDB. They then had to choose their preferred medicine and had to explain why on an answer form lying next to the computer. After answering some additional questions, the participants were paid and debriefed.

RESULTS

Two participants were excluded from the analyses, as they were exactly on the median of the RS.

Manipulation checks

Sixty-nine percent of the participants in the accountable condition said that they had taken into account that they would have to justify themselves later when searching for information as opposed to 43% of the participants in the non-accountable condition, $\chi^2(1, N = 73) = 5.1, p = .02$. This indicates that the accountability manipulation was moderately successful. This will be dealt with in the discussion.

Dependent measures

Interest in risk dimensions

Participants had to indicate which three (out of seven) dimensions they would want to have information about. The dimensions they chose most often were the effectiveness of the medicine (90%) and the probability of side-effects occurring (78%). Approximately 50% of the participants were interested in the disadvantages, and 45% wanted to know about the controllability of the negative consequences. Only 8% wanted to know about a positive experience and 4% wanted information about a negative experience.

Similar results were found when subjects were actually looking for information in the IDB. An ANOVA on the number of times information was looked up on the different dimensions, with the 7 dimensions as repeated measures, yielded a significant main effect, $F(6, 67) = 36.1, p < .001$. Post-hoc pairwise comparisons showed that the "effectiveness of the medicine" ($M = 5.1$) was looked up significantly more often than the other dimensions, all t 's, $p < .04$, except for the dimension "disadvantages" ($M = 4.5$), which did not differ significantly, $p = .07$. The next most popular dimensions were controllability ($M = 4.6$), disadvantages ($M = 4.5$), the probability of side effects occurring ($M = 4.5$) and advantages ($M = 4.0$). These means did not differ significantly from one another, all t 's, $p > .07$. Finally, the positive ($M = 2.2$) and negative ($M = 2.3$) scenario were looked up least of all. The means for these two dimensions did not differ significantly from each other, $p = .61$, but they did differ significantly from the other dimensions, all t 's, $p < .001$. Consequently, it can be concluded that the participants were mostly interested in the effectiveness of the medicine, the controllability of the side effects, the disadvantages, the probability of side effects occurring and the advantages.

A preliminary conclusion on the basis of these data could be that the participants in this study did not appear to be very interested in scenario information.

Effects of the independent variables on interest in risk information search

The total number of times the participants accessed items (re-inspections included) was computed and this was subjected to a 2 x 2 (accountability x risk-taking tendency) between subjects ANOVA³. The corresponding effect sizes (Cohen's *f*) are also given (Cohen, 1992). An effect size of 0.10 is considered small, but meaningful, an effect size of 0.25 indicates a medium effect size, and an effect size of 0.40 is considered large (Cohen, 1992).

The analysis revealed that accountable subjects looked up more information ($M = 30.86$) than non-accountable subjects ($M = 23.7$), $F(1, 69) = 7.6$, $p < .01$, $f = 0.33$. Risk-taking tendency also yielded a main effect on the amount of items looked up. Risk avoiders looked up information more often ($M = 30.3$) than risk takers ($M = 24.2$), $F(1, 69) = 4.5$, $p < .05$, $f = 0.3$. No interactions were found, $F(1, 69) = 1.2$, $p = .3$. These findings support our first hypothesis that accountable subjects look up more information than non-accountable subjects and it confirms Hypothesis 2a that risk avoiders look up more information than risk takers. However, since no interaction was found for risk-taking tendency and accountability, we found no support for Hypothesis 2b that risk avoiders would be more susceptible to the accountability manipulation than risk takers.

In order to find out whether the main effects could be attributed to a specific interest in some of the items, we looked at the univariate main effects. Univariate effects for accountability were found on "the controllability of the side effects", $F(1, 69) = 5.4$, $p < .05$, $f = 0.3$; on "disadvantages", $F(1, 69) = 4.2$, $p < .05$, $f = 0.2$; on "a positive experience", $F(1, 69) = 7.1$, $p = .01$, $f = 0.3$; and on "a negative experience with the medicine", $F(1, 69) = 7.3$, $p < .01$, $f = 0.3$ (see Table 3.1). The other means were in the predicted direction, but did not approach significance.

Univariate main effects for risk-taking tendency were found on two of the seven dimensions, notably "advantages of using the medicine", $F(1, 69) = 11.3$, $p = .001$, $f = 0.5$; and "disadvantages of using the medicine", $F(1, 69) = 4.8$, $p < .05$, $f = 0.3$ (see Table 3.2). Risk avoiders looked up these items significantly more often than risk takers. All other means were in the direction predicted in hypothesis 1, but did not approach significance.

Also, a univariate interaction was found for accountability manipulation and risk-taking tendency on the first dimension ("controllability of the consequences"), $F(1, 69) = 4.0$, $p < .05$. Accountable risk avoiders looked up this item more often than non-accountable risk avoiders, $t(34) = -3.4$, $p < .005$, $f = 1.2$, whereas risk takers were hardly affected by the accountability manipulation, $t(35) = -.21$, $p = .8$ (see Table 3.3). Although no other significant interactions were found, the results on two dimensions that were looked up often, "the effectiveness of the medicine" and "the probability of side effects occurring", displayed a similar pattern. Thus we found a slight indication that risk avoiders are more susceptible to the accountability manipulation than risk takers (Hypothesis 2b).

In order to test Hypothesis 3a (risk avoiders focus more on losses, risk takers focus more on gains), we computed two new variables. The first variable ("positive") consisted of the average number of times the positive dimensions ("controllability of

Table 3.1 *Influence of Accountability on the Mean Amount of Times Items about the Different Dimensions were Looked up.*

	Accountability	
	Non-accountable	Accountable
Controllability of the side effects	3.9	5.1
Disadvantages	3.9	5.1
Positive experience	1.7	2.8
Negative experience	1.7	2.8

Table 3.2 *Influence of Risk-taking Tendency on the Mean Amount of Items Looked up on the Different Dimensions*

Dimension	Risk-taking tendency	
	Risk avoider	Risk taker
Advantages of the medicine	5.0	3.1
Disadvantages of the medicine	5.2	3.9

Table 3.3 *Univariate Interaction Effect for Accountability and Risk-taking Tendency on the Mean Amount of Times Controllability of Consequences was Looked up*

Experimental condition	Risk-taking tendency	
	Risk avoider	Risk taker
Non-accountable	3.7	4.1
Accountable	5.8	4.3

side effects", "effectiveness of the medicine", "advantages of the medicine" and "positive experience with the medicine") had been looked up, and the second variable ("negative") consisted of the average number of times the negative dimensions ("disadvantages of the medicine", "probability of side effects occurring" and "a negative experience with the medicine") had been looked up. Support for Hypothesis 3a would be found if an interaction were found for risk taking tendency and the number of times positive and negative dimensions were looked up. This was tested by means of a 2 x 2 (risk taking tendency x accountability) MANOVA with positive and negative as repeated measures. The interaction was non-significant, $F < 1$. Thus no support was found for Hypothesis 3a that risk avoiders focus more on the negative items and risk takers focus more on the positive items. Consequently, there is also no support for Hypothesis 3b, in which we proposed that the effects predicted in Hypothesis 3a would be attenuated.

To assess whether the accountability manipulation or a person's risk-taking tendency affected the amount of attention paid to the information, the average reading time per chosen item was computed and subjected to a 2 x 2 (accountability x risk-taking tendency) between subjects ANOVA. This analysis did not reveal any statistically significant effects (all F 's < 1), indicating that neither factor influenced the amount of attention paid to the items. Apparently, risk-taking tendency and accountability only influenced the number of times the participants looked up information.

DISCUSSION

The aim of this study was twofold. First we wondered whether risk dimensions that prior risk perception research had found to affect risk perception, were also deemed relevant by subjects when they were looking for information about risks. Second, we wanted to find out how risk information search would be affected by one's risk-seeking tendency and by accountability.

Results revealed that our participants were interested most in the effectiveness of the medicine (i.e., the probabilities of positive consequences) which can be seen as frequency information, and they were least interested in scenario information. Apparently, when people seek information themselves, people do not seem to be particularly interested in scenario information, although (Hendrickx et al., 1989) showed that scenario information can influence the final decision to a greater extent than frequency information. These different findings may be due to the fact that we used a different risk subject (a medicine as opposed to "going swimming at a hazardous site" or "cleaning a facade using caustic chemicals"). Thus, although the scenarios may have given an idea about the controllability of the consequences for an expert (in this case a doctor), the consequences may be seen as being uncontrollable

from a personal point of view⁴. Perhaps scenario information is only used when it gives people an idea of how they can *personally* control the consequences of a risk.

Another reason might be that unlike in Hendrickx et al.'s (1989) experiment, the scenario information in this experiment did not provide additional process (i.e., causal) information about the way taking one of the medicines could lead to its consequences. Perhaps scenario information, like base rate information (e.g., Tversky & Kahneman, 1982), is only used when it offers extra information about the process that leads to the consequences. However, subjects were also not in the least interested in scenario information when they had to choose the three dimensions they preferred to have information about. This finding also seems to rule out the possibility that the preference for frequency information over scenario information was the consequence of the specific content of the information of the IDB.

Another likely explanation would seem to be that there is a difference between seeking information and using information offered by an experimenter (Huber, Wider & Huber, 1997). In other words, if scenario information is simply offered in a laboratory situation, participants might for instance also assume that the information is important, as the experimenter would otherwise not have given that information. Further research should extend our findings to more natural information seeking situations, in which an individual can really seek any information, and is not limited to a pre-determined set of dimensions as was the case in our study.

Furthermore, risk takers and risk avoiders do not seem to differ in the type of information they prefer. More specifically, when dealing with information about a risky medicine, we found no evidence that risk takers focused more on the gains, and risk avoiders more on the losses, in contrast to what (Horvath & Zuckerman, 1993) suggested. One reason for this may have been that the participants were relatively motivated to search information, given the fact that the medicine could save lives. As a consequence, they might have been processing information systematically. The accountability manipulation might have then added to that effect, leading them to process information even more systematically. Another reason why we may not have obtained the results predicted, is that the participants could not decide on the basis of the description of the dimension whether the information was positive or negative. For example, if they expected the effectiveness of the medicine to be small, this might have been seen as negative information, instead of positive information as we had intended it to be. Further research should specifically address this issue, for example by clearly labelling information as either positive or negative.

Risk avoiders and risk takers did display differences in the amount of information they looked up. Evidently, risk avoiders look up more information than risk takers. As Horvath and Zuckerman (1993) suggested, risk avoiders appear to engage in more elaborate planning than risk takers, and seem to be more careful before taking a risk, as suggested by Steketee and Frost (1994).

We did not find evidence for an interaction between risk-taking tendency and accountability. However, the univariate interaction on the dimension "controllability of the negative consequences" seems to warrant further investigation in this area, especially since a similar pattern was found on the two other variables that

were looked up most often, to wit "the effectiveness of the medicine" and "the probability of side effects occurring". Also, although the manipulation check indicated that the accountability manipulation was successful, quite a few non-accountable participants felt they were accountable and vice-versa. Consequently, it is possible that a stronger manipulation would have yielded better results.

Earlier research has established that accountability increases information search depth (Billings & Scherer, 1988; McAllister et al., 1979; Verplanken et al., 1997). Our results give further support for this finding and extends it to risk information. These results are also in line with the findings that accountable subjects process information more thoroughly than non-accountable subjects (Chaiken et al., 1989; Tetlock, 1983, 1992). People are often in a situation in which they are accountable (Tetlock, 1992) and our findings indicate that the social situation in which risky decision makers find themselves can exert an influence on the elaborateness of the information-seeking process.

A possible drawback of this study that has not been mentioned before, is that it can be argued that the generalization of the results should be done with caution, as the majority of the participants were women. However, the results of a recently conducted meta-analysis of gender differences on risk taking by Byrnes et al. (1999) seem to indicate that in hypothetical choice tasks (as we believe is the case in this study) gender differences tend to be quite small.

One of the first things that people will probably do when confronted with a risk is look for information about this risk. This has received relatively little attention in a risk perception research tradition that has tended to focus on judgements and decisions that had to be made by processing a pre-determined set of information. Our results indicate that the extent to which people actively search for information can be affected by one's risk-taking tendency and by accountability. This might be important as decision making very often begins with seeking information about the decision at hand, and apparently already at that stage several factors can influence the information-seeking process, which in turn might influence the final decision made.

Footnotes

1. We chose not to use Zuckerman's (1979) Sensation Seeking Scale, as we believe that choosing a risky medicine hardly involves seeking sensation. Instead, we were interested in risk taking in a more general sense.
2. Analyses using the ERI revealed comparable results.
3. Regression analyses with the total amount of items looked up as dependent variable, and the accountability manipulation and risk taking tendency as predictor variables yielded similar results.
4. We are grateful to an anonymous reviewer for this suggestion.

SECURITY OR OPPORTUNITY: THE INFLUENCE OF RISK-TAKING TENDENCY ON RISK INFORMATION PREFERENCE

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INTRODUCTION

When confronted with new risky objects or activities (risks), people can usually exert some influence over the kind of information they receive. For example, when introduced to, say, a new kind of investment, some people may be more interested in why they *should* participate in the investment (i.e., information about the positive aspects of the risk), whereas others may be more interested in why they should *not* participate in the investment (i.e., information about the negative aspects of the risk). Surprisingly, research on people's active risk information search is scarce (for exceptions see Huber et al., 1997; Lion & Meertens, 2001 [chapter 3]). The way people search for risk information might be very important however, as the kind of information that people seek may influence later risk judgements and risk taking.

Risk perception literature suggests that individual differences in people's tendency to take risks can influence people's risk judgement and risk taking. Horvath and Zuckerman (1993) for example, suggest that high sensation seekers focus more on the rewards associated with risk taking, whereas low sensation seekers focus more on the costs associated with risk taking. Furthermore, Lopes (1987) proposes that people can be categorised in terms of risk avoiders and risk seekers. This dispositional variable can predict the way people deal with risks. Lopes (1984) found that risk avoiders tend to pay more attention to the worst outcomes and risk takers tend to pay more attention to the best outcomes. Risk avoiders value security, risk takers value opportunities.

Risk taking tendency may also have implications for people's information search. Given the aforementioned, risk avoiders could be expected to be particularly interested in information about the worst outcomes (i.e., the extent to which one's sense of security is threatened). Risk takers, on the other hand, could be expected to be more interested in information about the best outcomes (i.e., the extent to which new opportunities are offered). Thus, risk avoiders and risk takers should seek information in line with the choice that they are inclined to make (i.e., a risk avoiding and risk taking one, respectively). Consequently, if a person were to decide whether or not to participate in a new kind of investment, a risk avoider would be more interested in the reasons not to participate in the investment (e.g., the size of potential losses, the probability of these losses), whereas a risk taker would be more interested in the reason to participate in the investment (e.g., the potential profits, the probability of those profits).

Risk perception literature has shown that controllability of the risk or of its consequences is an important determinant of the way people perceive risk (e.g., Hendrickx & Vlek, 1991; Hendrickx et al., 1989; Huber, 1995; Slovic, 1987; Vlek & Stallen, 1981). Information about a risk's controllability may indicate ways to reduce the chance of things going wrong. Differences in preferences for positive or negative risk information might therefore be especially apparent for information about a risk's controllability, as this would allow risk avoiders and risk takers to substantiate their decision whether or not to take a risk. Thus, risk takers may be especially interested

in information that implies that there are good ways to control the risk ("I can take the risk, it's controllable"), whereas risk avoiders may be especially interested in information about the lower bound of a risk's controllability ("Can't take the risk, I can't exert control").

The assumption is that the information seeking process described above is a person's default way of seeking information, or a chronically accessible construct (Bargh, 1989; Bargh & Barndollar, 1996), which operates when no particular social demands are present that may influence a person's information seeking. Fortuitously primed constructs (which can mimic chronically accessible constructs) can be overruled by explicit goals instigated by the environment (cf. Sedikides, 1990). Thus, when one has to justify one's behaviours, decisions or judgements to others, this demand for justification should overrule the default information strategy. Research on accountability has shown that being accountable can have considerable effects on information search and information processing (Lerner & Tetlock, 1999; Tetlock, 1992). Specifically, in order to be best prepared for possible criticisms, people engage in a more elaborate information search and processing style when they do not know their audience's preferences and norms. Thus, we assume that the default information processing strategy will be overruled if one is held accountable for one's decision making. This implies that differences between risk avoiders and risk takers should only be detected when they are not held accountable.

In earlier research, Lion and Meertens (in press [chapter 3]) found considerable differences between risk avoiders and risk takers in the amount of information that they looked up in an information display board. No differences were found for risk avoiders' and risk takers' preference for positive and negative information about the risk, however. This was probably due to an inadequate labelling of the positive and negative information about the risk. Another possible reason may have been that subjects in both the accountable and non-accountable condition were relatively highly motivated to search for and process information, as the risk was a matter of life and death (i.e., an anti-bloodclotting medicine). Therefore, in this study positive and negative information was clearly labelled as such. Moreover, several relatively unknown risks that were less life threatening were used, such as electromagnetic fields and a medicine against dengue fever. Using unknown risks should also exclude any effects of prior knowledge on a preference for risk information.

Another aim of this study was to investigate the relative importance of information about risk aspects. The following risk aspects were used in this study, as risk perception literature has shown that these should be of particular interest to risk information seekers: a risk's controllability (i.e., the extent to which one can influence the course of the risk; Hendrickx & Vlek, 1991; Hendrickx et al., 1992; Hendrickx et al., 1989; Huber, 1995; Slovic, 1987; Vlek & Stallen, 1981), the severity of the consequences (Slovic, 1987; Vlek & Stallen, 1981), the amount of scientific knowledge (Slovic, 1987; Vlek & Stallen, 1981), the (dis)advantages of a risk (Vlek & Stallen, 1981) and the probability of occurrence of the negative consequences (uncertainty). This last aspect is prevalent in virtually every definition of risk, and it has generated a huge body of research (e.g., Hendrickx et al., 1989; Kahneman &

Tversky, 1979; Lopes, 1987; Tversky & Kahneman, 1982). Finally, as people live in a social context (Turner & Oakes, 1986) and risk perception can also be seen as a social construct (see Douglas & Wildavsky, 1982) which is influenced by "informal communication networks" (Kasperson et al., 1988), it might well be that risk information seekers are also interested in other people's experiences in relation to a risk. Information about other people's experiences was consequently added to the risk aspects used in this study.

In conclusion, we tried to find support for the hypotheses that (a) risk avoiders prefer negative information about a risk and risk takers prefer positive information about a risk, (b) a finding that should manifest itself particularly on information about a risk's controllability, and (c) for participants who are held accountable for their decisions, differences in information preferences between risk avoiders and risk takers should not be discernable, as the participants default information strategy will be overruled by the explicit instruction to justify one's decision. A final explorative aim of this study was to investigate in what risk aspects the participants were most interested.

METHOD

Participants

Seventy-eight students of Maastricht University, 34 men and 44 women participated in the experiment, which took approximately 45 minutes. They were paid f12,50 (approximately €5,50) for their participation.

Materials

Risk-taking tendency was measured by means of a risk scale we constructed (RS; Lion & Meertens, 2001 [chapter 3]), which consists of seven general statements about risk taking (e.g., "Safety first" and "I do not take risks with my health") that are scored on a 9-point scale (1 = *totally disagree*, 9 = *totally agree*). The RS had been administered to 95 students during another study several months earlier. Seventy-eight of these participants eventually agreed to participate in the study reported here. The RS had good internal reliability, Cronbach's $\alpha = 0.77$. Earlier research has established that the RS correlated significantly with the Everyday Risk Inventory (ERI; (Steketee & Frost, 1994); see Lion and Meertens (in press; [chapter 3]). A median split ($Mdn = 4.71$) on the original group of 95 participants was used to create a group of risk avoiders (low scores on the RS) and a group of risk takers (high scores

on the RS). Although other validated scales exist that could have been used to distinguish risk avoiders from risk takers, these scales were not satisfactory given the aim of this study. For example, Lopes (1987) used five financial choices between a certain and an uncertain option to measure risk taking tendency. However, financial choices are a very specific kind of risk, and we were more interested in an overall risk taking tendency. The Sensation Seeking Scale (Zuckerman, 1994) was also deemed inappropriate, as the risks used in our research did not involve thrill or sensation seeking.

Risks

The task the participants had to perform involved selecting information about seven risks that were either unknown or fictitious. These risks were: a new (fictitious) medication against dengue fever, genetically modified crops, the use of dietary supplements, a new kind of paint (Chemtex), electromagnetic fields, intercontinental space aviation and participation in a new form of investment. These risks were used because they were (relatively) unknown at the time the study was conducted. This enabled us to measure information preferences that were relatively unbiased by prior knowledge about these risks.

Information preference was measured by offering participants six newspaper headlines about each of the aforementioned risks. The headlines were all operationalisations of the six risk aspects that have been discussed in the introduction (i.e., [dis]advantages, controllability, scientific knowledge, other people's experiences, severity and probability).

For every risk aspect, a positive and negative item was made, so that the positive and negative information was clearly labelled. For example, the positive controllability item for the medicine against dengue was "Side effects of the new medication against dengue easily controllable" and the negative controllability item was "Side effects of the new medication against dengue difficult to control" (see Table 4.1 for the complete set of items used for the new medication against dengue fever). Overall, six headlines were presented for each risk, three of which were positive and three of which were negative. The computer program that ran the experiments randomly determined whether a positive or negative item was presented. The order in which the aspects were presented was also determined randomly, as was the order in which the risks were presented. Figure 4.1 illustrates what a participant could have seen for genetically modified crops. Participants indicated their information preference by selecting the three newspaper headlines that interested them most, under the assumption that they would get to read the underlying articles.

Table 4.1 Example of the Positive and Negative Items for the New Medication against Dengue.

Risk aspect	Positive	Negative
(Dis)advantages	New medicine against dengue protects well	New medicine against dengue protects poorly
Controllability	Side-effects of the new medicine against dengue are easily controllable	Side-effects of medicine against dengue are difficult to control
Scientific knowledge	Ample experience with new medicine against dengue	Little experience with new medicine against dengue
Other people's experience	Users of medicine against dengue find it riskless	Users of medicine against dengue find it risky
Severity of consequences	New medicine against dengue has no serious side-effects	New medicine against dengue has serious side-effects
Probability of negative consequences	Small chance of side-effects occurring with new medicine against dengue	Large chance of side-effects occurring with new medicine against dengue

<input type="checkbox"/> Small chance of negative consequences with genetically modified crops <input type="checkbox"/> Negative consequences of genetically modified crops difficult to control <input type="checkbox"/> Less pesticides necessary with genetically modified crops <input type="checkbox"/> Cultivation of genetically modified crops does not have severe negative consequences <input type="checkbox"/> Little experience with cultivation of genetically modified crops <input type="checkbox"/> Cultivators find genetically modified crops risky
Choice 1: Choice 2: Choice 3:
Select the three newspaper headlines that you find most interesting

Figure 4.1 Example of information selection screen on which participants had to select the three newspaper headlines that interested them most

Procedure

The participants were seated behind computers in individual cubicles. After a short computer based introduction about the procedure and the use of the computers, the participants were told that they would participate in two unrelated studies. The first study involved the validation of a number of questionnaires that had been translated from English into Dutch. The results of this study, that was conducted in order to establish the validity of the RS, will not be discussed here. Having filled out the questionnaires, the participants were told that the aim of the second study was to find out how newspaper headlines could influence people's reading behaviour. Six newspaper headlines were then presented to the participants for each of the risks. They were asked to choose, in order of importance, the three headlines about which they wanted to read the underlying articles. The newspapers headlines they chose appeared at the bottom of the screen, and they could correct their choices if they so wished. Before starting with the actual task, they were given a practice choice task in which they had to choose three out of six CD titles. Directly after this practice task, accountability was manipulated by presenting the following text to participants in the *accountable* condition: "Before you start with the actual study, we want to inform you about the following: *You will have to accurately account for the choices you make for the newspaper headlines to the experimenter*" (the part in italics was printed bold on screen). Participants in the *unaccountable* condition got the following message: "Before you start, we would like to emphasise that all results are anonymous and will be treated confidentially."

The actual choice task started with a randomly determined presentation of one of the risks. For each risk, a short introduction was given. For electromagnetic fields for example, the introduction was: "Electromagnetic fields are omnipresent, for example due to mobile phones. It therefore also concerns you. On the next screen, select the newspaper headlines about which you would most like to have information. Select the headlines in order of importance." On the screen that followed, the six newspaper headlines were presented about the risk. The remaining six risks were then consecutively presented in the same fashion. The participants were never presented with the underlying articles. After the seven risks, they rated the extent to which they felt they were held accountable for the choices they had made on a nine-point scale (1 = *not at all*; 9 = *very much*).

Finally, the participants had to answer the following questions about each risk on seven-point scales: "To what extent are you concerned about [the new medication against dengue]?" (1 = *not at all concerned* ; 7 = *very concerned*); "To what extent are you afraid of [the new medication against dengue]?" (1 = *not at all*; 7 = *very much*); "To what extent do you find [the new medication against dengue] threatening?" (1 = *not at all threatening*; 7 = *very threatening*). All twenty-one questions were combined to create a scale measuring anxiety about the risks ($M = 3.5$, $SD = 0.71$, Cronbach's $\alpha = 0.86$).

Analyses

In order to find out whether the participants selected more positive or more negative information, difference scores were calculated for the amount of positive and negative items selected per risk aspect summed over all the risks. We used the difference scores as dependent measures, instead of simply the amount of positive items selected, as necessarily three aspects per risk were always *not* selected (for each risk, respondents had to indicate which three out of six headlines they most wanted information about). Thus, if only the number of positive items selected were used as a dependent measure, a zero value for an aspect could mean that either a negative item had been selected or that the item had not been selected at all.

As the presentation of a positive or negative item was randomly determined for each risk aspect, the randomisation may not have been completely successful (more positive than negative items may have been presented about one particular aspect), especially since seven risks were presented to each participant (therefore, the number of positive and negative items per aspect presented to each participant was never balanced). The number of positive items presented per risk aspect was therefore included as a covariate in a 2 (Accountability) \times 2 (Risk-seeking tendency) MANCOVA with the difference-scores on the six risk aspects as dependent variables.

RESULTS

Manipulation check

The participants had rated on a nine point scale the extent to which they had felt accountable for the choices they had made. A (one-sided) non-significant difference in perceived accountability between the accountable and non-accountable group, $t(76) = 1.46$, $p < 0.10$, indicated that participants in the accountable condition had felt slightly more accountable ($M = 5.55$) than participants in the non-accountable condition ($M = 4.78$). We will elaborate on this finding in the discussion.

Familiarity with the risk

The participants also had to indicate on seven-point scales how familiar they were with the risks. As intended, the participants were quite unfamiliar with the risks, with the new medication against dengue ($M = 1.54$) being least familiar. The other risks scored between 2.86 (dietary supplements) and 3.98 (a new kind of investment).

Table 4.2 Average Difference Scores per Risk Aspect for Risk Avoiders and Risk Takers

Risk aspect	Risk avoiders	Risk takers
(Dis)advantages*	-1.70	-1.04
Controllability**	0.72	-0.11
Knowledge	0.59	-0.10
Other people's experiences**	1.46	0.70
Severity*	1.29	0.64
Probability	2.68	2.19

Note. a higher value indicates that relatively more positive items were selected.

* $p < 0.10$, ** $p < 0.01$

Preference for positive and negative information

In order to investigate differences between the number of positive and negative items that had been selected for each risk aspect, the difference scores between the positive and negative items selected (summed over all the risks) were calculated for each risk aspect and these were submitted to a 2 (Accountability) \times 2 (Risk-taking tendency) MANCOVA with the number of positive items presented for each risk aspect as a covariate. All covariates were highly significant, all F 's > 12.00 , all p 's < 0.001 . There was no effect for accountability, $F(6,60) = 1.53$, ns . Risk-taking tendency, however, yielded a significant main effect, $F(6,60) = 3.05$, $p < 0.05$. The interaction was non-significant, $F(6,60) < 1$, ns . Univariate analyses with the appropriate covariate (e.g., for the difference scores for the (Dis)advantages only the number of positive items for this aspect was used as a covariate; again all covariates were highly significant, all F 's > 31.1 , all p 's < 0.001) showed that the multivariate effect of risk-taking tendency was due to significant univariate effects of risk-taking tendency on the difference scores of the second risk aspect, "Controllability", $F(1,69) = 5.54$, $p < 0.05$, and the fourth risk aspect, "Other people's experiences", $F(1,69) = 5.56$, $p < 0.05$. The fifth risk aspect, "Severity", $F(1,65) = 4.03$, $p < 0.10$, and the first aspect "(Dis)advantages", $F(1,65) = 3.50$, $p < 0.10$, were marginally significant¹. As can be seen in Table 4.2, risk avoiders selected positive information relatively more often than risk takers. The average scores for the other aspects were in the same directions, except for the aspect "(Dis)advantages". The main effect was thus contrary to our expectations.

To find out whether participants were generally more interested in positive or negative information about the risks, we calculated whether the difference scores were significantly different from zero. Significant differences were found for the risk aspect "(Dis)advantages" ($M = -1.39$), $F(1, 70) = 28.65$, $p < 0.001$, for the risk aspect "Experience" ($M = 1.08$), $F(1, 70) = 30.59$, $p < 0.001$, for the risk aspect "Severity" ($M = .96$), $F(1, 70) = 14.3$, $p < 0.001$ and the risk aspect "Probability" ($M = 2.44$), $F(1, 70) = 78.96$, $p < 0.001$. Thus, generally the participants were more interested in positive information than in negative information, except for "(Dis)advantages".

The finding that risk avoiders were more interested in positive information than in negative information led us to investigate a possible relation between anxiety and voluntariness of the risks and the number of positive items that participants had selected. With respect to anxiety, a significant correlation existed between reported anxiety about the risks and the difference scores, $r = .34$, $p < 0.01$. This seems to imply that the more anxious the participants were about the risks, the more positive information they sought. There was also a small and marginally significant negative correlation between risk-taking tendency and anxiety, $r = -.17$, $p < 0.10$. Second, we calculated the mean perceived controllability of the involuntary risks (dengue, genetically modified food and electromagnetic fields) and for the voluntary risks (dietary supplements, chemtex, space aviation and investments) and calculated the correlation between these mean scores and the number of positive items the participants had selected for these risks. These analyses revealed a significant correlation between the controllability and number of positive items selected for the involuntary risks, $r = -.26$, $p < .05$, but not for the voluntary risks, $r = -.12$, *ns*. Thus, the less controllable the participants perceived the risk to be, the likelier they were to select positive information about the risks, but this was only found for the involuntary risks.

Seeking information

The risk aspects that the participants were most interested in were (summed over all risks) the (Dis)advantages, the Severity and the Probability of negative consequences (see Table 4.3). Next came Controllability. A 2 (Accountability) \times 2 (Risk-taking tendency) MANOVA with the number of times a risk aspect was chosen (regardless whether it was positive or negative) as dependent variables gave no significant effects, all F 's < 1 , *ns*. There were no effects of accountability or risk-taking tendency on preference for risk aspects.

Table 4.3 *Number of Times that the Risk Aspects were Selected, Summed over All Risks*

	(Dis)advantages	Controllability	Knowledge	Other people's experiences	Severity	Probability
1st choice	192	31	60	40	104	119
2nd choice	80	98	53	63	114	138
3rd choice	88	146	68	75	91	78
<i>Total</i>	<i>350</i>	<i>275</i>	<i>181</i>	<i>178</i>	<i>309</i>	<i>335</i>

DISCUSSION

The aim of this study was to investigate whether individual differences in risk-taking tendency influenced the kind of information one desires about risks, and what influence accountability had on this information seeking process. Finally, we were also interested in what kind of risk-information people preferred to receive.

Our main hypothesis was that risk avoiders would be more interested in information about the negative consequences of taking a given risk, whereas risk takers would be more interested in information about the positive consequences. The results showed the opposite. Risk avoiders showed a stronger preference for positive information over negative information than risk takers. Thus, risk avoiders and risk takers appear to differ in their preference for positive and negative information about risks. A possible explanation for this finding may be that the participants were not really in a situation in which they could make the choice themselves. They either found themselves in a situation in which they were already considering the risky option (e.g., they had to consider the new medication against dengue as they were going to travel), or the risks were relatively involuntary (e.g., electromagnetic fields). Moreover, they had scanned the six headlines, and may thus have already had an idea of the risks and may have made an implicit decision. Thus, they may have engaged in post-decisional information selection, in which case selecting positive (reassuring) information may be the best option, in particular for risk avoiders. The negative correlation between controllability and amount of positive information selected found for the involuntary risks seems to provide some support for this idea. This would have to be investigated in a new study. It may also be that risk avoiders

were more anxious about the risks, and were therefore more interested in positive information in order to seek reassurance. However, if this is the case, the effect is not very strong, considering the low correlation between anxiety about the risks and risk-taking tendency.

The risk aspects on which differences between the amount of positive and negative information manifested themselves clearest, were "Controllability" and "Other people's experiences". If anxiety does play a role in risk information seeking, this may suggest that risk avoiders are inclined to select positive information rather than negative information about a risk's controllability and about other people's experience with a risk, in an attempt to seek reassurance.

An alternative explanation for the results could be that risk takers look up more negative information about a risk compared to risk avoiders, as this might give risk takers information about the 'kick' they might get from taking a risk. This would imply that risk takers want to find out to what extent their need for sensation or thrill is satisfied by taking a risk. However, the risks used in this study did not involve sensation, as would risks like for example bungee-jumping. Also, risk takers displayed a preference for positive information, as their difference scores were positive. Therefore, this alternative explanation does not appear to be very likely.

The results of the study also showed that the participants were mostly interested in the (Dis)advantages, the Severity and the Probability of the negative consequences. A risk's Controllability was fourth in the number of times it was selected. These results reflect the relative importance of these aspects on risk perception. Research by Hendrickx et al. (1992) showed that for large scale risks, probability information had the largest influence on risk perception. Furthermore, psychometric research has shown that a risk's severity and the (dis)advantages of a risk are of importance when judging risks (Slovic, 1987; Vlek & Stallen, 1981). Our results indicate that these risk aspects are also important for active information seekers, with information about the (dis)advantages being selected the most. Also, the sum scores of the amount of times a risk aspect was looked up indicated an overall information search strategy similar to the one found in Lion, Bot and Meertens (2000; [chapter 2]). Given the interest in information about the (dis)advantages, the severity and the probability of the negative consequences, the aim of this strategy seems to be to find out whether the risk is personally relevant. Only then do people want to know whether they can do anything about the risk, as the finding that controllability was the most selected third item seems to imply. Finally, participants hardly seemed to be interested in other people's experiences. It may be that the participants tried to select information in a rather objective manner, given the experimental setting in which they were selecting information. Probably, information about other people's experiences will be gathered in a more informal way.

No effects were found for the manipulation of accountability. The most apparent explanation seems to be that the manipulation was not strong enough to influence the dependent measures, as the manipulation check was only marginally significant. This is somewhat surprising, though, as research on accountability (e.g., Tetlock & Boettger 1989; 1994) used a similar simple method to manipulate

accountability. In a study conducted by Lion and Meertens (in press, chapter 3) the same manipulation also failed to give significant effects on the manipulation check, but it clearly had effects on the amount of information that the participants looked up. Thus, it may also be that accountability influences the amount of information but not the kind of information selected by the participants in an information selection task such as the one used in this study.

Finally, the results of this study provide further support for the idea that risk avoiders and risk takers differ in the way they deal with risk information, in the sense that risk avoiders and risk takers focus on different aspects of information. With the risks used in this study, risk avoiders appear to be more interested in the positive information about the risks, which may be an attempt to reassure themselves. A next step would be to find out whether this also influences one's perceived risk. If risk avoiders look up more positive information about risks than risk takers, this might lead to the paradoxical situation that risk avoiders judge risks to be smaller than risk takers.

Footnotes

1. Regression analyses with each of the six aspects as the dependent variable and Risk-taking tendency and Accountability as predictors gave similar results.

**THE EFFECTS OF RISK-TAKING TENDENCY
AND ANXIETY ON RISK CHOICE AND
PRE- AND POST-DECISIONAL INFORMATION SELECTION**

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INTRODUCTION

We are confronted with new risks on a regular basis. These may vary from relatively daily risks, such as trying a new soup flavour (what if it turns out to be awful?) to the decision to use a risky prophylaxis against a tropical disease (e.g., mefloquine against malaria). When confronted with such risks, there are different ways to deal with them. In some cases one will try to gather as much information as possible about the risk in order to make what one deems to be the optimal decision. Sometimes, be it through lack of interest, lack of time or other situational constraints, one can only make an "intuitive" decision.

Ideally, people will try to obtain information about risks that they are about to undertake from the many sources that are available to them in modern society. However, people may often make implicit or explicit risk choices when they do not have the time, the opportunity or the motivation to seek information first (Lion et al., 2000 [chapter 2]). In such cases, people will have to make a more or less intuitive choice and it seems plausible that these are then based on personal inclinations to take or avoid risks. There is ample research showing that personality characteristics that are related to risk taking, such as Sensation Seeking can affect risky decision making (Zuckerman, 1994), in the sense that high sensation seekers take more risk than low sensation seekers. We have argued before that the Sensation Seeking Scale (SSS; Zuckerman, 1994) does not seem to be an appropriate measure for risks that do not involve sensation or novelty. The Risk Scale (RS) was constructed to measure people's general risk-taking tendency, and evidence has been found that risk-taking tendency as measured by the RS can influence people's risk information seeking, in that risk avoiders seek more information than risk takers (Lion & Meertens, 2001 [chapter 3]) and risk avoiders prefer positive risk information (chapter 4). It would appear that risk-taking tendency should influence people's risky decisions (with risk takers making riskier choices than risk avoiders) particularly when people have little or no information to base their decision on and have to make an intuitive decision. Vice-versa, risk-taking tendency will probably not have a very large influence on people's risky decisions when they have been instructed to select information before making a risky choice (cf. Sedikides, 1990). Our first hypothesis is therefore that risk-taking tendency will have a stronger effect on participants' risk choices, if they do not have the opportunity to look up information first (i.e., they have to make an intuitive decision) compared to when they do look up information first (i.e., an effortful decision; Hypothesis 1).

We are also interested in people's risk information preference. Research and theoretical ideas from Lopes (1984, 1987), Schneider and Lopes (1986) and Horvath and Zuckerman (1993) suggest that risk avoiders generally focus more on the worst outcomes of a risk and risk takers focus more on the best outcomes of a risk. This should also have implications for the kind of risk information that they desire: risk avoiders should be more interested in negative information about a risk and risk takers should be more interested in positive information about a risk. However, in a previous study in which participants could select information before making a risky

decision, we found that risk avoiders were more interested in positive information than in negative information about unknown risks, a finding that was contrary to our hypothesis (chapter 4). However, the participants in the study in chapter 4 were told that they were already considering choosing the risky option (e.g., a medicine against dengue) or were confronted with relatively involuntary risks (e.g., electromagnetic fields). Moreover, the participants selected information by selecting newspaper headlines that they wanted more information about. They thus scanned the information in six newspaper headlines they were presented with and could thus have made an initial, implicit decision. Therefore, the participants in that study may have engaged in post-decisional information selection, in which case seeking reassuring (i.e. positive) information about involuntary risks seems like a rather good idea, particularly for risk avoiders. Some support for this idea was found in the previous study, where a negative correlation was found for the number of positive items selected and the perceived controllability, but only for involuntary risks. Postdecisional information selection was therefore explicitly investigated in this study.

Research on post-decisional information seeking suggests that a decision that people make can affect subsequent information seeking (e.g., Freedman & Sears, 1965; Frey & Rosch, 1984). However, the original idea derived from cognitive dissonance theory that people tend to select information that supports their decision appears to be less ubiquitous than expected. Freedman & Sears (1965) concluded that a preference for supportive information was not the de-facto information seeking strategy, and suggested that research should focus more on factors that determine voluntary exposure to information in general. So far, the little research that has been done on such factors has focused only on how task aspects (e.g., familiarity of the information, (ir)reversibility of the decision; e.g., Frey & Rosch, 1984) may affect selective exposure, but it seems quite probable that personality factors should also be able to influence people's post-decisional information selection.

In the present study, the participants could make a choice themselves, so they were not involuntarily confronted with a risky decision that had been made for them. Pre- and post-decisional information selection was investigated by letting the participants who had to make a decision without being able to select information beforehand select information *after* they had made an intuitive decision. Our main hypothesis, in line with ideas from Horvath and Zuckerman (1993), Lopes (1987) and Schneider and Lopes (1986) was that risk avoiders would prefer negative information about the risks, whereas risk takers prefer positive information about the risks (Hypothesis 2). When people can make a decision themselves, it may be that this effect is stronger in post-decisional information selection, in a desire to find information that supports their previous decision (i.e. risk avoiders make risk avoiding choices and select supportive (negative) information, whereas risk takers make risk taking choices and select supportive (positive) information). Whether this results in an interaction of risk-taking tendency with information selection situation (pre/post-decisional information selection) remains to be seen.

Being confronted with a risk may to a certain extent be anxiety provoking. Therefore, in addition to risk-taking tendency, we were also interested in the effects

of trait-anxiety on risk information selection. There is ample research providing evidence that anxiety is related to an attentional bias toward threatening or negative information in anxiety provoking situations, for both clinical and non-clinical populations (Butler & Mathews, 1987; Kindt & Brosschot, 1998). As far as we know, no research has specifically investigated the effects of anxiety on people's (risk) information seeking. It seems reasonable to assume that anxiety should lead to a preference for negative information when a risky decision can still be avoided, as is the case in this study. Therefore, we expected high anxious participants to look up more negative information about the risks than low anxious participants (Hypothesis 3). Trait-anxiety was measured by means of the State-Trait Anxiety Index (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

Moreover, when one gets the possibility to look up information after an initial risk choice is made (which is hypothesised to be affected by risk-taking tendency) and is offered the opportunity to reconsider one's initial choice, an effect of the initial risk choice on the second risk choice will probably remain (Hypothesis 4).

Lastly, we also expected that the kind of information that the participants would look up, would influence the final choices: the more the participants selected positive information about the risks, the more the participants would be inclined to make a risky choice (Hypothesis 5).

METHOD

Participants

One hundred and twenty-four first-year students, 15 male and 108 female, of the Faculty of Health Sciences and the Faculty of Psychology participated in a 2 (Order: Pre-decisional information selection vs. Post-decisional information selection) × 2 (Risk-taking tendency: Risk avoiders vs. Risk takers) × 2 (Trait-anxiety: Low anxiety vs. High anxiety) experiment. Their ages ranged from 18 to 25 years ($M = 21.1$). They were given $f7.50$ (appr. €3.40) for their participation in the experiment, which lasted approximately 30 minutes.

Materials

Personality measurements

Risk-taking tendency was measured with the Risk Scale (Lion & Meertens, 2000a; [chapter 6]). The RS consists of seven general statements about risk taking (e.g., "I do not take risks with my health") that are scored on a 9-point scale (1= *totally disagree*;

9 = *totally agree*). The RS had been administered to 168 students during workgroup sessions several weeks before the experiment. The RS had a good reliability, Cronbach's $\alpha = .78$. One-hundred and twenty-four of the students who had completed the questionnaire eventually agreed to participate in the experiment. We used a median split ($Mdn = 4.43$) on the original sample of 168 students to create a group of risk avoiders and a group of risk takers.

We also measured the participants' trait anxiety. We administered the State-Trait Anxiety Index (STAI; Spielberger et al., 1983) to the participants at the end of the experimental session. The trait anxiety subscale consists of twenty items (e.g., "I feel safe") that are rated on a 4-point scale (1 = *not at all*; 4 = *very much*). The trait anxiety subscale of the STAI, the Trait Anxiety Index (STAI-T; Cronbach's $\alpha = .88$) had a good internal reliability. Again, a median split ($Mdn = 1.63$) on the Trait-anxiety index was used to create a group of participants scoring low on trait-anxiety and a group scoring high on trait-anxiety. There was no significant correlation between risk-taking tendency and trait-anxiety, $r = -.17$, *ns*.

Risks

Four unknown risks were constructed for this study. It was necessary to use unknown risks, as we wanted to know what kind of information people would select about risks in a way that was relatively unaffected by any prior knowledge. The four risks used in this study were a new medication against tropical infections, a new, water-soluble powder that would prevent people from getting ill from food poisonings, a trip by a new high-speed magnetic train, and buying a new Xerox machine for a department. Before the participants could choose information, they were first given a short introduction to the decision they had to make. For example, the introduction to the medication against the tropical diseases was:

"Imagine that you are going to Kenya. At the Public Health Service you are given the possibility to try a new medication (a daily pill) against a number of tropical diseases. It is a completely new medicine; there is no comparable alternative."

The participants first chose for either positive or negative information about the risks. They could then make a more specific choice about the information they wanted. They could choose three out of the following six risk aspects: advantages, disadvantages, probability of the advantages, probability of the disadvantages, controllability of the consequences and finally the severity of the consequences. Earlier studies had established that information about these risk aspects was most desired by participants (Lion et al., 2000 [chapter 2]; Lion & Meertens, 2000b [chapter 4]; Lion & Meertens, 2001 [chapter 3]). Finally, the participants received the information they had selected.

Differences in the information the participants got to read were kept to a minimum, regardless of whether they had selected positive or negative information. The main difference between the two types of information was the way it was framed: positive information was framed as a gain, whereas negative information was framed as a loss. An example about the tropical infection, with both the positive and negative information is given in Table 5.1.

Table 5.1 *Operationalisations of Positive and Negative Information on Risk Aspects*

	Positive	Negative
Advantages	The medication provides a very good protection against no less than half of the important tropical diseases. It kills any viruses, bacteria and parasites in the blood	The medication provides a poor protection. It does nothing for half of the important tropical diseases
Disadvantages	The medication has few side-effects, to wit fatigue, having to urinate frequently, dizziness, anaemia, cardiac arrhythmia and acute psychosis	The medication has many side-effects, to wit acute psychosis, cardiac arrhythmia, anaemia, dizziness, having to urinate frequently and fatigue
Probability of the advantages	The medication is effective in 80 % of the cases	The medication is ineffective in 20 % of the cases
Probability of the disadvantages	The medication gives no side effects in 75 % of the cases	The medication gives side effects in 25 % of the cases
Controllability of the consequences	The side effects can be treated in 85 % of the cases. Usually through some simple actions, occasionally through more complex interventions	In 15 % of the cases the side-effects cannot be treated, not even through complex interventions
Severity of the consequences	In 90% of the cases the side-effects are short lived and the symptoms will disappear if the medication is stopped	In 10% of the cases the side-effects are long lasting and the symptoms will persist after stopping with the medication

Procedure

Upon arrival at the lab, the participants were seated behind a computer in separate rooms. They were told that they were going to participate in a computer-controlled study and were asked to carefully read the instructions on the computer screen. They started by pressing a key. Participants in the pre-decisional information selection

condition (Order1) then read that they were going to be given some risky options and that they first had to decide if they would rather have information about why they *should* choose for the presented option (i.e., positive information about the risks) or why they *should not* choose for the presented option (i.e., negative information about the risks). After they had made a decision for all the risks, they could specify the information they wanted, that is, they could choose three out of the six risk aspects described in the "Risks"-section of this paper (e.g. advantages, controllability of the consequences). After reading the information, they indicated their choice on 4-point scales (1 = *definitely not*; 2 = *I don't think so*; 3 = *I think so*; 4 = *definitely*). The instructions to the participants in the post-decisional information selection condition (Order 2) were mostly the same, except that they read that they had to decide whether or not they would choose for the presented options right away and could then look up information about the risky options. After choosing and reading the information, they could then reconsider their first choice. Basically, the only difference between Order 1 and Order 2 was that the participants in Order 2 were asked to make a choice before getting the same tasks as the participants in Order 1. Finally the participants were asked to indicate on 7-point scales how risky they thought the risks were (1 = *not at all risky*; 7 = *very risky*) and how familiar they were with the risks (1 = *very unfamiliar*; 7 = *very familiar*).

On a final screen the participants were told that they had come to the end of the session and that they could go to the experimenter. The experimenter then asked them if they would be so kind as to complete one final questionnaire (the State-Trait Anxiety Index). All the participants agreed to do this. All participants were thanked and paid for their participation and were debriefed about the goal of the study.

RESULTS

Riskiness and familiarity ratings

The participants had been asked to score the four risks on the extent to which they thought the risks were risky and the extent to which they were familiar. The mean riskiness ratings ranged from 3.01 for the magnetic train to 4.63 for the medication against tropical diseases. The risks were thus not seen as particularly risky. Furthermore, the familiarity ratings ranged from 1.86 for the magnetic train to 2.87 for the medication against tropical diseases. As intended, the risks were rather unfamiliar to the participants.

Choices

There were two conditions: in the pre-decisional information selection condition (Order 1), participants first chose and read information about the risks, and then made a risky choice. Participants in the post-decisional information selection condition (Order 2) first made a choice (*first choice*), then selected and read information about the risks and could then reconsider their first choice and make a *second choice*. Sumscores of the four choices made by the participants on 4-point scales (1 = definitely not; 4 = definitely; the sumscores ranged from 4 [always chose definitely not] to 16 [always chose definitely]) were computed. A 2 (Order) x 2 (Risk-taking tendency) x 2 (Trait-anxiety) ANOVA with the sumscores of the risky choices (*first choice* for participants in the post-decisional information selection condition) only yielded the expected significant interaction-effect for Order and Risk-taking tendency, $F(1, 95) = 5.08, p < .05$ (Table 5.2). T-tests for Risk-taking tendency within Order 1 (information selection first) and Order 2 (first choice in the post-decisional information selection condition) respectively, revealed a non-significant difference for Risk-taking tendency on the choices made in Order 1, $t(56) = 0.83, ns$. However, in Order 2 risk avoiders made significantly less risky choices ($M = 10.4$) than Risk takers ($M = 11.3$), $t(53) = 3.06, p < .005$. Thus, we found support for Hypothesis 1. Risk-taking tendency affected the choices participants made when they had to make a choice without any information, but it did not affect participants' choices when they could first select and read information about the risks.

Next, an analysis was carried out for the choices that in both conditions had been preceded by information selection. A 2 (Order) x 2 (Risk-taking tendency) x 2 (Trait-anxiety) ANOVA with the *second choice* for participants in Order 2 (post-decisional information selection) revealed a significant main effect for Order, $F(1, 95) = 8.34, p < .01$, a two-way interaction for Order and Risk-taking tendency, $F(1, 95) = 4.95, p < .05$ (see Table 5.3) and a two-way interaction for Risk-taking tendency and Trait-anxiety, $F(1, 95) = 4.82, p < .05$. However, these effects were qualified by a significant three-way interaction for Order, Risk-taking tendency and Trait-anxiety, $F(1, 95) = 3.98, p < .05$ (Table 5.4).

Analyzing the three-way interaction in more detail, the following results were obtained. A 2 (Risk-taking tendency) x 2 (Trait-anxiety) ANOVA for the choices participants made in Order 1 revealed no significant effects, all F 's $< 2.39, ns$. A 2 (Risk-taking tendency) x 2 (Trait-anxiety) ANOVA for the *second choice* made by the participants in Order 2 (post-decisional information selection) was conducted. This revealed a significant Risk-taking tendency x Trait-anxiety interaction, $F(1, 46) = 9.78, p < .005$. Simple main effects revealed that, in Order 2, high anxious risk avoiders and risk takers differed in their risk choices, with risk avoiders making less risky choices than risk takers, $t(25) = 4.23, p < .001$, whereas this difference was not found for low anxious risk avoiders and risk takers. Furthermore, high anxious risk avoiders made less risky choices than low anxious risk avoiders, $t(21) = 2.17, p < .05$, and high anxious risk takers made riskier choices than low anxious risk takers, $t(25) = 2.23, p < .05$. Thus, in general, it were the high anxious risk avoiders

Table 5.2 *Order x Risk-taking Tendency Interaction for Participants' Sumscores for the Risk Choices (First Choice for Order 2)*

		Order	
		1	2
<i>Risk-taking tendency</i>	Risk avoider	11.69 (.40) ^a	10.35 (.34) ^b
	Risk taker	11.23 (.35) ^{a,b}	11.37 (.32) ^a

Note. Different superscripts denote significant differences. Higher scores indicate more risk taking. Standard errors are given in parentheses.

Table 5.3 *Order x Risk-taking Tendency Interaction for Participants' Sumscores for the Risk Choices (Second Choice for Order 2)*

		Order	
		1	2
<i>Risk-taking tendency</i>	Risk avoider	11.69 (.40) ^a	9.78 (.39) ^b
	Risk taker	11.23 (.35) ^a	10.98 (.37) ^a

Note. Different superscripts denote significant differences. Higher scores indicate more risk taking. Standard errors are given in parentheses.

Table 5.4 *Order x Risk-taking Tendency x Trait Anxiety Interaction for Participants' Sumscores for the Risky Choices (Second Choice For Order 2)*

		Order			
		1		2	
		Trait-anxiety			
		Low	High	Low	High
<i>Risk-taking tendency</i>	Risk avoider	11.30 (.59)	12.08 (.52)	10.64 (.56) ^{a,b}	8.92 (.54) ^c
	Risk taker	10.77 (.45)	11.69 (.52)	10.27 (.56) ^{a,c}	11.69 (.47) ^b

Note. Different superscripts within Order 2 denote significant differences. Higher scores indicate more risk taking. Standard errors are given in parentheses.

that made the least risky choices. These data show that participants who first made a choice, then selected information and could then reconsider this choice (Order 2), were influenced in their decision making by their risk-taking tendency, even after having selected information. Moreover, their second decision was also influenced by anxiety. In contrast, participants who could first select information and then make their first decision were not affected by either personality trait.

Choice of information

The sumscore of the number of times the participants chose for "Why *should* I choose for the offered option" over all the risks was calculated (0 = never chose for positive information; 4 = always chose for positive information). A 2 (Order) x 2 (Risk-taking tendency) x 2 (Trait anxiety) ANOVA with the number of times participants chose for positive information about the risks as the dependent variable (ranging from 0 to 4) yielded a significant main effect for Order, $F(1, 95) = 8.80$, $p < .005$. Participants who started off with choosing information (Order 1) asked for positive information more often ($M = 2.12$, $SD = .14$) than participants who had first made a choice (Order 2; $M = 1.52$, $SD = .14$). There were no main effects for Risk-taking tendency or Trait anxiety, nor were there any two-way interactions, all F 's < 1.23 , *ns*. Therefore, no direct support was found for Hypothesis 2 and 3, that risk-taking tendency and anxiety should affect people's preference for negative information. However, there was a significant three-way interaction, $F(1, 95) = 7.26$, $p < .01$ (Table 5.5). A 2 (Risk-taking tendency) x 2 (Trait-anxiety) ANOVA within Order 1 did not yield any significant effects, all F 's < 2.39 , *ns*. Within Order 2, a 2 (Risk-taking tendency) x 2 (Trait-anxiety) ANOVA for the number of times participants chose positive information about the risks only yielded a significant Risk-taking tendency x Anxiety interaction, $F(1, 46) = 7.81$, $p < .01$. Simple main effects revealed that high anxious risk avoiders chose significantly less often for positive information than low anxious risk avoiders, $t(21) = 2.15$, $p < .05$, and high anxious risk takers, $t(26) = 2.11$, $p < .05$. None of the other differences were significant, all t 's < 1.90 , *ns*.

The simple main effects suggest that it was especially the high anxious risk avoiders that looked up less positive information. Thus, although no support was found for the predicted main effects of risk tendency and anxiety in Order 2, high anxious risk avoiders were most likely to select negative information, which is in line with our hypotheses. Moreover, these data fit nicely with the data in Table 5.4: the more participants select positive information, the likelier they were to make risky choices. Overall, the data suggest that the relationship between Risk-taking tendency and Trait anxiety on the one hand, and risky choice and information selection on the other is more complex than suggested by the hypotheses. We will elaborate on this in the discussion.

Table 5.5 Sumscores for the Number of Times Participants Selected Positive Information about the Risks

		Order			
		1		2	
		Trait-anxiety			
		Low	High	Low	High
<i>Risk-taking tendency</i>	Risk avoider	2.00 (.32)	2.15 (.28)	2.00 (.30) ^a	1.00 (.29) ^b
	Risk taker	2.41 (.24)	1.92 (.28)	1.27 (.31) ^{a, b}	1.81 (.25) ^a

Note. Higher scores indicate that more positive information is selected. Different superscripts within Order 2 indicate significant differences. Standard errors are given in parentheses.

Effects of information choice on subsequent choice

We were also interested in the influence of information selection on participants' decisions (Hypothesis 5). The results above suggest that choices in Order 1 (pre-decisional information selection) should *only* be influenced by the information read by the participants and not by Risk-taking tendency or Trait anxiety, whereas these latter two should also have an influence on the decisions made by participants in Order 2 (post-decisional information selection).

Regression analyses for the choices (sumscores) participants made in Order 1 with Information choice (sumscores), Risk-taking tendency, Trait-anxiety and their interactions as predictors revealed that Information choice was a strong (and the only significant) predictor of the choices the participants made, $\beta = .48, p < .001$. As expected, a regression analysis for the *first choice* the participants made in Order 2 revealed that Risk-taking tendency was the only significant predictor of the choices the participants made, $\beta = .41, p < .01$, with neither Trait-anxiety nor the interaction of Risk-taking tendency and Trait-anxiety as significant predictors (for Order 2, participants had not yet chosen information). For the *second choice*, a regression analysis with Information choice, Risk-taking tendency, Trait-anxiety and their interactions as predictors yielded significant effects for both Risk-taking tendency, $\beta = .37, p < .01$, and for Information choice, $\beta = .51, p < .001$. However, if the first choice was also included in the regression analysis, only the first choice, $\beta = .54, p < .001$, and Information choice, $\beta = .50, p < .001$ came out as significant predictors of the second choice, suggesting that the influence on risk-taking tendency on the second choice was due to the effect of risk-taking tendency on the first choice. These findings support Hypothesis 5, which stated that the information selected by the participants would to a large extent determine their final choices. Moreover, they are also consistent with Hypothesis 2, that the first choice participants made would affect their final choice. Note that the only difference between positive and negative information was the framing of the information.

Table 5.6 *Participants' Final Choices in Relation to their First Choice and Information Choice*

First choice/ information choice	Final choice: did not choose for the risky option	Final choice: did choose for the risky option
No / positive	18	34
No / negative	33	3
Yes / positive	3	30
Yes / negative	44	60

Table 5.7 *Participants' Information Choice with Regard to the Risk Aspects*

	Advantages	Dis- advantages	Probability of advantages	Probability of disadvantages	Controlla- bility	Severity
1 st choice	160	156	13	70	28	65
2 nd choice	107	167	40	73	42	63
3 rd choice	62	61	32	114	79	144
<i>Total</i>	<i>329</i>	<i>384</i>	<i>85</i>	<i>257</i>	<i>149</i>	<i>272</i>

On a more explorative note, we also took a look at participants' decision making process. To this end, we recomputed the participants' risky choices into a dichotomous variable. Participants scoring 1 (definitely not) or 2 (I don't think so) were categorised as choosing the riskless option, and participants scoring 3 (I think I will) or 4 (definitely) were categorised as choosing the risky option. The results showed that those choosing information that was in line with their first choice tend to stick with their first decision, as the regression analysis had also revealed. However, the data showed a different picture for participants choosing information opposite to their first choice (Table 5.6). When participants had first decided not to choose the risky option and consequently selected positive information about the risks, approximately one third of the participants stuck to their initial choice, whereas the remainder decided to switch. For subjects who had decided to make the risky choice, and consequently selected negative information, slightly less than half of the participants decided to switch their choice, although the majority stuck to their first one. We also investigated whether

risk-taking tendency or anxiety seemed to influence whether or not participants switched choices, but the number of participants per cell was too low to allow for this. At face value, neither personality trait seemed to affect participants' decision to switch.

We also investigated what risk aspects people selected after having chosen whether they wanted positive or negative information about the risks. As can be seen in Table 5.7, information about the disadvantages was the most selected item. Second were the advantages and third was information about the severity. Lastly, people appeared quite interested in probability information about the disadvantages, as this information was the fourth in line. They were not very interested in controllability information, and hardly in probability information about the advantages.

.....DISCUSSION

The first main aim of this study was to investigate whether personality would have a stronger influence on people's risky choices in situations where they had hardly any information about the risks compared to when they could first select risk information. The second main aim was to investigate the effects of risk-taking tendency and trait-anxiety on risk information preference in pre- and post-decisional risk information selection. Furthermore, we investigated whether participants' risk information selection would affect their risky choices and whether their first choice had an effect on their second choice.

Our first hypothesis was that risk-taking tendency would have a stronger effect on participants' decisions if they had to make a decision without getting the opportunity to select any information. The data supported this hypothesis. Risk takers made significantly riskier choices than risk avoiders when they had to make an intuitive decision, whereas risk takers and risk avoiders did not differ in their risky choices if they had first had the opportunity to select information about the risks. This suggests that when people do not spend much time or effort making a risky decision, they make an intuitive risky choice that is based on risk-taking tendency. Earlier research has established that people often do indeed not want to spend much effort or time on gathering risk information (Lion et al., 2000 [chapter 2]). It is therefore quite likely that people often make risky choices this way, particularly if they are not very involved with the risk. Furthermore, the finding that risk avoiders and risk takers differed in the riskiness of their choices shows that the RS can predict people's risk-taking behaviour.

We had expected participants' first choice to affect their second choice (a reconsideration of the first option). Put differently, we expected people to stick to their initial choices. We also found support for this hypothesis. Regression analyses revealed that the first choice the participants made was a significant predictor of the

second choice they made, regardless of their information search in between the choices. Thus, not only do participants make a choice that is in line with their personal inclinations, but people also tend to stick to these choices, suggesting that in many situations, relevant personality characteristics may have quite a strong influence on people's risky decision making.

Horvath and Zuckerman (1993) and Lopes (1987) had suggested that risk avoiders focus on the losses of a risk, whereas risk takers focus on the gains associated with a risk. We had therefore assumed that risk avoiders would be more interested in negative information about risks, and risk takers more in positive information about risks. Moreover, we had expected high trait anxious participants to have a stronger preference for negative information than low anxious participants. Although no direct support for these hypotheses was found, the interaction of risk-taking tendency and anxiety on participants' information selection was in the direction suggested in the hypotheses. The group of participants that were most likely to seek negative information, the high anxious risk avoiders, did indeed display a preference for negative information. This provides some support for the idea that individual differences can determine post-decisional information selection, although not in as straightforward a manner as we had expected. All in all, the data could be explained as follows: the participants who had hardly any information to base their decision on, made a choice that was in line with their risk-taking tendency. These participants could then select information about those risks. The significant interaction between risk-taking tendency and trait-anxiety indicated that in particular high anxious risk avoiders had a preference for *negative* information about the choices they had made. Moreover, the information they had selected seemed to affect their second choice, as an interaction for risk-taking tendency and trait-anxiety was also found here. There was a significant difference between high anxious risk avoiders and high anxious risk takers, with high anxious risk avoiders appearing to make second choices that were even more risk avoidant than their first ones.

Support for the fifth hypothesis was also found. The information the participants had selected and read influenced the choices the participants made. Information selection proved to be a significant predictor of the choices the participants made, in that the more people selected positive information the likelier it was that they made a risky choice. However in the post-decisional information selection task, the exploration of the process underlying people's risky choices indicated that quite a few participants selected non-supportive information, leading to a choice-reversal in some situations. It would be interesting to find out what factors affected participants' decision to select disconfirming information and to change their initial choice. Although the current study did not allow us to explicitly test whether risk-taking tendency or anxiety influenced participants' decision to select disconfirming information or reverse their choices, this did not seem to be the case based on a crude investigation of the process in information selection and choices made by the participants. These rather crude analyses do not allow for definite conclusions, but they suggest that it may be worthwhile to further investigate what factors affect people's search for unsupportive information.

In the previous study (chapter 4), we had suggested that risk avoiders' tendency to select positive rather than negative information about the risks may have been due to the fact that they had been confronted with relatively involuntary risks. The results suggest that it should be worthwhile to further investigate this issue further, as high anxious risk avoiders preferred negative information in the present study, using voluntary risks, whereas risk avoiders preferred positive information in the previous study (being confronted with a risky choice that had already been made). A drawback of the present study is that the difference between being able to make a choice oneself, or simply being confronted with a risky choice that had already been made (e.g., risks that are relatively involuntary, such as electromagnetic fields) was not explicitly investigated. The main reason was that adding another factor would have complicated the study design.

It seems that if the decision situation is such that effortful information selection and decision making is required, only information about the risks but not individual factors affects people's decisions. However, people do not always have the opportunity or the energy to seek for information about new risks that they are confronted with. The results of this study show that people then make intuitive choices that are influenced by their risk-taking tendency. Furthermore, risk-taking tendency and anxiety appear to influence people's information selection, although this process should be investigated further. It would also be interesting to investigate whether these choices may also be affected by other aspects in a decision situation (e.g., self-presentation motives; Weigold & Schlenker, 1991). Another finding was that people generally tend to stick to their initial decision. These findings suggest that risk communicators should try to inform people about new risks as soon as possible, before people have made a decision about the risk, be it through other sources or because they have been confronted with the risk without getting information about it beforehand. Otherwise, people can make definite decisions that are not based on information about the risks, but on factors that have little to do with the risk itself.

6

**MEASURING AN INDIVIDUAL'S TENDENCY TO TAKE RISKS:
T H E R I S K S C A L E**

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INTRODUCTION

When people talk about risks, they often refer to the fact that individuals differ in their ways of dealing with risks (Lion et al., 2000 [chapter 2]). It is therefore not surprising that individual differences in risk taking have been of major interest in risk perception literature. Many personality traits have been suggested as sources of influence on the tendency to take or avoid risks, such as Achievement Motivation (Atkinson, 1957) and Sensation Seeking (Zuckerman, 1979). Although the scales based on these personality constructs measure personality traits that may affect risk-taking behaviour, very few scales have been constructed specifically to measure the propensity to take risks. In this paper we introduce a new scale, the Risk Scale (RS), the main purpose of which is to measure general risk-taking tendency.

Of the scales and traits that have been associated with risk taking, achievement motivation (Atkinson, 1957) and the related uncertainty orientation (Sorrentino & Hewitt, 1984; Sorrentino et al., 1992; Sorrentino & Short, 1986) are not based on a theory of risk taking, but on a theory of achievement motivation. These are therefore not directly aimed at measuring risk taking (Kogan, 1972). Scales that have been more directly related to risk taking are the Sensation Seeking Scale (SSS; Zuckerman, 1979), the Everyday Risk Inventory (ERI; Steketee & Frost, 1994), the Tension Risk Adventure Inventory (TRAI; Keinan et al., 1984), the Telic Dominance Scale (TDS; Murgatroyd et al., 1978), and the Arnett Inventory of Sensation Seeking (AISS; Arnett, 1994). Of these scales, the best known and most widely used is probably the SSS. The SSS has four subscales: Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility. As can be inferred from the subscale titles, and is eminent when reading the items of the SSS, the SSS specifically aims to predict the propensity to engage in risk-taking behaviour that has an element of thrill, sensation or disinhibition. Studies have shown that the SSS correlates with participation in high-risk sports, and that individuals who have jobs that involve risk taking for oneself or others tend to score higher on the SSS (Trimpop, Kerr, & Kirkcaldy, 1999). However, the SSS measures sensation, thrill or tension seeking, of which risk taking is a side effect, rather than a defining characteristic. As such, the SSS does not seem to be intended to predict more mundane risk-taking behaviours that do not hold an element of thrill or sensation, such as behaviour regarding health risks and environmental risks. Likewise, both the TRAI and the TDS are (at least in part) based on the idea that risk-taking behaviour is related to arousal seeking. These scales therefore do not appear to be suitable for measuring risk-taking behaviour for the more mundane risks in which we are interested.

The Everyday Risk Inventory appears to be more attuned to this purpose, as it was constructed in order to measure everyday risk taking. The main reason for creating this scale was to find out whether individuals suffering from Obsessive Compulsive Disorder (OCD) were more harm-avoiding (i.e., risk-avoiding) than those who were not diagnosed as suffering from OCD. The ERI consists of 32 everyday situations ranging from "See a movie without knowing much about it" to "Drive

in a snowstorm to do an errand you can postpone". The ERI appears to be a good way to measure mundane risk-taking behaviour. Nevertheless, the ERI was intended to measure risk-taking behaviour relevant for measuring OCD. This is reflected by some of the items, such as "Open a can of soup without wiping the top off". Individuals with OCD may regard performing such behaviour as risky, but for most this is probably not the case.

Thus, despite a considerable amount of research in individual differences in risk taking, there does not appear to be a scale that measures an individual's *general* risk taking. Such a scale would be useful for gaining insight in the way people deal with risks ranging from environmental risks (e.g., electromagnetic fields) to health risks (e.g., using a new medicine). We therefore set out to construct a short, practical, and easy to use Risk Scale (RS) that measures the tendency to avoid or take risks. So far, the RS has been used in a number of experimental studies. In these studies, differences in risk-taking tendencies yielded differences in the amount of information that participants looked up about risky medicines (Lion & Meertens, 2001 [chapter 3]), in the preference of positive over negative information about a variety of risks (Lion & Meertens, 2000b [chapter 4]) and the tendency to choose risky options (Lion et al., 2000 [chapter 5]). However, we have not yet reported on the reliability of the RS and (discriminant) validity in a systematic manner.

The Risk Scale measure was compared to other scales that have been used to measure people's tendency to take risks. Specifically, these were the ERI, a short version of the SSS (Madsen, Das, Bogen, & Grossman, 1987) and five choices between a sure thing and a gamble (Schneider & Lopes, 1986). We anticipated a moderate correlation between the RS and the ERI, as they both measured a more general risk-taking tendency. The RS and the SSS should also correlate, but to a lesser extent, as the SSS measures a more specific kind of risk taking, i.e., one that involves elements of thrill, sensation and disinhibition, which the RS does not. Lastly, we investigated the relation between the risk scale and the five choices between a sure thing and a gamble (e.g., the choice between .80 of \$4,000 vs. \$3,200 for sure) that Schneider and Lopes (1986) used as a way to measure (personal) risk styles. The correlation between the RS and this measure of risk styles should be fairly low, as gambles are not very good examples of risks in general (Huber, 1997)

Cloninger (1987) suggested that individuals who are harm-avoiding are more inclined to plan ahead before they engage in an activity. This may also indicate that need for cognition is related to the tendency to take risks. Need for cognition has been described as "a need to structure relevant situations in meaningful, integrated ways. It is a need to understand and make reasonable the experiential world" (Cohen, Stotland & Wolfe, 1955, p. 291; cited in: Cacioppo & Petty, 1982). Those who have a great need for cognition, enjoy thinking and have a strong desire to understand. In order to determine the discriminant validity of the RS, the short form Need for Cognition scale (NC; Cacioppo & Petty, 1982; Cacioppo, Petty, & Kao, 1984) was included in this study. Given that both risk avoiders and people with a great need for cognition are more inclined to think things over, we expected the two scales to be negatively related.

The tendency to take risks should also be related to the method of coping with uncertainty about the surrounding world. It has been suggested that individuals may differ in the cognitive complexity of their perception of the world in which they live or in their "Need for Structure" (NFS; Neuberg & Newsom, 1993). Specifically, those with a great need for structure are conceptualised as "leading a simple, tightly organised life, both cognitively and behaviourally" (Neuberg & Newsom, 1993, p. 114). It would seem that a great need for structure corresponds with more risk avoidance, as uncertainty implies a lack of structure. Nevertheless, avoiding risks does not necessarily mean that one's cognitive complexity is low. Again, small correlations were expected.

Two self-esteem scales were also included in one of the samples. The underlying idea was that risk takers differed from risk avoiders in the extent to which they believed in their own ability to control the occurrence of risks or their negative outcomes. Perhaps risk takers are more inclined to take risks, because they believe that they have greater control over risks. Control is an essential aspect of risk perception (e.g., Hendrickx & Vlek, 1991; Myers, Henderson-King, & Henderson-King, 1997; Slovic, 1987; Vlek & Stallen, 1981). A study by Wyatt (1990) provided mixed results as to the relationship between risk taking and feelings of self-efficacy, suggesting that for some risks (e.g., dating) self-efficacy did predict behaviour, whereas for other risks (e.g., gambles) it did not. The two self-esteem scales that were used in the present study were the Rosenberg Self-Esteem Scale (SES; Rosenberg, 1965) and the Self-Liking/Self-Competence scale (SLCS, Tafarodi & Swann, 1995). The first scale is probably the best known, most widely used, and best validated self-esteem scale. However, it does not measure perceived self-efficacy, and it has been suggested that self-esteem consists of two distinct parts: on the one hand perceptions of one's self-worth, on the other perceptions of one's self-efficacy (Aidman, 1998; Tafarodi & Swann, 1995). We therefore investigated the relation between both scales (SES and SLCS) and the RS.

Lastly, we investigated the relationship between the tendency to take risks and anxiety. It is possible that risk avoiders are more anxious than risk takers and would therefore prefer to avoid risky situations, which are likely to provoke anxiety. We included the State Trait Anxiety Index (STAI; Spielberger et al., 1983) for this purpose.

METHOD

Participants

Several samples were used in this study. All participants were students at Maastricht University. The first sample consisted of 75 students from the Faculty of Health Sciences, 9 male and 66 female, ranging in age from 18 to 29 years ($M = 21$, $SD =$

2.0). The second sample consisted of 95 students from the Faculties of Health Sciences, Psychology, Law, and Economics and Business Administration. Forty-seven were male, 48 female, ranging in age from 17 to 25 years ($M = 19$, $SD = 1.3$). The third sample consisted of 301 students from the Faculties of Health Sciences and Psychology, 69 male and 232 female, with ages ranging from 17 to 32 years ($M = 19$, $SD = 1.6$). The fourth sample consisted of 168 students from the Faculties of Health Sciences and Psychology, 22 male and 139 female (7 had not indicated their sex), with ages ranging from 19 to 27 years ($M = 21$, $SD = 1.6$). Lastly, the fifth sample consisted of 151 psychology students, 25 male and 126 female, with ages ranging from 17 to 29 years ($M = 19$, $SD = 2.0$).

Measures

The RS was developed to measure the general tendency to take risks. Nine items were created to tap different aspects of risk taking. All items were rated on nine-point scales, ranging from 1 = *totally disagree*; 9 = *totally agree*, except for the last item, which ranged from 1 = *risk avoider* to 9 = *risk seeker* (Weigold & Schlenker, 1991). The nine items were: I prefer to avoid risks; Safety first; I really dislike not knowing what is going to happen; I do not take risks with my health; I enjoy participating in lotteries and other gambling games that involve money; I would participate in an experiment for a new medicine as a healthy person; I take risks regularly; I usually view risks as a challenge; I view myself as a risk avoider/risk seeker (a complete version of the final Risk Scale can be found in the appendix 2).

All participants completed the RS. In addition to the RS, the first sample also filled out the Everyday Risk Inventory. In the second sample, in addition to the RS and the ERI, the participants were asked to complete the SES, the SLCS, the NC, and the NFS. We also asked the participants in this sample to make the five choices used by Schneider and Lopes (1986). A subset of the participants in the third sample (the psychology students) completed the NFS and the trait anxiety measure of the STAI. The participants in the fourth sample completed the STAI, while the participants in the fifth sample completed the short version of the SSS (Madsen et al., 1987), in addition to the RS.

Procedure

The participants in samples 1 and 2 filled out the questionnaires as part of an experiment that was run at the Department of Health Education and Promotion. All participants in samples 3 and 4 were asked to fill out the RS during a mass testing session (psychology students) or during a workgroup (health sciences students). The fifth sample was also asked to fill out the RS and the short SSS as part of a mass testing session. The students partaking in one of the experiments received monetary compensation for their participation, which depended on the length of that particular

experiment (ranging from Hfl. 7.50 to Hfl. 12.50). The other participants, who filled out the RS during a workgroup session or during a mass testing session, received no reward for their participation.

RESULTS

The data from the first sample showed that the original scale of 9 items had a reasonably good internal reliability, Cronbach's $\alpha = .72$. However, removing two of the items increased the scale's internal reliability. These items were item 5 "I enjoy participating in lotteries and other gambling games that involve money" and item 6 "I would participate in an experiment for a new medicine as a healthy person". Presumably these items were too specific compared to the other items, and therefore measured that specific risk, rather than a more general risk-taking tendency. As the RS already had another item that dealt with health, item 6 was deleted from the scale. Furthermore, the item about lotteries and gambles was also deleted (item 5), based on low inter-item correlations and on the fact that lotteries and gambles are probably not viewed as real risks (Huber, 1997). The Cronbach's α of the resulting 7-item scale, using the data from the same respondents was .80. Deleting the item "I do not take risks with my health" would marginally increase the scale's alpha. However, this item concerning health was not deleted as we deemed it essential to the risk taking that we wanted to measure. The RS scores ranged from 1.71 to 8.14, with a mean score of 4.92 ($SD = 1.20$), and a median of 5.00. The Dutch translation of the ERI had a good internal reliability, similar to the original English version, Cronbach's $\alpha = .83$. The correlation between the two scales proved to be significant, $r = .54, p < .001$.

In the second sample, the seven-item scale yielded an internal reliability of Cronbach's $\alpha = .77$ (in all the following samples, the seven-item RS was used). The mean score was 4.63 ($SD = 1.23$) and the median was 4.71, with scores ranging from 2.00 to 7.00. The participants in the second sample also completed the ERI. As was the case in the first sample, the Pearson correlation between the RS and the ERI in this sample was significant, $r = .51, p < .001$. Furthermore, the participants in this sample also made the five-choice problems used by Schneider and Lopes (1986) to measure risk styles. The number of times that the participants chose the gambles were summed over the five choices. The correlations between this measurement of risk style and the RS and the ERI were computed. The correlation between the RS and the gambles was weak and non significant, $r = .15, ns$ and the correlation between the ERI and the gambles was practically zero, $r = .04, ns$. Seventy-eight participants of the original sample of 95 participated in an experiment, at the start of which they completed the SES, the SLCS, the NC, and the NFS.

Table 6.1 Correlations (Pearson *r*) for the Scales Used in the Second Sample (*N* = 78)

	RS	Gambles	SES	SLSC	Self-liking subscale	Self-competence	NC	NFS
Gambles			.02	.05	.02	.11	-.10	-.15
RS		.15	.13	.13	.16	.08	-.25**	-.49*
ERI	.48 ^a	.01	.12	.14	.14	.10	.01	-.41**

Notes: ** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

The correlations between the various scales are given in Table 6.1. There was a small, but significant correlation between the RS and the Need for Cognition scale, indicating that the need for cognition is less in risk takers than in risk avoiders. Furthermore, there was a significant and negative correlation between the RS and the Need for Structure scale, indicating that risk avoiders score higher on the need for structure scale than risk takers. None of the other scales correlated significantly with the RS. The ERI also correlated significantly and negatively with the NFS, but not with the NC. These results indicate that there is no relation between the Risk Scale and the self-esteem measures, and small to medium correlations between the Risk Scale and Need for Cognition and Need for Structure respectively.

The third sample again indicated that the RS has good internal reliability, Cronbach's $\alpha = .77$. The mean score of the RS was 4.34 ($SD = 1.14$) and the scores ranged from 1.29 to 7.57. Furthermore, some weeks later, 36 participants filled out the RS for a second time. Test-retest reliability for the RS using the Pearson correlation indicated that it was adequate, $r = .75$, $p < .001$. In this study, a subset of the sample (the psychology students) also completed the NFS and the Trait-anxiety subscale of the STAI. As was the case in the second sample, there was a significant negative correlation between the RS and the NFS scale, $r = -.49$, $p < .001$. Trait anxiety did not correlate at all with the RS, $r = -.02$, *ns*.

The results of the fourth sample again indicated that the RS had good internal reliability, Cronbach's $\alpha = .78$ ($M = 4.46$, $SD = 1.09$, $Min = 1.71$, $Max = 6.86$). A subset of the participants ($N=126$) who had completed the RS participated in an experiment, after which they completed the STAI. Again, there was no correlation between the RS and the STAI, $r = -.13$, *ns*. Neither of the subscales correlated significantly with the tendency to take risks: the correlation of the Trait-anxiety subscale with the RS was $-.17$, *ns*, while the correlation of the State-anxiety subscale with the RS was $-.08$, *ns*.

The short version of the SSS, completed by the participants in the fifth sample, had a fairly poor internal reliability, Cronbach's $\alpha = .34$ ($M = 6.0$, $SD = 1.8$),

Table 6.2 Sex Differences on the Risk Scale

Sample	M_{men}	M_{women}	t (df)	p
2 (N = 95)	4.9	4.4	2.16 (93)	< .05
3 (N = 301)	4.8	4.2	4.13 (299)	< .001
4 (N = 161)	4.7	4.4	1.05 (159)	<i>ns</i>
5 (N = 151)	4.9	4.4	2.72 (149)	< .01

Note: Higher scores indicate greater risk taking

which is in fact lower than the internal reliability reported by (Madsen et al., 1987). Eliminating the first item ("I can't wait to get into the indoors on a cold day/ I am invigorated by a brisk, cold day") increased the internal reliability to Cronbach's $\alpha = .38$. The RS had good internal reliability, Cronbach's $\alpha = .74$ ($M = 4.49$, $SD = 2.0$, $Min = 1.57$, $Max = 7.14$). The correlation between the two scales was low, but significant, $r = .28$, $p < .005$.

Research on risk perception has often shown that women tend to be more risk-avoiding than men (Byrnes, Miller, & Schafer, 1999). Therefore, sex differences for risk taking were also investigated, but not for the first sample, as it only included nine men. Independent t -tests showed that for three of the four samples, men scored significantly higher on the RS than women (Table 6.2). The same analysis was also done for the ERI scores in sample 2. The mean scores for men ($M = 3.0$) did not differ significantly from those from women ($M = 2.9$), $t(76) = 1.34$, *ns*. The SSS scores in the fifth sample did not differ between men ($M = 6.0$) and women ($M = 5.6$), $t(151) = 1.21$, *ns*, either.

DISCUSSION

The main aim of this paper was to provide information about the reliability and discriminant validity of the Risk Scale. The results clearly show that the RS has good internal and test-retest reliability. Overall, the Cronbach's α values were around .77, indicating that for different groups of students, reliability remained the same. Furthermore, results from experiments showed that those who scored differently on the RS also behaved differently with regard to risk-related behaviour (information seeking, risky choices; Lion & Meertens, 2000b [chapter 4]; Lion & Meertens, 2001 [chapter 3]; Lion & Meertens, 2001 [chapter 5]). Thus, the first data indicate that the RS can distinguish risk avoiders from risk takers. A further indication that the RS

measures risk taking is the significant and reasonably high correlation with the ERI. Also, the correlations between the ERI and the other scales measured in sample 3, and the correlations between the RS and the other scales show a similar pattern, suggesting that they measure a trait in the same domain.

The RS correlated significantly with the short version of the SSS, but the correlation was not very high. This is in line with our expectations: the RS measures general risk taking, whereas the SSS measures only risk taking that involves thrill and sensation. A high correlation would have meant that the RS was a superfluous measure, a low and non significant correlation would have meant that the RS does not measure risk taking at all. The short version of the SSS had a rather low internal reliability, but Madsen et al. (1987) state that the short SSS can serve as a valid and reliable measure of the SSS. This suggests that the correlation between the RS and the SSSV (from which the short form was derived) should be in the same league as the correlation found in this study.

A second aim of the study was to investigate the relationship between the tendency to take risks and other personality traits (i.e., its discriminant validity). The RS correlated significantly and negatively with both the Need for Cognition scale and the Need for Structure scale. As expected, the correlation between the RS and the NC was not very high, indicating that risk avoiders tend to have a somewhat greater need for cognition than risk takers. The correlation between the RS and the NFS, however, proved to be substantial and in the expected direction. A risk-taking tendency scale should also measure avoidance of uncertainty, so it would have been disquieting if no correlation had been found. However, the fact that the correlation was reasonable, but not high, indicates that the RS and NFS do not measure the same construct. Taken together, the correlation of the RS with both the NC and the NFC provides support for the idea that risk avoiders, as opposed to risk takers, should be more inclined to plan ahead before they engage in risky behaviour (Cloninger, 1987).

It is clear that there is no correlation between the tendency to take risks and the gambles used by Schneider and Lopes (1986) to distinguish risk avoiders and risk takers. This is not due to a deficit in the RS: the ERI does not correlate with this measure either. Choosing between an amount of money and the chance of getting an even larger amount of money does not appear to be an adequate way to distinguish risk avoiders from risk takers. This also supports the growing criticism of much of the experimental risk perception research, which has tended to use gambles as an operationalisation of risk (Huber, 1997; Lion & Meertens, 2001 [chapter 3]; Maule et al., 2000). Indeed, the fact that general risk-taking scales do not correlate with gambling behaviour is rather a serious problem for much of the risk perception research, which has tended to suggest broad implications based on risk taking that was measured by the choices made for gambles.

Clearly, risk taking and self-esteem are not related, which goes both for perceptions of self-worth and perceptions of self-competence. This effectively rules out the idea that risk takers may have greater self-esteem and/or self-competence, which would lead them to have a higher perceived control over risks. The fact that the ERI

does not correlate with the self-esteem scales used in these studies either, corroborates these findings. This does not mean that self-efficacy does not have any effect on risk taking. Rather, it suggests that these effects may be independent of an individual's risk-taking tendency. Probably, self-efficacy only influences risk taking for risks that offer the possibility of control over the outcome (Wyatt, 1990).

Lastly, we found significant differences for gender in three of the four samples on the RS, but not on the ERI or the SSS. A recent meta-analysis of gender differences in risk taking indicated that gender differences on self-reported behaviour were generally quite large for measures dealing with more general risk-taking (Byrnes et al., 1999). Our results provide further support for these findings, although the differences between the two groups were not very large. A possible explanation for the fact that the ERI nor the SSS yielded significant differences between male and female participants, may be that gender differences in risk-taking are less pronounced in the student population that our participants were drawn from. This would also imply that the RS is rather sensitive in measuring risk-taking tendency, as it did yield differences between the two groups.

The first results from using the RS show that it is a short and easy-to-use questionnaire, which appears to adequately measure the tendency to take risks. However, the samples used so far consisted only of students, necessarily limiting the extent to which definite conclusions can be drawn. Research with groups of participants who are known to differ in their risk-taking behaviour should be conducted, so that further support can be found for the capability of the RS to distinguish risk avoiders from risk takers. Given that the scale was capable of discerning risk avoiders from risk takers in a relatively homogeneous student population, the outlook is promising.

7

DISCUSSION AND CONCLUSION

You, dear reader, are showing that approaching people as active information seekers is a realistic approach. Unless you are on the review committee, it is highly unlikely that you are reading this thesis from beginning to end. Probably, you are scanning through the pages and selecting those pieces of information that you find interesting or valuable (e.g., whether you are mentioned in the foreword). Furthermore, situational factors can affect the way you read through this thesis. You would probably feel obliged to read the whole thing through if I were to sit next to you, not leaving until you had finished. Alternatively, you might have thrown it away immediately, disappointed by the absence of pictures.

The previous five chapters reported studies that were conducted in order to gain more insight into the way people select risk information. Two main research questions were investigated. The first was to find out what kinds of information people desire about risks. This has hardly been investigated in risk perception research, as it has usually approached risk perceivers as passive information processors. Thus, in the experimental paradigm people's risk perceptions were investigated by offering participants information about a risk, usually about its probability and severity, in order to find out how systematic differences in this information affected people's risk perceptions (e.g., Hendrickx, 1991; Hendrickx et al., 1989; Kahneman & Tversky, 1983). In the psychometric paradigm participants were asked to compare and rate risks in relation to one another on dimensions that theory had predicted to be of importance, such as a risk's voluntariness or controllability (e.g., Slovic, 1987; Vlek & Stallen, 1981). Traditional risk perception research has therefore not done justice to the fact that in real life people can actively seek information about the risks that they are confronted with (Huber et al., 1997; Jacoby et al., 1987; Payne, 1992; Payne et al., 1993). People will necessarily have to select and filter the information that they are presented with, as they cannot possibly process all the information they receive.

The second main aim of this thesis was to investigate what factors affect people's risk information search and selection. Information seeking can be affected by both individual and situational factors (e.g., Aarts, 1996; Huber et al., 1997; Jacoby et al., 1987; Payne, 1992; Payne et al., 1993). With regard to individual factors, evidence has been gathered that these can affect people's information search in non-risky decision-making (e.g., Brucks, 1985; Verplanken, 1993; Verplanken et al., 1992). Furthermore, people differ in the way they perceive risks (e.g., Vlek & Stallen, 1981), process risk information (e.g., Lopes, 1987; Schneider & Lopes, 1986), and take risks (e.g., Zuckerman, 1994). Therefore, individual differences in risk-taking tendency were expected to affect people's risk information preference. With regard to the influence of situational factors on people's risk information preference, there is ample evidence in social psychological literature that the (social) environment can influence people's behaviours and cognitions (e.g., Lerner & Tetlock, 1999; Madaras & Bem, 1968; Turner & Oakes, 1986). For example, research has shown that being held accountable for one's decisions affects (risk) information processing and risky decision making (Tetlock & Boettger, 1994). Furthermore, accountability can also affect information search depth (e.g., Billings & Scherer, 1988; Verplanken et al.,

1997). In other words, the social context in which the risky decisions have to be made was expected to affect risk information preference, particularly as risk perception has been suggested to be a social construct (e.g., Douglas & Wildavsky, 1982; Kaspersen et al., 1988).

These main research questions were investigated by providing the participants with naturalistic risks as opposed to gambles. Risk perception research, in particular the experimental paradigm, has traditionally relied heavily on gambles and lotteries. However, gambles form a specific category of risks, that lack many features (e.g., controllability) that are very important in other risks (e.g., nuclear energy or snowboarding; see Hendrickx, 1991; Huber, 1997). Naturalistic risks should thus lead to results that allow for more generalisations than gambles or lotteries.

This thesis thus attempted to expand existing research by integrating aspects that have not been given much attention in previous research (i.e. active information seeking, situational factors, and naturalistic risks). As relatively new terrain was being explored, both qualitative and quantitative research methods were used. In addition, a scale was constructed and validated in order to measure people's general risk-taking tendency in a way appropriate for our purposes. This resulted in the Risk Scale.

First, in order to investigate people's risk information preference, a qualitative research method was used. Several focus group interviews were conducted in which people were asked what kind of information they desired when confronted with new and unknown risks. The results of these interviews were backed up by a rank-ordering questionnaire that was sent to a random sample of the Dutch population. These studies were reported in more detail in chapter 2. Furthermore, the experiments reported in chapters 3, 4 and 5 provided additional data about people's risk information preference.

Second, effects of individual differences on people's risk information desire were investigated in experimental laboratory studies that were reported in chapters 3, 4 and 5. The influence of risk-taking tendency on people's information search depth was investigated in chapter 3. Risk avoiders were expected to look up more information about the medicines than risk takers. The effects of risk-taking tendency on risk information preference were investigated in chapters 3, 4 and 5. The main hypothesis was that risk avoiders were expected to be more interested in negative information about the risks (i.e. reasons to not take the risk), whereas risk takers were expected to be more interested in positive information about the risks (i.e. reasons to take the risk). Lastly, the role of trait anxiety in people's risk information preferences was investigated in chapter 5. Participants high in trait anxiety were expected to be more interested in negative information about the risk than participants low in trait anxiety.

Third, situational factors were investigated in the experimental laboratory studies reported in chapters 3, 4, and 5. Accountability – a social factor – was expected to affect people's risk information preference in two ways. First, accountable participants were expected to select more risk information than non-accountable participants. This was investigated in chapter 3. Second, accountability was also

expected to influence the effect of risk-taking tendency on people's information preference. Specifically, it was expected that accountability would lead both risk takers and risk avoiders to select information as objectively as possible, effectively overruling effects of risk-taking tendency on risk information preference. This hypothesis was investigated in chapters 3 and 4. Second, the effects of making a decision before or after selecting risk information were investigated in chapter 5. The general idea was that individual differences would have a stronger effect on people's risky decision making if people did not have the opportunity to select risk information before making a risky decision. Furthermore, the results of chapter 4 suggested that having made an implicit decision before selecting information may have influenced participants' information selection. Therefore, in chapter 5 differences between pre-decisional and post-decisional information selection were also investigated.

In addition, in chapter 5 the assumption that risk information influences people's risky decision making was investigated by relating participants' information selection to their final choices. Lastly, in chapter 6 the Risk Scale's reliability and validity was described in more detail.

Information search depth was investigated using an Information Display Board (IDB; see chapter 3), in which participants could select information about six attributes of four risky therapeutic drugs. This IDB in chapter 3 was also used to measure participants' information preference. In chapter 4, a different paradigm was constructed. Participants were presented with six newspaper headlines about seven different risks and for each risk they were asked to select the three (out of these six) newspaper headlines about which they would like to read the underlying article. In chapter 5, this information selection task was adapted somewhat. Here, participants were first asked to simply indicate whether they wanted positive or negative information about four different risks and could then select three out six different risk aspects about which they could obtain more information.

In the remainder of this chapter, the main results of the aforementioned studies will be discussed. The results suggest that people's information search appears to be goal-directed in the sense that people desire information that enables them to decide whether further action is called for. Furthermore, people's information preference can indeed be affected by individual and situational factors, although more research is necessary to be able to predict people's information search and decision making. Also, it seems that the context in which a risky decision is made can influence both people's risk information preference and their risky decision. Finally, the results will be discussed in relation to risk perception research in general and how the findings of this study may be used to improve risk communication.

.....INFORMATION PREFERENCE

The first main aim of this thesis was to investigate what kinds of risk information people desired. In the psychometric paradigm, two main factors, "Dread risk/catastrophicality" and "Unknown risk" have typically been found to underlie people's risk perceptions (Slovic, Fischhoff, & Lichtenstein, 1982). These factors were found by having people rate risks on a number of aspects that were deemed important for people's risk perception (Slovic et al., 1982; Vlek & Stallen, 1981). These aspects were also taken as a starting point for the research conducted in this thesis. We wondered whether people used these aspects when they could search for information themselves. In order to find an answer to this question, focus group interviews were conducted in which the participants were asked what kind of information they desired about new and unknown risks. These qualitative results were backed up by a rank-ordering questionnaire that was sent to a random sample of 500 people living in the Netherlands. In this questionnaire, nine questions were presented that were either important or unimportant, based on the data from the focus group interviews. Participants had to indicate which questions about risks they would most like to have information about. Further data was gathered by presenting participants in the laboratory studies (chapters 3, 4 and 5) with the most important of these aspects and asking them to indicate which of these they would most like to have information about.

The results of the focus groups, reported in chapter 2, showed that people used many of the risk aspects isolated in the psychometric paradigm. People wanted to know what the risk was, what the consequences were, whether it was controllable, how one could be exposed to the risk (when and where), who was responsible for the risk, what scientific knowledge existed about the risk and what other people did with regard to the risk. Furthermore, the questionnaire that was used to back up the results from the focus groups showed that people were most interested in information about what the risk was, how one could be exposed to a risk, what the consequences were and finally what the risk's probability and controllability were. The results of chapters 3 and 4 indicated a similar information preference. In chapter 3, participants could select information about four risky medicines and the order in which the participants were interested in the risk's aspects was as follows: effectiveness, the disadvantages, controllability, probability and finally the advantages of the medicine. In the information selection task reported in chapter 4, in which the participants could select newspaper headlines (e.g., "Negative consequences of genetically modified crops difficult to control"), people were most interested in information about the (dis)advantages, probability information, severity information and finally controllability information. In this study, participants could only select three newspaper headlines, and controllability information was the most selected third item. The findings of the focus group study in particular suggest that people's information search strategy be foremost aimed at determining whether a risk can personally affect them. The participants first ascertained the personal relevance of the risk and were only then interested in ways to control the risk. It seems that they initially

only desire basic risk information that enables them to determine the personal relevance of that risk. Interestingly, personal relevance is hardly mentioned in the psychometric paradigm. This is probably due to the fact that the psychometric paradigm was foremost inspired by a desire to explain why people's risk perceptions were irrationally high (at least, in the eyes of experts). Thus, the psychometric paradigm mostly studied risks for which the personal relevance was high and it may thus have not been an issue to the researchers.

The finding that people want to determine whether the new risk is personally relevant suggests that people's information preference is goal directed. Arguably, people want to know whether the risk is personally relevant in order to determine if any further actions are necessary. Personal relevance is an important feature of models that have been used to explain health risk behaviour, such as the Protection Motivation Theory (Rogers & Prentice-Dunn, 1997) and the Health Belief Model (Becker, 1974). These expectancy value models all assume an important role for perceived vulnerability or susceptibility in determining people's risk behaviour, in that providing information about the vulnerability and severity of the risk should lead people to more protective action (see Rogers & Prentice-Dunn, 1997; Ruiters, 2000). In research investigating these models, vulnerability information is usually provided in terms of probability information. Furthermore, these models have also regarded people as passive, rather than active information seekers (see Ruiters, 2000). It has more or less been assumed that probability and severity information about the risk should be sufficient to lead people to action, but this has never been specifically investigated. The focus group data in particular suggest that people would like to know what the consequences are (comparable to severity of the risk), but also on when and where they are exposed to the risk and what might be done to control it.

In risk research, probability information has always been very important, and probability information is always offered to the participants. Few participants in the focus group interviews asked for information about the probabilities however, and the subsequent questionnaire also revealed that obtaining probability information was not their foremost concern. Although participants were more likely to select probability information in the rank-ordering questionnaire and in the information selection tasks used in the laboratory studies, this may be due to the alternative research method. Huber and Macho (2000) showed that participants in an unstructured information seeking task (of which a focus group interview is a good example) were far less likely to ask for probability information than participants in a structured information seeking task (e.g., a rank ordering questionnaire), in which one of the items was "probability information". Thus, it is not that they do not want probability information at all - this would be rather unlikely given its central role in the definition of risk - but this thesis does indicate that it is not as important as prior research appears to suggest. In a similar vein, research by Huber and colleagues has shown that people are not interested in precise probability estimates but rather that vague indications are sufficient (Huber & Macho, 2000; Huber et al., 1997).

Cultural anthropological theories have stated that risk is a social construct (Douglas & Wildavsky, 1982; Kasper et al., 1988), implying that other people

might be an important source for risk information. The results obtained were rather mixed. The focus group participants quite often said that they had heard about risks from other people. However, the subsequent questionnaire revealed that people were not particularly interested in other people's experiences with the risk. Furthermore, the participants in the study reported in chapter 3 did not select scenario information about other people's experiences with the medicine very often and the participants in chapter 4 also did not display much interest in other people's experiences with the risks. These opposing findings between the focus group interviews and the experimental studies may also be the consequence of the different methods used. It is quite possible that the questionnaire and the experimental settings (chapter 3 and 4) led people to try and ask for risk information in an objective way, in which case other people's subjective and non-representative experiences might not have appeared to be very valuable information. This may suggest that people can be unobtrusively influenced by others, but as soon as they engage in a more effortful ("objective") information seeking, they deem information from others as less important.

So far, an underlying assumption of this thesis may have seemed to be that people always want information about new risks with which they are confronted. However, an important outcome of the focus group interviews was that participants were often not very inclined to search for information about such risks. Quite a few participants indicated that they would not have asked these questions, if it had not been for the interviewer. The three main reasons the participants gave were unconcern, not wanting to think about the risks, or the feeling that the risks were too complex for them to judge. As was stated in chapter 1, Weinstein (1979) also found that people who are unconcerned about a risk (in this case environmental cancer in New Jersey) tend not to seek information. However, people's apparent unconcern may also be a problem of the risks used in this thesis (e.g., electromagnetic fields; radon). The way the participants talked about the risks seemed to indicate that they did not believe the risks to be particularly important, presumably because they had not heard about it from the media. This led to a Catch-22 situation for our study designs: the participants know too much about risks that are in the media and that would probably affect their reaction to the risk in terms of information desire, but when a risk is not in the media, they are unconcerned and not interested in the risk. This suggests that caution must be taken in generalising the results of this thesis to new and important risks. Nevertheless, this finding also points out that in those cases where the media do not spend much attention to new risks, or in those cases where the risks appear to be part of everyday life, getting people interested in risk information may prove to be quite difficult.

The psychometric paradigm has investigated what factors underlie people's risk perceptions in order to better understand them. In doing so, it has tended to use a rather static description of people's risk perceptions. However, the finding that people are able to rate a risk on any aspect that appears logically related to a risk (e.g., rating "nuclear energy" and "smoking" on the perceived voluntariness of these risks) does not mean that people would actually use that aspect in their risk percep-

tions, let alone that they desire information about that aspect. The findings of this thesis suggest that not all the aspects that have been found to underlie people's risk perceptions are actually used to create a risk perception. People may simply not need information about all the risk aspects in order to create a risk perception, as most risk aspects are related to one another. For example, it is hard to imagine a risk that is perceived as controllable and involuntary, or new, unknown and controllable. Thus, having information about a few elementary risk aspects may be sufficient to deduce evaluations on other risk aspects. For example, knowing that it is a fungal infection (what is it) that you can contract when taking public showers (exposure) and which gives a severe itching between one's toes (consequences) may be sufficient to deduce the risk's voluntariness and catastrophicality. In essence, the psychometric paradigm describes people's risk perceptions *after* they have been formed. In contrast, the studies reported in this thesis have attempted to sketch a more dynamic picture of people's risk perceptions, investigating risk perceptions as they are formed.

FACTORS AFFECTING INFORMATION SEEKING

The second main aim of this study was to find out what individual and situational factors could affect people's information search. With regard to the former, individual differences in risk-taking tendency were expected to affect people's information search strategy. This expectation was based on the idea that risk avoiders focus more on the losses, or negative consequences, associated with a risk, whereas risk takers focus more on the gains, or positive consequences, associated with a risk (Horvath & Zuckerman, 1993; Lopes, 1987). Furthermore, the effect of trait-anxiety on risk information selection was also investigated. With regard to the situational factors, we investigated whether accountability could affect people's risk information seeking process. Accountability was deemed to be an excellent example of how one's social environment can influence one's risk information seeking. Lastly, the effects of the decision-context on people's risk information preference and risky decision making were investigated.

Risk-taking tendency and trait-anxiety

The three studies that were reported in chapters 3, 4 and 5 show that people's risk-taking tendency (as measured by the RS) can both influence the extent and the direction of people's information search. In chapter 3 evidence was found that risk-taking tendency affects information search depth. Risk avoiders searched for more

information than risk takers, suggesting that risk avoiders are more careful in making a decision (cf. Cloninger, 1987; Steketee & Frost, 1994).

Furthermore, the findings support the general idea that risk-taking tendency can influence people's information selection, although partly not in the way that was anticipated. The hypothesis was that across situations risk avoiders would be more interested in negative information and risk takers would be more interested in negative information. However, in chapter 4 risk avoiders displayed a preference for positive information. The results suggested that this could either be because risk avoiders were more anxious about the risks, or because the participants had engaged in post-decisional information selection about risks over which they had relatively little control. In the latter case, selecting positive (reassuring information) may be a logical way to deal with the situation. This was investigated in chapter 5. The results indicated that neither risk-taking tendency nor trait-anxiety affected participants' information selection directly (i.e., in pre-decisional information selection). However, an interaction of risk-taking tendency and anxiety was found on participants' post-decisional information selection. In particular high anxious risk avoiders selected negative information about the risks, a finding in line with the hypotheses. Thus, it seems that the effects of risk-taking tendency and anxiety on risk information preference are contingent on the decision-making situation. First, there were no effects of risk-taking tendency or trait-anxiety on pre-decisional information selection. Second, there were effects of risk-taking tendency and trait-anxiety on post-decisional information selection, but the direction of the risk information preference (i.e., a preference for positive or negative information) seems to depend on the kind of risks involved (i.e., in terms of controllability or voluntariness). For voluntary risks, risk avoiders seem to prefer negative information, for involuntary risks they seem to prefer positive information. However, before final conclusions can be drawn, this should be investigated more specifically in a study in which voluntariness of the risks is explicitly manipulated.

Accountability

With regard to the influence of situational factors on risk information search, the data from the first experiment (chapter 3) showed that people's risk information search is more extensive when they are held accountable to an unknown audience compared to when they are not held accountable. This shows that social factors can influence people's risk information search, at least the extent to which people search for risk information. The information selection tasks used in chapter 4 could not be used to investigate this hypothesis, as the participants had to select three items (i.e., differences in information search depth could not be investigated). A second hypothesis was that an accountability manipulation would lead both risk avoiders and risk takers to select information as objectively as possible. Therefore, no differences between risk avoiders and risk takers were expected in their preference for positive or negative information about the risks when they were held accountable. This inter-

action effect was investigated in chapters 3 and 4, but no support was found. In chapter 3 no effect of risk-taking tendency on risk information preference was found, so no interaction effects were found either. The study reported in chapter 4 also did not yield this interaction. This may either have been due to the fact that accountability does not have an effect on people's information preference (as opposed to the amount of information selected), or to the fact that the accountability manipulations did not work very well. The manipulation checks seemed to support this latter explanation, as they revealed small or insignificant differences in perceived accountability. However, the data also provide some, be it not very strong, evidence for the first explanation. For one, accountability had clear effects on information search depth in chapter 3, showing that the accountability manipulation did have an effect on people's information search despite a not very strong effect on the manipulation check. As a very similar accountability manipulation was used in chapter 4, it may be that accountability only affects the amount of information, but not the kinds of information that people desire. Perhaps, both accountable and non-accountable participants first select the information that they find important, after which non-accountable participants terminate their information search, and accountable participants start to select information about any possible other sides to the issue. This would not be visible in the task used in chapter 4, as the participants could select no more than three items.

The decision making context

Another situational factor that affects people's risk information seeking, is the decision-making context. People do not always have the opportunity to obtain information about the risks with which they are confronted, or as the results of chapter 2 show, they may not always be particularly inclined to search for information. The results in chapter 5 show that when people have made a first explicit decision about a risk, this affects both their information selection and their subsequent decision. Conversely, if people have *not* made such a decision, their information selection appears to be relatively unbiased and the information selection to a large extent determines their final risky decision. When people are asked to make a decision without getting the opportunity to select information about the risks, they make an intuitive decision that is affected by personal inclinations, such as one's risk-taking tendency. Moreover, this initial decision affects subsequent information selection. Furthermore, regression analyses showed that this initial decision affects people's final decisions, regardless of the information that they had selected.

Overall, the data prove that individual differences and social factors can have an effect on people's information preference, although not always in the way that was anticipated. First, risk avoiders selected more information than risk takers, and accountable participants selected more information than non-accountable participants. Second, risk avoiders displayed a stronger preference for positive or negative

information than risk takers. This may mean that risk avoiders are more susceptible to situational influences than risk takers. Furthermore, the results suggest that the effects of risk-taking tendency on people's risk information preference is affected by decision making context (e.g., the kind of risks, the voluntariness of the risky choice, whether information selection is pre- or post-decisional). Furthermore, the decision-making context can affect people's risk information search. Individual differences appear to exert a stronger effect on people's information preference and risky decision making when people first make a decision and then select information as opposed to the other way round. Furthermore, some indication was found that trait-anxiety can affect people's information seeking, and again more so for risk avoiders than for risk takers. Taken together, these results suggest that people's risk information search may be influenced by individual differences such as people's risk-taking tendency and trait-anxiety, social factors such as accountability (although the effects appear to be limited to the amount of information that people select) and whether or not one has made a decision about the risk. This latter finding can be seen as a situational effect, as many situations exist in which people do not have the opportunity to gather information about the risk with which they are confronted.

An important difficulty that was encountered when construing the dependent measures for investigating people's preference for positive or negative information about the risks, was that the items that the participants selected had to be clearly positive or negative on the one hand, yet not too informative on the other. For example, in the first study (chapter 3), we viewed information about the effectiveness about the medicines as positive information. However, these labels were probably rather ambiguous. If a subject suspected that the effectiveness would be rather low, he or she would be asking for negative rather than positive information. Therefore, in the second study (chapter 4), information about the risk aspects was clearly positive or negative (e.g., "new medicine against dengue protects well" and "new medicine against dengue has serious side effects"). This introduced a new problem, in the sense that the newspaper headlines may have been informative enough to enable participants to create an initial attitude about the risks before selecting the information. Therefore, in an attempt to disentangle the valence of the information from information about the risks aspects itself, in the last study (chapter 5) information preference was measured by first letting people select either positive or negative information, and then letting them select information about various risk aspects. However, this may have made the first choice rather abstract.

The Risk Scale

In order to investigate the effects of people's tendency to take or avoid risks, an adequate way to measure people's risk-taking tendency was needed. A few good personality measures existed that might have been used to measure individual differences in risk-taking behaviour, such as the Sensation Seeking Scale (SSS; Zuckerman, 1979, 1994). However, most of these measure novelty and sensation

seeking rather than risk taking. Not all risks are such that they satisfy people's need for novelty or sensation, so a scale that measures people's general risk-taking tendency was constructed: the Risk Scale (RS). The RS consists of seven general statements about risk-taking behaviour. Based on the data gathered thus far, the final seven-item RS indeed measures general risk-taking tendency. Across five samples, the RS has consistently shown a good internal reliability (chapter 6). Furthermore, it has shown solid test-retest reliability and its convergent and divergent validity in relation to relevant scales, such as the short form Sensation Seeking Scale, the Everyday Risk Inventory (Steketee & Frost, 1994) and the State Trait Anxiety Index (Spielberger et al., 1983) has proven to be satisfactory (chapter 6). Also, people scoring low on risk-taking tendency (risk avoiders) are less likely to choose a risky option than people scoring high on risk-taking tendency (risk takers), and these risks did not involve sensation or novelty, but for example health risks (chapter 5). Although the RS will have to be investigated further, with other risks and other populations to corroborate the findings of this thesis, the first results look decidedly promising.

In addition to the main findings, several other interesting results were obtained. The first concerns the effect of information search on the final risky decision. It may seem rather obvious that the information selected should influence people's decision, but the relation between the information selected and the final decision that was made has not been specifically investigated in risk perception research. The results of the experiment in chapter 5 show that the more participants selected positive information the more likely they were to choose the risky option, particularly if the participants had not made an explicit decision before selecting information about the risks. However, if participants first made a decision and could then select information, both the initial decision and the information determined the final risky decision. This finding is all the more interesting as objectively the positive and negative information were equivalent; they only differed in the way the information was framed (i.e., as gains or losses).

The second additional finding pertains to the fact that the risks used in this thesis were naturalistic risks, instead of the traditional lotteries or gambles. The major concern was that, as gambles are a very specific category of risks, it is difficult to generalise people's accepting or declining a gamble to people's eating or avoiding PCB-rich salmon. The undeniable advantage of lotteries is that losses and gains are expressed on the same dimension (money). In contrast, when using naturalistic risks, it is much more difficult to have equivalent losses (negative information) and gains (positive information), and this problem has given us considerable headaches. Nevertheless, the fact that neither the Risk Scale, nor the Everyday Risk Inventory correlated with people's tendency to opt for a sure thing versus a "risky" option, showed that gambles are insufficient to investigate people's behaviour with regard to risks in general.

DISCUSSION AND RECOMMENDATIONS

When one wants to improve understanding about the way people deal with risks, in order to improve risk communication, it would appear useful to find out what kinds of risk information people actually desire and how individual and situational factors might affect people's risk information desire. Hence, risk perceivers were approached as active information seekers, rather than passive information processors. People will and cannot process all information about all the risks that they are confronted with in their lives. Information seeking and selection is a crucial part of the process that leads to people's risk perceptions and one that has hardly been investigated. The results of this thesis show that this approach is useful, insightful, and important. People are indeed active information seekers, whose information seeking can be affected by individual characteristics and situational factors.

The first main finding is that people's risk information search is foremost aimed at determining whether the risk is personally relevant. The studies reported in this thesis have given an idea of the kind of information that people use to determine whether a risk is personally relevant. Personal relevance is clearly an important aspect in both the psychometric paradigm and the health behaviour models and it certainly needs further investigation. How do people use this information to decide whether further information is needed to form a perception of a risk? How do differences in information about risk exposure and risk consequences affect people's perception of a risk's relevance? Do people perhaps deduce some kind of personal probability estimate using exposure information? These are important questions to ask, as determining the relevance of a new (health) risk is a core aspect of models that attempt to explain risk perceptions and (health) behaviour.

The second main finding of this thesis is that individual and situational factors can influence people's risk information preference. If the quality of research can be measured by the amount of new questions that it spurs, the investigations presented in this thesis have been very successful indeed. Individual differences, situational factors and the decision-making context all appear to affect people's risk information preference. This thesis has provided some evidence that all these factors can interact, leading risk avoiders to set different risk information seeking goals than risk takers. However, rather than providing clear and definite conclusions, the results suggest that it is worthwhile further excavating these new grounds. For instance, further research is necessary to investigate under what conditions risk avoiders and risk takers prefer positive or negative information. For example, whether risk avoiders are indeed more inclined to seek positive information in order to be reassured when confronted with risky choice made by others, whereas they are more inclined to search for negative information when confronted with a risky choice they can make themselves. Lastly, it seems worthwhile further investigating under what conditions people do or do not engage in an open and unbiased risk information search and risky decision making. Revealing more about how social, situational and individual factors can affect people's risk information search, may, in the long run, have impli-

cations for both risk policy makers and risk communicators, as risk communications can then be designed more effectively. Furthermore, people's reactions to a new risk may be better anticipated and tools may be constructed so that where necessary and possible, better risk communications can be designed.

Several practical recommendations for risk communicators can already be deduced from the results of these investigations. Risk communicators should heed the finding that people are active information seekers, who select and filter information based on what they think they need to know. People's information seeking is goal-directed, and the results suggest that people desire information with which they can determine whether the risk is personally relevant. It is clearly insufficient to provide people only with probability and severity information about the risk. People also want information about how they can be exposed to the risk and how they can control the risk. Arguably, these latter pieces of information offer much more information about whether the risk is personally relevant, than rather abstract probability information, which is usually based on estimates and which appear to bear little relation to one's personal life. In any case, the results provide further support for the finding that people are not that interested in probability information, and certainly not in precise probabilities (Huber & Macho, 2000; Huber et al., 1997).

Furthermore, a perhaps somewhat disconcerting finding for risk communicators is that people often do not appear to be particularly interested in information about risks. This suggests that relevant risk information may not always reach people. The general finding was that one could not worry about everything, so unless they had heard about it from someone else or from the media, it was not worth fussing about it too much. It may therefore be quite difficult to get people interested in information about risks, even though the information is highly relevant. A well-known example is home radon testing in New Jersey. Although radon levels (a radio-active gas that is emitted by rocks) tend to be unacceptably high in many New Jersey homes, attempts to have people measure these levels and take appropriate action have met with little success. The focus group interviews suggest that only a few people (i.e., those who want as much information as possible) will enquire after the way agencies and institutes deal with risks on behalf of their society. This is an important finding, as the media do not always pick up new risks, the use of antibiotics in chicken food being a good example. Likewise, it is quite well known scientific knowledge that the consumption of fish in combination with vegetables rich in nitrate such as spinach can cause stomach cancer, but this has generated little attention in the media.

Furthermore, individual differences and the situational context can influence people's risk information desire and their risky decision making. Both risk-taking tendency and accountability appear to affect people's information search depth. One may try to tailor the communication to people's risk-tendency, but this will probably prove to be impractical, and it is debatable whether the advantages will outweigh the costs and efforts involved. It may in some cases help to make people accountable for their decisions, as this increases information search depth and deliberation before making a final decision, but it should be noted that accountability does not always lead to better decision-making (see Lerner & Tetlock

[1999] and Tetlock [1992] for a review on accountability). A more important finding, however, is that whether or not people have taken a stand with regard to a risk appears to influence people's risk information seeking. If people have not made an implicit or explicit decision, they will engage in a relatively open and unbiased information search, with the information selected being the most important determinant of their final decision. However, if they have made an explicit choice, this choice tends to be influenced by people's risk-taking tendency and so does their subsequent information search. More importantly, these people tend to stick to their initial decisions. Thus, the initial choice people make, the subsequent information selection, and the final decision appear to be affected by personality characteristics, such as one's risk-taking tendency, which have no bearing on the risks themselves. These results suggest that, where possible, risk communicators should start informing people about a risk as soon as possible, in order to avoid that people have already made an implicit or explicit choice about the new risk, be it through information that they have acquired through other sources, or simply because they have taken a stand based on personal inclinations. This does however also pose a dilemma, as it seems that people are not terribly interested in information when they have not heard about it, and if they have heard about it in the media, they will already have formed an opinion.

The research conducted for this thesis has advanced our insights into people's risk perceptions. It should be mentioned, however, that the larger part of this thesis is based on laboratory controlled experiments. Thus, even though they may be more realistic than gambles and lotteries, the findings are the result of rather artificial and highly formalised decision-making situations. The advantage of such an approach is that the experimenter can control the variables under investigation (e.g., accountability; risk information selection). There are, however, also a few drawbacks. First, the information the participants could select were pre-selected by the experimenters, and their information selection was limited (e.g., they could only choose three out of six items). Usually, people's information selection is less well structured. It should be noted, however, that the information that was presented to the participants was based on qualitative research. A more important problem with laboratory research is that participants have to project themselves in hypothetical situations proposed by the experimenter. A possible solution would be to investigate people's risk information with a real new risk, but then many external factors would no longer be under the investigators control and the extent to which causal conclusions might be drawn would be severely limited. Lastly, experimental laboratory studies, including the ones in this thesis, rely heavily on student participants. Thus, in fact *students'* risk information desires and how individual differences and situational factors affect *students'* information preference have been investigated. Like many others have concluded before, research should also include other populations than only students. However, it may be argued that the first investigations in a new research area would do well to use "convenience" samples consisting of students, but further investigations should include other populations, when these initial investigations have proven to be promising.

The research for this thesis started from the idea that people's information search and the factors that can affect this information search should be investigated in order to gain insight into people's risky decision-making. This was a good idea. The main strength of this thesis is that it has provided a more dynamic view of people's risk perception by investigating people's information desire and it has shown that the information people select can affect their risky decisions. These findings could be expanded and corroborated by a field study in co-operation with agencies that are the first to hear about new risks (e.g., the Health Council), in which people's risk information need would be monitored as soon as a new risk manifests itself. This might be done by creating a web-site that tracks the information that people select on the web and by monitoring the questions that people ask on the web and at helpdesks that may be set up.

Furthermore, this thesis has shown that individual differences in risk-taking tendency can affect people's risk information preference, although the effects appear to be rather subtle. Perhaps, these effects are so subtle that their effect on people's risk perceptions in the real world would be negligible. Nevertheless, investigating the effects of individual differences on risk information preference and risky decision making can further theoretical insights into the processes underlying people's risk perceptions. This is an area that has hardly been investigated, as risk perception research has tended to be normative or descriptive. Chapter 5 has taken a first step at investigating the effects of risk-taking tendency on information selection and subsequent risky decision making. Further research could expand the research conducted for this thesis investigating how people's risk information preference may be biased by individual differences and situational factors in order to determine under what conditions risk information preference may be biased toward positive or negative information. Furthermore, research could focus on expanding the results to more realistic situations, so the effects of biased information search on the way people deal with risks can be determined. Lastly, the results in the last two studies seemed to indicate that for involuntary risks, risk avoiders are more inclined to select positive information, whereas for voluntary risks, risk avoiders are more inclined to select negative information. Therefore, further research could also investigate how the kind of risk that is being dealt with influences risk information selection (cf. Huber & Macho, 2000).

Conclusion

The way people deal with risk has been a subject of investigation for years, and this probably will remain the case as long as people seem to deal with risks in a way that would not be expected from a scientific point of view. However, risk perceptions are not the only and often maybe not even the most important determinant of risk behaviour. For example, eating beef may still be better predicted by how much one likes meat, rather than by the perceived risk of getting Kreutzfeld-Jacob. Nevertheless, the way people deal with risks remains an important topic, as is

clearly shown again and again by incidents reported about in the media. This thesis is one of the first attempts to get insight in the information people select about risks, as this could provide part of the explanation on how people deal with risks. All in all, in approaching people as active information seekers, this thesis has painted a picture of the kinds of risk information that people desire and what individual differences and situational factors can affect the amount and kinds of risk information people select. Although this painting is still sketchy and unclear in several of its details, it suggests interesting new horizons.

SUMMARY

Introduction

We are regularly confronted with risks of which we had hitherto been unaware or which simply did not exist (e.g., fireworks storage, BSE, genetic modification). In particular when the media pick up such risk, people are submitted to a sheer endless amount of information. Moreover, modern society provides people with countless sources of information, such as library databases and the world wide web. If we are not to be overwhelmed by all this information, we have to select and filter the information that we receive or access. This information selection process was the main subject of this thesis. The central question was what kind of information people desire when they are first confronted with a new risk and what factors can influence this information desire.

People's risk information desire has hardly been investigated. In most risk perception research people are implicitly approached as *passive* information processors. In contrast, in this thesis people were approached as *active* information seekers. The information people seek about a risk may be a very important determinant of the way in which people deal with it. Thus, revealing people's information desire is important for shaping theory on the way people deal with risks. In addition, it is also of practical relevance. Risk communicators can probably communicate more effectively by adapting their risk communications to people's information desires.

This thesis also aimed to uncover what factors can influence their risk information desire. Two categories of factors can be distinguished. The first comprises *individual differences* (in this thesis, the main focus was on risk-taking tendency and trait-anxiety). The second category comprises *situational factors*, which are factors in the decision making situation (e.g., having to justify one's risky decision). If individual and situational factors can influence people's information desire, this would mean that the way in which people deal with risks can be influenced at an early stage in people's risk perception process.

Four perspectives within psychological risk perception research are particularly relevant to this thesis. The first is the experimental perspective, which mainly consists of experimental (laboratory) research in hypothetical risk situations and has firm roots in economics and decision-making research (e.g., Bar-Hillel & Neter, 1996; Kahneman & Tversky, 1979; Schneider & Lopes, 1986; Weigold & Schlenker, 1991). Most of this research has used lotteries and monetary bets as a way to operationalise risks and it has mainly focused on how differences in probability and value information can lead to different decisions. Second, the psychometric perspective originated from the fact that new, potentially dangerous technologies such as nuclear energy, had a large societal impact. Participants in this kind of research were asked to compare and rate risks such as nuclear energy and LPG-tankers on risk aspects such as voluntariness, newness etc. (e.g., Slovic, 1987; Vlek & Stallen, 1981). Third, the personalistic perspective's main focus has been to describe and

measure personality characteristics that might explain individual differences in risk taking, with a well-known example being Zuckerman's Sensation Seeking Scale (Zuckerman, 1979, 1994). Lastly, a social perspective can be distinguished, in that (cultural) anthropologists studied the fact that different societies feared different risks (Douglas & Wildavsky, 1982). So, for example, few Dutchman would dream of eating raw chicken from fear of a salmonella infection, whereas the Japanese have no qualms in presenting raw chicken liver on a tray of ice. Furthermore, social psychological research has provided evidence that risk perceptions can be influenced by group processes and social contexts (e.g., Wallach et al., 1962). In addition to these risk research perspectives, research on active information seeking is also relevant to this thesis. Research has shown that individual differences (e.g., need for cognition) and situational factors (e.g., accountability) can affect people's information selection (e.g., Payne et al., 1993; Verplanken et al., 1997; Verplanken et al., 1992). Furthermore, Huber (1997) has shown that people who can actively search for risk information, desire and use other information than is usually provided in the gambling paradigm.

As research on people's risk information desire is scarce (but see Huber, 1997; Huber & Macho, 2000; Huber et al., 1997), a variety of research methods were used to investigate these research questions. In addition to a number of experiments that were conducted in a laboratory setting, a qualitative research method was used (in this case, focus group interviews). Furthermore, it was necessary to develop and validate a scale measuring *general* risk-taking tendency, as such a scale did not yet exist. This has culminated in a qualitative study investigating people's risk information desire (chapter 2) and three experimental studies. In these latter three studies, people's risk information selection and the effects of individual differences (risk-taking tendency and anxiety) and situational factors (accountability and pre- and post-decisional information selection) on people's risk information selection were investigated (chapters 3, 4 and 5). Furthermore, chapter 6 describes the Risk Scale that was constructed to measure general risk-taking tendency in more detail.

The studies

The main purpose of the study reported in chapter 2 was to investigate what kind of risk information people desire when they are confronted with an unknown risk and how this desire for information relates to the main dimensions underlying risk perception. Nine focus group interviews were conducted. The main results of the focus groups were backed up by a paper and pencil questionnaire that was distributed among a random sample of 500 households in the Netherlands. The main findings were that people desire information with which they can determine the personal relevance of the risk with which they are confronted. They wanted information about a) how one could be exposed to the risk, b) the meaning of the risks, c) its consequences and d) probability and controllability information in a shared fourth place. Furthermore, people did not always desire information about the risks, because they

were unconcerned, were afraid of an information overload or thought themselves incapable of making a good decision. Also, people seldomly enquired after probability information. The focus group results also provided a dynamic picture of the way risk aspects might interact to create a final risk judgement.

The main purpose of the study conducted in chapter 3 was to provide additional evidence about people's risk information preference and to investigate how risk-taking tendency and accountability could affect participants' information search depth. The participants could look up information about four risky medicines by means of an Information Display Board. We hypothesised a) that risk avoiders would search information more elaborately than risk takers, b) that accountability should also lead participants to search for information more elaborately, c) that risk avoiders would be more susceptible to the accountability manipulation than risk takers, and d) that risk takers and risk avoiders would seek different information, with risk takers focusing more on positive information and risk avoiders focusing more on negative information. Results indicated that risk avoiders looked up more information than risk takers and that accountable participants looked up more information than non-accountable participants. However, accountability did not decrease the effects of risk-taking tendency on risk information selection. Furthermore, no support was found for the idea that risk avoiders and risk takers focus on negative and positive information respectively, but this may have been due to the fact that whether information was positive or negative may not have been obvious to the participants.

In the second experimental study, reported in chapter 4, the idea that risk avoiders and risk takers differ in their risk information preferences was tested more explicitly. In an information selection task, participants could choose newspaper headlines that indicated negative and positive information about a variety of risks (e.g. electromagnetic fields, genetically modified food). Furthermore, the effects of accountability on risk information preference were investigated. Contrary to our hypothesis, risk avoiders chose more positive information than risk takers. A post-hoc explanation was that risk avoiders desired reassurance about the risk more than risk takers, leading to a preference for positive information for risk avoiders. This also pointed to a possible role of anxiety in people's risk information selection. Another possible explanation for these findings was that participants were confronted with relatively involuntary risks. Thus, in a sense the information selection was post-decisional. For involuntary risks it might be more logical to select reassuring (i.e. positive information) than negative information. Accountability did not have any affect on people's information preference. This might either have been due an inadequate manipulation of accountability, but it is also quite likely that accountability only influences information search depth, but not risk information preference.

Chapter 5 reports the effects of personality characteristics (i.e., risk-taking tendency and trait anxiety) on risky choice and pre- and post-decisional information selection using voluntary risks. We expected a) that risk-taking tendency would exert stronger effects on risky choices if participants did not have the opportunity to select information beforehand, b) that risk avoiders would prefer negative risk information more than risk takers, c) that anxious participants would prefer negative information

more than non-anxious participants, d) that when participants could first make a choice, then select information and then reconsider their choice, the first choice would influence the second, and e) that the risk information selected would influence the subsequent risky choice. As expected, risk-taking tendency only affected the risky choices people made, when they had not engaged in pre-decisional information selection. Furthermore, risk-taking tendency did not affect people's pre-decisional risk information selection. Risk-taking nor anxiety affected people's post-decisional information selection directly, but an unexpected interaction effect was found, indicating that in particular high anxious risk avoiders preferred negative risk information. Also, the first choice participants made did have an influence on their second choice. Lastly, participants selecting negative information were more likely to make a risk-avoiding choice, whereas participants selecting positive information were more likely to make a risk-taking choice. The results suggest that if people can not select information before making a decision, risk-taking tendency has an effect on both the choice and subsequent information selection, whereas anxiety only affects information selection in interaction with risk-taking tendency.

Chapter 6 reports more extensively on the Risk Scale (RS) that was constructed to measure people's general risk-taking tendency. More information was given about the reliability and discriminant validity of the RS. Given the aims of the Risk Scale, we expected moderate to high correlation with the Everyday Risk Inventory (ERI) and the short version of the Sensation Seeking Scale (SSS). The RS was also compared to the Need for Cognition Scale, the Need for Structure Scale, and two self-esteem scales (the Self-Esteem Scale and the Self-Liking/Self-Competence Scale). Across the different samples, the RS had a good internal reliability and correlated well with the ERI. The RS also had good test-retest reliability. A moderate correlation with the SSS indicated that the RS did indeed measure general risk taking rather than sensation seeking. The correlation with the other scales was low to moderate, indicating good discriminant validity. Although the samples of participants were all students, the findings so far suggest that RS does indeed measure risk-taking tendency. Furthermore, it is easy to administer and complete.

Main conclusions

The first main aim of the thesis was investigating what kinds of information people desired about unknown risks with which they were confronted. The findings showed that participants used many of the aspects also isolated in the psychometric perspective. Furthermore, the findings of the focus group study in particular suggested that people's information search strategy was foremost aimed at determining whether a risk could personally affect them. The results of chapters 3 and 4 indicated a similar information preference. These results show that people use more than simply probability and severity information to determine how to deal with a risk. They desire information about when and where they can be exposed and how the consequences can be controlled. This also has implications for investigators using models explain-

ing (risky) behaviour, such as the Protection Motivation Theory (Rogers & Prentice-Dunn, 1997), as these tend to operationalise susceptibility/vulnerability information only in terms of probability and severity. The results also indicated that people often do not want information about the risks, due to unconcern, fear of an overload of information or perceived inability to use the information to make a good decision. Finally, when people seek information themselves, they hardly ever ask information about specific probabilities.

The second main aim of this thesis was to investigate what factors can influence people's risk information selection. Overall, the data prove that individual differences and social factors can have an effect on people's information preference. First, risk avoiders selected more information than risk takers, and accountable participants selected more information than non-accountable participants. Second, risk-taking tendency affected people's preference for positive or negative information, though less clear-cut than anticipated. Whether risk avoiders prefer positive or negative information appears to be affected by the decision-making context, like the voluntariness of the risky choice. Furthermore, the decision-making context can affect people's risk information search. When people have the opportunity to select information about a risk before making a choice, they tend to select information in an unbiased way, and risk takers and risk avoiders do not differ in the riskiness of their choices. However, if people do not have this opportunity, risk takers make riskier choices than risk avoiders and the risky choices affect consequent information selection. Lastly, some support was found for the idea that trait-anxiety can affect people's information seeking. Taken together, these results suggest that people's risk information search may be influenced by individual differences such as people's risk-taking tendency and trait-anxiety, social factors such as accountability (although the effects appear to be limited to the amount of information that people select) and whether or not one has made a decision about the risk. In addition to these main findings, the results showed that people's information selection influences their risky decisions. Furthermore, the thesis shows the appropriateness of using more naturalistic risks (see Huber, 1997) as opposed to gambles and lotteries.

Risk communicators should heed the finding that people are active information seekers, who can filter and select the information they desire. People's information seeking is goal-directed, and the results suggest that people desire information with which they can determine whether the risk is personally relevant in order to ascertain whether further action is called for. It is clearly insufficient to provide people only with probability and severity information about the risk. People also want information about how they can be exposed to the risk and how they can control the risk. Furthermore, a perhaps somewhat disconcerting finding for risk communicators is that people often do not appear to be particularly interested in information about risks. This suggests that relevant risk information may not always reach people. The results of chapter 5 also suggest that if people have not made an implicit or explicit decision, they will engage in a relatively open and unbiased information search, with the information selected being the most important determinant of their final decision. However, if they have made an explicit choice without first selecting

information, this choice tends to be influenced by people's risk-taking tendency. Moreover, this first choice then affects subsequent information search. This suggests that, where possible, risk communicators should start informing people about a risk as soon as possible, before people have already made an implicit or explicit choice about the new risk.

An important drawback of the current thesis is its reliance on convenience samples of students, except for the focus group interviews. Furthermore, most of the studies were conducted in laboratory settings, in rather artificial and highly formalised decision-making situations. Further research should therefore extend these findings to even more real-life situations and for other populations.

The research for this thesis started from the idea that people's information search and the factors that can affect this information search should be investigated in order to gain insight into people's risky decision-making. This was a good idea. One of the main strengths of this thesis is that it has provided a more dynamic view of the way people deal with risks. Although this view is still sketchy in its details, the prospects look decidedly promising.

SAMENVATTING

"Zekerheid of uitdaging: de effecten van individuele en situationele factoren op voorkeur voor risico-informatie."

Regelmatig worden we geconfronteerd met risico's waarvan we ons tot dan toe niet bewust waren, of die simpelweg niet bestonden (bijvoorbeeld vuurwerkopslag, BSE, genetisch modificatie). Als de media dergelijke risico's oppikken, worden mensen blootgesteld aan een schier oneindige stroom van informatie. Daarnaast hebben mensen in de huidige maatschappij de beschikking over vele informatiebronnen, zoals bibliotheekbestanden en het world wide web. Om het hoofd boven water te houden, filteren en selecteren ze die informatie waarin zij geïnteresseerd zijn. Dit informatieselectieproces vormt het onderwerp van dit proefschrift. Centraal staan de vragen welke informatie mensen willen hebben als zij voor het eerst worden geconfronteerd met een nieuw risico en welke factoren deze informatiebehoefte kunnen beïnvloeden.

Er is nog nauwelijks onderzoek uitgevoerd naar informatiebehoefte ten aanzien van risico's. Over het algemeen heeft men bij risico-onderzoek mensen benaderd als passieve informatieverwerkers. Men gaf deelnemers risico-informatie en keek hoe dit de risicobeoordeling beïnvloedde. In dit proefschrift worden mensen echter benaderd als actieve informatieverwerkers. Aangezien de informatie die mensen zoeken over risico's een belangrijke determinant zou kunnen zijn van de manier waarop mensen met risico's om zullen gaan, is het achterhalen van deze risico-informatiebehoefte belangrijk voor de theorievorming ten aanzien van de manier waarop mensen met risico's omgaan. Bovendien is het ook van praktisch belang. Risicovoorlichters zullen hun boodschappen waarschijnlijk effectiever kunnen communiceren als zij rekening houden met de informatiebehoefte die mensen hebben ten aanzien van risico's.

Daarnaast heeft dit proefschrift tot doel om inzicht te verkrijgen in de factoren die risico- informatiebehoefte(n) kunnen beïnvloeden. Hierbij kunnen twee categorieën factoren worden onderscheiden. De eerste betreft individuele verschillen (in dit proefschrift zal daarbij gekeken worden naar enerzijds risicogeneigdheid en anderzijds ongerustheid, ofwel trait-anxiety). De tweede categorie omvat situationele factoren. Dit zijn factoren die te maken hebben met de context waarin risicobeslissingen worden genomen (bijvoorbeeld: moet men de risicobeslissing verantwoorden aan anderen of niet). Als individuele en situationele factoren de informatiebehoefte van mensen kunnen beïnvloeden, zou dit betekenen dat de manier waarop mensen met risico's omgaan al in een vroeg stadium beïnvloed kan worden.

Vier onderzoekstradities binnen het psychologische risico-onderzoek zijn van belang voor dit proefschrift. De eerste is de experimentele traditie, die zich hoofdzakelijk heeft beziggehouden met experimenteel (laboratorium) onderzoek met hypothetische risicosituaties en die stevig verankerd is in de economische

wetenschappen en besliskunde (bijv. Bar-Hillel & Neter, 1996; Kahneman & Tversky, 1979; Schneider & Lopes, 1986; Weigold & Schlenker, 1991). De experimentele onderzoekers operationaliseerden risico's veelal met behulp van loterijen en kansspelletjes. Daarbij is voornamelijk onderzocht hoe verschillen in kansen en uitkomsten uiteindelijk keuzes kunnen beïnvloeden. Hiernaast bestaat er een psychometrische traditie, die ontstond in reactie op mogelijke (maatschappelijke) gevolgen en gevaren van nieuwe technologieën, zoals kernenergie en LPG-tankers. In het psychometrisch onderzoek werden deelnemers gevraagd om dergelijke risico's te vergelijken en beoordelen. Onderzocht werd welke aspecten mogelijk ten grondslag liggen aan risicopercepties. Te denken valt aan aspecten als vrijwilligheid, "nieuwheid" enzovoort (bijv. Slovic, 1987; Vlek & Stallen, 1981). Een derde onderzoekstraditie hanteerde een personalistische benadering. Getracht werd om persoonskenmerken te beschrijven en te meten die individuele verschillen in de geneigdheid om risico's te nemen zouden kunnen verklaren. Het bekendst is waarschijnlijk de Sensation Seeking Scale (Zuckerman, 1979, 1994). Ten slotte kan er nog een sociale traditie onderscheiden worden, in die zin dat (cultureel) antropologen onderzoek deden naar de bevinding dat culturen onderling verschillen ten aanzien van de dingen die zij als risico's aanmerken (Douglas & Wildavsky, 1982). Zo denkt een Nederlander er niet aan om rauwe kip te eten, uit angst een salmonella-infectie op te lopen. Een Japanner heeft er daarentegen geen problemen mee als hem een rauwe kippenlever wordt voorgeschoteld op een bedje van ijs. Verder heeft sociaal-psychologisch onderzoek aangetoond dat risicopercepties beïnvloed kunnen worden door groepsprocessen en de sociale context van de waarnemer (bijv. Wallach et al., 1962)

Naast deze vier tradities binnen het domein van risico-onderzoek, is onderzoek naar actief informatiezoeken ook relevant voor dit proefschrift. Aangetoond is dat individuele verschillen (bijvoorbeeld de behoefte aan denken - need for cognition) en situationele factoren (bijvoorbeeld het moeten afleggen van verantwoording) een invloed kunnen hebben op de informatie die mensen selecteren (bijv. Payne et al., 1993; Verplanken et al., 1997; Verplanken et al., 1992). Verder heeft Huber (1997) aangetoond dat actief informatiezoekende mensen andere informatie zoeken dan de informatie die normaal gesproken wordt aangeboden in experimenteel onderzoek, namelijk informatie over de kans en de ernst van de gevolgen.

Omdat er weinig onderzoek is gedaan naar risico-informatiebehoefte, is in dit onderzoek gebruik gemaakt van verschillende onderzoeksmethoden. Naast een aantal laboratoriumexperimenten is ook kwalitatief onderzoek uitgevoerd (in dit geval focusgroepinterviews). Bovendien was het noodzakelijk om een schaal te ontwikkelen die algemene risicogeneigdheid meet, aangezien een dergelijke schaal nog niet bestond.

Dit alles heeft uiteindelijk geresulteerd in één kwalitatieve studie naar risico-informatiebehoefte (hoofdstuk 2) en drie experimentele studies. In deze experimentele studies werd onderzocht welke effecten individuele verschillen (risicogeneigdheid en ongerustheid) en situationele factoren (het moeten afleggen van verantwoording; alsmede het moment van informatieselectie: vóór of na het nemen van

een beslissing) hebben op risico-informatieselectie (hoofdstuk, 3, 4 en 5). In hoofdstuk 6 wordt de Risico Schaal in meer detail beschreven.

De studies

Het doel van de studie die gerapporteerd wordt in hoofdstuk 2 was om de informatiebehoefte te achterhalen van mensen die worden geconfronteerd met onbekende risico's. Hierbij werd ook gekeken in hoeverre deze informatiebehoefte te herleiden was tot de onderliggende risicoaspecten. Er werden negen focusgroepinterviews gehouden. De belangrijkste resultaten van dit onderzoek werden gekwantificeerd met behulp van een vragenlijst die werd toegestuurd aan een willekeurige steekproef van 500 huishoudens in Nederland. Uitkomst was dat mensen informatie willen waarmee ze kunnen bepalen of het risico waarmee ze geconfronteerd worden voor hen persoonlijk relevant is. Ze willen informatie over a) hoe ze blootgesteld kunnen worden aan het risico; b) wat het risico betekent; c) de gevolgen van het risico; en d) de kans en de beheersbaarheid van het risico. Daarnaast bleek dat mensen niet altijd risico-informatie wensten te hebben, omdat zij zich niet om het risico bekommerden, bang waren om te veel informatie te krijgen of vonden dat zij zelf niet in staat waren om een goede beslissing te nemen. Verder bleek dat mensen zelden zelf om kansinformatie vroegen. De focusgroepinterviews geven verder een dynamisch beeld van de manier waarop risico-oordelen tot stand komen.

Het voornaamste doel van de eerste experimentele studie (hoofdstuk 3) was het verkrijgen van verder inzicht in de risico-informatiebehoefte. Daarbij werd gekeken hoe risicogeneïdheid en het moeten afleggen van verantwoording ten aanzien van de risicobeslissing invloed hebben op informatiezoekdiepte. De deelnemers konden informatie opzoeken over vier risicovolle medicijnen door middel van een Informatie Display Bord (IDB). De veronderstellingen waren dat a) risicomijders meer informatie zouden opzoeken dan risiconemers; b) het moeten afleggen van verantwoording zou leiden tot het opzoeken van meer informatie; c) risicomijders meer beïnvloed zouden worden door de verantwoordelijkheidsmanipulatie dan risiconemers; en d) risicomijders en risiconemers verschilden in hun informatiebehoefte. Verondersteld werd dat risicomijders meer negatieve risico-informatie zouden selecteren, terwijl risiconemers meer positieve risico-informatie zouden selecteren. De resultaten gaven aan dat risicomijders inderdaad meer informatie opzochten dan risiconemers en dat deelnemers die verantwoording moesten afleggen meer informatie opzochten dan deelnemers die geen verantwoording hoefden af te leggen. De verantwoordingsmanipulatie verminderde echter niet de effecten van risicogeneïdheid op het zoeken van informatie zoals was verondersteld. Bovendien werd geen ondersteuning gevonden voor het idee dat risicomijders meer negatieve informatie zouden selecteren en risiconemers meer positieve informatie. Dit zou echter te wijten kunnen zijn aan het feit dat het voor de deelnemers niet duidelijk was wat positieve en negatieve informatie was.

In de tweede experimentele studie (hoofdstuk 4) werd het idee dat risicomijders en risiconemers verschillen in hun voorkeur voor risico-informatie explicieter getest. Deelnemers konden in een informatieselectietaak krantenkoppen selecteren over een aantal risico's (bijvoorbeeld elektromagnetische velden, genetisch gemodificeerd voedsel), waarbij de koppen positieve of negatieve informatie impliceerden. De effecten van het moeten afleggen van verantwoording op de selectie van risico-informatie werden ook onderzocht. In tegenstelling tot de verwachtingen selecteerden risicomijders meer positieve informatie dan risiconemers. Dit resultaat zou verklaard kunnen worden door de veronderstelling dat risicomijders gerustgesteld wilden worden over de risico's. Dit zou impliceren dat ongerustheid ook een rol speelt bij de selectie van risico-informatie. Een andere mogelijke verklaring zou kunnen zijn dat de deelnemers werden geconfronteerd met risico's waarop ze weinig invloed konden uitoefenen (onvrijwilligheid). In die zin was er mogelijk sprake van informatiezoeken na het nemen van een beslissing. Voor onvrijwillige risico's ligt het dan misschien meer voor de hand om geruststellende informatie (ofwel positieve informatie) te selecteren. Het moeten afleggen van verantwoording had geen invloed op de informatiebehoefte. Dit kan te wijten zijn geweest aan een inadequate manipulatie van de verantwoordingstaak. Het kan echter ook zijn dat verantwoording weliswaar een invloed heeft op de hoeveelheid informatie die opgezocht wordt, maar niet op de informatiebehoefte.

In hoofdstuk 5 werden de effecten van persoonlijkheidskenmerken (risicogeneigdheid en ongerustheid) op risicokeuze en informatiekeuze onderzocht, zowel vóór als na het maken van een risicokeuze. Er werden 'vrijwillige' risico's aangeboden. De verwachting was dat a) risicogeneigdheid sterkere effecten zou hebben op risicokeuzes als deelnemers niet eerst de mogelijkheid hadden om risico-informatie te selecteren; b) dat risicomijders een voorkeur zouden hebben voor negatieve risico-informatie en risiconemers een voorkeur voor positieve risico-informatie; c) dat ongeruste deelnemers meer negatieve informatie zouden selecteren dan rustig gestemde deelnemers; d) dat voor deelnemers die eerst een keuze maken, dan informatie opzoeken en ten slotte hun keuze zouden heroverwegen, de eerste keuze de heroverweging zou beïnvloeden; en e) dat de geselecteerde risico-informatie de uiteindelijke risicokeuze zou beïnvloeden. Zoals verwacht had risicogeneigdheid alleen een invloed op de risicokeuzes als de deelnemers niet van tevoren informatie konden selecteren. Verder bleek dat risicogeneigdheid geen invloed had op de informatiekeuze wanneer men eerst informatie kon selecteren en dan een definitieve keuze moest maken. Bovendien hadden risicogeneigdheid noch ongerustheid een direct effect op de selectie van risico-informatie na het maken van een risicokeuze. Er trad wel een onverwachte interactie op, die aangaf dat met name ongeruste risicomijders een voorkeur hadden voor negatieve risico-informatie. Bovendien bleek dat de eerste risicokeuze die deelnemers maakten de uiteindelijke keuze medebepaalde. Tenslotte bleek dat deelnemers die negatieve informatie selecteerden eerder een risicomijdende keuze maakten, terwijl deelnemers die positieve informatie selecteerden eerder een meer risicovolle keuze maakten. Deze resultaten lijken het volgende te suggereren: als mensen niet in de gelegenheid zijn om infor-

matie te zoeken voordat zij een risicokeuze moeten maken, heeft risicogeneidheid een invloed op zowel de risicokeuze als op aansluitende informatieselectie. Bovendien suggereren de resultaten dat ongerustheid alleen een invloed heeft in een interactie met risicogeneidheid. Tenslotte hebben mensen de neiging om bij hun aanvankelijke keuze te blijven, ongeacht de informatie die ze naderhand selecteren.

In hoofdstuk 6 wordt een uitvoeriger beschrijving gegeven van de Risico Schaal (RS), die geconstrueerd werd om algemene risicogeneidheid te meten. Er wordt daarin nadere informatie verschaft over de betrouwbaarheid en de (divergente) validiteit van de RS. Uitgaande van de doelen waarvoor de RS werd geconstrueerd, werd een matige tot sterke correlatie verwacht met de Everyday Risk Inventory (ERI) en de korte versie van de Sensation Seeking Scale (SSS). De RS werd verder vergeleken met de Need for Cognition schaal, de Need for Structure schaal en twee zelf-waarderingschalen, de Self Esteem Scale en de Self-Liking/Self-Competence schaal. De RS had een goede interne betrouwbaarheid en correleerde goed met de ERI. De RS had ook een goede test-hertest betrouwbaarheid. Een redelijke correlatie met de SSS gaf aan dat de RS inderdaad algemene risicogeneidheid meette, in plaats van het zoeken van sensatie. De correlaties met de andere schalen waren laag tot redelijk, hetgeen een goede discriminante validiteit impliceert. Alhoewel de steekproeven waarbij de RS is gebruikt alleen uit studenten bestonden, lijkt het erop dat de RS inderdaad algemene risicogeneidheid meet. Bijkomend voordeel van de RS is dat de vragenlijst kort is en makkelijk kan worden ingevuld.

Belangrijkste conclusies

Het voornaamste doel van dit onderzoek was om te achterhalen welke informatiebehoefte mensen hebben als zij worden geconfronteerd met onbekende risico's. De resultaten geven aan dat mensen informatie willen hebben over veel van de risicoaspecten die gevonden waren in de psychometrische traditie. Verder geven met name de bevindingen uit de focusgroepinterviews aan dat de informatiezoekstrategie er vooral op is gericht om vast te stellen of risico's persoonlijk relevant zijn. De resultaten van hoofdstuk 3 en 4 gaven een vergelijkbare informatiebehoefte aan. Mensen betrekken meer informatie in hun overwegingen dan alleen informatie over de kans en de ernst van mogelijke gevolgen. Ze willen informatie over waar en wanneer ze worden blootgesteld aan het risico en hoe de gevolgen beheerst kunnen worden. Deze bevindingen hebben ook implicaties voor onderzoekers die gebruik maken van modellen die (risicovol) gedrag trachten te verklaren, zoals de Protectie-Motivatie Theorie (Rogers & Prentice-Dunn, 1997). In het algemeen wordt daarin namelijk informatie aangaande "kwetsbaarheid" alleen gegeven in termen van informatie over de kans en de ernst van de gevolgen. De resultaten in dit proefschrift geven verder aan dat mensen vaak ook geen informatie willen hebben, omdat ze zich niet over de risico's bekommerden, bang waren een overvloed aan informatie te krijgen of dachten dat ze niet in staat waren om een goede beslissing te maken.

Tenslotte bleek ook dat mensen vrijwel nooit specifiek naar informatie over de kansen vragen, als zij zelf informatie kunnen zoeken.

Het tweede doel van dit onderzoek was om te achterhalen welke factoren een invloed kunnen hebben op de selectie van risico-informatie. Over het geheel gezien blijkt dat persoonlijkheidskenmerken en sociale factoren een invloed kunnen uitoefenen op risico-informatiekeuze. Ten eerste bleek dat risicomijders meer informatie opzochten dan risiconemers en dat deelnemers die verantwoording moesten afleggen meer risico-informatie opzochten dan deelnemers die geen verantwoording hoefden af te leggen. Ten tweede bleek dat risicogeneigdheid een invloed had op de voorkeur voor negatieve of positieve informatie, alhoewel die invloed minder eenduidig was dan verwacht. De voorkeur voor positieve of negatieve risico-informatie van risicomijders bleek te worden beïnvloed door de context waarin de risicobeslissing moet worden gemaakt, bijvoorbeeld: hoe vrijwillig wordt men aan het risico blootgesteld. Daarnaast lijkt de context waarin de risicobeslissing wordt gemaakt van invloed op hoe mensen informatie selecteren. Wie de mogelijkheid heeft om informatie te selecteren voordat hij/zij een risicokeuze moet maken, selecteert informatie op een onbevooroordeelde manier. Risicomijders en risiconemers verschillen dan niet in de uiteindelijke keuze die ze maken. Echter, als mensen niet de mogelijkheid hebben om vooraf informatie te selecteren, maken risicomijders minder risicovolle keuzes dan risiconemers. Dan blijkt ook dat informatieselectie na die risicokeuze wordt beïnvloed door die risicokeuze. Tenslotte is er enige ondersteuning gevonden voor het idee dat ongerustheid een invloed kan uitoefenen op de selectie van risico-informatie.

De gevonden resultaten suggereren dat risico-informatiezoeken beïnvloed kan worden door persoonlijkheidskenmerken zoals risicogeneigdheid en ongerustheid en sociale factoren zoals het moeten afleggen van verantwoording en het in een eerder stadium al nemen van een beslissing ten aanzien van het risico. De bevindingen geven verder aan dat de selectie van risico-informatie inderdaad de uiteindelijke risicokeuze kan beïnvloeden. Tenslotte tonen de in het kader van dit proefschrift uitgevoerde onderzoeken aan dat het gebruik van 'natuurlijke' risico's in plaats van loterijen en gokjes tot nieuwe inzichten leidt (Huber, 1997).

Risicovoorlichters zouden rekening moeten houden met het feit dat mensen actieve informatiezoekers zijn, die risico-informatie selecteren en filteren naar gelang hun wensen en behoeftes. Het informatiezoekgedrag is doelbewust, in die zin dat mensen die informatie wensen waarmee ze kunnen vaststellen of een risico persoonlijk relevant is en of verder actie is gewenst. Het is duidelijk onvoldoende om mensen slechts informatie te verschaffen over kans en ernst van de gevolgen van het risico. Mensen willen ook informatie over hoe ze blootgesteld kunnen worden aan de risico's en hoe ze het risico kunnen beheersen. Verder is een mogelijk wat verontrustende bevinding voor risicovoorlichters dat mensen vaak niet bijzonder geïnteresseerd lijken te zijn in risico-informatie. Dit lijkt erop te wijzen dat relevante informatie over risico's mensen niet altijd zal bereiken. De resultaten van hoofdstuk 5 suggereren bovendien dat mensen die nog geen impliciete of expliciete keuze hebben gemaakt ten aanzien van risico's, redelijk objectief informatie zullen

zoeken. Als zij echter al wel een impliciete of expliciete keuze hebben gemaakt zonder daarvoor relevante informatie te hebben opgezocht, zal hun keuze beïnvloed worden door risicogeneidheid en zal eventuele later informatiezoekgedrag beïnvloed worden door de eerste keuze. Een suggestie zou derhalve kunnen zijn dat risicovoorlichters zo snel mogelijk aan voorlichting moeten beginnen, dus voordat mensen al een impliciete of expliciete keuze hebben gemaakt.

Een belangrijk voorbehoud ten aanzien van de verkregen resultaten is dat de onderzoeken zijn uitgevoerd met behulp van "gemakssteekproeven" uit studentenpopulaties, met uitzondering van de focusgroepsinterviews. Bovendien is het merendeel van de studies uitgevoerd in een laboratorium, in een tamelijk kunstmatige en geformaliseerde besliskundige situatie. Verder onderzoek zou derhalve de hier gevonden bevindingen moeten valideren in meer levensechte situaties en met andere deelnemerpopulaties.

Het onderzoek dat aan dit proefschrift ten grondslag ligt werd gestart vanuit het idee dat actief informatiezoekgedrag en de factoren die dat gedrag kunnen beïnvloeden onderzocht moeten worden om een beter beeld te krijgen van de manier waarop mensen met risico's omgaan. Dat was een goed idee. Een van de sterke kanten van deze aanpak is dat zo een dynamisch beeld ontstaat van de manier waarop mensen met risico's omgaan. Waar deze schets nog details bevat die erom vragen verder te worden uitgewerkt, dient zich een veelbelovend onderzoeksterrein aan.

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APPENDIX 1

An example of the items used in the questionnaire is given here for electromagnetic fields. The items were virtually identical for the other risks, except for the anti-blood clotting medication.

I would like to know....

- A.what electromagnetic fields are.
- B.how I and/or the government can prevent exposure to electromagnetic fields.
- C.under what circumstances I can get exposed to electromagnetic fields and at what intensity this may lead to health effects.
- D.what the consequences of electromagnetic fields are to people and the environment, and how serious they are.
- E.what is the probability of negative consequences of electromagnetic fields to people and the environment.
- F.if the risks of electromagnetic fields is similar to a more familiar risk.
- G.if there are advantages to electromagnetic fields.
- H.what other people's experiences are with the risks of electromagnetic fields.
- I.who is responsible for any potential negative consequences of electromagnetic fields.

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René, august 2001.

CURRICULUM VITAE

René Lion was born on the 24th of September 1971 in Nijmegen. In 1989 he graduated from Het Stedelijk Gymnasium in 's-Hertogenbosch. After a one year attempt at Industrial Design Engineering at Delft Technical University in 1989/1990, he spent one year in France at the Centre d'Etudes Françaises Pour les Etudiants Etrangers at the Université de Caen in Normandy. In 1991 he started studying psychology at the University of Nijmegen. After receiving his master's degree in Social Psychology in 1996, he started on Ph.D. research project entitled "Risk perception and communication" at the department of Health Promotion and Education at Maastricht University. This project has resulted in the present thesis. Since January 2001, he has been employed as a consumer scientist at Unilever Research Vlaardingen.

CONTENTIONS CORRESPONDING TO THE DISSERTATION
S E C U R I T Y O R O P P O R T U N I T Y
The effects of individual and situational factors on risk information preference

René Lion

1. Het aanbieden van alleen informatie over de kans en de ernst van een risico, zoals over het algemeen gebeurt in risicoperceptie-onderzoek, sluit onvoldoende aan bij de werkelijke behoefte aan risico-informatie van mensen (dit proefschrift).
2. Als mensen informatie wensen over risico's, willen zij allereerst weten of het risico hen aangaat (dit proefschrift).
3. Zowel persoonlijkheidsfactoren als situationele factoren zijn van invloed op de informatie die mensen over een risico zoeken (dit proefschrift).
4. De Risicoschaal is een goede manier om risicogeneigdheid te meten (dit proefschrift).
5. Risico-onderzoek zou zich meer bezig moeten houden met de mensen die geconfronteerd worden met risico's en minder met de risico's waarmee mensen worden geconfronteerd (dit proefschrift).
6. Een land dat buitenlanders pas accepteert als zij zich volledig aan de cultuur van dat land hebben aangepast, kan zich niet roemen om zijn tolerantie.
7. Kwalitatieve en kwantitatieve onderzoekstechnieken zijn niet gelijk maar wel gelijkwaardig, mits op de juiste manier gebruikt.
8. Er zit weinig gevoel in gedragsverklarende modellen die uitgaan van berekend gedrag.
9. De behandeling van het cornea-ulcus in de tropen is zo weinig succesrijk en zo kostbaar dat ook kostbare preventiestrategieën uit medisch en economisch oogpunt gerechtvaardigd zijn.
10. Het idee dat attitudes geen relatief stabiele constructen zijn, maar telkens opnieuw worden gegenereerd bij confrontatie met het attitude-object (zie Schwarz, N. [2000]. *European Journal of Social Psychology*, 30, 149-176), is moeilijk te rijmen met de bevinding dat sommige attitudes sterker zijn dan anderen.
11. Onderzoekers zijn beter in het stellen van vragen dan in het geven van antwoorden.