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Risk Attitude Scales: Concepts, Questionnaires, Utilizations
Information about crafted instruments

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Preview

People's mind-sets towards risk-taking, i.e., risk attitudes, such as risk propensity and risk aversion, have been far less investigated than risk behavior and especially risk perceptions. These can be conceptualized as two poles of a one-dimensional attitude towards risk-taking but also as two separate concepts. It is widely assumed that people differ considerably in their attitude towards risks, ranging from cautiousness to risk-seeking and even pleasure in risk-taking. However, there is no convincing evidence that this presumed dimension is a general trait (rather than a state, or a domain-specific attitude, e.g., distinct for physical, financial, or social risks people may encounter). Furthermore, basically no established measurement tools exist.

In the project report "Risk attitude scales: Concepts, questionnaires, utilizations" (Rohrman 2005) [RAX], the conceptualization of risk attitudes was outlined, the creation of several new instruments presented, and empirical findings about the characteristics of these scales examined, including contingencies with related constructs (e.g., venturesomeness, sensation-seeking, impulsiveness). The investigations were conducted in three countries, using versions prepared in English, German and Chinese language.

The results so far indicate that risk attitudes are multi-dimensional, that individual risk orientations are not necessarily consistent across domains, and that the motivations for accepting risks vary considerably, depending on the type of hazard. Finally, potential applications and implications for further research are discussed.

The purpose of the present research report is to provide descriptions of the four instruments crafted in Project RAC. These are:

- o Risk Orientations Questionnaire (ROQ)
- o Risk Propensity Questionnaire (RPQ)
- o Risk Scenarios Questionnaire (RSQ)
- o Risk Motivations Questionnaire (RMQ)

All instruments are based on the respondents' view of their principal standpoint in risk situations (rather than hypothetical gambles), they are fully standardized questionnaires, and they are handled as self-administered 'paper-and-pencil' devices.

To supply pertinent information, below the text of Report RAX is reprinted, and the essential sections are marked; they belong to chapter 3 and partly chapter 4.

All instruments are available for researchers, in English or German or Chinese language. In case of interest, prof Rohrman needs to be contacted via e-mail.

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1 The conceptualization of risk attitudes

1.1 The issue

Do people like to go for a risk, and would that be a good thing, or rather not? Consulting the wisdom of proverbs provides a whole range of 'yes' and 'no' attitudes: "*Nothing ventured, nothing gained*", "*It's better to be safe than sorry*", "*When fortune smiles, embrace her*", "*Look before you leap*", "*Who dares wins*", "*A bird in the hand beats two in the bush*" ... In fact, concepts such as risk propensity, risk-seeking versus risk-averse, risk-taker and so on are widely used and seen as existing by most laypeople and many risk researchers. They are postulated - implicitly or explicitly - as personality trait(s) by some authors but not (yet?) convincingly validated as such. However, it seems that these constructs are inconsistently and sometimes illogically defined in the literature.

While risk behavior has been studied intensely and a large number of risk perception studies are available, far less research exists regarding people's mind-sets towards risk-taking, i.e., *risk attitudes*, such as, risk propensity and risk aversion. However, this issue is highly relevant to risk research: if systematic individual differences in risk attitudes exist, then this needs to be considered in risk perception research as well as in risk communication aiming at modifying the risk behavior of particular people or groups.

1.2 Definition of main concepts

Given the ambiguity of many concepts dealt with in risk research, it seems important to clarify the main notions. In this project, the main concepts are understood as follows (cf. Rohrmann 1998):

RISK:

The possibility of physical or social or financial harm/detriment/loss due to a hazard.

This is the (dominating) 'negative' perspective; however, there is also a neutral perspective, i.e., risk = uncertainty about the outcomes (good and/or bad ones) of a decision; and a positive perspective, i.e., risk can mean: 'thrill' (danger-induced feelings of excitement)

PERCEIVED RISK MAGNITUDE

A person's judgment (opinion, belief) about how large the risk associated with a hazard is (regarding negative outcomes)

RISK ATTITUDE

A generic orientation (as a mind-set) towards taking or avoiding a risk when deciding how to proceed in situations with uncertain outcomes. Risk propensity: Attitude towards taking risks; Risk aversion: Attitude towards avoiding risks.

RISK ACCEPTANCE/REFUSAL

Decisions about how acceptable a risk is in individual or societal terms (in principal or de-facto, i.e., in a concrete situation)

RISK BEHAVIOR

The actual behavior of people when facing a risk situation

The definition of risk propensity and aversion proposed above means that these constructs are understood as attitudes (in line with how this term is used in social psychology) and are to be measured accordingly. It is also important to be clear about what a scale actually captures: most "risk" questionnaires, even those labelled "risk-taking" or "risk behavior questionnaire", do not measure behavior; rather, cognitions which precede the actual behavior.

1.3 Literature review

Research into the attitude people hold towards taking or avoiding risks mostly evolved in three contexts: decision processes, social psychology, and personality models. Mind-sets such as risk-seeking are a core factor in models of choice and decision (cf., e.g., Edwards 1954, 1992, Hogarth 1987, Kahneman & Tversky 1979, Weber & Camerer 1987). A main interest in early studies on risky behavior was how individuals deal with risk in a group situation, and whether "risky shifts" occur or not (e.g., Kogan & Wallach 1964, 1967, Lamm et al. 1970, Rim 1964). There is also a long-standing debate within personality researchers whether risk propensity should be treated as a personality trait (e.g., Klebelsberg 1969, Knowles et al. 1973, Levenson 1990, Pennings & Smidts 2000, Schwenkmezger 1977, Shure & Meeker 1967, Trimpop et al. 1999; overview in Bromiley & Curley 1992) and how risk orientations vary across hazard types and domains (e.g., Jackson et al. 1972, Nicholson et al. 2005, Slovic 1962, 1972).

Within economic psychology, risk attitudes received considerable attention as well (e.g., McCrimmon & Wehrung 1986, Schubert et al. 1999, Waerneryd 1996). From a clinical viewpoint, researchers explored whether unusual behaviors can be linked to risk attitudes (e.g., Andresen 2000, Eysenck & Eysenck 1978, Horvath & Zuckerman 1993) - the title of Jackson & Wilson's article (1993), "Mad, bad or sad? The personality of bikers" is a nice example for this line of work.

More recently, gender differences in risk attitudes have been looked at (e.g., Andresen 2000, Arch 1993, Byrnes et al. 1999, Schubert et al. 1999, Siegrist et al. 2002), induced by multifold observations that women show high-risk behavior less often than men. Furthermore there is special literature on "risk" as something appealing and pleasant, that discusses why some people in some circumstances are attracted rather than scared by risk situations (e.g., Brengelmann 1991, Keyes 1985, Lupton 1999, Schneider & Rheinberg 1996, Semler 1994).

Some of these researchers developed tests for risk propensity or related concepts, including Andresen 1995, Dahlbaeck 1990, Eysenck & Eysenck 1978, Farley 1987, 1991, Keinan et al. 1984, Krueger & Amelang 1995, Weber et al. in press, Wolfram 1982, Zalieskiewicz 2001; partial overview in Harrison et al. 2005.

See *Table 1* for a list of questionnaires (in English) which either are or contain risk propensity and/or risk aversion scales.

Table 1:
List of questionnaires aiming at risk propensity mind-sets

Questionnaires, based on statements about risk-taking orientations:

| | |
|-----------|---|
| EVQ | Venturesomeness Questionnaire (Eysenck & Eysenck 1978) |
| TRA | Tension/Risk/Adventure Scale (Keinan et al. 1984), |
| DQS | Decision Q-Sort (Wolfram 1982, English version Rohrmann 1991), |
| DRP | Risk-taking Propensity (Dahlbaeck 1990) |
| TPFT-type | Personality Scale (Farley 1991) |
| ROQ | Risk Orientation Questionnaire (Rohrmann 1997) < previously called ARD> |
| LRP | Risk propensity (Lindemann 1997) |
| (x) | Stimulating-Instrumental Risk Inventory (Zaleskiewicz 2001) |
| (x) | Domain-specific Risk Attitude Scale (Weber/Blais/Betz in press) |

Related constructs/instruments:

| | |
|-----|--|
| SSS | Sensation Seeking Scale (Zuckerman 1991) <version VI>, |
| FAD | Active/decisive Style (Franken 1988) |
| EIQ | Impulsiveness Questionnaire (Eysenck & Eysenck 1977) |

New instruments - resulting from this project:

| | |
|-----|---|
| RPQ | Risk Propensity - Holistic Questions (designed 1999) |
| RMQ | Risk Motivation Questionnaire (designed by Rohrmann & Davis 2000) |
| RSQ | Risk Situation Questionnaire (designed 2000) |

From a theoretical viewpoint, significant contributions to the conceptualization of subjective orientations towards risk have been made by Lopes (1988), Lopes & Ogden (1998), MacCrimmon & Wehrung (1986), Sitkin & Pablo (1992), Trimpop (1994), Weber (1988), and Wilde (1988). The understanding of human thinking about risk situations is quite heterogenous in these works, as is the research context, ranging from psychology to economics.

Finally, there is a body of research about personality features variables which are not risk attitudes but have been linked to decision-making about risky courses of action, foremost the sensation-seeking construct (Zuckerman 1979, 1991) but also impulsiveness (e.g., Eysenck & Eysenck 1977, Wolfram 1982) and decision-making style (e.g., Franken 1988, Wolfram 1982).

In sum, a considerable amount of studies on risk propensity/aversion exist. However, this literature does not provide a coherent picture - neither conceptually nor in terms of measurement instruments.

1.4 Problems with measuring risk-taking intentions

1.4.1 Competing conceptualizations

How risk attitude(s) are conceptualized varies considerably. In terms of dimensionality,

either a one-dimensional attitude towards risk-taking with two poles - risk propensity vs risk aversion/cautiousness - can be assumed; or risk propensity and risk aversion are seen as two distinct concepts.

Regarding the construct's theoretical status, three principal possibilities are to hypothesize that risk propensity/aversion is a general trait, or a state, or a domain-specific attitude.

1.4.2 Types of operationalization

There are two principal approaches to measure risk propensity/aversion:

- o via choice problems with risky options (gambles),
- o via statements describing risk-taking mind-sets or behaviors.

The first approach evolved in decision research, the second one is common in social and personality psychology. Theoretically, measures based on these approaches should show high correlations but - concluding from the very few empirical studies into this matter (e.g., MacCrimmon & Wehrung 1986) - they are unlikely to do so.

Both approaches can be criticized: Questionnaires are 'only' self-reports (this is critical indeed if the interest is in risk behavior, as various scales seem to intend). The main arguments against judgments about gambles are that they are highly hypothetical and not easily understood by everyone (consequently the utility or risk function derived from responses to such tasks may not be valid for people's risk propensity or aversion in real-life situations).

Alltogether, there is no 'established' instrument available yet which is valid across populations, situations and domains.

1.5 Research shortcomings

When reviewing the existing research into risk attitudes, various shortcomings become salient. Deficits include:

- o lack of a stringent conceptual basis for measurement efforts;
- o heterogenous/non-systematic coverage of hazards types (such as physical, financial, social risks),
- o divergent samples (i.e.: students or general-public samples, occasionally actual risk-takers),
- o restricted cross-validation with respect to related constructs (e.g., "sensation seeking", "adventure" attitude", "impulsiveness").

Such shortcomings may well be the reason for unclear or conflicting results.

2 Project aims

2.1 Research questions

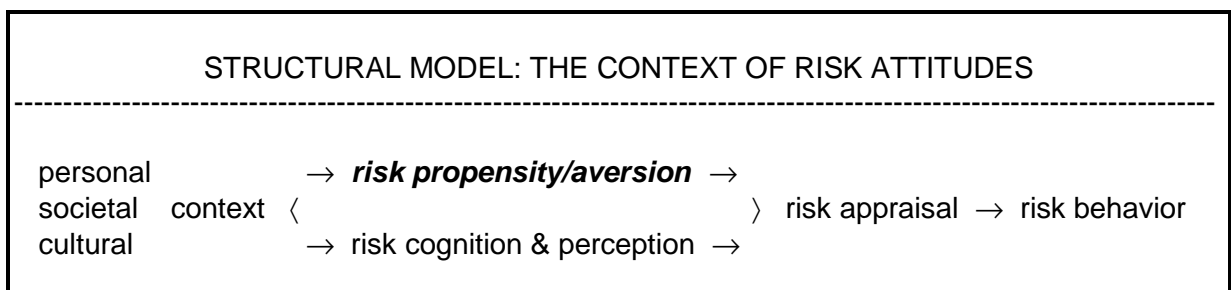
The project was undertaken to clarify the following questions:

- Can the presumed risk attitude be constructed as a 1-dimensional variable, or are risk propensity and risk aversion distinct constructs?
- Is risk propensity and/or aversion consistent across hazard types, i.e., physical risks, financial risks, social risks?
- What is the structural relationship between risk attitudes, risk perception and risk behavior?
- Are risk attitudes influenced by people's cultural background in terms of their ideological, professional and national affiliations?

2.2 Conceptual framework

Risk attitudes are conceptualized as variables which moderate risk decisions. The model shown in *Figure 1* is based on the assumption that a person's risk propensity/aversion influences in addition to the outcomes of risk cognition and perception processes how positive or negative a risk appraisal is, thereby enhancing or reducing the likelihood that a risky course of action is taken or not.

Figure 1:
The potential role of risk attitudes



It is also assumed that personal and societal and cultural factors shape how strong risk propensity or aversion are in various contexts.

In order to investigate whether risk attitudes are consistent across domains it is necessary to identify relevant categories of hazards people may be exposed to. Principal hazard types include:

- physical - accidents (e.g., climbing, fast-driving, fire-fighting);
- physical - illness (e.g., smoking, unprotected sex, working with x-rays);
- financial (e.g., stockmarket investments, gambling, horse-betting);
- social (e.g., standing for elections, dating, revealing homosexuality).

Accidents represent the risk of acute/immediate physical harm while illness refers to hazards with the risk of chronic physical harm.

This classification - which is partly similar to but also deviating from proposals by, e.g., Jackson et al. 1972 or Weber et al in press - was chosen because of insights from risk perception research (Rohrmann 1994, 1999) which indicated that the motivation structure for deciding about such hazards is different.

2.3 Main project agenda

The project comprised four phases: Theoretical work; development of new instruments, general and domain-specific ones; empirical studies to check the validity of conceptualizations; and a cross-cultural extension (which is still underway).

As a principal conceptual decision, only measures based on statements about risk-taking mind-sets - reflecting thoughts and feelings about how to act in a risk situation - were investigated. Risk behavior is not studied in this project.

3 Development of four types of instruments

Altogether four instruments were developed and tested, each based on a different rationale. Three of them are specified for hazard domains, using the typology outlined above (cf. 2.2). The underlying considerations were as follows:

3.1 Risk Orientation Questionnaire <"ROQ">

Rationale:

- o Aiming at general orientations towards risk-taking.
- o Using a standard format of attitude scaling, i.e., presenting statements and asking for level of agreement on a 7-point scale.
- o Providing statements for expressing risk propensity and for risk avoidance.
- o Restricting the length (one page with about a dozen items).

Sample items:

"I follow the motto, 'nothing ventured, nothing gained'",

"I don't like to put something at stake, I would rather be on the safe side"

Response format (as presented in the questionnaire):

The following sentences describe how various people deal with risky situations and what their *attitude towards risk decisions* is. We would like to learn how you think about these issues. Could you please read each sentence and then rate to what extent that statement is true for you. For your answers, a seven-point scale is provided:

| | | |
|-----------------------|---------------------------|--------------------------|
| | <i>true for me</i> | |
| no, not at all | -----> | yes, very much so |
| | 1 - 2 - 3 - 4 - 5 - 6 - 7 | |

3.2 Risk Propensity - Holistic Questions <"RPQ">

Rationale:

- o Direct and holistic self-assessment of risk propensity.
- o Rating of general risk attitude and of domain-specific risk propensity for relevant domains.
- o Additional self-rating of own risk propensity in comparison to others.

Sample item & response format:

| | | | | |
|--|--|------------------|--------|------------------|
| | | <i>extremely</i> | | <i>extremely</i> |
| | | <i>low</i> | >----> | <i>high</i> |
| "Some activities involve a "financial" risk, such as starting a business, investing (e.g., buying shares), or gambling (e.g. in casinos) and betting (e.g., on horses) - that is, there is a risk of losing money or other assets. | | | | |

In general, my propensity for accepting *financial* risks is ... 0 1 2 3 4 5 6 7 8 9 10

3.3 Risk Situation Questionnaire <"RSQ">

Rationale:

- o Presenting (short) stories about a person facing a situation where both good reasons for taking and for avoiding a risky course of action exist.
- o Asking the respondent how likely s/he would decide for the risky behavior in such a situation.
- o Using domain-specific scenarios (about 5 for each type of risk).

Sample item:

"RISK-SITUATION [K] -- ROCK CLIMBING

Imagine that you frequently go rock climbing in the mountains. Rock climbers are people who climb steep rocks on mountain sides with the help of ropes and hooks etc. Think of a situation in which your friends and you have climbed up half the mountain. You have come to a particularly difficult rock face which requires considerable skill. Successfully climbing up such a rock face would give satisfaction, the feeling that one has some mastery over the environment. However, accidents may also occur if the situation turns out to be too difficult and mistakes are made.

So the critical question is: Is it better to be cautious or to take a risk? In such a situation, how likely is it that you would decide to tackle the upcoming rock face?

Response format:

definitely not for sure
0 1 2 3 4 5 6 7 8 9 10

3.4 Risk Motivation Questionnaire <"RMQ">

Rationale:

- o Elaborating a set of motivations which may induce people to engage in risky activities.
- o Asking people to scale for particular risks they are familiar with how influential these motivators were in pertinent situations.
- o Run separate sub-questionnaires for different types/domains of risks.

Sample item:

"Now please try to remember why you took part in this activity (or imagine why if you haven't actually done it). Using the following scale, rate how relevant each of the following factors were for your decision to engage in this activity:

{List of about 40 reasons, such as: Excitement and thrill, Satisfaction of seeking new experiences, Gain in self-confidence, Attracting admiration, Others urged me to take part in the activity, Chance of 'the big win', Didn't see the activity as hazardous}."

Response format:

This factor influenced my decision to take part in the above activity ...
 1 - - - - - 2 - - - - - 3 - - - - - 4 - - - - - 5
not at all a little moderately quite a bit very much

Please circle the number which best reflects your experience and attitude!

Note: There is an open-ended section in which respondents can identify further personally relevant motivators.

These four instruments were employed in a series of small studies and subsequently further developed. Then German and Chinese versions were created, to be used in the cross-cultural part of the project.

4 Empirical findings

4.1 Data collection: Overview

The studies conducted so far are listed in *Table 2*. Because of the length of these instruments, not all questionnaires could be employed together within one study. The RSQ was tested at several stages (from RSQ3 to the final version RSQ7) because it requires considerable 'tuning' to optimize scenarios for risk decisions. Unfortunately the budget available for this project did not allow for a full-scale testing of the four questionnaires; rather, opportunities within the department's Research Participation Scheme for students had to be utilized.

Table 2:
Empirical studies during questionnaire development: overview

| <i>Study</i> | <i>N</i> | <i>Questionnaires run</i> |
|--|----------|--|
| ----- | | |
| <i>SAMPLES OF PSYCHOLOGY STUDENTS AT MELBOURNE UNIVERSITY</i> | | |
| RAM | 58 | RMQ2, ROQ2, RPQ1, DRP, HEQ (partially) |
| RAS | 42 | RSQ3, ROQ2, RPQ1, LRP, TPF, DRP, SSS, EIQ, HEQ (partially) |
| RAR1 | 400 | RSQ4, RPQ2 |
| RAN | 62 | RSQ4, ROQ2, RMQ5 (partially) |
| RAR2 | 125 | RSQ6, RPQ1 |
| RAF | 56 | RSQ7, RPQ1, ROQ2 |
| ----- | | |
| <i>STUDENT SAMPLES IN EUROPE - USING GERMAN QUESTIONNAIRE VERSIONS</i> | | |
| RAZ | 100 | ROQ2, RMQ6, RSQ7, RPQ1 |
| <i>(underway; in collaboration with D. Grasmueck; students in Zuerich/Switzerland)</i> | | |
| RAG | 100 | ROQ2, RMQ6, RSQ7, RPQ1 |
| <i>(underway; in collaboration with S. Pedell, students in Munich/Germany)</i> | | |

Notes:

HEQ refers to the author's Hazard Evaluation Questionnaire, a large instrument dealing with 12 types of risk perceptions for a set of 24 different hazards.

The ROQ was also administered within several of the author's studies of risk perception; and in 1995 pretests for a larger ROQ item pool were conducted (Study ARD).

For each questionnaire, the following issues were analyzed:

- o means and response distributions for single items,
- o dimensional structure of item sets/instruments,
- o contingencies with conceptually related constructs,
- o domain-specificity of risk attitudes.

Various analyses used combined samples (e.g., NAS+RAM, N=100). Because of the large number of analyses, only a small selection of results can be presented here.

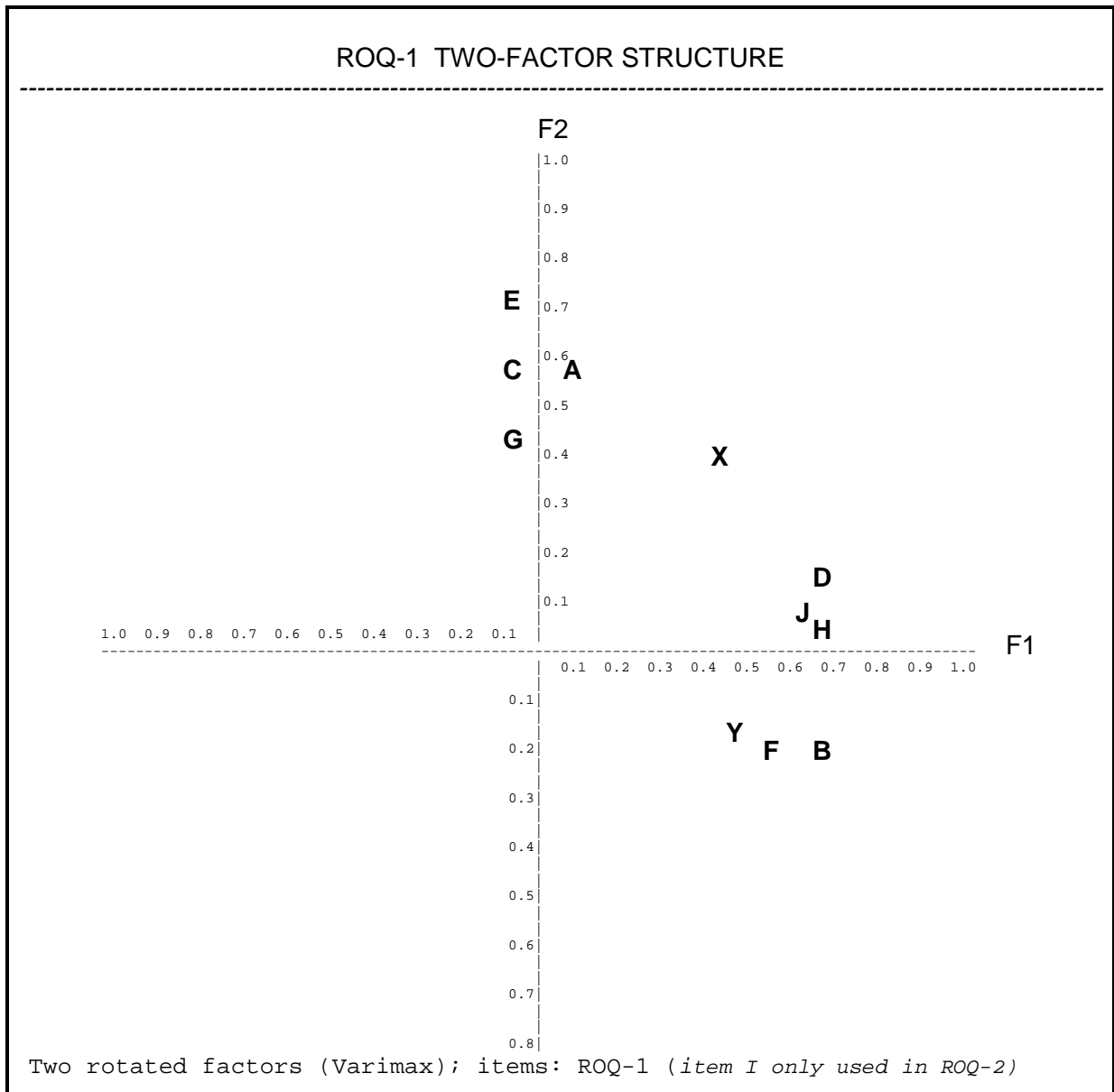
4.2 Selected results for questionnaire items

4.2.1 ROQ results

The Risk Orientation Questionnaire items were analyzed within several different samples. Results from factor analyses (using both orthogonal and oblique rotation) are presented in *Figure 2* and *Table 3*.

Figure 2:

ROQ item structure: factor analysis of 11 version-1 items (Data: study ARD-95).



The results show a substantial main factor, but not all items load on it; rather, the analyses indicate two (correlated) factors: "risk propensity" and "cautiousness". Based on these findings, the ROQ items are used to create two 'summated ratings' scores, ROQ-Propensity and ROQ-Cautiousness. As expected, these correlate negatively; cf. *Table 4*.

Table 3:

ROQ: Factor structure for two factors (Data: Studies RAM+RAS)

| Item | Unrotated Factors | | Rotated, Varimax | | Rotated, Oblimin | |
|------|-------------------|----|------------------|-----|------------------|-----|
| | 1 | 2 | 1 | 2 | 1 | 2 |
| A | 74 | | 71 | -23 | 74 | -20 |
| B | -60 | | -51 | 33 | -56 | 30 |
| C | 51 | | 53 | | 53 | |
| D | -43 | | -36 | 25 | -39 | 25 |
| E | 72 | | 67 | -26 | 71 | -26 |
| F | -45 | 20 | -32 | 38 | -38 | 38 |
| G | 42 | | 44 | | 45 | |
| H | -25 | 63 | | 68 | | 68 |
| I | 49 | 35 | 60 | | 57 | |
| J | -24 | 66 | | 70 | | 70 |
| X | 41 | 48 | 58 | 25 | 53 | 25 |
| Y | -46 | 34 | -26 | 51 | -34 | 51 |

Note: Analysis for for ROQ version #2, using combined sample RAM+RAS (N=100). All factor loadings multiplied by 100; loadings < .20 omitted.

Table 4:

ROQ: Correlations for propensity and cautiousness variables (Data: Studies RAM+RAS)

| <i>Contingency risk propensity and cautiousness</i> | | <i>correlation r_{ij}</i> |
|---|------------------------|--|
| ROQ-propensity | ROQ-cautiousness | -30 .. -40 |
| Dahlbaeck-propensity | Dahlbaeck-cautiousness | -50 .. -60 |
| <i>Contingency with reference measures</i> | | <i>correlation r_{ij}</i> |
| ROQ-propensity | Dahlbaeck-propensity | +50 |
| ROQ-cautiousness | Dahlbaeck-cautiousness | +50 |
| ROQ-propensity | Lindemann-propensity | +60 |
| ROQ-propensity | Farley-propensity | +40 |

Note: Summary, using data from several sub-studies; scores for Dahlbaeck's, Farley's and Lindeman scales created by this author, based on factor analyses.

Contingencies with three other generic risk attitude scales are also shown in table 4. (The items of Dahlbaeck's instrument, designed as 1-dimensional scale, are actually better described by a 2-factor structure and were re-scored accordingly). The two ROQ measures correlate reasonably well with the other instruments (lowest with Farley's scale, which is the least general one).

4.2.2 **RPQ results**

The main results for the holistic self-ratings obtained from the Risk Propensity Questionnaire are as follows:

- o The intercorrelations between the domain-specific ratings (for physical risks which might induce accidents, physical risks which might induce illness, social risks and financial risks) are low.
- o The overall self-rating (RPQ-O) is influenced by all domain-specific risk attitudes but least by ROQ-F, the financial risk propensity.. It correlates moderately with pertinent ROQ measures, i.e., $\sim +.50$ with ROQ-P = general propensity, and $\sim -.50$ with ROQ-C = general cautiousness.

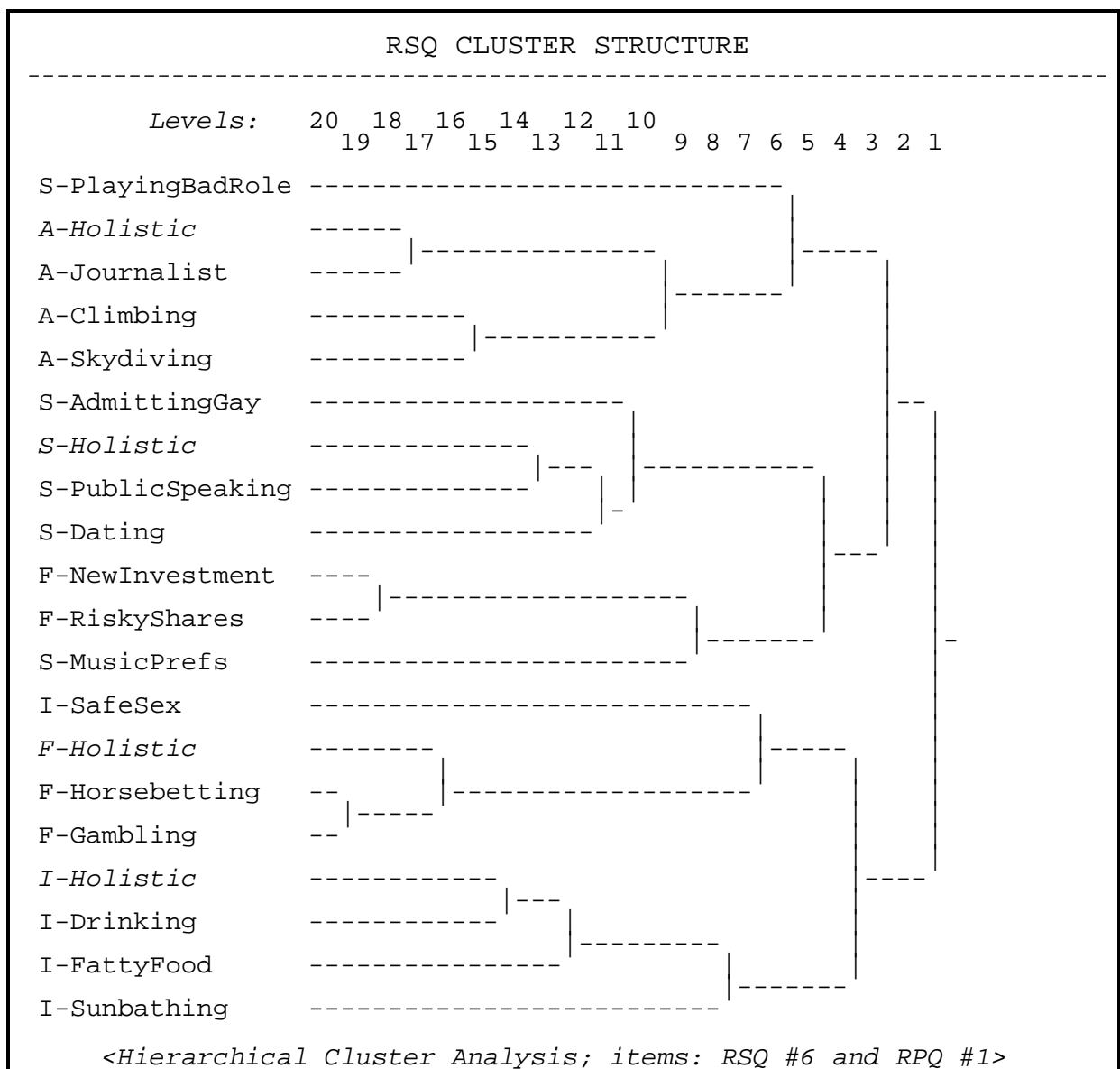
Further results, regarding the contingency with pertinent RSQ data, are shown below.

4.2.3 RSQ results

Analyses of the 20 Risk Scenario Questionnaire items were run at several development stages until the final version RSQ7. In *Figure 3* and *Table 5*, results from cluster and factor analyses are shown; in these analyses, the holistic ratings from the RPQ were included as 'anchor' items.

Figure 3:

RSQ structure: Cluster analysis for 16 scenarios plus 4 holistic ratings (*Data: Study RAR2*)



Factor analyses showed that a 4-factor solution describes best the structure of the items - in line with the conceptualization of the RSQ.

Table 5:

RSQ & RPQ: Factor structure of 16 scenarios plus 4 holistic ratings (Data: Study RAR2)

| | 4-factor model - VARIMAX-rotated | | | |
|------------------------|----------------------------------|-----|-----|-----|
| | 1 | 2 | 3 | 4 |
| <i>Domain RSQ Item</i> | | | | |
| A - Skydiving | 13 | 31 | 12 | 71 |
| A - Climbing | | 48 | 26 | 37 |
| A - Journo | | | | 78 |
| I - Sunbathing | | 41 | 55 | |
| I - Fatty Food | 33 | -18 | 70 | |
| I - Safe Sex | | 11 | 58 | 31 |
| I - Drinking | 42 | -41 | 63 | 27 |
| S - Music Pref | 25 | 58 | | |
| S - Dating | | 70 | | 18 |
| S - Speaker | 29 | 55 | | |
| S - Admit Gay | 42 | 38 | | 25 |
| S - Bad Role | | 38 | | 21 |
| F - Gambling | 69 | 44 | 10 | |
| F - Horsebet | 72 | 40 | 20 | -11 |
| F - Shares | 66 | 14 | -14 | |
| F - New Invest | 73 | -12 | | 32 |
| <i>RPQ Items</i> | | | | |
| A - Holistic | | | | 77 |
| I - Holistic | | 11 | 87 | |
| S - Holistic | 22 | 76 | | |
| F - Holistic | 76 | 17 | 18 | -23 |

Note: Scenario items as in version #6 of the RSQ (factor analyses for #7 not available).

Table 6:

RSQ & RPQ: Intercorrelations among domain-specific scores (Data: Studies RAR2, RAF)

(A) ACROSS RSQ DOMAINS

| <i>Correlation of ...</i> | <i>with ...</i> | <i>correlation r_{ij}</i> |
|---------------------------|-----------------------|--|
| RSQ-A physical/accident | domain scores I, F, S | 10 .. 40 |
| RSQ-I physical/illness | domain scores A, F, S | 10 .. 40 |
| RSQ-F financial | domain scores A, I, S | 00 .. 30 |
| RSQ-S social | domain scores A, I, F | 10 .. 30 |

(B) CORRELATIONS RSQ WITH RPQ

| <i>RSQ domain score</i> | <i>RPQ (holistic)</i> | <i>correlation r_{ij}</i> |
|-------------------------|-----------------------|--|
| RSQ-A physical/accident | physical/accident | 50 .. 70 |
| RSQ-I physical/illness | physical/illness | 50 .. 70 |
| RSQ-F financial | financial | 50 .. 80 |
| RSQ-S social | social | 60 .. 70 |

Note: Results taken from several of the substudies listed in table 2.

However, two 'social risk' and one 'accident' scenario do not load well on 'their' factor (these were later slightly re-worded). The cluster analysis conveys a similar structure. Consequently, the scores for scenarios belonging to the same domain (4 or 5 items) were merged as summated rating scores to create domain-specific risk propensity indices; this is essential for analyses across questionnaires.

These variables can be utilized to check the domain-specificity of risk attitudes. The (low) correlations listed in *Table 6*, part A demonstrate that people's risk orientation is quite heterogeneous across domains. The correlations in part B indicate reasonable validity of the domain-specific risk attitude measures.

The intra-individual variability of risk attitudes was further analyzed, utilizing the self-assessed "personal variability in risk-taking". This variable correlates with an dispersion index, measuring the heterogeneity of the 4 domain scores, as follows: 0.47 if based on RSQ domain scores, 0.54 for holistic RPQ ratings.

In sum: Risk orientations can be measured separately for hazard domains, and it appears that risk propensity is not generic, rather, it reflects context-bound personality characteristics.

4.2.4 **RMQ results**

For the items of the Risk Motivation Questionnaire, several factor analyses were conducted, separately for hazard domains and one for mean responses per motivator item. These results, as well as findings from the qualitative part of the RMQ (not included here) were utilized to revise the RMQ (e.g., to decide which motivators to test for which hazard), and to group the about 40 motivators into 10 facets of risk-taking motivations.

The means for the relevance of main motivations for risky behavior, as rated for 5 types of hazards, are listed in *Table 7*. For each facet, selected typical items are given. The response pattern differs considerably for the 5 domains, especially between occupational and private risks. For example, for the prototypical type-A risks (e.g. rock-climbing), experience-seeking and excitement are the most salient motivations; regarding social risks (PS), prestige-seeking is a major influence; occupational physical risks (OP) are often accepted (or rather ignored) because of inertia or time pressure (cf. pertinent columns in *table 7*).

These data also demonstrate that the two types of physical risk, accident-inducing and illness-inducing hazards, are different not only in their possible negative outcomes but also in their 'attractiveness' for risk-takers. This supports the conceptual decision to separate these two categories when measuring domain-specific risk attitudes. Interestingly, self-devaluating & 'gloomy' views are not salient as risk-taking motivators.

In sum, the RMQ proved useful to examine not only how much but also why people are inclined to take a risk.

Table 7:

RMQ: Endorsement of motivators (single, grouped) per hazard type (Data: Study RAM)

Hazard types: **Personal** risks (hazards which might induce **Accidents** or **Illness** or **Financial losses** or **Social problems**); **Occupational** risks: **Physical harm**.
Endorsement scale: 1..5.

| <i>Kind of motivation</i> | <i>Rated relevance in relation to hazard type ... -></i> | | | | | <i>mean</i> |
|---|---|------------|------------|------------|------------|--------------|
| | PA | PI | PF | PS | OP | |
| Experience-seeking & Self-enhancement (8 items) | 3.4 | 2.2 | 2.3 | 3.1 | 1.5 | (2.6) |
| Satisfaction of seeking new experiences | 3.8 | 2.0 | 2.7 | 2.8 | 1.3 | |
| Gain in self-confidence | 3.4 | 2.3 | 1.9 | 3.6 | 1.4 | |
| Personal challenge (opportunity to test my own limits) | 3.6 | 1.7 | 2.3 | 3.4 | 1.8 | |
| Excitement & Pleasure from Being at Risk (4 items) | 3.2 | 2.0 | 2.4 | 1.9 | 1.2 | (2.1) |
| Excitement and thrill | 3.7 | 2.2 | 3.0 | 2.3 | 1.2 | |
| To enjoy being 'at risk' | 2.5 | 1.8 | 2.0 | 1.7 | 1.2 | |
| Physical Enjoyment (2 items) | 2.6 | 3.3 | | | | (3.0) |
| Physical pleasure, such as pleasant body feelings | 2.6 | 3.3 | | | | |
| Prestige-seeking (3 items) | 2.3 | 2.0 | 1.6 | 2.8 | 1.4 | (2.0) |
| Proving myself to others | 2.6 | 1.7 | 1.6 | 2.6 | 1.7 | |
| Attracting admiration | 2.2 | 2.3 | 1.6 | 3.0 | 1.3 | |
| Social Influences (6 items) | 1.8 | 1.8 | 1.7 | 1.8 | 1.5 | (1.7) |
| Others urged me to take part in the activity | 2.0 | 2.0 | 2.1 | 2.0 | 1.4 | |
| Wanting to keep up with my peers | 2.2 | 2.2 | 1.7 | 1.9 | 1.6 | |
| Don't want to be seen as 'cowardly' | 1.8 | 1.7 | 1.4 | 2.0 | 1.4 | |
| Financial Gain (2 items) | | | 4.1 | | | (4.1) |
| Earning additional income | | | 4.1 | | | |
| Chance of 'the big win' | | | 4.0 | | | |
| Inertia & Lack of Time or Means (6 items) | 1.6 | 1.7 | | | 3.2 | (2.4) |
| Too much effort (time-wise/cost-wise) to employ safety procedures | 1.5 | 1.8 | | | 3.0 | |
| Time pressure (lack of time for safety efforts) | 1.6 | | | | 3.7 | |
| Lack of safety-enhancing items/tools | | 1.6 | | | 2.9 | |
| Inexperience & Under-estimation of Hazard (3 items) | 2.3 | 2.3 | 2.0 | 2.0 | 2.5 | (2.2) |
| Don't see the activity as hazardous | 2.8 | 2.4 | 2.6 | 2.6 | 3.1 | |
| Underestimated the prob. and/or severity of adverse consequences | 2.4 | 2.8 | 1.8 | 1.6 | 2.8 | |
| Irrelevance of Risk Avoidance (4 items) | 1.2 | 1.6 | 1.4 | | 1.3 | (1.4) |
| My safety and health is not that important | 1.2 | 1.5 | | | 1.4 | |
| The future is too bleak to worry that much about my life | 1.1 | 1.3 | | | 1.1 | |

Note: Analysis based on RMQ version #2; several items were modified later when creating the final RMQ. For each motivator type, only sample items are listed. Empty cells: motivator not included for that hazard type.

4.3 Correlations between general and domain-specific risk attitudes

Which is the most important component of a person's general risk orientation? As the data in *Table 8* indicate, the overall risk propensity RPQ-O (rated as "own risk propensity compared to other people") correlates best with type-A risk propensity - it appears that accepting this type of physical hazards is the prototypical kind of risk propensity.

Table 8:

RPQ: Contingencies between general and domain-specific risk propensity (*Data: Study RAN*)

(A) Correlations of RPQ-O with RSQ indices

| | |
|---|----|
| RSQ-A physical/accident risk propensity | 49 |
| PSQ-I physical/illness risk prop. | 18 |
| RSQ-S social risk propensity | 20 |
| RSQ-F financial risk propensity | 28 |

(B) Multiple prediction of RPQ-O using RPQ variables

| Predictor | r_{PC} | Beta |
|---|----------|------|
| RPQ-A physical/accident risk propensity | 48 | 46 |
| PPQ-I physical/illness risk propensity | 46 | 28 |
| RPQ-S social risk propensity | 29 | 41 |
| RPQ-F financial risk propensity | 10 | 18 |
| multR = 0.70 (p < .01) | | |

Note: RPQ-O = self-assessed overall risk propensity.

4.4 Links to other constructs

The measures for risk propensity and cautiousness derived from the Risk Orientation Questionnaire were used to explore contingencies with constructs to which a conceptual link has been claimed by some authors. In *Table 9*, the relevant correlations are listed. (Cf. tables 1 and 2 for information about these instruments. Risk Acceptance was measured by the author's HEQ (Rohrmann 1994) as mean acceptance rating across a set of hazards.) The results include: moderate correlations with Zuckerman's sensation-seeking construct; moderate link to Eysenck's impulsiveness; and low relationships with risk acceptance.

These findings substantiate that the frequent equation of sensation-seeking and risk propensity is not valid - i.e., the two constructs overlap, but they don't measure the same. A high level of sensation-seeking can increase risky behavior (depending on a person's motives sensu *Table 7*), but not all types of experience-enhancing situations require to take risks (e.g., organized travel or web-surfing); a high level of risk propensity induces actions which may or may not lead to novel sensations.

Table 9:

Relationship of risk attitudes to other constructs (Data: Studies RAM, RAS)

| <i>Risk attitude variable</i> | <i>other constructs</i> | <i>correlation r_{ij}</i> |
|-------------------------------|-------------------------|--|
| ROQ-Propensity | SSS Sensation-seeking | ~ 50 |
| ROQ-Cautiousness | SSS Sensation-seeking | ~ -50 |
| ROQ-Propensity | EIQ Impulsiveness | ~ 40 |
| ROQ-Cautiousness | EIQ Impulsiveness | ~ -60 |
| ROQ-Propensity | HEQ Risk acceptance | ~ 10 |
| ROQ-Cautiousness | HEQ Risk acceptance | ~ -30 |

4.5 Project outcomes so far

In sum, it appears that the presumed risk attitude is *not* a 1-dimensional generic personality feature. How strong a person's risk propensity or risk aversion 'comes to life' depends on the type of hazard to be dealt with, such as physical risks, financial risks, and social risks; different mind-sets and motivations for accepting risks are relevant in these contexts. People's risk attitudes are likely to be influenced by other personality characteristics, such as sensation-seeking or impulsivity, but they are not just a derivative of such factors.

However, how exactly risk propensity/aversion affect risk acceptance and actual risk behavior is yet to be clarified.

5 Needs and plans for future research

5.1 Significance of risk attitude studies

Research into the conceptualization, measurement and effects of risk attitudes can provide several benefits:

- o For *fundamental* (theory-centered) research, clarifying discrepant findings about the validity of risk attitudes are to be gained;
- o for *methodological* research, appropriate instruments which reflect the complexity of people's thinking about risk situations can be provided;
- o For *applied* (problem-centered) research, understanding risk mind-sets is essential for designing hazard information and risk communication programs (in occupational or private contexts).

5.2 Necessity of further research

It is obvious that many facets of risk attitudes are not yet sufficiently clarified; this applies to both to the roots and the impacts of risk propensity/aversion. Main research needs include: Wider sampling (including actual risk-takers), systematic reliability analyses for instruments; empirical linking of risk attitude variables to risk perception and risk behavior, and further explicating of domain-specific validities.

As the reference variable "risk behavior" is hard to operationalize and multiple hazard domains are to be represented, such research requires serious efforts.

Advanced findings will be very valuable for the utilization of the four risk attitude scales developed in this project.

5.3 Cross-cultural extension

The fourth item in the research agenda (cf. section 2.1), " Are risk attitudes influenced by people's cultural background in terms of their ideological, professional and national affiliations?" has not yet been completed. As listed in *Table 2* (above), two studies are currently underway, one in Switzerland (data collection completed) and one in Germany (data collection running). Both use the German versions of the ROQ, RPQ, RSQ and RMQ, which are fully equivalent. Preliminary results (Grasmueck & Rohrmann 2002) are encouraging, as item structure and dimensionality of all instruments appear to be very similar to the findings presented here. Final analyses shall be conducted in 2005.

Further data collections are focussed on Asian countries. The first one began in late 2002 in HongKong/China, for which Chinese versions of the four risk attitude questionnaires had to be prepared. A small first sample of students at the Chinese University was taken in 2003, and a second one will follow in late 2004 and 2005.

This will be a critical investigation - trying to clarify whether risk attitudes can be measured in a way which is valid for 'western' and 'eastern' cultures (cf., e.g., Bond 1996, Ralston et al. 1992, Tse et al. 1988, Weber et al. 1998, Xie et al. 2003). If successful, individual and cultural differences can be analyzed in conjunction.

Finally the conducted cross-cultural risk *perception* research (cf. Rohrmann 1994, 2005) and the pursued cross-cultural risk *attitude* research shall be linked (cf the model in figure 1), given that both phenomena are vital antecedents of risk behavior.

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References

- Andresen, B. (1995). Risikobereitschaft (R) - der sechste Basisfaktor der Persönlichkeit: Konvergenz multivariater Studien und Konstruktionsexplikation. *Zeitschrift fuer Differentielle und Diagnostische Psychologie*, 16, 210-236.
- Andresen, B. (2000). Six basic dimensions of personality and a seventh factor of generalized dysfunctional personality: a diathesis system covering all personality disorders. *Neuropsychobiology*, 41, 5-23.
- Arch, E. (1993). Risk taking: A motivational basis for sex differences. *Psychological Reports*, 73, 3-11.
- Bond, M. H. (1996). *The handbook of Chinese psychology*. Hong Kong: Oxford University Press.
- Brenkelmann, J. C. (1991). *Die Lust auf Spiel und Risiko*. Zuerich: Varia Press.
- Bromiley, P., & Curley, S. P. (1992). Individual differences in risk taking. In J. F. Yates (Ed.), *Risk taking behavior* (pp. 87-132). Chichester: John Wiley & Sons.
- Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, 125, 367-383.
- Dahlbaeck, O. (1990). Personality and risk taking. *Personality and Individual Differences*, 11, 1235-1242.
- Edwards, W. (1954). The theory of decision making. *Psychological Bulletin*, 51, 380-417.
- Edwards, W. (1992). *Utility theories: measurements and applications*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Eysenck, S. B. G., & Eysenck, H. J. (1977). The place of impulsiveness in a dimensional system of personality description. *British Journal of Social and Clinical Psychology*, 16, 57-68.
- Eysenck, S. B. G., & Eysenck, H. J. (1978). Impulsiveness and venturesomeness: Their position in a dimensional system of personality description. *Psychological Reports*, 43, 1247-1255.
- Farley, F. (1987). The Farley Test for Risk Takers. *U.S. News & World Report*, January 26, 64.
- Farley, F. (1991). The type-T personality. In L. P. Lipsitt & L. L. Mitnick (Eds.), *Self-regulatory behavior and risk-taking: Causes and consequences* (pp. 371-382). Norwood/NJ: Ablex.
- Franken, R. E. (1988). Sensation seeking, decision making styles and preference for individual responsibility. *Personality and Individual Differences*, 9, 139-146.
- Grasmueck, D., & Rohrmann, B. (2001). *Motivation and Risiko*. Zuerich: Poster contribution to: Motivationspsychologisches Kolloquium 2001.
- Harrison, J. D., Young, J. M., Butow, P., Salkeld, G., & Solomon, M. J. (2005 in press). Is it worth the risk? A systematic review of instruments that measure risk propensity for use in the health setting. *Social Science & Medicine*.
- Hogarth, R. M. (1987). *Judgment and choice: The psychology of decision making*. New York: Wiley.
- Horvath, P., & Zuckerman, M. (1993). Sensation seeking, risk appraisal and risky behaviour. *Personality and Individual Differences*, 14, 41-52.
- Jackson, C., & Wilson, G. (1993). Mad, bad or sad? the personality of bikers. *Personality and Individual Differences*, 14, 241-242.
- Jackson, D., Hournay, L., & Vidmar, N. (1972). A four-dimensional interpretation of risk taking. *Journal of Personality*, 40, 483-501.
- Kahneman, D., & Tversky, A. (1979). Prospect theory - An analysis of decision under risk. *Econometrica*, 47, 263-292.
- Keinan, G., Meir, E., & Gome-Nemirovsky, T. (1984). Measurement of risk takers' personality. *Psychological Reports*, 55, 163-167.
- Keyes, R. (1985). *Chancing it: Why we take risks*. Boston, MA: Little, Brown and Co.
- Klebersberg, D., v. (1969). *Risikoverhalten als Persönlichkeitsmerkmal*. Bern: Huber.
- Knowles, E. S., Cutter, H. S. G., Walsh, D. H., & Casey, N. A. (1973). Risk-taking as a personality trait. *Social Behavior and Personality*, 123-136.

- Kogan, N., & Wallach, M. A. (1964). *Risk taking: A study in cognition and personality*. New York: Holt, Rinehart and Winston.
- Kogan, N., & Wallach, M. A. (1967). Risk taking as a funktion of the situation, the person and the group. *New directions in Psychology, III*, 111-278.
- Krueger, C., & Amelang, M. (1995). Bereitschaft zu riskantern Verhalten als Trait-Konstrukt und Test-Konzept: Zur Entwicklung eines Fragebogens auf der Basis des Handlungs-Haeufigkeits-Ansatzes. *Diagnostica, 41*, 35-52.
- Lamm, H., Lamm-Trommsdorf, G. & Kogan, N. (1970): Pessimism-optimism and risk-taking in individual and group contexts. *Journal of Personality and Social Psychology, 15*, 366-374.
- Levenson, M. R. (1990). Risk taking and personality. *Journal of Personality and Social Psychology, 58*, 1073-1080.
- Lindemann, B. (Oct. 1997). *Risk propensity scale*. Personal communication via E-mail.
- Lopes, L. L. (1988). Between hope and fear: The psychology of risk. *Advances in Experimental Social Psychology, 20*, 255-295.
- Lopes, L., & Ogden, G. (1998). *Modeling individual differences in risk attitude*. Paper presented at the Contribution to Psychonomics, Dallas.
- Lupton, D. (1999). *Risk*. New York: Routledge.
- MacCrimmon, K. R., & Wehrung, D. A. (1986). Assessing risk propensity. In L. Daboni, A. Montesano, & M. Lines (Eds.), *Recent developments in the foundations of utility and risk theory* (pp. 291-309). Dordrecht: Reidel Press.
- McCrimmon, K. R., & Wehrung, D. A. (1986). *Taking risks*. New York: The Free Press.
- Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research, 8*, 157-176.
- Pennings, J. M. E., & Smidts, A. (2000). Assessing the construct validity of risk attitude. *Management Science, 46*, 1337-1348.
- Ralston, D. A., Gustafson, D. J., Elsass, P. M., Cheung, F., & Terpstra, R. H. (1992). Eastern values: A comparison of managers in the United States, Hong Kong, and the People's Republic of China. *Journal of Applied Psychology, 77*(5), 664-671.
- Rim, Y. (1964). Social attitudes and risk taking. *Human relations, 17*, 259-265.
- Rohrmann, B. (1991). *The EQS Questionnaire on Decision Making (WOLFRAM 1982) - English version*. Dept. of Psychology, Univ. of Melbourne.
- Rohrmann, B. (1994). Risk perception of different societal groups: Australian findings and cross-national comparisons; *Australian Journal of Psychology, 46*, 150-163.
- Rohrmann, B.: (1998). The risk notion - epistemological and empirical considerations; in: Stewart, M.G., & Melchers, R.E. (Eds.): *Integrative risk assessment*; Rotterdam: Balkema.
- Rohrmann, B. (1999). Risk perception research - Review and documentation; Research Center Juelich: RC Studies #68. <Available via www.fz-juelich.de/mut/hefte/heft_69.pdf>
- Rohrmann, B. (2005). Perception of risk: Research, results, relevance. In Gough, J. (Ed.), *Sharing the future*. Christchurch: CAE publications.
- Schneider, K., & Rheinberg, F. (1996). Erlebnissuche und Risikomotivation. In M. Amelang (Ed.), *Temperaments- und Persoenlichkeitsunterschiede* (pp. 407-459). Goettingen: Hogrefe.
- Schubert, R., Brown, M., Gysler, M., Brachinger, H.W. (1999). Financial Decision Making: Are Women Really More Risk Averse? *The American Economic Review, 89*, 381-385.
- Schwenkmezger, P. (1977). *Risikoverhalten und Risikobereitschaft*. Weinheim: Beltz.
- Semler, G. (1994). *Die Lust an der Angst - Warum sich Menschen freiwillig extremen Risikien aussetzen*. Muenchen.
- Shure, G. H., & Meeker, R. J. (1967). A personality/attitude schedule for use in experimental bargaining studies. *Journal of Psychology, 65*, 233-252.
- Siegrist, M., Cvetkovich, G., Gutscher, H. (2002). Risk preference predictions and gender stereotypes. *Organizational Behavior and Human Decision Processes, 87*, 91-102.

- Sitkin, S. B., & Pablo, A. L. (1992). Reconceptualizing the determinants of risk behavior. *Academy of Management Review*, 17, 9-38.
- Slovic, P. (1962). Convergent validation of risk-taking measures. *Journal of Abnormal and Social Psychology*, 65, 60-71.
- Slovic, P. (1972). Information processing, situation specificity, and the generality of risk-taking behavior. *Journal of Personality and Social Psychology*, 22, 128-134.
- Trimpop, R. M. (1994). *The psychology of risk taking behavior*. Amsterdam : New Holland.
- Trimpop, R. M., Kerr, J. H., & Kirkcaldy, B. D. (1999). Comparing personality constructs of risk-taking behavior. *Personality and Individual Differences*, 26, 237-254.
- Tse, D. K., Lee, K., Vertinsky, I., & Wehrung, D. A. (1988). Does culture matter? A cross-cultural study of executives' choice, decisiveness and risk adjustment. *Journal of Marketing*, 52, 81-95.
- Waerneryd, K. E. (1996). Risk attitudes and risky behavior. *Journal of Economic Psychology*, 17, 749-770.
- Weber, E. (1988). A descriptive measure of risk. *Acta Psychologica*, 69, 185-203.
- Weber, E. U., Hsee, C. K., & Sokolowska, J. (1998). What folklore tells about risk and risk taking? Cross-cultural comparisons of American, German and Chinese proverbs. *Organizational and Behavior and Human Decision Processes*, 75, 170-186.
- Weber, E. U., Blais, A., & Betz, N. E. (2004 in press). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*.
- Weber, M., & Camerer, C. (1987). Recent developments in modelling preferences under risk. *OR Spektrum*, 129-151.
- Wilde, G. J. S. (1988). Risk homeostasis theory. *Ergonomics*, 31, 491-506.
- Wolfram, H. (1982). *Entscheidungs-Q-Sort*. Berlin (Ost): Psychodiagnostisches Zentrum, Humboldt-Universitaet.
- Xie, X., Wang, M., & Xu, L. (2003). What risks are Chinese people concerned about? *Risk Analysis*, 23, 685-695.
- Zaleskiewicz, T. (2001). Beyond risk seeking and risk aversion: personality and the dual nature of economic risk taking. *European Journal of Psychology*, 15, s105-122.
- Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale: Earlbaum.
- Zuckerman, M. (1991). Sensation seeking: The balance between risk and reward. In L. P. Lipsitt & L. L. Minick (Eds.), *Self-regulatory behavior and risk taking: Causes and consequences* (pp. 143-152). Norwood: Ablex.

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