

1. State of Research

1.1 Research activities performed, milestones and deliverables accomplished

Research activities	Milestones
Development of the project design Development of the treatments Development of the questionnaire Pretest and necessary adaptation of the questionnaire	finished in Mai/June 2002
Experimental investigation (part I) (include the evaluation of two risk communication tools (Ecolog and SSK)	finished in December 2002
(1) Research questions: Influence of information frames on laypersons' risk appraisal Design: 2x2x2x Sample: 103 Pb from Germany and 150 Pb from Austria	finished in August 2002
Deliverables accomplished: - cf. insights 1 - Oral presentation at the 12 th SRA Europe Annual Meeting 2002 of the Society for Risk Analysis. 21.7.02 – 24.7.02, Berlin	
(2) Research questions: laypersons perception of verbal labels describing different strengths of evidence Design: classification of different evidence-labels on a rating scale sample: 103 Pb from Germany and 150 Pb from Austria	finished in December 2002
deliverables accomplished: - cf. insights 2 to 4 below	
(3) Research questions: modification of tools to optimize laypersons' understanding of evidence labels Design: Classification of different labels on a rating scale Sample: 50 Pb from Austria	finished in Mai 2003
(4) Research questions: How comprehensible are current communication tools? Design: Qualitative Analysis of current brochures Sample: 9 brochures of different stakeholders from Switzerland, Germany and Austria	finished in October 2003
Deliverables accomplished: - cf. insights 5 - oral presentation at the World Congress on Risk. Society for Risk Analysis. 22.6.03 – 25.6.03, Brussels.	
- Ph.D. Thesis at the University of Kassel, Germany - at least two publications in preparation in international Journals (Risk Analysis, Risk Research) - at least two publications in preparation in German Journals	will be finished till spring 2004

1.2 Findings (insights)

General Insights: Under the layperson's perspective both researched evidence characterization formats lack clarity, transparency, and understanding. As a consequence for risk communication, more emphasis must be placed on transparent definitions of evidence-labels.

In order to provide an effective and transparent communication of different strengths of evidence, labels have to be evaluated with regard to the layperson-oriented perspective before being implemented in brochures.

Insights 1: The choice of the information format is important for the risk appraisal. The strength of evidence lead to different risk appraisal in the table-format, but not in the text-format.

Insight 2: Both communication formats, which are created by experts in order to characterize the strengths of evidence, were not properly understood by laypersons.

Insight 3: The used verbal labels (e.g. suspicion or consistent hint) were not properly understood by laypersons.

Insight 4: Even in the case in which definitions for categories were given, laypersons had not properly understood the categories. In contrast to the definitions of SSK, the Ecolog-definitions did not improve the laypersons' understanding of the labels.

Insight 5: Laypersons' perception of evidence -labels seems to be improved if (1) labels are chosen from the same word-family, and if (2) quantifiers are designed according to interval-scaling.

1.3. Problems

Students' willingness to participate in experimental studies was lower than expected. Therefore, one experiment has to be conducted again which caused a delay in the schedule.

Due to unexpected results in the first unit (Experiment 1 and 2) of the investigation, new questions evolved. To be adoptive, new research question were raised and had to be tested in the second research unit.

2. Annex

2.1. Publications

Proceedings:

Thalmann, A. T. (2002) The Impact of Information Frames on the Laypersons' Risk Appraisal, in: Wiedemann, P.M., Clauberg, M. (eds.) Integrated Risk Management: Strategic, Technical, and Organizational Perspectives, Final Programme of 12th SRA Europe Annual Meeting 2002 of Society for Risk Analysis, Berlin, July 21-24, 2002, 76.

Oral Presentations:

Thalmann, A.T. (2003). Communicating Uncertainty: Effective Communication of Different Strengths of Evidence to Laypersons. World Congress on Risk. Society for Risk Analysis. 22.6.03 – 25.6.03, Brussels.

Thalmann, A.T. (2002). The Impact of Information Frames on the Laypersons' Risk Appraisal. 12th SRA Europe Annual Meeting 2002 of the Society for Risk Analysis. 21.7.02 – 24.7.02, Berlin.

Publications in preparation:

Thalmann, A..T. (in Vorbereitung). *Weder schwarz noch weiss: Was Experten meinen und Laien verstehen... Bewertung von Strategien zur Vermittlung undeutlicher Risiken und Optimierungsvorschläge für eine laienorientierte Kommunikation* (Arbeitstitel). Unveröffentlichte Dissertation: Universität Gesamthochschule Kassel.

Thalmann, A.T. (In Vorbereitung). The Impact of Information Frames on the Layperson's risk perception.

Thalmann, A.T. (In Vorbereitung). The Evaluation of Communication Strategies of Different Strengths of Evidence from a Consumer-oriented Perspective.

Thalmann, A.T., Bernhard, M., Wiedemann, P, M. (in Vorbereitung). Wie verständlich sind Broschüren? Qualitative Analyse von Informationsmaterialien zum Thema EMF des Mobilfunks. Programmgruppe Mensch Umwelt Technik. Jülich: Forschungszentrum Jülich GmbH.

2.3 Documents: Report of the Research – Project

Introduction in the problem

The need of communication approaches regarding uncertainties in scientific knowledge continues to play an important role. Dealing with uncertainty is a part of risk science (cf. Row, 1994) but its significance increases due to fast-developing technologies. In particular taking up the precautionary perspective the gaps in the scientific knowledge draw the attention of experts (cf. Wiedemann & Brüggemann, 2001; Wiedemann et al., 2001). Although guidelines and tools based on theoretical knowledge in the social and communication sciences are nicely developed (cf. Covello et al., 1989; Jungermann, Rohrmann & Wiedemann, 1991; Wiedemann, 1999; Wiedemann & Schütz, 2000), deficits of empirical studies is to be pinpointed regarding this issue. There are still many open questions in risk communication when scientific knowledge lacks. A good example of uncertainty in the scientific knowledge is the intention felt issue of radiofrequency electromagnetic fields (EMF). In the center of the debate is the question whether health risks below the limit values or not can be detected (cf. Wiedemann, Schütz & Thalmann, 2002). Furthermore, regarding risk communication the question is raised how to communicate effectively different strengths of evidence to laypersons. However, communication tools are given. Their effectiveness is not tested. Exactly this deficit in scientific research represents the major issue in this investigation.

The communication tools in the debate on EMF and health risk

According to current EMF-Debate, several risk assessments were realized in the last years and various communication strategies could be identified. Examples of such risk communication tools are report of Bundesamt für Umwelt, Wald und Landwirtschaft in Switzerland (2003), the Californian Health Department Report in USA (2002), the Recommendation of the Strahlenschutzkommission of Germany (2001) and the Report of the Ecolog-Institut in Germany (2002). Each of them attempts to communicate the current state of knowledge to laypersons utilising specific characteristics regarding the presentation of information: On the one side, tables to present the scientific knowledge in a compressed way and on the other side, a system describing the strengths of evidence. Regarding these strategies the question can be raised if laypersons will understand this kind of communication and if so, whether they will be able to process the communicate information critically.

Research Question – Design – Key Results

Based on the following research questions two of these communication tools – the one of Ecolog and the one of the SSK – were evaluated in several experimental studies: (Q1) Do different characteristics of information (e.g. information frames) provoke differences in appraising risks among laypersons? (Q2) How do laypersons perceive verbal labels describing different strengths of evidence?

Based on the results of the first experimental study new research questions were developed and tested by new experimental studies. One of these is the following: (Q3) Which modifications concerning evidence labels optimize the laypersons' understanding of communication tools describing different strengths of evidence?

As theoretical background the ELM of Petty and Cacioppo (1981, 1986) and their enhancements (Bakker, 1999, Smith, 1996) were chosen and adapted for the first research question. The second as well as the third research question about the comprehensiveness of the evidence labels describing different strengths of evidence is based on literature about verbal description of numeral quantities and individual meanings of such verbal description (Brun & Teigen, 1988; Budescu & Wallsten, 1985; Erev & Cohen, 1990; Jablonowski, 1994; Moxey & Salford, 2000; Mosteller & Youtz, 1990.). Other conceptions about comprehensibility are integrated as well.

For the first research question a 2 x 2 x 2 design with following three factors was chosen: The first factor concerns the format of the information (text or table), the second factor concerns the quality of the arguments (weak evidence vs. strong evidence) and the third factor was designed regarding the quantity of arguments (e.g. 4 arguments vs. 10 arguments). The impact was measured on a rating scale regarding the risk appraisal. To test the second research question a specific rating scale from 0% to 100% strengths of evidence was used to categorize the participants' meanings of the evidence labels. Both research questions were tested on two samples with 103 students from Germany (sample 1)¹ and 153 students from Austria (sample 2).

One of the results concerning the first research question is the different impact of the identical information presented in two different format on the risk appraisal. As shown in Figure 1, a statistical significant interaction-effect ($F(1)=6.63$, $p=.012$) occurs between the information frames (table or text) and the quality of arguments (strength of evidence). A change of the

¹ Because of the small number of participant of sample 1 the third factor "quantity" could not be realized.

strengths of evidence has an influence the risk appraisal of the participants in the case of the table-presentation, but not in the case of the text-presentation. In the table-format the risk was perceived higher when “strong hint” and lower when “weak hint” was mentioned. In the text format both variations of the strengths of evidence lead to the same perceived risk-level.

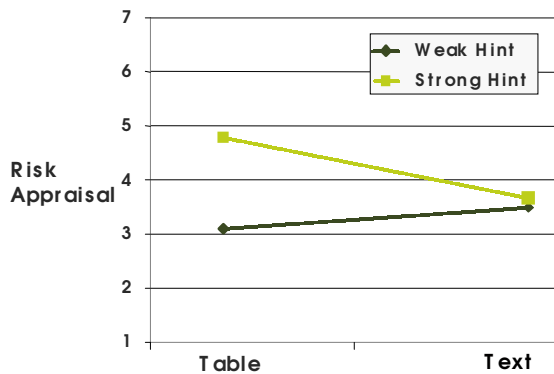


Figure 1: Interaction-effect between the two components information frames and strengths of evidence

Information presented in a table format seems to help people to proof the quality of arguments more critically compared with the information that were presented in a text-format. To conclude, the choice of the information frame plays a crucial role in laypersons’ risk appraisal.

The results concerning the perception of different verbal labels describing the strengths of evidence (cf. 2nd research question) were very disillusioning regarding the risk communication perspective. As visualized in the Figures below, both Evidence-labels – the five of Ecolog and the three of SSK – were not properly understood by laypersons.

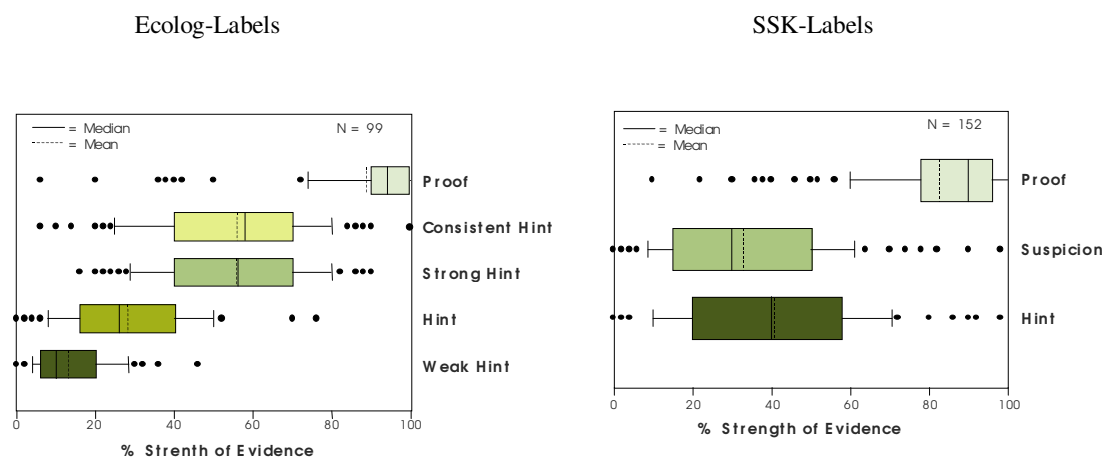


Figure 2: Laypersons’ perception of the five Ecolog-labels and of the three SSK-labels

In both system describing different strengths of evidence the meaning of the labels are not clear: There are a lot of overlaps, all labels spread very widely and some labels were perceived as identical (cf. strong hint and consistent hint). As shown in Figure 3, the definitions do not necessarily improve laypersons’ understanding of the evidenc -labels:

In contrast to the definitions of SSK – the perception of the Ecolog-definitions is even worse than of the labels: Regarding the Ecolog-definitions there are more overlaps between different definitions of a labels and higher variance of each definition of a label. The comprehensibility

of the Ecolog Definitions for all evidence-labels is very low; the participants do not understand them. In the case of the SSK-Definition of their labels an improvement in the laypersons' perception is found. But also here the result shows overlaps between the three definitions of the labels. And the variance of each definition is smaller but still exists.

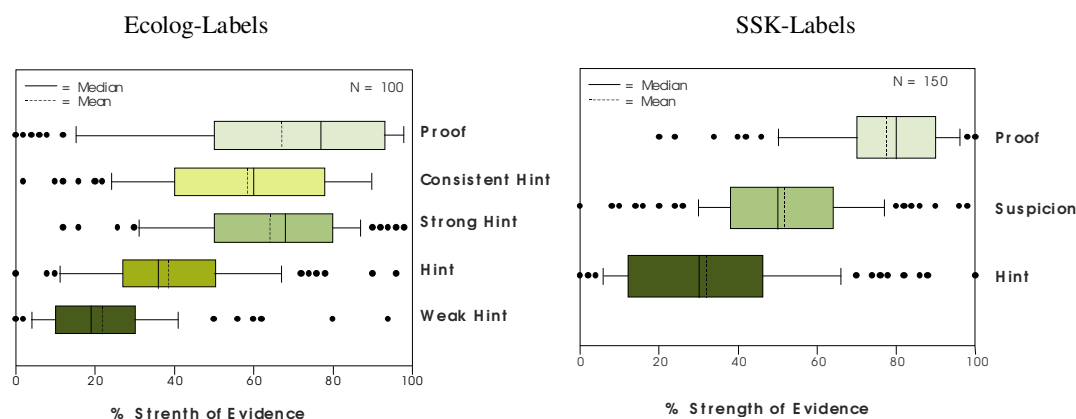


Figure 3: Laypersons' perception of the five Ecolog-definitions and of the three SSK-definitions

Based on these rather disillusioning outcomes concerning the laypersons' perception of labels describing different strengths of evidence a new focus was placed on the comprehensiveness of information tools. On the one site the question was raised how to improve the comprehensiveness of evidence labels (Q3). On the other site the question was raised to which extent current information tools meet this need of comprehensiveness (Q4). To test the third question 50 students (sample 3) were asked to assign given definitions of different strengths of evidence to different new labels (e.g. weak hint and strong hint) which were anticipated as more comprehensible than the one of the second experiment. The fourth research question was tested by applying qualitative analysis. Nine brochures taken from Switzerland, Germany and Austria were evaluated in a qualitative approach with regard to their intention to inform laypersons adequately.

The third research question based on three hypothesized reasons for the lack of understanding of the evidence labels of Ecolog and SSK: First, labels of different word-families (e.g. suspicion and hint) are ambiguous regarding their distinctiveness. Second, quantifiers which do not describe an interval-scale (e.g. consistent and strong) are ambiguous regarding their distinctiveness. Third, definitions of evidence-labels which are not mutually exclusive are ambiguous regarding their meaning.

Using evidence-labels which take in account these three explanations improve the laypersons’

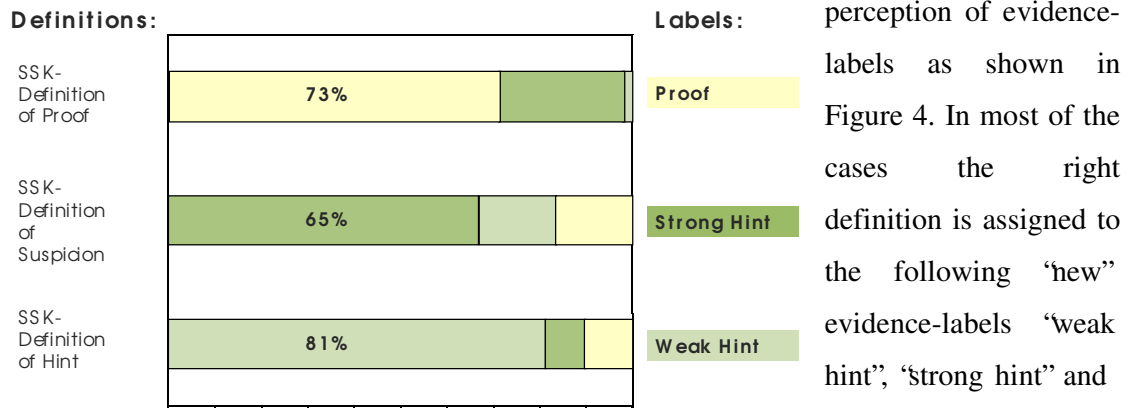


Figure 4: Percentage of right Classification of labels and definitions

perception of evidence-labels as shown in Figure 4. In most of the cases the right definition is assigned to the following “new” evidence-labels “weak hint”, “strong hint” and “proof”. Although the improvement in the

laypersons’ comprehensiveness is small, the results shows clearly that is possible to optimize with a systematic layperson-oriented construction of communication tools.

The promising approach for the fourth research question is a qualitative study of different information tools (e.g. brochure of BUWAL or of the Bürgerwelle) with regard to their comprehensiveness and their ambition to inform people adequately. This qualitative study is connected with a diploma thesis at MUT and the University of Innsbruck (cf. Bernhard, in preparation). A major outcome is that only three of nine brochures are highly rated on on a general comprehensive score. Further results and insights of these part can be expected soon.

Based on the results, the following new research questions can be developed, which are tested in a connected experimental investigation: (Q5) Do different characteristics of the content of information (e.g. accentuation of exclusively pro-arguments or accentuation of exclusively frightful disorders) provoke differences in appraising risks among laypersons? (Q6) Which role play beliefs or attitudes on the part of laypersons in appraising risks based on specific information? These two questions are investigated by a classical experimental design (2 x 4 design with factor 1 as the kind of disorders and Factor 2 as the kind of argumentation and an additional natural factor about three kinds of attitude-groups) and are realized in the doctoral thesis (cf. Thalmann, in preparation).

Conclusion

As an overall conclusion we can highlight to the fact that there are in current communication tools a lack of clarity, of transparency and of understanding. To reach an effective and transparent communication of different strengths of evidence, tools have to be evaluated with regard to a layperson-oriented perspective before being implemented in brochures.

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